



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Operating Instructions

Liquiphant M FTL50H, FTL51H

Level Limit Switch

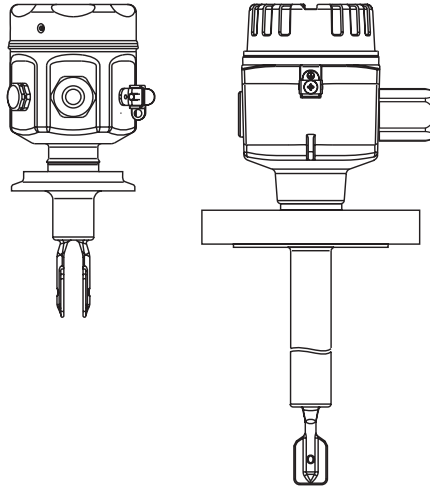


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1 Safety Instructions

Safe and secure operation of the unit can only be guaranteed if the operating instructions and all safety notes are read, understood and followed.

1.1 Approved usage

The Liquiphant M FTL50H and FTL51H is designed for level limit detection in liquids. If used incorrectly, it is possible that application-related dangers may arise. The level limit switch Liquiphant M FTL50H and FTL51H may be installed, connected, commissioned, operated and maintained **by qualified and authorized personnel only**, under strict observance of these operating instructions, any relevant standards, legal requirements, and, where appropriate, the certificate.

1.2 Safety pictograms and symbols

Safe and reliable operation of this unit can only be guaranteed if the safety hints and warnings in these operating instructions are followed. The safety hints in these instructions are highlighted using the following symbols:



Caution!

This symbol indicates activities and actions that, if followed incorrectly, could lead to faulty operation or even damage to the unit.



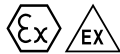
Note!

This symbol indicates activities and actions that, if followed incorrectly, could have an indirect influence on the unit operation or could lead to an unforeseen unit reaction.



Warning!

This symbol indicates activities and actions that, if followed incorrectly, could lead to personal injury, a safety hazard, or destruction of the instrument.



Hazardous area, certified equipment!

If this character is shown on the unit, then it may be operated in hazardous areas.



Non-hazardous area!

This symbol identifies the non-hazardous areas in these instructions. Units that operate in the non-hazardous areas but that are connected to the hazardous areas must also be certified.



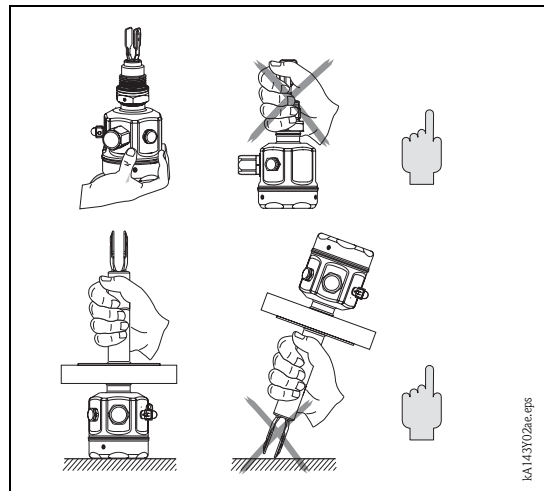
Warning!(For Intrinsically Safe Units)

Installation shall be in accordance with the National Electrical Code (ANSI/NFPA 70) and ANSI/ISA RP 12.6, "Wiring Practices for Hazardous (Classified) Locations, Instrumentation Part I: Intrinsic Safety".

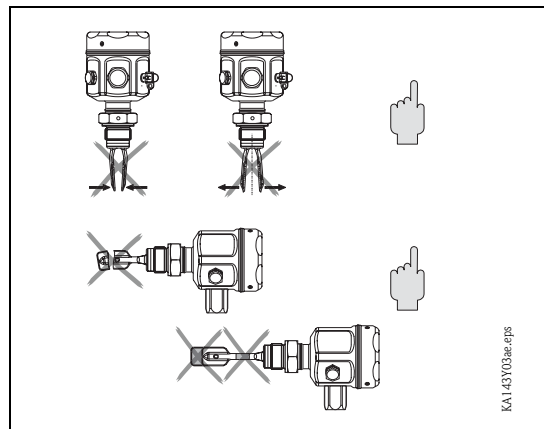
Liquiphant M has been tested for pharmaceutical, food and dairy processing, earning EHEDG certificates, and meeting 3-A Sanitary Standards.

1.3 Handling

Hold by housing, flange or extension tube



Do not bend.
Do not shorten.
Do not lengthen



2 Order Codes

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		
P	FM	IS, Class I, II, III	Division 1, Group A-G
Q	FM	XP, Class I, II, III	Division 1, Group B-C, 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	
Y	Special version		
ATEX and TIIS certified units available on request			
20	Process connection, material		Additional weight
EE2	1" flush-mounted (52001047)	316L	0.7 lb 0.3 kg
A82	1" 150 lb	RF Flange ANSI B16.5	316/316L 2.2 lb 1.0 kg
AA2	1-1/4" 150 lb	RF Flange ANSI B16.5	316/316L 2.6 lb 1.2 kg
AC2	1-1/2" 150 lb	RF Flange ANSI B16.5	316/316L 3.3 lb 1.5 kg
AE2	2" 150 lb	RF Flange ANSI B16.5	316/316L 5.3 lb 2.4 kg
AF2	2" 300 lb	RF Flange ANSI B16.5	316/316L 7.1 lb 3.2 kg
AJ2	2-1/2" 300 lb	RF Flange ANSI B16.5	316/316L (FTL51H) 10.6 lb 4.8 kg

20	Process connection, material						Additional weight	
	AL2	3"	150 lb	RF	Flange ANSI B16.5	316/316L	10.8 lb	4.9 kg
	AM2	3"	300 lb	RF	Flange ANSI B16.5	316/316L (FTL51H)	15 lb	6.8 kg
	AP2	4"	150 lb	RF	Flange ANSI B16.5	316/316L	15.4 lb	7.0 kg
	AQ2	4"	300 lb	RF	Flange ANSI B16.5	316/316L (FTL51H)	25.3 lb	11.5 kg
	TC2	DN 25-38 (1 to 1-1/2")		ISO 2852 Tri-Clamp		316L		
	TE2	DN 40-51 (2")		ISO 2852 Tri-Clamp		316L	0.2 lb	0.1 kg
	WE2	DN65-	PN10	Varivent N		316L	1.1 lb	0.5 kg
	YY9	Special version						
Other process connections available, contact Endress+Hauser								

30	Probe Length; Type								
FTL50H									
	AC	Compact	Ra <1.5 µm/120 grit						
	AD	Compact	Ra <0.3 µm/320 grit						
	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	
	OC	Compact	Ra <1.5 µm/120 grit + pressure tight feed through				1.5 lb	0.7 kg	
	OD	Compact	Ra <0.3 µm/320 grit/A3 + pressure tight feed through				1.5 lb	0.7 kg	
FTL51H									
	CC	..... inch	Ra <1.5 µm/120 grit				5 lb/100 inches		
	CD	..... inch	Ra <0.3 µm/320 grit / A3				5 lb/100 inches		
	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	
	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/A3 + temperature spacer				5 lb/100 in +1.3 lb		
	LC	Length type II*	Ra <1.5 µm/120 grit + temperature spacer				0.2 lb	0.1 kg	+1.3 lb +0.6 kg
	LD	Length type II*	Ra <0.3 µm/320 grit + temperature spacer				0.2 lb	0.1 kg	+1.3 lb +0.6 kg
	SC	..... inch	Ra <1.5 µm/120 grit + pressure tight feed through				5 lb/100 in + 1.5 lb		
	SD	..... inch	Ra <0.3 µm/320 grit/A3 + pressure tight feed through				5 lb/100 in +1.5 lb		
	TC	Length type II*	Ra <1.5 µm/120 grit + pressure tight feed through				0.2 lb	0.1 kg	+1.5 lb +0.7 kg
	YY	Special version							
*) Replacing instruments: when vertically mounting a Liquiphant M FTL51H with length II, the switch point is at the same height as for the Liquiphant II FTL360, FTL365, FDL30, FDL35									

40	Electronic insert								
	1	FEL51*	Contact-free two-wire, 19 to 253 V AC						
	2	FEL52*	PNP three-wire, 10 to 55 V DC						
	4	FEL54	Floating change-over contacts, DPDT, 19 to 253 V AC, 19 to 55 V DC						
	5	FEL55	8/16 mA, 11 to 36 V DC						
	6	FEL56	NAMUR						
	7	FEL57	Two-wire PFM						
	8	FEL58*	NAMUR with push button (disconnects wire)						
	9	Special version							
*) Also available in compact housing									

50	Housing, cable entry							
	C3	Compact housing 316L IP66/68 16 ft. cable						
	D3	Compact housing 316L IP65 Pg11 connector						
	E3	Compact housing 316L NEMA4X NPT 1/2" connector						
	N3	Compact housing 316L IP66/68 M12 connector						
	E4	Polyester housing Nema 4x, NPT 1/2"						
	E5	F13/F17 Aluminum housing Nema 4X, NPT 3/4"						0.9 lb/0.4 kg
	E6	F15 316L housing Nema 4X, NPT 1/2"						
	E7	T13 Aluminum housing IP66 NPT 3/4", with separate connection compartment						1.8 lb/0.8 kg
	Y9	Special version						

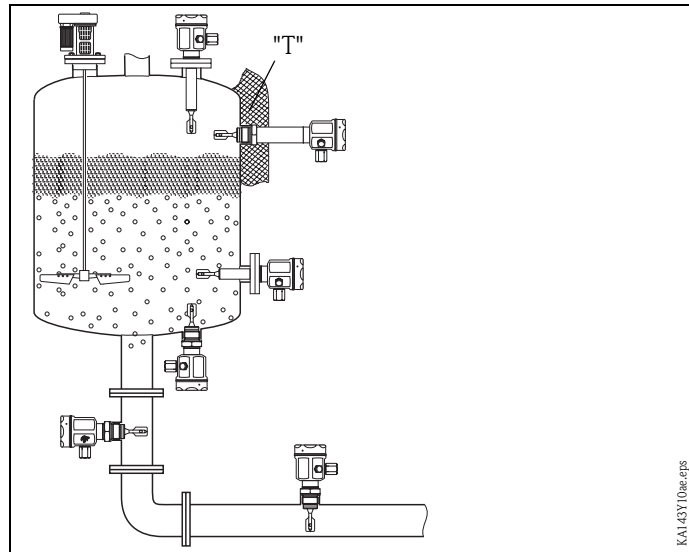
60	Additional option							
	A	Basic version						

