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Safety Instructions
Micropilot FMR50/51/52/53/54/57

4-20 mA HART

Ex d [ia] IIC T6...T1 Ga/Gb

Endress+Hauser
People for Process Automation

Micropilot FMR50/51/52/53/54/57

4-20 mA HART

Table of contents

Associated documentation

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

- BA01045F/00 (FMR50)
- BA01049F/00 (FMR51, FMR52)
- BA01050F/00 (FMR53, FMR54)
- BA01048F/00 (FMR56, FMR57)

Supplementary documentation

Special Documentation for cable gland M20 Ex d: SD02550F/00

Explosion-protection brochure: CP00021Z/11

The Explosion-protection brochure is available:
- In the download area of the Endress+Hauser website:
  www.endress.com -> Downloads -> Brochures and Catalogs -> Text Search: CP00021Z
- On the CD for devices with CD-based documentation

Manufacturer's certificates

Certificate of Conformity

Certificate number:
CML 17JPN1331X

Affixing the certificate number certifies conformity with the following standards (depending on the device version):

- JNIOSH-TR-46-1 : 2015
- JNIOSH-TR-46-2 : 2018
- JNIOSH-TR-46-6 : 2015
- IEC 60079-26 : 2014

Manufacturer address

Endress+Hauser SE+Co. KG
Hauptstraße 1
79689 Maulburg, Germany

Address of the manufacturing plant: See nameplate.

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

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

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.

Extended order code: Micropilot

The following specifications reproduce an extract from the product structure and are used to assign:
- This documentation to the device (using the extended order code on the nameplate).
- The device options cited in the document.

Device type

FMR50, FMR51, FMR52, FMR53, FMR54, FMR57

Basic specifications

Position 1, 2 (Approval)		
Selected option		**Description**
FMR50	JJ	JPN Ex d [ia] IIC T6...T1 Ga/Gb
FMR51 FMR54	JC, JD, JE	JPN Ex d [ia] IIC T6...T1 Ga/Gb
FMR52	JC, JF	JPN Ex d [ia] IIC T6...T1 Ga/Gb
FMR53	JC	JPN Ex d [ia] IIC T6...T1 Ga/Gb
FMR57	JF	JPN Ex d [ia] IIC T6...T1 Ga/Gb

Position 3 (Power Supply, Output)		
Selected option		**Description**
FMR5x	A	2-wire, 4-20 mA HART
	B	2-wire, 4-20 mA HART, switch output (PFS)

Position 4 (Display, Operation)		
Selected option		**Description**
FMR5x	A	Without, via communication
	C	SD02, 4-line, push buttons + data backup function

Position 5 (Housing)		
Selected option		**Description**
FMR5x	C	GT20 dual compartment, Alu coated

Position 6 (Electrical Connection)		
Selected option		**Description**
FMR5x	B	Thread M20, IP66/68 NEMA4X/6P

Position 7, 8 (Antenna)		
Selected option		**Description**
FMR50 FMR51	Bx	Horn (different sizes)
FMR52	BO	Horn 50 mm/2", -196...200°C, flush mount
	BP	Horn 80 mm/3", -196...200°C, flush mount
FMR53	Cx	Rod (different sizes)
FMR54	Ax	Without Horn
	Bx	Horn (different sizes)
FMR57	Bx	Horn (different sizes)
	Fx	Parabolic (different sizes)

Position 9, 10 (Seal)		
Selected option		**Description**
FMR51	A5	Viton GLT, -40...150°C
	C1	Kalrez, -20...150°C
	D2	Graphite, -196...450°C (HT)
	D3	Graphite, -40...250°C (XT)
FMR54	A7	Viton, -20...150°C (Planar)
	A8	Viton, -40...200°C
	B4	EPDM, -40...150°C
	C2	Kalrez, -20...200°C, conductive media max. 150°C
	D1	Graphite, -196...280°C (XT)
	D2	Graphite, -196...400°C (HT)
FMR57	A6	Viton GLT, -40...200°C

Position 11-13 (Process Connection)		
Selected option		**Description**
FMR50	Gxx Rxx Xxx	ANSI, DIN, JIS: flange, threads, hygienic or other standardized process connections
FMR51	AFx, AGx, AHx, AJx, ARx, ASx, ATx Cxx Kxx Pxx Rxx Txx	ANSI, DIN, JIS: flange, threads, hygienic or other standardized process connections
FMR52	AFK, AGK, AHK, AJK CFK, CGK, CHK, CJK Kxx Mxx TDK, TFK, THK	ANSI, DIN, JIS: flange, threads, hygienic or other standardized process connections
FMR53	AFx, AGx, AHx, AJJ, ASJ, ATJ CFx, CGx, CHx, CJJ, CSJ KFx, KGx, KHx, KJJ RxJ	ANSI, DIN, JIS: flange, threads, hygienic or other standardized process connections
FMR54	Axx Cxx Kxx	ANSI, DIN, JIS: flange, threads, hygienic or other standardized process connections
FMR57	Axx Cxx Kxx Rxx Xxx	ANSI, DIN, JIS: flange, threads, hygienic or other standardized process connections
FMR5x	YYY	Special version, TSP-no. to be spec.

