

Safety Instructions

Liquiphant FailSafe

FTL80, FTL81, FTL85

Control Drawing IS



Document: XA00605F-B

Safety instructions for electrical apparatus for explosion-hazardous areas classified according to the National Electrical Code (NEC) and Canadian Electrical Code (CEC)

Liquiphant FailSafe FTL80, FTL81, FTL85

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Associated documentation This document is an integral part of the following Operating Instructions:
BA01037F/00
The Operating Instructions pertaining to the device apply.

Extended order code The extended order code is indicated on the nameplate, which is affixed to the device in such a way that it is clearly visible. Additional information about the nameplate is provided in the associated Operating Instructions.

Structure of the extended order code

FTL8x	-	*****	+	A*B*C*D*E*F*G*..
Device type		Basic specifications		Optional specifications

* = Placeholder

At this position, an option (number or letter) selected from the specification is displayed instead of the placeholders.

- Basic specifications

The features that are absolutely essential for the device (mandatory features) are specified in the basic specifications. The number of positions depends on the number of features available. The selected option of a feature can consist of several positions.

- Optional specifications

The optional specifications describe additional features for the device (optional features). The number of positions depends on the number of features available. The features have a 2-digit structure to aid identification (e.g. JA). The first digit (ID) stands for the feature group and consists of a number or a letter (e.g. J = test, certificate). The second digit constitutes the value that stands for the feature within the group (e.g. A = 3.1 material (wetted parts), inspection certificate).

More detailed information about the device is provided in the following tables. These tables describe the individual positions and IDs in the extended order code which are relevant to hazardous locations.

