



Technical Information

Liquiphant M FTL50(H), FTL51(H)

Vibronic

Point level switch for all kinds of liquids

Suitable for use in hazardous areas, food and pharmaceuticals

25472-101-V1A-JL10-W0011 02

Supplier Document Status

Code 1

Order 1 = Work may proceed, submit verified print
Order 2 = Review and resubmit. Work may proceed subject to resolution of indicated comments
Order 3 = Review and resubmit. Work may not proceed.
Order 4 = Review and resubmit. Work may proceed.
Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by the Supplier and does not relieve the Supplier from full compliance with contractual obligations.
Responsible Engineer - **Rehani, Tanmay**
Date Signed - 01/25/2011
VPTL - VPTL-02108
Equipment No. - 121-HRDBP-BOLT0301



The reliable function is not affected by flow, turbulence, bubbles, foam, vibration, solids content or buildup. The Liquiphant is thus the ideal substitute for float switches.

FTL50:

Compact design, ideal for mounting in pipes and for installation in areas difficult to access

FTL51:

With extension pipe up to 115" (3 m) Optional lengths up to 235" (6 m) available

FTL50H, FTL51H:

With polished tuning fork and easy-to-clean process connections and housings for food and pharmaceutical applications

High corrosion-resistant AlloyC4 (2.4610), AlloyC22 (2.4602) is available for the fork and process connections for applications in very aggressive liquids.

International approvals certify use in hazardous areas.

Your benefits

- Use in safety systems requiring functional safety to SIL2/SIL3 in accordance with IEC 61508/IEC 61511-1
- Large number of process connections to choose from: universal usage
- Suitable for use in sterile applications in the life science industry (device design according to ASME BPE-2007)
- PROFIBUS PA protocol: for commissioning and maintenance
- No adjustment: quick, low-cost startup
- No mechanically moving parts: no maintenance, no wear, long operating life
- Monitoring of fork for damage: guaranteed function
- FDA-approved material (PFA Edlon)
- Compact stainless steel housing (optional): the IP69K protection rating guarantees the unit remains permanently tight and can keep out water even in the event of intensive cleaning or flooding for several hours.

Application

The Liquiphant M is a point level switch which can be used in all liquids

- for process temperatures from -58 to +300°F (-50 to 150°C)
- for pressures up to 1450 psi (100 bar)
- for viscosity up to 10,000 cP (10,000 mm²/s)
- for densities ≥ 0.5 or ≥ 0.7 SGU (0.5 g/cm³ or ≥ 0.7 g/cm³), other settings available on request
- foam detection on request

Table of contents

Application	4	Connectable load	12
Point level detection	4		
Function and system design	4	Electronic insert FEL56 (NAMUR L-H edge)	13
Measuring principle	4	Power supply	13
Modularity	4	Electrical connection	13
Electronic versions	5	Output signal	13
Electronics for continuous density measurement	5	Signal on alarm	13
Galvanic isolation	5	Connectable load	13
Design	5		
Input	5	Electronic insert FEL58 (NAMUR H-L edge)	14
Measured variable	5	Power supply	14
Measuring range (detection range)	5	Electrical connection	14
Density	5	Output signal	14
		Signal on alarm	14
		Connectable load	14
Electronic insert FEL51 (AC 2-wire)	6	Electronics FEL58 (NAMUR H-L edge, in compact housing)	15
Power supply	6	Power supply	15
Electrical connection	6	Electrical connection	15
Output signal	6	Output signal	15
Signal on alarm	6	Signal on alarm	15
Connectable load	6	Connectable load	15
Electronics FEL51 (AC, in compact housing)	7	Electronic insert FEL57 (PFM)	16
Power supply	7	Power supply	16
Electrical connection	7	Electrical connection	16
Output signal	7	Output signal	17
Signal on alarm	7	Signal on alarm	17
Connectable load	7	Connectable load	17
Electronic insert FEL52 (DC PNP)	8	Electronic insert FEL50A (PROFIBUS PA)	18
Power supply	8	Power supply	18
Electrical connection	8	Electrical connection	18
Output signal	8	Output signal	19
Signal on alarm	8	Signal on alarm	19
Connectable load	8		
Electronics FEL52 (DC PNP, in compact housing)	9	Electronic insert FEL50D (density)	20
Power supply	9	Power supply	20
Electrical connection	9	Electrical connection	20
Output signal	9	Signal on alarm	20
Signal on alarm	10	Adjustment	20
Connectable load	10	Operating principle	21
		Light signals	21
Electronic insert FEL54 (AC/DC with relay output)	11	Connection and function	22
Power supply	11	Connecting cables	22
Electrical connection	11	Safety mode	22
Output signal	11	Switching time	22
Signal on alarm	11	Switch-on behavior	22
Connectable load	11		
Electronic insert FEL55 (8/16 mA)	12	Performance characteristics	22
Power supply	12	Reference operating conditions	22
Electrical connection	12	Maximum measured error	22
Output signal	12	Repeatability	22
Signal on alarm	12	Hysteresis	22

Influence of medium temperature	22
Influence of medium density	22
Influence of medium pressure	22

Operating conditions 23

Installation	23
Examples of mounting	23
Orientation	25

Environment 25

Ambient temperature range	25
Ambient temperature limits	25
Storage temperature	26
Climate class	26
Degree of protection	26
Vibration resistance	26
Electromagnetic compatibility	26

Medium conditions 26

Medium temperature	26
Thermal shock	26
Medium pressure pe	26
Test pressure	27
State of aggregation	27
Density	27
Viscosity	27
Solids content	27
Lateral loading capacity	27

Mechanical construction 27

Design	27
Dimensions	29
Weights	33
Material	33
Process connections	34

Human interface 35

Electronic inserts	35
Compact housing	35
Operating concept	38

Certificates and approvals 39

General approvals	39
CRN approval	39
Other certificates	39
Combinations of housings and electronic inserts	39

Ordering information 41

Liquiphant M FTL50, FTL51 product structure	41
Liquiphant M FTL50H, FTL51H product structure	46

Accessories 49

Welding neck	49
G $\frac{3}{4}$, d=55 with flange for flush-mounted installation	51
G1, d=60 with flange for flush-mounted installation with sealing surface	52
G1, Sensor can be positioned	52
RD52, Sensor can be positioned	53
DRD DN50 (65 mm), for flush-mounted installation of devices with DRD flange	53

Flange	54
Flange	54
Sliding sleeves for unpressurized operation	54
High pressure sliding sleeves	55
Transparent cover	56
Cover with sight glass	56
Circular connector	56

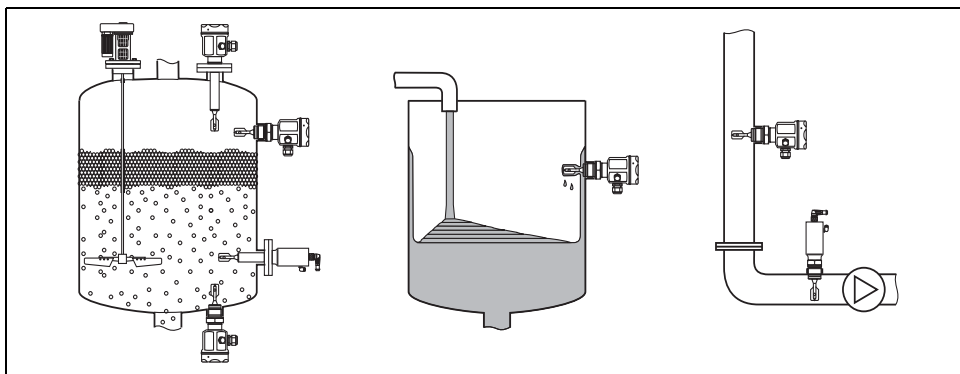
Documentation 57

Operating Instructions	57
Technical Information	57
Functional safety (SIL)	58
Safety Instructions (ATEX)	59
Safety Instructions (NEPSI)	59
Control Drawings	59
System information	60

Application

Point level detection

Maximum or minimum detection in tanks or pipes containing all kinds of liquids, including use in hazardous areas, food and pharmaceuticals.



L00-FTL5xxxx-11-05-xx-xx-000

Function and system design

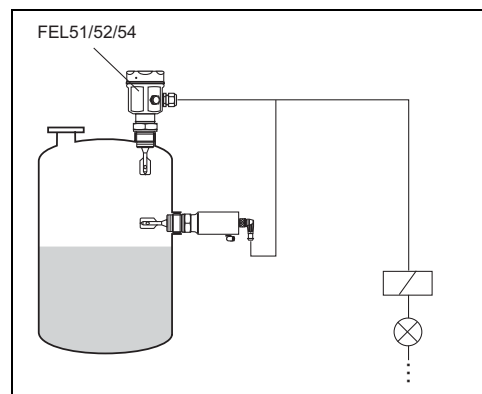
Measuring principle

The sensor's fork vibrates at its intrinsic frequency. This frequency is reduced when covered with liquid. This change in frequency causes the point level switch to switch.

Modularity

Point level switch

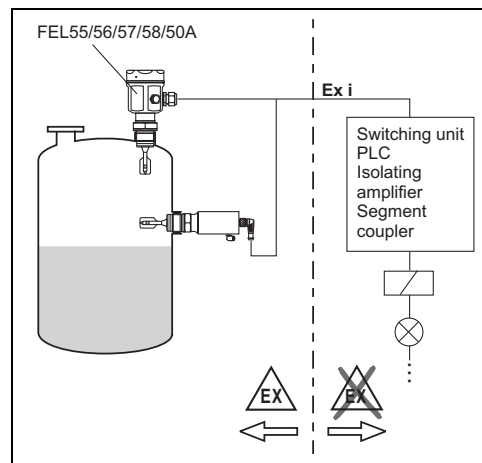
Liquiphant M FTL with electronic versions
FEL51, FEL52, FEL54



L00-FTL5xxxx-15-05-xx-xx-000

Point level switch

Liquiphant M FTL with electronic versions
FEL55, FEL56, FEL57, FEL58
for connecting to a separate switching unit
or an isolating amplifier FEL50A
for connecting to a PROFIBUS PA segment



L00-FTL5xxxx-15-05-xx-en-000

Electronic versions	FEL51: Two-wire AC version; Switches the load directly into the power supply circuit via an electronic switch.
	FEL52: Three-wire DC version; Switches the load via the transistor (PNP) and separate connection.
	FEL54: Universal current version with relay output; Switches the loads via 2 floating change-over contacts.
	FEL55: For separate switching unit; signal transmission 16/8 mA on two-wire cabling.
	FEL56: For separate switching unit; signal transmission L-H edge 0.6 to 1.0 / 2.2 to 2.8 mA to EN 50227 (NAMUR) on two-wire cabling.
	FEL58: For separate switching unit; signal transmission H-L edge 2.2 to 3.5 / 0.6 to 1.0 mA to EN 50227 (NAMUR) on two-wire cabling. Checking of connecting cabling and other devices by pressing a key on the electronic insert.
	FEL57: For separate switching unit; PFM signal transmission; Current pulses superposed on the power supply along the two-wire cabling. Cyclical checking from the switching unit without changing levels.
	FEL50A: For connecting to PROFIBUS PA; Cyclic and acyclic data exchange acc. to PROFIBUS-PA Profile 3.0 Discrete Input

Electronics for continuous density measurement	FEL50D: For connecting to Density Computer FML621
---	---

Galvanic isolation	FEL51, FEL52, FEL50A: Between sensor and power supply
	FEL54: Between sensor and power supply and load
	FEL55, FEL56, FEL57, FEL58, FEL50D: See connected switching unit

Design	FTL50: Compact
	FTL51: With extension pipe
	FTL50H: Compact, with polished tuning fork and hygienic process connections
	FTL51H: With extension pipe, polished tuning fork and hygienic process connections

Input

Measured variable	Level (limit value)
Measuring range (detection range)	FTL50: Depends on mounting point
	FTL51: Depends on mounting point and the pipe extension. Standard 118" / 3000 mm (up to 236" / 6000 mm on request)
Density	Adjustment on the electronic insert > 0.5 SGU (0.5 g/cm ³) or > 0.7 SGU (0.7 g/cm ³), other on request

Electronic insert FEL51 (AC 2-wire)

Power supply

Supply voltage: 19 to 253 V AC
 Power consumption: < 0.83 W
 Residual current consumption: < 3.8 mA
 Short-circuit protection
 Overvoltage protection FEL51: overvoltage category III

Electrical connection

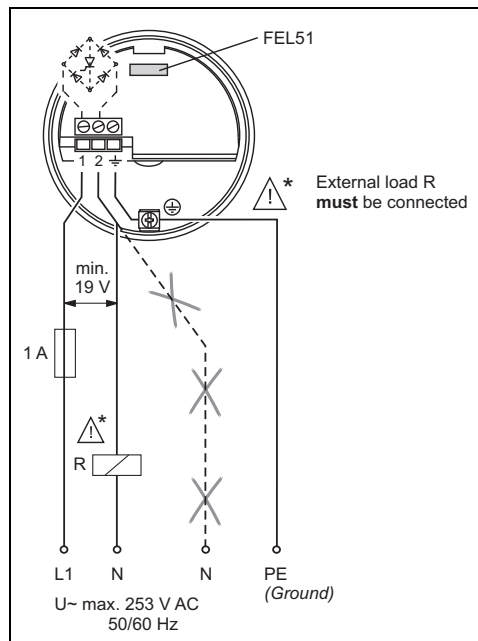
Two-wire AC connection

Switches the load directly into the power supply circuit via an electronic switch.

Always connect in series with a load!

Check the following:

- The residual current in blocked state (up to 3.8 mA)
- That for low voltage
 - the voltage drop across the load is such that the minimum terminal voltage at the electronic insert (19 V) when blocked is not undershot.
 - the voltage drop across the electronics when switched through is observed (up to 12 V)
- That a relay cannot de-energize with holding power below 3.8 mA.
 If this is the case, a resistor should be connected parallel to the relay. An RC module is available under the modification number MVT2Y1278.
- When selecting the relay, pay attention to the holding power / rated power (see "Connectable load")



L00-FTL5xxxx-04-05-xx-en-007

Output signal

I_L = load current (switched through)

< 3.8 mA = residual current (blocked)



= lit



= unlit

L00-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal	LEDs green	red
Max.		1 I_L 2		
		1 < 3.8 mA 2		
Min.		1 I_L 2		
		1 < 3.8 mA 2		

L00-FTL5xxxx-04-05-xx-xx-001

Signal on alarm

Output signal on power failure or in the event of damaged sensor: < 3.8 mA

Connectable load

- For relays with a minimum holding power/rated power > 2.5 VA at 253 V AC (10 mA) or > 0.5 VA at 24 V AC (20 mA)
- Relays with a lower holding power/rated power can be operated by means of an RC module connected in parallel.
- For relays with a maximum holding power/rated power < 89 VA at 253 AC or < 8.4 VA at 24 V AC
- Voltage drop across FEL51 max. 12V
- Residual current with blocked electrical switch: max. 3.8 mA.
- Load switched directly into the power supply circuit via the thyristor.
 Transient (40 ms) max. 1.5 A, max. 375 VA at 253 V or max. 36 VA at 24 V (not short-circuit proof)

Electronics FEL51 (AC, in compact housing)

Power supply

Supply voltage: 19 to 253 V AC
 Power consumption: < 0.83 W
 Residual current consumption: < 3.8 mA
 Short-circuit protection
 Overvoltage protection FEL51: overvoltage category III

Electrical connection

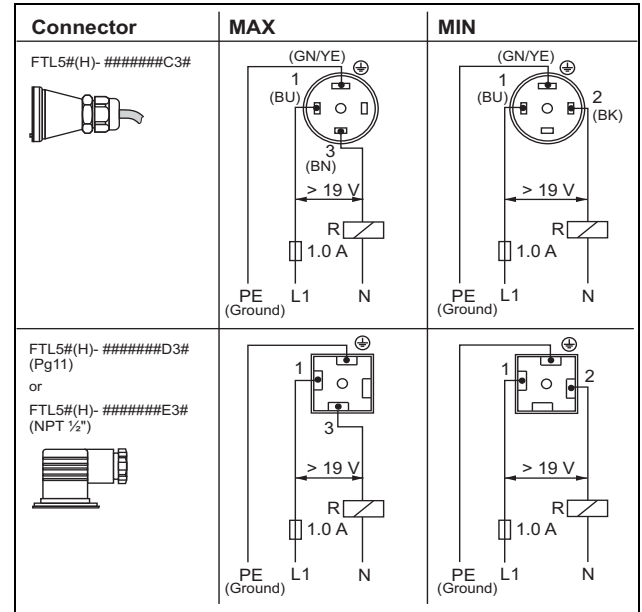
Two-wire AC connection

Switches the load directly into the power supply circuit via an electronic switch.

Always connect in series with a load!

Check the following:

- The residual current in blocked state (up to 3.8 mA)
- that for low voltage
 - the voltage drop across the load is such that the minimum terminal voltage at the electronic insert (19 V) when blocked is not undershot.
 - the voltage drop across the electronics when switched through is observed (up to 12 V)



L00-FTL5xxxx-04-05-xx-en-008

- That a relay cannot de-energize with holding power below 3.8 mA.
 If this is the case, a resistor should be connected parallel to the relay (RC module available on request).

Output signal

I_L = load current (switched through)
 < 3.8 mA = residual current (blocked)

= lit
 = unlit

L00-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal	LEDs green	red
Max.		$1 \xrightarrow{I_L} 3$		
		$1 \xrightarrow{< 3.8 \text{ mA}} 3$		
Min.		$1 \xrightarrow{I_L} 2$		
		$1 \xrightarrow{< 3.8 \text{ mA}} 2$		

L00-FTL5xxxx-04-05-xx-xx-001

Signal on alarm

Output signal on power failure or in the event of damaged sensor: < 3.8 mA

Connectable load

- For relays with a minimum holding power/rated power > 2.5 VA at 253 V AC (10 mA) or > 0.5 VA at 24 V AC (20 mA)
- Relays with a lower holding power/rated power operated by means of an RC module connected in parallel.
- For relays with a maximum holding power/rated power < 89 VA at 253 AC or < 8.4 VA at 24 V AC
- Voltage drop across FEL51 max. 12V
- Residual current with blocked electrical switch: max. 3.8 mA.
- Load switched directly into the power supply circuit via the thyristor.
 Transient (40 ms) max. 1.5 A, max. 375 VA at 253 V or max. 36 VA at 24 V (not short-circuit proof)

Electronic insert FEL52 (DC PNP)

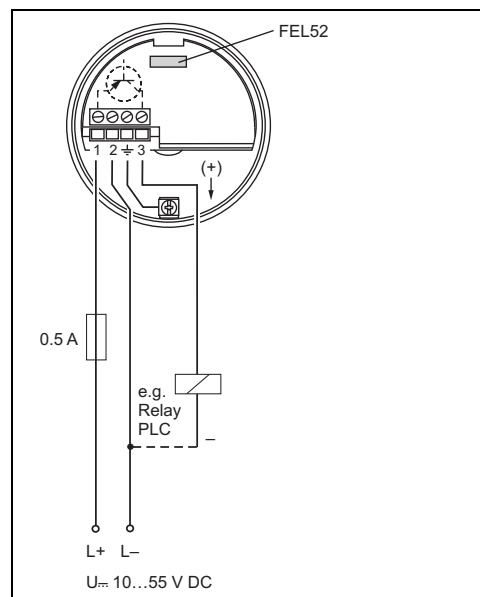
Power supply

Supply voltage: 10 to 55 V DC
Ripple: max. 1.7 V, 0 to 400 Hz
Current consumption: max. 15 mA
Power consumption: max. 0.83 W
Reverse polarity protection
Overvoltage protection FEL52: overvoltage category III

Electrical connection

Three-wire DC connection

Preferably used with programmable logic controllers (PLC).
DI module as per EN 61131-2.
Positive signal at switching output of the electronics (PNP);
Output blocked on reaching limit.



L00-FTL5xxxx-04-05-xx-en-001

Output signal













I_L = load current
(switced through)

$< 100 \mu A$ = residual current
(blocked)

 = lit

 = unlit

L00-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal	LEDs green	red
Max.		$L+ \xrightarrow{I_L} +$ 1 3		
		$1 \xrightarrow{< 100 \mu A} 3$		
Min.		$L+ \xrightarrow{I_L} +$ 1 3		
		$1 \xrightarrow{< 100 \mu A} 3$		

L00-FTL5xxxx-04-05-xx-xx-004

Signal on alarm

Output signal on power failure or in the event of damaged sensor: $< 100 A$

Connectable load

- Load switched via the transistor and separate PNP connection, max. 55 V DC
- Load current max. 350 mA (pulsed overload and short-circuit protection)
- Residual current $< 100 A$ (with transistor blocked).
- Capacitance load max. 0.5 F at 55 V, max. 1.0 F at 24 V
- Residual voltage $< 3 V$ (with transistor switched through);

Electronics FEL52 (DC PNP, in compact housing)

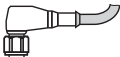

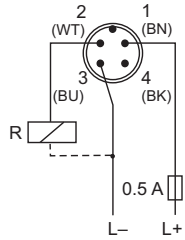
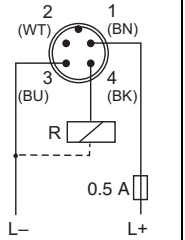

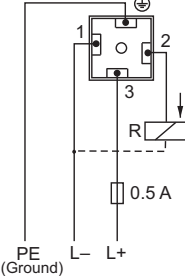
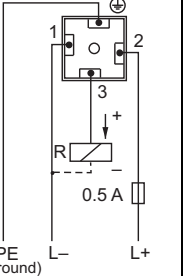
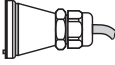
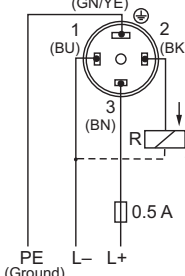
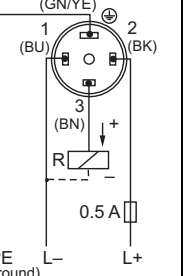
Power supply

Supply voltage: 10 to 55 V DC
 Ripple: max. 1.7 V, 0 to 400 Hz
 Current consumption: max. 15 mA
 Power consumption: max. 0.83 W
 Reverse polarity protection
 Overvoltage protection FEL52: overvoltage category III

Electrical connection

Three-wire DC connection

Preferably used with programmable logic controllers (PLC).
 DI module as per EN 61131-2.
 Positive signal at switching output of the electronics (PNP);
 Output blocked on reaching limit.

Connector	MAX	MIN
FTL5#(H)- #####N3# (M12x1) 52018763  FTL5#(H)- #####N3# (M12x1) 52010285 / 52024216 		
FTL5#(H)- #####D3# (Pg11) or FTL5#(H)- #####E3# (NPT 1/2") 		
FTL5#(H)- #####C3# 		

L00-FTL5xxxx-04-05-xx-en-010

Output signal

With valve connector or cable tail

I_L = load current
 (switched through)

$< 100 \mu A$ = residual current
 (blocked)

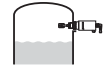


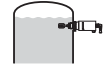


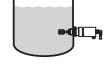







= lit



= unlit

L00-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal	LEDs green	red
Max.		$L^+ \xrightarrow{I_L} 2$ 3		
		$L^+ < 100 \mu A \xrightarrow{+}$ 3 --- 2		
Min.		$L^+ \xrightarrow{I_L} 3$ 2		
		$L^+ < 100 \mu A \xrightarrow{+}$ 2 --- 3		

L00-FTL5xxxx-04-05-xx-xx-004

With M12x1 connector 52010285 / 52024216 (without LEDs)



I_L = load current
(switched through)

$< 100 \mu A$ = residual current
(blocked)



= lit



= unlit

L00-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal	LEDs
Max.		$L^+ \xrightarrow{I_L} -$ 1 2	
		$L^+ < 100 \mu A \xrightarrow{-}$ 1 2	
Min.		$L^+ \xrightarrow{I_L} -$ 1 4	
		$L^+ < 100 \mu A \xrightarrow{-}$ 1 4	

L00-FTL5xxxx-04-05-xx-xx-010

With M12x1 connector 52018763 (with LEDs)



I_L = load current
(switched through)

$< 100 \mu A$ = residual current
(blocked)



= lit



= unlit

L00-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal	LEDs
Max.		$L^+ \xrightarrow{I_L} -$ 1 2	
		$L^+ < 100 \mu A \xrightarrow{-}$ 1 2	
Min.		$L^+ \xrightarrow{I_L} -$ 1 4	
		$L^+ < 100 \mu A \xrightarrow{-}$ 1 4	

L00-FTL5xxxx-04-05-xx-xx-011

Signal on alarm

Output signal on power failure or in the event of damaged sensor: $< 100 A$

Connectable load

- Load switched via the transistor and separate PNP connection, max. 55 V DC
- Load current max. 350 mA (pulsed overload and short-circuit protection)
- Residual current $< 100 A$ (with transistor blocked).
- Capacitance load max. 0.5 F at 55 V, max. 1.0 F at 24 V
- Residual voltage $< 3 V$ (with transistor switched through);

Electronic insert FEL54 (AC/DC with relay output)

Power supply

Supply voltage: 19 to 253 V AC, 50/60 Hz or 19 to 55 V DC
 Power consumption: max. 1.3 W
 Reverse polarity protection
 Overvoltage protection FEL54: overvoltage category III

Electrical connection

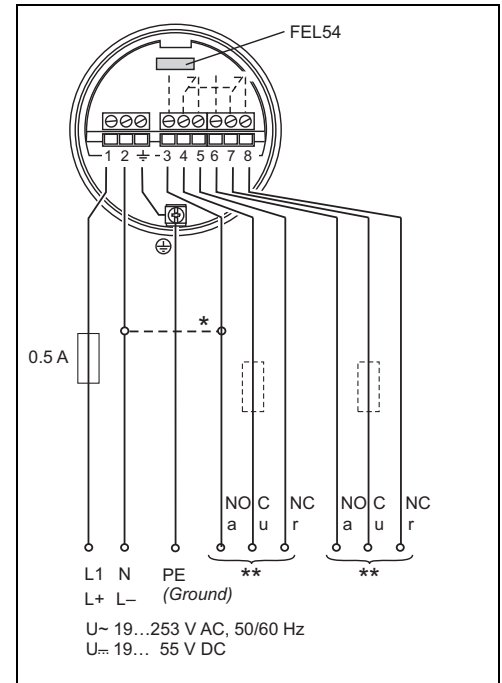
Universal current connection with relay output

Power supply:
 Please note the different voltage ranges
 for AC and DC.

Output:
 When connecting an instrument with
 high inductance, provide a spark arrester
 to protect the relay contact.
 A fine-wire fuse (depending on the
 load connected) protects the relay contact
 on short-circuiting.
 Both relay contacts switch simultaneously.

* When jumpered, the relay
 output works with NPN logic.

** See "Connectable load"



L00-FTL5xxxx-04-05-xx-xx-002

Output signal

= relay energized
 = relay de-energized
 = lit
 = unlit

L00-FTL2xxxx-07-05-
xx-xx-001

Safety mode	Level	Output signal	LEDs green	red
Max.				
Min.				

L00-FTL5xxxx-04-05-xx-xx-003

Signal on alarm

Output signal on power failure or in the event of damaged sensor: relay de-energized

Connectable load

- Loads switched via 2 floating change-over contacts (DPDT).
- I~ max. 6 A (Ex de 4 A), U~ max. 253 V AC; P~ max. 1500 VA, cos φ = 1, P~ max. 750 VA, cos φ > 0.7
- I= max. 6 A (Ex de 4 A) bis 30 V DC, I= max. 0.2 A to 125 V
- When connecting a low-voltage circuit with double isolation according to IEC 1010, the following applies: total of voltages of relay output and power supply max. 300 V.

Electronic insert FEL55 (8/16 mA)

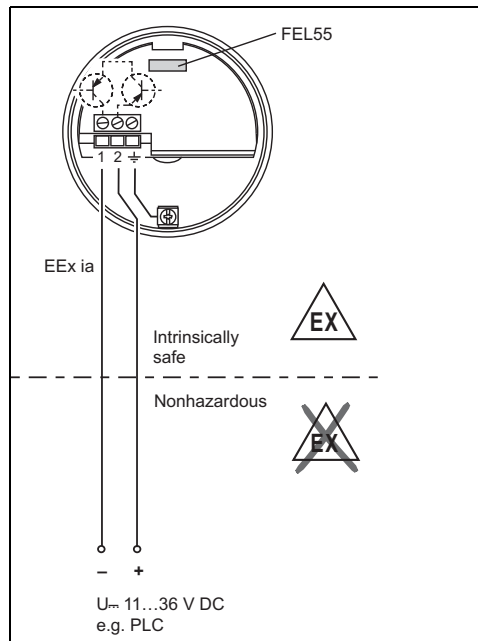
Power supply

Supply voltage: 11 to 36 V DC
 Power consumption: < 600 mW
 Reverse polarity protection
 Overvoltage protection FEL55: overvoltage category III

Electrical connection

Two-wire connection for separate switching unit

For connecting to programmable logic controllers (PLCs) for example, AI module 4 to 20 mA to EN 61131-2. Output signal jump from high to low current on limit.



L00-FTL5xxxx-04-05-xx-en-000

Output signal













$$\sim 16 \text{ mA} = 16 \text{ mA} \pm 5 \%$$

$$\sim 8 \text{ mA} = 8 \text{ mA} \pm 6 \%$$

 = lit

 = unlit

L00-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal	LEDs	
			green	red
Max.		+ 2 $\xrightarrow{\sim 16 \text{ mA}}$ 1		
		+ 2 $\xrightarrow{\sim 8 \text{ mA}}$ 1		
Min.		+ 2 $\xrightarrow{\sim 16 \text{ mA}}$ 1		
		+ 2 $\xrightarrow{\sim 8 \text{ mA}}$ 1		

L00-FTL5xxxx-04-05-xx-xx-000

Signal on alarm

Output signal on power failure or in the event of damaged sensor: < 3.6 mA

Connectable load

- $R = (U - 11 \text{ V}) : 16.8 \text{ mA}$
- $U = \text{connection voltage: 11 to 36 V DC}$

Example:
 PLC with 250 Ω with 2-wire version

$$250 \Omega = (U - 11 \text{ V}) / 16.8 \text{ mA}$$

$$4.2 [\Omega/\text{A}] = U - 11 \text{ V}$$

$$U = 15.2 \text{ V}$$

Electronic insert FEL56 (NAMUR L-H edge)

Power supply

Power consumption: < 6 mW at I < 1 mA; < 38 mW at I = 2.8 mA
Connection data interface: IEC 60947-5-6

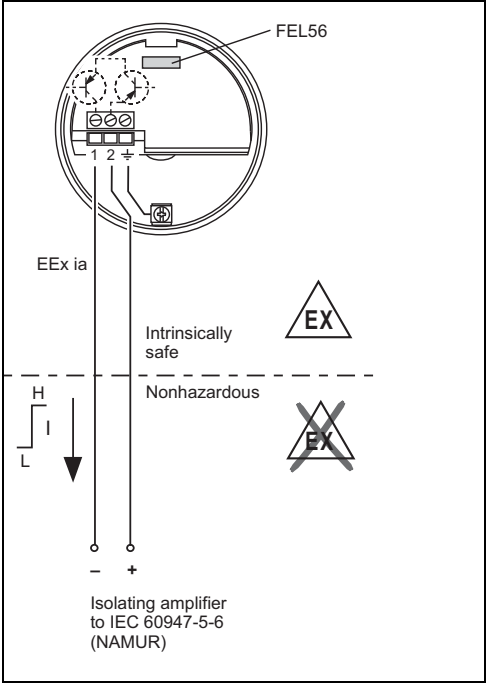
Electrical connection

Two-wire connection for separate switching unit

For connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e.g. FTL325N, FTL375N from Endress+Hauser.
Output signal jump from low to high current on limit.




(L-H edge)

Connecting to multiplexer:
Set clock time to min. 2 s.















L00-FTL5xxx-04-05-xx-en-004

Output signal

 = lit
 = flashes
 = unlit

L00-FTL5xxx-07-05-xx-xx-002

Safety mode	Level	Output signal	LEDs	
			green	red
Max.		+ 0.6 ... 1.0 mA 2 → 1		
		+ 2.2 ... 2.8 mA 2 → 1		
Min.		+ 0.6 ... 1.0 mA 2 → 1		
		+ 2.2 ... 2.8 mA 2 → 1		

L00-FTL5xxx-04-05-xx-xx-003

Signal on alarm

Output signal in the event of damaged sensor: > 2.2 mA

Connectable load

See Technical Data of the isolating amplifier connected according to IEC 60947-5-6 (NAMUR)

Electronic insert FEL58 (NAMUR H-L edge)

Power supply

Power consumption: < 6 mW at $I < 1 \text{ mA}$; < 38 mW at $I = 3.5 \text{ mA}$
 Connection data interface: IEC 60947-5-6


Electrical connection

Two-wire connection for separate switching unit

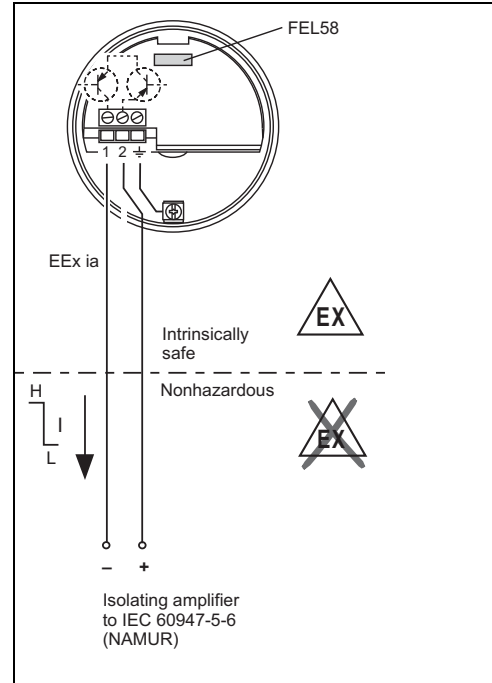
For connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e.g. FTL325N, FTL375N from Endress+Hauser.
 Output signal jump from high to low current on limit.

(H-L edge)

Additional function:
 Test key on the electronic insert.
 Pressing the key breaks the connection to the isolating amplifier.




 **Note!**
 In Ex-d applications, the additional function can only be used if the housing is not exposed to an explosive atmosphere.

Connecting to multiplexer:
 Set clock time to min. 2 s.















100-FTL5xxxx-04-05-xx-en-002

Output signal

 = lit
 = flashes
 = unlit

100-FTL5xxxx-07-05-xx-xx-002

Safety mode	Level	Output signal	LEDs green yellow
Max.		$\begin{matrix} + \\ 2 \end{matrix} \xrightarrow{2.2 \dots 3.5 \text{ mA}} 1$	 
		$\begin{matrix} + \\ 2 \end{matrix} \xrightarrow{0.6 \dots 1.0 \text{ mA}} 1$	 
Min.		$\begin{matrix} + \\ 2 \end{matrix} \xrightarrow{2.2 \dots 3.5 \text{ mA}} 1$	 
		$\begin{matrix} + \\ 2 \end{matrix} \xrightarrow{0.6 \dots 1.0 \text{ mA}} 1$	 

100-FTL5xxxx-04-05-xx-xx-007

Signal on alarm

Output signal in the event of damaged sensor: < 1.0 mA

Connectable load

- See Technical Data of the isolating amplifier connected according to IEC 60947-5-6 (NAMUR)
- Connection also to isolating amplifiers which have special safety circuits ($I > 3.0 \text{ mA}$)

Electronics FEL58 (NAMUR H-L edge, in compact housing)

Power supply

Power consumption: < 6 mW at I < 1 mA; < 38 mW at I = 3.5 mA
Connection data interface: IEC 60947-5-6

Electrical connection

Two-wire connection for separate switching unit

For connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e.g. FTL325N, FTL375N from Endress+Hauser. Output signal jump from high to low current on limit



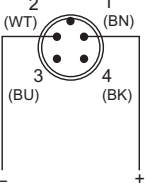
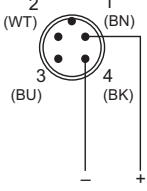

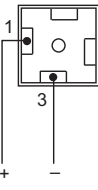
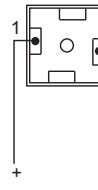

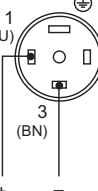
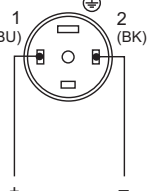
(H-L edge)

Additional function:
If the test magnet is held against the marking on the nameplate, the output signal is inverted.

Connecting to multiplexer:
Set clock time to min. 3 s.




The NAMUR interface has a defined power consumption rate.

Thus, it is not possible to use the M12 connector with an integrated LED (52018763)













Connector	MAX	MIN
FTL5#(H)- #####N3# (M12x1) 52018763  FTL5#(H)- #####N3# (M12x1) 52010285 / 52024216 		
FTL5#(H)- #####D3# (Pg11) or FTL5#(H)- #####E3# (NPT 1/2") 		
FTL5#(H)- #####C3# 		

L00-FTL5xxxx-04-05-xx-en-009

Output signal

 = lit
 = flashes
 = unlit

L00-FTL5xxxx-07-05-xx-xx-002

Safety mode	Level	Output signal	LEDs green yellow
Max.		$\begin{matrix} + & 2.2 \dots & - \\ 1 & 3.5 \text{ mA} & 3 \end{matrix}$	 
		$\begin{matrix} + & 0.6 \dots & - \\ 1 & 1.0 \text{ mA} & 3 \end{matrix}$	 
Min.		$\begin{matrix} + & 2.2 \dots & - \\ 1 & 3.5 \text{ mA} & 2 \end{matrix}$	 
		$\begin{matrix} + & 0.6 \dots & - \\ 1 & 1.0 \text{ mA} & 2 \end{matrix}$	 

L00-FTL5xxxx-04-05-xx-xx-007

Signal on alarm

Output signal in the event of damaged sensor: < 1.0 mA

Connectable load

- See Technical Data of the isolating amplifier connected according to IEC 60947-5-6 (NAMUR)
- Connection also to isolating amplifiers which have special safety circuits (I > 3.0 mA)

Electronic insert FEL57 (PFM)

Power supply

Supply voltage: 9.5 to 12.5 V DC
 Current consumption: 10 to 13 mA
 Power consumption: < 150 mW
 Reverse polarity protection

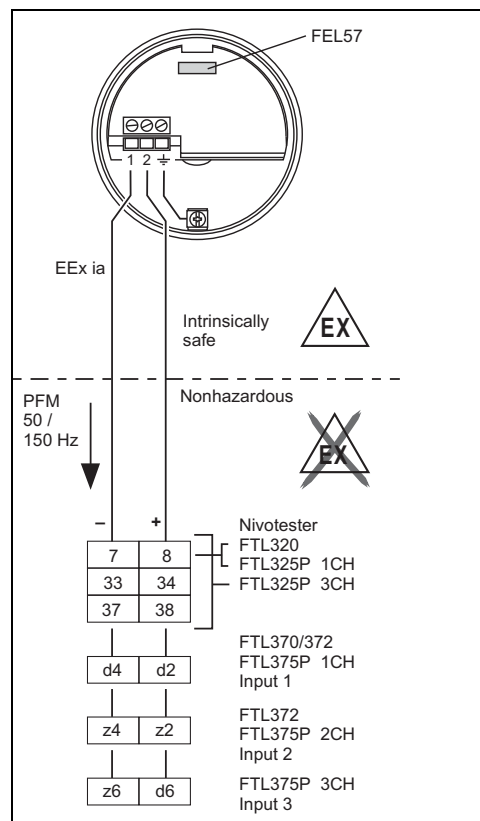
Electrical connection

Two-wire connection for separate switching unit

For connecting to Nivotester switching units FTL320, FTL325P, FTL370, FTL372, FTL375P (also with cyclical checking) from Endress+Hauser. Output signal jump of the PFM signal from high to low frequency when sensor is covered. Switching between minimum/maximum safety in the Nivotester.

Additional function “cyclical checking”:
 After interruption of the power supply, a test cycle is activated which checks the sensor and electronics without any change in level. Approved for overfill protection acc. to WHG (German Water Resources Act). The following can be switched at the electronic insert:

- **Standard (STD):**
 Corrosion of the fork unlikely;
 simulation approx. 8 s
 tuning fork exposed – covered – exposed.
 This setting tests level reporting in the Nivotester during cyclical checking.
- **Extended (EXT):**
 Corrosion of the fork possible;
 Simulation approx. 41 s: tuning fork exposed – covered – corroded – exposed.
 This setting tests level reporting and alarm notification in the Nivotester during cyclical checking.



The check is activated and monitored at the switching unit.

Switching behavior of the connected device:



Fail-safe mode set at switching unit	Setting at FEL57	Fork	Switching status of relay in switching unit on = energised off = de-energised	
			Test start (power off) > 3 s	End of test start (power on)
Max.	STD	free	on | off	~ 5 s off | ~ 2 s on | ~ 2 s off | on
Max.	EXT	free	on | off	~ 5 s off | ~ 2 s on | ~ 35 s off | // | on
Max.	STD	covered	off | off	off
Max.	EXT	covered	off | off	off
Min.	STD	free	off | ~ 3 s on *	~ 5 s off | ~ 3 s on | off
Min.	EXT	free	off | ~ 3 s on *	~ 7 s off | ~ 30 s on | // | off
Min.	STD	covered	on | ~ 3 s on *	~ 5 s off | on
Min.	EXT	covered	on | ~ 3 s on *	~ 5 s off | ~ 35 s on | // | ~ 3 s off | on

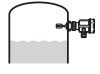



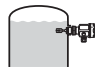



L00-FTL5xxxx-05-05-xx-en-000

* De-energized on power supply failure

Please note this switching response and function of the plant especially when replacing a Liquiphant with an EL17Z or FEL37 electronic insert with a Liquiphant M with an FEL57 electronic insert.

Output signal

 = lit
 = unlit
L00-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal (PFM)	LEDs green yellow
		150 Hz 	 
		50 Hz 	 

L00-FTL5xxxx-04-05-xx-xx-000

Signal on alarm

Output signal on power failure or in the event of damaged sensor: 0 Hz

Connectable load

- Floating relay contacts in the connected switching device Nivotester FTL320, FTL325P, FTL370, FTL372, FTL375P
- For contact load, see the Technical Data of the switching unit

Electronic insert FEL50A (PROFIBUS PA)

Power supply

Bus voltage: 9 to 32 V DC

Bus current:

- 12.5 mA \pm 1.0 mA (software version: 01.03.00, hardware version: 02.00)
- 10.5 mA \pm 1.0 mA (software version: 01.03.00, hardware version: 01.00)

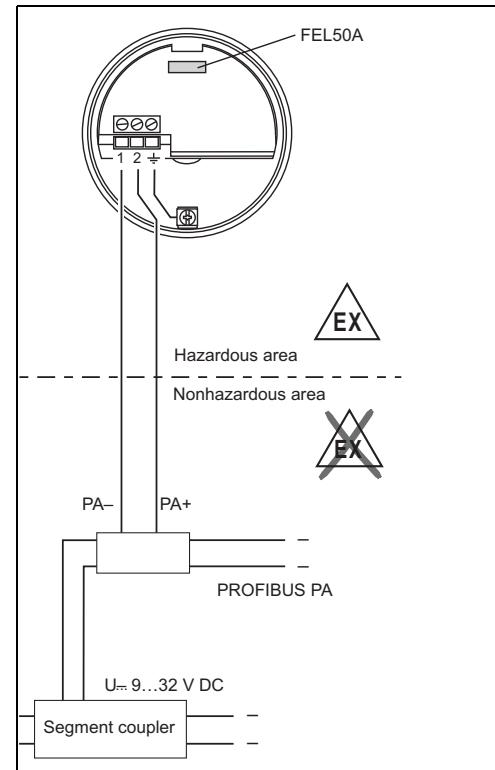
Electrical connection

Two-wire connection for power supply and data transfer

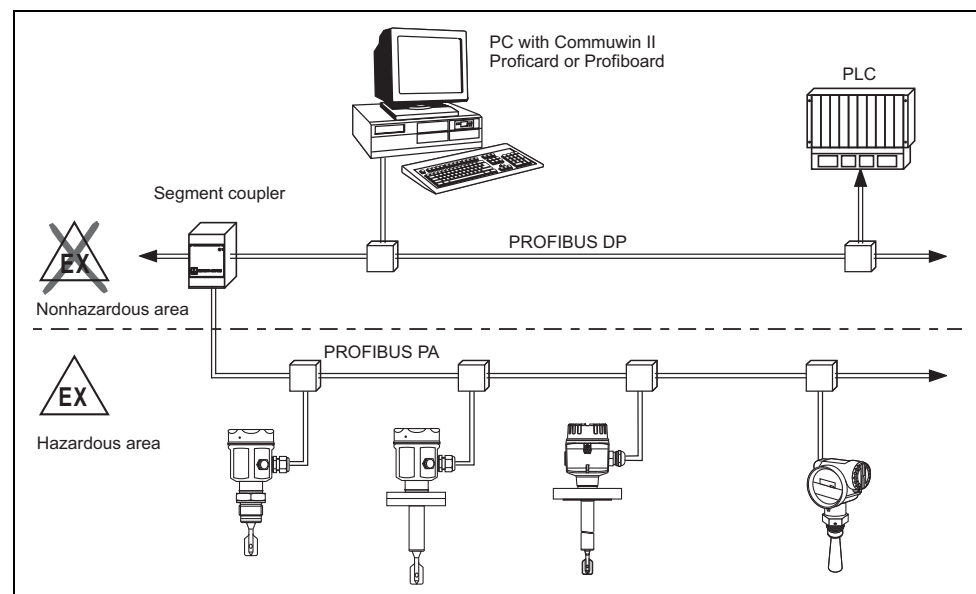
For connecting to PROFIBUS PA

Additional functions:

- Digital communication enables the representation, reading and editing of the following parameters:
Fork frequency, switch-on frequency, switch-off frequency, switch-on time and switch-off time, status, measured value, density switch.
- Matrix locking possible
- Switch to WHG mode possible (WHG approval).
- For a detailed description, see BA198F
- You can also visit www.profibus.com for more information





L00-FTL5xxxx-04-05-xx-en-005















L00-FTL5xxxx-04-05-xx-en-006

Output signal

 = lit
 = unlit

L00-FTL2xxxx-07-05-
xx-xx-000

Setting	Level	LEDs		FEL50A
		green	yellow	
not inverted				OUT_D = 0 PA bus signal
				OUT_D = 1 PA bus signal
inverted				OUT_D = 1 PA bus signal
				OUT_D = 0 PA bus signal

L00-FTL5xxxx-04-05-xx-xx-000

Signal on alarm

- Failure information can be opened using the following interfaces:
Yellow LED flashing, status code, diagnostic code; see BA198F

Electronic insert FEL50D (density)

Power supply

Frequency range: 300 to 1500 Hz
 Signal level: 4 mA
 Pulse height: 16 mA
 Pulse width: 20 µs

Electrical connection

Two-wire connection at Density Computer FML621

For connecting to the density and concentration computer FML621.