Optional specifications

Nine respectively ten double combinations of numbers or characters.

Here are some examples:

ID Jx (Test, Certificate)		
Selected option		**Description**
FMR51 [1)] FMR52 FMR54 [2)]	JN	Ambient temperature transmitter −50°C

1) Only in connection with Position 9, 10 = D2
2) Only in connection with Position 9, 10 = D1, D2

ID Nx, Ox (Accessory Mounted)		
Selected option		**Description**
FMR5x	NF [1]	Bluetooth
FMR51	OM OU OV	Antenna extension (different sizes)
	OW	Horn protection, PTFE, no airpurge possible
FMR54	OM ON OR OS	Antenna extension (different sizes)
FMR57	OP OT	Antenna extension (different sizes)
	OW	Horn protection, PTFE, no airpurge possible

1) Only in connection with Position 4 = C

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. enclosure, sensor element, special varnishing, attached additional plates, ..)
  - Of isolated capacities (e.g. isolated metallic plates)
- Modifications to the device can affect the explosion protection and must be carried out by staff authorized to perform such work by Endress+Hauser.
- 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.

Safety instructions: Special conditions

Permitted ambient temperature range at the electronics enclosure:
$-40\ °C \leq T_a \leq +80\ °C$

Optional specification, ID Jx = JN
Permitted ambient temperature range at the electronics enclosure:
$-50\ °C \leq T_a \leq +80\ °C$

- Observe the information in the temperature tables.
- In the case of process connections made of polymeric material or with polymeric coatings, avoid electrostatic charging of the plastic surfaces.
- To avoid electrostatic charging: Do not rub surfaces with a dry cloth.
- In the event of additional or alternative special varnishing on the enclosure or other metal parts or for adhesive plates:
  - Observe the danger of electrostatic charging and discharge.
  - Do not install in the vicinity of processes (≤ 0.5 m) generating strong electrostatic charges.

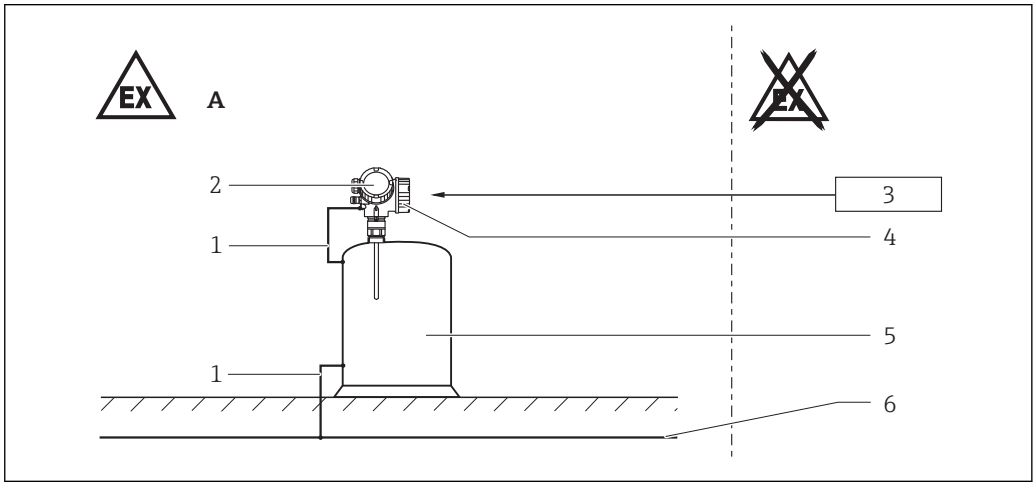
Device type FMR50, FMR52, FMR53, FMR54 (planar, enamel)
An antenna coated with non-conductive material can be used if avoiding electrostatic charging (e.g. through friction, cleaning, maintenance, strong medium flow).

Device type FMR51, FMR57 and Optional specification, ID Nx, Ox = OW
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 FMR57 and Basic specification, Position 11-13 = Xxx
- Changing the position of the alignment device must be impossible:
  - After the alignment of the antenna via the pivot bracket
  - After tightening of the clamping flange
  - After setting the damping ring (torque 15 Nm)
- Degree of protection IP67 must be fulfilled.

Device type FMR51, FMR54, FMR57 and Optional specification, ID Nx, Ox = OM, ON, OR, OS, OU, OV, OP, OT
Avoid contact between sensor and tank wall. Take into account tank fittings and flow conditions (avoid sparks caused by impact and friction).