Device type: FTL80, FTL81, FTL82

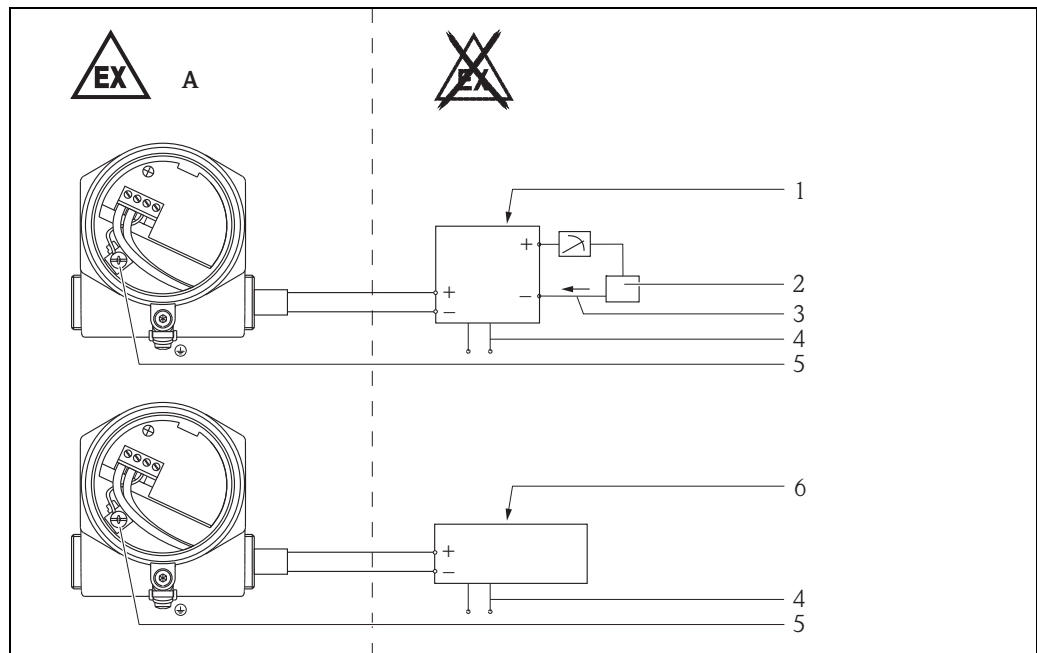
Basic specifications

Position	Selected option	Description
1, 2 Approval	FTL8x: FB	FM IS Cl. I, II, III, Div. 1, Gr. A-G, Cl. I, Zone 0, AEx ia IIC T6
3 Electronics; Output	FTL8x: S	FEL85; 2-wire, 4-20 mA
4 Display; Operating	FTL8x: A	LED; switch
5 Housing	FTL8x: A C D E H I	F16 Polyester, IP66/67 NEPA Type 4X Encl. F17 Alu, IP66/67 NEPA Type 4X Encl. F13 Alu, IP66/68 NEPA Type 4X/6P Encl. T13 Alu, separate conn. compartment, IP66/68 NEPA Type 4X/6P Encl. F15 316L hygiene, IP66/67 NEPA Type 4X Encl. F27 316L, IP66/68 NEPA Type 4X/6P Encl.
6 Electrical Connection	FTL8x: A B C D E I	Gland M20 Thread M20 Thread G1/2 Thread NPT1/2 Thread NPT3/4 Plug M12
7 Application	FTL80: A C D Y	Process max. 150 °C/302 °F, 64 bar/928 psi Process max. 230 °C/446 °F, 100 bar/1450 psi; incl. gas-tight feed through Process max. 280 °C/536 °F, 100 bar/1450 psi; incl. gas-tight feed through Process max. 300 °C/572 °F, 100 bar/1450 psi
	FTL81: A B C D Y	Process max. 150 °C/302 °F, 64 bar/928 psi Process max. 150 °C/302 °F, 100 bar/1450 psi Process max. 230 °C/446 °F, 100 bar/1450 psi; incl. gas-tight feed through Process max. 280 °C/536 °F, 100 bar/1450 psi; incl. gas-tight feed through Process max. 300 °C/572 °F, 100 bar/1450 psi
	FTL85: N P T	ECTFE, Process max. 120 °C/248 °F, 40 bar/580 psi PFA, Process max. 150 °C/302 °F, 40 bar/580 psi Enamel, Process max. 150 °C/302 °F, 25 bar/362 psi
9 Surface Refinement	FTL85: N P Q R T	Coating ECTFE Coating PFA (Edlon) Coating PFA (RubyRed) Coating PFA (conductive) Coating Enamel

Optional specifications

ID	Selected option	Description
Mx Sensor Design	FTL8x: MP MR MS	Ambient temperature -50 °C/-58 °F Temperature separator Pressure tight feed through, incl. temperature separator
Nx Accessory Mounted	FTL8x: NA NC ND NE NH	Cover, housing F16 PA, transparent Cover, housing F17 Alu, window Cover, housing F13 Alu, window Cover, housing T13 Alu, window Cover, housing F15 316L, window

Installation drawing IS



FTL8x_11



A Class I, Div. 1, Groups A, B, C, D;
Class II, Div. 1, Groups E, F, G;
Class III
Zone 0, AEx/Ex ia IIC T6

- 1 FM-approved barrier/associated equipment
2 External load
3 4...20 mA
4 Supply
5 Ground stud
6 FM-approved associated Endress+Hauser transmitter
Liquiphant FailSafe, Nivotester FTL825

Class I, Div. 1;
Class II and Class III, Div. 1

Intrinsically safe, Ex ia

IS Class I, Div. 1, Groups A, B, C, D, Class II, Div. 1, Groups E, F, G, Class III;
Zone 0 AEx/Ex ia IIC T6

Hazardous locations installations

- Control room equipment may not use or generate over 250 V_{rms}.
- Install as per NEC (National Electrical Code) (ANSI/NFPA70) or CEC (Canadian Electrical Code), as applicable.
- Always follow the installation drawing provided by the intrinsic safety barrier manufacturer when installing this equipment. The configuration of the intrinsic safety barrier(s) must be FM-approved.
- Warning: Substitution of components may impair intrinsic safety.
- Use supply wires suitable for 20 K above the ambient temperature.

For entity installations:

- Use a FM-approved intrinsic safety barrier or other associated equipment that satisfies the following conditions: $V_{oc} \leq V_{max}$, $I_{sc} \leq I_{max}$, $C_a \geq C_1 + C_{cable}$, $L_a \geq L_1 + L_{cable}$. → 11, "Connection data" section.

