

Safety Instructions

Micropilot

FMR50/51/52/53/54

4-20 mA HART, 4-wire

Ex d [ia] IIC T6 Ga/Gb



Document: XA01294F-A

Safety instructions for electrical apparatus for explosion-hazardous areas

Micropilot
FMR50/51/52/53/54

4-20 mA HART

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Extended order code

This document is an integral part of the following Operating Instructions:

BA01045F/00 (FMR50), BA01049F/00 (FMR51/52), BA01050F/00 (FMR53/54)

The Operating Instructions pertaining to the device apply.

Explosion-protection brochure:
CP00021Z/11

The Explosion-protection brochure is available:

- In the download area of the Endress+Hauser website: www.endress.com → Download → Advanced → Documentation Code: CP00021Z
- On the CD for devices with CD-based documentation

Certificate of Conformity

Certificate number:
TÜV 13.2010 X

Affixing the certificate number certifies conformity with the standards under www.abnt.org.br (depending on the device version).

- ABNT NBR IEC 60079-0 :2008
- ABNT NBR IEC 60079-1 :2007
- ABNT NBR IEC 60079-11 :2009
- ABNT NBR IEC 60079-26 :2008

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

FMR5x	-	*****	+	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
- Optional specifications

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: FMR50, FMR51, FMR52, FMR53, FMR54

Basic specifications

Position		Selected option		Description
1, 2	Approval	FMR5x	MC	Ex d [ia] IIC T6 Ga/Gb
3	Power Supply; Output	FMR5x	K L	4-wire 90...253 VAC, 4-20 mA HART 4-wire 10.4...48 VDC, 4-20 mA HART
4	Display; Operation	FMR5x	A C E L M	Without, via communication SD02 4-line, push buttons + data backup function SD03 4-line, illum., touch control + data backup function Prepared for display FHX50 + M12 connection Prepared for display FHX50 + custom connection
5	Housing	FMR51-54	B	Dual compartment, 316L (GT18)
		FMR5x	C	Dual compartment, Alu coated (GT20)
7, 8	Antenna	FMR50	BM BN BR	Horn 40 mm/1½", PVDF encapsulated, -40...130 °C Horn 80 mm/3", PP cladded, -40...80 °C Horn 100 mm/4", PP cladded, -40...80 °C
		FMR51	Bx	Horn (different sizes)
		FMR52	BO BP	Horn 50 mm/2", -40...200 °C, flush mount Horn 80 mm/3", -40...200 °C, flush mount
		FMR53	Cx	Rod (different sizes)
		FMR54	Ax Bx Dx	Without Horn Horn (different sizes) Planar (different sizes)
9, 10	Seal	FMR51	A5 C1 D2 D3	Viton GLT, -40...150 °C Kalrez, -20...150 °C Graphite, -196...450 °C (HT) Graphite, -40...250 °C (XT)
		FMR54	A7 A8 B4 C2 D1 D2	Viton, -20...150 °C (Planar) Viton, -40...200 °C EPDM, -40...150 °C Kalrez, -20...200 °C, conductive media max. 150 °C Graphite, -196...280 °C (XT) Graphite, -196...400 °C (HT)
11-13	Process Connection	FMR51-54	Axx, Cxx, Kxx	Flange (different sizes)
		FMR50	GGF, RGF UAE XR0 XxG	Thread, PVDF Mounting bracket Connection, without flange/mounting bracket Slip on flange (different sizes)
		FMR51	Pxx Rxx Txx	Flange (different sizes) Thread, 316L and PVDF Tri-Clamp
		FMR52	Mxx Txx	Slotted-nut Tri-Clamp
		FMR53	RxJ RxF	Thread, 316L Thread, PVDF

Optional specifications

ID		Selected option		Description
Ox	Accessory Mounted	FMR51	OW	Horn protection, PTFE, no airpurge possible