Safety instructions: Installation



1

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

- After aligning (rotating) the enclosure, retighten the fixing screw (see Operating Instructions).
- Install the device to exclude any mechanical damage or friction during the application. Pay particular attention to flow conditions and tank fittings.
- In potentially explosive atmospheres:
  - Do not disconnect 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 and standards. Accordingly, the connection terminal does not include any ignition sources.
- When operating the transmitter enclosure 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 enclosure.
- 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.
- Continuous service temperature of the connecting cable: −40 °C to ≥ +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).

Optional specification, ID Jx = JN
Continuous service temperature of the connecting cable: −50 °C to ≥ +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).

Explosion protection "Flameproof enclosure Ex db"

Flameproof equipment with G threaded entry holes is not intended for new installations but only for replacement of equipment in existing installations. Application of this equipment shall comply with the local installation requirements.

Intrinsic safety

- The device can be connected to the Endress+Hauser FXA291 service tool: refer to the Operating Instructions.
- The device can be equipped with the Bluetooth® module: refer to the Operating Instructions and specifications in the "Bluetooth® module" chapter.

Potential equalization

Integrate the device into the local potential equalization.

Bluetooth® module

Optional specification, ID Nx, Ox = NF
- With Bluetooth® module installed: Use of external hardware not allowed (e.g. external display, service interface).
- The intrinsically safe input power circuit of the Bluetooth® module is isolated from ground.

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

→ 🖹 14

Connection data

Optional specification, ID Nx, Ox = NF
When using the Bluetooth® module: No changes to the connection values.

Connection compartment Ex db

Basic specification, Position 3 = A

Terminal 1 (+), 2 (−)
Power supply U_N = 35 V_{DC} U_m = 250 V I_{max} = 22 mA

Basic specification, Position 3 = B

The power consumption of I/O modules with passive PFS output can be limited for certain applications.

- Recommended: Power consumption = 1 W. This is obtained for a supply voltage at the terminals of 27 V_{DC}.
- For higher supply voltages (U_{max}): Insert a serial resistance (R_V) in order to limit the power consumption, see table below.

Table for the PFS serial resitance (R_V):

Power consumption	1.0 W
Total power consumption	1.88 W
Internal resistance R_I	760 Ω

U_{max} [V]	R_V min
35	205 Ω
34	177 Ω
33	150 Ω
32	122 Ω
31	95 Ω
30	67 Ω
29	39 Ω
28	12 Ω
27	0 Ω

For values associated with a higher or lower internal power consumption please contact Endress+Hauser.

Terminal 1 (+), 2 (–)	Terminal 3 (+), 4 (–)
Power supply U_N = 35 V_{DC} U_m = 250 V I_{max} = 22 mA	Switch output (PFS) U_N = 35 V_{DC} U_m = 250 V

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 V effective inner inductance L_i = negligible effective inner capacitance C_i = negligible													
U_o = 7.3 V I_o = 100 mA P_o = 160 mW													
L_o (mH) =	5.00	2.00	1.00	0.50	0.20	0.15	0.10	0.05	0.02	0.01	0.005	0.002	0.001
C_o (µF) [1] =	0.73	1.20	1.60	2.00	2.60	-	3.20	4.00	5.50	7.30	10.00	12.70	12.70
C_o (µF) [2] =	-	0.49	0.90	1.40	-	2.00	-	-	-	-	-	-	-

1) Values according to PTB "ispark" program
2) Values according to IEC/EN 60079-25, Annex C

Micropilot FMR50/51/52/53/54/57

4-20 mA HART

Table of contents

Notes on the structure

Extract from the extended order code

Device type

FMR50, FMR51, FMR52, FMR53, FMR54, FMR57

Basic specifications

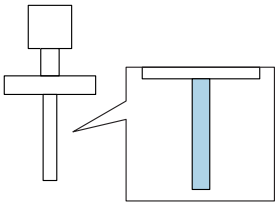
Position 1, 2 (Approval)		
Selected option		**Description**
FMR50	JJ	JPN Ex d [ia] IIC T6...T1 Ga/Gb
FMR51 FMR54	JC, JD, JE	JPN Ex d [ia] IIC T6...T1 Ga/Gb
FMR52	JC, JF	JPN Ex d [ia] IIC T6...T1 Ga/Gb
FMR53	JC	JPN Ex d [ia] IIC T6...T1 Ga/Gb
FMR57	JF	JPN Ex d [ia] IIC T6...T1 Ga/Gb

Position 3 (Power Supply, Output)		
Selected option		**Description**
FMR5x	A	2-wire, 4-20 mA HART
	B	2-wire, 4-20 mA HART, switch output (PFS)

Position 5 (Housing)		
Selected option		**Description**
FMR5x	C	GT20 dual compartment, Alu coated

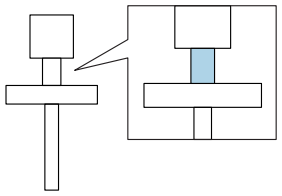
Position 7, 8 (Antenna)		
Selected option		**Description**
FMR50 FMR51	Bx	Horn (different sizes)
FMR52	BO	Horn 50 mm/2", -196...200°C, flush mount
	BP	Horn 80 mm/3", -196...200°C, flush mount
FMR53	Cx	Rod (different sizes)
FMR54	Ax	Without Horn
	Bx	Horn (different sizes)
FMR57	Bx	Horn (different sizes)
	Fx	Parabolic (different sizes)