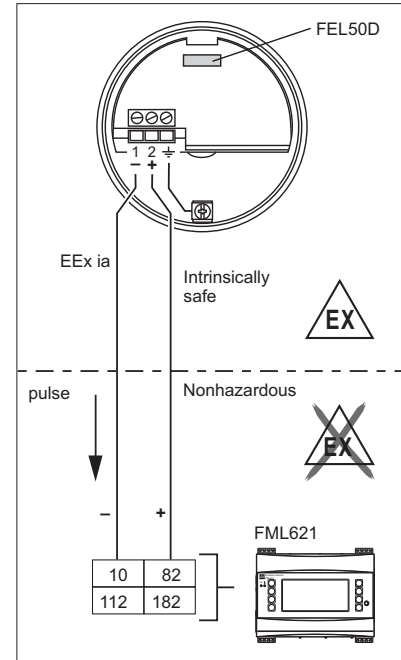
The output signal is based on pulse technology.
 With the aid of this signal, the fork frequency is constantly forwarded to the switching unit.



Caution!

Operation with other switching units, such as FTL325P, is not permitted.

This electronic insert cannot be installed in devices that were originally used as a point level switch.



TI420Fde004

Signal on alarm

Output signal on power failure or in the event of damaged sensor: 0 Hz

Adjustment

In the Liquiphant M modular system, the option of adjustment is also provided in addition to the electronics (see feature 60: "Accessories").

There are three types of adjustment:

Standard adjustment (see ordering information for additional options, basic version A)

- Here, two fork parameters are determined to describe the sensor characteristics, indicated in the adjustment report and provided with the product. These parameters must be transmitted to the Density Computer FML621.

Special adjustment (see ordering information for additional options, special adjustment, density H₂O (K) or special adjustment, density H₂O with 3.1 certificate (L))

- Here, three fork parameters are determined to describe the sensor characteristics, indicated in the adjustment report and provided with the product. These parameters must be transmitted to the Density Computer FML621. Greater accuracy is achieved with this type of adjustment (see also "Performance characteristics").

Field adjustment

- During field adjustment, a density value actually determined by the customer is entered and the system is automatically adjusted to this value (wet adjustment).

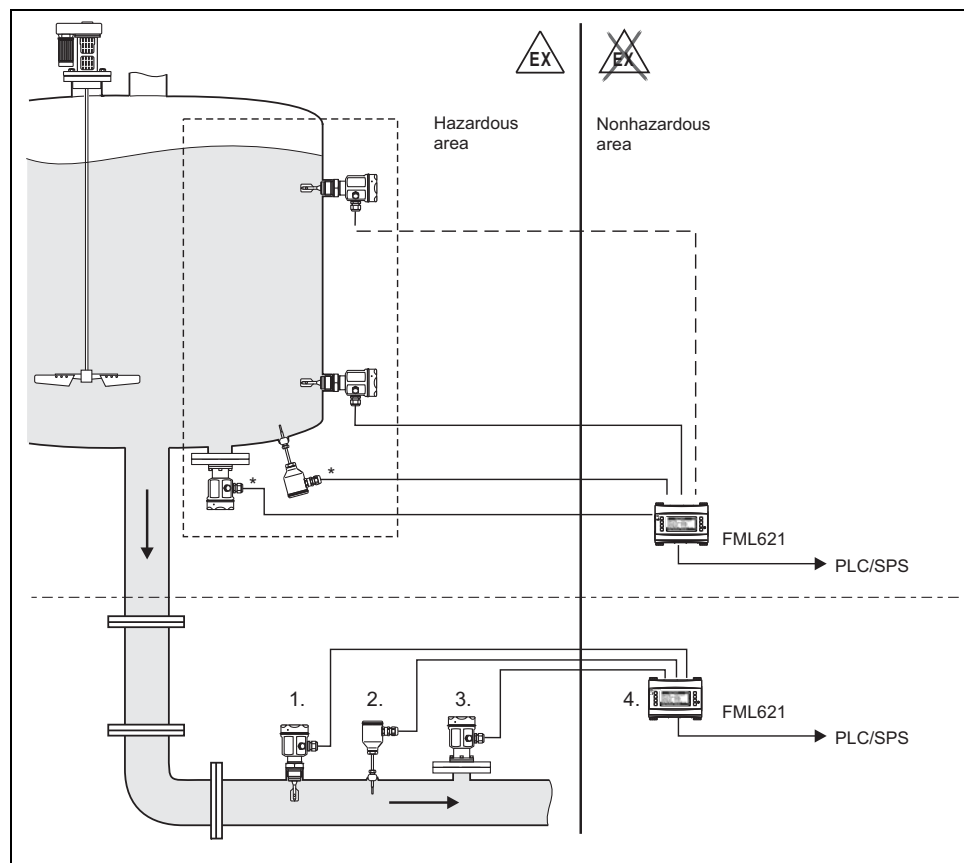


Note!

Further information on Liquiphant M Density is available in Technical Information TI420F. This document is available for download at www.endress.com => Download.

Operating principle

Measuring the density of a liquid medium in pipes and tanks. Also suitable for use in hazardous areas, and preferably for applications in the chemical and food industry.



* Pressure and temperature information required depending on the application.

1. Liquiphant M sensor with electronic insert FEL50D (pulse output);
2. Temperature sensor (e.g. 4 to 20 mA output);
3. Pressure transmitter (4 to 20 mA output);
4. Liquiphant density and concentration computer FML621 with display and operating unit

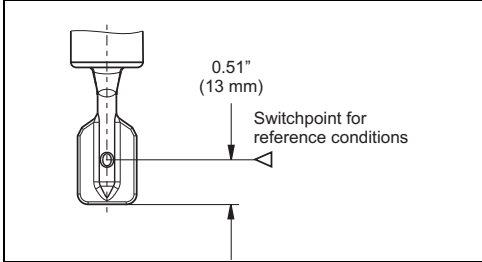
Light signals

LED	Symbol	Information
Yellow		Measurement valid
		Unstable process situation
		Maintenance required
Green		Power on
		Power off
Red		No fault
		Maintenance required
		Device failure

Connection and function

Connecting cables	<ul style="list-style-type: none"> ■ Electronic inserts: cross-section max. 14 AWG (2.5 mm²); strand in ferrule to DIN 46228 ■ Protective ground in housing: cross-section max. 14 AWG (2.5 mm²) ■ External equipotential bonding connection on housing: cross-section max. 0.006 in² (4 mm²)
Safety mode	<p>Minimum/maximum residual current safety selectable on electronic insert. (with FEL57 on Nivotester only)</p> <p>Max. = maximum safety: The output switches to the power fail response when the fork is covered For use with overflow protection for example</p> <p>Min. = minimum safety: The output switches to the power fail response when the fork is exposed For use with dry running protection for example</p>
Switching time	<p>When fork is covered: approx. 0.5 s When fork is exposed: approx. 1.0 s (Other switching times on request.)</p> <p>Additionally configurable for PROFIBUS PA: 0.5-60 s</p>
Switch-on behavior	<p>When switching on the power supply, the output assumes the alarm signal. After max. 3 s it assumes the correct switching mode (exception: FEL57)</p>

Performance characteristics

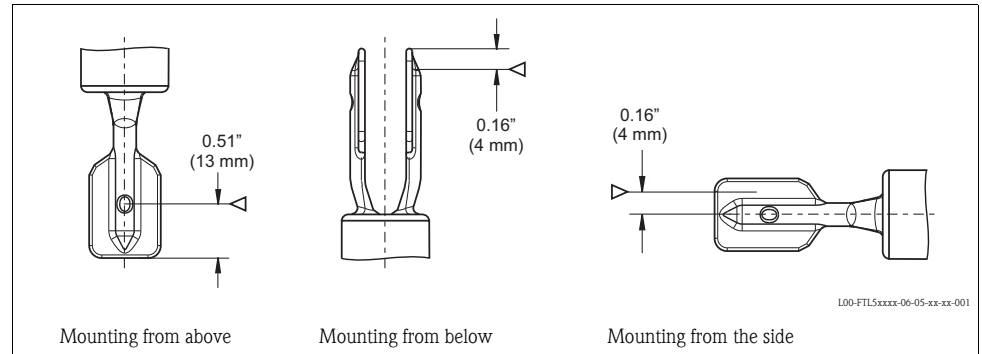
Reference operating conditions	<p>Ambient temperature: 73°F (23°C) Medium temperature: 73°F (23°C) Medium density: 1 SGU (1 g/cm³), water Viscosity: 1 cP (1 mm²/s) Medium pressure p_e: 0 psi (0 bar) Sensor mounting: vertical from above Density switch: to > 0.7</p>	 <p>0.51" (13 mm) Switchpoint for reference conditions</p> <p><small>L00-FTL5xxxx-06-05-xx-en-000</small></p>
Maximum measured error	Max. ± 0.04" (1 mm), at reference operating conditions	
Repeatability	0.004" (0.1 mm)	
Hysteresis	Approx. 0.08" (2 mm)	
Influence of medium temperature	Max. +0.07" to -0.11", -58 to +302°F (+1.8 to -2.8 mm, -50 to +150°C)	
Influence of medium density	Max. +0.19" to -0.14", 0.5 to 1.5 SGU (+4.8 to -3.5 mm, 0.5 to 1.5 g/cm ³)	
Influence of medium pressure	Max. 0 to -0.1", -14.5 to 930 psi (0 to -2.5 mm, -1 to 64 bar)	

Operating conditions

Installation

Installation instructions

Switch points \triangleright on the sensor depend on the mounting position, with reference to water, Density 1 SGU, 73°F, 0 psi (1 g/cm³, 23 °C, p_e 0 bar)



Note!

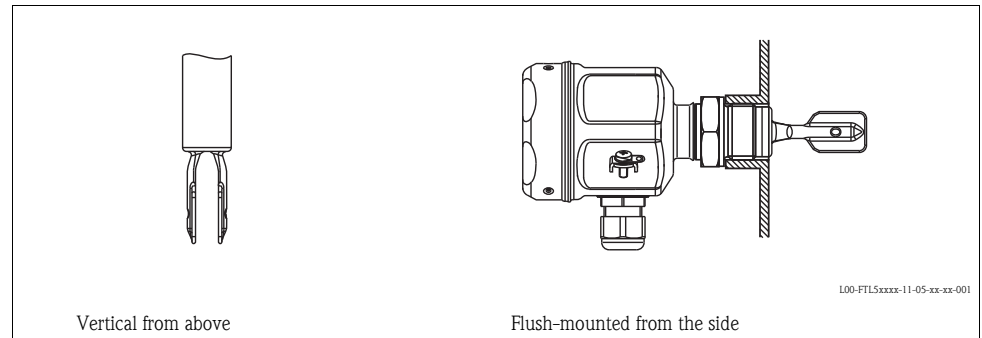
The switch points of the Liquiphant **M** are at other positions to those of the previous version Liquiphant **II**.

Examples of mounting

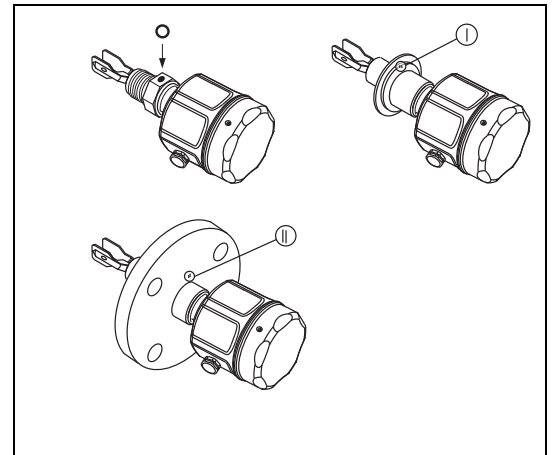
Examples of mounting with regard to the viscosity ν of the liquid and the tendency to form buildup

Optimum mounting, without problem even with high viscosity:

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

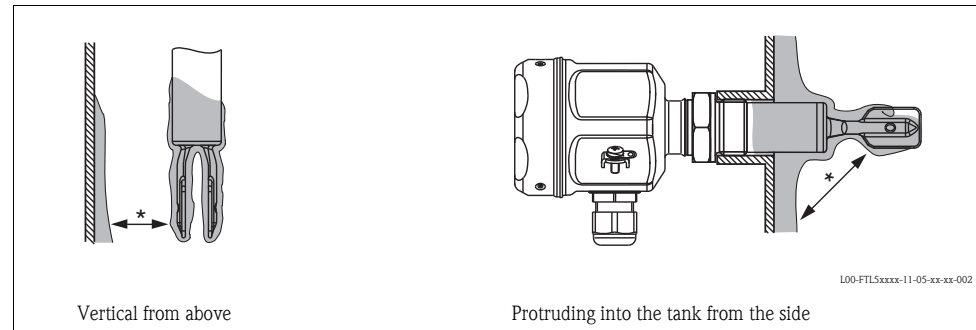


When installing the Liquiphant where the orientation of the tine is critical, such as in a pipeline, marks on the process connection indicate the tine orientation (see diagram)



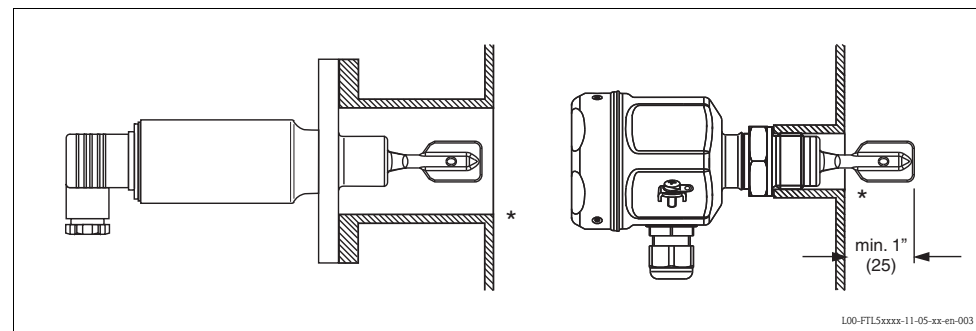
With buildup on the tank walls:

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



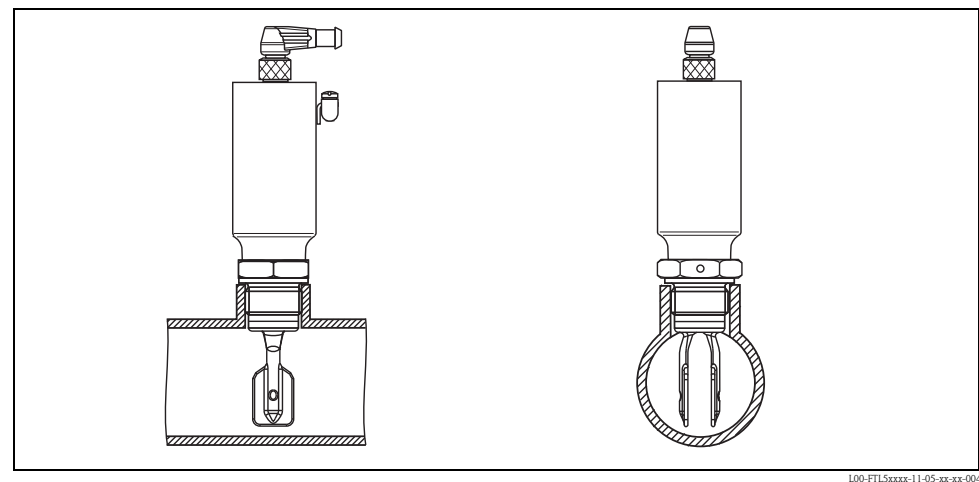
Mounting positions with low viscosity (up to $2000 \text{ mm}^2/\text{s}$):

* Deburr the nozzle surfaces

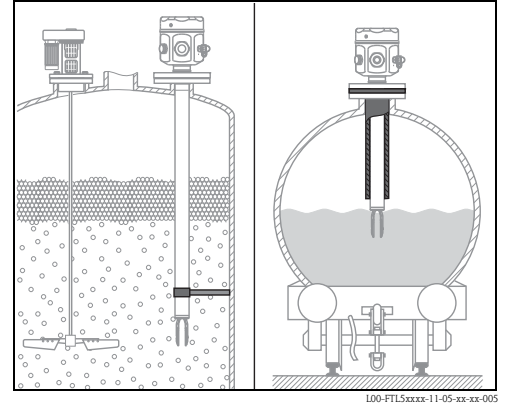


Mounting in piping from 2"

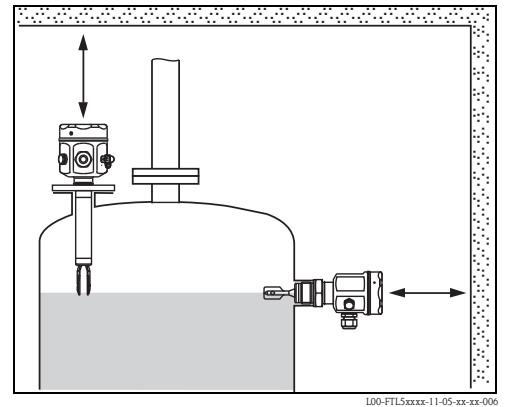
Flow velocities up to 16 ft/s (5 m/s) for viscosity 1 cP (1 mm^2/s) and density 1 SGU (1 g/cm^3).
(Check the function for other medium conditions.)



Support the Liquiphant M FTL51(H) in the event of severe dynamic load.



Ensure adequate space outside the tank for mounting, connection and configuration.



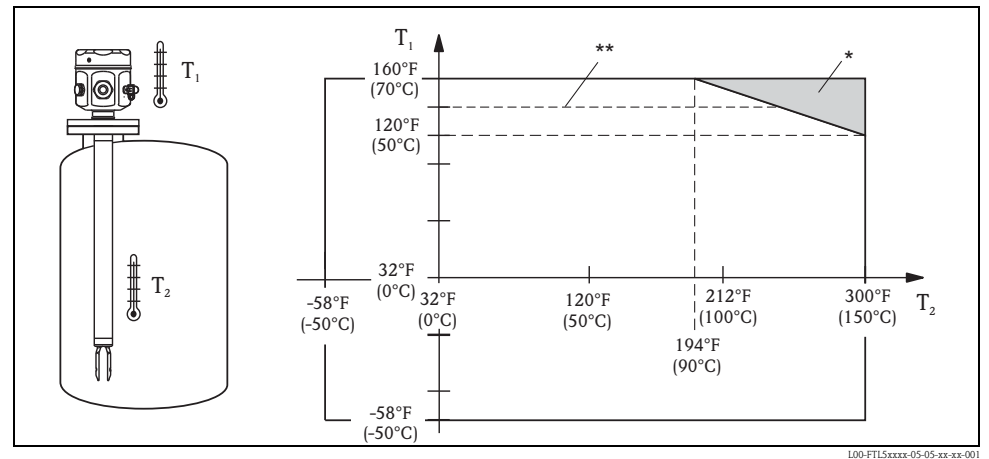
Orientation

FTL50(H) and FTL51(H) with short pipe (up to approx. 20" / 500 mm) - any position,
FTL51(H) with long pipe - vertical

Environment

Ambient temperature range

Permitted ambient temperature T_a at the housing depending on the medium temperature T_p in the tank:



* Additional temperature range for devices with a temperature spacer or Pressure tight feed through.

** Maximum ambient temperature with FEL50D/FEL50A in hazardous areas.

Ambient temperature limits

-58 to +160°F (-50 to +70°C), function with restricted data

Storage temperature -58 to +180°F (-50 to +80°C)

Climate class Climate protection to IEC 68, Part 2-38, Fig. 2a

Degree of protection

Types of housing	IP65	IP66*	IP67*	IP68*	IP69k	NEMA4X**
Compact housing with valve connector Pf11/NPT ½	X	—	—	—	—	—
Compact housing with 16 ft/5 m cable tail	—	X	—	X	—	—
Compact housing with M12x1 connector (52010285) 316L (metal)	—	X	—	X	—	—
Compact housing with elbowed connector (52024216) / L= 16 ft / 5 m, without integrated LEDs	—	X	—	X	X	—
Compact housing with elbowed connector (52018763) / L= 16 ft / 5 m, with integrated LEDs	—	X	—	X	X	—
Polyester housing F16	—	X	X	—	—	X
Stainless steel housing F15	—	X	X	—	—	X
Aluminum housing F17	X	X	X	—	—	X
Aluminum housing F13	X	X	—	X***	—	X
Stainless steel housing F27	—	X	—	X	—	4x/6P
Aluminum housing T13 with separate connection compartment (Ex d)	X	X	—	X***	—	4x/6P

* As per EN60529

** As per NEMA 250

*** Only with M20 cable entry or G1/2 thread

Vibration resistance To IEC 68, Part 2-6 (10 to 55 Hz, 0.15 mm, 100 cycles)
In the event of increased vibrations, we recommend the additional fitting feature "060" version "P" 1450 psi (100 bar) process pressure.

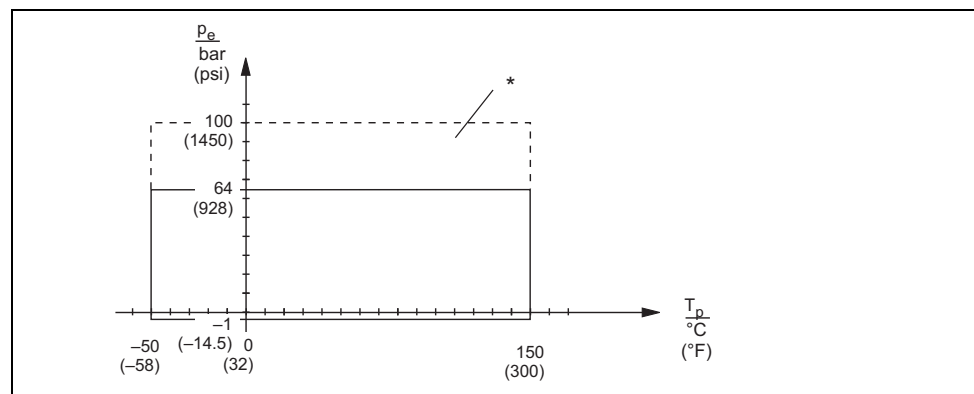
Electromagnetic compatibility Interference emission to EN 61326, Electrical Equipment Class B
Interference immunity to EN 61326; Annex A (Industrial) and NAMUR Recommendation NE 21 (EMC)

Medium conditions

Medium temperature -58 to +300°F (-50 to +150°C); see "Process connections" for exceptions

Thermal shock Max. 250°F/s (120°C/s)

Medium pressure p_e



* Allowed pressure rating when the "1450 psi / 100 bar" option is selected (see "Product structure FTL51", feature 060, page 41). See "Process connections" for exceptions.

Please refer to the standards listed for the permitted pressure values of the flanges at higher temperatures:

- pR EN 1092-1: 2005
With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are identical and are grouped together under 13E0 in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.
- ASME B 16.5a - 1998 Tab. 2-2.2 F316
- ASME B 16.5a - 1998 Tab. 2.3.8 N10276
- JIS B 2220

The lowest value from the derating curves of the device and selected flange applies in each case.

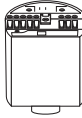
Test pressure	<p>$p_e = 928 \text{ psi (64 bar)}$: Max. 1450 psi / 100 bar (1.5 times the medium pressure p_e); no function during test pressure Sensor burst pressure 2900 psi (200 bar)</p> <p>$p_e = 1450 \text{ psi (100 bar)}$: Max. 2175 psi / 150 bar (1.5 times the medium pressure p_e); no function during test pressure Sensor burst pressure 5800 psi (400 bar)</p>
State of aggregation	Liquid
Density	<p>0.7 SGU (0.7 g/cm³) = delivery status</p> <p>0.5 SGU (0.5 g/cm³*) can be adjusted via switches</p> <p>* Density settings for the compact housing on request</p>
Viscosity	Max. 10,000 cP (10000 mm ² /s)
Solids content	Max. ø0.2" (5 mm)
Lateral loading capacity	≤ 55 lbf ft (75 Nm)

Mechanical construction

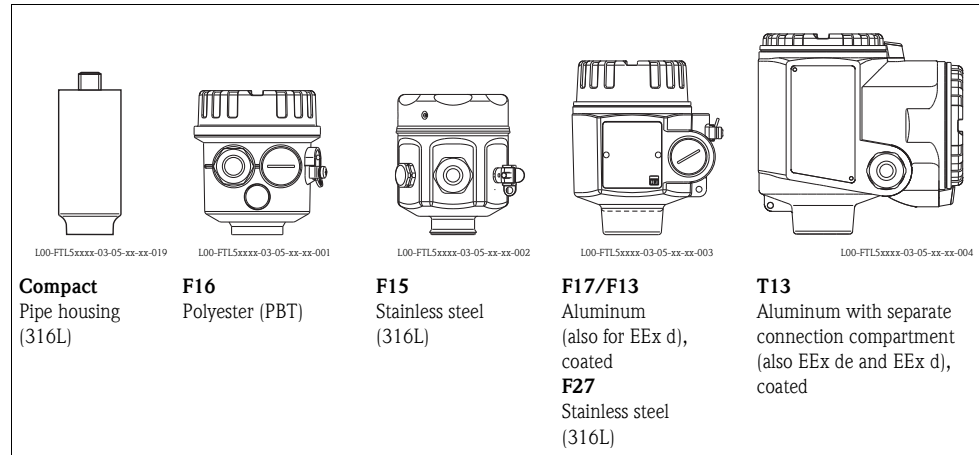
Design

Summary of all electrical and mechanical versions

Plug-in electronic inserts to mount in the housing

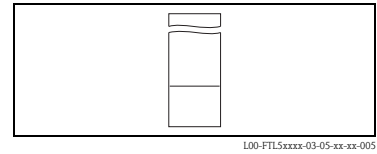
	FEL51*:	Two-wire AC connection
	FEL52*:	Three-wire DC connection PNP
	FEL54:	Universal current connection, 2 relay outputs
	FEL55:	Output 16/8 mA for separate switching unit
	FEL56:	Output 0.6 to 1.0 / 2.2 to 2.8 mA for separate switching unit (NAMUR)
	FEL58*:	Output 2.2 to 3.5 / 0.6 to 1.0 mA for separate switching unit (NAMUR)
	FEL57:	Output 150/50 Hz, PFM, for separate switching unit (Nivotester)
	FEL50A:	Digital communication PROFIBUS PA
	FEL50D:	Pulse output for Density Computer FML621
	* Electronics also available as compact housing. The electronics cannot be exchanged!	

Housing

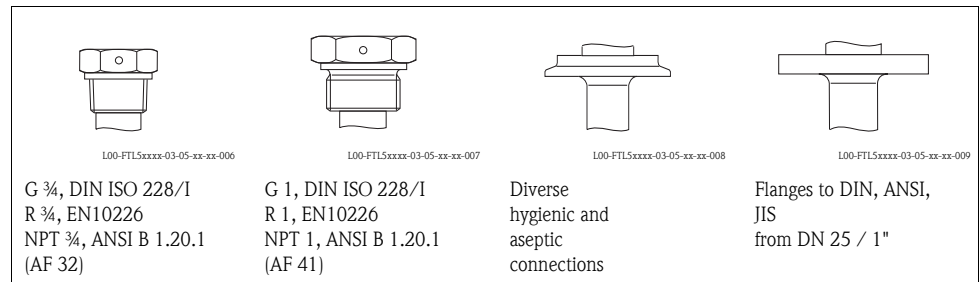


Bushings (optional)

Temperature spacer and pressure tight feed through

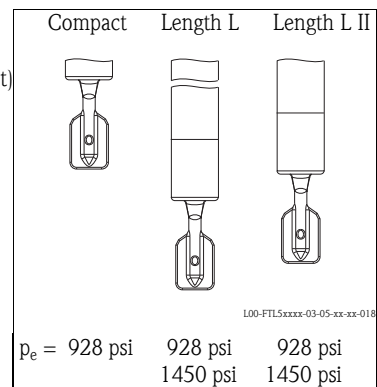


Process connections



Sensors

Compact,
with extension pipe up to 115" / 3 m (up to 236" / 6 m on request)
or special "length L II" (see Page 30)

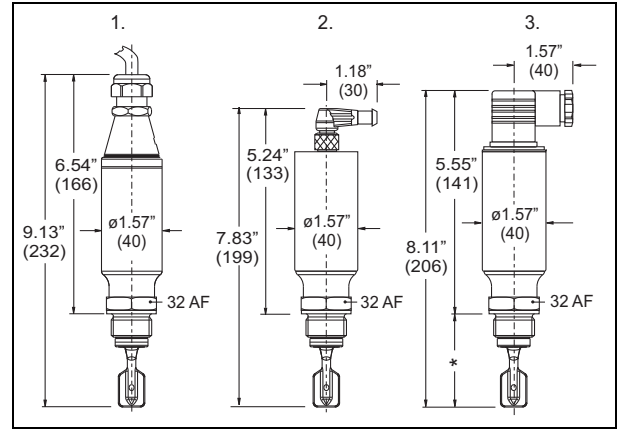


Dimensions

Housing and sensor FTL50(H)

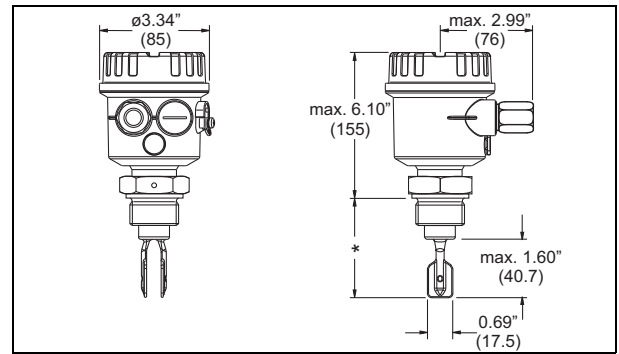
Compact housing, primarily for hygienic applications

1. 16 ft (5 m) cable
2. M12 connector
3. Pg11/NPT ½ connector



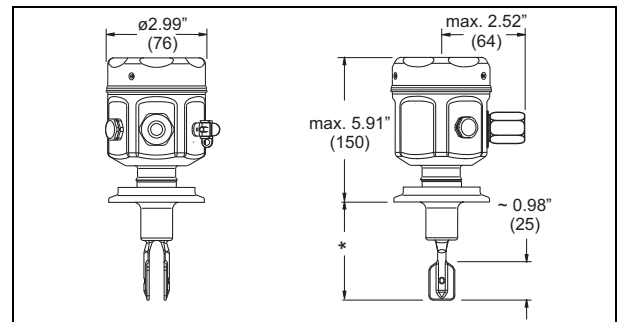
L00-FTL5xxxx-06-05-xx-xx-008

Polyester housing F16



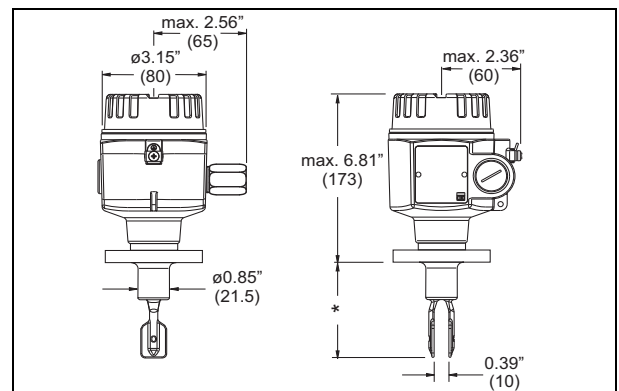
L00-FTL5xxxx-06-05-xx-xx-004

Stainless steel housing F15, primarily for hygienic applications



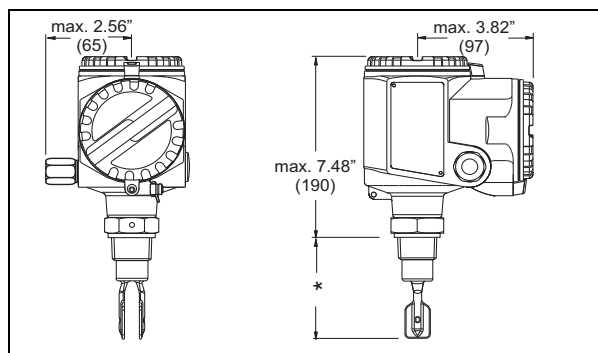
L00-FTL5xxxx-06-05-xx-xx-005

Aluminum housing F17/F13 Stainless steel housing (316L) F27



L00-FTL5xxxx-06-05-xx-xx-006

Aluminum housing T13
with separate connection
compartment



L00-FTL5xxxx-06-05-xx-xx-007

* See "Process connections"



Note!

The switch points of the Liquiphant **M** are at other positions to those of the previous version Liquiphant **II**.

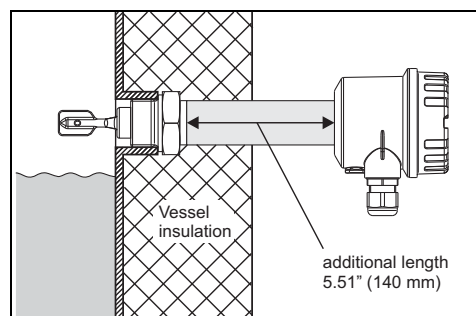
Bushings: temperature spacer, pressure tight feed through

Temperature spacer

Provides sealed insulation for the vessel
and normal ambient temperatures
for the housing.

Pressure tight feed through

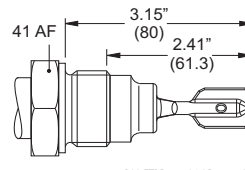
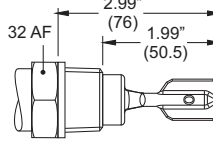
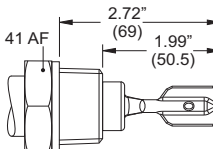
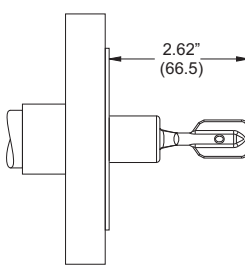
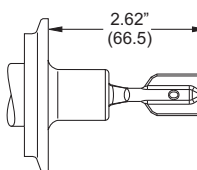
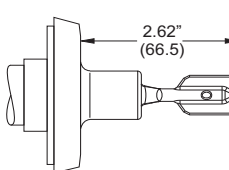
Protects the housing from pressures
up to 1450 psi (100 bar) if the sensor is damaged.
Provides sealed insulation for the
vessel and normal ambient temperatures
for the housing.

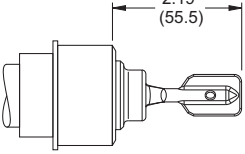
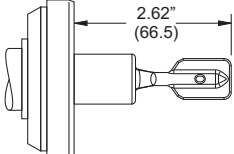
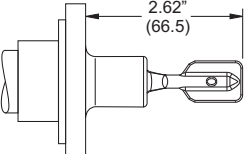
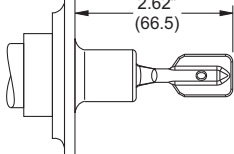
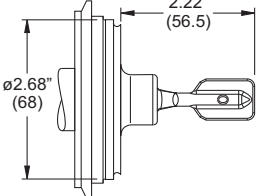
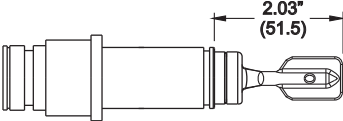


L00-FTL5xxxx-11-05-xx-xx-en-000

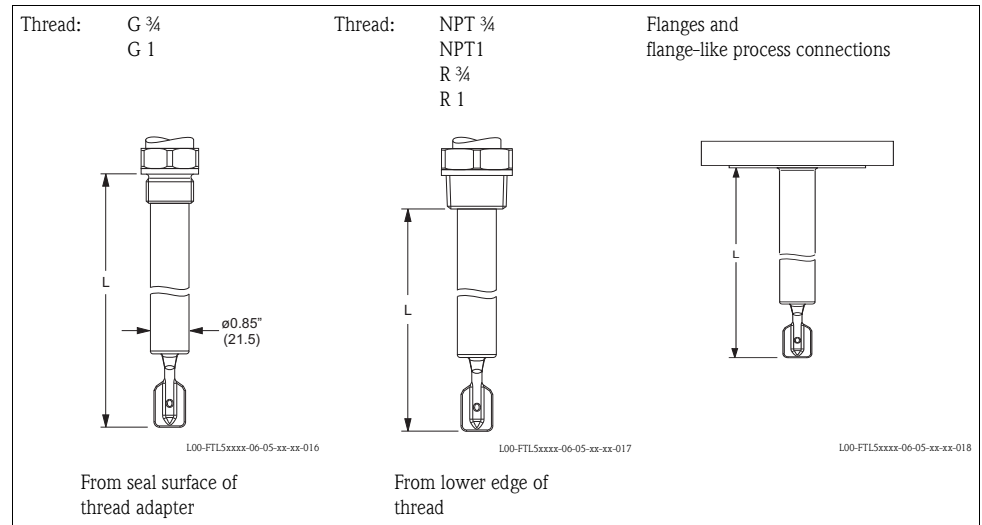
Process connections for FTL50(H) and FTL51(H)

Process connection		Dimensions	Accessories	Pressure Temperature
G ¾ DIN ISO 228/1 with defined thread start With elastomer flat seal to DIN 7603: supplied	GQ2 GQ5 GQ6	 L00-FTL5xxxx-06-05-xx-en-001		Max. 1450 psi (100 bar) (only FTL51) Max. 300°F (150°C)
G ¾ DIN ISO 228/1 with defined thread start For flush-mounted installation in welding neck	GQ2 GQ5 GQ6	 L00-FTL5xxxx-06-05-xx-en-001	Welding neck (with defined thread start) with silicone O-ring Endress+Hauser 52001052 In conformity with FDA* See "Accessories"	Max. 363 psi (25 bar) Max. 300°F (150°C) Max. 580 psi (40 bar) Max. 212°F (100°C)
G 1 DIN ISO 228/1 With elastomer flat seal to DIN 7603: supplied	GR2 GR5 GR6	 L00-FTL5xxxx-06-05-xx-en-002		Max. 1450 psi (100 bar) (only FTL51) Max. 300°F (150°C)

Process connection		Dimensions	Accessories	Pressure Temperature
* FDA approved materials according to 21 CFR Part 177.1550/2600				
G 1 DIN ISO 228/1 with defined thread start With seal surface for flush-mounted installation in welding neck	GW2	 L00-FTL5xxxx-06-05-xx-en-003	Welding neck (with defined thread start) with silicone O-ring Endress+Hauser 52001051 In conformity with FDA* See "Accessories"	Max. 363 psi (25 bar) Max. 300°F (150°C) Max. 580 psi (40 bar) Max. 212°F (100°C)
NPT ¾ ANSI B 1.20.1 or R ¾ EN10226	GM2 GM5 GM6 GE2 GE5 GE6	 L00-FTL5xxxx-06-05-xx-en-004	In conformity with FDA*	Max. 1450 psi (100 bar) (only FTL51) Max. 300°F (150°C)
NPT 1 ANSI B 1.20.1 or R 1 EN10226	GN2 GN5 GN6 GF2 GF5 GF6	 L00-FTL5xxxx-06-05-xx-en-005	In conformity with FDA*	Max. 1450 psi (100 bar) (only FTL51) Max. 300°F (150°C)
Flanges ANSI B 16.5 EN 1092-1 (DIN 2527 B) JIS B2220	A## B## C## F## N## K##	 L00-FTL5xxxx-06-05-xx-xx-008	Seal depending on design installed on site In conformity with FDA*	See nominal pressure of flange, however Max. 1450 psi (100 bar) (only FTL51) Max. 300°F (150°C)
AlloyC4/C22 -plated flanges are available for higher chemical-resistance. The flange carrier material comprises 316L and is welded with a 0.08 to 0.12" (2 to 3 mm) thick AlloyC4/C22 disk.				
Tri-Clamp 1 ½" = ø50.5 mm 2" = ø64.0 mm ISO 2852	TC2 TE2	 L00-FTL5xxxx-06-05-xx-xx-009	Clamping ring and front seal installed on site In conformity with FDA*	Max. 232 psi (16 bar) Max. 250°F (120°C) Max. 29 psi (2 bar) Max. 300°F (150°C)
Mounting with NA connector (as per ASME, TUBE Standard ASTM A276) only in conjunction with T13, F13 and compact housing. Other housings on request.				
Threaded pipe joint DN 32 DN 40 DN 50 DIN 11851 With thread adapter nut	MA2 MC2 ME2	 L00-FTL5xxxx-06-05-xx-xx-010	Sealing ring with collar, installed on site In conformity with FDA*	DN 32, DN 40: Max. 40 bar to 100°C Max. 25 bar to 140°C DN 50: Max. 25 bar Max. 140°C
* FDA approved materials according to 21 CFR Part 177.1550/2600				

Process connection		Dimensions	Accessories	Pressure Temperature
Flush-mounted for welding neck Factory standard Endress+Hauser with silicone seal and thread adapter nut: supplied	EE2	 L00-FTL5xxxx-06-05-xx-xx-011	Welding neck (fork can be positioned) Endress+Hauser 52001047 In conformity with FDA* See "Accessories"	Max. 580 psi (40 bar) Max. 212°F (100°C) Max. 363 psi (25 bar) Max. 300°F (150°C)
Aseptic DN 50 DIN 11864-1 Form A for pipe DIN 11850 with thread adapter nut	HE2	 L00-FTL5xxxx-06-05-xx-xx-012	Sealing ring, installed on site In conformity with FDA*	Max. 363 psi (25 bar) Max. 284°F (140°C)
DRD With clamped flange	PE2	 L00-FTL5xxxx-06-05-xx-xx-013	Welding flange with PTFE flat seal (fork can be positioned) Endress+Hauser 52002041 In conformity with FDA* See "Accessories" (or installed on site)	Max. 580 psi (40 bar) Max. 212°F (100°C) Max. 363 psi (25 bar) Max. 300°F (150°C)
SMS 2" (DN 51) with thread adapter nut	UE2	 L00-FTL5xxxx-06-05-xx-xx-014	Sealing ring, installed on site In conformity with FDA*	Max. 363 psi (25 bar) Max. 284°F (140°C)
Varivent for piping ≥ DN 65 ≥ O.D. 3" ≥ I.P.S. 3"	WE2	 L00-FTL5xxxx-06-05-xx-xx-015	Clamping ring and O-ring seal, installed on site In conformity with FDA*	See specification as per Tuchenhausen VARIVENT-Inline housing, however: Max. 363 psi (25 bar) Max. 300°F (150°C)
Ingold fitting DN 25 Fitting length 1.81" (46 mm) Thread adapter nut G 1 1/4 With EPDM O-ring seal	TT2	 L00-FTL5xxxx-06-05-xx-xx-104	In conformity with FDA* (USP Class VI)	Max. 145 psi (10 bar) Max. 300°F (150°C)
* FDA-compliant material in accordance with 21 CFR Part 177.1550/2600				

Sensor length L for FTL51 and FTL51H,
depending on process connection



Any length L:
6 to 118 in (148 mm to 3000 mm); special version (TSP) on request up to 236 in (6000 mm)



Note!