For system installation:

- Use FM-approved safety barriers as follows:
 - 28 V / 300 Ω + ground or
 - 28 V / 300 Ω + 28 V / diode or
 - 28 V / 300 Ω + 10 V / 50 W

Process seals**Single/Dual Seal per ANSI/ISA 12.27.01**

Single seal device:

- Gas-tight conduit seal not required for FTL80, FTL81, FTL85: For version without gas-tight glass feed-through (Basic specification, Position 7 (Application) = A, B, N, P, T)

Dual seal device:

- Gas-tight conduit seal not required for FTL80, FTL81: For version with gas-tight glass feed-through (Basic specification, Position 7 (Application) = C, D, Y).

Zone concept (X-marking)**Electrostatic/impact sparks**

Gas group IIC

- If electrostatic charging of the probe can be avoided (e.g. through friction, cleaning, maintenance, strong medium flow), a probe coated with non-conductive material can be used.

Gas group IIB

- A probe coated with non-conductive material can be used.

Device type FTL85, Basic specification, Position 9 (Surface Refinement) = N, P, Q

- The probe can be electrostatically charged.
- Warning: Avoid electrostatic charging of the plastic surfaces, for plastic process connections or plastic coatings.
- Not suitable for dust application.

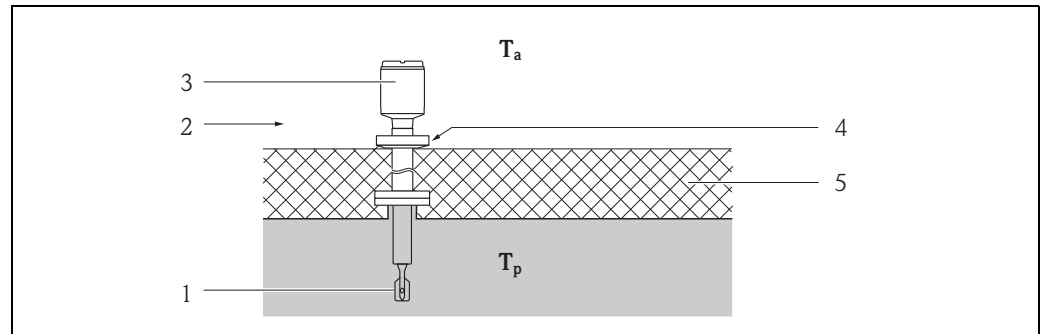
Basic specification, Position 5 (Housing) = C, D, E

- Avoid sparks caused by impact and friction.

Explosion protection with heat insulation

Device type FTL80, FTL81, Basic specification, Position 7 (Application) = C, D, Y

- While observing the "temperature derating", the device is suitable for process temperatures up to 300 °C (→ 9.10).
- When operating, ensure that you rule out contact between hot component surfaces and potentially explosive atmospheres beyond the limits of the corresponding temperature class (→ 9.9). Suitable measures: e.g. thermal insulation at container and/or pipes.
- The temperature of 85 °C specified at the reference point may not be exceeded.
- To protect the electronics, observe the specified ambient temperature at the electronics housing.



- T_a Ambient temperature
 T_p Process temperature
 1 Sensor
 2 Temperature class, e.g. T6
 3 Housing
 4 Reference point: max. +85 °C
 5 E.g. thermal insulation

Temperature tables



Note!
Observe the permitted probe temperature range.

Application in gas**Ambient temperature electronics**

When used in Zone 0
-20...+60 °C

When used outside Zone 0
-50...+70 °C
Basic specification, Position 5 (Housing) = A: -40...+70 °C

Process temperature sensor

When used in Zone 0
-20...+60 °C

Device type FTL80, FTL81, Basic specification, Position 7 (Application) = A, B, C, D, Y

When used outside Zone 0
-50...+150 °C (A, B)
-60...+230 °C (C)
-60...+280 °C (D)
-60...+300 °C (Y)

Device type FTL85, Basic specification, Position 7 (Application) = N, P, T

When used outside Zone 0
-50...+120 °C (N)
-50...+150 °C (P, T)

Application in dust

Probe in Zone 20, electronics housing in Zone 21
$T = T_a + 10K$
$T_{500} = T_a + 30K$

The dependency of the ambient and process temperatures upon the temperature class:

Device type FTL80, FTL81, Basic specification, Position 7 (Application) = A, B

Temperature class	Process temperature T_p (process): sensor	Ambient temperature T_a (ambient): electronics
T6	-50...+ 85 °C	-50...+60 °C Basic specification, Position 5 (Housing) = A: -40...+60 °C
T5	-50...+100 °C	-50...+70 °C Basic specification, Position 5 (Housing) = A: -40...+70 °C Additional temperature range for sensors with Optional specification $M_x = MR, MS \rightarrow$ 3
T4	-50...+135 °C	
T3	-50...+150 °C	

Device type FTL80, FTL81, Basic specification, Position 7 (Application) = C, D, Y

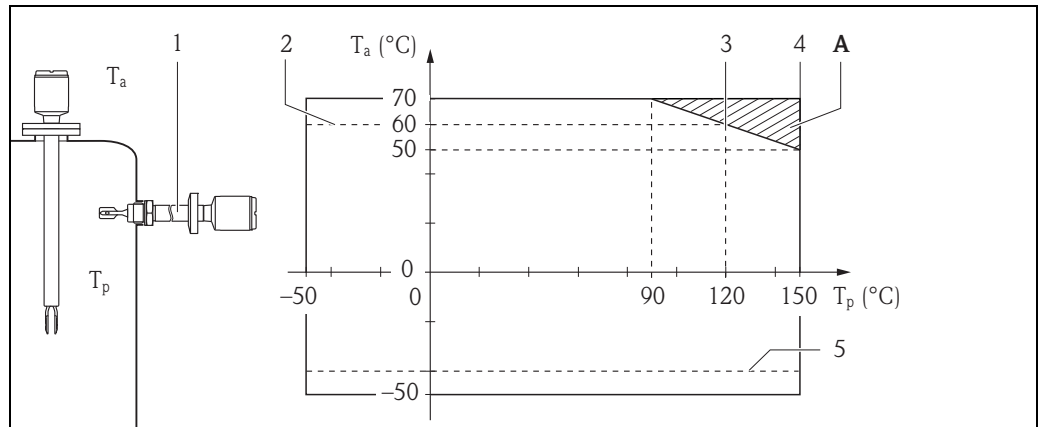
Temperature class	Process temperature T_p (process): sensor	Ambient temperature T_a (ambient): electronics
T6	-60...+ 85 °C	-50...+60 °C Basic specification, Position 5 (Housing) = A: -40...+60 °C
T5	-60...+100 °C	-50...+70 °C Basic specification, Position 5 (Housing) = A: -40...+70 °C For restrictions \rightarrow 4
T4	-60...+135 °C	
T3	-60...+200 °C	
T2	-60...+230 °C (C) -60...+280 °C (D) -60...+300 °C (Y)	

Device type FTL85, Basic specification, Position 7 (Application) = N, P, T

Temperature class	Process temperature T_p (process): sensor	Ambient temperature T_a (ambient): electronics
T6	-50...+ 85 °C	-50...+60 °C Basic specification, Position 5 (Housing) = A: -40...+60 °C
T5	-50...+100 °C	-50...+70 °C Basic specification, Position 5 (Housing) = A: -40...+70 °C Additional temperature range for sensors with Optional specification $M_x = MR, MS \rightarrow$ 3
T4	-50...+120 °C (N)	
T4	-50...+135 °C (P, T)	
T3	-50...+150 °C (P, T)	