Safety instructions: General

- Staff must meet the following conditions for mounting, electrical installation, commissioning and maintenance of the device:
 - Be suitably qualified for their role and the tasks they perform
 - Be trained in explosion protection
 - Be familiar with national regulations
- Install the device according to the manufacturer's instructions and national regulations.
- Do not operate the device outside the specified electrical, thermal and mechanical parameters.
- Only use the device in media to which the wetted materials have sufficient durability.
- Avoid electrostatic charging:
 - Of plastic surfaces (e.g. housing, sensor element, special varnishing, attached additional plates, ..)
 - Of isolated capacities (e.g. isolated metallic plates)
- Refer to the temperature tables for the relationship between the permitted ambient temperature for the sensor and/or transmitter, depending on the range of application, and the temperature class.
- Modifications to the device can affect the explosion protection and must be carried out by staff authorized to perform such work by Endress+Hauser.

Safety instructions: Special conditions

Permitted ambient temperature range at the electronics housing: $-40\text{ °C} \leq T_a \leq +80\text{ °C}$.
Observe the information in the temperature tables.

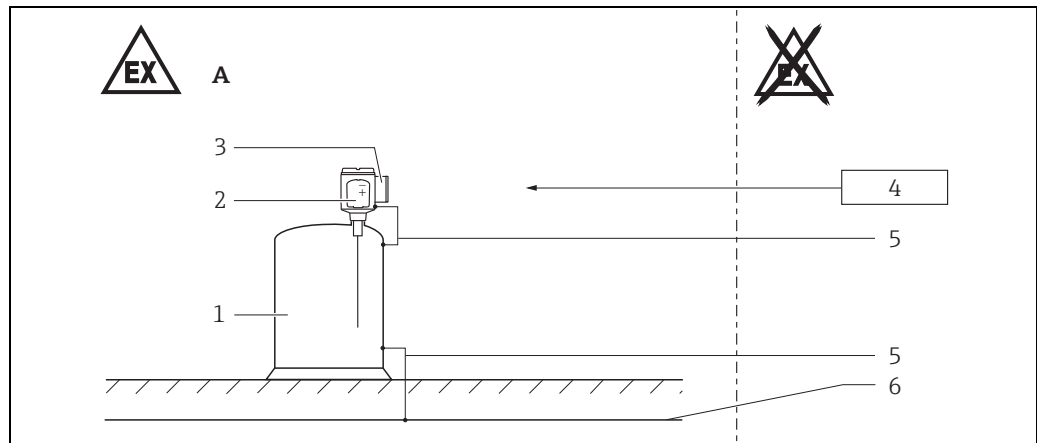
Device type FMR50, FMR52, FMR53, FMR54 (planar, enamel)

- An antenna coated with non-conductive material can be used if avoiding electrostatic charging (e.g. through friction, cleaning, maintenance, strong medium flow).

Device type FMR51 and Optional specification, ID Ox (Accessory Mounted) = OW

- An antenna coated with non-conductive material can be used if avoiding electrostatic charging (e.g. through friction, cleaning, maintenance, strong medium flow).
- In the case of process connections made of polymeric material or with polymeric coatings, avoid electrostatic charging of the plastic surfaces.
- In the event of additional or alternative special varnishing on the housing or other metal parts:
 - Observe the danger of electrostatic charging and discharge.
 - Do not rub surfaces with a dry cloth.

Safety instructions: Installation



FMP5x_02



A Zone 1

- 1 Tank; Zone 0, Zone 1
- 2 Electronics compartment Ex ia; Electronic insert
- 3 Connection compartment Ex d
- 4 Power supply
- 5 Potential equalization line
- 6 Potential equalization