Shown in the temperature tables exemplary as follows:



Position 9, 10 (Seal)		
Selected option		**Description**
FMR51	A5	Viton GLT, -40…150°C
	C1	Kalrez, -20…150°C
	D2	Graphite, -196…450°C (HT)
	D3	Graphite, -40…250°C (XT)
FMR54	A7	Viton, -20…150°C (Planar)
	A8	Viton, -40…200°C
	B4	EPDM, -40…150°C
	C2	Kalrez, -20…200°C, conductive media max. 150°C
	D1	Graphite, -196…280°C (XT)
	D2	Graphite, -196…400°C (HT)
FMR57	A6	Viton GLT, -40…200°C

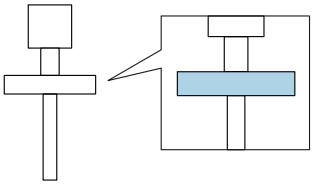
Shown in the temperature tables exemplary as follows:



Position 11-13 (Process Connection)		
Selected option		**Description**
FMR50	Gxx Rxx Xxx	ANSI, DIN, JIS: flange, threads, hygienic or other standardized process connections
FMR51	AFx, AGx, AHx, AJx, ARx, ASx, ATx Cxx Kxx Pxx Rxx Txx	ANSI, DIN, JIS: flange, threads, hygienic or other standardized process connections
FMR52	AFK, AGK, AHK, AJK CFK, CGK, CHK, CJK Kxx Mxx TDK, TFK, THK	ANSI, DIN, JIS: flange, threads, hygienic or other standardized process connections
FMR53	AFx, AGx, AHx, AJJ, ASJ, ATJ CFx, CGx, CHx, CJJ, CSJ KFx, KGx, KHx, KJJ RxJ	ANSI, DIN, JIS: flange, threads, hygienic or other standardized process connections
FMR54	Axx Cxx Kxx	ANSI, DIN, JIS: flange, threads, hygienic or other standardized process connections

Position 11-13 (Process Connection)		
Selected option		**Description**
FMR57	Axx Cxx Kxx Rxx Xxx	ANSI, DIN, JIS: flange, threads, hygienic or other standardized process connections
FMR5x	YYY	Special version, TSP-no. to be spec.

Shown in the temperature tables exemplary as follows:



Optional specifications

ID Jx (Test, Certificate)		
Selected option		**Description**
FMR51 [1] FMR52 FMR54 [2]	JN	Ambient temperature transmitter −50°C

1) Only in connection with Position 9, 10 = D2
2) Only in connection with Position 9, 10 = D1, D2

General notes

Observe the permitted temperature range at the antenna.

Basic specification, Position 3 = B
Deratings are based on a power consumption of 1 W (PFS); → 10.

Description notes

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

1st column: Position 5 = A, B, ...

2nd column: Position 3 = A, B, ..
- (1): 1 channel used
- (2): 2 channels used

3rd column: Temperature classes T6 (85 °C) to T1 (450 °C)

Column P1 to P6: Position (temperature value) on the axes of the derating
- T_a: Ambient temperature in °C
- T_p: Process temperature in °C

Column P6 is only relevant for version B of the derating.
→ 17

= C	(1)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	A, B, C	T6	-40	60	60	60	85	53	85	-40	-40	-40	-	-
		T5	-40	75	75	75	100	68	100	-40	-40	-40	-	-
		T4	-40	80	80	80	135	67	135	-40	-40	-40	-	-
		T3	-40	80	80	80	200	51	200	-40	-40	-40	-	-