The switch points of the Liquiphant **M** are at other positions to those of the previous version Liquiphant **II**.

Special length "L II":

With vertical mounting from above the same switchpoint as for the Liquiphant II

FTL360, FTL365, FDL30, FDL35

"L II" depends on process connection:

L = 4.5" (115 mm) for flanges and flange-like process connections

L = 4.0" (99 mm) for threads NPT and R (BSPT)

L = 4.6" (118 mm) for threads G1 (BSP 1)

L = 4.5" (115 mm) for threads G ¾ (BSP ¾)

L = 4.1" (104 mm) for flush-mounted 1" (Endress+Hauser)

Weights

See "Product structure"

Material

Material specifications as per AISI and DIN-EN.

Parts in contact with process

- Process connection and extension pipe: 316L SS (1.4435) optionally 2.4610 (AlloyC4), 2.4602 (AlloyC22)
- Tuning fork: 316L SS (1.4435) optionally 2.4610 (AlloyC4), 2.4602 (AlloyC22)
- With a surface roughness quality Ra < 0.38 µm (electropolished), the wetted parts are made of 316L SS (1.4435) in accordance with BN2 (delta ferrite content < 1 %)
- Flanges: 316L SS (1.4435 or 1.4404)
- Flange plating: AlloyC4, AlloyC22
- Flat seal for process connection G ¾ or G 1: elastomer fiber, asbestos-free

Parts with no process contact

- Tuning fork/housing seal: EPDM
- Temperature spacer: 316 L SS (1.4435)
- Pressure tight feed through: 316L SS (1.4435)
- Grounding at housing (outside): 304 SS (1.4301)
- Nameplate at housing (outside): 304 SS (1.4301)
- Cable glands
 - Housing F13, F15, F16, F17: polyamide (PA)
 - With B or C approval (Page 41 ordering information): nickel-plated brass
 - Housing F27: 316L SS
 - Housing T13: nickel-plated brass

- Polyester housing F16: PBT-FR with PBT-FR cover or with PA12 transparent cover
 - Cover seal: EPDM
 - Nameplate glued: polyester film (PET)
 - Pressure compensation filter: PBT-GF20
- Stainless steel housing F15: 316L (1.4404)
 - Cover seal: silicone
 - Safety claw: 304 SS (1.4301)
 - Pressure equalizing filter: PBT-GF20, PA
- Aluminum housing F17/F13: EN-AC-ALSi10Mg, plastic-coated
 - Cover seal: EPDM
 - Safety claw: nickel-plated brass
 - Pressure compensation filter: silicone
- Stainless steel housing F27: 316L (1.4435)
 - Cover seal: FVMQ (optional: EPDM seal available as spare part)
 - Safety claw: 316L SS (1.4435)
- Aluminum housing T13: EN-AC-ALSi10Mg, plastic-coated
 - Cover seal: EPDM
 - Safety claw: nickel-plated brass
- Compact housing (valve connector or M12 connector): 316L SS (1.4435)

Process connections

- Parallel thread G ¾, G 1 to DIN ISO 228/I with flat seal to DIN 7603
- Tapered thread R ¾, R 1 to EN10226
- Tapered thread ¾ -14 NPT, 1 - 1½ NPT to ANSI B 1.20.1
- Flush-mounted installation with welding neck to factory standard Endress+Hauser (G ¾, G 1)
- Flush-mounted installation with welding neck to factory standard Endress+Hauser (1"), sensor can be positioned
- Tri-Clamp 1½", 2" to ISO 2852
- Threaded pipe joint DN 32, 40, 50 to DIN 11851
- Aseptic connection DN 50 to DIN 11864-1 Form A for pipe DIN 11850
- SMS connection 2" (DN 51)
- DRD flange
- Varivent® DN 50 (50/40) to factory standard Tuchenhausen
- Flanges to EN/DIN from DN 25, for standards see "Product structure," to ANSI B 16.5 from 1", to JIS B2220 (RF)
- Ingold DN25 fitting length 1.81" (46 mm) with thread adapter nut G1 ¼

Human interface

Electronic inserts

With FEL51, FEL52, FEL54, FEL55:

- 2 switches for safety mode and density change,
- green LED to indicate operational status,
- red LED to indicate the switching status, flashes in the event of corrosion damage on sensor or if the electronics are defective

With FEL56:

- 2 switches for safety mode and density change,
- green LED flashes to indicate operational status,
- red LED to indicate the switching status, flashes in the event of corrosion damage on sensor or if the electronics are defective

With FEL57:

- 2 switches for density change and cyclical checking,
- green LED to indicate operational status,
- yellow LED to indicate the covered status, flashes in the event of corrosion damage on sensor or if the electronics are defective

With FEL58:

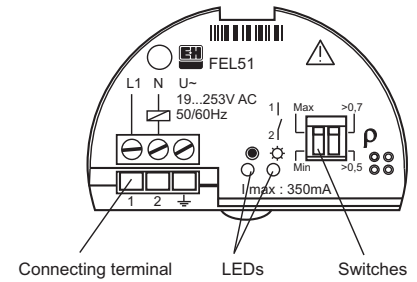
- 2 switches for safety mode and density change,
- green LED
 - flashes quickly to indicate operational status,
 - flashes slowly in the event of corrosion damage on sensor or if the electronics are defective,
- yellow LED to indicate the switching status,
 - Test key – breaks the cable connection

With FEL50A:

- 8 switches for configuring the device address
- green LED to indicate operational status, pulsing to indicate communication;
- yellow LED to indicate the switching status, flashes in the event of corrosion damage on sensor or if the electronics are defective

With FEL50D:

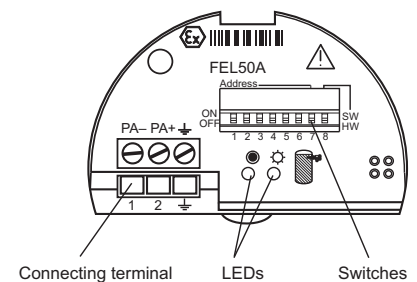
- yellow LED: to indicate the validation of the measurement
- green LED: to indicate the operational status
- red LED: to indicate faults



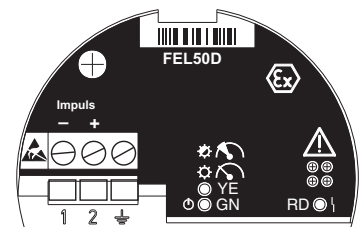
L00-FTL5xxxx-03-05-xx-en-001



L00-FTL5xxxx-03-05-xx-xx-013



L00-FTL5xxxx-03-05-xx-en-002



TI328Fxx004

Compact housing

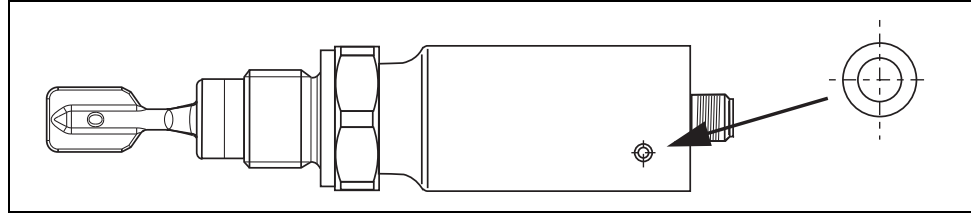
Function test with test magnet

Versions AC, DC-PNP and NAMUR:

During the test, the current state of the electronic switch is reversed.

Performing the test

Hold the test magnet against the marking on the nameplate:

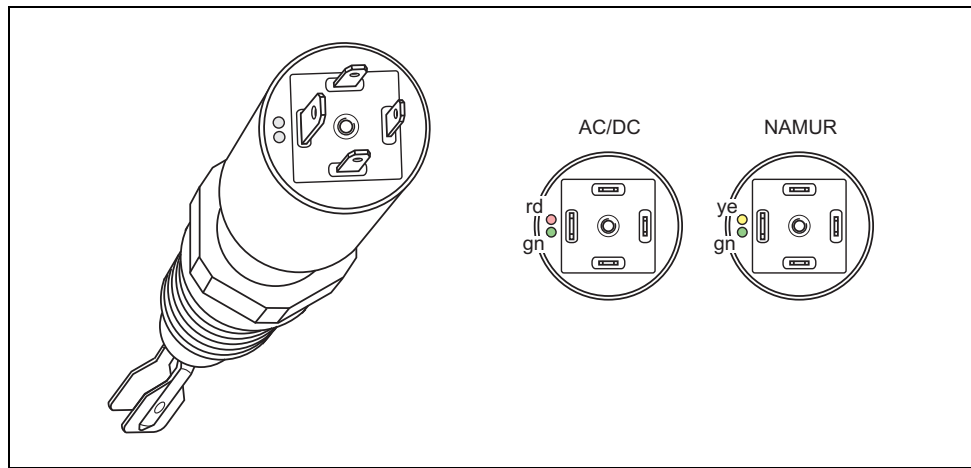


L00-FTL5xxxx-19-05-xx-xx-001

The switching status is changed.

Light signals

Versions AC and DC-PNP with valve connector or cable tail



L00-FTL5xxxx-07-05-xx-xx-005

Green light (gn) lights up (AC/DC):

Liquiphant M is connected to the power supply and is operational.

Green light (gn) flashing (NAMUR):

Liquiphant M is connected to the power supply and is operational.

Red light (rd) lights up (AC/DC):

MAX application mode (overflow protection): sensor is immersed in liquid.

MIN application mode (dry running protection): sensor is not immersed in liquid.

Yellow light (ye) lights up (NAMUR):

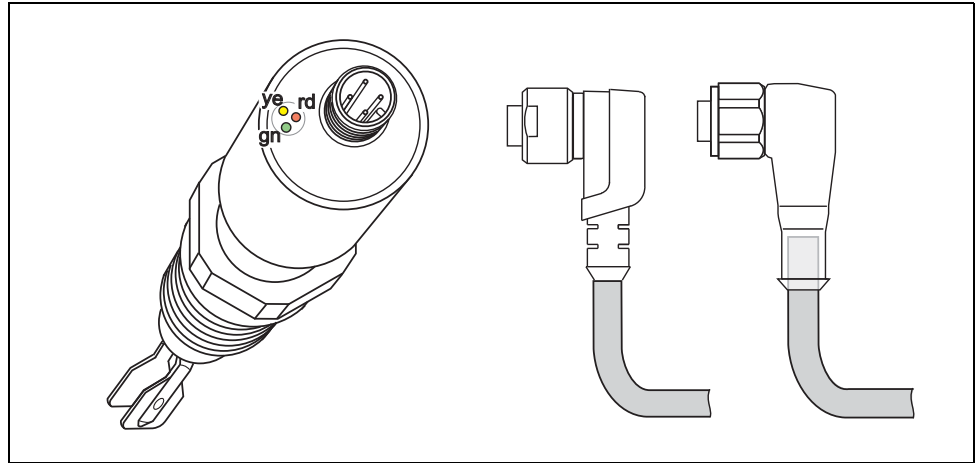
MAX application mode (overflow protection): sensor is not immersed in liquid.

MIN application mode (dry running protection): sensor is immersed in liquid.

Red light (rd) flashing (AC/DC):

Liquiphant M has detected a fault.

Version NAMUR and DC-PNP with M12x1 round connector 316L



L00-FTL5xxx-07-05-xx-xx-003

Green light (gn) lights up (DC-PNP):

Liquiphant M is connected to the power supply and is operational.

Green light (gn) flashing with 1 Hz (NAMUR):

Liquiphant M is connected to the power supply and is operational.

Yellow light (ye) lights up (DC-PNP):

Sensor is immersed in liquid.

Yellow light (ye) lights up (NAMUR):

MAX application mode (overflow protection): sensor is not immersed in liquid.

MIN application mode (dry running protection): sensor is immersed in liquid.

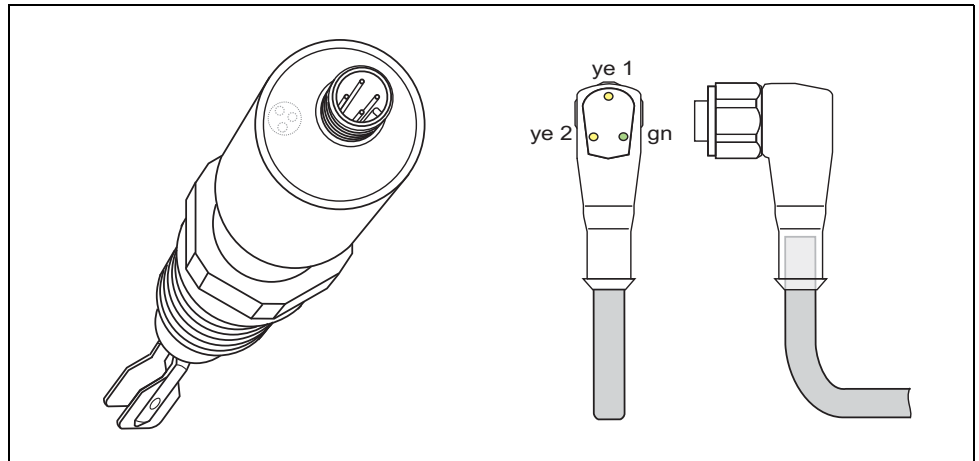
Red light (rd) flashing (DC-PNP):

Liquiphant M has detected a fault.

Green light (gn) flashing with 0.3 Hz (NAMUR):

Liquiphant M has detected a fault.

Version DC-PNP with M12x1 round connector 316L



L00-FTL5xxx-07-05-xx-xx-004

Green light (gn) lights up:

Liquiphant M is connected to the power supply and is operational.

Yellow light (ye 1) lights up:

MAX application mode (overflow protection): sensor is not immersed in liquid.

MIN application mode (dry running protection): sensor is not immersed in liquid.

Yellow light (ye 2) lights up:

MAX application mode (overflow protection): sensor is immersed in liquid.

MIN application mode (dry running protection): sensor is immersed in liquid.

Green light (gn) lights up, both yellow lights (ye 1+2) do not light up:

Liquiphant M has detected a fault.

Operating concept


Onsite configuration

Certificates and approvals

General approvals

The following approvals are available for Liquiphant M FTL50(H), FTL51(H):

- EHEDG: certification (from TNO, The Netherlands), Report No. V99.394:
- 3A: 3A Certificate (USA), Authorization No. 459
- Certificate of Compliance as per ASME BPE-2007. For further information, please refer to SD310F.
(Order code: additional option = B)

Process connections	Order code			ASME BPE + CoC	
				Ra (µm)	
				< 0.38	< 1.5
Flush-mounted G ¾, G1 (with welding neck)	GQ2, GW2	X	X	-	X
Tri-Clamp 2" (special seal from Hyjoin Limited, UK)	TE2	X	X	X	X
Threaded pipe joint	MA2, MC2, ME2	X	X	X	X
Flush-mounted (can be positioned)	EE2	X	X	X	X
Aseptic	HE2	X	X	X	X
DRD	PE2	X	-	-	X
SMS	UE2	X	X	X	X
Varivent®	WE2	X	X	X	X
Ingold	TT2	X	-	X	-



Note!

- For CIP (Clean in Place) and SIP (Sterilize in Place) processes the pressure and temperature specifications of the process connections must be observed.
- Suitable fittings and seals must be used to ensure hygiene-compliant design according to 3A, EHEDG, ASME BPE etc.
- Surface Ra < 0.38 µm (< 15 µin) electropolished; surface Ra < 1.5 µm (59 µin) mechanically polished.



Warning!

To avoid risk of contamination, install according to the "Hygienic Equipment Design Criteria (HDC)" as stated in the Subgroup Design Principles of the EHEDG, Doc. 8, July 1993.

The flow of liquid during cleaning is important and should be in compliance with the HDC.

CRN approval

Versions with a CRN approval (Canadian Registration Number) are marked with a "*" in ordering information feature 20 "process connection" (see Page 41 ff.). CRN-approved devices are fitted with a separate plate bearing the registration number 0F10525.5C.

Other certificates

- Leak-detection system in conjunction with WHG approval
Approval number: Z-65.40-446
(See also "Ordering information" Page 41)

- TSE Certificate of Suitability

The following applies to wetted device components:

- They do not contain any materials derived from animals.
- No additives or operating materials derived from animals are used in production or processing.



Note!

Wetted device components are listed in the "Mechanical construction" (see Page 27) and "Ordering information" (see Page 41) sections.

Combinations of housings and electronic inserts

Based on the various certificates, permissible combinations of housings *) and electronic inserts are given in the following table.

*) Abbreviations: Polyester = PBT, Stainless steel 316L = St., Aluminum = Alu
Aluminum housing with separate connection compartment = Alu/sep

Certificate, applications		Housing	Electronic inserts
A	Without any special certificate (for non-hazardous area)	PBT, St., Alu, Alu/sep.	FEL51/52/54, FEL55/56/57/58/50A/50D
D	Overfill protection to WHG (Germany)	PBT, St., Alu, Alu/sep.	FEL51/52/54, FEL55/56/57/58/50A
B	ATEX II 3G EEx nC IIC T6, WHG	PBT, St., Alu, Alu/sep.	FEL54
	ATEX II 3G EEx nC IIC T6, WHG ATEX II 3D T85°C, WHG	St., Alu, Alu/sep.	FEL54
C	ATEX II 3G EEx nA II T6, WHG	PBT, St., Alu, Alu/sep.	FEL51/52, FEL55/56/57/58/50A/ 50D***
	ATEX II 3G EEx nA II T6, WHG ATEX II 3D T85°C, WHG	St., Alu, Alu/sep.	FEL51/52, FEL55/56/57/58/50A/ 50D***
E	ATEX II 1/2 G, EEx de, WHG	Alu/sep.	FEL51/52/54, FEL55/56/57/58/50A/50D
F	ATEX II 1/2 G, EEx ia IIC T6, WHG	PBT, St., Alu, Alu/sep.	FEL55/56/57/58/50A/50D
	ATEX II 1/2 G, EEx ia IIC T6, WHG ATEX II 1/2 D, T80°C	St., Alu, Alu/sep.	FEL55/56/57/58/50A/50D
G	ATEX II 1/2 G, EEx ia IIC T6	PBT, St., Alu, Alu/sep.	FEL55/56/57/58/50A/50D
	ATEX II 1/2 G, EEx ia IIC T6 ATEX II 1/2 D, T80°C	St., Alu, Alu/sep.	FEL55/56/57/58/50A/50D
H	ATEX II 1G, EEx ia IIC T6		FEL55/56/57/58/50A/50D
J	ATEX II 1G, EEx ia IIC T6, WHG		FEL55/56/57/58/50A
I	ATEX II 1/2 G, EEx de	Alu/sep.	FEL51/52/54, FEL55/56/57/58/50A/50D
K	ATEX II 1/2 G, EEx d IIC T6	Alu	FEL51/52/54, FEL55/56/57/58/50A/50D
L	ATEX II 1/2 G, EEx d IIC T6, WHG	Alu	FEL51/52/54, FEL55/56/57/58/50A/50D
P	FM, IS, Cl. I, II, III, Div. 1, Gr. A–G	PBT, St., Alu, Alu/sep. with NPT cable entry	FEL55/56/57/58/50D FEL50A
Q	FM, XP, Cl. I, II, III, Div. 1, Gr. A–G	Alu with NPT cable entry	FEL51/52/54 FEL55/56/57/58/50D/50A
R	FM, NI, Cl. I, Div. 2, Gr. A–D	St., Alu, Alu/sep. with NPT cable entry	FEL51/52/54, FEL55/56/57/58/50D
		PBT with NPT cable entry	FEL55/56/57/58/50D/50A
U	CSA, General Purpose	St., Alu, Alu/sep. with NPT cable entry	FEL51/52/54, FEL55/56/57/58/50D/50A
		PBT with NPT cable entry	FEL51/52, FEL55/56/57/58/50D/50A
S	CSA, IS, Cl. I, II, III, Div. 1, Gr. A–G	PBT, St., Alu, Alu/sep. with NPT cable entry	FEL55/56/57/58/50D/50A
T	CSA, XP, Cl. I, II, III, Div. 1, Gr. A–G	Alu with NPT cable entry	FEL51/52/54, FEL55/56/57/58/50D/50A
V	TIIS Ex ia IIC T3	PBT, St., Alu	FEL57/50D***
W	TIIS Ex d IIB T3	Alu	FEL52/54/50D***
Y	Other certificate (for non-hazardous area)	PBT, St., Alu, Alu/sep.	FEL51/52/54, FEL55/56/57/58/50A/50D
*** In preparation!			



Note!

With polyester housing (PBT), electric connecting cables run in pipes:
Do not screw cable entries firmly to the piping. Use flexible connections (e.g. with armored hose).
If piping is used for grounding, then ensure that there is a continuous electrical connection.



Note!

Despite the additional dust ignition-proof certificates, the FTL5x(H) is to be used as a liquid point level switch only.

Ordering information



Note!

Versions that are mutually exclusive are not indicated in this list.

Liquiphant M FTL50 FTL51 product structure

Design		Basic weight	
FTL50	Compact	1.3 lb	0.6 kg
FTL51	With extension pipe	1.3 lb	0.6 kg

10	Approval:			
A	Non-hazardous area			
B	ATEX/NEPSI II 3 G/ ATEX/NEPSI II 3 D	EEx nC II T6 T 85 °C*	Overfill protection to WHG (Germany)	
C	ATEX/NEPSI II 3 G ATEX /NEPSI II 3 D	EEx nA II T6 T 85 °C*	Overfill protection to WHG (Germany)	
D	Non-hazardous area			Overfill protection to WHG (Germany)
E	ATEX II 1/2 G	EEx de IIC T6	Overfill protection to WHG (Germany)	
F	ATEX II 1/2 G ATEX II 1/2 D	EEx ia IIC T6 T 80 °C*	Overfill protection to WHG (Germany)	
G	ATEX II 1/2 G ATEX II 1/2 D	EEx ia IIC T6 T 80 °C*		
H	ATEX II 1 G	EEx ia IIC T6		
I	ATEX II 1/2 G	EEx de IIC T6		
J	ATEX II 1 G	EEx ia IIC T6	Overfill protection to WHG (Germany)	
K	ATEX II 1/2 G	EEx d IIC T6		
L	ATEX II 1/2 G	EEx d IIC T6	Overfill protection to WHG (Germany)	
M	NEPSI	Ex ia IIC T6		
N	NEPSI	Ex d IIC T6		
P	FM	IS, Class I, II, III	Division 1, Group A–G	
Q	FM	XP, Class I, II, III	Division 1, Group B–G, for E5 housing Group A–G	
R	FM	NI, Class I	Division 2, Group A–D	
S	CSA	IS, Class I, II, III	Division 1, Group A–G	
T	CSA	XP, Class I, II, III	Division 1, Group A–G	
U	CSA	General Purpose		
V	TIIS	Ex ia IIC T3		
W	TIIS	Ex d IIB T3		
X	TIIS	Ex ia IIC T6		
7	TIIS	Ex d IIC T3		
8	TIIS	Ex d IIC T6		
Y	Special version			
	*) Not for PBT			

20	Process connection:			Additional weight	
	Note! For a process pressure of 100 bar, please select the appropriate option under "Additional options"				
GQ2	G ¾	316L	Thread ISO 228		
	Installation > accessories: welding neck				
GQ5	G ¾	Alloy C4	Thread ISO 228		
GQ6**	G ¾	AlloyC22	Thread ISO 228		
GR2	G 1	316L	Thread ISO 228	0.4 lb	0.2 kg
GR5	G 1	Alloy C4	Thread ISO 228	0.4 lb	0.2 kg
GR6**	G 1	AlloyC22	Thread ISO 228	0.4 lb	0.2 kg
GW2*	G 1	316L	Thread ISO 228	0.4 lb	0.2 kg
	Installation > accessories: welding neck				

20	Process connection:					Additional weight	
	GM2*	NPT ¾		316L	Thread ANSI		
	GM5*	NPT ¾		Alloy C4	Thread ANSI		
	GM6**	NPT ¾		AlloyC22	Thread ANSI		
	GN2*	NPT1		316L	Thread ANSI	0.4 lb	0.2 kg
	GN5*	NPT1		Alloy C4	Thread ANSI	0.4 lb	0.2 kg
	GN6**	NPT1		AlloyC22	Thread ANSI	0.4 lb	0.2 kg
	GE2	R ¾		316L	Thread EN10226		
	GE5	R ¾		Alloy C4	Thread EN10226		
	GE6**	R ¾		AlloyC22	Thread EN10226		
	GF2	R 1		316L	Thread EN10226	0.4 lb	0.2 kg
	GF5	R 1		Alloy C4	Thread EN10226	0.4 lb	0.2 kg
	GF6**	R 1		AlloyC22	Thread EN10226	0.4 lb	0.2 kg
	BA2	DN32	PN6 A	316L	Flange EN 1092-1 (DIN 2527 B)	2.6 lb	1.2 kg
	BB2	DN32	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	4.4 lb	2.0 kg
	BC2	DN40	PN6 A	316L	Flange EN 1092-1 (DIN 2527 B)	3.0 lb	1.4 kg
	BD2	DN40	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	5.3 lb	2.4 kg
	BE2	DN50	PN6 A	316L	Flange EN 1092-1 (DIN 2527 B)	3.5 lb	1.6 kg
	BG2	DN50	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	7.1 lb	3.2 kg
	BH2	DN65	PN6 A	316L	Flange EN 1092-1 (DIN 2527 B)	5.3 lb	2.4 kg
	BJ2	DN50	PN100 A	316L (FTL51)	Flange EN 1092-1 (DIN 2527 B)		
	BK2	DN65	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	9.5 lb	4.3 kg
	BM2	DN80	PN10/16 A	316L	Flange EN 1092-1 (DIN 2527 B)	11 lb	4.8 kg
	BN2	DN80	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	13 lb	5.9 kg
	BQ2	DN100	PN10/16 A	316L	Flange EN 1092-1 (DIN 2527 B)	12 lb	5.6 kg
	BR2	DN100	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	17 lb	7.5 kg
	B12	DN80	PN100 A	316L (FTL51)	Flange EN 1092-1 (DIN 2527 B)		
	B82	DN25	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	3.0 lb	1.4 kg
	CA2	DN32	PN6 B1	316L	Flange EN 1092-1 (DIN 2527 C)	2.5 lb	1.1 kg
	CA5	DN32	PN6	Alloy C4 >316L	Flange EN 1092-1 (DIN 2527)	2.5 lb	1.1 kg
	CA6**	DN32	PN6 B1	AlloyC22 >316L	Flange EN 1092-1 (DIN 2527)	2.5 lb	1.1 kg
	CE2	DN50	PN6 B1	316L	Flange EN 1092-1 (DIN 2527 C)	3.3 lb	1.5 kg
	CE5	DN50	PN6	Alloy C4 >316L	Flange EN 1092-1 (DIN 2527)	3.3 lb	1.5 kg
	CE6**	DN50	PN6 B1	AlloyC22 >316L	Flange EN 1092-1 (DIN 2527)	3.3 lb	1.5 kg
	CG2	DN50	PN25/40 B1	316L	Flange EN 1092-1 (DIN 2527 C)	6.4 lb	2.9 kg
	CG5	DN50	PN25/40	Alloy C4 >316L	Flange EN 1092-1 (DIN 2527)	6.4 lb	2.9 kg
	CG6**	DN50	PN25/40 B1	AlloyC22 >316L	Flange EN 1092-1 (DIN 2527)	6.4 lb	2.9 kg
	CJ2	DN50	PN100 B2	316L (FTL51)	Flange EN 1092-1 (DIN 2527)		
	CN2	DN80	PN25/40 B1	316L	Flange EN 1092-1 (DIN 2527 C)	12 lb	5.2 kg
	CN5	DN80	PN25/40	Alloy C4 >316L	Flange EN 1092-1 (DIN 2527)	12 lb	5.2 kg
	CN6**	DN80	PN25/40 B1	AlloyC22 >316L	Flange EN 1092-1 (DIN 2527)	12 lb	5.2 kg
	CQ2	DN100	PN10/16 B1	316L	Flange EN 1092-1 (DIN 2527 C)	12 lb	5.3 kg
	CQ5	DN100	PN10/16	Alloy C4 >316L	Flange EN 1092-1 (DIN 2527)	12 lb	5.3 kg

20		Process connection:					Additional weight	
		CQ6**	DN100	PN10/16 B1	AlloyC22 >316L	Flange EN 1092-1 (DIN 2527)	12 lb	5.3 kg
		C12	DN80	PN25/40 B1	316L (FTL51)	Flange EN 1092-1 (DIN 2527)		
		C82	DN25	PN25/40 B1	316L	Flange EN 1092-1 (DIN 2527 C)	2.9 lb	1.3 kg
		C85	DN25	PN25/40	Alloy C4 >316L	Flange EN 1092-1 (DIN 2527)	2.9 lb	1.3 kg
		C86**	DN25	PN25/40 B1	AlloyC22 >316L	Flange EN 1092-1 (DIN 2527)	2.9 lb	1.3 kg
		DG2	DN50	PN40 B1	316L	Flange EN 1092-1 (DIN 2526 D)		
		DN2	DN80	PN40 B1	316L	Flange EN 1092-1 (DIN 2526 D)		
		D82	DN25	PN40 B1	316L	Flange EN 1092-1 (DIN 2526 D)		
		FG2	DN50	PN40 C	316L	Flange EN 1092-1 (DIN 2512 F)	5.7 lb	2.6 kg
		NG2	DN50	PN40 D	316L	Flange EN 1092-1 (DIN 2512 N)	6.4 lb	2.9 kg
		AA2*	1¼"	150 lbs	RF 316/316L	Flange ANSI B16.5	2.6 lb	1.2 kg
		AB2*	1¼"	300 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5	4.4 lb	2.0 kg
		AC2*	1½"	150 lbs	RF 316/316L	Flange ANSI B16.5	3.3 lb	1.5 kg
		AD2*	1½"	300 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5	6.0 lb	2.7 kg
		AE2*	2"	150 lbs	RF 316/316L	Flange ANSI B16.5	5.3 lb	2.4 kg
		AE5*	2"	150 lbs	RF Alloy C4 >316/316L	Flange ANSI B16.5	5.3 lb	2.4 kg
		AE6**	2"	150 lbs	RF AlloyC22 >316/316L	Flange ANSI B16.5	5.3 lb	2.4 kg
		AF2*	2"	300 lbs	RF 316/316L	Flange ANSI B16.5	7.1 lb	3.2 kg
		AG2*	2"	600 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5	9.3 lb	4.2 kg
		AJ2*	2½"	300 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5	11 lb	4.8 kg
		AL2*	3"	150 lbs	RF 316/316L	Flange ANSI B16.5	11 lb	4.9 kg
		AM2*	3"	300 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5	15 lb	6.8 kg
		AM6**	3"	300 lbs	RF AlloyC22 >316/316L	Flange ANSI B16.5	15 lb	6.8 kg
		AN2*	3"	600 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5		
		AP2*	4"	150 lbs	RF 316/316L	Flange ANSI B16.5	15 lb	7.0 kg
		AQ2*	4"	300 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5	25 lb	11.5 kg
		AQ6**	4"	300 lbs	RF AlloyC22 >316/316L	Flange ANSI B16.5	25 lb	11.5 kg
		AR2*	4"	600 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5	38 lb	17.3 kg
		A82*	1"	150 lbs	RF 316/316L	Flange ANSI B16.5	2.2 lb	1.0 kg
		KA2	10 K 25		RF 316L	Flange JIS B2220		
		KC2	10 K 40		RF 316L	Flange JIS B2220		
		KE2	10 K 50		RF 316L	Flange JIS B2220	3.7 lb	1.7 kg
		KE5	10 K 50		RF Alloy C4 >316L	Flange JIS B2220	3.7 lb	1.7 kg
		KE6**	10 K 50		RF AlloyC22 >316L	Flange JIS B2220	3.7 lb	1.7 kg
		KL2	10 K 80		RF 316L	Flange JIS B2220		
		KP2	10 K 100		RF 316L	Flange JIS B2220		
		TC2*	DN25-38 (1 to 1½")		316L	ISO 2852 Tri-Clamp		
		TE2*	DN40-51 (2")		316L	ISO 2852 Tri-Clamp	0.2 lb	0.1 kg
		YY9	Special version					
			* With CRN approval.					
			** AlloyC22 in preparation					
30		Probe length; Type:						
		FTL50						
		AA	Compact;		Ra <3.2 µm/80 grit			
		IA	Compact;		Temperature spacer		1.3 lb	0.6 kg
		QA	Compact;		Pressure tight feed through		1.5 lb	0.7 kg
		FTL51						
		BB	..... mm;	316L**	Ra <3.2 µm/80 grit			
		BE	..... mm;	Alloy**	Ra <3.2 µm/80 grit			
		CB	..... inch;	316L**	Ra <3.2 µm/80 grit			
		CE	..... inch;	Alloy**	Ra <3.2 µm/80 grit		5.0 lb/100 in	
		DB	Length: type II*;	316L	Ra <3.2 µm/80 grit		0.2 lb	0.1 kg
		DE	Length: type II*;	Alloy	Ra <3.2 µm/80 grit		0.2 lb	0.1 kg
		JB	..... mm;	316L**	+ Temperature spacer			0.9 kg/m +0.6 kg
		JE	..... mm;	Alloy**	+ Temperature spacer			0.9 kg/m +0.6 kg

30				Probe length; Type:			
			KB	..... inch;	316L**	+ Temperature spacer	5 lb/100 in +1.3 lb
			KE	..... inch;	Alloy**	+ Temperature spacer	5lb/100 in +1.3 lb
			LB	Length: type II*;	316L	+ Temperature spacer	0.2 lb 0.1 kg +1.3 lb +0.6 kg
			LE	Length: type II*;	Alloy	+ Temperature spacer	0.2 lb 0.1 kg +1.3 lb +0.6 kg
			RB	..... mm;	316L**	+ Pressure tight feed through	0.9 kg/m +0.7 kg
			RE	..... mm;	Alloy**	+ Pressure tight feed through	0.9 kg/m +0.7 kg
			SB	..... inch;	316L**	+ Pressure tight feed through	5 lb/100 in +1.5 lb
			SE	..... inch;	Alloy**	+ Pressure tight feed through	5 lb/100 in +1.5 lb
			TB	Length: type II*;	316L	+ Pressure tight feed through	0.2 lb 0.1 kg 1.5 lb +0.7 kg
			TE	Length: type II*;	Alloy	+ Pressure tight feed through	0.2 lb 0.1 kg 1.5 lb +0.7 kg
			YY	Special version			
				*) Replacing devices: when vertically mounting a Liquiphant M FTL51 with length II, the switch point is at the same height as for a Liquiphant II FTL360, FTL365, FDL30, FDL35. See also Page 33, "L II" depends on process connection.			
				**) Order 116 to 235 in (3001 to 6000 mm) via yy			
40				Electronics; output:			
			A	FEL50A	PROFIBUS PA		
			D	FEL50D	Density/concentration		
			1	FEL51*	2-wire,	19 to 253 V AC	
			2	FEL52*	3-wire PNP,	10 to 55 V DC	
			4	FEL54	Relay DPDT,	19 to 253 V AC, 19 to 55 V DC	
			5	FEL55	8/16 mA,	11 to 36 V DC	
			6	FEL56	NAMUR (L-H signal)		
			7	FEL57	2-wire PFM		
			8	FEL58*	NAMUR + test keys (H-L signal)		
			9	Special version			
				*) Also available in compact housing			
50				Housing; cable entry:			
			C3	Compact 316L	IP66/68;	Cable 5 m	
			D3	Compact 316L	IP65;	Plug Pg11	ISO4400
			E1*	F27 316L	NEMA6P;	Thread NPT ¾	
			E3	Compact 316L	NEMA4X;	Plug NPT ½	ISO4400
			N3	Compact 316L	IP66/68;	M12 connector	
			E4	F16 Polyester	NEMA4X;	Thread NPT ½	
			E5	F13/F17 Alu	NEMA4X;	Thread NPT ¾	1.1 lb 0.5 kg
			E6	F15 316L	NEMA4X;	Thread NPT ½	0.2 lb 0.1 kg
			E7	T13 Alu	IP66;	Thread NPT ¾	2.0 lb 0.9 kg
				Separate connection compartment			
			F1*	F27 316L	IP68	Thread G1/2	
			F4	F16 Polyester	IP66;	Thread G ½	
			F5	F13/F17 Alu	IP66;	Thread G ½	1.1 lb 0.5 kg
			F6	F15 316L	IP66;	Thread G ½	0.2 lb 0.1 kg
			F7	T13 Alu	coated, IP66;	Thread G ½	2.0 lb 0.9 kg
				Separate connection compartment			
			G1*	F27 316L	IP68;	M20 threaded joint	
			G4	F16 Polyester	IP66;	M20 threaded joint	
			G5	F13/F17 Alu	IP66;	M20 threaded joint	1.1 lb 0.5 kg (EEx d > M20 thread)
			G6	F15 316L	IP66;	M20 threaded joint	0.2 lb 0.1 kg
			G7	T13 Alu	coated, IP66;	M20 threaded joint	2.0 lb 0.9 kg (EEx d > M20 thread)
				Separate connection compartment			
			N4	F16 Polyester	IP66;	M12 connector	
			N5	F13/F17 Alu	IP66;	M12 connector	
			N6	F15 316L	IP66;	M12 connector	
			Y9	Special version			
				* F27 housing in preparation.			

60						Additional options	
						A	Basic version
						B	Cleaned for silicone-free service, max 78" (2000mm)
						C	EN 10204 - 3.1 material (316L wetted) inspection certificate
						K	Special adjustment, density H2O
						L	Special adjustment, density H2O, EN10204-3.1
						N	EN 10204 - 3.1 material, NACE MR0175 (316L wetted) inspection certificate
						P	100 bar process pressure (FTL51)
						R	100 bar process pressure, EN 10204 - 3.1 material, NACE MR0175 (316L wetted) inspection certificate (FTL51)
						S	GL/ABS marine approval (FTL51: max. 63"/1600 mm)
						Y	Special version
FTL5# -							Complete product designation



Note!
The basic weight includes the compact sensor, thread adapter G 3/4, electronic insert, polyester housing

Liquiphant M
FTL50H
FTL51H product structure

Design		Basic weight	
FTL50H	Compact	1.5 lb	0.7 kg
FTL51H	With extension pipe	1.5 lb	0.7 kg
10 Approval:			
A	Non-hazardous area		
B	ATEX/NEPSI II 3 G	EEx nC II T6	Overfill protection to WHG (Germany)
	ATEX/NEPSI II 3 D	T 85 °C*	
C	ATEX/NEPSI II 3 G	EEx nA II T6	Overfill protection to WHG (Germany)
	ATEX/NEPSI II 3 D	T 85 °C*	
D	Non-hazardous area		Overfill protection to WHG (Germany)
E	ATEX II 1/2 G	EEx de IIC T6	Overfill protection to WHG (Germany)
F	ATEX II 1/2 G	EEx ia IIC T6	Overfill protection to WHG (Germany)
	ATEX II 1/2 D	T 80 °C*	
G	ATEX II 1/2 G	EEx ia IIC T6	
	ATEX II 1/2 D	T 80 °C*	
H	ATEX II 1 G	EEx ia IIC T6	
I	ATEX II 1/2 G	EEx de IIC T6	
J	ATEX II 1 G	EEx ia IIC T6	Overfill protection to WHG (Germany)
K	ATEX II 1/2 G	EEx d IIC T6	
L	ATEX II 1/2 G	EEx d IIC T6	Overfill protection to WHG (Germany)
M	NEPSI	Ex ia IIC T6	
N	NEPSI	Ex d IIC T6	
P	FM	IS, Class I, II, III	Division 1, Group A–G
Q	FM	XP, Class I, II, III	Division 1, Group B–G, for E5 housing Group A–G
R	FM	NI, Class I	Division 2, Group A–D
S	CSA	IS, Class I, II, III	Division 1, Group A–G
T	CSA	XP, Class I, II, III	Division 1, Group A–G
U	CSA	General Purpose	
V	TIIS	Ex ia IIC T3	
W	TIIS	Ex d IIB T3	
X	TIIS	Ex ia IIC T6	
7	TIIS	Ex d IIC T3	
8	TIIS	Ex d IIC T6	
Y	Special version		
	*) Not for PBT		
20 Process connection:			
			Additional weight
GQ2	G ¾	316L (FTL50H)	Thread ISO 228
	Installation > accessories: welding neck		
GW2*	G 1	316L	Thread ISO 228
	Installation > accessories: welding neck		
BA2	DN32 PN6 A	316L	Flange EN 1092-1 (DIN 2527 B)
			2.6 lb 1.2 kg
BB2	DN32 PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)
			4.4 lb 2.0 kg
BC2	DN40 PN6 A	316L	Flange EN 1092-1 (DIN 2527 B)
			3.1 lb 1.4 kg
BD2	DN40 PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)
			5.3 lb 2.4 kg
BE2	DN50 PN6 A	316L	Flange EN 1092-1 (DIN 2527 B)
			3.5 lb 1.6 kg
BG2	DN50 PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)
			7.1 lb 3.2 kg
BH2	DN65 PN6 A	316L	Flange EN 1092-1 (DIN 2527 B)
			5.3 lb 2.4 kg
BK2	DN65 PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)
			9.5 lb 4.3 kg
BM2	DN80 PN10/16 A	316L	Flange EN 1092-1 (DIN 2527 B)
			11 lb 4.8 kg
BN2	DN80 PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)
			13 lb 5.9 kg
BQ2	DN100 PN10/16 A	316L	Flange EN 1092-1 (DIN 2527 B)
			12 lb 5.6 kg
BR2	DN100 PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)
			17 lb 7.5 kg
B82	DN25 PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)
			3.1 lb 1.4 kg
CG2	DN50 PN25/40 B1	316L	Flange EN 1092-1 (DIN 2527 C)
			7.1 lb 3.2 kg

20		Process connection:					Additional weight		
		CN2	DN80	PN25/40 B1	316L	Flange EN 1092-1 (DIN 2527 C)	13 lb	5.9 kg	
		CQ2	DN100	PN10/16 B1	316L	Flange EN 1092-1 (DIN 2527 C)	12 lb	5.6 kg	
		EE2	1" flush-mounted (52001047)		316L		0.7 lb	0.3 kg	
			Installation > accessories: welding neck						
		HE2	DN50	Pipe DIN 11850	316L	DIN 11864-1 A	0.7 lb	0.3 kg	
		AA2*	1¼"	150 lbs	RF 316/316L	Flange ANSI B16.5	2.6 lb	1.2 kg	
		AC2*	1½"	150 lbs	RF 316/316L	Flange ANSI B16.5	2.6 lb	1.5 kg	
		AE2*	2"	150 lbs	RF 316/316L	Flange ANSI B16.5	5.3 lb	2.4 kg	
		AF2*	2"	300 lbs	RF 316/316L	Flange ANSI B16.5	7.1 lb	3.2 kg	
		AJ2*	2½"	300 lbs	RF 316/316L (FTL51H)	Flange ANSI B16.5	11 lb	4.8 kg	
		AL2*	3"	150 lbs	RF 316/316L	Flange ANSI B16.5	11 lb	4.9 kg	
		AM2	3"	300 lbs	RF 316/316L (FTL51H)	Flange ANSI B16.5	15 lb	6.8 kg	
		AP2*	4"	150 lbs	RF 316/316L	Flange ANSI B16.5	15 lb	7.0 kg	
		AQ2*	4"	300 lbs	RF 316/316L (FTL51H)	Flange ANSI B16.5	25 lb	11.5 kg	
		A82*	1"	150 lbs	RF 316/316L	Flange ANSI B16.5	2.2 lb	1.0 kg	
		KA2	10 K 25		RF 316L	Flange JIS B2220			
		KC2	10 K 40		RF 316L	Flange JIS B2220			
		KE2	10 K 50		RF 316L	Flange JIS B2220	3.7 lb	1.7 kg	
		KL2	10 K 80		RF 316L	Flange JIS B2220			
		KP2	10 K 100		RF 316L	Flange JIS B2220			
		MA2	DN32	PN25	316L	DIN 11851	0.2 lb	0.1 kg	
		MC2	DN40	PN25	316L	DIN 11851	0.4 lb	0.2 kg	
		ME2	DN50	PN25	316L	DIN 11851	0.7 lb	0.3 kg	
		PE2	DRD	65 mm	316L		0.7 lb	0.3 kg	
		TC2*	DN25-38 (1 to 1½")		316L	ISO 2852 Tri-Clamp			
		TE2*	DN40-51 (2")		316L	ISO 2852 Tri-Clamp	0.2 lb	0.1 kg	
		TT2**	Ingold fitting 25x46mm		316L				
		UE2	SMS 2"	PN25	316L		0.4 lb	0.2 kg	
		WE2*	DN65-162 PN10		316L	Varivent N pipe	1.1 lb	0.5 kg	
		YY9	Special version						
			* CRN approval						
			** In preparation						

30		Probe length; Type:						
		FTL50H						
		AC	Compact;	Ra <1.5 µm/120 grit				
		AD	Compact;	Ra <0.3 µm/320 grit / A3				
		IC	Compact;	Ra <1.5 µm/120 grit + temperature spacer			1.3 lb	0.6 kg
		ID	Compact;	Ra <0.3 µm/320 grit / A3 + temperature spacer			1.3 lb	0.6 kg
		QC	Compact;	Ra <1.5 µm/120 grit + Pressure tight feed through			1.5 lb	0.7 kg
		Q	Compact;	Ra <0.3 µm/320 grit / A3 + Pressure tight feed through			1.5 lb	0.7 kg
		D						
		FTL51H						
		BC	..... mm;	Ra <1.5 µm/120 grit				0.9 kg/m
		BD	..... mm;	Ra <0.3 µm/320 grit / A3				0.9 kg/m
		CC	..... inch;	Ra <1.5 µm/120 grit			5 lb/100 in	
		CD	..... inch;	Ra <0.3 µm/320 grit / A3			5 lb/100 in	
		DC	Length: type II*;	Ra <1.5 µm/120 grit			0.2 lb	0.1 kg
		DD	Length: type II*;	Ra <0.3 µm/320 grit / A3			0.2 lb	0.1 kg
		JC	..... mm;	Ra <1.5 µm/120 grit + Temperature spacer				0.9 kg/m
		JD	..... mm;	Ra <0.3 µm/320 grit + Temperature spacer				0.9 kg/m
		KC	..... inch;	Ra <1.5 µm/120 grit + Temperature spacer			5 lb/100 in	+1.3 lb
		KD	..... inch;	Ra <0.3 µm/320 grit + Temperature spacer			5 lb/100 in	+1.3 lb
		LC	Length: type II*;	Ra <1.5 µm/120 grit + Temperature spacer			0.1 lb	0.1 kg
		LD	Length: type II*;	Ra <0.3 µm/320 grit + Temperature spacer			+1.3 lb	+0.6 kg
		RC	..... mm;	Ra <1.5 µm/120 grit + Pressure tight feed through			0.1 lb	0.1 kg
		RD	..... mm;	Ra <0.3 µm/320 grit + Pressure tight feed through			+1.3 lb	+0.6 kg
		SC	..... inch;	Ra <1.5 µm/120 grit + Pressure tight feed through			0.9 kg/m	+0.7 kg
		SD	..... inch;	Ra <0.3 µm/320 grit + Pressure tight feed through			5 lb/100 in	+1.5 lb

30					Probe length; Type:			
				TC	Length: type II*; + Pressure tight feed through	Ra <1.5 µm/120 grit	0.2 lb +1.5 lb	0.1 kg +0.7 kg
				TD	Length: type II*; + Pressure tight feed through	Ra <0.3 µm/320 grit	0.2 lb +1.5 lb	0.1 kg +0.7 kg
				YY	Special version			
					*) Replacing devices: when vertically mounting a Liquiphant M FTL51H with length II, the switch point is at the same height as for a Liquiphant II FTL360, FTL365, FDL30, FDL35. See also Page 33, "L II" depends on process connection.			
40					Electronics; output:			
				A	FEL50A	PROFIBUS PA		
				D	FEL50D	Density/concentration		
				1	FEL51*	2-wire, 19 to 253 V AC		
				2	FEL52*	3-wire PNP, 10 to 55 V DC		
				4	FEL54	Relay DPDT, 19 to 253 V AC, 19 to 55 V DC		
				5	FEL55	8/16 mA, 11 to 36 V DC		
				6	FEL56	NAMUR (L-H signal)		
				7	FEL57	2-wire PFM		
				8	FEL58*	NAMUR + test keys (H-L signal)		
				9	Special version			
				*) Also available in compact housing				
50					Housing; cable entry:			
				C3	Compact 316L	IP66/68;	Cable 5 m	
				D3	Compact 316L	IP65;	Plug Pg11	ISO 4400
				E1*	F27 316L	NEMA6P;	Thread NPT ¾	
				E3	Compact 316L	NEMA4X;	Plug NPT ½	ISO 4400
				N3	Compact 316L	IP66/68;	M12 connector	
				E4	F16 Polyester	NEMA4X;	Thread NPT ½	-0.2 lb -0.1 kg
				E5	F13/F17 Alu	NEMA4X;	Thread NPT ¾	0.9 lb 0.4 kg
				E6	F15 316L	NEMA4X;	Thread NPT ½	
				E7	T13 Alu	coated, IP66;	Thread NPT ¾	1.8 lb 0.8 kg
					Separate connection compartment			
				F1*	F27 316L	IP68	Thread G1/2	
				F4	F16 Polyester	IP66;	Thread G ½	-0.2 lb -0.1 kg
				F5	F13/F17 Alu	IP66;	Thread G ½	0.9 lb 0.4 kg
				F6	F15 316L	IP66;	Thread G ½	
				F7	T13 Alu	coated, IP66;	Thread G ½	1.8 lb 0.8 kg
					Separate connection compartment			
				G1*	F27 316L	IP68;	M20 threaded joint	
				G4	F16 Polyester	IP66;	M20 threaded joint	-0.2 lb -0.1 kg
				G5	F13/F17 Alu	IP66;	M20 threaded joint	0.9 lb 0.4 kg
					(EEx d > M20 thread)			
				G6	F15 316L	IP66;	M20 threaded joint	
				G7	T13 Alu	coated, IP66;	M20 threaded joint	1.8 lb 0.8 kg
					Separate connection compartment			
				N4	F16 Polyester	IP66;	M12 connector	
				N5	F13/F17 Alu	IP66;	M12 connector	
				N6	F15 316L	IP66;	M12 connector	
				Y9	Special version			
					* F27 housing in preparation.			
60					Additional options			
				A	Basic version			
				B*	CoC, EN 10204 - 3.1 material (316L wetted) Inspection certificate			
				C	EN 10204 - 3.1 material (316L wetted), Inspection certificate			
				K	Special adjustment, density H20			
				L	Special adjustment, density H20, EN10204-3.1 (316L wetted) inspection certificate			
				S	GL/ABS marine approval (FTL51H: max. 1600 mm)			
				Y	Special version			
				* In preparation.				
					FTL5#H - Complete product designation			



Note!