- After aligning (rotating) the housing, retighten the fixing screw (see Operating Instructions).
- When mounting the device:
 - Exclude any mechanical damage or friction during the application.
 - Pay particular attention to flow conditions and tank fittings.
- Continuous service temperature of the connecting cable: -40 to $\geq +85$ °C; in accordance with the range of service temperature taking into account additional influences of the process conditions ($T_{a,min}$), ($T_{a,max} + 20$ K).
- In potentially explosive atmospheres:
 - Do not open the electrical connection of the power supply circuit when energized.
 - Do not open the connection compartment cover.
- Only use certified cable entries suitable for the application.
Observe national regulations or standards. Accordingly, the connection terminal does not include any ignition sources.
- When operating the transmitter housing at an ambient temperature under -20 °C, use appropriate cables and cable entries permitted for this application.
- When connecting through a conduit entry approved for this purpose, mount the associated sealing unit directly at the housing.
- Seal unused entry glands with approved sealing plugs that correspond to the type of protection.
The plastic transport sealing plug does not meet this requirement and must therefore be replaced during installation.
- Before operation:
 - Screw in the cover all the way.
 - Tighten the securing clamp on the cover.

Basic specification, Position 3 (Power Supply; Output) = K

- Connect the protective ground to the device.

Intrinsic safety

- The device can be connected to the Endress+Hauser FXA291 service tool: refer to the Operating Instructions.

Potential equalization

- Integrate the device into the local potential equalization.

Safety instructions: Zone 0

- In the event of potentially explosive vapor/air mixtures, only operate the device under atmospheric conditions.
 - Temperature: -20 to $+60$ °C
 - Pressure: 80 to 110 kPa (0.8 to 1.1 bar)
 - Air with normal oxygen content, usually 21 % (V/V)
 If no potentially explosive mixtures are present, or if additional protective measures have been taken, the device may also be operated under non-atmospheric conditions in accordance with the manufacturer's specifications.

Temperature tables

→  9

Connection data

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

Connection compartment Ex d

Basic specification, Position 3 (Power Supply; Output) = K (TRC [09])

Terminal 1 (L), 2 (N)	Terminal 3 (+), 4 (-)
Power supply: $U_N = 253\text{ V AC}; 50/60\text{ Hz}$ $U_m = 250\text{ V}$ $I_N = 25\text{ mA}$ $I_{\text{max}} = 160\text{ mA}$	Output 4...20 mA: $U_N = 22\text{ V DC}$ $U_m = 250\text{ V}$ $I_{\text{max}} = 22\text{ mA}$

Basic specification, Position 3 (Power Supply; Output) = L (TRC [08])

Terminal 1 (L+), 2 (L-)	Terminal 3 (+), 4 (-)
Power supply: $U_N = 48\text{ V DC}$ $U_m = 250\text{ V}$ $I_N = 112\text{ mA}$ $I_{\text{max}} = 300\text{ mA}$	Output 4...20 mA: $U_N = 22\text{ V DC}$ $U_m = 250\text{ V}$ $I_{\text{max}} = 22\text{ mA}$

Electronics compartment Ex ia

Service interface (CDI)

Taking the following values into consideration, the device can be connected to the certified Endress+Hauser FXA291 service tool or a similar interface:

Service interface													
$U_i = 7.3\text{ V}$ effective inner inductance L_i = negligible effective inner capacitance C_i = negligible													
$U_o = 7.3\text{ V}$ $I_o = 100\text{ mA}$ $P_o = 160\text{ mW}$													
$L_o\text{ (mH)} =$	5.00	2.00	1.00	0.50	0.20	0.10	0.05	0.02	0.01	0.005	0.002	0.001	
$C_o\text{ (}\mu\text{F)} =$	0.73	1.20	1.60	2.00	2.60	3.20	4.00	5.50	7.30	10.00	12.70	12.70	

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Antenna: Zone 0, Electronics housing: Zone 1

 FMR5x 18

General notes



Unless otherwise indicated, the positions always refer to the basic specification.

Note!
Observe the permitted temperature range at the antenna.