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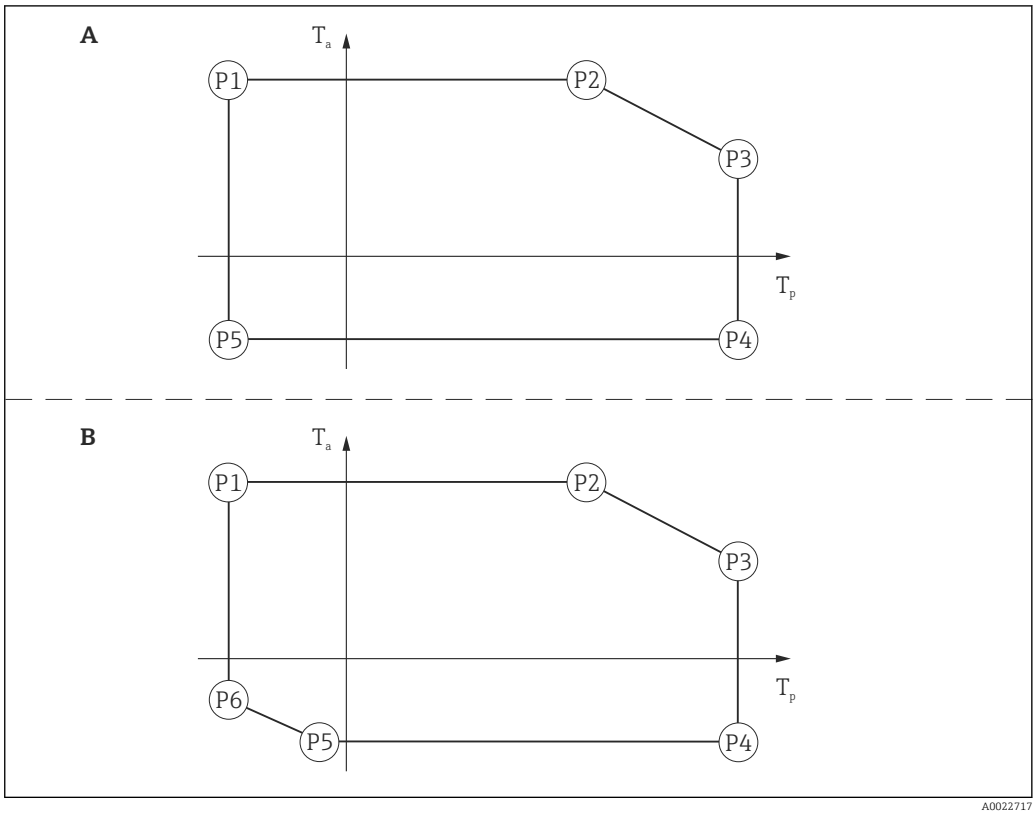
Example diagrams of possible deratings



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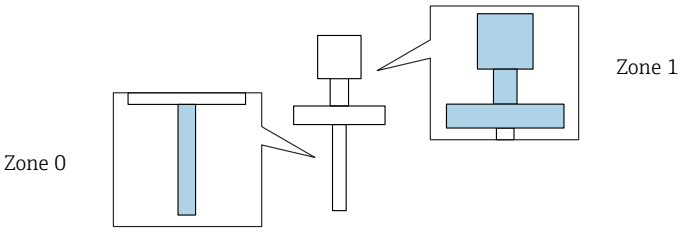
Zone 0, Zone 1: 1 channel *Position 3 = A, B*: 1 channel used

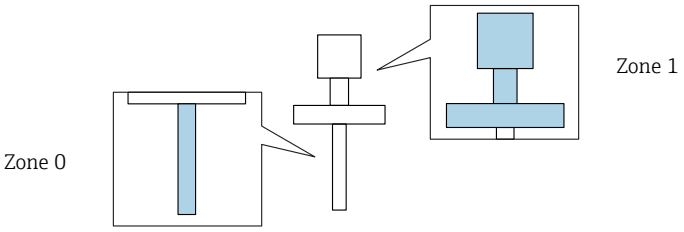


FMR5x

= *C*	(1)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	A, B	T6	–20	60	60	60	60	60	60	–40 –50 [1]	–20	–40 –50 [1]	–	–
		T5	–20	75	60	75	60	75	60	–40 –50 [1]	–20	–40 –50 [1]	–	–
		T4	–20	80	60	80	60	80	60	–40 –50 [1]	–20	–40 –50 [1]	–	–

1) Only in connection with Optional specification, ID Jx = JN

Zone 0, Zone 1: 2 channels *Position 3 = B*: 2 channels used



FMR5x

= *C*	(2)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	B	T6	–20	60	60	60	60	60	60	–40 –50 [1]	–20	–40 –50 [1]	–	–
		T5	–20	75	60	75	60	75	60	–40 –50 [1]	–20	–40 –50 [1]	–	–

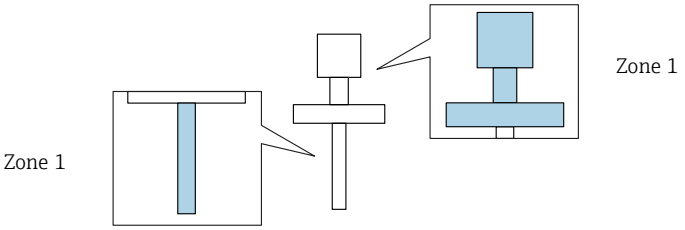
1) Only in connection with Optional specification, ID Jx = JN

Zone 1: 1 channel

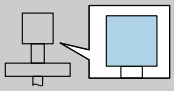
Position 3 = A, B: 1 channel used

Page references to the temperature tables of the respective device types: See the following list.

