ZD208F-C/00/EN/07.09
CCS/FM6.0
FM/C 05.05.09
71100407

FM Control Drawing
960007254 C

Micropilot M
FMR250/255
FISCO-Model
PROFIBUS PA, FOUNDATION Fieldbus

Endress+Hauser
People for Process Automation

FISCO-Concept

The FISCO Concept allows interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination.
The criteria for interconnection is that the voltage (Ui or Vmax), the current (Ii or Imax) and the power (Pi or Pmax) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (Uo or Voc or Vt), the current (Io or Isc or It) and the power (Po or Pmax) levels which can be delivered by the associated apparatus, considering faults and applicable factors.
In addition, the maximum unprotected capacitance (Ci) and inductance (Li) of each apparatus (other than the termination) connected to the fieldbus must be less than or equal to 5 nF and 10 µH respectively.
In each segment only one active device, normally the associated apparatus, is allowed to provide the necessary energy for the fieldbus system. The voltage Uo (or Voc or Vt) of the associated apparatus has to be limited to the range of 14 V to 24 V d.c.
All other equipment connected to the bus cable has to be passive, meaning that they are not allowed to provide energy to the system, except to a leakage current of 50 µA for each connected device.
Separately powered equipment needs a galvanic isolation to assure that the intrinsically safe fieldbus circuit remains passive.
The cable used to interconnect the devices needs to have the parameters in the following range:

loop resistance R:	15...150 Ω/km
inductance per unit length L:	0.4...1 mH/km
capacitance per unit length C:	80...200 nF/km
C = C line/line + 0,5 C line/screen, if both lines are floating or	
C = C line/line + C line/screen, if the screen is connected to one line	
length of spur cable:	≤ 30 m
length of trunk cable:	≤ 1 km
length of splice:	≤ 1 m.

At each end of the trunk cable an approved infallible line termination with the following parameters is suitable:
R = 90...100 Ω
C = 0...2.2 µF.
One of the allowed terminations might already be integrated in the associated apparatus.
The number of passive devices connected to the bus segment is not limited due to I.S. reasons.
If the above rules are respected, up to a total lenght of 1000 m (sum of the length of trunk cable and all spur cables), the inductance and capacitance of the cable will not impair the intrinsic safety of the installation.

Intrinsically safe installation

Intrinsically safe (entity), Class I, Div. 1, Groups A, B, C, D Hazardous Location Installation.

1. FM approved apparatus must be installed in accordance with manufacturer instructions.
2. FM approved associated apparatus must meet the following requirements:
   Uo or Voc or Vt ≤ Ui (Vmax) **and** Io or Isc or It ≤ Ii (Imax) **and** Po or Pmax ≤ Pi (Pmax).
3. The maximum non-hazardous area voltage must not exceed 250 V.
4. The installation must be in accordance with the National Electrical Code NFPA 70 and ANSI/ISA RP 12.06.01 (except chapter 5).
5. Multiple earthing of screen is allowed only, if high integrity equipotential system is realised between the points of bonding (see drawing No. 960373-1022 A).
6. Caution: Use only supply wires suitable for 5 K above surrounding temperature.
7. Warning: Substitution of components may impair intrinsic safety.
8. The polarity for connecting + (2) and – (1) is of no importance due to an internal rectifier.
9. FMR250: Use of scavenge junction.
   It is the users responsibility to use the adequate method by using the scavenge device, like:
   Installation has to be IP-grade 67 resp. IP-grade 65 (IEC/EN 60529), depends on location.
   Scavege pressure > inside pressure at the container, max 10 bar resp. 150 psi.
   At non-scavenge status, a barrier spigot resp. valve must be closed.
   If the valve / spigot is open and no scavenge fluid is present the risk of flammable gas or combustible dust releases and flame entrance from outside exists.
10. FMR255: Avoid electrostatic charge at the antenna; (e.g. do not rub with dry cloth; do not install within the filling curtain).
11. Apparatus with faucet: In case of disconnection of Micropilot M from the faucet (e.g. for maintenance) we recommend to secure resp. to close the faucet e.g. with an additional blind flange. The responsibility for applicability of the arrangement behooves exclusive the operator.
12. T12-OVP housing: The surge protection device (OVP) fulfills the requirements of IEC 60079-14 clause 12.3.