*1 = Functional
Max. permissible process temperature

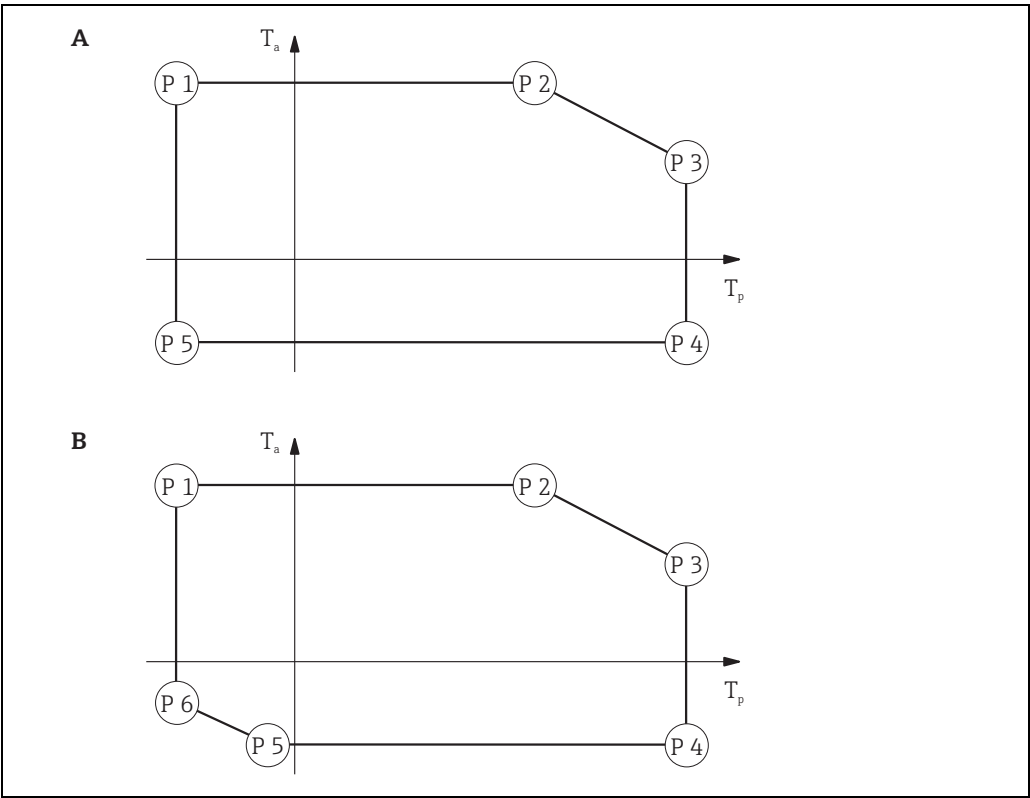
Selection table

Position 1, 2 (Approval)		Position 5 (Housing)	
MC	Ex d [ia] IIC T6 Ga/Gb	B	GT18 dual compartment, 316L
		C	GT20 dual compartment, Alu coated

Position 3 (Power Supply; Output)		Transmission code of the terminal module	
K	4-wire 90...253 VAC, 4-20 mA HART	TRC [09]	
L	4-wire 10,4...48 VDC, 4-20 mA HART	TRC [08]	

Diagram

Example diagrames to the temperature tables



A Version 1
B Version 2
 T_a Ambient temperature
 T_p Process temperature

Antenna and electronics housing: Zone 1**FMR50**, Position 7, 8 (Antenna) = BM**Position 3 (Power Supply; Output) = K, L (TRC [08/09])**

Position 5 (Housing) = C												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	80 °C	58 °C	80 °C	-40 °C	-40 °C	-40 °C	-	-

FMR50, Position 7, 8 (Antenna) = BN, BR**Position 3 (Power Supply; Output) = K, L (TRC [08/09])**

Position 5 (Housing) = C												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	80 °C	58 °C	80 °C	-40 °C	-40 °C	-40 °C	-	-