60						Additional option	
						B	CoC, EN 10204 - 3.1 material (316L wetted parts) Inspection certificate
						C	EN10204 - 3.1 material (316L wetted parts) Inspection certificate
						S	GL/ABS marine certificate (FTL51H: max. 63 inches/1600 mm)
						Y	Special version
FTL 5#H -						Complete product designation	

3 Installation

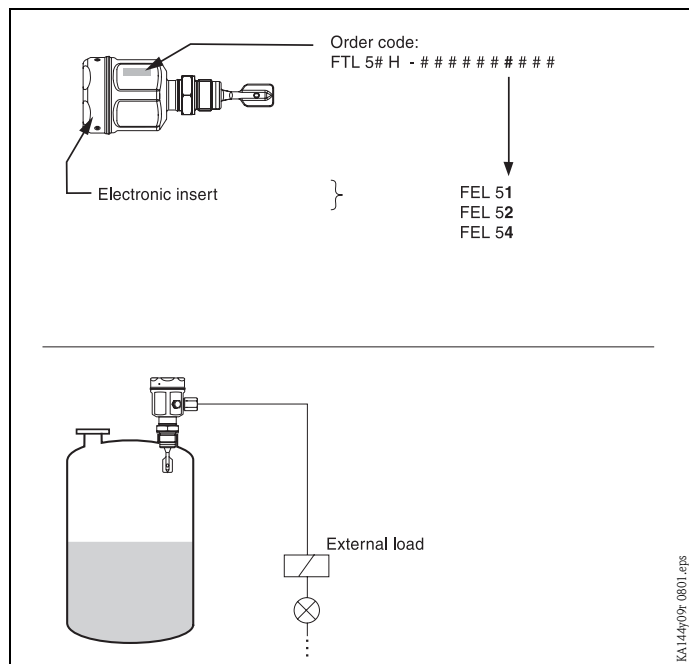
3.1 Application

Level limit detection in liquids

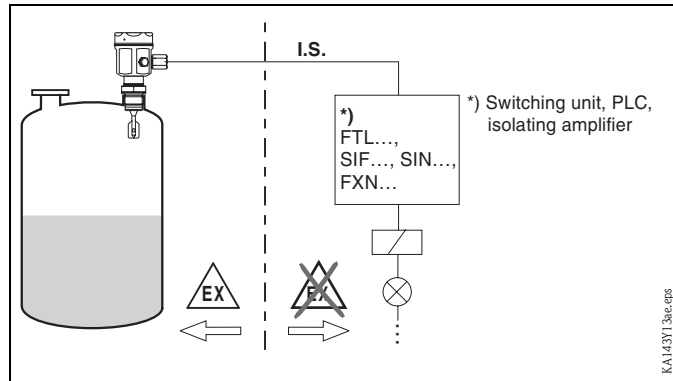
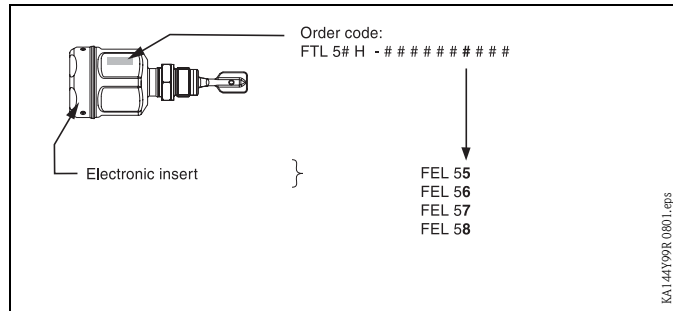


3.2 Measuring System

For direct connection

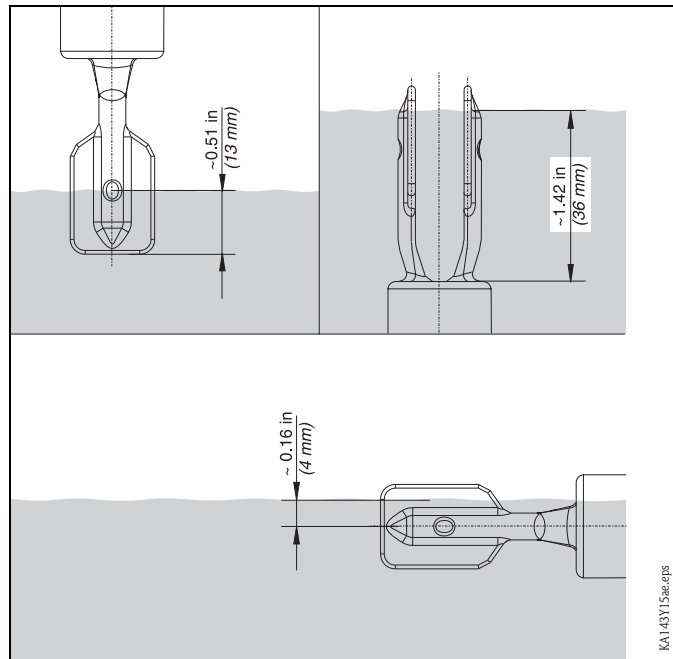


For connection via switching unit



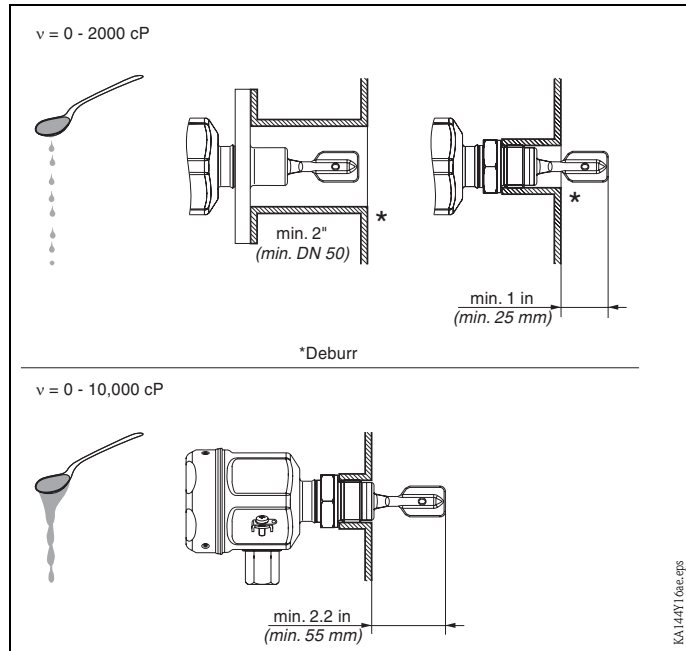
3.3 Installation

Switchpoint depends on mounting position

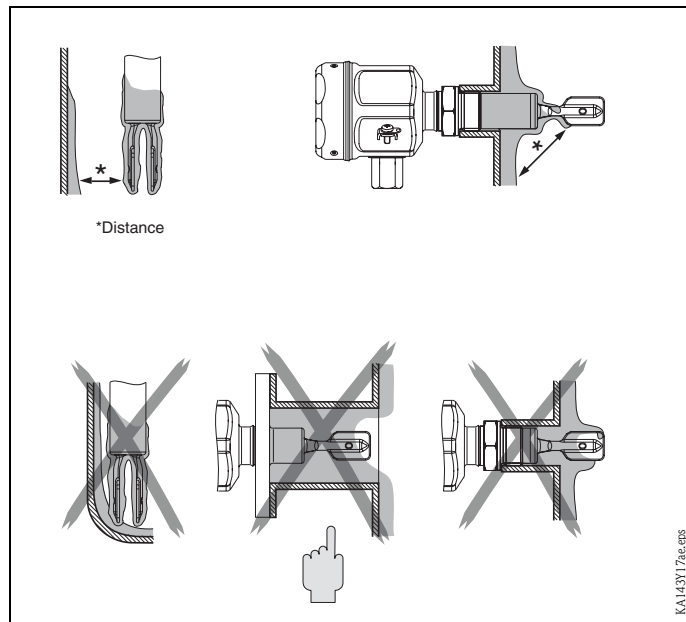


Note!
The switchpoints of the Liquiphant **M** are at different positions than those of the previous version Liquiphant **II**.

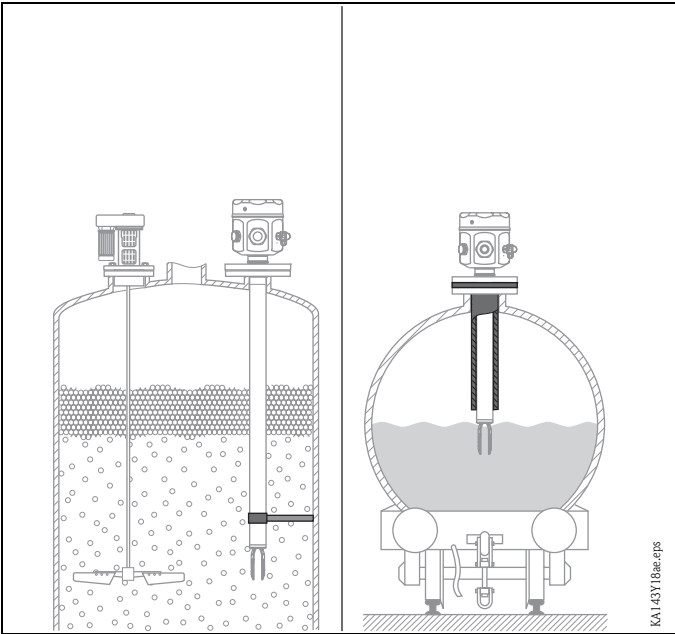
Mounting examples as a function of liquid viscosity