Basic weight = compact sensor, thread adapter G ¾, electronic insert, stainless steel housing

Accessories

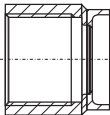
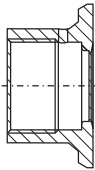
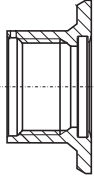
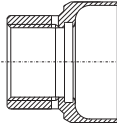
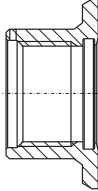
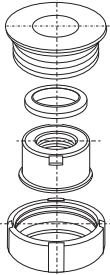


Note!

- All dimensions in mm
- For more detailed information on welding necks, please refer to TI426F/00.
- The tolerance of the defined thread start between the welding neck and sensor is $\pm 15^\circ$.

Welding neck


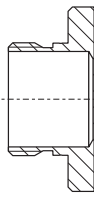
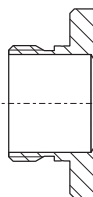
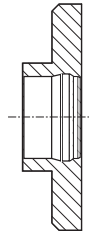

Overview

							
		a0008246	a0008251	a0008256	a0011924	a0008248	a0008253
		G$\frac{3}{4}$, d=29 without flange	G$\frac{3}{4}$, d=50 with flange	G$\frac{3}{4}$, d=55 with flange	G1, d=53 with flange	G1, d=60 with flange	G1 can be positioned
Material roughness μm (μin)		316L 1.5 (59.1)	316L 0.8 (31.5)	316L 0.8 (31.5)	316L 0.8 (31.5)	316L 0.8 (31.5)	316L 0.8 (31.5)
Without inspection certificate EN10204-3.1 material		–	–	52001052	–	52001051 ¹⁾	52001221 ²⁾
With inspection certificate EN10204-3.1 material		52028295	52018765	52011897	71093129 ¹⁾	52011896 ¹⁾	52011898 ²⁾
Seal (set of 5)		Silicone O-ring 52021717 ³⁾	Silicone O-ring 52021717 ³⁾	Silicone O-ring 52014473 ³⁾	Silicone O-ring 52014472 ³⁾	Silicone O-ring 52014472 ³⁾	Silicone profile gasket 52014424 ³⁾
Weld-in dummy		–	–	MVT2L0692	MVT2L0691	MVT2L0691	M40167
Liquiphant M	Feature	Version					
FTL50	020			GQ2			
FTL5x					GW2	GW2	GW2
FTL50H				GQ2			
FTL5xH					GW2	GW2	GW2

1) This welding neck replaces the welding neck with the order number 917969-1000.

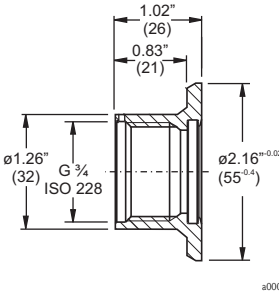
2) This welding neck replaces the welding neck with the order number 215159-0000.

3) A seal is included in the delivery.

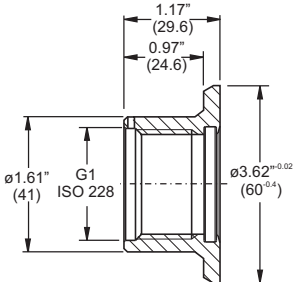
						
		a0008252	a0008245	a0008245	a0008552	a0008254
		RD52	Uni D85	Uni D65	M24 D65	DRD DN50 (65 mm) (welding flange)
Material roughness μm (μin), process side		316L 0.8 (31.5)	316L 3.2 (126)	316L 0.8 (31.5)	316L 0.8 (31.5)	316L/304 0.8 (31.5)
Without inspection certificate EN10204-3.1 material		52001047 ¹⁾	52006262	214880-0002	71041381	52002041/ 916743-0000
With inspection certificate EN10204-3.1 material		52006909 ¹⁾	52010173	52010174	71041383	52011899/ –
Seal (set of 5)		Silicone profile gasket 52014424	Silicone profile gasket 52023572	Silicone profile gasket 52023572	–	PTFE flat seal 52024228
Weld-in dummy		M40167	71093102	71093102	–	–
Device	Feature	Version				
Liquiphant M						
FTL5xH	020	EE2				PE2

1) This welding neck replaces the welding neck with the order number 942329-0001.

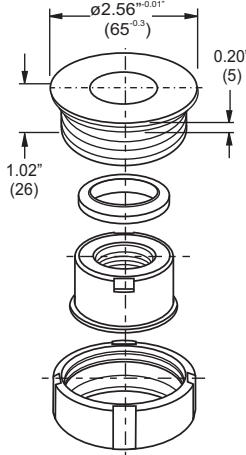
G^{3/4}, d=55
with flange for
flush-mounted installation

Dimensions	Version	Order number
 <p> ■ Max. 362 psi (25 bar) max. 300°F (150°C) ■ Max. 580 psi (40 bar) 212°F (max. 100°C) </p>	■ AISI 316L (1.4435) ■ Roughness: Ra <0.8 µm	52001052
	■ AISI 316L (1.4435) with inspection certificate EN10204-3.1 material ■ Roughness: Ra <0.8 µm	52011897
	Silicone O-ring, Ø 21.89 x 2.62 Material: VMQ70, FDA	52014473 (set of 5)
	Sensor dummy for welding in the welding neck	MVT2L0692
	FDA-compliant material in accordance with 21 CFR Part 177.1550/2600 Approval: 3A, EHEDG	
	Alternative seals Ø 21.89 x 2.62	Order number
	Material: EPDM, FDA	MVT2L1148
	Material: Kalrez Comp. 2035	MVT2L0666
	Material: Viton	MVT2L0655
	Material: Viton/FEP-FEK 75 Shore	MVT2L1748
	Material: Silicone, VMQ23-70, FDA, USP Class VI	71086100 (set of 3)

G1, d=60
with flange for flush-mounted
installation with sealing
surface

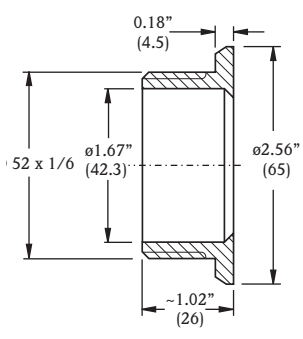
Dimensions	Version	Order number
 <ul style="list-style-type: none"> ■ Max. 362 psi (25 bar) max. 300°F (150°C) ■ Max. 580 psi (40 bar) max. 212°F (100°C) 	<ul style="list-style-type: none"> ■ AISI 316L (1.4435) ■ Roughness: Ra <0.8 µm 	52001051
	<ul style="list-style-type: none"> ■ AISI 316L (1.4435) with inspection certificate EN10204-3.1 material ■ Roughness: Ra <0.8 µm 	52011896
	Silicone O-ring, Ø 28.17 x 3.53 Material: VMQ70, FDA	52014472 (set of 5)
	Sensor dummy for welding in the welding neck	MVT2L0691
	FDA-compliant material in accordance with 21 CFR Part 177.1550/2600 Approval: EHEDG, 3A	
	Alternative seals Ø 28.17 x 3.53	Order number
	Material: EPDM70, FDA	MVT2L0920
	Material: Viton665, FDA	MVT2L0705 (set of 5)
	Material: Viton971, V, FDA	MVT2L1682
	Material: Kalrez comp. 4079	MVT2L0567
	Material: Silicone, VMQ23-70, FDA, USP Class VI	71086102 (set of 3)

G1
Sensor can be positioned

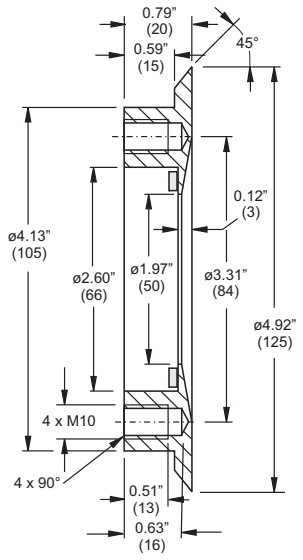
Dimensions	Version	Order number
 <ul style="list-style-type: none"> ■ Max. 362 psi (25 bar) max. 300°F (150°C) ■ Max. 580 psi (40 bar) max. 212°F (100°C) 	<ul style="list-style-type: none"> ■ AISI 316L (1.4435) ■ Roughness: Ra <0.8 µm 	52001221
	<ul style="list-style-type: none"> ■ AISI 316L (1.4435) with inspection certificate EN10204-3.1 material ■ Roughness: Ra <0.8 µm 	52011898
	Silicone profile gasket 29 x 36 x 3.7 Material: SI-60, FDA	52014424 (set of 5)
	Sensor dummy for welding in the welding neck	M40167
	FDA-compliant material in accordance with 21 CFR Part 177.1550/2600 Approval: 3A, EHEDG	
	Alternative seals 29 x 36 x 3.7	Order number
	Material: EPDM-60, FDA	52012805
	Material: Silicone, VMQ60, FDA, USP Class VI	71075662 (set of 5)

RD52

Sensor can be positioned

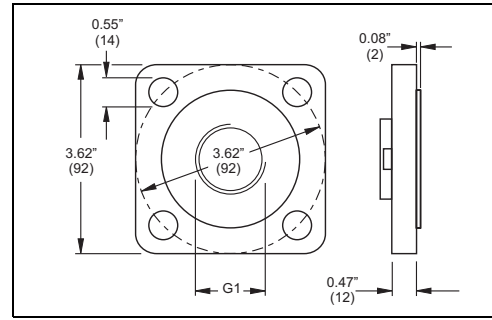
Dimensions	Version	Order number
 <p> ■ Max. 362 psi (25 bar) max. 300°F (150°C) ■ Max. 580 psi (40 bar) max. 212°F (100°C) </p>	■ AISI 316L (1.4435) ■ Roughness: Ra <0.8 µm	52001047
	■ AISI 316L (1.4435) with inspection certificate EN10204-3.1 material ■ Roughness: Ra <0.8 µm	52006909
	Silicone profile gasket 29 x 36 x 3.7 Material: SI-60, FDA ■ The seal can be easily replaced with this version.	52014424 (set of 5)
	Sensor dummy for welding in the welding neck	M40167
	FDA-compliant material in accordance with 21 CFR Part 177.1550/2600 Approval: 3A, EHEDG	
	Alternative seals 29 x 39 x 3.7	Order number
	Material: EPDM-60, FDA	52012805
	Material: Silicone, VMO60, FDA, USP Class VI	71075662 (set of 5)

DRD DN50 (65 mm)
for flush-mounted installation
of devices with DRD flange

Dimensions	Version	Order number
 <p> ■ Max. 362 psi (25 bar) max. 300°F (150°C) ■ Max. 580 psi (40 bar) max. 212°F (100°C) </p>	■ AISI 316L (1.4435) ■ Roughness: Ra <0.8 µm	52002041
	■ AISI 316L (1.4435) with inspection certificate EN10204-3.1 material ■ Roughness: Ra <0.8 µm	52011899
	AISI 304 (1.4301)	916743-0000
	Flat seal, 50 x 65 x 1 Material: PTFE, FDA	52024228 (set of 5)
	FDA-compliant material in accordance with 21 CFR Part 177.1550/2600	

Flange

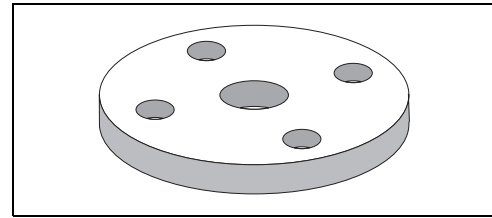
Order number: 918158-0000
 With G 1 thread for mounting
 a Liquiphant FTL50, FTL51
 with process connection GR2
 Pressure up to 580 psi (40 bar)
 Material: corrosion-resistant steel
 1.4301 (AISI 304 SS)
 Weight: 1.2 lb (0.54 kg)



100-FTL5xxxx-00-05-xx-xx-024

Flange

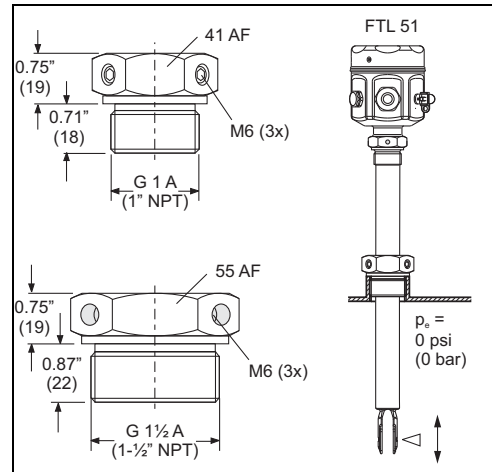
With G 1 thread for mounting
 a Liquiphant FTL50, FTL51
 with process connection GR2
 Material: corrosion-resistant steel
 1.4571 (AISI 316Ti SS)
 – Order number: 918143-0000
 Flange DN50 PN40, EN 1092-1
 Weight: 6.9 lb (3.11 kg)
 – Order number: 918144-0000
 Flange ANSI 2", 150 psi, RF
 Weight: 5.2 lb (2.38 kg)



100-FTL5xxxx-03-05-xx-xx-015

Sliding sleeves for unpressurized operation

For continuous adjustment of the switch
 point of a Liquiphant M FTL51
 Material: corrosion-resistant steel
 1.4435 (AISI 316 L SS)
 Weight for G 1, NPT 1: 0.5 lb (0.21 kg)
 Weight for G 1½, NPT 1½: 1.2 lb (0.54 kg)



100-FTL5xxxx-00-05-xx-en-006

Thread	Standard	Material	Order number	Approval
G 1	DIN ISO 228/1	1.4435 (AISI 316 L)	52003978	
G 1	DIN ISO 228/1	1.4435 (AISI 316 L)	52011888	3.1 inspection certificate EN 10204 - 3.1 material
NPT1	ANSI B 1.20.1	1.4435 (AISI 316 L)	52003979	
NPT1	ANSI B 1.20.1	1.4435 (AISI 316 L)	52011889	3.1 inspection certificate EN 10204 - 3.1 material
G 1½	DIN ISO 228/1	1.4435 (AISI 316 L)	52003980	
G 1½	DIN ISO 228/1	1.4435 (AISI 316 L)	52011890	3.1 inspection certificate EN 10204 - 3.1 material
NPT1½	ANSI B 1.20.1	1.4435 (AISI 316 L)	52003981	
NPT1½	ANSI B 1.20.1	1.4435 (AISI 316 L)	52011891	3.1 inspection certificate EN 10204 - 3.1 material

High pressure sliding sleeves

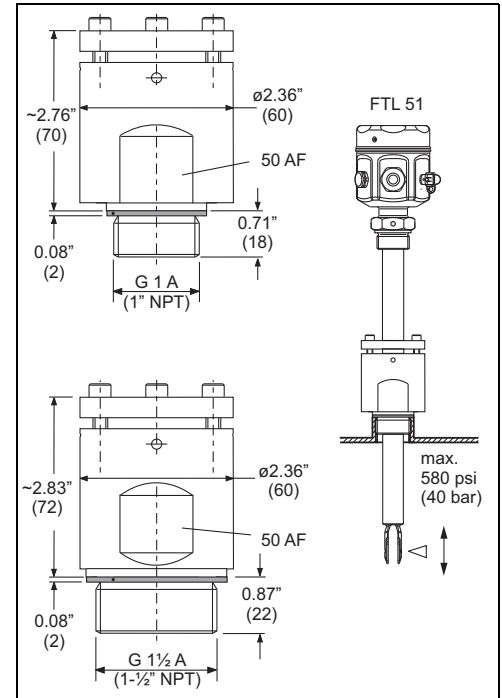
For continuous adjustment of the switch point of a Liquiphant M FTL51.
Also for use in hazardous areas.
For further information Page 59.
(ATEX, NEPSI).

Material: corrosion-resistant steel
1.4435 (AISI 316L SS) or AlloyC4

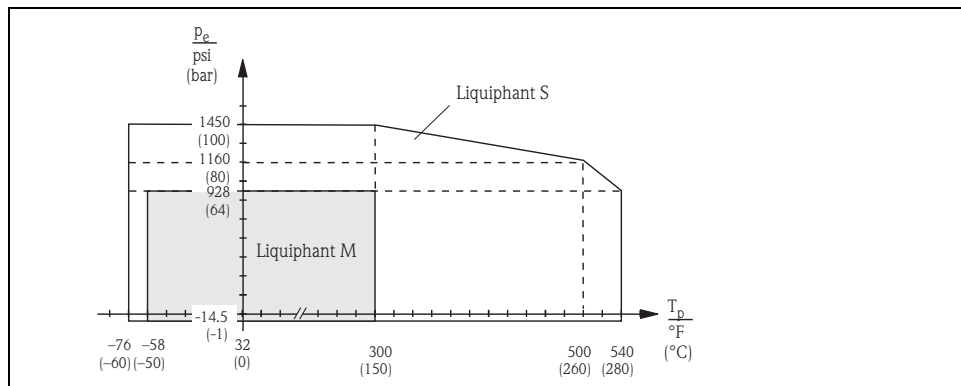
Weight for G 1, NPT 1: 2.5 lb (1.13 kg)

Weight for G 1½, NPT 1½: 2.9 lb (1.32 kg)

Seal package made of graphite



Thread	Standard	Material	Order number	Approval
G 1	DIN ISO 228/1	1.4435 (AISI 316 L)	52003663	
G 1	DIN ISO 228/1	1.4435 (AISI 316 L)	52011880	3.1 inspection certificate EN 10204 - 3.1 material
G 1	DIN ISO 228/1	Alloy C4	52003664	
G 1	DIN ISO 228/1	AlloyC22	*	
NPT1	ANSI B 1.20.1	1.4435 (AISI 316 L)	52003667	
NPT1	ANSI B 1.20.1	1.4435 (AISI 316 L)	52011881	3.1 inspection certificate EN 10204 - 3.1 material
NPT1	ANSI B 1.20.1	Alloy C4	52003668	
NPT1	ANSI B 1.20.1	AlloyC22	*	
G 1½	DIN ISO 228/1	1.4435 (AISI 316 L)	52003665	
G 1½	DIN ISO 228/1	1.4435 (AISI 316 L)	52011882	3.1 inspection certificate EN 10204 - 3.1 material
G 1½	DIN ISO 228/1	Alloy C4	52003666	
G 1½	DIN ISO 228/1	AlloyC22	*	
NPT1½	ANSI B 1.20.1	1.4435 (AISI 316 L)	52003669	
NPT1½	ANSI B 1.20.1	1.4435 (AISI 316 L)	52011883	3.1 inspection certificate EN 10204 - 3.1 material
NPT1½	ANSI B 1.20.1	Alloy C4	52003670	
NPT1½	ANSI B 1.20.1	AlloyC22	*	
* AlloyC22 in preparation.				



100-FTL5xxxx-05-05-xx-xx-002

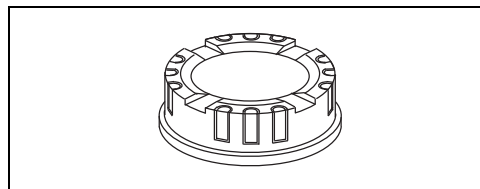
* FTL51 with high-pressure sliding sleeve (1450 psi / 100 bar). See "Additional fitting" Page 41 option "P" or "R".l

Transparent cover

Order number: 943461-0001
for polyester housing F16

Material: PA 12

Weight: 0.1 lb (0.04 kg)



100-FTL5xxxx-03-05-xx-xx-016

Cover with sight glass

For stainless steel housing F15

Material: AISI 316L SS

Weight: 0.4 lb (0.16 kg)

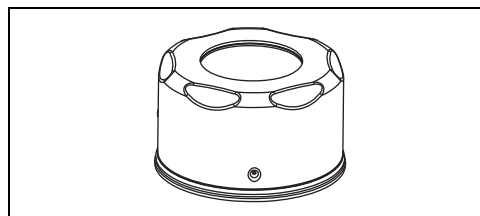
– Order number: 943301-1000

With glass sight glass

– Order number: 52001403

With PC sight glass

(Not for CSA, General Purpose)



100-FTL5xxxx-03-05-xx-xx-017

Circular connector

Order number: 52010285

4x0.34 M12 socket

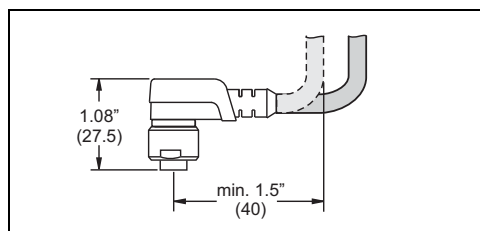
Cable: PVC (gray) 16 ft / 5 m

Body: PUR (blue)

Thread adapter nut: Cu Sn/Ni

Degree of protection: IP67

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



100-FTL20Hxx-07-05-xx-xx-004

Order number: 52024216

4x0.34 M12 socket

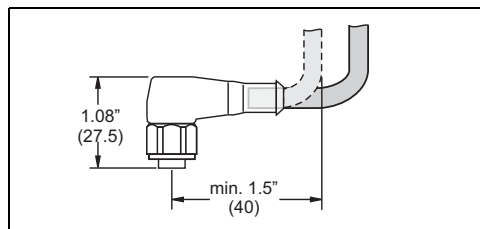
Cable: PVC (orange) 16 ft / 5 m

Body: PVC (orange)

Thread adapter nut: 316L SS

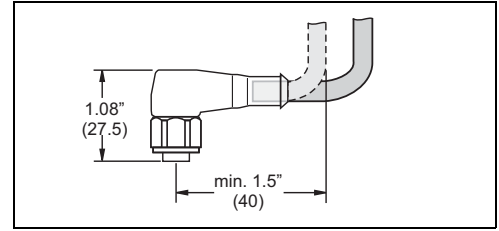
Degree of protection: IP69K (fully locked)

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



100-FTL20Hxx-07-05-xx-xx-005

Order number: 52018763
4x0.34 M12 socket with integrated LEDs
Cable: PVC (orange) 16 ft / 5 m
Body: PVC (transparent)
Thread adapter nut: 316L SS
Degree of protection: IP69K (fully locked)
Temperature range: -13 to +158°F (-25 to +70°C)



Documentation



Note!

You can find supplementary documentation on the product pages at www.endress.com

Operating Instructions

Electronic insert FEL50A for Liquiphant M/S
PROFIBUS PA
BA141F/00/en

Liquiphant M Density,
Density Computer FML621
BA335F/00/en

Liquiphant M FTL50, FTL51
KA143F/00/a6

Liquiphant M FTL50(H), FTL51(H)
KA144F/00/a6

Liquiphant M FTL51C
KA162F/00/a6

Liquiphant M FTL50-##### # 7 #, FTL51-##### # 7 #
KA163F/00/a6

Liquiphant M FTL50H-##### 7 #, FTL51H-##### 7 #
KA164F/00/a6

Liquiphant M FTL51C-##### 7 ##
KA165F/00/a6

Liquiphant M FTL5#-# ### ## # #3 #, FTL5#H-# ### ## # #3 #
KA220F/00/a6

Liquiphant M Density FTL50, FTL51
Electronic insert: FEL50D
KA284F/00/a6

Liquiphant M Density FTL50H, FTL51H
Electronic insert: FEL50D
KA285F/00/a6

Liquiphant M Density FTL51C
Electronic insert: FEL50D
KA286F/00/a6

Liquiphant M Sliding Sleeve for FTL51, G 1, NPT 1
KA151F/00/a6

Liquiphant M Sliding Sleeve for FTL51, G 1½, NPT 1½
KA152F/00/a6

Liquiphant M High-pressure Sliding Sleeve for FTL51, G 1, NPT 1
KA153F/00/a6

Liquiphant M High-pressure Sliding Sleeve for FTL51, G 1½, NPT 1½
KA154F/00/a6

Technical Information	<p>Nivotester FTL370/372, switching units in Racksyst design for Liquiphant M with electronic insert FEL57 TI198F/00/en</p> <p>Nivotester FTL320, switching unit in Minipac design for Liquiphant M with electronic insert FEL57 TI203F/00/de</p> <p>General instructions for electromagnetic compatibility (Test procedure, installation recommendation) TI241F/00/en</p> <p>Liquiphant M FTL51C, wetted parts with highly corrosion-resistant ECTFE, PFA or enamel coating TI347F/00/en</p> <p>Isolating amplifier FTL325P, 1 or 3-channel switching units for top-hat rail mounting for Liquiphant M/S with electronic insert FEL57 TI350F/00/en</p> <p>Isolating amplifier FTL325N, 1 or 3-channel switching units for top-hat rail mounting For Liquiphant M/S with electronic insert FEL56, FEL58 TI353F/00/en</p> <p>Liquiphant S FTL70/71, for medium temperatures up to 280 °C TI354F/00/en</p> <p>Isolating amplifier FTL375P, 1 to 3-channel switching units for top-hat rail mounting for Liquiphant M/S with electronic insert FEL57 TI360F/00/en</p> <p>Isolating amplifier FTL375N, 1 to 3-channel switching units for top-hat rail mounting For Liquiphant M/S with electronic insert FEL56, FEL58 TI361F/00/en</p> <p>Liquiphant M Density, Density Computer FML621 TI420F/00/en</p> <p>Welding neck, TI426F/00/en</p> <p>ASME-BPE Certificate of Compliance SD310F/00/en</p>
Functional safety (SIL)	<p>Liquiphant M/S with electronic insert FEL51 (MAX) SD164F/00/en</p> <p>Liquiphant M/S with electronic insert FEL51 (MIN) SD185F/00/en</p> <p>Liquiphant M/S with electronic insert FEL52 (MAX) SD163F/00/en</p> <p>Liquiphant M/S with electronic insert FEL52 (MIN) SD186F/00/en</p> <p>Liquiphant M/S with electronic insert FEL54 (MAX) SD162F/00/en</p> <p>Liquiphant M/S with electronic insert FEL54 (MIN) SD187F/00/en</p> <p>Liquiphant M/S with electronic insert FEL55 (MAX) SD167F/00/en</p> <p>Liquiphant M/S with electronic insert FEL55 (MIN) SD279F/00/en</p> <p>Liquiphant M/S with electronic insert FEL57 + Nivotester FTL325P (MAX) SD111F/00/en</p> <p>Liquiphant M/S with electronic insert FEL57 + Nivotester FTL325P (MIN) SD231F/00/en</p>

Liquiphant M/S with electronic insert FEL57+ Nivotester FTL375P (MAX)
SD113F/00/en


Liquiphant M/S with electronic insert FEL56 + Nivotester FTL325N (MAX)
SD168F/00/en


Liquiphant M/S with electronic insert FEL56 + Nivotester FTL325N (MIN)
SD188F/00/en


Liquiphant M/S with electronic insert FEL58 + Nivotester FTL325N (MAX)
SD161F/00/en


Liquiphant M/S with electronic insert FEL58 + Nivotester FTL325N (MIN)
SD170F/00/en


Safety Instructions (ATEX)

CE  II 1/2 G, EEx d IIC/B
(KEMA 99 ATEX 1157)
XA031F/00/a3

CE  II 1/2 G, EEx ia/ib IIC/B
(KEMA 99 ATEX 0523)
XA063F/00/a3

CE  II 1 G, EEx ia IIC/B
(KEMA 99 ATEX 5172 X)
XA064F/00/a3

CE  II 1/2 G, EEx de IIC/B
(KEMA 00 ATEX 2035)
XA108F/00/a3

CE  II 3 G, EEx nA/nC II
(EG 01 007-a)
XA182F/00/a3

Safety Instructions (NEPSI)

Ex d IIC/IIB T3-T6, Ex d IIC T2-T6 (NEPSI GYJ06424)
XA401F/00/B2

Ex ia IIC T2-T6, Ex ia IIB T3-T6 (NEPSI GYJ05556, NEPSI GYJ06464)
XC009F/00/b2

Ex nA II T3-T6, Ex nC/nL IIC T3-T6 (NEPSI GYJ04360, NEPSI GYJ071414)
XC010F/00/b2

Control Drawings

Liquiphant M/S (IS and NI) Current output PFM, NAMUR Entity installation
Class I, Div. 1, 2, Groups A, B, C, D
Class I, Zone 0
Class II, Div. 1, 2, Groups E, F, G
Class III
ZD041F-I/00/EN

Liquiphant M, Liquiphant S (cCSAus / IS)
Class I, Div. 1, Groups A, B, C, D Ex ia IIC T6
Class II, Div. 1, Groups E, F, G
Class III
ZD042F-G/00/EN

Liquiphant M/S (NI), FTL50(H), FTL51(H), FTL51C, FTL70, FTL71
Class I, Div. 2, Groups A, B, C, D
Class II, Div. 2, Groups F, G
Class III
ZD043F-C/00/EN

Liquiphant M, Liquiphant S (cCSAus / XP)
Class I, Groups A, B, C, D
Class II, Groups E, F, G
Class III
ZD240F/00/EN

Liquiphant M/S (IS and NI) PROFIBUS PA, FOUNDATION FieldbusClass I, Zone 0, IIC
 Class I, Division 1, 2, Groups A, B, C, D
 Class II, Division 1, 2, Groups E, F, G
 Class III
 ZD244F/00/EN

System information

Liquiphant M
 SI040F/00/en

United States

Endress+Hauser, Inc.
 2350 Endress Place
 Greenwood, IN 46143
 Tel. 317-535-7138
 Sales 888-ENDRESS
 888-363-7377
 Service 800-642-8737
 fax 317-535-8498
 inquiry@us.endress.com
 www.us.endress.com

Canada

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

Mexico

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



Level



Pressure



Flow



Temperature

Liquid
Analysis

Registration

Systems
Components

Services



Solutions

Technical Information

Levelflex M FMP40

Run Time Measurement

Guided Level Radar; Smart Transmitter for

- Level Measurement in Bulk Solids and Liquids
- Interface Measurement in Liquids



Cable probe



Rod probe



Coax probe



Application

Level measurement

Continuous level measurement of powdery to granular bulk solids e.g. plastic granulate and liquids.

- Measurement independent of density or bulk weight, conductivity, dielectric constant, temperature and dust e.g. during pneumatic filling.
- Measurement is also possible in the event of foam or if the surface is very turbulent.

- The HART® with 4 to 20 mA analog, PROFIBUS® PA and FOUNDATION™ Fieldbus protocols are available for system integration.
- Application in safety related systems (overspill protection) with requirements for functional safety up to SIL 2 in accordance with IEC 61508/IEC 61511-1.
- WHG approval

Interface measurement

Continuous measurement of interfaces between two liquids with very different dielectric constants, such as in the case of oil and water for example.

- Measurement independent of density, conductivity and temperature
- Electronics version for the simultaneous measurement of the level of interfaces and the total level in liquids. The HART with 4 to 20 mA analog protocol is available for system integration
- Special version for the measurement of the level of interfaces at a constant total level. The PROFIBUS PA and FOUNDATION Fieldbus protocols are available for system integration.

Your benefits

Probes are available with threaded process connections from 3/4" and flanges from DN40 / 1 1/2".

- Cable probes, for measurement in bulk solids, measuring range up to 115 ft (35 m).
- Rod probes, for liquids and solids
- Coax probes, for liquids
- Simple, menu-guided local operation with four-line plain text display.
- Local envelope curve on the display for easy diagnosis.
- Easy remote operation, diagnosis and measuring point documentation with the free operating program supplied.
- Optional remote display and operation.
- With coax probes the measurement is independent of structures in the tank or installation in a nozzle.
- Probe rod and probe cable can be replaced/shortened.
- Approvals: ATEX, FM, CSA, TIIS, NEPSI, IECEx.

Table of contents

Function and system design	4
Measuring principle	4
Measuring system	6

Input	11
Measured variable	11
Measuring range	11
Blocking distance	12
Used frequency spectrum	12

Output	13
Output signal	13
Signal on alarm	13
Linearization	13
Data of the FOUNDATION Fieldbus interface	13

Auxiliary energy	15
Electrical connection	15
Ground connection	15
Cable gland	15
Terminals	15
Terminal assignment	16
Fieldbus plug connectors	17
Load HART	18
Supply voltage	18
Cable entry	18
Power consumption	18
Current consumption	19
FISCO	19
Overvoltage protection	19

Performance characteristics	19
Reference operating conditions	19
Maximum measured error	19
Resolution	21
Reaction time	21
Influence of ambient temperature	21

Operating conditions: installation with level measurement	22
General information on level measurement	22
Special notes for bulk solids	24
Special notes for liquids	28

Operating conditions: installation with interface measurement	32
General information on interface measurement	32
Special information on interface measurement	34

Operating conditions: general installation instructions for special installation situations	35
Probe length	35
Installation in nozzles > 6" (150 mm) high	35
Installation in DN200/8" and DN250/10" nozzles	35
Installation in nozzle ≥ 12" (DN300)	36
Installation with heat insulation	36

Installation for difficult-to-access process connections	37
Replacing a displacer system in an existing displacer chamber	38

Operating conditions: Environment	39
Ambient temperature range	39
Ambient temperature limits	39
Storage temperature	40
Climate class	40
Degree of protection	40
Vibration resistance	40
Cleaning the probe	40
Electromagnetic compatibility (EMC)	40

Operating conditions: Process	40
Process temperature range	40
Process pressure limits	40
Materials in contact with process	41
Dielectric constant	41
Extension of the rope probes through tension and temperature	41

Mechanical construction	42
Design, dimensions	42
General information on flanges	44
Tolerance of probe length	44
Weight	44
Material	44
Process connection	44
Seal	44
Probe	44

Human interface	45
Operating concept	45
Display elements	45
Operating elements	46
Local operation	47
Remote operation	48

Certificates and approvals	51
CE mark	51
Ex approval	51
Overspill protection	52
Telecommunications	52
Standards and guidelines applied	52

Ordering information	53
Levelflex M FMP40	53

Accessories	57
Weather protection cover	57
Flange with horn adapter to adapt on the following nozzles	57
Remote display and operation FHX40	58
Centering disks	59
Commubox FXA191 HART	60
Commubox FXA195 HART	60
Commubox FXA291	60
ToF adapter FXA291	60

Adapter flange FAU70E /FAU70A	61
Extension rod / Centering	62
Mounting-kit isolated	62
HART loop converter HMX50	63

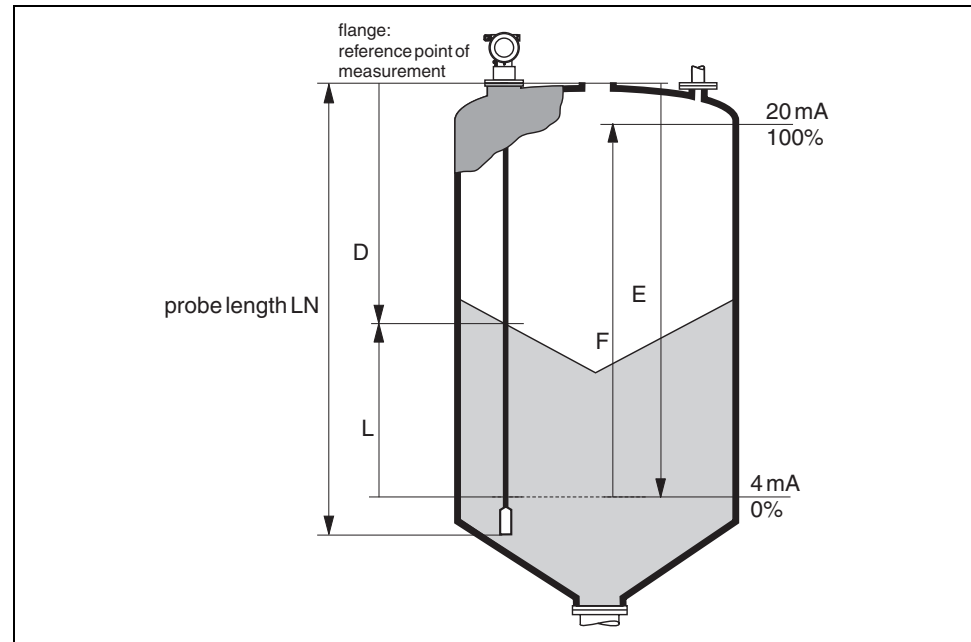
Additional documentation..... 63

Special Documentation	63
Technical Information	63
Operating Instructions	63
Certificates	63
Patents	63

Function and system design

Measuring principle

The Levelflex is a "downward-looking" measuring system that functions according to the ToF method (ToF = Time of Flight). The distance from the reference point to the product surface is measured. High-frequency pulses are injected to a probe and led along the probe. The pulses are reflected by the product surface, received by the electronic evaluation unit and converted into level information. This method is also known as TDR (Time Domain Reflectometry).



Reference point of the measurement

Dielectric constant

The dielectric constant (DK) of the medium has a direct impact on the degree of reflection of the high-frequency pulses. In the case of large DK values, such as for water or ammonia, there is strong pulse reflection while, with low DK values, such as for hydrocarbons, weak pulse reflection is experienced.

Input

The reflected pulses are transmitted from the probe to the electronics. There, a microprocessor analyzes the signals and identifies the level echo which was generated by the reflection of the high-frequency pulses at the product surface. This clear signal detection system benefits from over 30 years' experience with pulse time-of-flight procedures that have been integrated into the development of the PulseMaster® software.

The distance D to the product surface is proportional to the time of flight t of the impulse:

$$D = c \cdot t / 2,$$

where c is the speed of light.

Based on the known empty distance E, the level L is calculated:

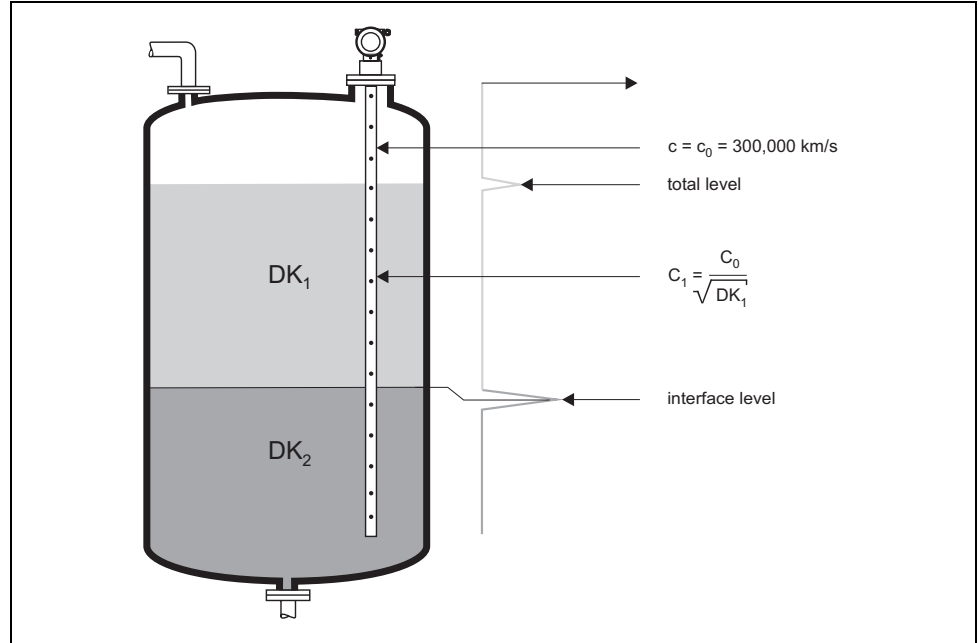
$$L = E - D$$

Reference point for "E" see diagram above.