FMR51**Position 3 (Power Supply; Output) = K, L (TRC [08/09])**

Position 5 (Housing) = B												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	85 °C	54 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-40 °C	75 °C	75 °C	75 °C	100 °C	69 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-40 °C	76 °C	76 °C	76 °C	135 °C	64 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-40 °C	76 °C	76 °C	76 °C	150 °C	61 °C	150 °C	-40 °C	-40 °C	-40 °C	-	-

Position 5 (Housing) = C												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	85 °C	55 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-40 °C	75 °C	75 °C	75 °C	100 °C	70 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-40 °C	76 °C	76 °C	76 °C	135 °C	66 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-40 °C	76 °C	76 °C	76 °C	150 °C	64 °C	150 °C	-40 °C	-40 °C	-40 °C	-	-

Antenna and electronics housing: Zone 1

FMR51, Position 9, 10 (Seal) = D3

Position 3 (Power Supply; Output) = K, L (TRC [08/09])

Position 5 (Housing) = B												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	85 °C	57 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-40 °C	75 °C	75 °C	75 °C	100 °C	72 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-40 °C	76 °C	76 °C	76 °C	135 °C	70 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-40 °C	76 °C	76 °C	76 °C	200 °C	63 °C	200 °C	-40 °C	-40 °C	-40 °C	-	-
T2 (300 °C)	-40 °C	76 °C	76 °C	76 °C	250 °C	58 °C	250 °C	-40 °C	-40 °C	-40 °C	-	-

Position 5 (Housing) = C												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	85 °C	58 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-40 °C	75 °C	75 °C	75 °C	100 °C	73 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-40 °C	76 °C	76 °C	76 °C	135 °C	72 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-40 °C	76 °C	76 °C	76 °C	200 °C	66 °C	200 °C	-40 °C	-40 °C	-40 °C	-	-
T2 (300 °C)	-40 °C	76 °C	76 °C	76 °C	250 °C	62 °C	250 °C	-40 °C	-40 °C	-40 °C	-	-

Antenna and electronics housing: Zone 1**FMR51**, Position 9, 10 (Seal) = D2**Position 3 (Power Supply; Output) = K, L (TRC [08/09])**

Position 5 (Housing) = B												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-196 °C	60 °C	60 °C	60 °C	85 °C	56 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-196 °C	75 °C	75 °C	75 °C	100 °C	71 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-196 °C	76 °C	76 °C	76 °C	135 °C	68 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-196 °C	76 °C	76 °C	76 °C	200 °C	60 °C	200 °C	-40 °C	-40 °C	-40 °C	-	-
T2 (300 °C)	-196 °C	76 °C	76 °C	76 °C	300 °C	46 °C	300 °C	-40 °C	-40 °C	-40 °C	-	-

Position 5 (Housing) = C												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-196 °C	60 °C	60 °C	60 °C	85 °C	57 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-196 °C	75 °C	75 °C	75 °C	100 °C	72 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-196 °C	76 °C	76 °C	76 °C	135 °C	70 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-196 °C	76 °C	76 °C	76 °C	200 °C	63 °C	200 °C	-40 °C	-40 °C	-40 °C	-	-
T2 (300 °C)	-196 °C	76 °C	76 °C	76 °C	300 °C	52 °C	300 °C	-40 °C	-40 °C	-40 °C	-	-
T1 (450 °C) *1	-196 °C	76 °C	76 °C	76 °C	450 °C	36 °C	450 °C	-40 °C	-40 °C	-40 °C	-	-

Antenna and electronics housing: Zone 1**FMR52**, Position 7, 8 (Antenna) = BO**Position 3 (Power Supply; Output) = K, L (TRC [08/09])**

Position 5 (Housing) = B												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	85 °C	55 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-40 °C	75 °C	75 °C	75 °C	100 °C	70 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-40 °C	76 °C	76 °C	76 °C	135 °C	66 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-40 °C	76 °C	76 °C	76 °C	200 °C	55 °C	200 °C	-40 °C	-40 °C	-40 °C	-	-