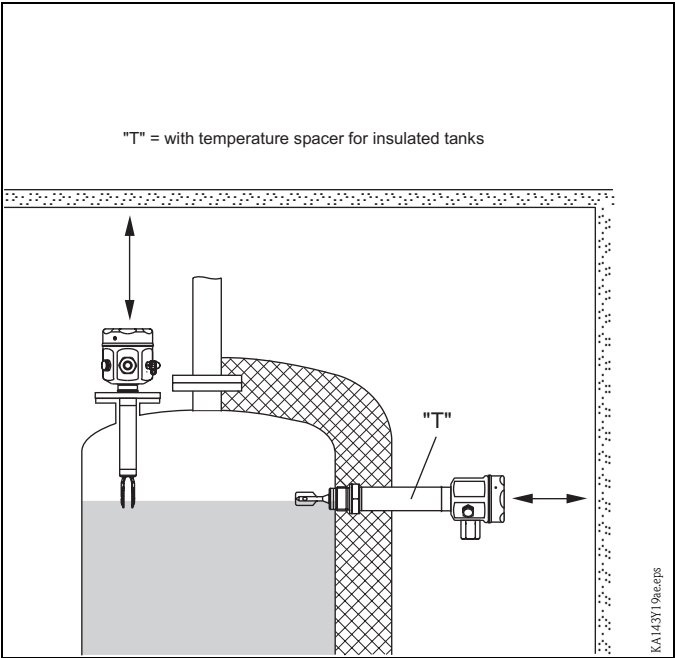
**Consider buildup.
Fork may not contact the buildup**



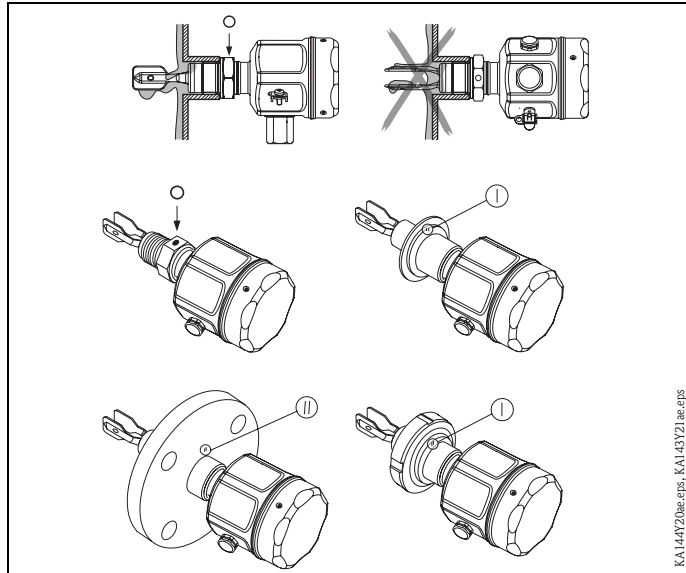
In cases of dynamic forces support



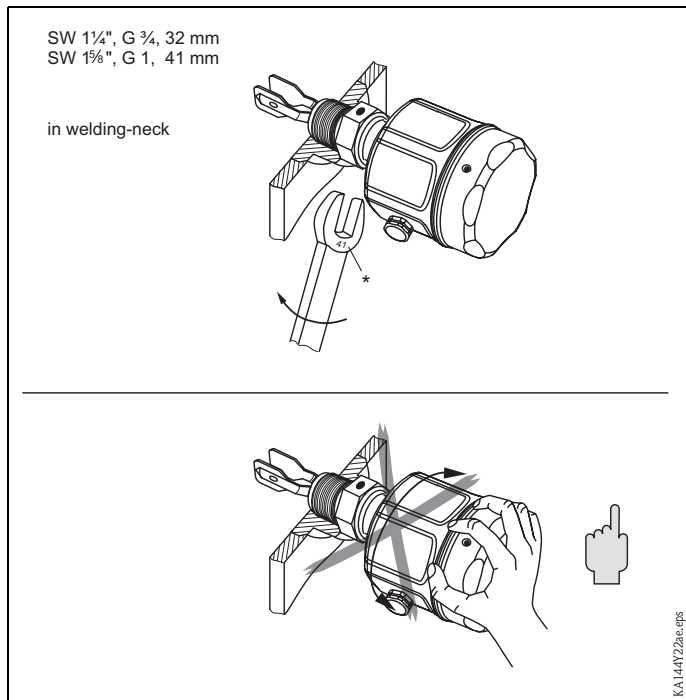
Allow clearance



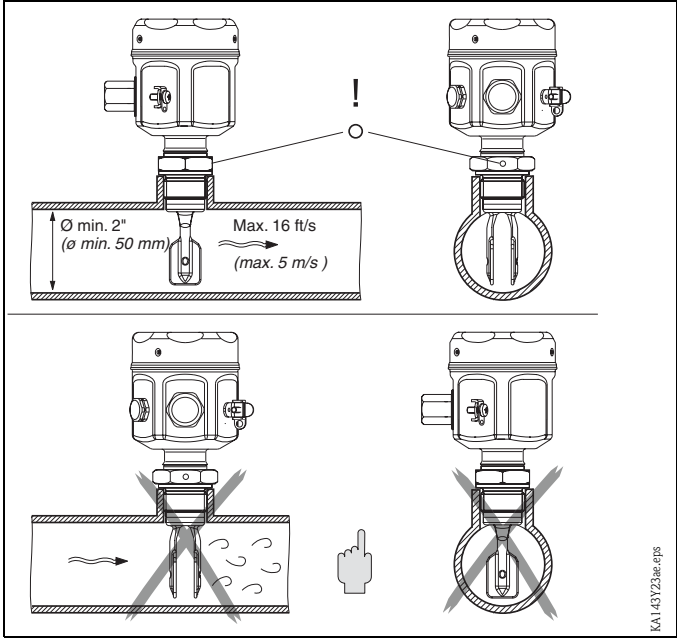
**Orientation of fork tines:
marking above or below**



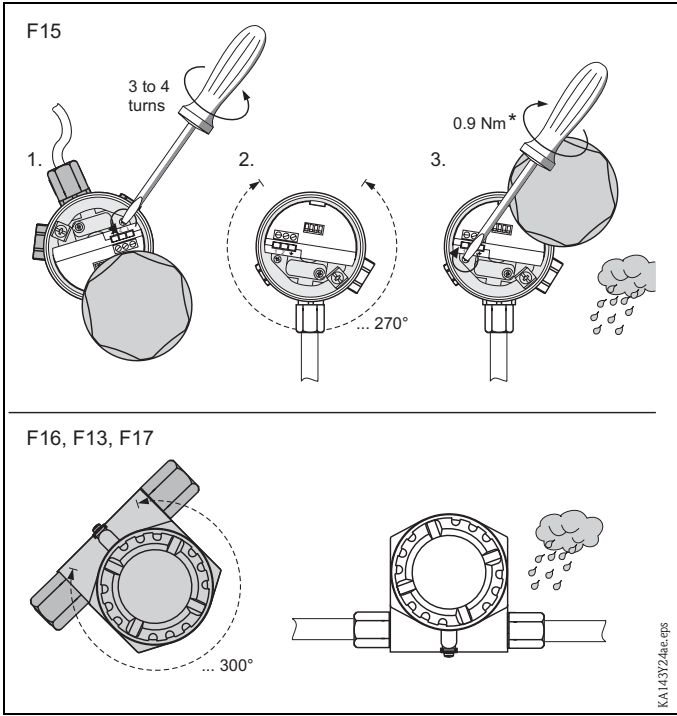
**Screw Liquiphant into
process connection.
DON'T use housing to turn.**