The Levelflex possesses functions for interference echo suppression that can be activated by the user. They guarantee that interference echoes from e.g. internals and struts are not interpreted as level echoes.

Interface measurement

When the high-frequency pulses hit the surface of the medium, only a percentage of the transmission pulse is reflected. In the case of media with a low DK_1 , in particular, the other part penetrates the medium. The pulse is reflected once more at the interface point to a second medium with a higher DK_2 . The distance to the interface layer now can also be determined taking into account the delayed time-of-flight of the pulse through the upper medium.



L00-FMP4xxxx-15-00-00-en-007







Output

The Levelflex is preset at the factory to the probe length ordered so that in most cases only the application parameters that automatically adapt the device to the measuring conditions need to be entered. For models with a current output, the factory adjustment for zero point E and span F is 4 mA and 20 mA, for digital outputs and the display module 0 % and 100 %. A linearization function with max. 32 points, which is based on a table entered manually or semi-automatically, can be activated on site or via remote operation. This function allows the level to be converted into units of volume or mass, for example.

Measuring system
Probe selection

The various types of probe in combination with the process connections are suitable for the following applications:




Probes with 1½" threaded connection or flange

Type of probe:	6 mm/0.24" cable probe	6 mm/0.24" cable probe PA-coated	4 mm/0.16" cable probe	16 mm/0.63" rod probe	16 mm/0.63" rod probe, separable probe	Coax probe
						
Max. probe length:	115 ft (35 m) ¹⁾	115 ft (35 m) ¹⁾	Liquids: 115 ft (35 m) Bulk solids: 49 ft (15 m)	13 ft (4 m)	33 ft (10 m)	13 ft (4 m)
For application:	■ Bulk solids	■ Bulk solids especially cereal, flour	■ Liquids measuring range > 13 ft (4 m)	■ Liquids ■ bulk solids on short measuring ranges and sideways mounting ■ Interface measurement	■ Liquids ■ cramped mounting position (limited head clearance) ■ Interface measurement	■ Liquids ■ Interface measurement
Sideways capacity:	not relevant	not relevant	not relevant	22 lbf ft (30 Nm)	15 lbf ft (20 Nm)	221 lbf ft (300 Nm)
Tensile loading capacity (min.): rupture load (max.): ²⁾	6744 lbf (30 kN) 7868 lbf (35 kN)	6744 lbf (30 kN) 7868 lbf (35 kN)	2698 lbf (12 kN) 3597 lbf (16 kN)	not relevant	not relevant	not relevant
Feature 30	Option "B"	Option "H"	Option "A"	Option "K"	Option "S, T, U, V"	Option "L"

1) Greater lengths available on request.

2) Max. load of silo ceiling. If overloaded, the cable tears; the bushing remains air-tight.

Probes with 3/4" threaded connection

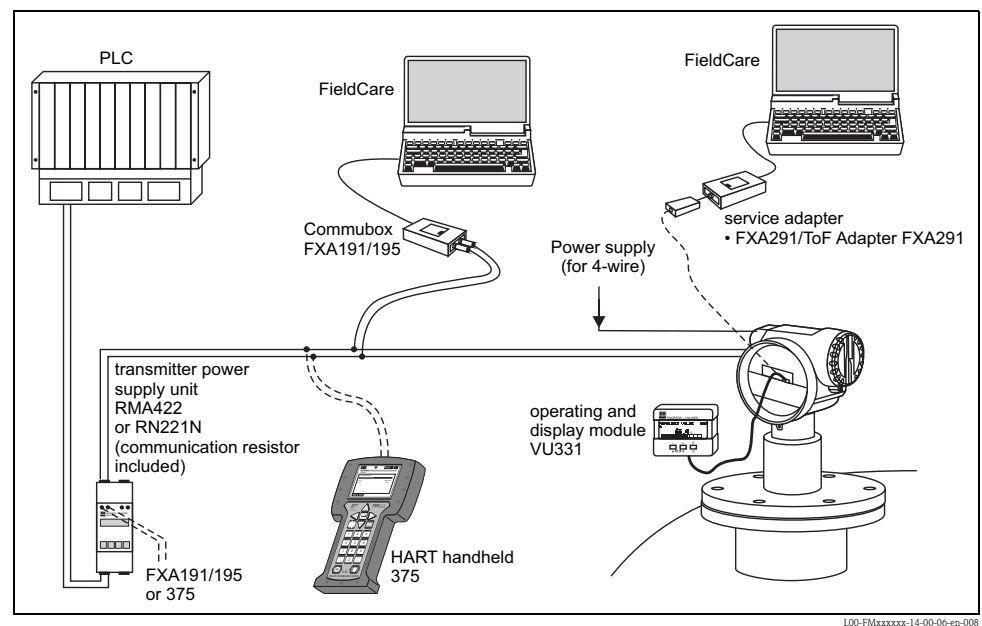
Version:	FMP40- #A#####	FMP40- #P#####	FMP40- #L#####
Type of probe:	4 mm/0.16" cable probe	6 mm/0.24" rod probe	Coax probe
			
Tensile loading capacity (min.): rupture load (max.): ¹⁾	1124 lbf (5 kN) 1798 lbf (12 kN)	not relevant	not relevant
Sideways capacity:	not relevant	3 lbf ft (4 Nm)	44 lbf ft (60 Nm)
For application:	<ul style="list-style-type: none"> Liquids measuring range > 4 m 	<ul style="list-style-type: none"> Liquids Interface measurement 	<ul style="list-style-type: none"> Liquids
Max. probe length:	115 ft (35 m) ²⁾	6.6 ft (2 m)	13 ft (4 m)

1) Max. load of silo ceiling. If overloaded, the cable tears; the bushing remains air-tight.

2) Longer lengths available on request.

Stand-alone

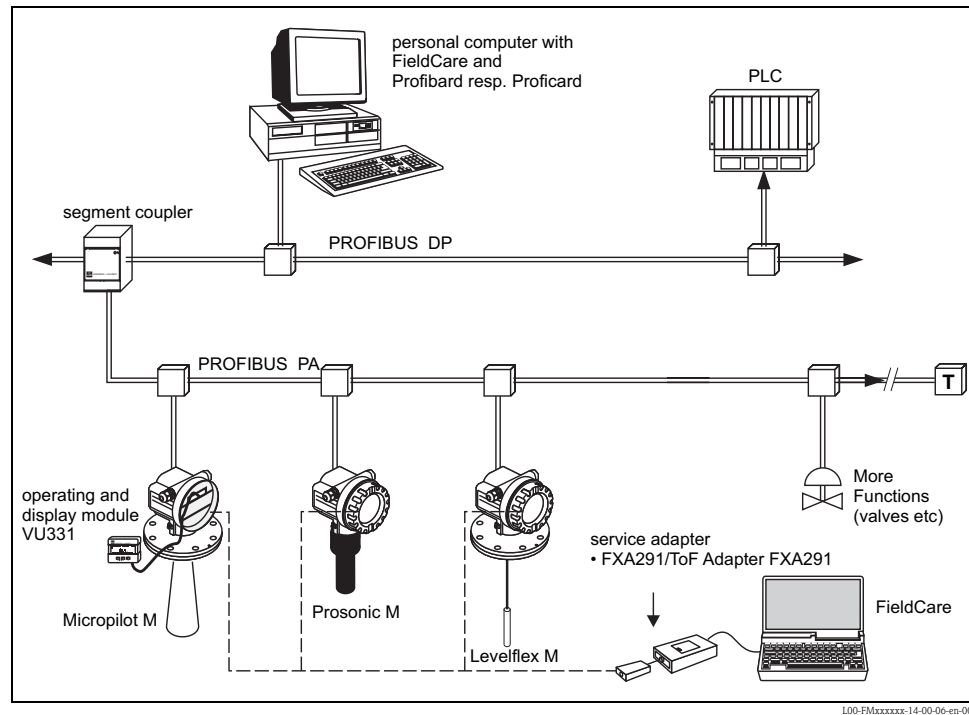
- Power supply directly from power line (4-wire) or from transmitter power supply unit (2-wire).
- Local operation with integrated display or remote operation with HART protocol.



If the HART communication resistor is not installed in the supply device and HART protocol communication is to be carried out, it is necessary to insert a communication resistor $\geq 250 \Omega$ into the 2-wire line.

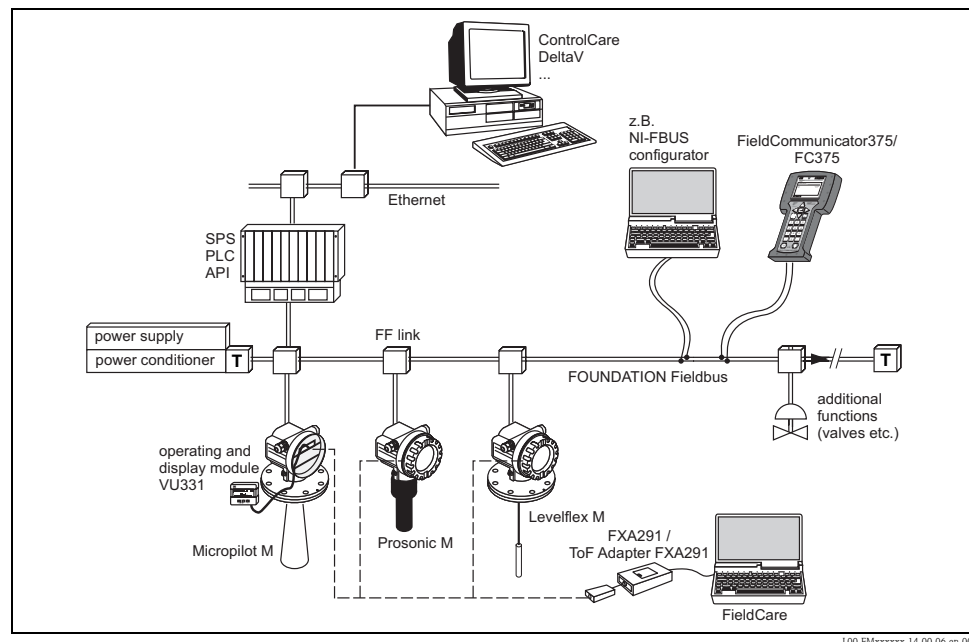
System integration via PROFIBUS PA

Maximum 32 transmitters (depending on the segment coupler, 10 in the Intrinsically safe / Ex ia IIC hazardous area according to the FISCO Model) can be connected to the bus. The Bus voltage is supplied by the segment coupler. Both local or remote operation are possible.



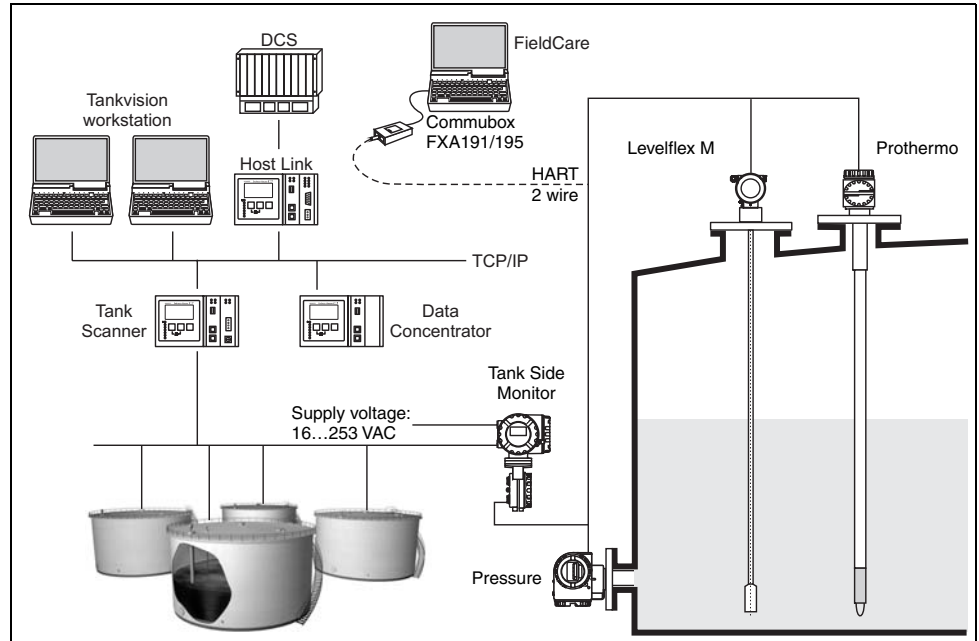
System integration via FOUNDATION Fieldbus

Max. 32 transmitters (standard, encapsulated / Ex em or explosion proof / Ex d) can be connected to the bus. In Intrinsically safe / Ex ia IIC explosion protection: the max. number of transmitters is based on the applicable regulations and standards for interconnecting intrinsically safe circuits (EN 60079-14), proof of intrinsic safety. Both local or remote operation are possible. The complete measuring system consists of:



Integration into the tank gauging system

The Endress+Hauser Tank Side Monitor NRF590 provides integrated communications for sites with multiple tanks, each with one or more sensors on the tank, such as radar, spot or average temperature, capacitive probe for water detection and/or pressure sensors. Multiple protocols out of the Tank Side Monitor guarantee connectivity to nearly any of the existing industry standard tank gauging protocols. Optional connectivity of analog 4 to 20 mA sensors, digital I/O and analog output simplify full tank sensor integration. Use of the proven concept of the intrinsically safe HART bus for all on-tank sensors yields extremely low wiring costs, while at the same time providing maximum safety, reliability and data availability.



L00-FMPxxxxx-14-00-06-en-004

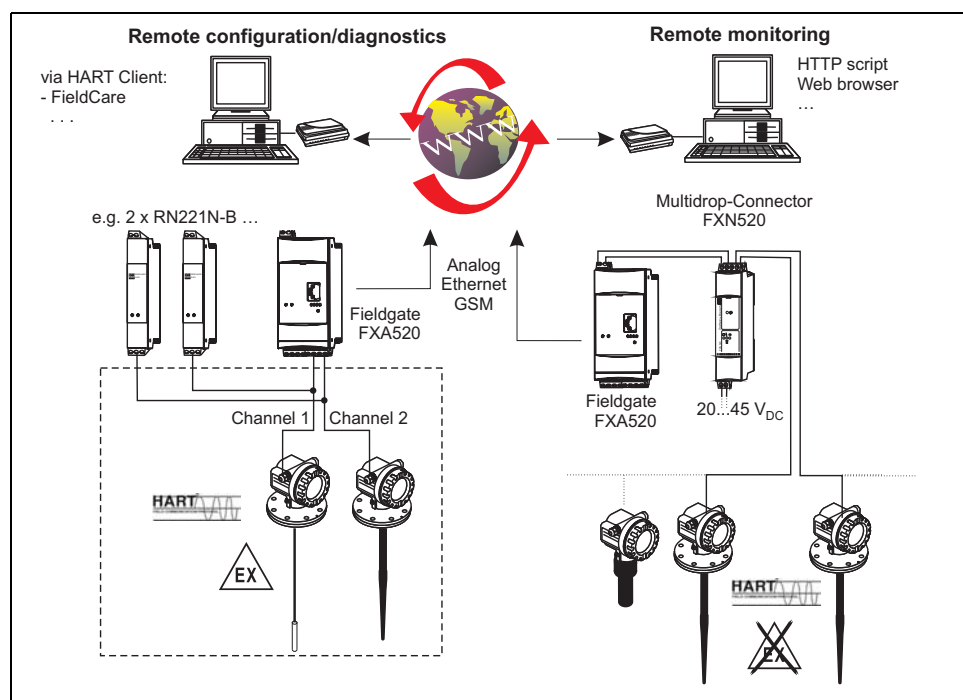
System integration via Fieldgate

Vendor Managed Inventory

By using Fieldgates to interrogate tank or silo levels remotely, suppliers of raw materials can provide their regular customers with information about the current supplies at any time and, for example, account for them in their own production planning. For their part, the Fieldgates monitor the configured level limits and, if required, automatically activate the next supply. The spectrum of options here ranges from a simple purchasing requisition via e-mail through to fully automatic order administration by coupling XML data into the planning systems on both sides.

Remote maintenance of measuring equipment

Fieldgates not only transfer the current measured values, they also alert the responsible standby personnel, if required, via e-mail or SMS. In the event of an alarm or also when performing routine checks, service technicians can diagnose and configure connected HART devices remotely. All that is required for this is the corresponding HART operating software (e.g. FieldCare, etc.) for the connected device. Fieldgate passes on the information transparently, so that all options for the respective operating software are available remotely. Some onsite service operations can be avoided by using remote diagnosis and remote configuration and all others can at least be better planned and prepared.



Note!

The number of instruments which can be connected in multidrop mode can be calculated by the "FieldNetCalc" program. A description of this program can be found in Technical Information TI 400F (Multidrop Connector FXN520). The program is available from your Endress+Hauser sales organization or on the Internet at: "www.de.endress.com Download" (Text Search = "Fieldnetcalc").

Input

Measured variable

The measured variable is the distance between the reference point (see Fig. on → 43) and the product surface.
Subject to the empty distance entered (E, see Fig. on → 4), the level is calculated.
Alternatively, the level can be converted into other variables (volume, mass) by means of linearization (32 points).

Measuring range

Level measurement

The following table describes the media groups and the possible measuring range as a function of the media group.

Medium group	DC (Er)	Typical bulk solids	Typical liquids	Measuring range	
				bare metallic probes	PA-coated Cable probes
1	1.4 to 1.6	—	– Condensed gases, e.g. N ₂ , CO ₂	15 ft (4 m), only coax probe	—
2	1.6 to 1.9	– Plastic granulate – White lime, special cement – Sugar	– Liquefied gas, e.g. propane – Solvent – Freon – Palm oil	82 to 98 ft (25 to 30 m)	16 to 50 ft (12.5 to 15 m)
3	1.9 to 2.5	– Portland cement, plaster	– Mineral oils, fuels	98 to 115 ft (30 to 35 m)	—
		– Flour	—	—	50 to 82 ft (15 to 25 m)
4	2.5 to 4	– Grain, seeds	—	—	82 to 98 ft (25 to 30 m)
		– Ground stones – Sand	– Benzene, styrene, toluene – Furan – Naphthalene	115 ft (35 m)	82 to 98 ft (25 to 30 m)
5	4 to 7	– Naturally moist (ground) stones, ores – Salt	– Chlorobenzene, chloroform – Cellulose spray – Isocyanate, aniline	115 ft (35 m)	115 ft (35 m)
6	> 7	– Metallic powder – Carbon black – Coal	– Aqueous solutions – Alcohols – Ammonia	115 ft (35 m)	115 ft (35 m)

The respective lower group applies for very loose or loosened bulk solids.

Reduction of the max. possible measuring range through:

- Extremely loose surfaces of bulk solids, e.g. bulk solids with low bulk weight for pneumatic filling.
- Buildup, above all of moist products.



Note!

Due to the high diffusion rate of ammonia it is recommended to use the FMP45 with gas-tight bushing for measurements in this medium.

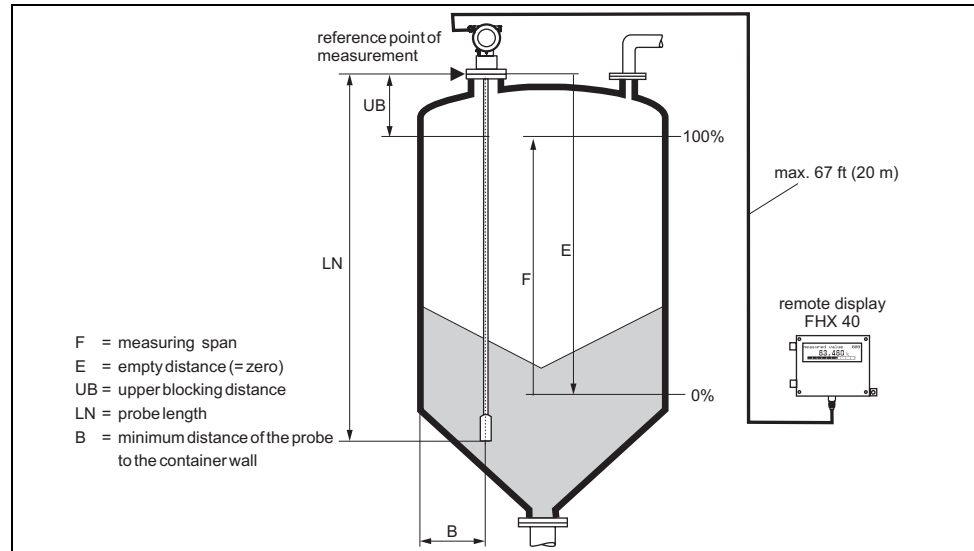
Interface measurement

The measuring range for interface measurement is limited to 33 ft (10 m). Larger measuring range available on request.

Blocking distance

The upper blocking distance (= UB) is the minimum distance from the reference point of the measurement (mounting flange) to the maximum level.

At the lowest part of the probe an exact measurement is not possible, see "Performance characteristics" on → 19.



Reference point of the measurement, details → 43

Blocking distance and measuring range:

FMP40	LN ft [m]		UB ft [m]
	min	max	min
Cable probe	3.3 (1)	115 (35) ¹⁾	0.6 (0.2) ²⁾
6 mm (0.24") rod probe	1 (0.3)	6.5 (2)	0.6 (0.2) ²⁾
16 mm (0.63") rod probe	1 (0.3)	13 (4)	0.6 (0.2) ²⁾
Coax probe	1 (0.3)	13 (4)	0

- 1) Larger measuring range available on request.
- 2) The indicated blocking distances are preset. At media with DK > 7, the upper blocking distance UB can be reduced for rod and rope probes on 0.1 m. The upper blocking distance UB can be entered manually.

FMP40 (interface)	LN ft [m]		UB ft [m]
	min	max	min
Coax probe	1 (0.3)	13 (4)	0
16 mm (0.63") rod probe in the bypass	1 (0.3)	13 (4)	0.3 (0.1) ¹⁾
6 mm (0.24") rod probe in the bypass	1 (0.3)	6.5 (2)	0.3 (0.1) ¹⁾
Cable probe in free field ²⁾	1 (0.3)	33 (10) ³⁾	0.3 (0.1) ¹⁾

- 1) The indicated blocking distances are preset. The upper blocking distance UB can be entered manually.
- 2) Measurements in free field available on request.
- 3) Larger measuring range available on request.



Note!
Within the blocking distance, a reliable measurement can not be guaranteed.

Used frequency spectrum

100 MHz to 1.5 GHz

Output

Output signal

- 4 to 20 mA with HART protocol
- PROFIBUS PA:
 - signal coding: Manchester Bus Powered (MBP); Manchester II
 - data transmission rate: 31.25 KBit/s, voltage mode
- FOUNDATION Fieldbus (H1):
 - signal coding: Manchester Bus Powered (MBP); Manchester II
 - data transmission rate: 31.25 KBit/s, voltage mode

Signal on alarm

Failure information can be accessed via the following interfaces:

- Local display:
 - Error symbol
 - Plain text display
- Current output, failsafe mode can be selected (e.g. according to NAMUR Recommendation NE 43).
- Digital interface

Linearization

The Levellflex M linearization function enables the measured value to be converted into any desired length or volume units and mass or %. Linearization tables for volume calculation in cylindrical tanks are preprogrammed. Any other tables with up to 32 value pairs can be input manually or semi-automatically. The creation of a linearization table with FieldCare is particularly convenient.

Data of the FOUNDATION Fieldbus interface

Basic Data

Device Type	1012 (hex)
Device Revision	04 (hex)
DD Revision	02 (hex)
CFF Revision	02 (hex)
ITK Version	4.61
ITK-Certification Driver-No.	www.endress.com / www.fieldbus.org
Link-Master (LAS) capable	yes
Link Master / Basic Device selectable	yes; Default: Basic Device
Number VCRs	24
Number of Link-Objects in VFD	24

Virtual communication references (VCRs)

Permanent Entries	1
Client VCRs	0
Server VCRs	24
Source VCRs	23
Sink VCRs	0
Subscriber VCRs	23
Publisher VCRs	23

Link Settings

Slot time	4
Min. Inter PDU delay	6
Max. response delay	10

Transducer Blocks

Block	Content	Output values
Sensor Block	contains all parameters related to the measurement	<ul style="list-style-type: none"> ■ level or volume¹⁾ (channel 1) ■ distance (channel 2)
Diagnsotic Block	contains diagnostiv information	no output values
Display Block	contains parameters to configure the local display	no output values

1) depending on the configuration of the sensor-block

Function Blocks

Block	Content	Execution time	Functionality
Resource Block	The Resource Block contains all the data that uniquely identifies the field device. It is an electronic version of a nameplate of the device.		enhanced
Analog Input Block 1 Analog Input Block 2	The AI block takes the manufacturer's input data, selected by channel number, and makes it available to other function blocks at its output.	30 ms	standard
PID Block	The PID block serves as proportional-integral-derivative controller and is used almost universally to do closed-loop-control in the field including cascade and feedforward.	80 ms	standard
Arithmetic Block	This block is designed to permit simple use of popular measurement math functions. The user does not have to know how to write equations. The math algorithm is selected by name, chosen by the user for the function to be done.	50 ms	standard
Input Selector Block	The input selector block provides selection of up to four inputs and generates an output based on the configured action. This block normally receives its inputs from AI blocks. The block performs maximum, minimum, middle, average and 'first good' signal selection.	30 ms	standard
Signal Characterizer Block	The signal characterizer block has two sections, each with an output that is a non-linear function of the respective input. The non-linear function is determined by a single look-up table with 21 arbitrary x-y pairs.	40 ms	standard
Integrator Block	The Integrator Function Block integrates a variable as a function of the time or accumulates the counts from a Pulse Input block. The block may be used as a totalizer that counts up until reset or as a batch totalizer that has a setpoint, where the integrated or accumulated value is compared to pre-trip and trip settings, generating discrete signals when these settings are reached.	60 ms	standard

Auxiliary energy

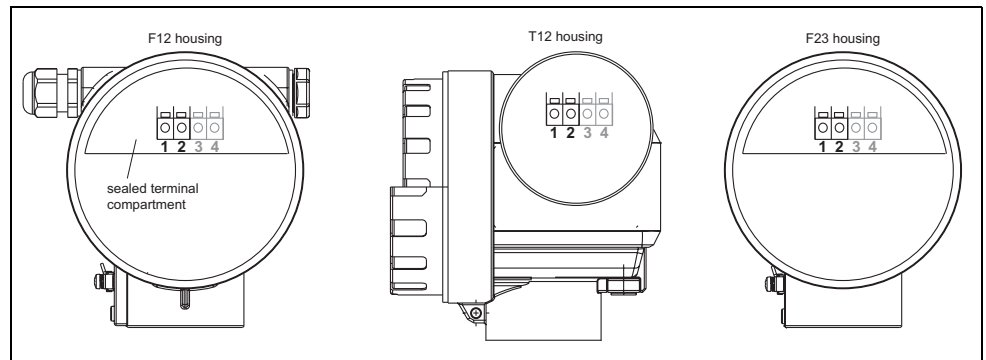
Electrical connection

Connection compartment

Three housings are available:

- Aluminum housing F12 with additionally sealed connection compartment for:
 - standard
 - Intrinsically safe / Ex ia
 - dust ignition-proof
- Aluminum housing T12 with separate connection compartment for:
 - standard
 - Encapsulated / Ex e
 - Explosion proof / Ex d
 - Intrinsically safe / Ex ia (with overvoltage protection)
 - dust ignition-proof
- Stainless steel 1.4435/316L housing F23 for:
 - standard
 - Intrinsically safe / Ex ia
 - dust ignition-proof

After mounting, the housing can be turned 350° in order to make it easier to access the display and the connection compartment.



Ground connection

It is necessary to make a good ground connection to the ground terminal on the outside of the housing, in order to achieve EMC security.

Cable gland

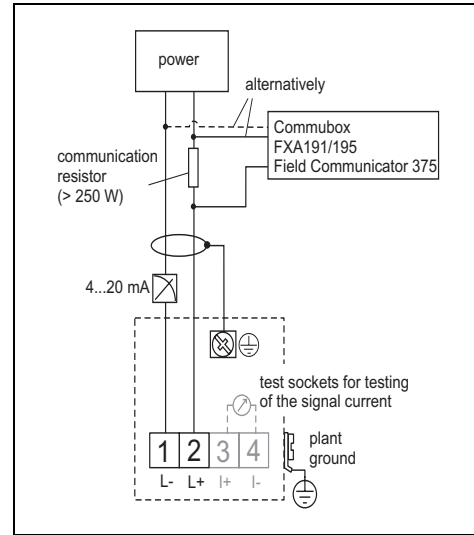
	Type	Clamping area
Standard, Ex ia, IS	Plastic M20x1.5	5 to 10 mm
Ex em, Ex nA	Metal M20x1.5	7 to 10.5 mm
All	1/2" NPT, metal	

Terminals

For wire cross-sections of 16 to 18 AWG (0.5 to 2.5 mm²)

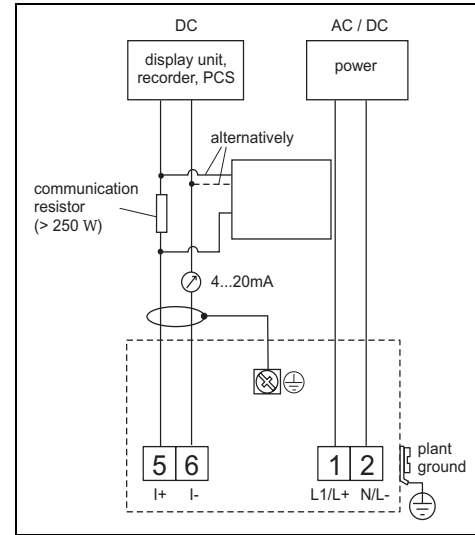
Terminal assignment

2-wire, 4 to 20 mA with HART



L00-FMxxxxxx-04-00-00-en-015

4-wire, 4 to 20 mA active with HART



L00-FMxxxxxx-04-00-00-en-011



Note!

If 4-wire for dust-Ex-applications is used, the current output is intrinsically safe.

Connect the connecting line to the screw terminals in the terminal compartment.

Cable specification:

- A standard installation cable is sufficient if only the analog signal is used. Use a shielded cable when working with a superimposed communications signal (HART).



Note!

- See TI402F/00/en for connection to Tank Side Monitor NRF590.
- Protective circuitry against reverse polarity, RFI and over-voltage peaks is built into the device (see also Technical Information TI241F "EMC Test Procedures").

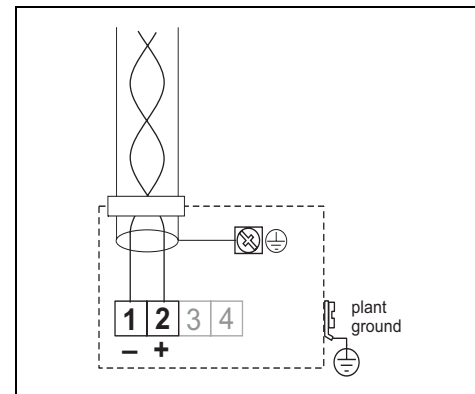
PROFIBUS PA

The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary energy.

For further information on the network structure and grounding and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA034S "Guidelines for planning and commissioning PROFIBUS DP/PA" and the PNO Guideline.

Cable specification:

- Use a twisted, shielded two-wire cable, preferably cable type A



L00-FMxxxxxx-04-00-00-en-022

Note!

For further information on the cable specifications, see Operating Instructions BA034S "Guidelines for planning and commissioning PROFIBUS DP/PA", PNO Guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

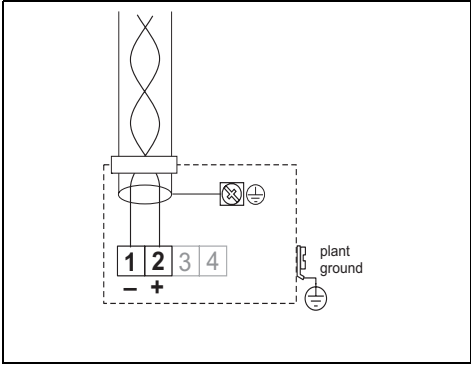
FOUNDATION Fieldbus

The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary energy.

For further information on the network structure and grounding and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA013S "FOUNDATION Fieldbus Overview" and the FONDATION Fieldbus Guideline.

Cable specification:

- Use a twisted, shielded two-wire cable, preferably cable type A



L00-FMxxxxxx-04-00-00-en-022

Note!

For further information on the cable specifications, see Operating Instructions BA013S "FOUNDATION Fieldbus Overview", FONDATION Fieldbus Guideline and IEC 61158-2 (MBP).

Fieldbus plug connectors

For the versions with fieldbus plug connector (M12 or 7/8"), the signal line can be connected without opening the housing.

Pin assignment of the M12 plug connector (PROFIBUS PA plug)

	Pin	Meaning
	1	Ground
	2	Signal +
	3	Signal -
	4	not connected

L00-FMxxxxxx-04-00-00-yy-016

Pin assignment of the 7/8" plug connector (FOUNDATION Fieldbus plug)

	Pin	Meaning
	1	Signal -
	2	Signal +
	3	not connected
	4	Ground

L00-FMxxxxxx-04-00-00-yy-017

Load HART Minimum load for HART communication: 250 Ω

Supply voltage

HART, 2-wire

All the following values are the terminal voltages directly at the device:

Communication		Current consumption	Terminal voltage	
			minimum	maximum
HART	Standard	4 mA	16 V	36 V
		20 mA	7.5 V	36 V
	Intrinsically safe (Ex ia)	4 mA	16 V	30 V
		20 mA	7.5 V	30 V
	Encapsulated (Ex em) Explosion proof (Ex d)	4 mA	16 V	30 V
		20 mA	11 V	30 V
Fixed current, adjustable e.g. for solar power operation (measured value transmitted via HART)	Standard	11 mA	10 V	36 V
	Intrinsically safe (Ex ia)	11 mA	10 V	30 V
Fixed current for HART Multidrop mode	Standard	4 mA ¹⁾	16 V	36 V
	Intrinsically safe (Ex ia)	4 mA ¹⁾	16 V	30 V

1) Start up current 11 mA.

HART residual ripple, 2-wire: $U_{ss} \leq 200$ mV

HART, 4-wire active

Version	Voltage	max. load
DC	10.5 to 32 V	600 Ω
AC, 50/60 Hz	90 to 253 V	600 Ω

Residual ripple HART, 4-wire, DC version: $U_{ss} \leq 2$ V, voltage incl.
ripple within the permitted voltage (10.5 to 32 V)

PROFIBUS PA and FOUNDATION Fieldbus

Supply voltage	9 V to 32 V ¹⁾
Lift-off voltage	9 V

1) There may be additional restrictions for devices with an explosion protection certificate. Refer to the notes in the appropriate safety instructions (XA).

Cable entry

Cable gland: M20x1.5 (only cable entry for Ex d)
Cable entry: G ½ or ½ NPT
PROFIBUS PA M12 plug
Fieldbus Foundation 7/8" plug

Power consumption

Min. 60 mW, max. 900 mW

Current consumption
HART

3.6 to 22 mA for HART Multidrop: start up current is 11 mA.

PROFIBUS PA

Max. 11 mA.

FOUNDATION Fieldbus

Nominal current	15 mA
Starting current	≤ 15 mA
Error current	0 mA
FISCO/FNICO conformal	compliant
Polarity sensitive	no

FISCO

U_i	17,5 V
I_i	500 mA; with overvoltage protection 273 mA
P_i	5.5 W; with overvoltage protection 1.2 W
C_i	5 nF
L_i	0.01 mH

Overvoltage protection

If the measuring device is used for level measurement in flammable liquids which requires the use of overvoltage protection according to DIN EN 60079-14, standard for test procedures 60060-1 (10 kA, pulse 8/20 μ s), it has to be ensured that:

- the measuring device with integrated overvoltage protection with 600 V gas discharge tubes within the T12-enclosure is used, refer to product overview Ordering information on page 53
- or
- This protection is achieved by the use of other appropriate measures (external protection devices e.g. HAW262Z).

Performance characteristics

Reference operating conditions

- Temperature = +20°C (68°F) \pm 5 °C (9°F)
- Pressure = 1013 mbar abs. (14.7 psia) \pm 20 mbar (0.3 psi)
- Humidity = 65 % \pm 20%
- Reflection factor \geq 0.8 (surface of the water for coax probe, metal plate for rod and rope probe with min. 1 m \varnothing)
- Flange for rod or cable probe \geq 30 cm (12") \varnothing
- Distance to obstructions \geq 1 m (3 ft)
- For interface measurement:
 - Coax probe
 - DK of the lower medium = 80 (water)
 - DK of the upper medium = 2 (oil)

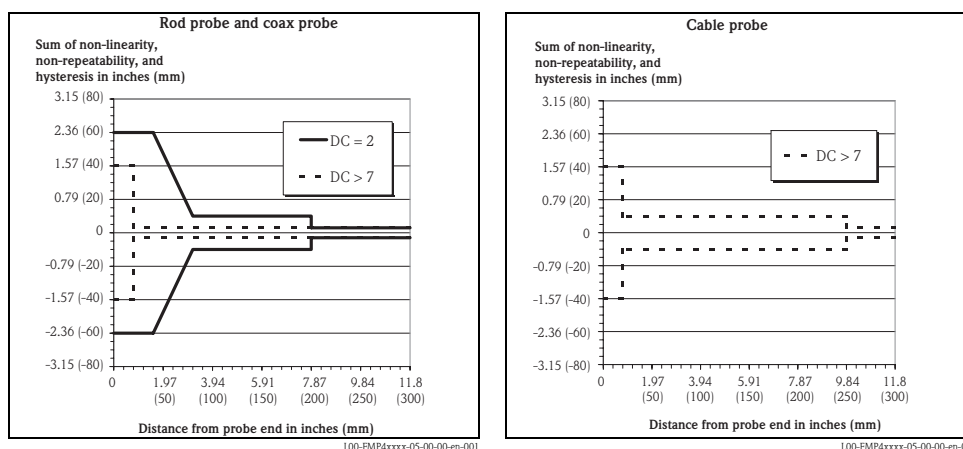
Maximum measured error

Typical data under reference operating conditions: DIN EN 61298-2, percentage values in relation to the span.

Output:	Digital	Analog
Sum of non-linearity, non-repeatability and hysteresis	Level (electronic version level and interface measurement): <ul style="list-style-type: none"> Measuring range up to 10 m: ± 3 mm (33 ft: ± 0.13") Measuring range > 10 m (33 ft): ± 0.03 % For PA-coated cable probes: <ul style="list-style-type: none"> Measuring range up to 5 m: ± 5 mm (16 ft: ± 0.2") Measuring range > 5 m (16 ft): ± 0.1 % Interface (only for electronic version "K" interface measurement): <ul style="list-style-type: none"> Measuring range up to 10 m: ± 10 mm (33 ft: ± 0.4") If the thickness of the interface is < 60 mm (2.4"), the interface can no longer be differentiated from the overall level such that both output signals are identical.	± 0.06 %
Offset / Zero	± 4 mm (0.16")	± 0.03 %

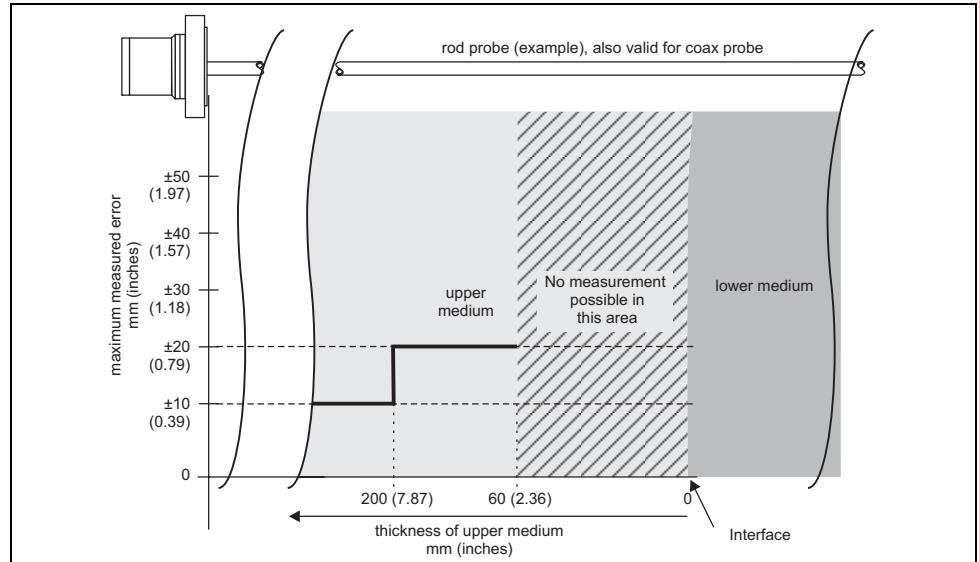
If the reference conditions are not met, the offset/zero point arising from the mounting situation may be up to ± 12 mm (0.47") for cable and rod probes. This additional offset/zero point can be compensated for by entering a correction (function "Offset" (057)) during commissioning.

Differing from this, the following measuring error is present in the vicinity of the level (electronic version level and interface measurement):



If for cable probes the DC value is less than 7, then measurement is not possible in the area of the straining weight (0 to 250 mm / 0 to 10" from end of probe; lower blocking distance).

Differing from this, the following measuring error is present for thin interfaces (only for electronic version "K" interface measurement):



L00-FMP4t1xx-05-00-00-en-001

Resolution

- Digital: 1 mm (0.04")
- Analog: 0.03 % of the measuring range

Reaction time

The reaction time depends on the configuration.

Shortest time:

- 2-wire electronics: 1 s
- 4-wire electronics: 0.7 s

Influence of ambient temperature

The measurements are carried out in accordance with EN 61298-3:

- digital output (HART, PROFIBUS PA, FOUNDATION Fieldbus):
 - **FMP40**
Average T_K : 0.6 mm/10 K (0.023"/10K), max. ±3.5 mm (0.14") over the entire temperature range -40°C to +80°C (-40 to +176°F)

2-wire:

- Current output (additional error, in reference to the span of 16 mA):
 - **Zero point (4 mA)**
Average T_K : 0.032 %/10 K, max. 0.35 % over the entire temperature range -40°C to +80°C (-40 to +176°F)
 - **Span (20 mA)**
Average T_K : 0.05 %/10 K, max. 0.5 % over the entire temperature range -40°C to +80°C (-40 to +176°F)

4-wire:

- Current output (additional error, in reference to the span of 16 mA):
 - **Zero point (4 mA)**
Average T_K : 0.02 %/10 K, max. 0.29 % over the entire temperature range -40°C to +80°C (-40 to +176°F)
 - **Span (20 mA)**
Average T_K : 0.06 %/10 K, max. 0.89 % over the entire temperature range -40°C to +80°C (-40 to +176°F)

Operating conditions: installation with level measurement

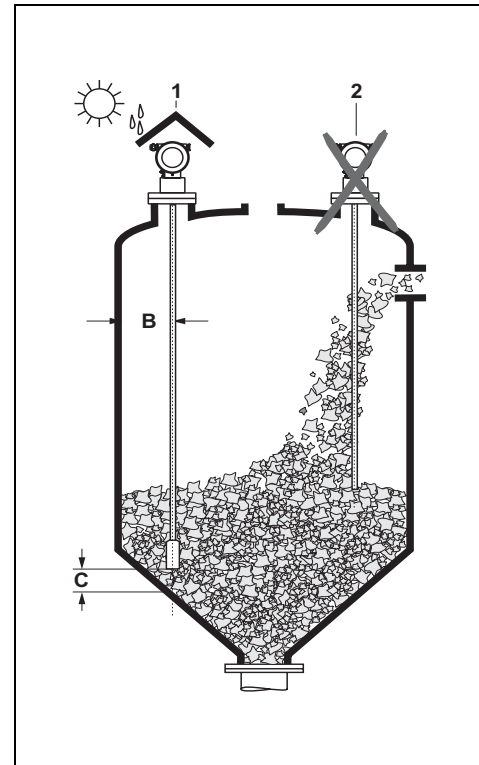
General information on level measurement

Probe selection (see overview on page 6-7)

- Normally, cable probes should be used for bulk solids, rod probes are only suitable for short measuring ranges up to approx. 2 m (6.5 ft) in bulk solids. This applies above all to applications in which the probe is installed laterally at an angle and for light and pourable bulk solids.
- Normally use rod or coax probes for liquids. Cable probes are used in liquids for measuring ranges > 4m (15 ft) and with restricted ceiling clearance which does not allow the installation of rigid probes.
- Coax probes are suited to liquids with viscosities of up to approx. 500 cst.
Coax probes can measure most liquefied gases, as of a dielectric constant of 1.4. Moreover, installation conditions, such as nozzles, tank internal fittings etc., have no effect on the measurement when a coax probe is used. A coax probe offers maximum EMC safety when used in plastic tanks.
- In the case of large silos, the lateral pressure on the cable can be so high that a cable with plastic jacketing must be used. We recommend PA-coated cables be used for cereal products wheat, flour etc..