Position 5 (Housing) = C												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	85 °C	56 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-40 °C	75 °C	75 °C	75 °C	100 °C	71 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-40 °C	76 °C	76 °C	76 °C	135 °C	68 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-40 °C	76 °C	76 °C	76 °C	200 °C	59 °C	200 °C	-40 °C	-40 °C	-40 °C	-	-

FMR52, Position 7, 8 (Antenna) = BP**Position 3 (Power Supply; Output) = K, L (TRC [08/09])**

Position 5 (Housing) = B												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	85 °C	54 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-40 °C	75 °C	75 °C	75 °C	100 °C	69 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-40 °C	76 °C	76 °C	76 °C	135 °C	64 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-40 °C	76 °C	76 °C	76 °C	200 °C	51 °C	200 °C	-40 °C	-40 °C	-40 °C	-	-

Position 5 (Housing) = C												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	85 °C	55 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-40 °C	75 °C	75 °C	75 °C	100 °C	70 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-40 °C	76 °C	76 °C	76 °C	135 °C	67 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-40 °C	76 °C	76 °C	76 °C	200 °C	56 °C	200 °C	-40 °C	-40 °C	-40 °C	-	-

Antenna and electronics housing: Zone 1**FMR53**, Position 11, 12, 13 (Process Connection) = Rx F**Position 3 (Power Supply; Output) = K, L (TRC [08/09])**

Position 5 (Housing) = B												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	80 °C	58 °C	80 °C	-40 °C	-40 °C	-40 °C	-	-

Position 5 (Housing) = C												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	80 °C	58 °C	80 °C	-40 °C	-40 °C	-40 °C	-	-

FMR53**Position 3 (Power Supply; Output) = K, L (TRC [08/09])**

Position 5 (Housing) = B												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	85 °C	53 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-40 °C	75 °C	75 °C	75 °C	100 °C	68 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-40 °C	76 °C	76 °C	76 °C	135 °C	63 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-40 °C	76 °C	76 °C	76 °C	150 °C	59 °C	150 °C	-40 °C	-40 °C	-40 °C	-	-

Position 5 (Housing) = C												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	85 °C	54 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-40 °C	75 °C	75 °C	75 °C	100 °C	69 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-40 °C	76 °C	76 °C	76 °C	135 °C	65 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-40 °C	76 °C	76 °C	76 °C	150 °C	63 °C	150 °C	-40 °C	-40 °C	-40 °C	-	-

Antenna and electronics housing: Zone 1

FMR54

Position 3 (Power Supply; Output) = K, L (TRC [08/09])

Position 5 (Housing) = B												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	85 °C	53 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-40 °C	75 °C	75 °C	75 °C	100 °C	68 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-40 °C	76 °C	76 °C	76 °C	135 °C	62 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-40 °C	76 °C	76 °C	76 °C	200 °C	46 °C	200 °C	-40 °C	-40 °C	-40 °C	-	-

Position 5 (Housing) = C												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	85 °C	54 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-40 °C	75 °C	75 °C	75 °C	100 °C	69 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-40 °C	76 °C	76 °C	76 °C	135 °C	65 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-40 °C	76 °C	76 °C	76 °C	200 °C	52 °C	200 °C	-40 °C	-40 °C	-40 °C	-	-

FMR54, Position 9, 10 (Seal) = D1

Position 3 (Power Supply; Output) = K, L (TRC [08/09])

Position 5 (Housing) = B												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-196 °C	60 °C	60 °C	60 °C	85 °C	55 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-196 °C	75 °C	75 °C	75 °C	100 °C	70 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-196 °C	76 °C	76 °C	76 °C	135 °C	67 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-196 °C	76 °C	76 °C	76 °C	200 °C	55 °C	200 °C	-40 °C	-40 °C	-40 °C	-	-
T2 (300 °C)	-196 °C	76 °C	76 °C	76 °C	280 °C	42 °C	280 °C	-40 °C	-40 °C	-40 °C	-	-