**Orientation in pipes:
marking in direction of
flow**

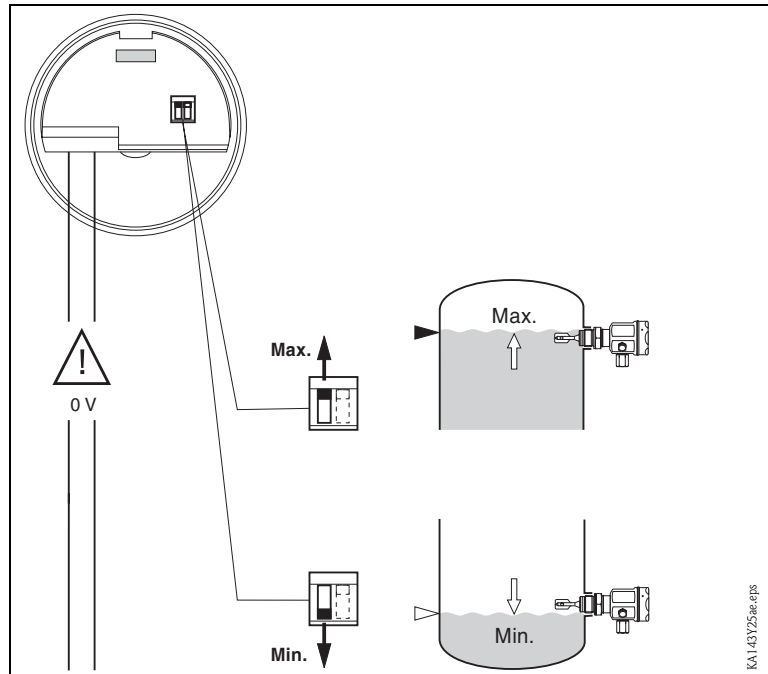


Cable entry orientation

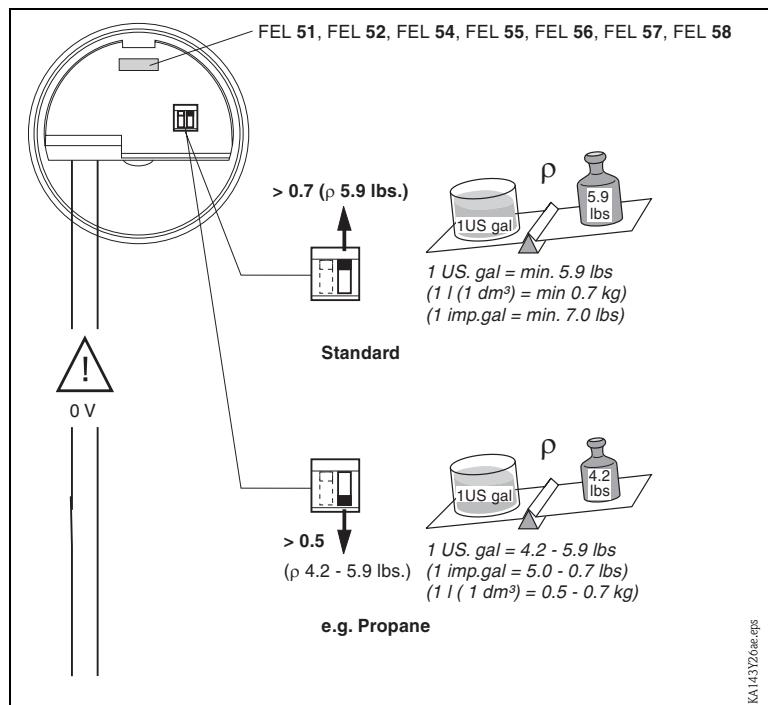


4 Setup

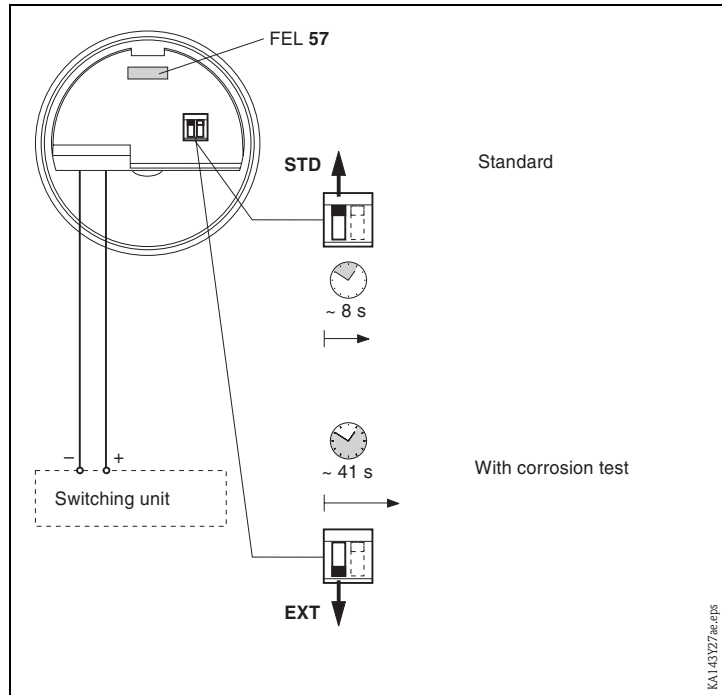
Minimum/maximum fail-safe mode



Liquid density. Density ρ measured in g/cm^3 (SGU) or in kg/l

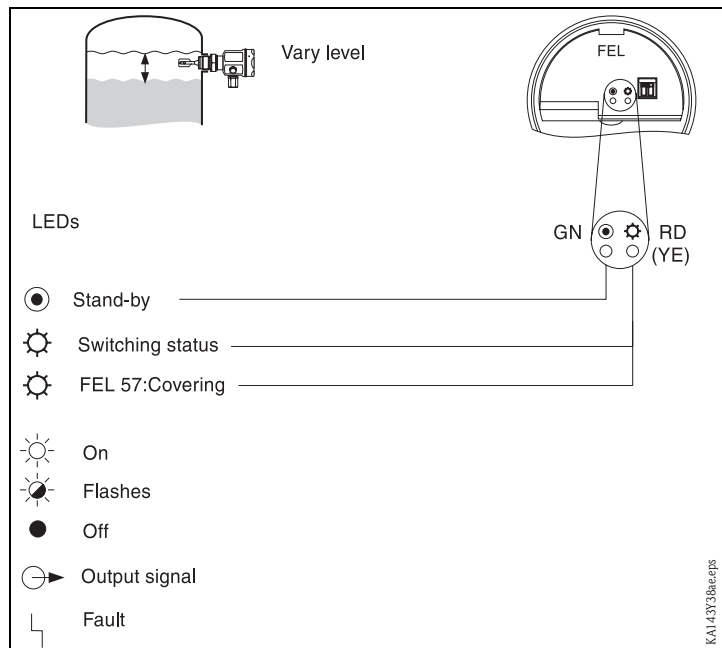


Self test FEL57

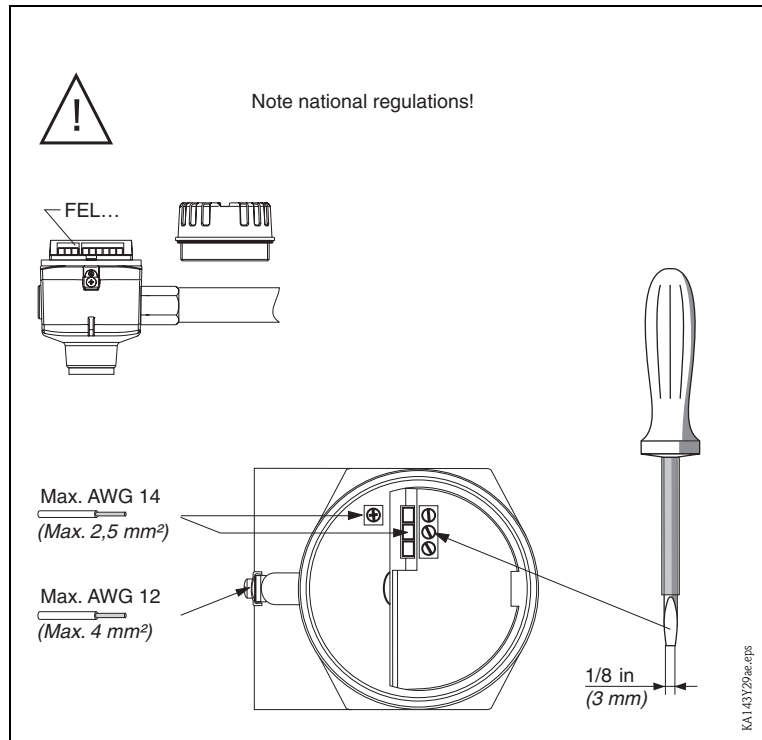


(See page 21 and switching unit for sequence)