Mounting location

- Do not mount rod or cable probes in the filling curtain (2)
- Mount rod and cable probes away from the wall (B) at such a distance that, in the event of buildup on the wall, there is still a minimum distance of 100 mm (4") between the probe and the buildup.
- Mount rod and cable probes as far away as possible from installed fittings. "Mapping" must be carried out during commissioning in the event of distances < 300 mm (12").
- When installing rod and cable probes in plastic containers, the minimum distance of 300 mm (12") also applies to metallic parts outside the container.
- Rod and cable probes may not, at times, contact metallic container walls or floors.
- Minimum distance of probe end to the container floor (C):
 - Cable probe: 150 mm (6")
 - Rod probe: 50 mm (2")
 - Coax probe: 10 mm
- When installing outdoors, it is recommended that you use a protective cover (1) see "Accessories" on page 57.
- Avoid buckling the cable probe during installation or operation (e.g. through product movement against silo wall) by selecting a suitable mounting location.



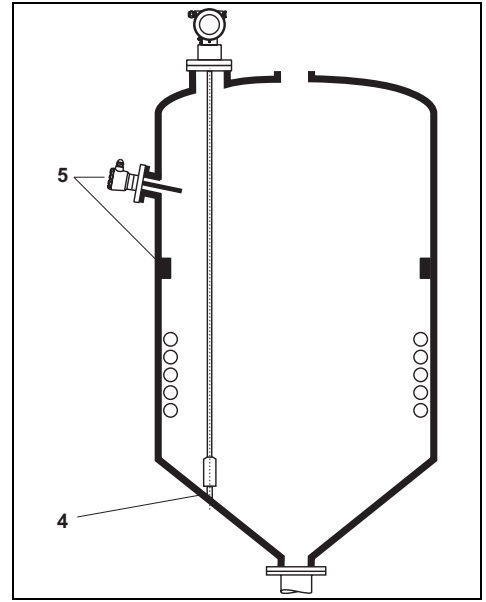
100-FMP4xxxx-17-00-00-xx-003

Other installations

- Select the mounting location such that the distance to internals (5) (e.g. limit switch, struts) is > than 300 mm (12") over the entire length of the probe, also during operation.
- Probe must within the measuring span not touch any internals during operation. If necessary, when using cable probes the probe end (4) may be fixed to secure it (page 25)!

Optimization options

- Interference echo suppression: measurement can be optimized by electronically tuning out interference echoes.

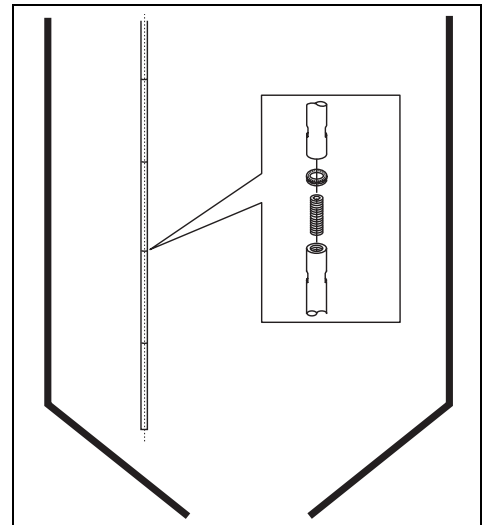


L00-FMP4xxxx-17-00-00-xx-008

Separable probes

If there is little mounting space (distance to the ceiling), it is advisable to use separable rod probes ($\varnothing 16$ mm / 0.63").

- max. probe length 10 m (394")
- max. sideways capacity 20 Nm (15 lbf ft)
- probes are separable several times with the lengths:
 - 500 mm (20")
 - 1000 mm (40")
- torque: 15 Nm (11 lbf ft)

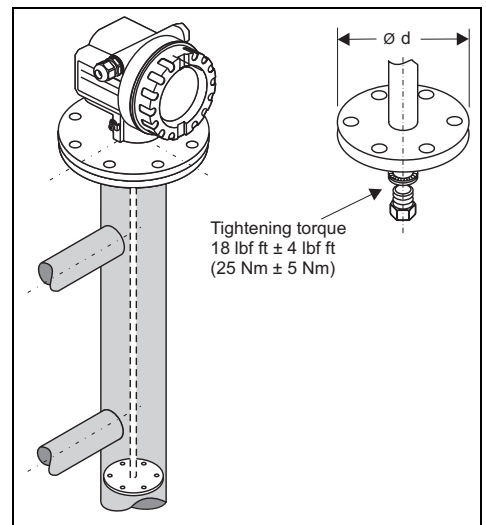


L00-FMP4xxxx-17-00-00-xx-015

Centering of probe end

If the centering disk is mounted at the end of the probe, it enables a reliable measuring. See "Ordering information" page 53.

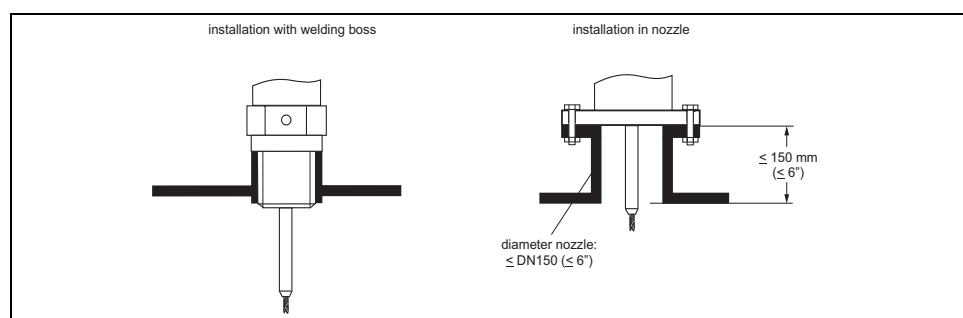
- Centering disk for rod probes:
 - d = 45 mm/1.77" (DN50/2" + DN65/2-1/2")
 - d = 75 mm/2.95" (DN80/3" + DN100/4")



L00-FMP4xxxx-17-00-00-en-068

Type of probe installation

- Probes are mounted to the process connection with threaded connections or flanges and are usually also secured with these. If during this installation there is the danger that the probe end moves so much that it touches the tank floor or cone at times, the probe must, if necessary, be shortened and fixed down. The easiest way to fix the cable probes is to screw them to the internal thread on the lower end of the weight. Thread size, page 25.
- The ideal installation is mounting in a screwed joint / screw-in sleeve which is internally flush with the container ceiling.
- If installation takes place in a nozzle, the nozzle should be 50 to 150 mm (2" to 6") in diameter and should not be more than 150 mm (6") high. Installation adapters are available for other dimensions, page 35.



L00-FMP4xxxx-17-00-00-en-017

Welding the probe into the vessel

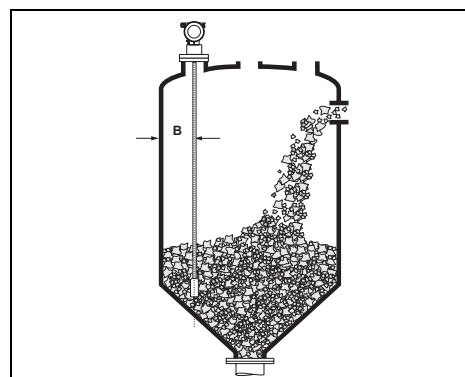


Caution!

Before welding the probe into the vessel, it must be grounded by a low-resistive connection. If this is not possible, the electronics as well as the HF module must be disconnected. Otherwise the electronics may be damaged.

Special notes for bulk solids

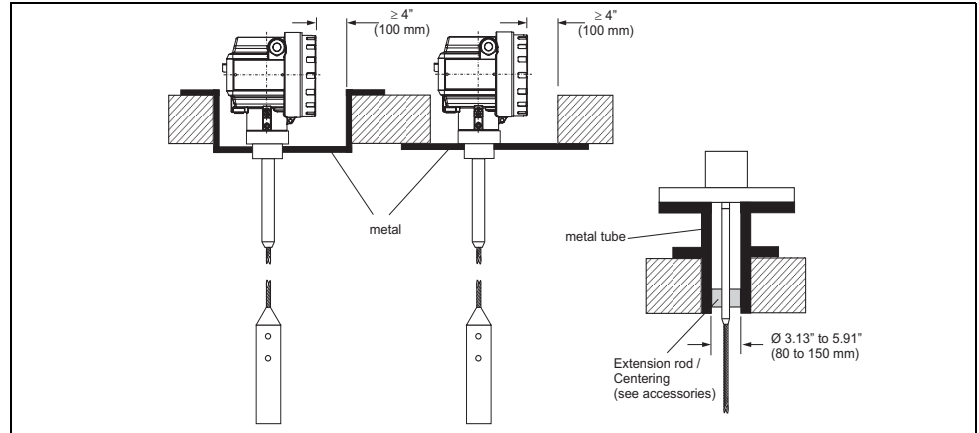
- In the case of bulk solids, as great a distance as possible from the filling curtain is especially important to avoid wear.
- In concrete silos, a **large distance** (B) should be observed between the probe and the concrete wall, if possible ≥ 1 m (3ft), but at least 0.5 m (1.5 ft).
- The installation of cable probes must be carried out carefully. The cable should not be buckled. If possible, installation should be carried out when the silo is empty.
- Check the probe regularly for defect.



L00-FMP4xxxx-17-00-00-xx-005

Installation in concrete silos

Installation, for example, into a thick concrete ceiling should be made flush with the lower edge. Alternatively, the probe can also be installed into a pipe that must not protrude over the lower edge of the silo ceiling. The pipe should be kept at a minimum length. Installation suggestions see diagram.

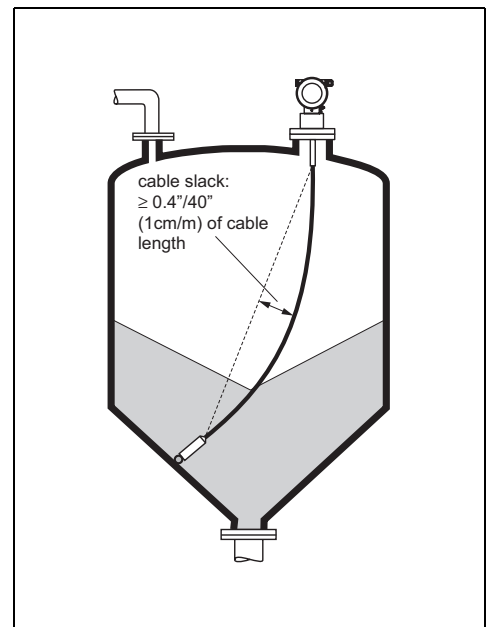


L00-FMP4xxx-17-00-00-en-008

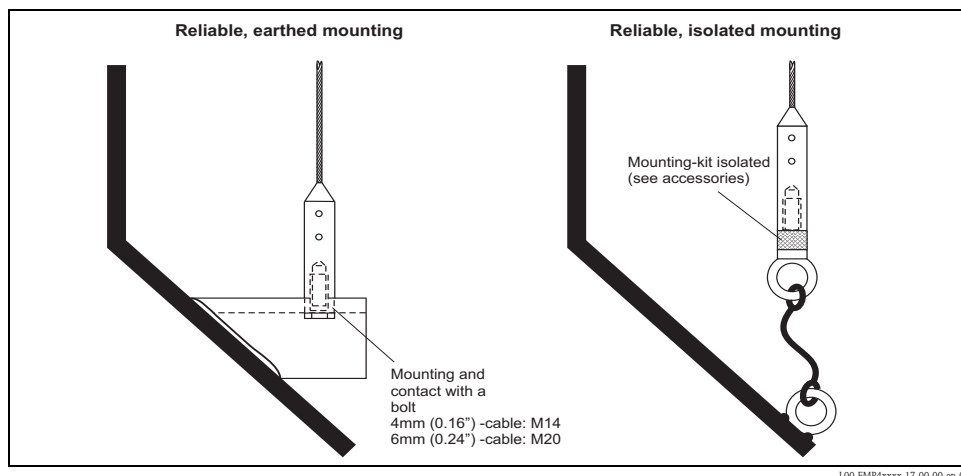
Note for installations with rod extension/center washer (accessories):
Strong dust generation can lead to build-up behind the center washer. This can cause an interference signal.
For other installation possibilities please contact Endress+Hauser.

Fixing cable probe

- The end of the probe needs to be secured if the probe would otherwise touch the silo wall, the cone or another part, or the probe comes closer than 0.5 m (1.5 ft) to a concrete wall. This is what the internal thread in the probe weight is intended for:
 - for 4 mm (0.16") cable: M14
 - for 6 mm (0.24") cable: M20
- Preferably use the 6 mm (0.24") cable probe due to the higher tensile strength when fixing a cable probe
- Page 57 The fixing must be either reliably grounded or reliably insulated (see accessories on Accessories). If it is not possible to mount the probe weight with a safe ground connection, it can be secured using an isolated eyelet, which is available as an accessory (page 62).
- In order to prevent an extremely high tensile load and the risk of cable crack, the cable has to be slack. Make the cable longer than the required measuring range such that there is a sag in the middle of the rope that is $\geq 1 \text{ cm/m}$ (0.4"/40") of the cable length.



L00-FMP4xxx-17-00-00-en-019



L00-FMP4xxxx-17-00-00-en-027

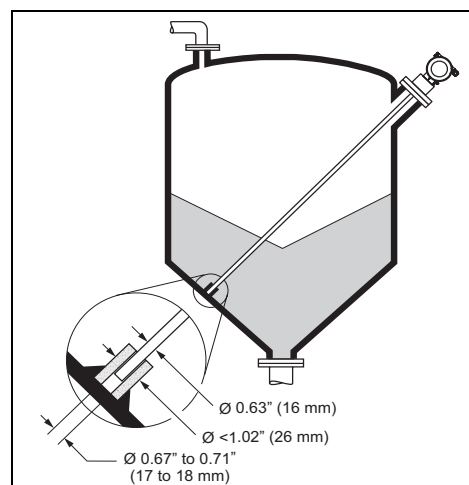
Installation from the side

- If installation from above is not possible, the Levelflex can also be mounted from the side.
- In this case, always fix the cable probe (see Fixing cable probe).
- Support rod and coax probe if the lateral load-bearing capacity is exceeded (see table, page 6-7). Only fix rod probes at the probe end.



Caution!

Remove or ground the electronics when welding the sleeve as the device will otherwise be destroyed!



L00-FMP4xxxx-17-00-00-en-035

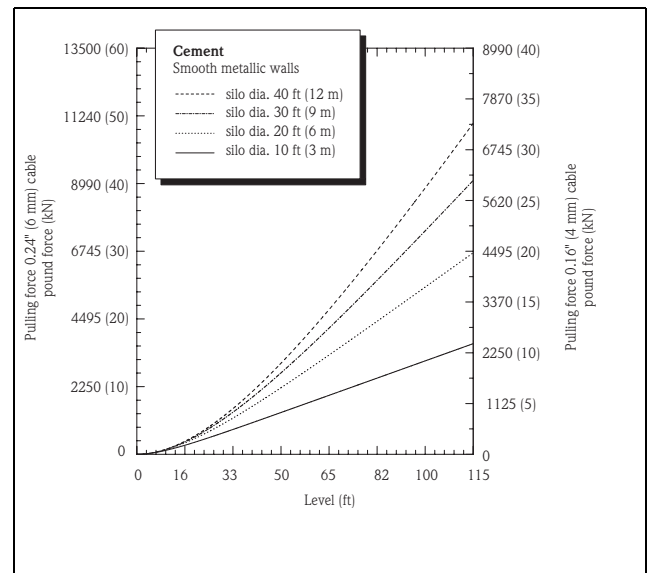
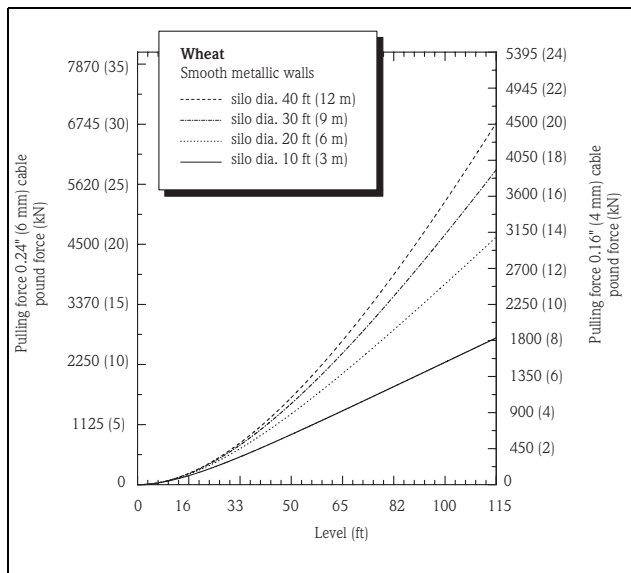
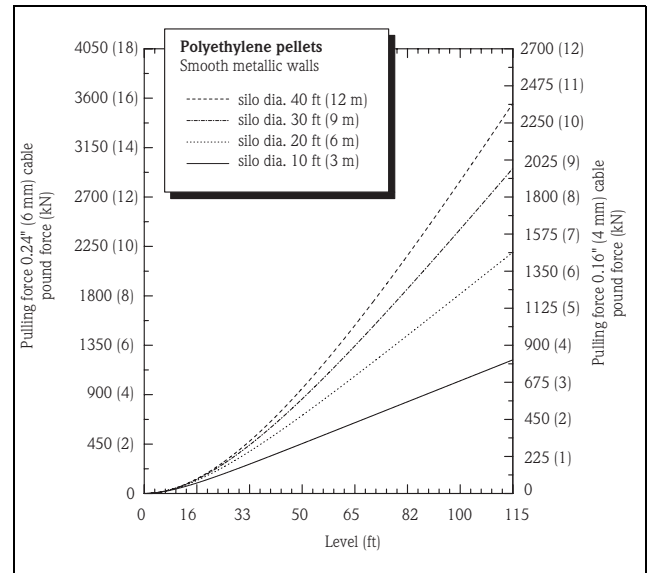
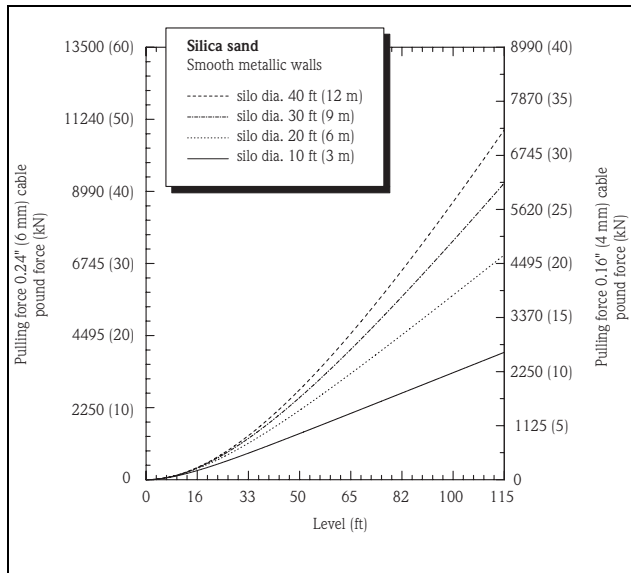
Tensile load

Bulk solids exert tensile forces (maximum admissible values page 6-7) on cable probes whose height increases with:

- the length of the probe, i.e. max. cover,
- the bulk density of the product,
- the silo diameter and
- the diameter of the probe cable

The following diagrams show typical loads for frequently occurring bulk solids as reference values. The calculation is performed for the following conditions:

- Suspended probe (probe end not fixed at the bottom)
- Free-flowing bulk solid, i.e. mass flow. A calculation for core flow is not possible. In the event of collapsing cornices, considerably higher loads can occur.
- The specification for tensile forces contains the safety factor 2, which compensates for the normal fluctuation range in pourable bulk solids.



Since the tensile forces are also heavily dependent on the viscosity of the product, a higher safety factor is necessary for highly viscous products and if there is a risk of cornice buildup. In critical cases it is better to use a 6 mm (0.24") cable instead of a 4 mm (0.16") one.

The same forces also act on the silo cover.

On a fixed cable, the tensile forces are definitely greater, but this can not be calculated.

Observe the tensile strength of the probes or ensure that the tensile strength of the probes is not exceeded (see table, page 6-7).

Options for reducing the tensile forces:

- Shorten the probe.
- If the maximum tensile load is exceeded, check whether it would be possible to use a non-contact Ultrasonic or Level-Radar device.

Special notes for liquids

- When installing in agitation units, check whether a no-contact process (Ultrasonic or Level-Radar) would be better suited, especially if the agitator generates large mechanical loads on the probe.

If Levelflex is, nevertheless, installed in tanks with agitators, it is better to use coax probes which have a greater lateral loading capacity, page 6-7. Additionally the coax probe can be protected against warping, see page 31.

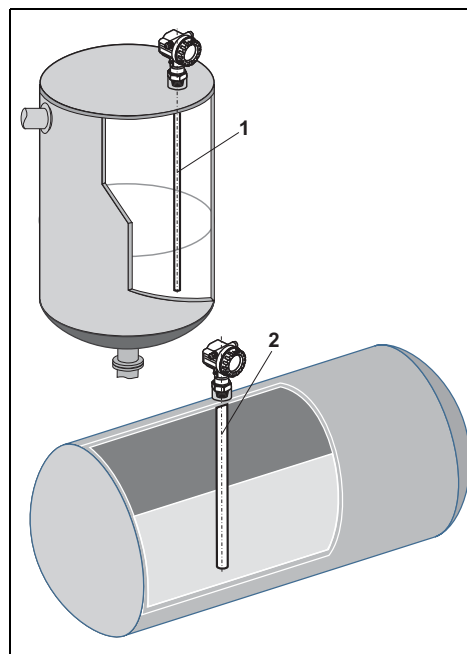
Standard installation

Using a coax probe offers great advantages when the viscosity of the product is < 500 cst and it is certain that the product does not accumulate buildup:

- Greater reliability:
As of dielectric constant=1.4, measurement functions independently of all electrical properties in all liquids.
- Internals in the tank and nozzle dimensions do not have any influence on measurement.
- Higher lateral load-bearing capacity than rod probes.
- For higher viscosity a rod probe is recommended, or using a non-contact measuring principle with the Level-Radar Micropilot M.

Installation in horizontal and upright cylindrical tanks

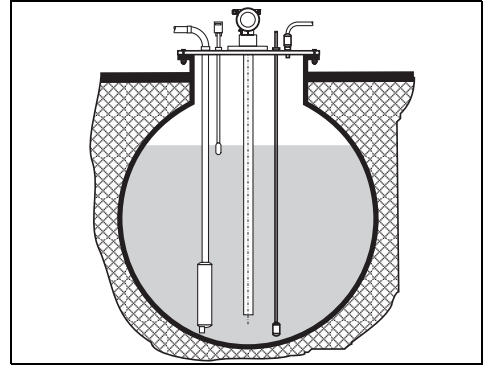
- Use the following types of probe for measuring ranges
 - up to 4 m (13 ft): rod probe (1) or coax probe (2)
 - up to 10 m (33 ft): separable probe
 - above 10 m (33 ft): 4mm (0.16") cable probe
- Installation and possible fixing as with bulk solids.
- Any distance from wall, as long as occasional contact is prevented.
- When installing in tanks with a lot of internals or internals situated close to the probe: use a coax probe.



L00-FMP4xxxx-17-00-00-yy-021

Installation in underground tanks

- Use coax probe for nozzles with large diameters in order to avoid reflections at the nozzle wall.



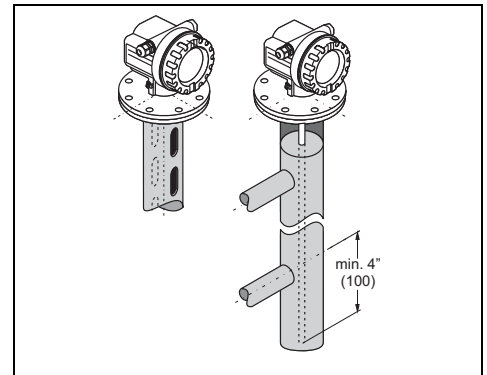
L00-FMP4xxx-17-00-00-yy-022

Measurement in corrosive liquids

For measurement in corrosive liquids use Levelflex M FMP41C. When using plastic tanks it is also possible to mount the probe on the outside of the tank (see installation instructions on page 30). Levelflex measures the level of aqueous media through the plastic.

Installation in stilling well or bypass

- A rod probe can be used for pipe diameters bigger than 40 mm (1.5").
- When installing a rod probe into a metallic pipe with internal diameter of up to 150 mm (6"), you have all the advantages of a coax probe.
- Welded joints that protrude up to approx. 5 mm (0.2") inwards do not influence measurement.
- If a rod probe is used, the probe length must be 100 mm (4") longer than the lower disposal.
- It must be ensured that the probe does not come into contact with the side wall. Where necessary, use a centering disk at the lower end of the probe (page 55 "Type of Probe:")

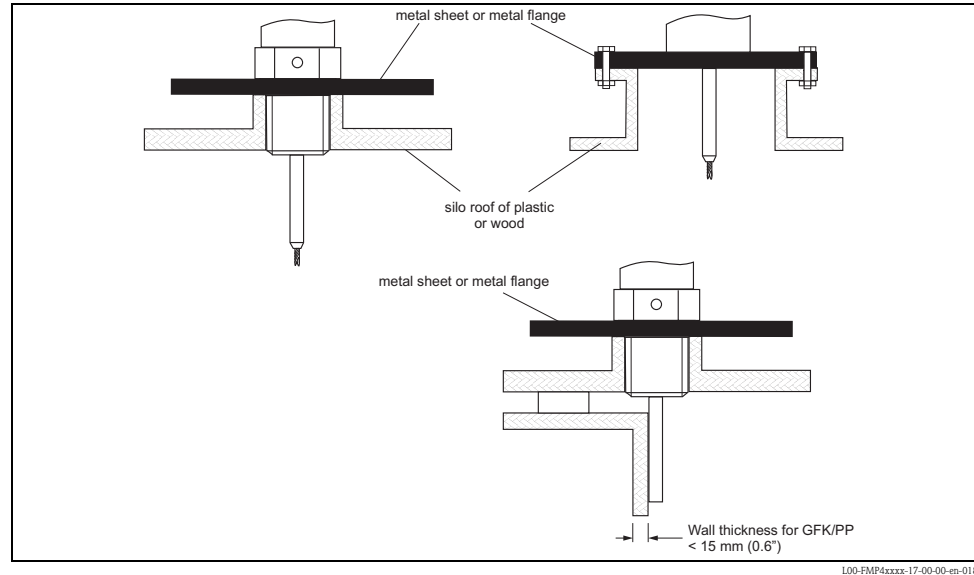


L00-FMP4xxx-17-00-00-yy-023

Installation in plastic containers

Please note that the "guided level radar" measuring principle requires a metallic surface at the process connection!

When installing the rod and rope probes in plastic silos, whose silo cover is also made of plastic or silos with wood cover, the probes must either be mounted in a $\geq \text{DN50} / 2"$ metallic flange, or a metal sheet with diameter of $\geq 200 \text{ mm}$ (8") must be mounted under the screw-in piece.



- It is also possible to mount the probe externally on the tank wall for measuring in Aqueous solutions. Measurement then takes place through the tank wall without contacting the medium. If people are in the vicinity of the probe mounting location, a plastic half pipe with a diameter of approx. 200 mm (8"), or some other protective unit, must be affixed externally to the probe to prevent any influences on the measurement.
- There must not be any metallic reinforcement rings secured to the tank.
- The wall thickness should be $< 15 \text{ mm}$ (0.6") for at GFR/PP.
- There must be no open space between the tank wall and the probe.

Supporting probes against warping

For WHG or Ex approval:

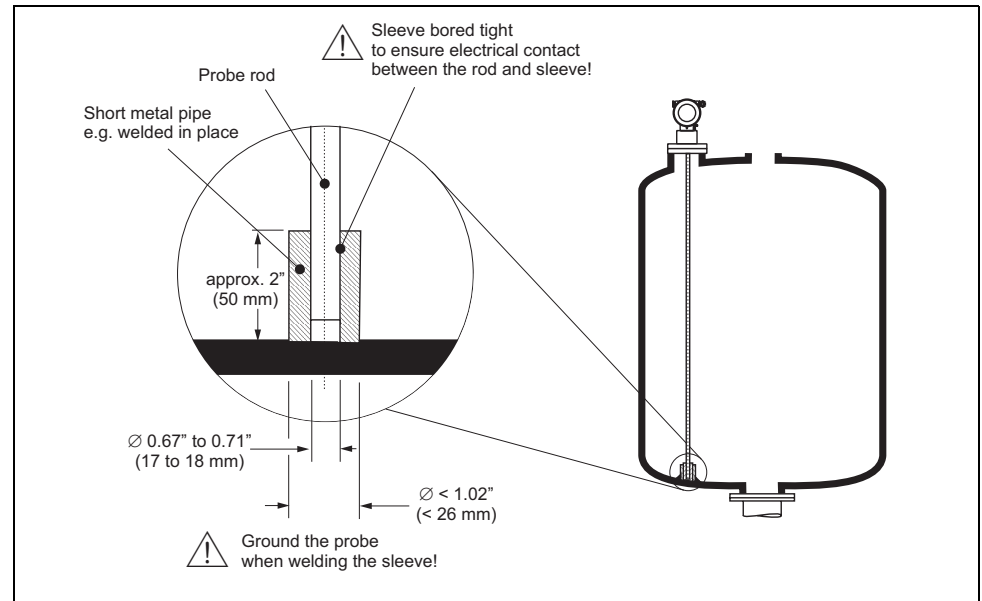
For probe lengths ≥ 3 m (10 ft) a support is required (see figure).

For GL/ABS approval:

Rod probes $\varnothing 16$ mm (0.63") ≤ 1 m (3 ft) permissible, rod probes $\varnothing 6$ mm (0.24") not permissible.

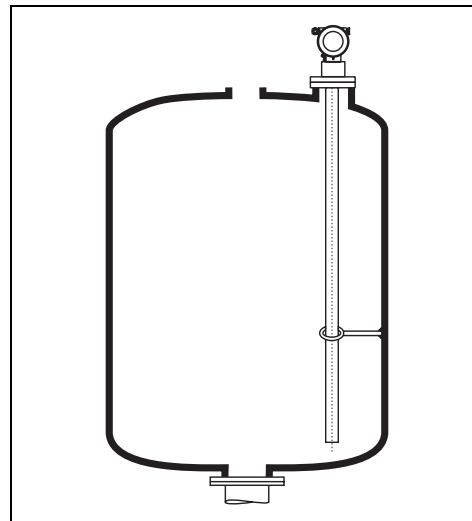
For coax probes ≥ 1 m (3 ft) a support is required (see figure).

a. Rod probes



L00-FMP4xxxx-17-00-00-en-055

b. Coax probes

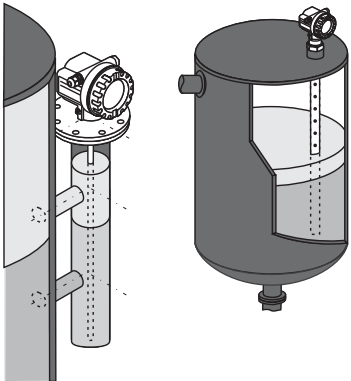
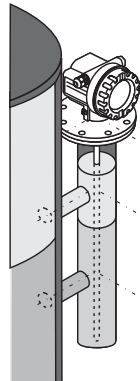


L00-FMP4xxxx-17-00-00-en-054

Operating conditions: installation with interface measurement

General information on interface measurement

The Levellflex M with the "Interface" electronics version ("power supply, output" feature) is the ideal choice for measuring interfaces. However, it is also possible to measure interfaces with a special version of the standard device but the total level has to remain constant here. This version is available on request.

	"Interface" electronics version	Special version
	 L00-FMP4xxxx-15-00-00-xx-001	 L00-FMP4xxxx-15-00-00-xx-002
Function	<ul style="list-style-type: none"> ■ Measurement of variable interfaces and variable total levels. ■ Variable assignment of the output parameters. ■ Extended interface function 	Measurement of variable interfaces with the prerequisite of a constant total level
Commissioning	Interface-specific menu guidance via onsite display or DTM	Special configuration, see modification information SV0107
Digital Communication	HART	PROFIBUS PA, FOUNDATION Fieldbus
Ordering information	FMP40 - ##### K #####	FMP40 - ##### D ###Y (PROFIBUS PA) FMP40 - ##### F ###Y (FOUNDATION Fieldbus) Y = Special version available on request

In addition, the following general conditions must be observed for interface measurement:

- The DK of the upper medium must be known and constant. The DK can be determined with the aid of the DK manual SD106F. In addition, whenever the interface thickness is existing and known, the DK can be calculated automatically via FieldCare.
- The DK of the upper medium may not be greater than 10.
- The DK difference between the upper medium and lower medium must be >10.
- The interface must have a minimum thickness of 60 mm/2.4" (interface electronics version) or 100 mm/4" (special version).
- Emulsion layers in the vicinity of the interface can severely dampen the signal. However, emulsion layers up to 50 mm /2" are permitted.

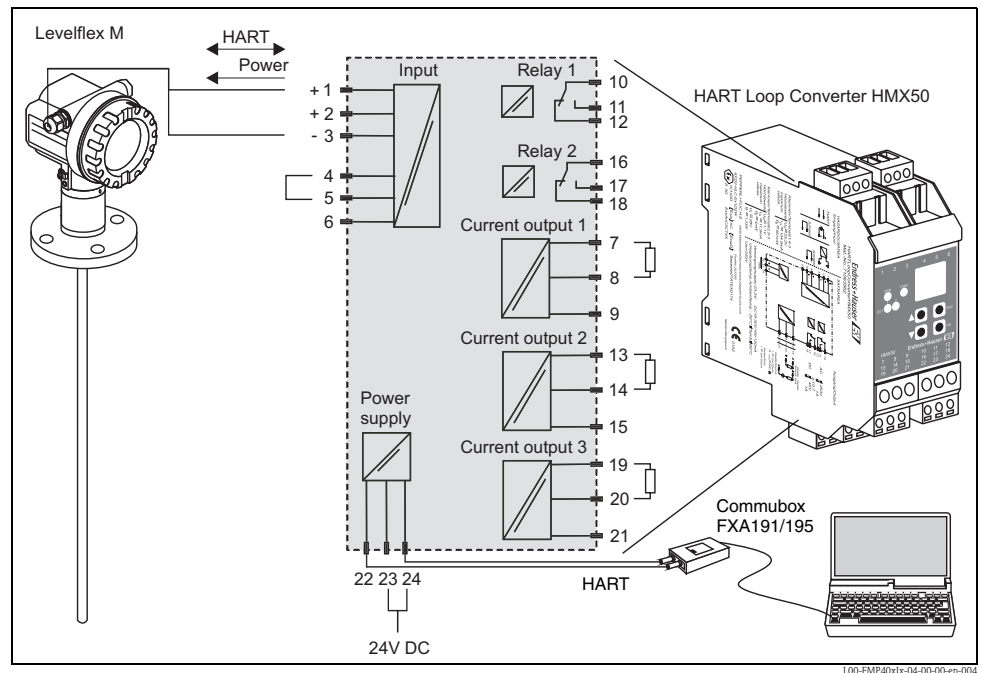
Interface electronics version:

The device with the "Interface" electronics version makes it possible to measure the total level and the interface level simultaneously. The resulting process variables are output using the dynamic variables of the HART protocol. The process variables can be flexibly assigned to the dynamic variables (primary, secondary, tertiary, quaternary value).

Dynamic variables of the HART protocol	Possible process variable assignment	Comment
Primary Value	<ul style="list-style-type: none"> Interface Total level Thickness of the upper layer 	The "primary value" is permanently assigned to the 4 to 20mA current output
Secondary Value	<ul style="list-style-type: none"> Interface Total level Thickness of the upper layer 	—
Tertiary Value	<ul style="list-style-type: none"> Interface Total level Thickness of the upper layer Amplitude of the total level signal 	—
Quaternary (4 th) Value	Amplitude of the interface level signal	No variable assignment

Using the HART loop converter HMX50:

The dynamic variables of the HART protocol can be converted into individual 4 to 20 mA sections using the HART Loop Converter HMX50. The variables are assigned to the current output and the measuring ranges to the individual parameters in the HMX50.



Connection diagram for HART loop converter HMX50 (example: passive 2-wire device and current outputs connected as power source)

The HART loop converter HMX50 can be acquired using the order number 71063562. Additional documentation: TI429F and BA371F.

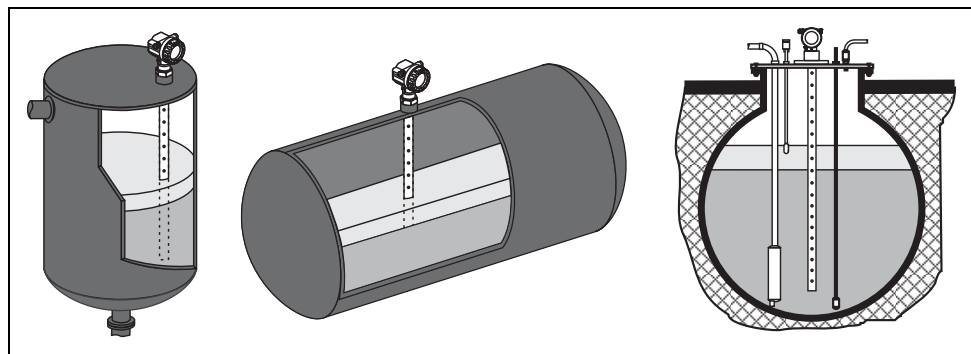
Probe selection (see overview on page 6-7)

- For interface measurement, ideally coax probes or rod probes are used in the bypass/stilling well.
- Coax probes are suited to liquids with viscosities of up to approx. 500 cst. Coax probes can measure most liquefied gases, as of a dielectric constant of 1.4. Moreover, installation conditions, such as nozzles, tank internal fittings etc., have no effect on the measurement when a coax probe is used. A coax probe offers maximum EMC safety when used in plastic tanks.
- Rod or cable probes for free installation in the tank available on request. Cable probes for free installation in the tank must always be used with a rod weight in accordance with special products MVTFN0203 or MVT6N0186. Cable probes may not be used in the bypass/stilling well since the end weight always causes interference reflection which can be misinterpreted during interface measurement.

Special information on interface measurement

Installation in horizontal cylindrical, upright and underground tanks

- Use coax probes or rod probes in the bypass/stilling well. A separable probe is available as a special version for longer measuring ranges.
- Any distance from the wall is possible for coax probes or rod probes in the stilling well. In the case of rod probes, it must be ensured that the probe does not come into contact with the wall.



100-FMP40xxx-17-00-00-xx-002

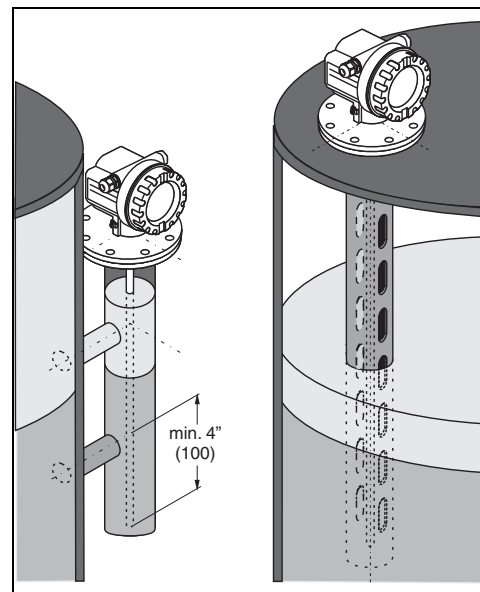
Installation in stilling well or bypass

- A rod probe can be used for pipe diameters bigger than 40 mm (1-1/2").
- Rod probe installation can take place up to a diameter size of 100 mm (4"). In the event of larger diameters, a coax probe is recommended.
- Welded joints that protrude up to approx. 5 mm (0.2") inwards do not influence measurement.
- The pipe may not exhibit any steps in diameter.
- If a rod probe is used, the probe length must be 100 mm (4") longer than the lower disposal.
- In the case of rod probes, it must be ensured that the probe does not come into contact with the wall. If necessary, use a centering disk at the end of the probe.



Note!

A plastic centering disk has to be used for interface measurement (see Accessories page 59).



100-FMP40xxx-17-00-00-xx-003

Operating conditions: general installation instructions for special installation situations

Probe length

The measuring range is directly dependent on the probe length.

It is better to order probes too long than too short since it is possible to shorten the probe if necessary.

In the case of the cable probe with a rod weight, shortening at the probe end weight is only possible with the special product in accordance with MVT6N0186. See also modification information MI0079.

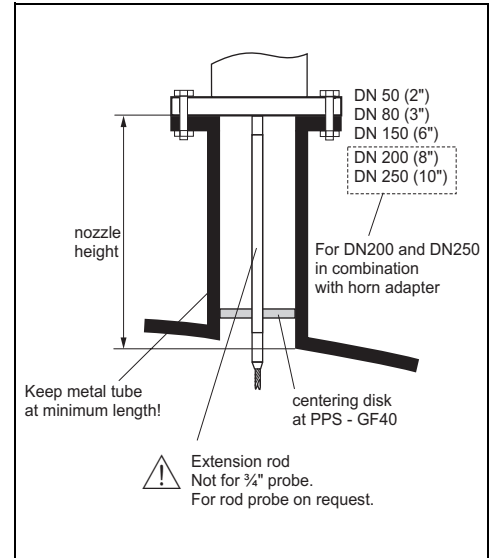
Installation in nozzles > 150 mm (6") high

If, when installing probes in nozzles DN40 to 250 / 1½" to 10" with nozzle height (HS) of > 150 mm/6", the probe could touch the lower edge of the nozzle due to moving materials in the container, we recommend using an extension rod with or without centering disk.

This accessory consists of the extension rod corresponding to the nozzle height, on which a centering disk is also mounted if the nozzles are narrow or when working in bulk solids. This component is delivered separately from the device. Please order the probe length correspondingly shorter. For the exact length of the rod see "extension rod/centering" on page 62.

Order codes for specific nozzle nominal diameters and heights can be found on page 62.

Only use centering disks with small diameters (DN40 and DN50 / 1-1/2" to 2") if there is no significant buildup in the nozzle above the disk. The nozzle must not become clogged with product.



L00-FMP4xxxx-17-00-00-en-025

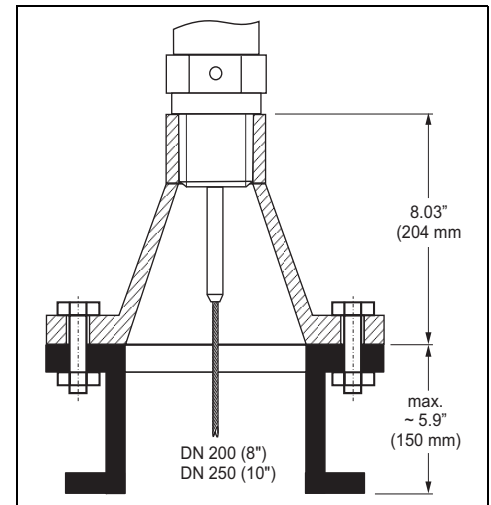
Installation in DN200/8" and DN250/10" nozzles

When installing the Levelflex in nozzles of > 200 mm/8", signals are generated by reflections on the nozzle wall, which can sometimes lead to faulty measurements in the case of products with small dielectric constants.

With nozzle diameters of 200 mm / 8" or 250 mm / 10", therefore, a special flange with a "horn adapter" must be fitted.

Nozzles with nominal diameters greater than DN250 / 10" should be avoided.

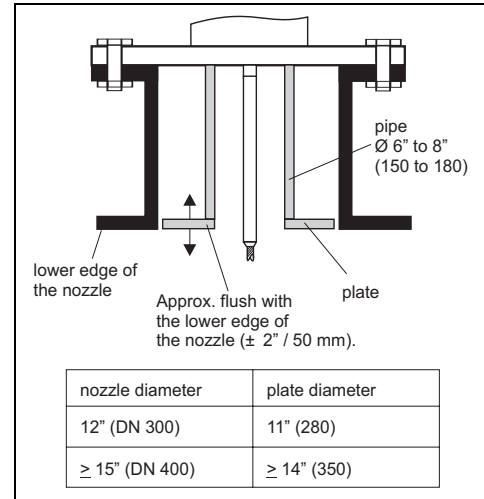
If the rope probe is strongly deflected: use an extension rod/centering HMP40, additionally.



L00-FMP4xxxx-17-00-00-en-026

Installation in nozzle \geq DN300 (12")

If installation in $\geq 300\text{mm}/12"$ nozzles is unavoidable, installation must be carried out in accordance with the sketch on the right.