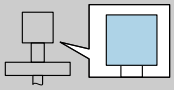
- FMR50 → 🖹 19
- FMR51 → 🖹 19
- FMR52 → 🖹 21
- FMR53 → 🖹 22
- FMR54 → 🖹 22
- FMR57 → 🖹 24



FMR50

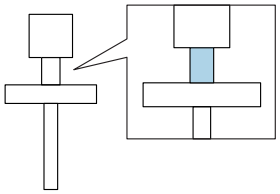
 = *C*	(1)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	A, B	T6	–40	60	60	60	80	58	80	–40	–40	–40	–	–

FMR51

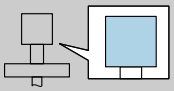
 = *C*	(1)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	A, B	T6	–40	60	60	60	85	55	85	–40	–40	–40	–	–
		T5	–40	75	75	75	100	70	100	–40	–40	–40	–	–
		T4	–40	80	80	80	135	70	135	–40	–40	–40	–	–
		T3 [1)]	–40	80	80	80	150	68	150	–40	–40	–40	–	–

1) Functional: Maximum permissible process temperature

FMR51

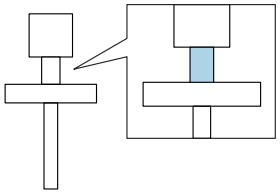


= D3

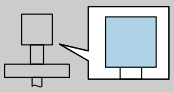
 = C	(1)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	A, B	T6	–40	60	60	60	85	58	85	–40	–40	–40	–	–
		T5	–40	75	75	75	100	73	100	–40	–40	–40	–	–
		T4	–40	80	80	80	135	75	135	–40	–40	–40	–	–
		T3	–40	80	80	80	200	70	200	–40	–40	–40	–	–
		T2 [1]	–40	80	80	80	250	66	250	–40	–40	–40	–	–

1) Functional: Maximum permissible process temperature

FMR51

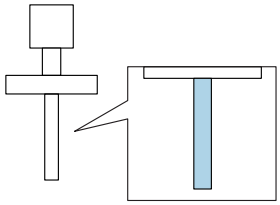


= D2

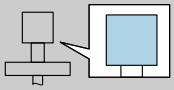
 = C	(1)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	A, B	T6	–196	60	60	60	85	57	85	–40 –50 [1]	–40 –50 [1]	–40 –50 [1]	–196	–20 –28 [1]
		T5	–196	75	75	75	100	72	100	–40 –50 [1]	–40 –50 [1]	–40 –50 [1]	–196	–20 –28 [1]
		T4	–196	80	80	80	135	74	135	–40 –50 [1]	–40 –50 [1]	–40 –50 [1]	–196	–20 –28 [1]
		T3	–196	80	80	80	200	67	200	–40 –50 [1]	–40 –50 [1]	–40 –50 [1]	–196	–20 –28 [1]
		T2	–196	80	80	80	300	56	300	–40 –50 [1]	–40 –50 [1]	–40 –50 [1]	–196	–20 –28 [1]
		T1	–196	80	80	80	450	39	450	–40 –50 [1]	–40 –50 [1]	–40 –50 [1]	–196	–20 –28 [1]

1) Only in connection with Optional specification, ID Jx = JN

FMR52

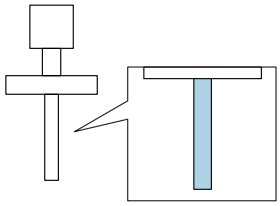


= BO

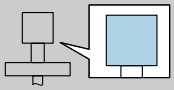
 = C	(1)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	A, B	T6	−196	60	60	60	85	56	85	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−14
		T5	−196	75	75	75	100	71	100	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−14
		T4	−196	80	80	80	135	72	135	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−14
		T3	−196	80	80	80	200	63	200	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−14

1) Only in connection with Optional specification, ID Jx = JN

FMR52

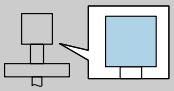


= BP

 = C	(1)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	A, B	T6	−196	60	60	60	85	55	85	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−8
		T5	−196	75	75	75	100	70	100	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−8
		T4	−196	80	80	80	135	71	135	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−8
		T3	−196	80	80	80	200	60	200	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−8

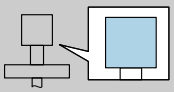
1) Only in connection with Optional specification, ID Jx = JN

FMR53

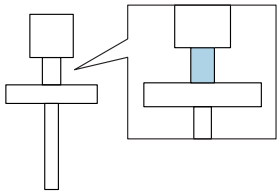
 = *C*	(1)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	A, B	T6	–40	60	60	60	85	54	85	–40	–40	–40	–	–
		T5	–40	75	75	75	100	69	100	–40	–40	–40	–	–
		T4	–40	80	80	80	135	70	135	–40	–40	–40	–	–
		T3 [1]	–40	80	80	80	150	67	150	–40	–40	–40	–	–

1) Functional: Maximum permissible process temperature

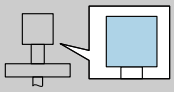
FMR54

 = *C*	(1)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	A, B	T6	–40	60	60	60	85	54	85	–40	–40	–40	–	–
		T5	–40	75	75	75	100	69	100	–40	–40	–40	–	–
		T4	–40	80	80	80	135	69	135	–40	–40	–40	–	–
		T3	–40	80	80	80	200	56	200	–40	–40	–40	–	–