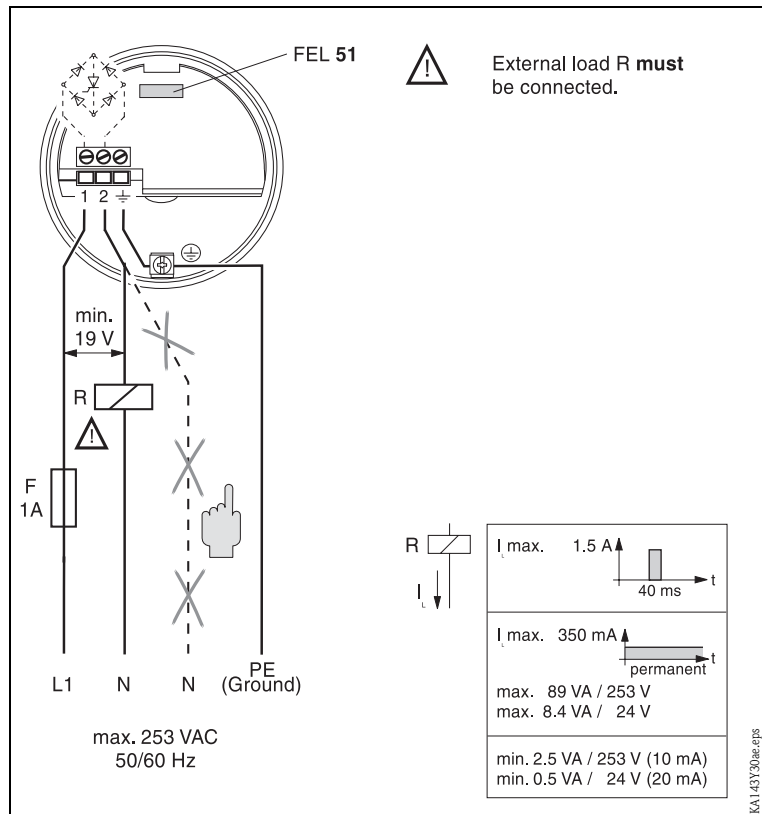
4.1 Display elements



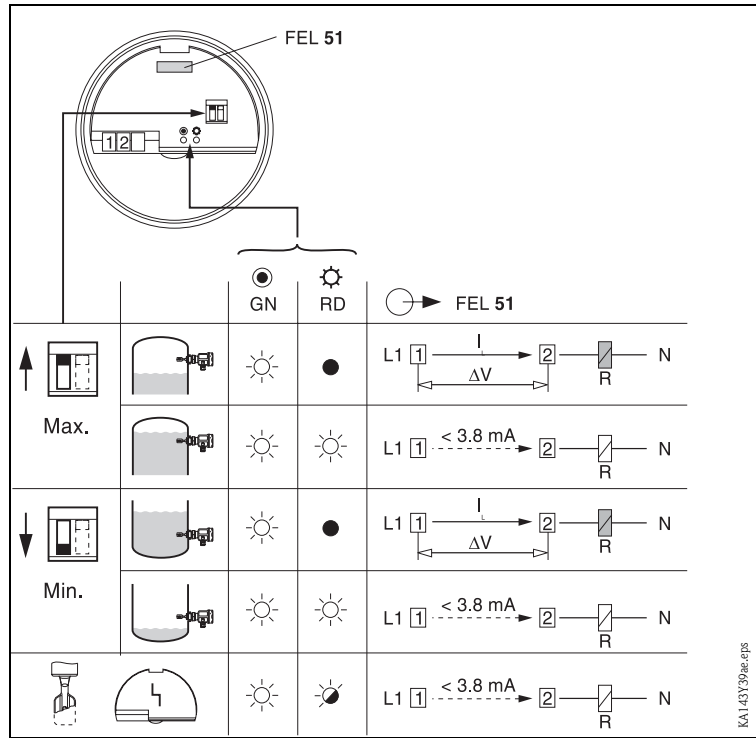
4.2 Connections, Function



Connections FEL51 Two-wire AC connection

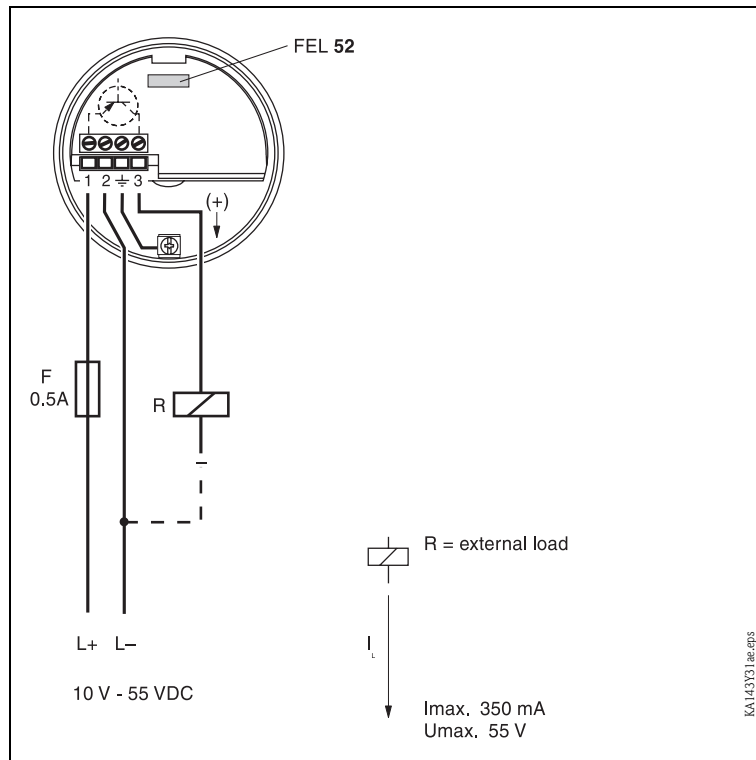


Function FEL51



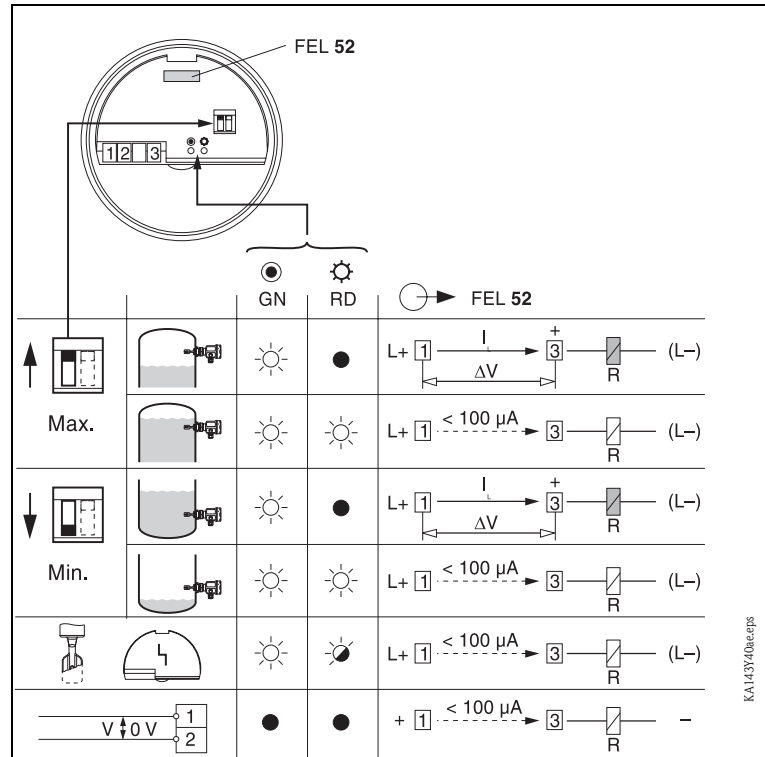
ΔV_{FEL51} max. 12V

**Connections FEL52
DC connection (PNP)**



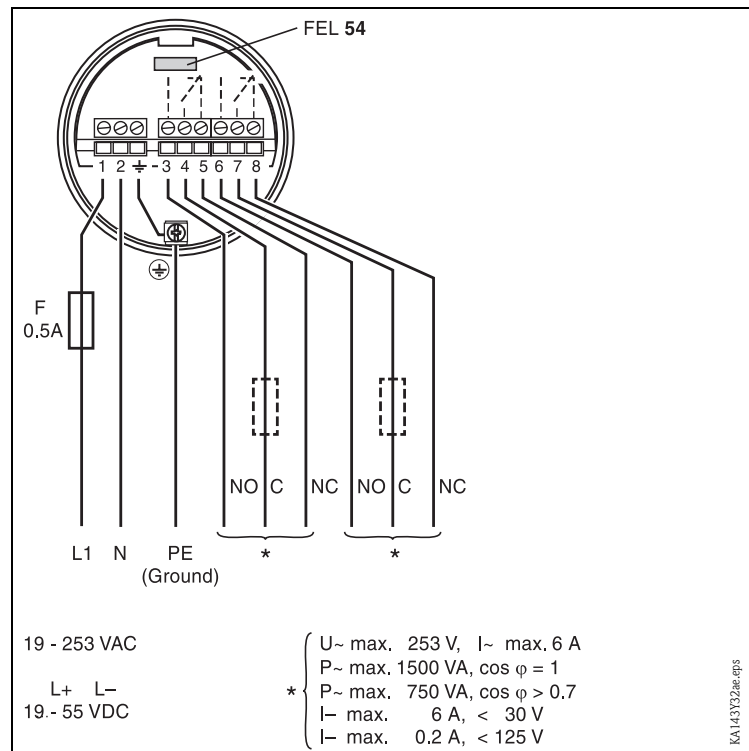
also for DI modules

Function FEL52

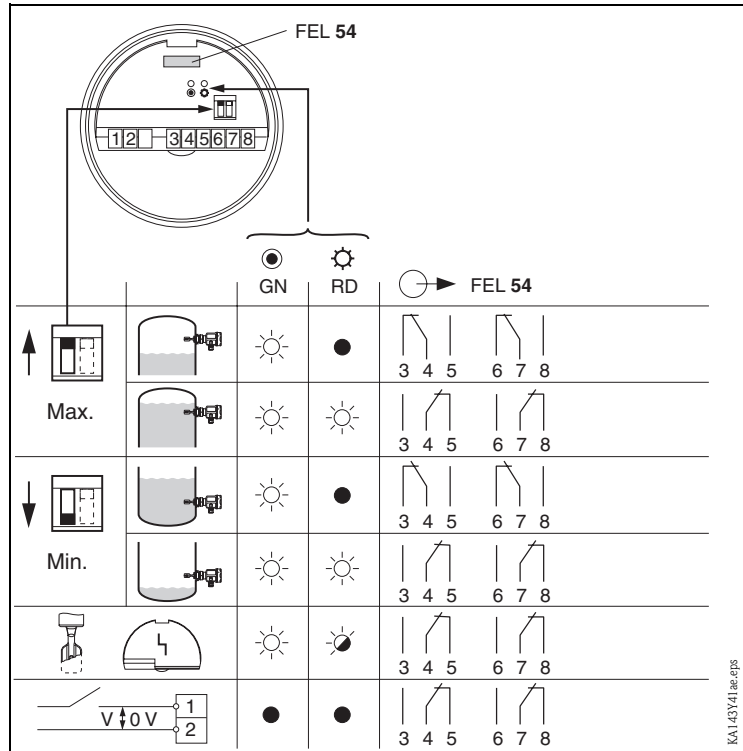


$\Delta V_{FEL52} \text{ max. } 3V$

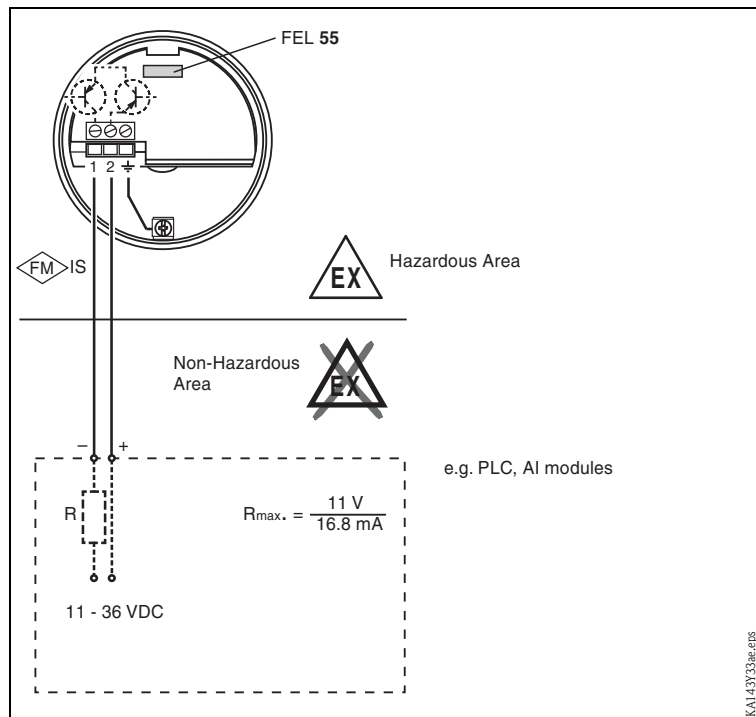
Connections FEL54
Universal connection
Relay output