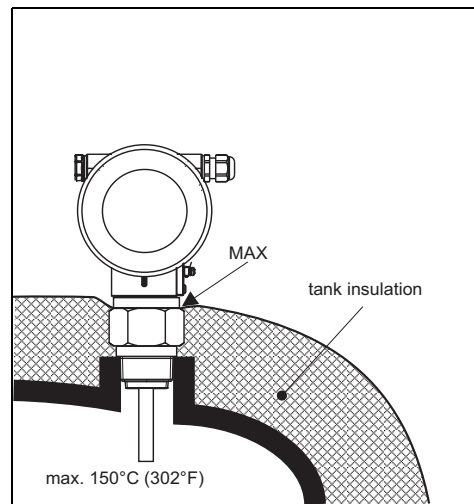
L00-FMP40xxx-17-00-00-en-034

Installation with heat insulation

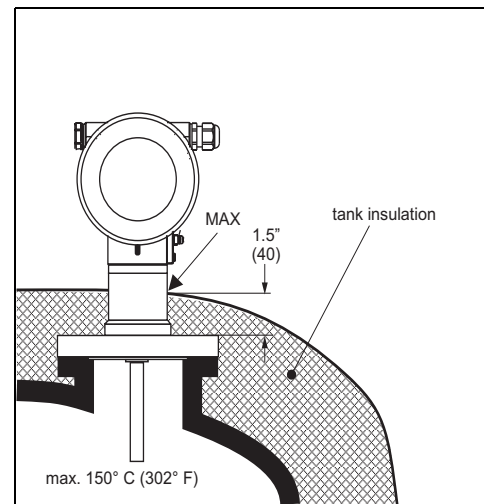
- If process temperatures are high, FMP40 must be included in normal tank insulation to prevent the electronics heating up as a result of heat radiation or convection.
- The insulation may not exceed beyond the points labeled "MAX" in the drawings.

Process connection with adapter G $\frac{3}{4}$ ", G $1\frac{1}{2}$ ", $\frac{3}{4}$ NPT or $1\frac{1}{2}$ NPT

Process connection with flange DN40 to DN200



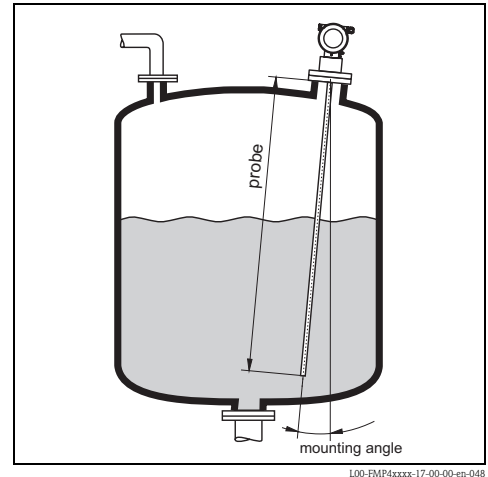
L00-FMP40xxx-17-00-00-en-003



L00-FMP40xxx-17-00-00-en-002

Installation at an angle

- For mechanical reasons, the probe should be installed as vertically as possible.
- With inclined installations the probe length has to be adjusted in dependence to the installation angle.
 - up to 1 m (3 ft) = 30°
 - up to 2 m (6.5 ft) = 10°
 - up to 4 m (13 ft) = 5°.



L00-FMP4xxx-17-00-00-en-048

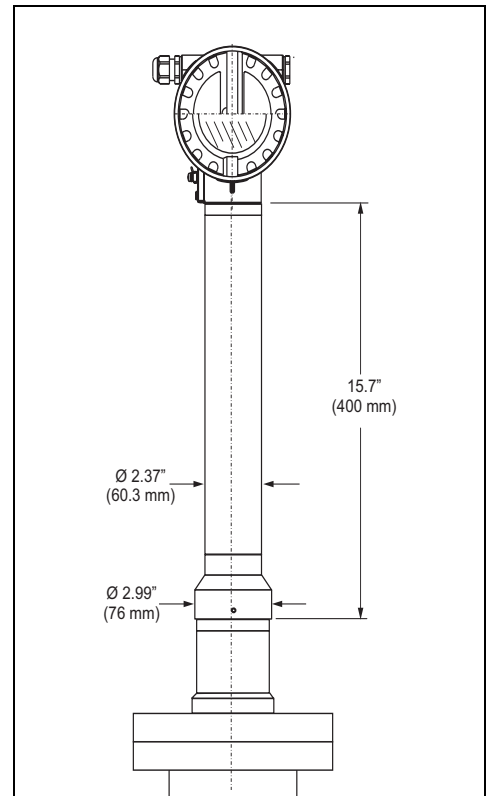
Installation for difficult-to-access process connections

For tight spaces or temperatures above that in the graphic (page 39), the electronics housing can be ordered with distance pipe or connecting cable (remote housing).

Installation with spacer tube

When mounting please observe engineering hints on page 22 the following points:

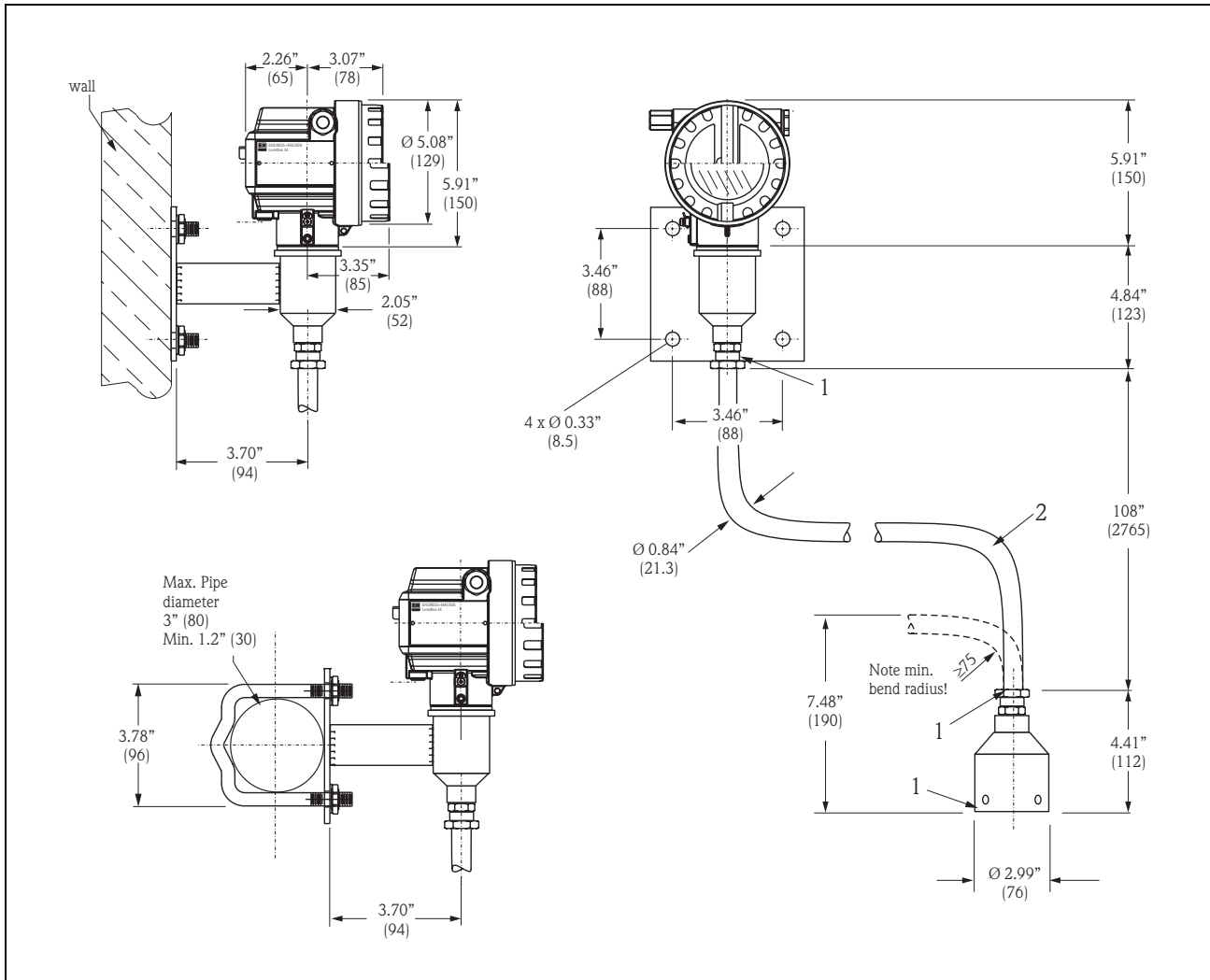
- After mounting, the housing can be turned 350° in order to make it easier to access the display and the connection compartment.
- The max. measuring range is reduced to 34 m (111 ft).



L00-FMP4xxx-17-00-00-en-014

Installation with remote electronics

- When installing, follow the instructions on page 22.
- Mount housing on a wall or pipe (vertically or horizontally) as shown in the diagram.



100-FMP40xxx-17-00-00-en-015



Note!

The protective hose cannot be disassembled at these points (1).

The ambient temperature for the connecting pipe (2) between the probe and the electronics must not be greater than 105°C (221°F).

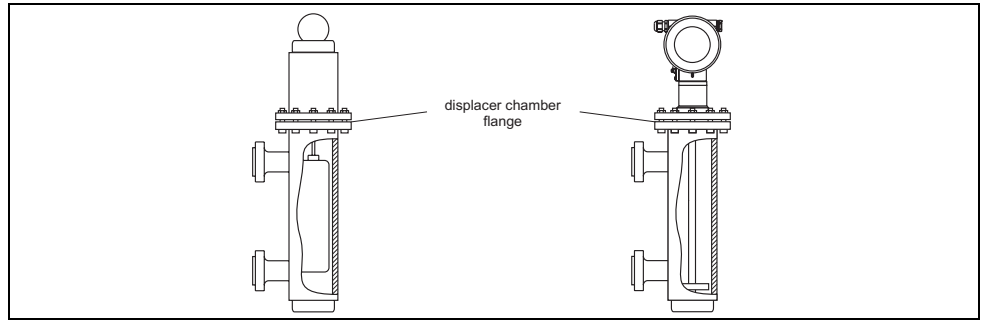
The version with remote electronics consists of the probe, a connecting cable and the housing. If they are ordered as a complete unit they are assembled when delivered.

Replacing a displacer system in an existing displacer chamber

The Levellflex M is a perfect replacement for a conventional displacer system in an existing displacer chamber. In addition to the DIN and ANSI flanges, which are available as standard, Endress+Hauser also offers flanges that suit Fischer and Masoneilan displacer chamber (special product) for this purpose. Thanks to menu-guided local operation, commissioning the Levellflex M only takes a few minutes. Replacement is also possible when partially filled, and wet calibration is not required.

Your benefits:

- No moving parts, thus zero-maintenance operation.
- Not sensitive to process influences such as temperature, density, turbulence and vibrations.
- The rod probes can be shortened or replaced easily. In this way, the probe can be easily adjusted on site.



L00-FMP40xxx-17-00-00-en-002

Planning instructions:

- In normal cases, use a rod probe. When installing into a metallic displacer chamber up to 150 mm (6"), you have all the advantages of a coax probe (see probe selection page 6-7).
- It must be ensured that the probe does not come into contact with the side wall. Where necessary, use a centering disk at the lower end of the probe (page 55 "Type of Probe:").
- A centering disk must be adapted as accurately as possible to the internal diameter of the displacer chamber to also ensure perfect operation in the area of the probe end.

Additional information on interface measurement

- The pipe may not exhibit any steps in diameter. Use the coax probe where necessary.
- In the case of rod probes, it must be ensured that the probe does not come into contact with the wall. If necessary, use a centering disk at the end of the probe.



Note!

A plastic centering disk has to be used for interface measurement (see Accessories page 59).

Operating conditions: Environment

Ambient temperature range

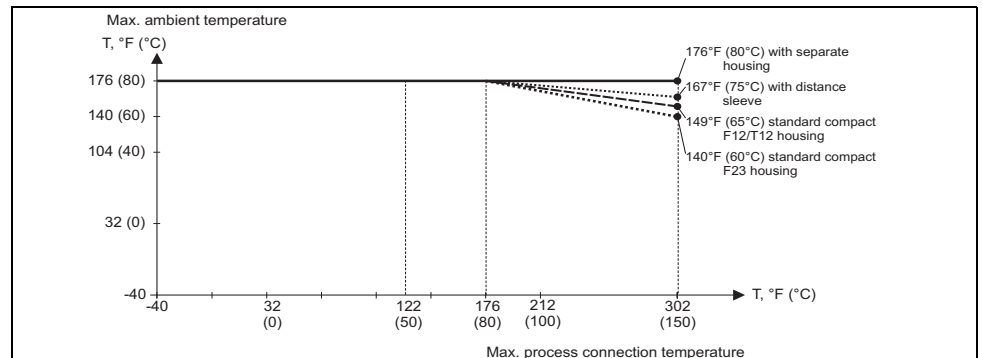
Ambient temperature at the electronics: -40°C to $+80^{\circ}\text{C}$ (-40° to $+176^{\circ}\text{F}$)

The function of the LCD display is restricted at $T_A < -20^{\circ}\text{C}$ (-4°F) and $T_A > +60^{\circ}\text{C}$ (140°F).


A weather protection cover should be used for outdoor operation if the device is exposed to direct sunlight.

Ambient temperature limits

If temperatures above 80°C (176°F) are present at the process connection, the permitted ambient temperature is reduced according to the following diagram (temperature derating):

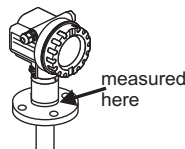


L00-FMP40xxx-05-00-00-en-001

Storage temperature	-40°C to +80°C (-40° to +176°F)
Climate class	DIN EN 60068-2-38 (test Z/AD)
Degree of protection	<ul style="list-style-type: none"> ■ With closed housing tested according to: <ul style="list-style-type: none"> – IP68, NEMA6P (24 h at 1.83 m / 6 ft under water surface) – IP66, NEMA4X ■ With open housing: IP20, NEMA1 (also ingress protection of the display) <p>  Caution! Degree of protection IP68 NEMA6P applies for M12 PROFIBUS PA plugs only when the PROFIBUS cable is plugged in. </p>
Vibration resistance	DIN EN 60068-2-64 / IEC 68-2-64: 20 to 2000 Hz, 1 (m/s ²)/Hz
Cleaning the probe	Depending on the application, contamination or buildup can accumulate on the probe. A thin, even layer only influences measurement slightly. Thick layers can dampen the signal and then reduce the measuring range. Severe, uneven buildup, adhesion e.g. through crystallization, can lead to incorrect measurement. In this case, we recommend that you use a non-contact measuring principle, or check the probe regularly for soiling.
Electromagnetic compatibility (EMC)	<p>Electromagnetic compatibility to EN 61326 and NAMUR Recommendation EMC (NE21). Details are provided in the Declaration of Conformity. A standard installation cable is sufficient if only the analog signal is used. Use a shielded cable when working with a superimposed communications signal (HART).</p> <p>When installing the probes in metal and concrete tanks and when using a coax probe:</p> <ul style="list-style-type: none"> ■ Interference emission to EN 61326 – x series, electrical equipment Class B. ■ Interference immunity to EN 61326 – x series, requirements for industrial areas and NAMUR Recommendation NE 21 (EMC) <p>The measured value can be affected by strong electromagnetic fields when installing rod and rope probes without a shielding/metallic wall, e.g. plastic, and in wooden silos.</p> <ul style="list-style-type: none"> ■ Interference emission to EN 61326 – x series, electrical equipment Class A. ■ Interference Immunity: the measured value can be affected by strong electromagnetic fields.

Operating conditions: Process

Process temperature range	The maximum permitted temperature at the process connection (see Figure for measuring point) is determined by the O-ring version ordered:
----------------------------------	---

O-ring material	Min. temperature	Max. temperature ¹⁾	
FKM (Viton)	-30°C (-22°F)	+150°C (+302°F)	
EPDM	-40°C (-40°F)	+120°C (+248°F)	
FFKM (Kalrez)	-5°C (+23°F) ²⁾	+150°C (+302°F)	

- 1) For PA coated probes, the maximal admissible temperature is 100°C. (212°F)
- 2) The min. temperature of FFKM may be -15°C (+5°F) if the max. temperature of +80°C (+176°F) is not exceeded.



Note!
The medium temperature can be higher.
However, when using rope probes the stability of the probe rope is reduced by structural changes at temperatures over 350°C (662°F).

Process pressure limits	<p>All models: -1 to 40 bar (-14 to +586 psi). This range may be reduced by the selected process connection. The pressure rating (PN) specified on the flanges refers to a reference temperature of 20°C, for ASME flanges 100°F. Pay attention to pressure-temperature dependencies.</p>
--------------------------------	---

Please refer to the following standards for the pressure values permitted for higher temperatures:

- "EN 1092-1: 2001 Tab. 18
With regard to their temperature stability properties, the materials 1.4435 and 1.4404 are grouped under 13EO in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.
- ASME B 16.5a - 1998 Tab. 2-2.2 F316
- ASME B 16.5a - 1998 Tab. 2.3.8 N10276
- JIS B 2220



Note!

All Levelflex probes have two levels of sealing. There is an O-ring seal and a molded seal behind that.

Materials in contact with process

Part	Material
Seal	See "Ordering information" from → 53
Process connection ¹⁾	See "Ordering information" from → 53
Feedthrough rod	1.4462, Duplex CR22
NordLock washers	1.4547
Cable probe	Cable probe, uninsulated: 1.4401; Weight: 1.4435 Cable probe coated: galv. steel PA 12 (Vestamid L 1940), suitable for use in food
Rod probe	See "Ordering information" from → 53
Coax probe	See "Ordering information" from → 53 Centering stars: PFA
All probes with 1½"- and flange connection	On the lower edge of the process connections: PTFE (Dyneon Hostaflon TFM 1600)
All probes with ¾" connection	Lower edge of the process connections: PPS-GF 40

- 1) Endress+Hauser supplies DIN/EN flanges made of stainless steel AISI 316L with the material number 1.4435 or 1.4404. With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are grouped together under 13EO in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

Dielectric constant

- With coax probe: $\epsilon_r \geq 1.4$
- Rod and cable probe: $\epsilon_r \geq 1.6$

Extension of the cable probes through tension and temperature

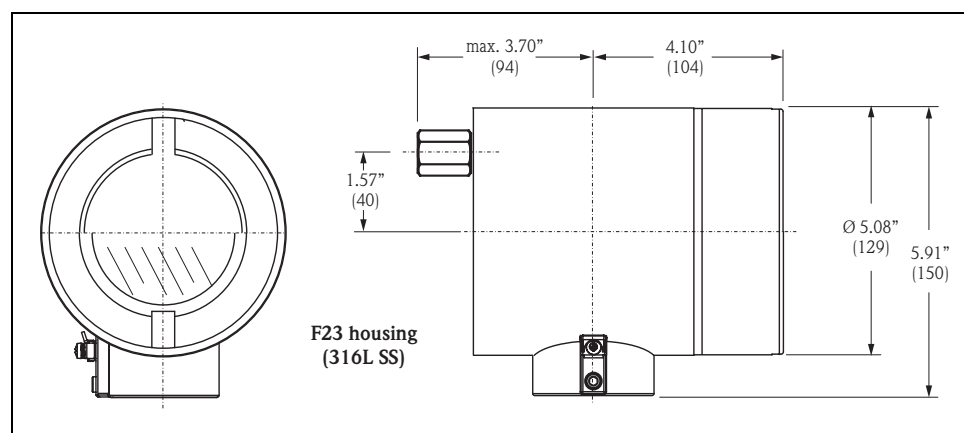
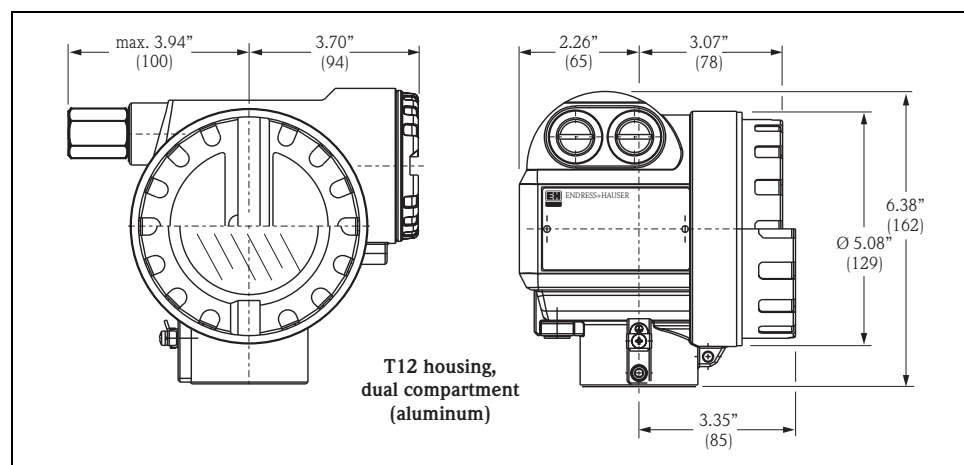
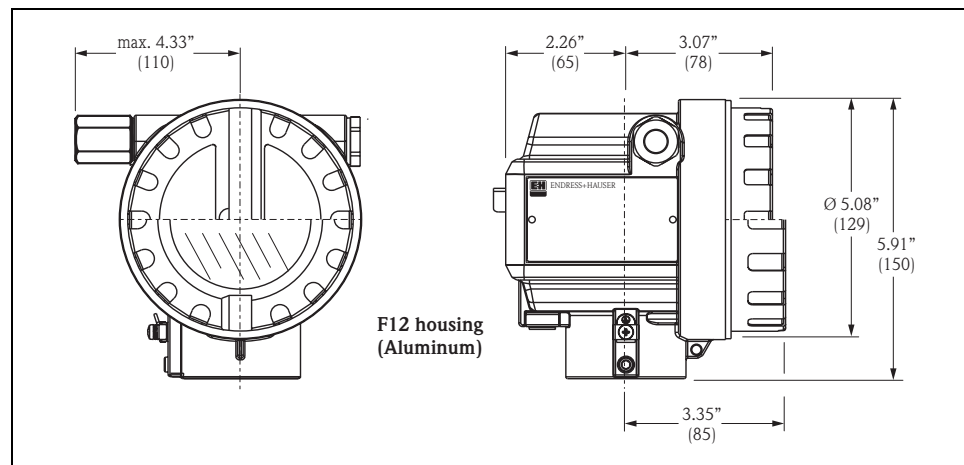
- 6 mm (0.24") cable:
- Elongation through tension: at max. permitted tensile load 6745 lbf (30 KN): 13 mm / m (0.51"/3 ft) cable length
 - Elongation through temperature increase from 30 to 150°C (86 to 350°F): 2 mm / m (0.08"/3 ft) cable length
- 4 mm (0.16") cable:
- Elongation through tension: at max. permitted tensile load 2700 lbf (12 KN): 11 mm / m (0.43"/3 ft) cable length
 - Elongation through temperature increase from 30 to 150°C (86 to 350°F): 2 mm / m (0.08"/3 ft) cable length

Mechanical construction

Design, dimensions

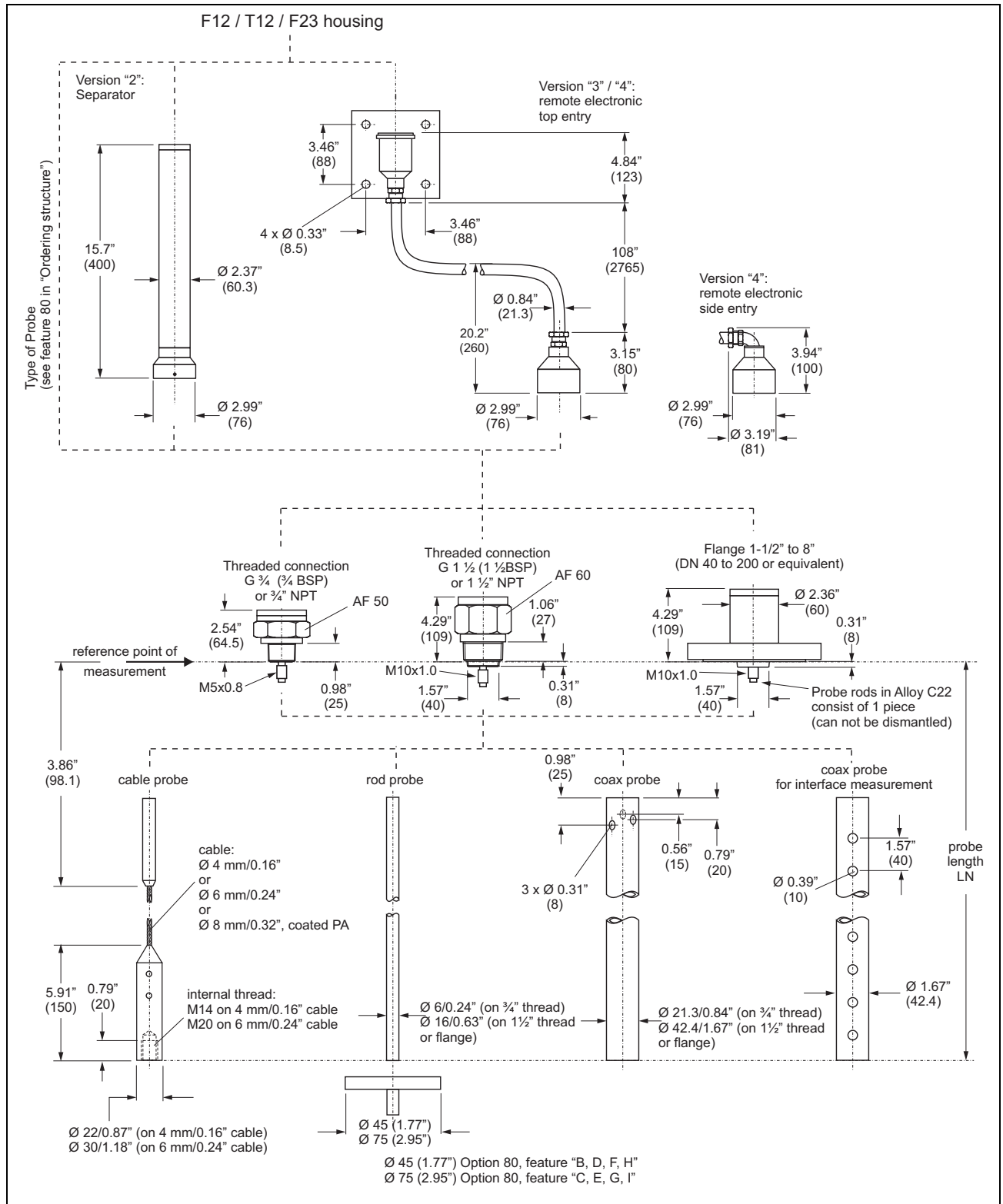
Housing dimensions

Dimensions for process connection and probe type page 43.



Levellflex M FMP40 - process connection, probe type

Housing dimensions page 42



L00-FMP40-06-00-00-en-007

General information on flanges

The surface roughness of the surface in contact with the medium, including the sealing surface of the flanges (all standards) made of Hastelloy C, Monel or Tantalum, is Ra 3.2. Lower surface roughness levels are available on request.

Tolerance of probe length

Rod probes/coax probes				
Over		1 m (3 ft)	3 m (10 ft)	6 m (20 ft)
Up to	1 m (3 ft)	3 m (10 ft)	6 m (20 ft)	
Admissible tolerance (mm)	- 5 (-0.2")	- 10 (-0.4")	- 20 (-0.8")	- 30 (-1.2")

Cable probes				
Over		1 m (3 ft)	3 m (10 ft)	6 m (20 ft)
Up to	1 m (3 ft)	3 m (10 ft)	6 m (20 ft)	
Admissible tolerance (mm)	- 10 (-0.4")	- 20 (-0.8")	- 30 (-1.2")	- 40 (-1.6")

Weight

Levelflex M	FMP40 + cable probe 4 mm (0.16")	FMP40 + rod or cable probe 6 mm (0.24")	FMP40 + rod probe 16 mm (0.63")	FMP40 Coax probe
Weight for F12 or T12 housing	Approx. 4 kg (8.8 lb) + Approx. 0.1 kg/m (0.3 lb/3 ft) Probe length + weight of flange	Approx. 4 kg (8.8 lb) + Approx. 0.2 kg/m (0.4 lb/3 ft) Probe length + weight of flange	Approx. 4 kg (8.8 lb) + Approx. 1.6 kg/m Probe length (3.5/3 ft) + weight of flange	Approx. 4 kg (8.8 lb) + Approx. 3.5 kg/m Probe length (7.7 lb/3 ft) + weight of flange
Weight for F23 housing	Approx. 7.4 kg (16 lb) + Approx. 0.1 kg/m (0.3 lb/3 ft) Probe length + weight of flange	Approx. 7.4 kg (16 lb) + Approx. 0.2 kg/m (0.4 lb/3 ft) Probe length + weight of flange	Approx. 7.4 kg (16 lb) + Approx. 1.6 kg/m (3.5/3 ft) Probe length + weight of flange	Approx. 7.4 kg (16 lb) + Approx. 3.5 kg/m (7.7 lb/3 ft) Probe length + weight of flange

Material

- Housing:
 - Housing F12/T12: aluminum (AlSi10Mg), seawater-resistant, powder-coated
 - Housing F23: 316L, corrosion-resistant steel
- Sight window: glass

Process connection

See "Ordering information" on page 53.

Seal

See "Ordering information" on page 53.

Probe

See "Ordering information" on page 53.

Human interface

Operating concept

The display of the process value and the configuration of the Levelflex occur locally by means of a large 4-line alphanumeric display with plain text information. The guided menu system with integrated help texts ensures a quick and safe commissioning.

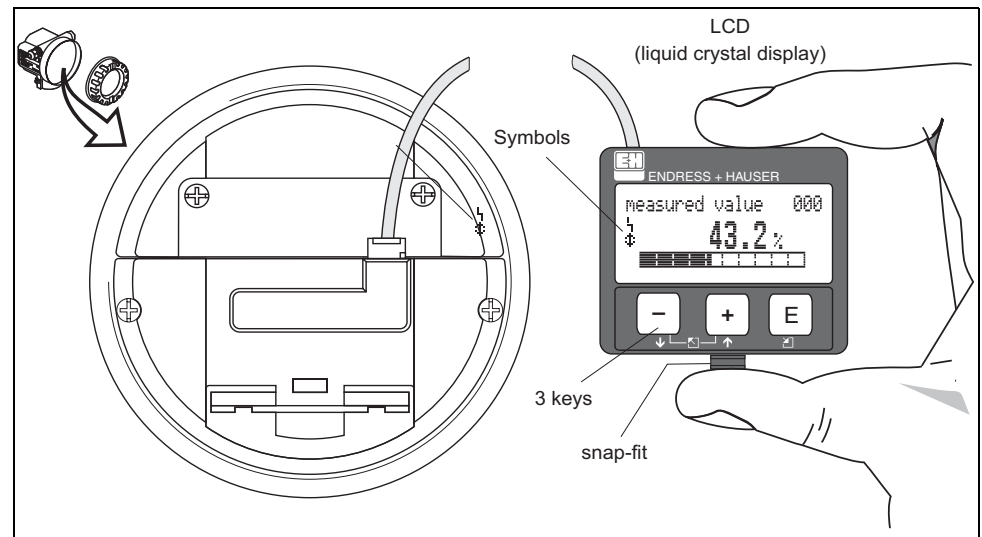
To access the display the cover of the electronic compartment may be removed even in hazardous area (IS and XP).

Remote commissioning, including documentation of the measuring point and in-depth analysis functions, is supported by FieldCare, the graphical operating software for Endress+Hauser time-of-flight systems.

Display elements

Liquid crystal display (LCD):

Four lines with 20 characters each. Display contrast adjustable through key combination.



L00-FMxxxxx-07-00-00-en-001

The VU331 LCD display can be removed to ease operation by simply pressing the snap-fit (see graphic above). It is connected to the device by means of a 500 mm (20") cable.
















The following table describes the symbols that appear on the liquid crystal display:

Symbol	Meaning
	ALARM_SYMBOL This alarm symbol appears when the instrument is in an alarm state. If the symbol flashes, this indicates a warning.
	LOCK_SYMBOL This lock symbol appears when the instrument is locked, i.e. if no input is possible.
	COM_SYMBOL This communication symbol appears when a data transmission via e.g. HART, PROFIBUS PA or FOUNDATION Fieldbus is in progress.
	SIMULATION_SWITCH_ENABLE This communication symbol appears when simulation in FOUNDATION Fieldbus is enabled via the DIP switch.

Operating elements

The operating elements are located inside the housing and are accessible for operation by opening the lid of the housing.

Function of the keys

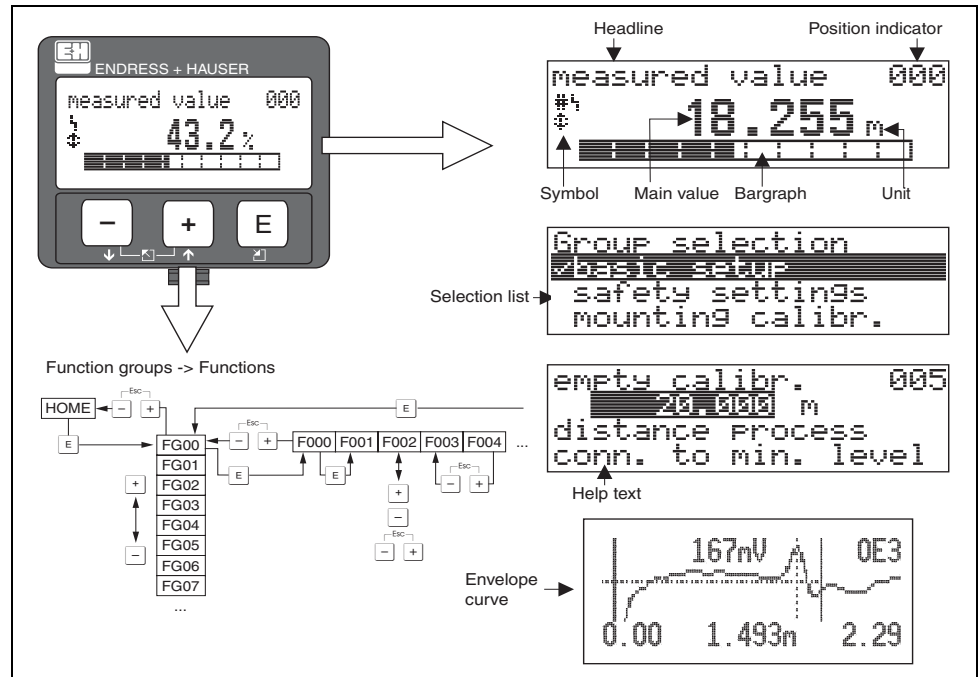
Key(s)	Meaning
 or 	Navigate upwards in the selection list Edit numeric value within a function
 or 	Navigate downwards in the selection list Edit numeric value within a function
  or 	Navigate to the left within a function group
	Navigate to the right within a function group, confirmation.
 and  or  and 	Contrast settings of the LCD
 and  and 	Hardware lock / unlock After a hardware lock, operation of the device via display or communication is not possible! The hardware can only be unlocked via the display. A release code must be entered to do so.

Local operation

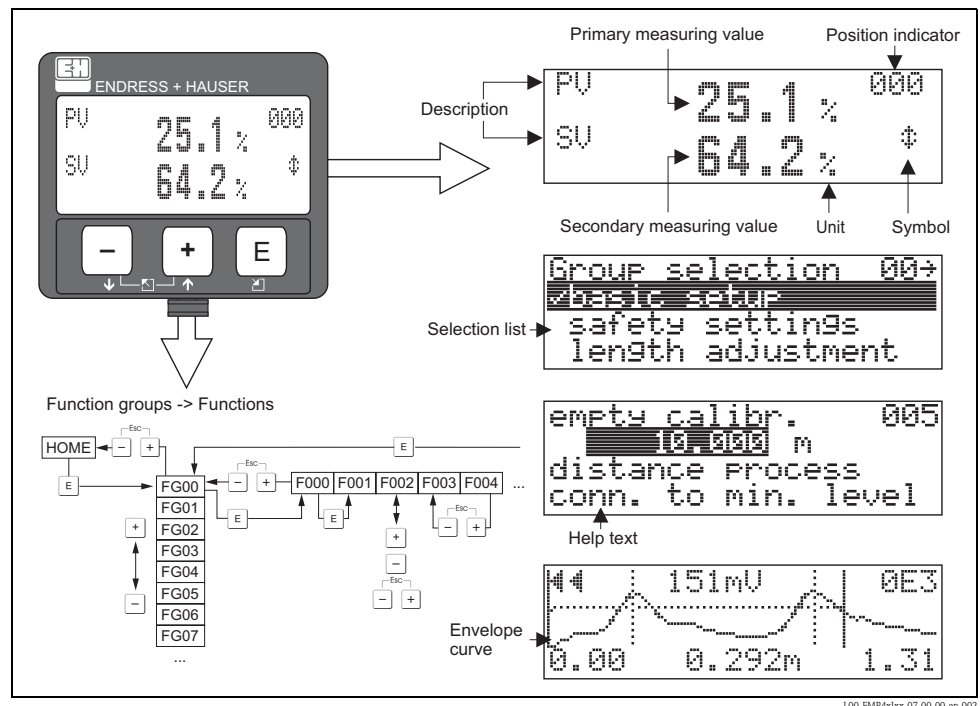
Operation with VU331

The LC-Display VU331 allows configuration via 3 keys directly at the instrument. All device functions can be set through a menu system. The menu consists of function groups and functions. Within a function, application parameters can be read or adjusted. The user is guided through a complete configuration procedure.

Display for level measurement



Display for interface measurement



Operation with FieldCare

FieldCare supports the following functions:

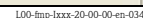
- Connection options:

- HART via Commubox FXA191 and the RS 232 C serial port of a computer
- HART via Commubox FXA195 and the USB port of a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card

Menu-guided commissioning



Signal analysis via envelope curve

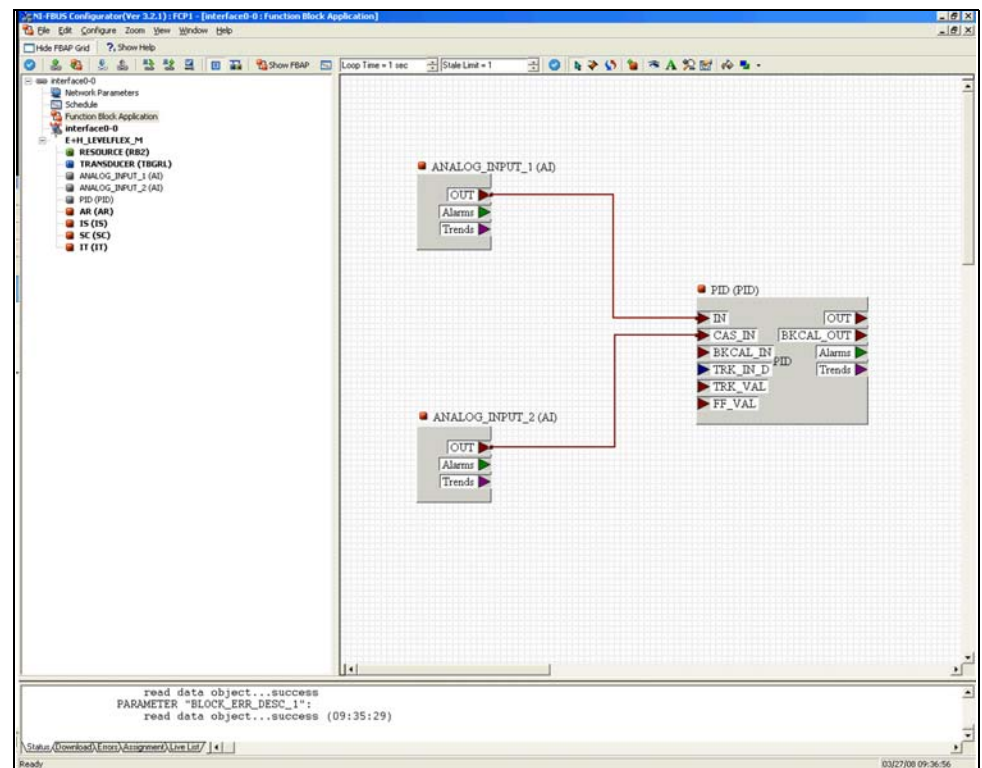


Operation with NI-FBUS Configurator (only FOUNDATION Fieldbus)

The NI-FBUS Configurator is an easy-to-use graphical environment for creating linkages, loops, and a schedule based on the fieldbus concepts.

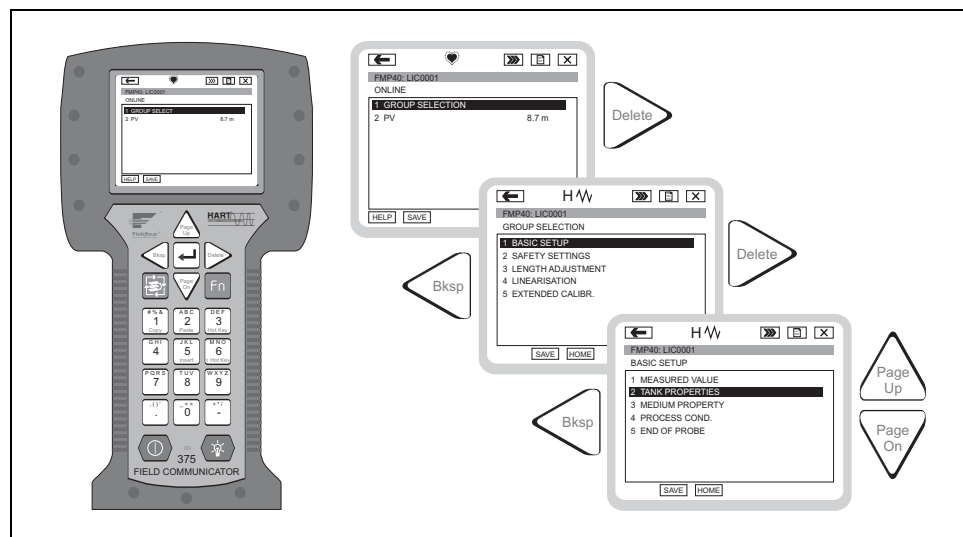
You can use the NI-FBUS Configurator to configure a fieldbus network as follows:

- Set block and device tags
- Set device addresses
- Create and edit function block control strategies (function block applications)
- Configure vendor-defined function and transducer blocks
- Create and edit schedules
- Read and write to function block control strategies (function block applications)
- Invoke Device Description (DD) methods
- Display DD menus
- Download a configuration
- Verify a configuration and compare it to a saved configuration
- Monitor a downloaded configuration
- Replace devices
- Save and print a configuration



Operation with handheld terminal Field Communicator 375

With the handheld terminal Field Communicator 375, you can configure all the device functions via menu operation.



L00-FMPxxxx-07-00-00-yy-005



Note!

- Further information on the HART handheld terminal is given in the appropriate Operating Instructions included in the carrying case of the Field Communicator 375.

Certificates and approvals

CE mark

The measuring system meets the legal requirements of the applicable EC guidelines. These are listed in the corresponding EC Declaration of Conformity together with the standards applied. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

Ex approval

See "Ordering information" on page 53.