Division 2 and Zone 2 installation

Nonincendive, Class I, Div. 2, Groups A, B, C, D Hazardous Location Installation.

1. Installation shall be in accordance with NEC using threaded conduits or other wiring methods in accordance with Article 500 through Article 510. Intrinsic safety barrier not required. Max. supply voltage 33 V. For T-code see table.
2. Nonincendive field wiring installation.
   The Nonincendive Field Wiring Circuit Concept allows interconnection of nonincendive field wiring apparatus with associated nonincendive field wiring apparatus or associated apparatus not specifically examined in combination as a system using any of the wiring methods permitted for unclassified locations, when Vmax ≥ Voc or Vt, Ca ≥ Ci + Ccable, La ≥ Li + Lcable.
   Transmitter non incendive field wiring parameters for these current controlled circuit are as follows:
   Vmax = 33 V; Ci ≤ 5 nF; Li ≤ 10 µH; Imax = see note 3.
3. For these current controlled circuit, the parameter Imax is not required and need not to be aligned with parameter Isc and It of the associated nonincendive field wiring apparatus or associated apparatus.
4. Warning: Explosion Hazard - do not disconnect equipment unless power has been switched off or the area is known to be Non-Hazardous.
   Warning: Substitution of components may impair suitability for Class I, Division 2.
5. The transmitter is suitable to be installed according the FNICO concept.

Class II, III installation

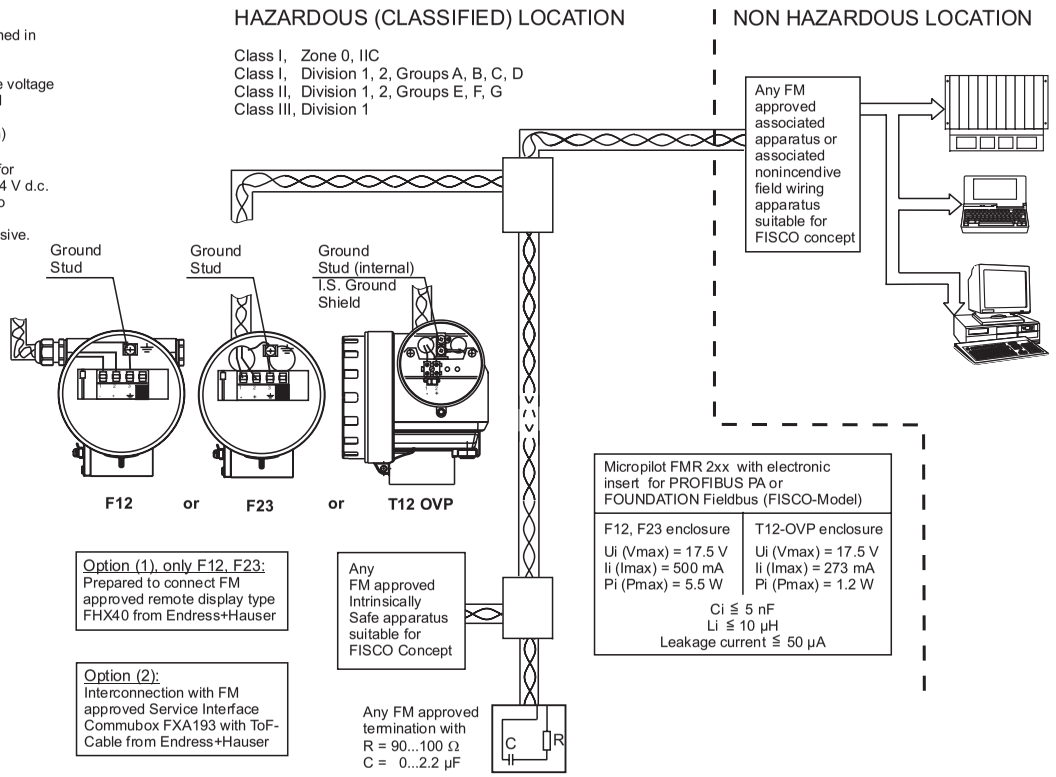
DIP for Class II and III, Div. 1, Groups E, F, G Hazardous Location Installation.