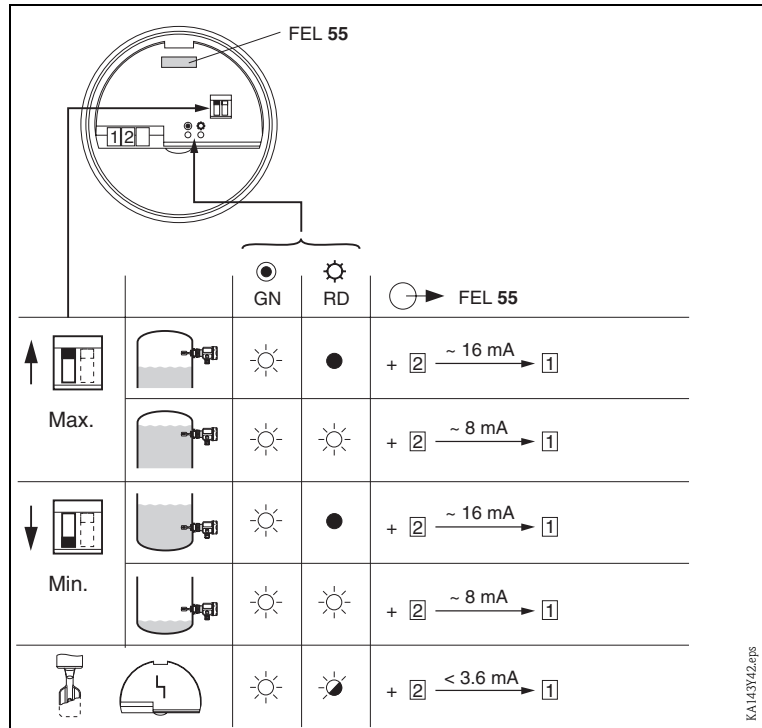
Function FEL54



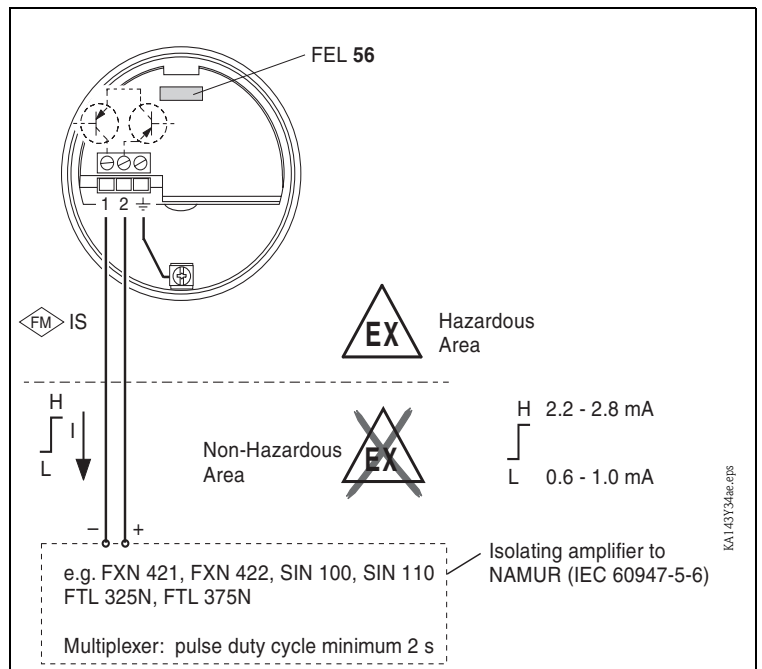
**Connections FEL55
Output
8/16 mA**



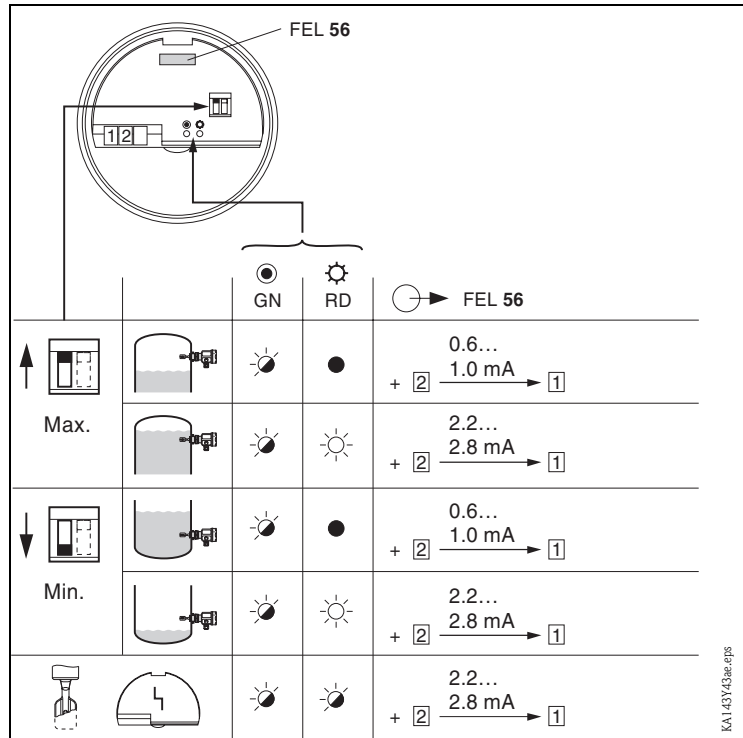
Function FEL55



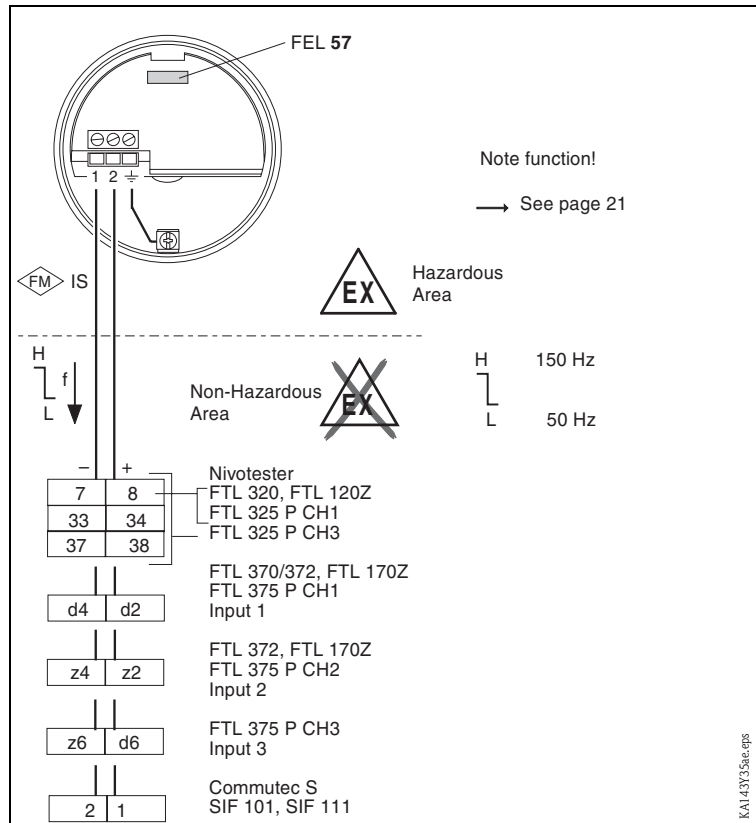
**Connections FEL56
NAMUR output L-H
<math>< 1.0 \text{ mA}</math> / $> 2.2 \text{ mA}$**



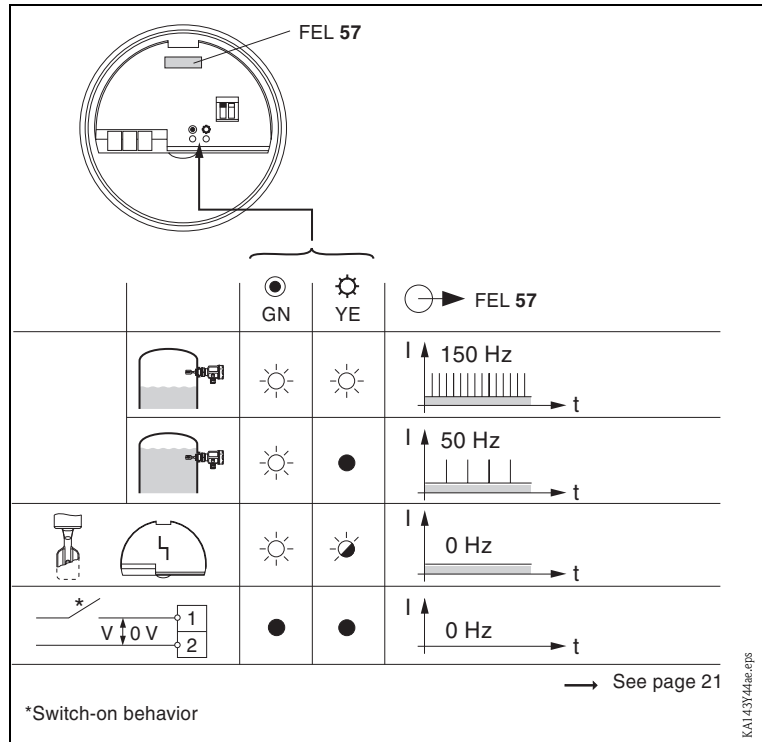
Function FEL56



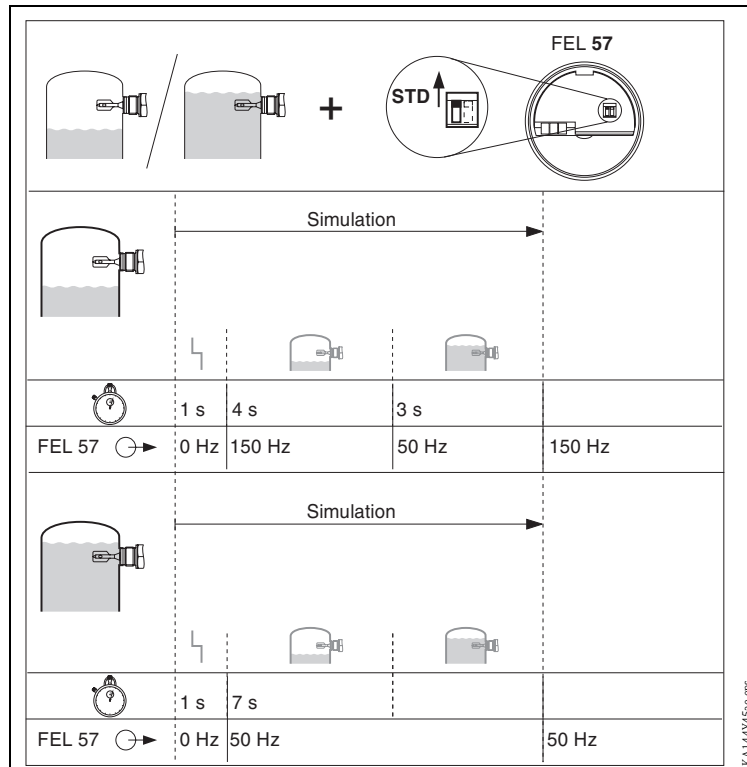
Connections FEL57
PFM output
150 Hz/50 Hz