The devices are certified for use in hazardous areas. The safety instructions to be observed are enclosed and referenced on the nameplate:

- Europe: EC type-examination certificate, safety instructions XA
- USA: FM Approval, Control Drawing
- Canada: CSA Certificate of Compliance, Control Drawing
- China: NEPSI Explosion Protection Certificate of Conformity, Safety Instructions XA
- Japan: TIIS Certificate for Ex-apparatus

Assignment of the certificates (XA, ZD, ZE) to the device:

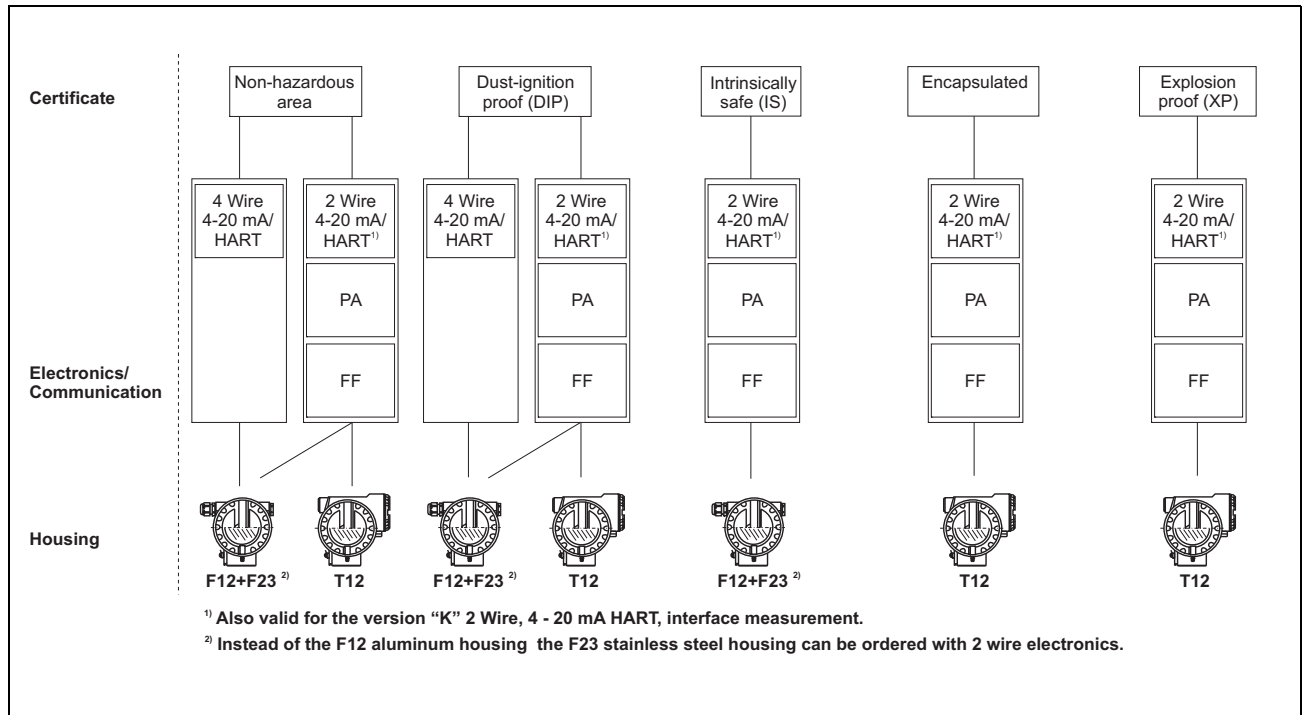
Feature		Variant	XA164F	XA165F	XA166F	XA167F	XA168F	XA172F	XA173F	XA175F	XA176F	XA178F	XA179F	XA180F	XA181F	XA186F	XA187F	XA188F	XA189F	XA190F	XA191F	XA192F	XA193F	XA194F	XA195F	XA196F	XA197F	XA198F	XA199F	XA200F	XA201F	XA202F	XA203F	XA204F	XA205F	XA206F	XA207F	XA208F	XA209F	XA210F	XA211F	XA212F	XA213F	XA214F	XA215F	XA216F	XA217F	XA218F	XA219F	XA220F	XA221F	XA222F	XA223F	XA224F	XA225F	XA226F	XA227F	XA228F	XA229F	XA230F	XA231F	XA232F	XA233F	XA234F	XA235F	XA236F	XA237F	XA238F	XA239F	XA240F	XA241F	XA242F	XA243F	XA244F	XA245F	XA246F	XA247F	XA248F	XA249F	XA250F	XA251F	XA252F	XA253F	XA254F	XA255F	XA256F	XA257F	XA258F	XA259F	XA260F	XA261F	XA262F	XA263F	XA264F	XA265F	XA266F	XA267F	XA268F	XA269F	XA270F	XA271F	XA272F	XA273F	XA274F	XA275F	XA276F	XA277F	XA278F	XA279F	XA280F	XA281F	XA282F	XA283F	XA284F	XA285F	XA286F	XA287F	XA288F	XA289F	XA290F	XA291F	XA292F	XA293F	XA294F	XA295F	XA296F	XA297F	XA298F	XA299F	XA300F	XA301F	XA302F	XA303F	XA304F	XA305F	XA306F	XA307F	XA308F	XA309F	XA310F	XA311F	XA312F	XA313F	XA314F	XA315F	XA316F	XA317F	XA318F	XA319F	XA320F	XA321F	XA322F	XA323F	XA324F	XA325F	XA326F	XA327F	XA328F	XA329F	XA330F	XA331F	XA332F	XA333F	XA334F	XA335F	XA336F	XA337F	XA338F	XA339F	XA340F	XA341F	XA342F	XA343F	XA344F	XA345F	XA346F	XA347F	XA348F	XA349F	XA350F	XA351F	XA352F	XA353F	XA354F	XA355F	XA356F	XA357F	XA358F	XA359F	XA360F	XA361F	XA362F	XA363F	XA364F	XA365F	XA366F	XA367F	XA368F	XA369F	XA370F	XA371F	XA372F	XA373F	XA374F	XA375F	XA376F	XA377F	XA378F	XA379F	XA380F	XA381F	XA382F	XA383F	XA384F	XA385F	XA386F	XA387F	XA388F	XA389F	XA390F	XA391F	XA392F	XA393F	XA394F	XA395F	XA396F	XA397F	XA398F	XA399F	XA400F	XA401F	XA402F	XA403F	XA404F	XA405F	XA406F	XA407F	XA408F	XA409F	XA410F	XA411F	XA412F	XA413F	XA414F	XA415F	XA416F	XA417F	XA418F	XA419F	XA420F	XA421F	XA422F	XA423F	XA424F	XA425F	XA426F	XA427F	XA428F	XA429F	XA430F	XA431F	XA432F	XA433F	XA434F	XA435F	XA436F	XA437F	XA438F	XA439F	XA440F	XA441F	XA442F	XA443F	XA444F	XA445F	XA446F	XA447F	XA448F	XA449F	XA450F	XA451F	XA452F	XA453F	XA454F	XA455F	XA456F	XA457F	XA458F	XA459F	XA460F	XA461F	XA462F	XA463F	XA464F	XA465F	XA466F	XA467F	XA468F	XA469F	XA470F	XA471F	XA472F	XA473F	XA474F	XA475F	XA476F	XA477F	XA478F	XA479F	XA480F	XA481F	XA482F	XA483F	XA484F	XA485F	XA486F	XA487F	XA488F	XA489F	XA490F	XA491F	XA492F	XA493F	XA494F	XA495F	XA496F	XA497F	XA498F	XA499F	XA500F	XA501F	XA502F	XA503F	XA504F	XA505F	XA506F	XA507F	XA508F	XA509F	XA510F	XA511F	XA512F	XA513F	XA514F	XA515F	XA516F	XA517F	XA518F	XA519F	XA520F	XA521F	XA522F	XA523F	XA524F	XA525F	XA526F	XA527F	XA528F	XA529F	XA530F	XA531F	XA532F	XA533F	XA534F	XA535F	XA536F	XA537F	XA538F	XA539F	XA540F	XA541F	XA542F	XA543F	XA544F	XA545F	XA546F	XA547F	XA548F	XA549F	XA550F	XA551F	XA552F	XA553F	XA554F	XA555F	XA556F	XA557F	XA558F	XA559F	XA560F	XA561F	XA562F	XA563F	XA564F	XA565F	XA566F	XA567F	XA568F	XA569F	XA570F	XA571F	XA572F	XA573F	XA574F	XA575F	XA576F	XA577F	XA578F	XA579F	XA580F	XA581F	XA582F	XA583F	XA584F	XA585F	XA586F	XA587F	XA588F	XA589F	XA590F	XA591F	XA592F	XA593F	XA594F	XA595F	XA596F	XA597F	XA598F	XA599F	XA600F	XA601F	XA602F	XA603F	XA604F	XA605F	XA606F	XA607F	XA608F	XA609F	XA610F	XA611F	XA612F	XA613F	XA614F	XA615F	XA616F	XA617F	XA618F	XA619F	XA620F	XA621F	XA622F	XA623F	XA624F	XA625F	XA626F	XA627F	XA628F	XA629F	XA630F	XA631F	XA632F	XA633F	XA634F	XA635F	XA636F	XA637F	XA638F	XA639F	XA640F	XA641F	XA642F	XA643F	XA644F	XA645F	XA646F	XA647F	XA648F	XA649F	XA650F	XA651F	XA652F	XA653F	XA654F	XA655F	XA656F	XA657F	XA658F	XA659F	XA660F	XA661F	XA662F	XA663F	XA664F	XA665F	XA666F	XA667F	XA668F	XA669F	XA670F	XA671F	XA672F	XA673F	XA674F	XA675F	XA676F	XA677F	XA678F	XA679F	XA680F	XA681F	XA682F	XA683F	XA684F	XA685F	XA686F	XA687F	XA688F	XA689F	XA690F	XA691F	XA692F	XA693F	XA694F	XA695F	XA696F	XA697F	XA698F	XA699F	XA700F	XA701F	XA702F	XA703F	XA704F	XA705F	XA706F	XA707F	XA708F	XA709F	XA710F	XA711F	XA712F	XA713F	XA714F	XA715F	XA716F	XA717F	XA718F	XA719F	XA720F	XA721F	XA722F	XA723F	XA724F	XA725F	XA726F	XA727F	XA728F	XA729F	XA730F	XA731F	XA732F	XA733F	XA734F	XA735F	XA736F	XA737F	XA738F	XA739F	XA740F	XA741F	XA742F	XA743F	XA744F	XA745F	XA746F	XA747F	XA748F	XA749F	XA750F	XA751F	XA752F	XA753F	XA754F	XA755F	XA756F	XA757F	XA758F	XA759F	XA760F	XA761F	XA762F	XA763F	XA764F	XA765F	XA766F	XA767F	XA768F	XA769F	XA770F	XA771F	XA772F	XA773F	XA774F	XA775F	XA776F	XA777F	XA778F	XA779F	XA780F	XA781F	XA782F	XA783F	XA784F	XA785F	XA786F	XA787F	XA788F	XA789F	XA790F	XA791F	XA792F	XA793F	XA794F	XA795F	XA796F	XA797F	XA798F	XA799F	XA800F	XA801F	XA802F	XA803F	XA804F	XA805F	XA806F	XA807F	XA808F	XA809F	XA810F	XA811F	XA812F	XA813F	XA814F	XA815F	XA816F	XA817F	XA818F	XA819F	XA820F	XA821F	XA822F	XA823F	XA824F	XA825F	XA826F	XA827F	XA828F	XA829F	XA830F	XA831F	XA832F	XA833F	XA834F	XA835F	XA836F	XA837F	XA838F	XA839F	XA840F	XA841F	XA842F	XA843F	XA844F	XA845F	XA846F	XA847F	XA848F	XA849F	XA850F	XA851F	XA852F	XA853F	XA854F	XA855F	XA856F	XA857F	XA858F	XA859F	XA860F	XA861F	XA862F	XA863F	XA864F	XA865F	XA866F	XA867F	XA868F	XA869F	XA870F	XA871F	XA872F	XA873F	XA874F	XA875F	XA876F	XA877F	XA878F	XA879F	XA880F	XA881F	XA882F	XA883F	XA884F	XA885F	XA886F	XA887F	XA888F	XA889F	XA890F	XA891F	XA892F	XA893F	XA894F	XA895F	XA896F	XA897F	XA898F	XA899F	XA900F	XA901F	XA902F	XA903F	XA904F	XA905F	XA906F	XA907F	XA908F	XA909F	XA910F	XA911F	XA912F	XA913F	XA914F	XA915F	XA916F	XA917F	XA918F	XA919F	XA920F	XA921F	XA922F	XA923F	XA924F	XA925F	XA926F	XA927F	XA928F	XA929F	XA930F	XA931F	XA932F	XA933F	XA934F	XA935F	XA936F	XA937F	XA938F	XA939F	XA940F	XA941F	XA942F	XA943F	XA944F	XA945F	XA946F	XA947F	XA948F	XA949F	XA950F	XA951F	XA952F	XA953F	XA954F	XA955F	XA956F	XA957F	XA958F	XA959F	XA960F	XA961F	XA962F	XA963F	XA964F	XA965F	XA966F	XA967F	XA968F	XA969F	XA970F	XA971F	XA972F	XA973F	XA974F	XA975F	XA976F	XA977F	XA978F	XA979F	XA980F	XA981F	XA982F	XA983F	XA984F	XA985F	XA986F	XA987F	XA988F	XA989F	XA990F	XA991F	XA992F	XA993F	XA994F	XA995F	XA996F	XA997F	XA998F	XA999F	XA1000F	XA1001F	XA1002F	XA1003F	XA1004F	XA1005F	XA1006F	XA1007F	XA1008F	XA1009F	XA1010F	XA1011F	XA1012F	XA1013F	XA1014F	XA1015F	XA1016F	XA1017F	XA1018F	XA1019F	XA1020F	XA1021F	XA1022F	XA1023F	XA1024F	XA1025F	XA1026F	XA1027F	XA1028F	XA1029F	XA1030F	XA1031F	XA1032F	XA1033F	XA1034F	XA1035F	XA1036F	XA1037F	XA1038F	XA1039F	XA1040F	XA1041F	XA1042F	XA1043F	XA1044F	XA1045F	XA1046F	XA1047F	XA1048F	XA1049F	XA1050F	XA1051F	XA1052F	XA1053F	XA1054F	XA1055F	XA1056F	XA1057F	XA1058F	XA1059F	XA1060F	XA1061F	XA1062F	XA1063F	XA1064F	XA1065F	XA1066F	XA1067F	XA1068F	XA1069F	XA1070F	XA1071F	XA1072F	XA1073F	XA1074F	XA1075F	XA1076F	XA1077F	XA1078F	XA1079F	XA1080F	XA1081F	XA1082F	XA1083F	XA1084F	XA1085F	XA1086F	XA1087F	XA1088F	XA1089F	XA1090F	XA1091F	XA1092F	XA1093F	XA1094F	XA1095F	XA1096F	XA1097F	XA1098F	XA1099F	XA1100F	XA1101F	XA1102F	XA1103F	XA1104F	XA1105F	XA1106F	XA1107F	XA1108F	XA1109F	XA1110F	XA1111F	XA1112F	XA1113F	XA1114F	XA1115F	XA1116F	XA1117F	XA1118F	XA1119F	XA1120F	XA1121F	XA1122F	XA1123F	XA1124F	XA1125F	XA1126F	XA1127F	XA1128F	XA1129F	XA1130F	XA1131F	XA1132F	XA1133F	XA1134F	XA1135F	XA1136F	XA1137F	XA1138F	XA1139F	XA1140F	XA1141F	XA1142F	XA1143F	XA1144F	XA1145F	XA1146F	XA1147F	XA1148F	XA1149F	XA1150F	XA1151F	XA1152F	XA1153F	XA1154F	XA1155F	XA1156F	XA1157F	XA1158F	XA1159F	XA1160F	XA1161F	XA1162F	XA1163F	XA1164F	XA1165F	XA1166F	XA1167F	XA1168F	XA1169F	XA1170F	XA1171F	XA1172F	XA1173F	XA1174F	XA1175F	XA1176F	XA1177F	XA1178F	XA1179F	XA1180F	XA1181F	XA1182F	XA1183F	XA1184F	XA1185F	XA1186F	XA1187F	XA1188F	XA1189F	XA1190F	XA1191F	XA1192F	XA1193F	XA1194F	XA1195F	XA1196F	XA1197F	XA1198F	XA1199F	XA1200F	XA1201F	XA1202F	XA1203F	XA1204F	XA1205F	XA1206F	XA1207F	XA1208F	XA1209F	XA1210F	XA1211F	XA1212F	XA1213F	XA1214F	XA1215F	XA1216F	XA1217F	XA1218F	XA1219F	XA1220F	XA1221F	XA1222F	XA1223F	XA1224F	XA1225F	XA1226F	XA1227F	XA1228F	XA1229F	XA1230F	XA1231F	XA1232F	XA1233F	XA1234F	XA1235F	XA1236F	XA1237F	XA1238F	XA1239F	XA1240F	XA1241F	XA1242F	XA1243F	XA1244F	XA1245F	XA1246F	XA1247F	XA1248F	XA1249F	XA1250F	XA1251F	XA1252F	XA1253F	XA1254F	XA1255F	XA1256F	XA1257F	XA1258F	XA1259F	XA1260F	XA1261F	XA1262F	XA1263F	XA1264F	XA1265F	XA1266F	XA1267F	XA1268F	XA1269F	XA1270F	XA1271F	XA1272F	XA1273F	XA1274F	XA1275F	XA1276F	XA1277F	XA1278F	XA1279F	XA1280F	XA1281F	XA1282F	XA1283F	XA1284F	XA1285F	XA1286F	XA1287F	XA1288F	XA1289F	XA1290F	XA1291F
---------	--	---------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------

Overspill protection	<p>WHG. See "Ordering information" on page 53 (see ZE256F/00/en).</p> <p>SIL 2, for 4 to 20 mA output signal (see SD174F/00/en "Functional Safety Manual").</p>
Telecommunications	<p>Complies with part 15 of the FCC rules for an unintentional radiator. All probes meet the requirements for a Class A digital device.</p> <p>Coax probes and probes mounted in closed metallic vessels also meet the requirement for a class B digital device (residential environment).</p>
Standards and guidelines applied	<p>The European directives and standards applied can be taken from the associated EC Declarations of Conformity. In addition, the following also applied for Levelflex M:</p> <p>EN 60529</p> <p>Protection class of housing (IP-code)</p> <p>NAMUR - international user association of automation technology in process industries</p> <ul style="list-style-type: none"> ■ NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment. ■ NE 43 Standardization of the signal level for the failure information of digital transmitters.

Ordering information

Levellflex M FMP40

Instrument selection



100-FMP4xxx-16-00-00-en-003

Temperature: (depending on O-ring)	V Viton, -30°C to +150°C (-22 to +302°F)	
	E EPDM, -40°C to +120°C (-40 to +248°F)	
	K Kalrez, -5°C to +150°C (+23 to +302°F)	
Pressure: (all types)	-1 to 40 bar (-14 to +580 psi)	
Wetted parts	Cable probes: Flanges: 1.4404 (SS316L) Process connection: 1.4435 (SS316L), 1.4462 Cable: 1.4401 (SS316) Cable weight: 1.4435 (SS316L)	Rod probes: Flanges: 1.4404 (SS316L) Process connection: 1.4435 (SS316L), 1.4462 Rod and coax pipe: 1.4435 (SS316L)

The metallic uninsulated probes are only insulated in the area of the bushing. Thus there is no danger of electrostatic charging. The PA-coated cable has been tested and there is no dangerous electrostatic charging. As a result, there are no restrictions on use in Ex-areas for any of the probes.



Note!

For orders with a display, the housing cover is delivered with an inspection glass. For orders without a display, a dummy cover is delivered.

Exception: For orders with the ATEX II 1/2 D dust ignition-proof certificate, a dummy cover is always delivered, even for orders with a built-in display.

This overview does not mark options which are mutually exclusive.

10	Approval:	A Non-hazardous area F Non-hazardous area, WHG 1 ATEX II 1/2G Ex ia IIC T6/IECEx Zone 0/1 2 ATEX II 1/2D, Alu blind cover 3 ATEX II 2G Ex em (ia) IIC T6/IECEx Zone1 4 ATEX II 1/3D 5 ATEX II 1/2G Ex ia IIC T6, ATEX II 1/3D 6 ATEX II 1/2G Ex ia IIC T6, WHG 7 ATEX II 1/2G Ex d (ia) IIC T6 8 ATEX II 1/2G Ex ia IIC T6, ATEX II 1/3D, WHG G ATEX II 3G Ex nA II T6 C NEPSI Ex em (ia) IIC T6 I NEPSI Ex ia IIC T6 J NEPSI Ex d (ia) IIC T6 Q NEPSI DIP R NEPSI Ex nA II T6 M FM DIP Cl.II Div.1 Gr.E-G N.I. S FM IS Cl.I,II,III Div.1 Gr.A-G N.I. T FM XP Cl.I,II,III Div.1 Gr.A-G N CSA General Purpose P CSA DIP Cl.II Div.1 Gr.G + coal dust, N.I. U CSA IS Cl.I,II,III Div.1 Gr.A-D,G + coal dust, N.I. V CSA XP Cl.I,II,III Div.1 Gr.A-D,G + coal dust, N.I. W IEC Ex td A20/21 X IEC Ex td A20/22 K *TIIS Ex ia IIC T4 L TIIS Ex d (ia) IIC T4 Y Special version, to be specified
20	Probe:	A Cable 4mm / 0.16", mainly liquid B Cable 6mm / 0.24", solid H Cable 6mm / 0.24", PA > steel, solid, $T_{max} = 100^{\circ}\text{C} / 212^{\circ}\text{F}$ P Rod 6mm / 0.24", liquid I Rod 12mm / 0.47", liquid K Rod 16mm / 0.63", mainly liquid L Coax, liquid Y Special version, to be specified
30	Probe length:	A mm, cable 4mm, 316 B mm, cable 6mm, 316 C inch cable 0.16", 316 D inch, cable 0.24", 316 E mm, cable 6mm, PA > steel F inch, cable 0.24", PA > steel K mm, rod 16mm, 316L L mm, coax, 316L M inch, rod 16mm / 0.63", 316L N inch, coax, 316L P mm, rod 6mm, 316L R inch, rod 6mm / 0.24", 316L S *..... mm, rod 16mm, 316L, 500mm divisible T *..... mm, rod 16mm, 316L, 1000mm divisible U *..... inch, rod 16mm / 0.63", 316L, 500mm (20") divisible V *..... inch, rod 16mm, / 0.63" 316L, 1000mm (40") divisible 1 mm rod 12mm, AlloyC22 2 mm coax, AlloyC22 3 inch, rod 12mm / 0.47", AlloyC22 4 inch, coax, AlloyC22 Y Special version, to be specified
40	O-ring Material; Temperature:	2 Viton; -30...150°C/-22...302°F 3 EPDM; -40...120°C/-40...248°F 4 Kalrez; -5...150°C/23...302°F 9 Special version, to be specified

50						Process Connection:
						ACJ 1-1/2" 150lbs RF, 316/316L flange ANSI B16.5
						ACM 1-1/2" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
						ADJ 1-1/2" 300lbs RF, 316/316L flange ANSI B16.5
						ADM 1-1/2" 300lbs, AlloyC22 >316/316L flange ANSI B16.5
						AEJ 2" 150lbs RF, 316/316L flange ANSI B16.5
						AEM 2" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
						AFJ 2" 300lbs RF, 316/316L flange ANSI B16.5
						AFM 2" 300lbs, AlloyC22 >316/316L flange ANSI B16.5
						ALJ 3" 150lbs RF, 316/316L flange ANSI B16.5
						ALM 3" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
						AMJ 3" 300lbs RF, 316/316L flange ANSI B16.5
						AMM 3" 300lbs, AlloyC22 >316/316L flange ANSI B16.5
						APJ 4" 150lbs RF, 316/316L flange ANSI B16.5
						APM 4" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
						AQJ 4" 300lbs RF, 316/316L flange ANSI B16.5
						AQM 4" 300lbs, AlloyC22 >316/316L flange ANSI B16.5
						AWJ 6" 150lbs RF, 316/316L flange ANSI B16.5
						AWM 6" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
						A3J 8" 150lbs RF, 316/316L flange ANSI B16.5
						CFJ DN40 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)
						CFM DN40 PN25/40, AlloyC22 >316L flange EN1092-1 (DIN2527)
						CGJ DN50 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)
						CGM DN50 PN25/40, AlloyC22 >316L flange EN1092-1 (DIN2527)
						CMJ DN80 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)
						CMM DN80 PN10/16, AlloyC22 >316L flange EN1092-1 (DIN2527)
						CSJ DN80 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)
						CSM DN80 PN25/40, AlloyC22 >316L flange EN1092-1 (DIN2527)
						CQJ DN100 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)
						CQM DN100 PN10/16, AlloyC22 >316L flange EN1092-1 (DIN2527)
						CTJ DN100 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)
						CTM DN100 PN25/40, AlloyC22 >316L flange EN1092-1 (DIN2527)
						CWJ DN150 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)
						CWM DN150 PN10/16, AlloyC22 >316L flange EN1092-1 (DIN2527)
						CXJ DN200 PN16 B1, 316L flange EN1092-1 (DIN2527 C)
						CRJ Thread ISO228 G3/4, 316L
						GRJ Thread ISO228 G1-1/2, 316L
						GRM Thread ISO228 G1-1/2, AlloyC22
						CNJ Thread ANSI NPT3/4, 316L
						GNJ Thread ANSI NPT1-1/2, 316L
						GNM Thread ANSI NPT1-1/2, AlloyC22
						KDJ 10K 40 RF, 316L flange JIS B2220
						KDM 10K 40, AlloyC22 >316L flange JIS B2220
						KEJ 10K 50 RF, 316L flange JIS B2220
						KEM 10K 50, AlloyC22 >316L flange JIS B2220
						KLJ 10K 80 RF, 316L flange JIS B2220
						KLM 10K 80, AlloyC22 >316L flange JIS B2220
						KPJ 10K 100 RF, 316L flange JIS B2220
						KPM 10K 100, AlloyC22 >316L flange JIS B2220
						YY9 Special version, to be specified
60						Power Supply; Output:
						B 2-wire; 4-20mA SIL HART
						D 2-wire; PROFIBUS PA
						F 2-wire; FOUNDATION Fieldbus
						K 2-wire; 4-20mA HART, Interface measurement
						G 4-wire 90-250VAC; 4-20mA SIL HART
						H 4-wire 10.5-32VDC; 4-20mA SIL HART
						Y Special version, to be specified
70						Operation:
						1 W/o display, via communication
						2 4-line display VU331, Envelope curve display, local
						3 Prepared for FHX40, Remote display (Accessory)
						9 Special version, to be specified
80						Type of Probe:
						B *Compact, centering disk d=45mm, 316L, pipe diameter DN50/2" + DN65/2-1/2"
						C *Compact, centering disk d=75mm, 316L, pipe diameter DN80/3" + DN100/4"
						D *Spacer, center rod d=45mm, 316L, pipe diameter DN50/2" + DN65/2-1/2", spacer, 400mm

[illegible]

You can fill in the options of the respective feature into the following table. The filled in options result in the complete order code.

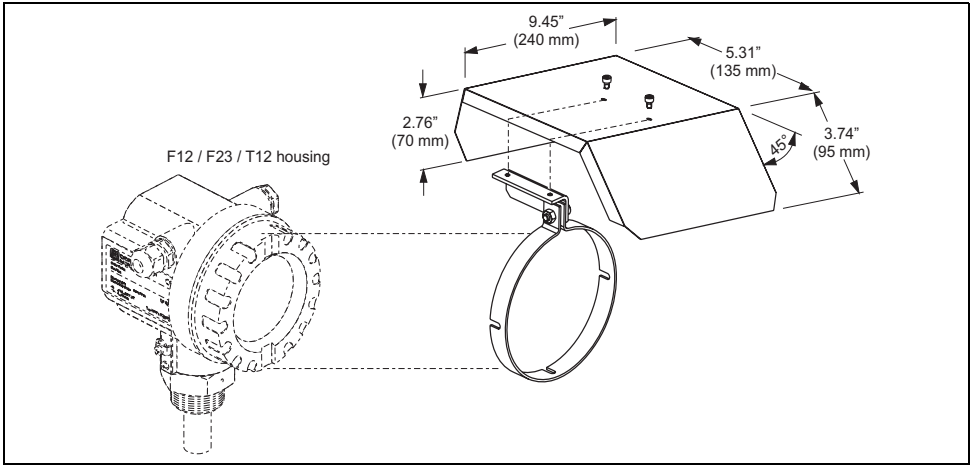
[illegible]

¹⁾ OVP = overvoltage protection

Accessories

Weather protection cover

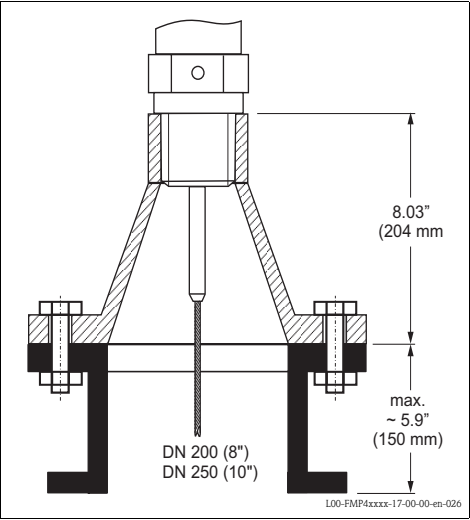
A weather protection cover made of stainless steel is available for outdoor installation (order code: 543199-0001). The shipment includes the protective cover and tension clamp.



L00-FMR2xxxx-00-00-06-en-001

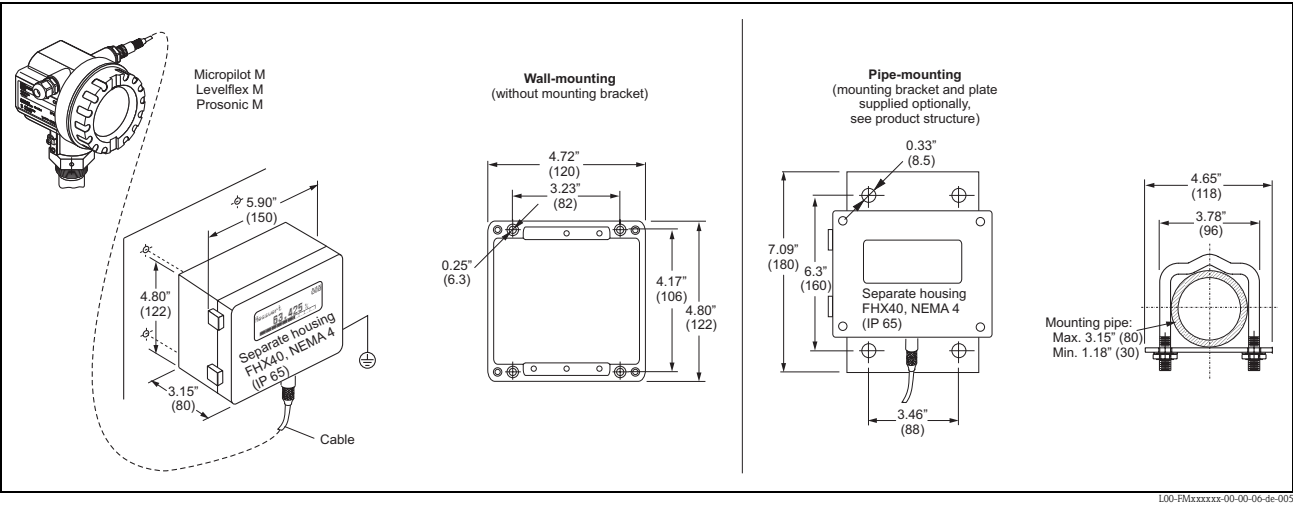
Flange with horn adapter to adapt on the following nozzles

Horn adapter	Order-No.
G 1 1/2" at DN 200 / PN 16	52014251
G 1 1/2" at DN 250 / PN 16	52014252
NPT 1 1/2" at 8" / 150 psi	52014253
NPT 1 1/2" at 10" / 150 psi	52014254
Material: 1.4435	



L00-FMP4xxxx-17-00-00-en-026

Remote display and operation
FHX40



Technical data (cable and housing) and product structure:

Max. cable length	20 m (65 ft)
Temperature range	-30°C to +70°C (-22°F to 158°F)
Degree of protection	IP65/67 (NEMA 4), housing; IP68 (NEMA 6), cable acc. to IEC 60529
Materials	Housing: AlSi12; cable glands: nickle plated brass
Dimensions [mm] / [inch]	122x150x80 (HxWxD) / 4.8 x 5.9 x 3.2

			Approval:
		A	Non-hazardous area
		C	NEPSI Ex ia IIC T6/T5
		G	IECEx Zone1 Ex ia IIC T6/T5
		K	TIIS Ex ia IIC T6
		N	CSA General Purpose
		S	FM IS Cl. I Div.1 Gr. A-D
		U	CSA IS Cl. I Div.1 Gr. A-D
		I	ATEX II 2G Ex ia IIC T6, ATEX II 3D
		Y	Special version, to be specified
			Cable:
		1	20m / 65ft (> for HART)
		5	20m / 65ft (> for PROFIBUS PA/FOUNDATION Fieldbus)
		9	Special version, to be specified
			Additional option:
		A	Basic version
		B	Mounting bracket, pipe 1" / 2"
		Y	Special version, to be specified
			Marking:
		1	Tagging (TAG)
FHX40 -			Complete product designation

For connection of the remote display FHX40 use the cable which fits the communication version of the respective instrument.

Centering disks

If the probes with rod version are used in a stilling well or bypass, it must be ensured that the probe does not come into contact with the wall. The centering disk fixes the rod probe in the middle of the pipe.

Centering disk PEEK Ø 1.89 - 3.74 inch

The centering disk is suitable for probes with a rod diameter of Ø 0.63in and can be used in pipes from DN40 (1½") up to DN100 (4"). Markings on the 4-leg centering disk ensure a simple tailoring. Hence the centering disk can be adapted to the pipe diameter. See also Operating Instruction BA377F.

- PEEK (statically dissipative)
- Measuring range: -60 to +250°C (-76 to +482°F)

Order-no. 71069064

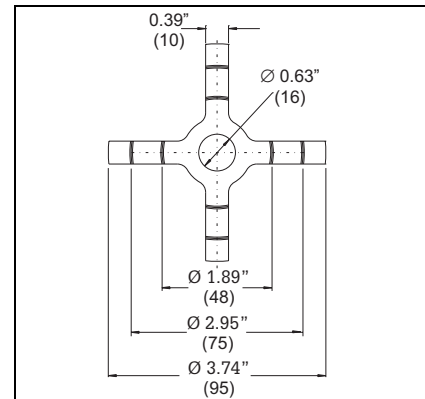
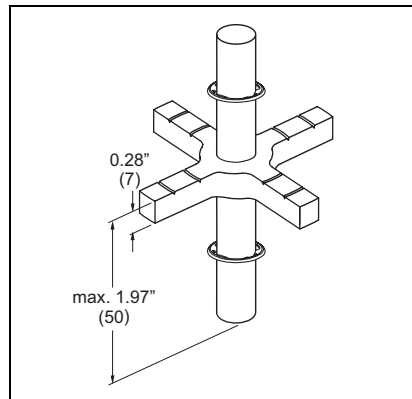


Note!

If the centering disk is inserted in an bypass, it must be positioned below the lower bypass outlet. The has to be accounted for when choosing the probe length.

Generally, the centering disk should not be mounted higher than 50 mm (2") from the probe end.

It is recommended not to insert the PEEK centering disk in the measuring range of the rod probe.

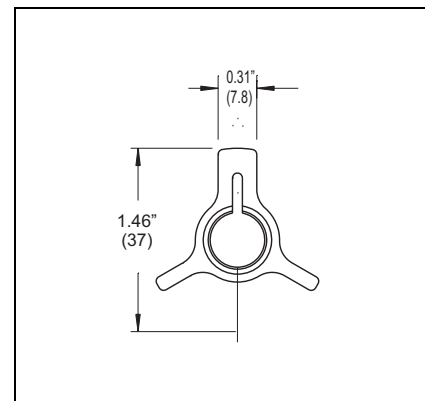
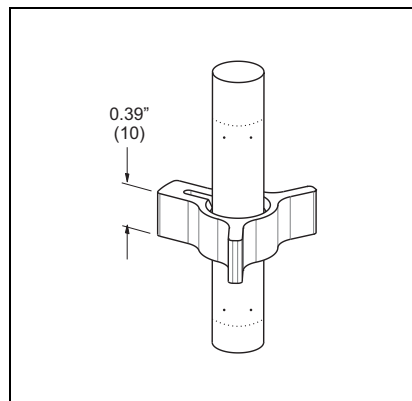



Centering disk PFA Ø 1.46 inch

The centering disk is suitable for probes with a rod diameter of 0.63 inch (also coated rod probes) and can be used in pipes from DN40 (1½") upto DN50 (2").

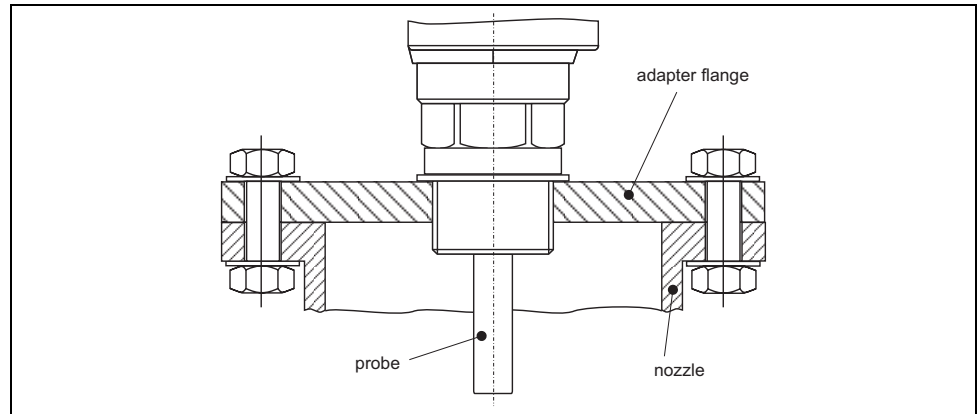
- Measuring range.: -20 to +150°C (-4 to +302°F)

Order-no. 71069065



Commubox FXA191 HART	For intrinsically safe HART communication with FieldCare via the RS232C interface. For details refer to TI237F/00/en.
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. For details refer to TI404F/00/en.
Commubox FXA291	<p>The Commubox FXA291 connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) to the USB port of a personal computer or laptop. For details refer to TI405C/07/en.</p> <p> Note! For the following Endress+Hauser devices you need the "ToF adapter FXA291" as an additional accessory:</p> <ul style="list-style-type: none"> ■ Cerabar S PMC71, PMP7x ■ Deltabar S PMD7x, FMD7x ■ Deltapilot S FMB70 ■ Gammapilot M FMG60 ■ Levelflex M FMP4x ■ Micropilot FMR130/FMR131 ■ Micropilot M FMR2xx ■ Micropilot S FMR53x, FMR540 ■ Prosonic FMU860/861/862 ■ Prosonic M FMU4x ■ Tank Side Monitor NRF590 (with additional adapter cable)
ToF adapter FXA291	<p>The ToF adapter FXA291 connects the Commubox FXA291 via the USB port of a personal computer or laptop to the following Endress+Hauser devices:</p> <ul style="list-style-type: none"> ■ Cerabar S PMC71, PMP7x ■ Deltabar S PMD7x, FMD7x ■ Deltapilot S FMB70 ■ Gammapilot M FMG60 ■ Levelflex M FMP4x ■ Micropilot FMR130/FMR131 ■ Micropilot M FMR2xx ■ Micropilot S FMR53x, FMR540 ■ Prosonic FMU860/861/862 ■ Prosonic M FMU4x ■ Tank Side Monitor NRF590 (with additional adapter cable) <p>For details refer to KA271F/00/a2.</p>

Adapter flange FAU70E / FAU70A

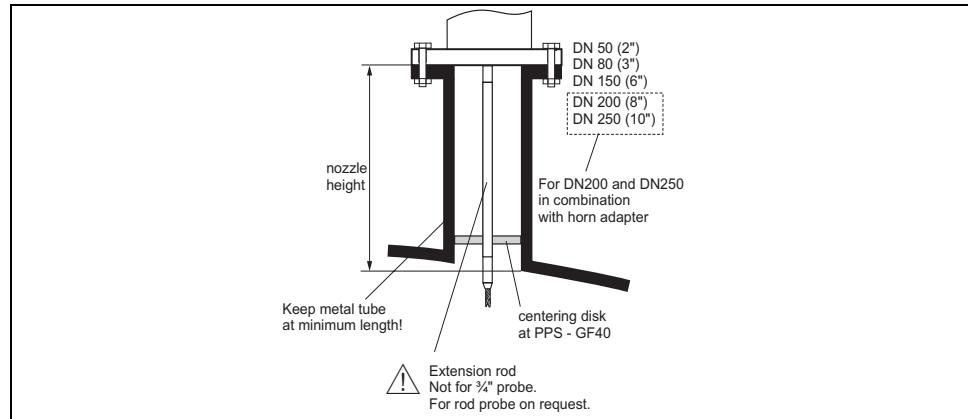


L00-FMP4xxx-00-00-00-en-001

Process connection	
12	DN50 PN16 A, flange EN1092-1 (DIN2527 B)
14	DN80 PN16 A, flange EN1092-1 (DIN2527 B)
15	DN100 PN16 A, flange EN1092-1 (DIN2527 B)
99	Special version, to be specified
Sensor connection	
3	Thread ISO228 G1-1/2
4	Thread ISO228 G2
9	Special version, to be specified
Flange material	
2	316L
3	Steel
7	Polypropylene
9	Special version, to be specified
FAU70E	Complete product designation

Process connection	
22	2" 150lbs FF, flange ANSI B16.5
24	3" 150lbs FF, flange ANSI B16.5
25	4" 150lbs FF, flange ANSI B16.5
99	Special version, to be specified
Sensor connection	
5	Thread NPT1-1/2
6	Thread NPT2
9	Special version, to be specified
Flange material	
2	316L
3	Steel
7	Polypropylene
9	Special version, to be specified
FAU70A	Complete product designation

Extension rod / Centering



L00-FMP4xxxx-17-00-00-en-025

Approval	
A	Non-hazardous area
M	FM DIP Cl.II Div.1 Gr. E-G N.I.
P	CSA DIP Cl.II Div.1 Gr. G + Coal dust, N.I.
S	FM Cl.I, II, III Div.1 Gr. A-G, N.I.
U	CSA Cl.I, II, III Div.1 Gr. A-G N.I.
1	ATEX II 1G
2	AREX II 1D
Extension rod	
1	115mm; 150-250mm / 6-10"
2	215mm; 250-350mm / 10-14"
3	315mm; 350-450mm / 14-18"
4	415mm; 450-550mm / 14-22"
9	Special version, to be specified
Center washer	
A	not selected
B	DN40 / 1-1/2", inside-d.= 40-45mm, PPS
C	DN50 / 2", inside-d.= 50-57mm, PPS
D	DN80 / 3", inside-d.= 80-85mm, PPS
E	DN80 / 3", inside-d.= 76-78mm, PPS
G	DN100 / 4", inside-d.= 100-110mm, PPS
H	DN150 / 6", inside-d.= 152-164mm, PPS
J	DN200 / 8", inside-d.= 210-215mm, PPS
K	DN250 / 10", inside-d.= 253-269mm, PPS
Y	Special version, to be specified
HMP40-	Complete product designation

Mounting-kit isolated

Mounting-kit	Order-No.	<p>Reliable, isolated mounting</p>
for 4mm (0.16") cable probe	52014249	
for 6mm (0.24") cable probe	52014250	
<p>If a cable probe has to be fixed and a secure grounded mounting is not possible, we recommend using the insulating sleeve made of PEEK GF-30 with accompanying DIN 580 eye-bolt made of stainless steel.</p> <p>Max. process temp. 150°C (302°F).</p> <p>Due to the risk of electrostatic charge, the insulating sleeve is not suitable for use in hazardous areas. In these cases the fixing must be reliably grounded (page 26).</p>		<p>eye-bolt</p> <p>D = 20 mm (0.78") at M8 DIN 580 for 4 mm cable</p> <p>D = 25 mm (0.98") at M10 DIN 580 for 6 mm cable</p>

L00-FMP4xxxx-17-00-00-en-036

HART loop converter HMX50

The HART loop converter HMX50 can be acquired using the order number 71063562.
Additional documentation: TI429F and BA371F.

Additional documentation

This Additional documentation can be found on our product pages on "www.endress.com".

Special Documentation
Time of Flight Liquid Level Measurement

Selection and engineering for the process industry, SD157F/00/en.

Radar Tank Gauging brochure

For inventory control and custody transfer applications in tank farms and terminals,
SD001V/00/en.

Technical Information
Tank Side Monitor NRF590

Technical Information for Tank Side Monitor NRF590, TI402F/00/en.

Fieldgate FXA520

Technical Information for Fieldgate FXA520, TI369F/00/en.

Operating Instructions
Levellflex M FMP40

Correlation of operating instructions to the instrument:

Instrument	Output	Communication	Operating Instructions	Description of Device Functions	Brief Operating Instructions (in the device)
FMP40	B, G, H	HART	BA242F/00/en	BA245F/00/en	KA189F/00/a2
	K	HART (interface)	BA363F/00/en	BA366F/00/en	KA283/F/00/a2
	D	PROFIBUS PA	BA243F/00/en	BA245F/00/en	KA189F/00/a2
	F	FOUNDATION Fieldbus	BA244F/00/en	BA245F/00/en	KA189F/00/a2

Tank Side Monitor NRF590

Operating Instructions for Tank Side Monitor NRF590, BA256F/00/en.
Description of Instrument Functions for Tank Side Monitor NRF590, BA257F/00/en.

Engineering hints PROFIBUS PA

Guidelines for planning and commissioning, BA198F/00.

Certificates

See Section "Certificates and approvals" → Page 51 ff..

Patents

This product is protected by at least one of the following patents.
Further patents are pending.

- US 5,661,251 ≙ EP 0 780 664
- US 5,827,985 ≙ EP 0 780 664
- US 5,884,231 ≙ EP 0 780 665
- US 5,973,637 ≙ EP 0 928 974

United States	Canada	Mexico
<p>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</p>	<p>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</p>	<p>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</p>

TI358F/24/ae/05.09
© 2009 Endress+Hauser, Inc.