1. Installation shall be in accordance with NEC using threaded conduits or other wiring methods in accordance with Article 500 through Article 510.
2. Use a dust tight seal at the conduit entry.

For Installaion acc. -ENTITY- Concept see Control dwg. part 960007257

Functional ratings:

These ratings do not supersede Hazardous Locations values Unom ≤ 33 V, Inom = 15 mA.



Permissible ambient temperature: Electronic: F12, F23, T12-OVP enclosure –40...+80 °C resp. –40...176 °F

Temperature class with/without display VU331	Permissible max. medium temperature at the probe (process connection) Tmed	Permissible max. ambient temperature of the electronic compartment (Ta)					
		FMR250 (Horn or parabolic antenna)				**FMR255**	
		Option 20 (Antenna): 4, 5 or 6		Option 20 (Antenna): D, E, G, H or 9[2]			
		F12 or T12-OVP housing	F23 housing	F12 or T12-OVP housing	F23 housing	F12 or T12-OVP housing	F23 housing
T6	+ 80 °C + 60 °C	+55/50 °C +60/55 °C	+55/50 °C +60/55 °C	+55/50 °C +60/55 °C	+55/50 °C +60/55 °C	+55/50 °C +60/55 °C	+55/50 °C +60/55 °C
T5	+ 95 °C + 75 °C	+70/65 °C +75/70 °C	+70/65 °C +75/70 °C	+70/65 °C +75/70 °C	+70/65 °C +75/70 °C	+70/65 °C +75/70 °C	+70/65 °C +75/70 °C
T4	+130 °C + 80 °C	+75 °C +80 °C	+70 °C +80 °C	+70 °C +80 °C	+70 °C +80 °C	+70 °C +80 °C	+65 °C +80 °C
T3C (functional)[1]	+150 °C + 80 °C	+73 °C +80 °C	+68 °C +80 °C	+70 °C +80 °C	+68 °C +80 °C	+65 °C +80 °C	+60 °C +80 °C
T3	+195 °C + 80 °C	+70 °C +80 °C	+65 °C +80 °C	+65 °C +80 °C	+60 °C +80 °C	---	---
T2, T1 (functional)[1]	+200 °C + 80 °C	+70 °C +80 °C	+65 °C +80 °C	+65 °C +80 °C	+60 °C +80 °C	---	---

Note: the applicable temperature of antenna must be within their specified limits
[1] functional means max. permissible process temperature
[2] special version of horn or parabolic reflector dimensions
T6 and T5 requires for FF-electronic enlarged derating: for ambient; 1st number = PA electronic insert; 2nd number = FF electronic insert
e.g. +60/55 °C expression means: Apparatus with PA electronic insert max. ambient at housing = +60 °C;
Apparatus with FF electronic insert max. ambient at housing = +55 °C

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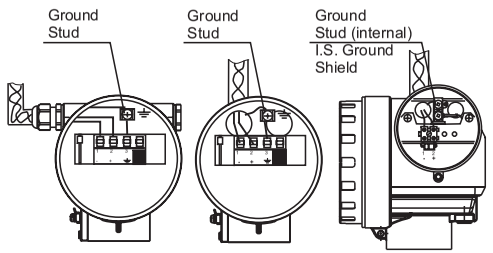
HAZARDOUS LOCATION

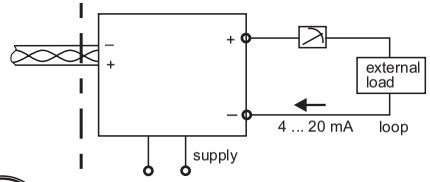
Class I, Div. 1, 2, Groups A, B, C, D
Class I, Zone 0, IIC
Class II, Div. 1, 2, Groups E, F, G
Class III