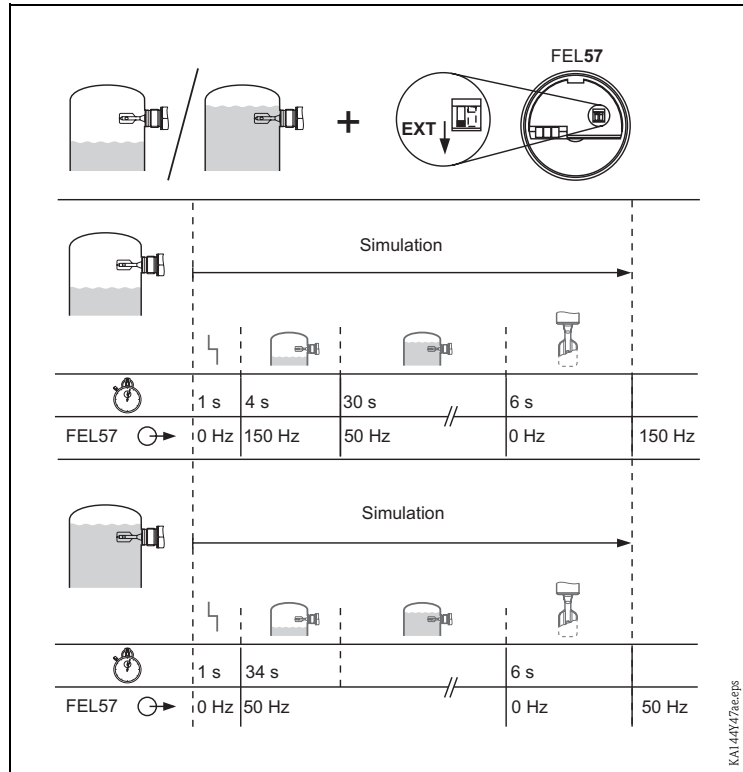
Function FEL57



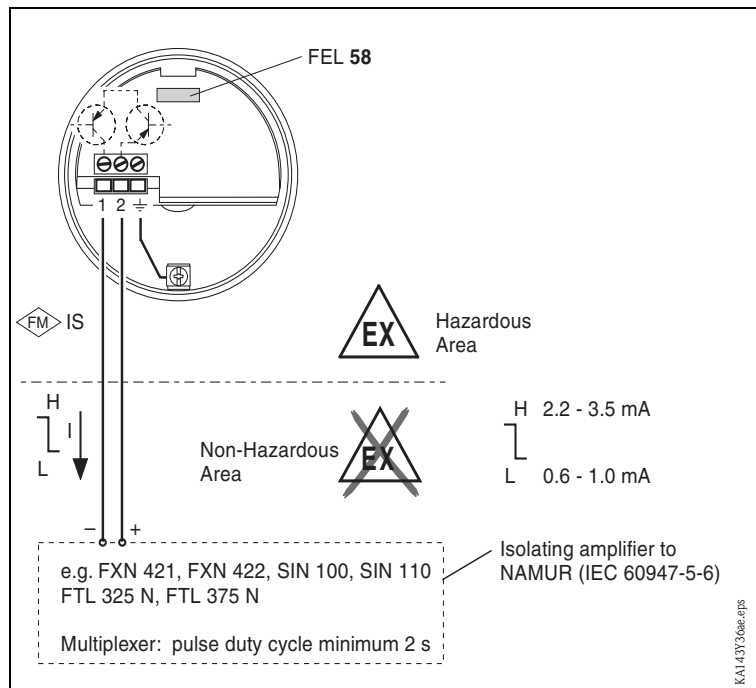
Switch-on behavior STD (Self test)



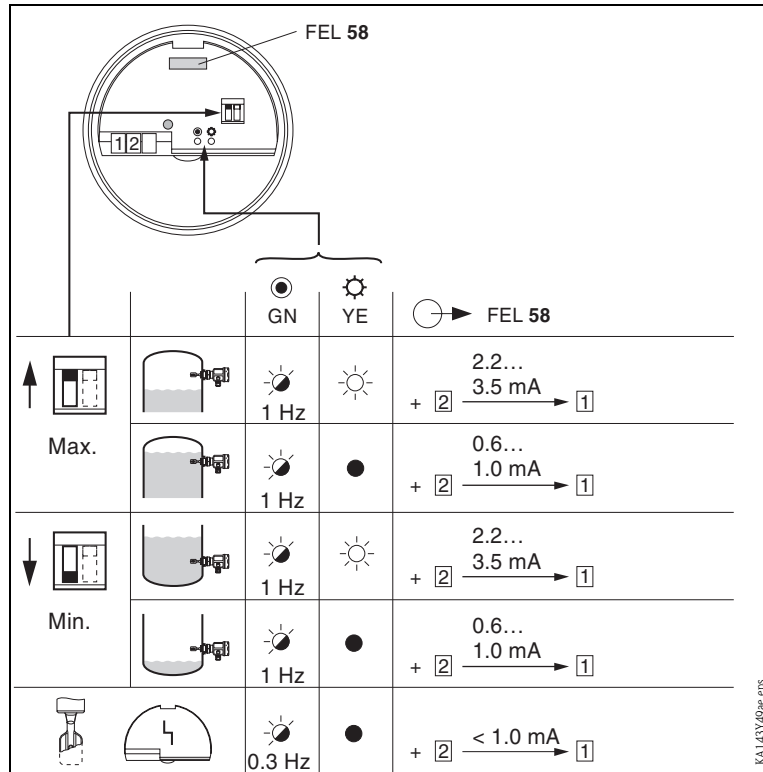
**Switch-on behavior EXT
(Self test)**



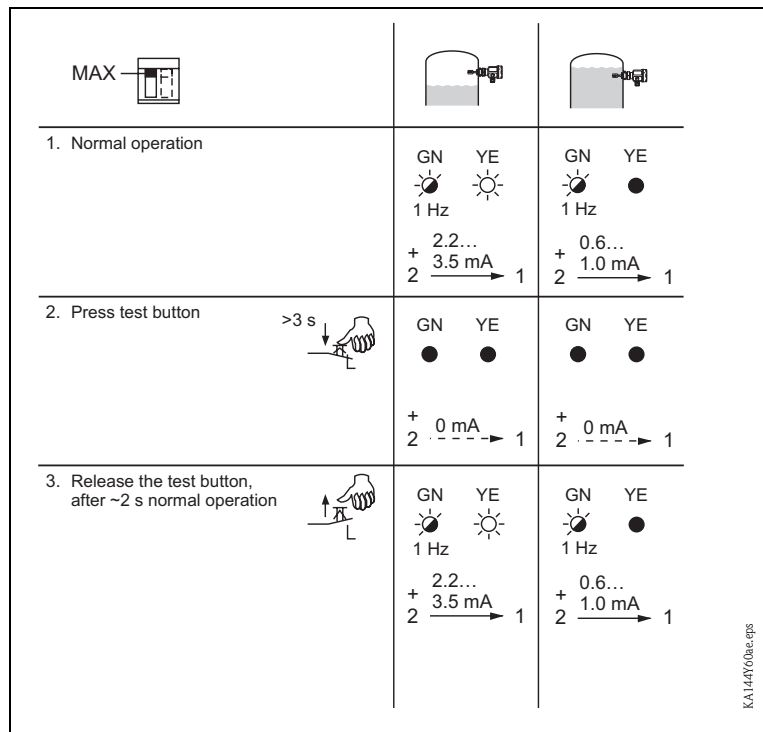
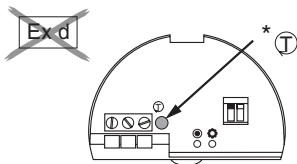
**Connections FEL58
NAMUR output H-L
>2.2 mA / <1.0 mA**



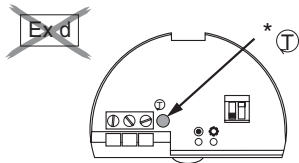
Function FEL58














Function test button FEL58
Fail-safe mode MAX



Function test button FEL58
Fail-safe mode MIN

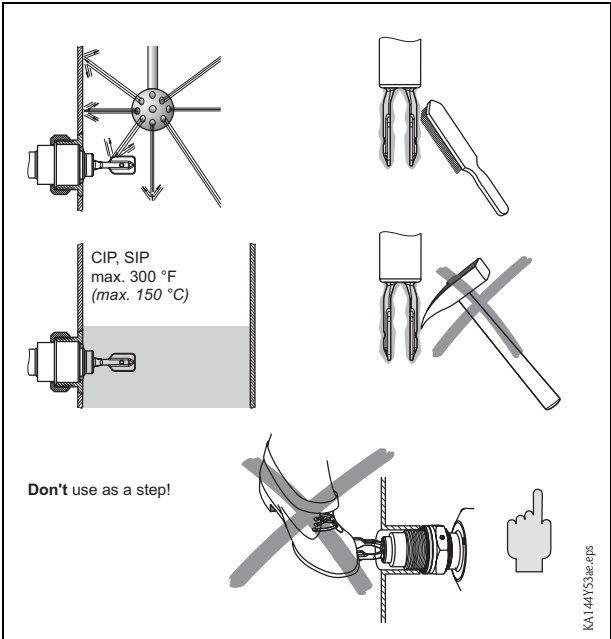


		
1. Normal operation	GN YE  1 Hz + 2.2... 3.5 mA 2 → 1	GN YE  1 Hz + 0.6... 1.0 mA 2 → 1
2. Press test button 	GN YE  + 0 mA 2 → 1	GN YE  + 0 mA 2 → 1
3. Release the test button, after ~2 s normal operation 	GN YE  1 Hz + 2.2... 3.5 mA 2 → 1	GN YE  1 Hz + 0.6... 1.0 mA 2 → 1