FMR54

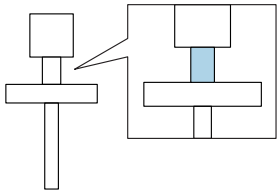


= D1

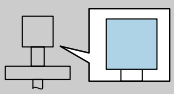
 = C	(1)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	A, B	T6	−196	60	60	60	85	56	85	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−15
		T5	−196	75	75	75	100	71	100	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−15
		T4	−196	80	80	80	135	72	135	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−15
		T3	−196	80	80	80	200	64	200	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−15
		T2 [2]	−196	80	80	80	280	53	280	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−15

1) Only in connection with Optional specification, ID Jx = JN
2) Functional: Maximum permissible process temperature

FMR54

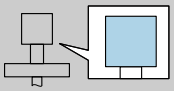


= D2

 = C	(1)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	A, B	T6	−196	60	60	60	85	57	85	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−19 −26 [1]
		T5	−196	75	75	75	100	72	100	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−19 −26 [1]
		T4	−196	80	80	80	135	74	135	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−19 −26 [1]
		T3	−196	80	80	80	200	66	200	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−19 −26 [1]
		T2	−196	80	80	80	300	54	300	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−19 −26 [1]
		T1 [2]	−196	80	80	80	400	42	400	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−19 −26 [1]

1) Only in connection with Optional specification, ID Jx = JN
2) Functional: Maximum permissible process temperature

FMR57

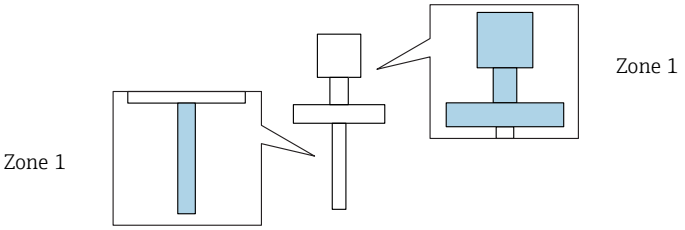
 = *C*	(1)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	A, B	T6	–40	60	60	60	85	57	85	–40	–40	–40	–	–
		T5	–40	75	75	75	100	72	100	–40	–40	–40	–	–
		T4	–40	80	80	80	135	75	135	–40	–40	–40	–	–
		T3	–40	80	80	80	200	69	200	–40	–40	–40	–	–

Zone 1: 2 channels

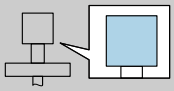
Position 3 = B: 2 channels used

Page references to the temperature tables of the respective device types: See the following list.

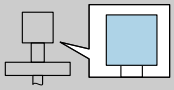
- FMR50 → 🖹 25
- FMR51 → 🖹 25
- FMR52 → 🖹 27
- FMR53 → 🖹 28
- FMR54 → 🖹 28
- FMR57 → 🖹 30



FMR50

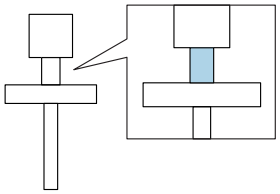
 = *C*	(2)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	B	T6	–40	60	60	60	80	58	80	–40	–40	–40	–	–

FMR51

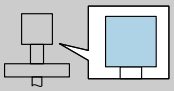
 = *C*	(2)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	B	T6	–40	60	60	60	85	55	85	–40	–40	–40	–	–
		T5	–40	75	75	75	100	70	100	–40	–40	–40	–	–
		T4	–40	75	75	75	135	65	135	–40	–40	–40	–	–
		T3 [1)]	–40	75	75	75	150	62	150	–40	–40	–40	–	–

1) Functional: Maximum permissible process temperature

FMR51

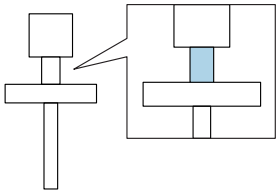


= D3

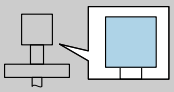
 = C	(2)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	B	T6	–40	60	60	60	85	58	85	–40	–40	–40	–	–
		T5	–40	75	75	75	100	73	100	–40	–40	–40	–	–
		T4	–40	75	75	75	135	70	135	–40	–40	–40	–	–
		T3	–40	75	75	75	200	65	200	–40	–40	–40	–	–
		T2 [1]	–40	75	75	75	250	60	250	–40	–40	–40	–	–