F12 / F23 / T12-OVP-Housing:
IS / I, II, III / 1 / A, B, C, D



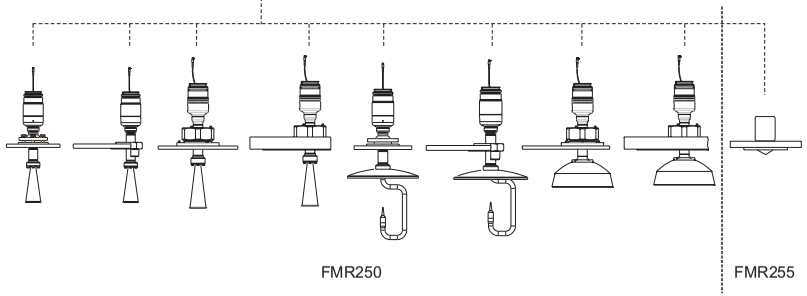
NON HAZARDOUS LOCATION

Any FM approved associated apparatus or associated nonincendive field wiring apparatus



Option (1), only F12, F23:
Prepared to connect FM approved remote display type FHX40 from Endress+Hauser

Option (2):
Interconnection with FM approved Service Interface Commubox FXA193 with ToF-Cable from Endress+Hauser



Permissible ambient temperature: Electronic: F12, F23, T12-OVP enclosure –40...+80 °C resp. –40...176 °F

Type	Type of antennas	Operation temperature
FMR250 -	Horn, Parabolic	–40 °C/–40 °F to +200 °C/392 °F
FMR255 -	Compact	–40 °C/–40 °F to +150 °C/302 °F

Note: take care to specific temperature ranges of antenna versions

For Installation acc. -FISCO- Concept see Control dwg. part 960007254

Functional ratings:
These ratings do not supersede Hazardous Locations values Unom ≤ 33 V, Inom = 15 mA

Notes.

Intrinsically safe installation
Intrinsically safe (entity), Class I, Div. 1, Group A, B, C, D Hazardous Location Installation.

1. Control room equipment may not use or generate over 250 Vrms.
2. Use Factory Mutual Entity-Approved intrinsic safety barrier with Voc or Vt ≤ Vmax, Isc or It ≤ Imax, Ca ≥ Ci + C cable, La ≥ Li + Lcable barrier must be incapable of delivering more than defined value (Pmax.) to a matched load.
   Transmitter entity parameters are as follows:
   F12, F23 enclosure: Vmax = 17.5 V or 24 V; Imax = 500 mA or 250 mA; Ci ≤ 5 nF; Li ≤ 10 µH; Pmax = 5.5 W or 1.2 W
   T12-OVP enclosure: Vmax = 17.5 V or 24 V; Imax = 273 mA or 250 mA; Ci ≤ 5 nF; Li ≤ 10 µH; Pmax = 1.2 W or 1.2 W
3. Installation should be in accordance with ANSI / ISA RP12.06.01 Installation of intrinsically safe systems for Hazardous (Classified) locations and the National Electrical code (ANSI / NFPA 70).
4. Warning: Substitution of components may impair intrinsic safety.
5. Intrinsic safety barrier manufacturer´s installation drawing must be followed when installing this equipment.
   The configuration of the intrinsic safety barrier(s) must be FM Approved.
6. Use supply wires suitable for 5 K above surrounding ambient.
7. FMR250: Use of scavenge junction.
   It is the users responsibility to use the adequate method by using the scavenge device, like: Installation has to be IP-grade 67 resp. IP-grade 65 (IEC/EN 60529), depends on location.
   Scavege pressure > inside pressure at the container, max 10 bar resp. 150 psi. At non-scavenge status, a barrier spigot resp. valve must be closed. If the valve / spigot is open and no scavenge fluid is present the risk of flammable gas or combustible dust releases and flame entrance from outside exists.
8. FMR255: avoid electrostatic charge at the antenna; (e.g. do not rub with dry cloth; do not install within the filling curtain).
9. Apparatus with faucet: In case of disconnection of Micropilot M from the faucet (e.g. for maintenance) we recommend to secure resp. to close the faucet e.g. with an additional blind flange. The responsibility for applicability of the arrangement behooves exclusive the operator.
10. T12-OVP housing: The surge protection device (OVP) fulfills the requirements of IEC 60079-14 clause 12.3.