Device type FTL80, FTL81, Basic specification, Position 7 (Application) = A, B

Device type FTL85, Basic specification, Position 7 (Application) = N, P, T



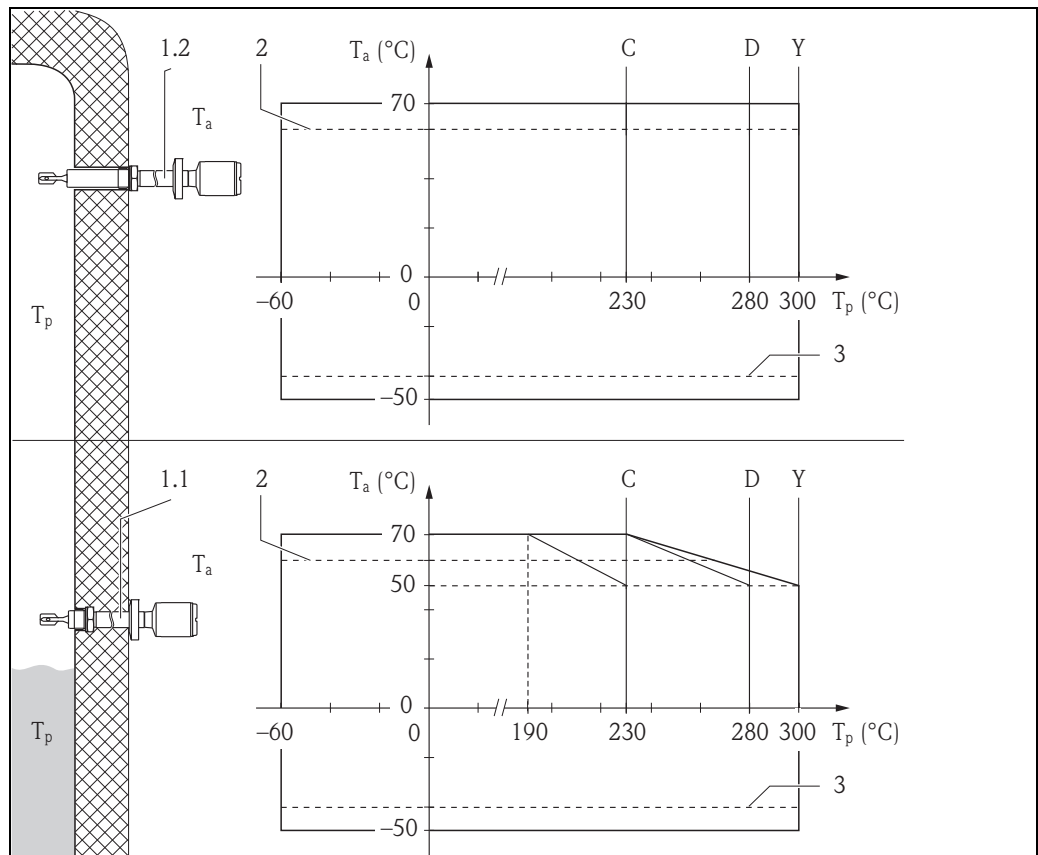
FTL8x_12



A Additional temperature range for sensors with Optional specification Mx = MR, MS

- 1 Temperature separator or pressure tight feed through
- 2 T_a for T6: $-50...+60\text{ }^\circ\text{C}$
- 3 ECTFE
- 4 PFA, Enamel
- 5 T_a for Basic specification, Position 5 (Housing) = A: $-40...+60\text{ }^\circ\text{C}/70\text{ }^\circ\text{C}$

Device type FTL80, FTL81, Basic specification, Position 7 (Application) = C, D, Y



FTL8x_13



- 1 Temperature separator:
 - 1.1 insulated
 - 1.2 free-standing
- 2 T_a for T6: $-50...+60\text{ }^\circ\text{C}$
- 3 T_a for Basic specification, Position 5 (Housing) = A: $-40...+60\text{ }^\circ\text{C}/70\text{ }^\circ\text{C}$

Connection data

Basic specification, Position 1, 2 (Approval) = FB

Intrinsically safe

- Power supply and signal circuit with protection type: intrinsic safety Ex ia IIC.

Power supply:

- Barrier/associated equipment or
- FM-approved associated apparatus or
- FM-approved associated Endress+Hauser transmitter: Liquiphant FailSafe, Nivotester FailSafe



Note!

Only connect the device to terminals 1 and 2 or terminals 2 and 3, respectively.

Terminal 1 (-) Max. level safety

Terminal 2 (+)

Terminal 3 (-) Min. level safety

Power supply:

$$U_i \leq 30 \text{ V}$$

$$I_i \leq 170 \text{ mA}$$

$$P_i \leq 1 \text{ W}$$

effective inner inductance $L_i = 0 \text{ mH}$

effective inner capacitance $C_i \leq 16 \text{ nF}$



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