Position 5 (Housing) = C												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-196 °C	60 °C	60 °C	60 °C	85 °C	56 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-196 °C	75 °C	75 °C	75 °C	100 °C	71 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-196 °C	76 °C	76 °C	76 °C	135 °C	69 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-196 °C	76 °C	76 °C	76 °C	200 °C	60 °C	200 °C	-40 °C	-40 °C	-40 °C	-	-
T2 (300 °C)	-196 °C	76 °C	76 °C	76 °C	280 °C	49 °C	280 °C	-40 °C	-40 °C	-40 °C	-	-

Antenna and electronics housing: Zone 1

FMR54, Position 9, 10 (Seal) = D2

Position 3 (Power Supply; Output) = K, L (TRC [08/09])

Position 5 (Housing) = B												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-196 °C	60 °C	60 °C	60 °C	85 °C	56 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-196 °C	75 °C	75 °C	75 °C	100 °C	71 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-196 °C	76 °C	76 °C	76 °C	135 °C	68 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-196 °C	76 °C	76 °C	76 °C	200 °C	58 °C	200 °C	-40 °C	-40 °C	-40 °C	-	-
T2 (300 °C)	-196 °C	76 °C	76 °C	76 °C	300 °C	44 °C	300 °C	-40 °C	-40 °C	-40 °C	-	-

Position 5 (Housing) = C												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-196 °C	60 °C	60 °C	60 °C	85 °C	57 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-196 °C	75 °C	75 °C	75 °C	100 °C	72 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-196 °C	76 °C	76 °C	76 °C	135 °C	70 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-196 °C	76 °C	76 °C	76 °C	200 °C	62 °C	200 °C	-40 °C	-40 °C	-40 °C	-	-
T2 (300 °C)	-196 °C	76 °C	76 °C	76 °C	300 °C	50 °C	300 °C	-40 °C	-40 °C	-40 °C	-	-
T1 (450 °C) *1	-196 °C	76 °C	76 °C	76 °C	400 °C	39 °C	400 °C	-40 °C	-40 °C	-40 °C	-	-

FMR54, Position 7, 8 (Antenna) = Dx

Position 3 (Power Supply; Output) = K, L (TRC [08/09])

Position 5 (Housing) = B												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	85 °C	55 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-40 °C	75 °C	75 °C	75 °C	100 °C	70 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-40 °C	76 °C	76 °C	76 °C	135 °C	66 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-40 °C	76 °C	76 °C	76 °C	150 °C	63 °C	150 °C	-40 °C	-40 °C	-40 °C	-	-

Position 5 (Housing) = C												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-40 °C	60 °C	60 °C	60 °C	85 °C	56 °C	85 °C	-40 °C	-40 °C	-40 °C	-	-
T5 (100 °C)	-40 °C	75 °C	75 °C	75 °C	100 °C	71 °C	100 °C	-40 °C	-40 °C	-40 °C	-	-
T4 (135 °C)	-40 °C	76 °C	76 °C	76 °C	135 °C	68 °C	135 °C	-40 °C	-40 °C	-40 °C	-	-
T3 (200 °C)	-40 °C	76 °C	76 °C	76 °C	150 °C	66 °C	150 °C	-40 °C	-40 °C	-40 °C	-	-

Antenna: Zone 0, Electronics housing: Zone 1**FMR5x****Position 3 (Power Supply; Output) = K, L (TRC [08/09])**

Position 5 (Housing) = B, C												
Temperature class	P 1		P 2		P 3		P 4		P 5		P 6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
T6 (85 °C)	-20 °C	60 °C	60 °C	60 °C	60 °C	60 °C	60 °C	-40 °C	-20 °C	-40 °C	-	-
T5 (100 °C)	-20 °C	75 °C	60 °C	75 °C	60 °C	75 °C	60 °C	-40 °C	-20 °C	-40 °C	-	-
T4 (135 °C)	-20 °C	76 °C	60 °C	76 °C	60 °C	76 °C	60 °C	-40 °C	-20 °C	-40 °C	-	-



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