1) Functional: Maximum permissible process temperature

FMR51

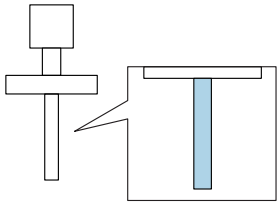


= D2

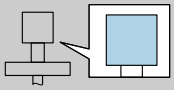
 = C	(2)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	B	T6	–196	60	60	60	85	57	85	–40 –50 [1]	–40 –50 [1]	–40 –50 [1]	–196	–20 –28 [1]
		T5	–196	75	75	75	100	72	100	–40 –50 [1]	–40 –50 [1]	–40 –50 [1]	–196	–20 –28 [1]
		T4	–196	75	75	75	135	68	135	–40 –50 [1]	–40 –50 [1]	–40 –50 [1]	–196	–20 –28 [1]
		T3	–196	75	75	75	200	61	200	–40 –50 [1]	–40 –50 [1]	–40 –50 [1]	–196	–20 –28 [1]
		T2	–196	75	75	75	300	51	300	–40 –50 [1]	–40 –50 [1]	–40 –50 [1]	–196	–20 –28 [1]
		T1	–196	75	75	75	450	34	450	–40 –50 [1]	–40 –50 [1]	–40 –50 [1]	–196	–20 –28 [1]

1) Only in connection with Optional specification, ID Jx = JN

FMR52

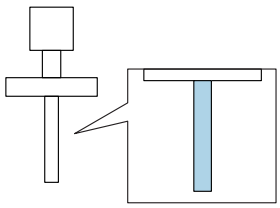


= BO

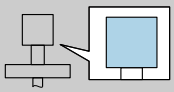
 = C	(2)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	B	T6	−196	60	60	60	85	56	85	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−14
		T5	−196	75	75	75	100	71	100	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−14
		T4	−196	75	75	75	135	67	135	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−14
		T3	−196	75	75	75	200	58	200	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−14

1) Only in connection with Optional specification, ID Jx = JN

FMR52

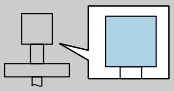


= BP

 = C	(2)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	B	T6	−196	60	60	60	85	55	85	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−8
		T5	−196	75	75	75	100	70	100	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−8
		T4	−196	75	75	75	135	65	135	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−8
		T3	−196	75	75	75	200	54	200	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−8

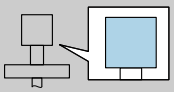
1) Only in connection with Optional specification, ID Jx = JN

FMR53

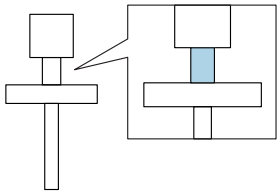
 = *C*	(2)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	B	T6	–40	60	60	60	85	54	85	–40	–40	–40	–	–
		T5	–40	75	75	75	100	69	100	–40	–40	–40	–	–
		T4	–40	75	75	75	135	64	135	–40	–40	–40	–	–
		T3 [1]	–40	75	75	75	150	61	150	–40	–40	–40	–	–

1) Functional: Maximum permissible process temperature

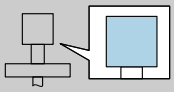
FMR54

 = *C*	(2)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	B	T6	–40	60	60	60	85	54	85	–40	–40	–40	–	–
		T5	–40	75	75	75	100	69	100	–40	–40	–40	–	–
		T4	–40	75	75	75	135	63	135	–40	–40	–40	–	–
		T3	–40	75	75	75	200	50	200	–40	–40	–40	–	–

FMR54

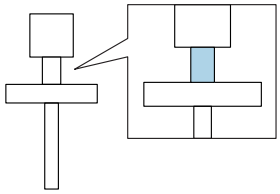


= D1

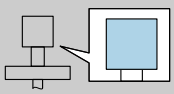
 = C	(2)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	B	T6	−196	60	60	60	85	56	85	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−15
		T5	−196	75	75	75	100	71	100	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−15
		T4	−196	75	75	75	135	67	135	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−15
		T3	−196	75	75	75	200	58	200	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−15
		T2 [2]	−196	75	75	75	280	47	280	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−15

1) Only in connection with Optional specification, ID Jx = JN
2) Functional: Maximum permissible process temperature

FMR54

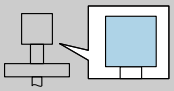


= D2

 = C	(2)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	B	T6	−196	60	60	60	85	57	85	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−19 −26 [1]
		T5	−196	75	75	75	100	72	100	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−19 −26 [1]
		T4	−196	75	75	75	135	68	135	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−19 −26 [1]
		T3	−196	75	75	75	200	60	200	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−19 −26 [1]
		T2	−196	75	75	75	300	49	300	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−19 −26 [1]
		T1 [2]	−196	75	75	75	400	37	400	−40 −50 [1]	−40 −50 [1]	−40 −50 [1]	−196	−19 −26 [1]

1) Only in connection with Optional specification, ID Jx = JN
2) Functional: Maximum permissible process temperature

FMR57

 = *C*	(2)		P1		P2		P3		P4		P5		P6	
			T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
	B	T6	–40	60	60	60	85	57	85	–40	–40	–40	–	–
		T5	–40	75	75	75	100	72	100	–40	–40	–40	–	–
		T4	–40	75	75	75	135	69	135	–40	–40	–40	–	–
		T3	–40	75	75	75	200	63	200	–40	–40	–40	–	–

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