Division 2 and Zone 2 installation
Nonincendive, Class I, Div. 2, Group A, B, C, D Hazardous Location Installation.

1. Installation shall be in accordance with NEC using threaded conduits or other wiring methods in accordance with Article 500 through Article 510.
   Intrinsic safety barrier not required. Max. supply voltage 33 V. For T-code see table.
2. Nonincendive field wiring installation
   The Nonincendive Field Wiring Circuit Concept allows interconnection of nonincendive field wiring apparatus with associated nonincendive field wiring apparatus or associated apparatus not specifically examined in combination as a system using any of the wiring methods permitted for unclassified locations, when Vmax ≥ Voc or Vt, Ca ≥ Ci + Ccable, La ≥ Li + Lcable.
   Transmitter entity parameters are as follows: Vmax = 33 V; Ci ≤ 5 nF; Li ≤ 10 µH; Imax = see note 3.
3. For these current controlled circuit, the parameter Imax is not required and need not to be aligned with parameter Isc and It of the associated nonincendive field wiring apparatus or associated apparatus.
4. Warning: Explosion Hazard - do not disconnect equipment unless power has been switched off or the area is known to be Non-Hazardous.
   Warning: Substitution of components may impair suitability for Class I, Division 2.
5. The transmitter is suitable to be installed according the FNICO concept.

Class II, III installation
DIP for Class II and III, Div. 1, Group E, F, G Hazardous Location Installation.

1. Installation shall be in accordance with NEC using threaded conduits or other wiring methods in accordance with Article 500 through Article 510.
2. Use a dust tight seal at the conduit entry.

Temperature class with/without display VU331	Permissible max. medium temperature at the probe (process connection) Tmed	Permissible max. ambient temperature of the electronic compartment (Ta)					
		FMR250 (Horn or parabolic antenna)				**FMR255**	
		Option 20 (Antenna): 4, 5 or 6		Option 20 (Antenna): D, E, G, H or 9[2]			
		F12 or T12-OVP housing	F23 housing	F12 or T12-OVP housing	F23 housing	F12 or T12-OVP housing	F23 housing
T6	+ 80 °C + 60 °C	+55/50 °C +60/55 °C	+55/50 °C +60/55 °C	+55/50 °C +60/55 °C	+55/50 °C +60/55 °C	+55/50 °C +60/55 °C	+55/50 °C +60/55 °C
T5	+ 95 °C + 75 °C	+70/65 °C +75/70 °C	+70/65 °C +75/70 °C	+70/65 °C +75/70 °C	+70/65 °C +75/70 °C	+70/65 °C +75/70 °C	+70/65 °C +75/70 °C
T4	+130 °C + 80 °C	+75 °C +80 °C	+70 °C +80 °C	+70 °C +80 °C	+70 °C +80 °C	+70 °C +80 °C	+65 °C +80 °C
T3C (functional)[1]	+150 °C + 80 °C	+73 °C +80 °C	+68 °C +80 °C	+70 °C +80 °C	+68 °C +80 °C	+65 °C +80 °C	+60 °C +80 °C
T3	+195 °C + 80 °C	+70 °C +80 °C	+65 °C +80 °C	+65 °C +80 °C	+60 °C +80 °C	---	---
T2, T1 (functional)[1]	+200 °C + 80 °C	+70 °C +80 °C	+65 °C +80 °C	+65 °C +80 °C	+60 °C +80 °C	---	---

Note: the applicable temperature of antenna must be within their specified limits
[1] functional means max. permissible process temperature
[2] special version of horn or parabolic reflector dimensions
T6 and T5 requires for FF-electronic enlarged derating: for ambient; 1st number = PA electronic insert; 2nd number = FF electronic insert
e.g. +60/55 °C expression means: Apparatus with PA electronic insert max. ambient at housing = +60 °C;
Apparatus with FF electronic insert max. ambient at housing = +55 °C