KAN43165ae-eps

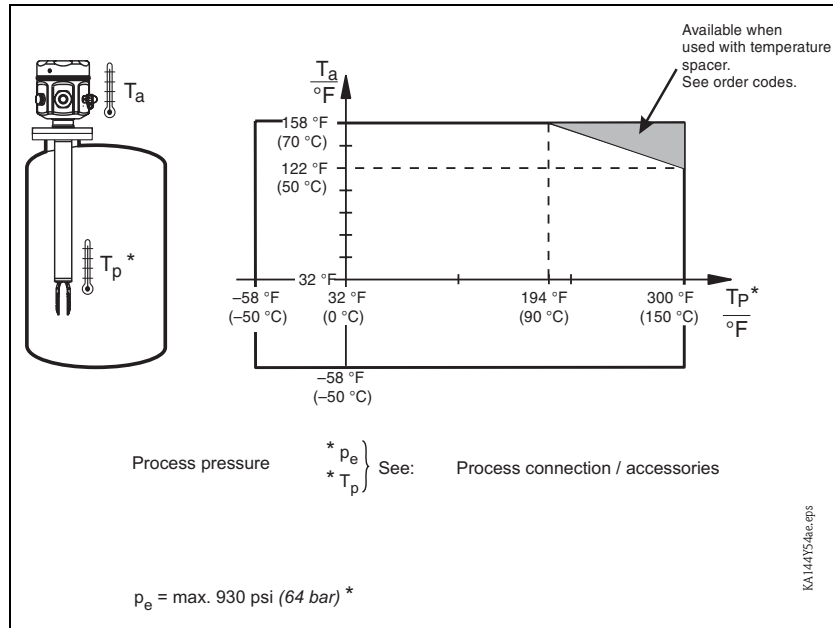
5 Maintenance & Cleaning

Removal of encrustation



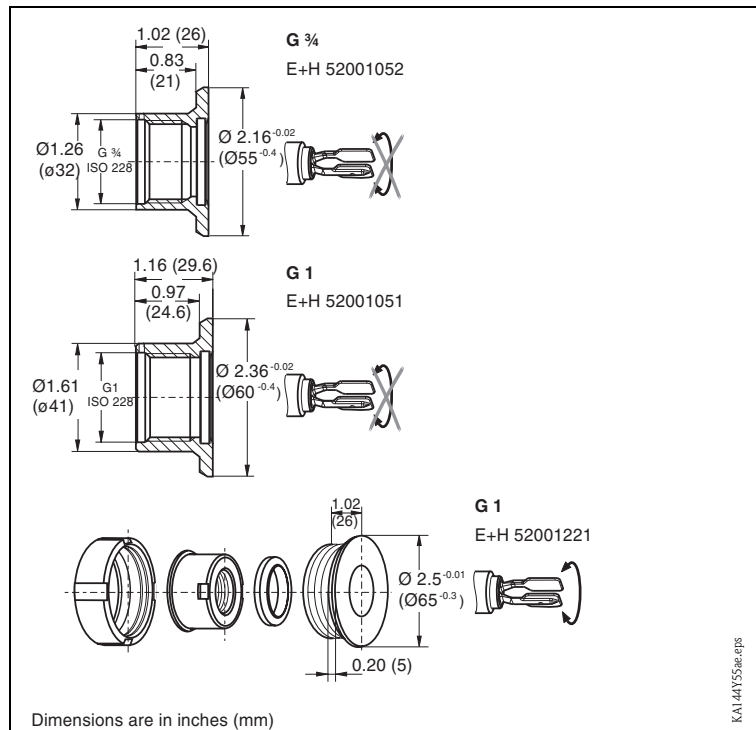
6 Technical Data

Ambient temperature T_a
 Process temperature T_p



6.1 Accessories

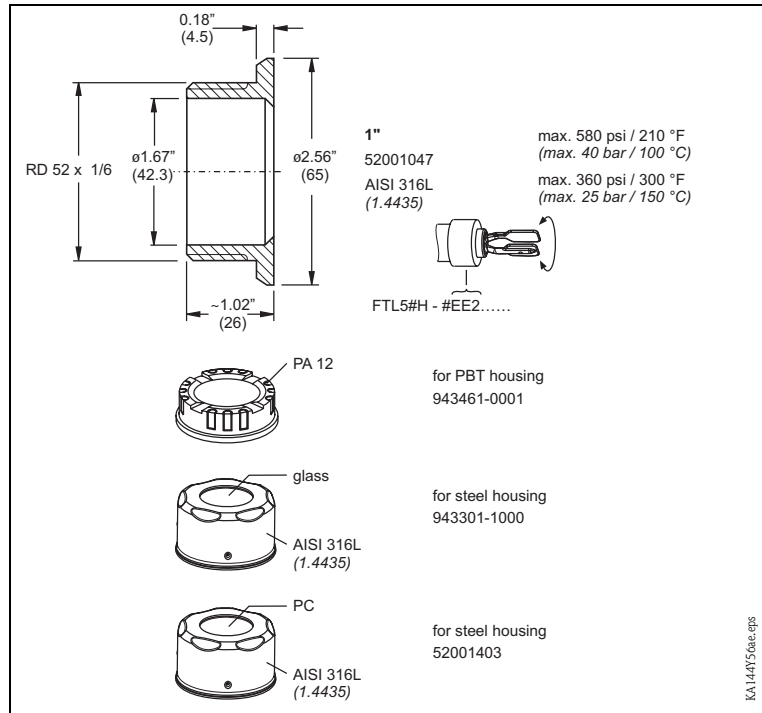
Weld-in sockets



max. 360 psi/300°F
 (max. 25 bar/150°C)

max. 580 psi/210°F
 (max. 40 bar/100°C)

Weld-in socket; Covers with window



7 Troubleshooting

Fault	Reason	Remedy
Does not switch	No power	Check power
	Faulty signal line	Check signal line
	Faulty electronic insert – FEL51 connected directly to L1 and N	Exchange – always connect FEL51 via external load
	Density of liquid too low	Set density to >0.5 at electronic insert
	Fork encrusted	Clean fork
	Fork corroded (Indication on FEL: red/yellow flashes, FEL58: green flashes (0.3 Hz))	Exchange fork and process connection
	FEL51: Internal resistance of connected relay too large	Connect suitable relay
	FEL51: Holding current of connected relay too low	Connected resistor in parallel with relay
	FEL54: Contacts welded together (after short-circuit)	Exchange FEL54; put fuse in contact circuit
Switches incorrectly	Min-/Max- fail-safe mode set wrong	Set correct mode at electronic insert


Fault	Reason	Remedy
Sporadic faulty switching	Thick heavy foam, very turbulent conditions, foaming liquid	Mount Liquiphant in bypass
	Extreme RFI	Use shielded cable
	Extreme vibration	Decouple, damp, turn fork 90°
	Water in housing	Screw cover and cable gland tight
	FEL52: Output overloaded	Reduce load, (cable) capacitance
Switches incorrectly after power failure	FEL57: behavior during switch-on test (functional test)	Observe switching behavior of FEL57; after power failure block plant control for up to 45 s

Troubleshooting Supplement

If the switching behavior of the fork is abnormal, the fork frequency can be measured at PIN 4 of the diagnosis socket. With electronic inserts FEL 51/52/54/55/56/57/58, this is a sinusoidal vibration whose amplitude makes it possible to determine the condition of the fork.

8 Spare Parts

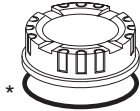
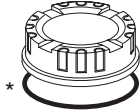

Electronic inserts

	FEL51	52002304	KA144/58ae-eps
	FEL52	52002305	
	FEL54	52002306	
	FEL55	52002307	
	FEL56	52002308	
	FEL57	52002309	
	FEL58	52006454	

Installation specification:

During installation, please keep in mind that electrical resources (electronic inserts) which are powered by non-intrinsically-safe circuits may **no** longer be interconnected with intrinsically-safe circuits.

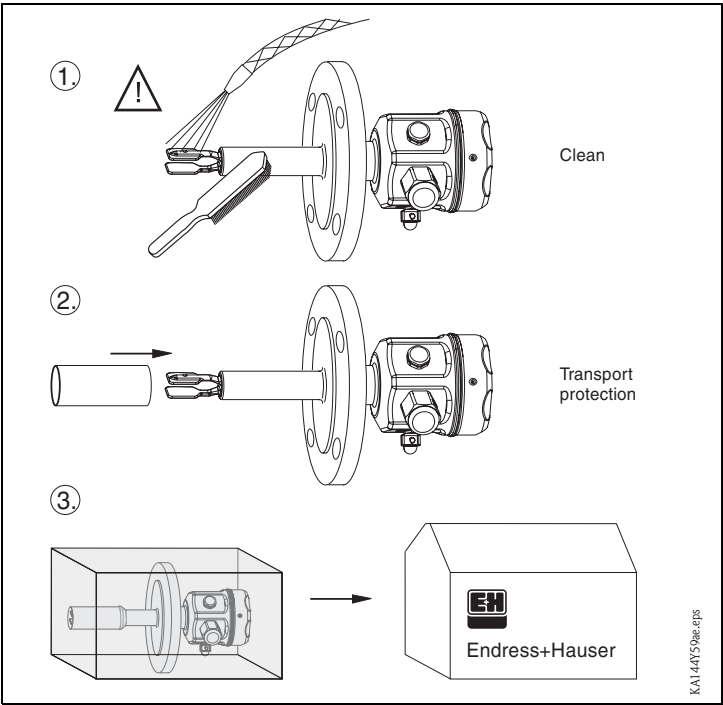
Housing covers, seals

	Alu	} Alu w/EPDM O-ring E+H 52002699
	EPDM		Alu (EX) w/EPDM O-ring E+H 52002698
		PBT-FR (cover only) E+H 943461-0000
		EPDM O-ring E+H 017717-0003
		AISI 304/316L (cover only) (1.4301/1.4435) E+H 943301-0000
		MVQ Silicone Seal E+H 943304-0000

* Lubricate with silicone grease or graphite.

9 Repair

Repair is done at Endress+Hauser



10 Supplemental Documentation

Technical Information

TI328F

Liquiphant FTL50, FTL50H, FTL51, FTL51H

Notes on Safety

XA031F	CE	II 1/2 G	EEx d	IIC/IIB
XA063F	CE	II 1/2 G, II 1/2 D	EEx ia/ib	IIC/IIB
XA064F	CE	II 1 G	EEx ia	IIC/IIB
XA154F	CE	II 1/2 G, II 1/2 D	EEx ia/ib	IIC/IIB
XA159F	CE	II 1 G	EEx ia	IIC/IIB

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