



# FM Control Drawing

## 960409-1171 D

Levelflex M  
 FMP4x  
 FISCO-Model  
 PROFIBUS PA, FOUNDATION Fieldbus

**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 (U<sub>i</sub> or V<sub>max</sub>), the current (I<sub>i</sub> or I<sub>max</sub>) and the power (P<sub>i</sub> or P<sub>max</sub>) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (U<sub>o</sub> or V<sub>o</sub> or V<sub>i</sub>), the current (I<sub>o</sub> or I<sub>o</sub> or I<sub>i</sub>) and the power (P<sub>o</sub> or P<sub>max</sub>) levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprohibited capacitance (C<sub>i</sub>) and inductance (L<sub>i</sub>) 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 U<sub>o</sub> (or V<sub>o</sub> or V<sub>i</sub>) of the associated apparatus has to be limited to the range of 14 V to 24 V DC. 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.

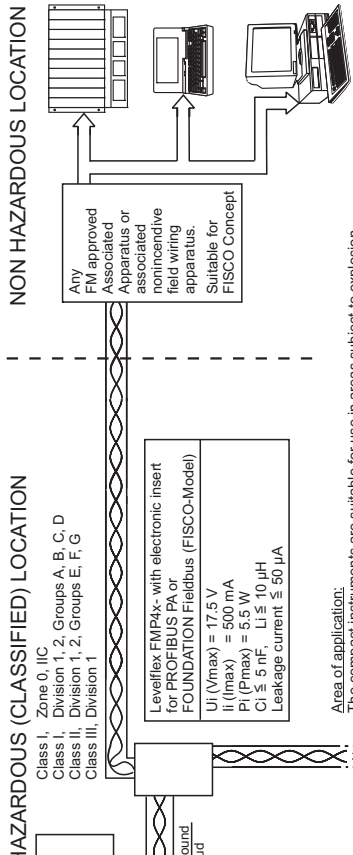
The cable used to interconnect the devices needs to have the parameters in the following range:  
 loop resistance R: 15...150 Ω/km  
 inductance per unit length L<sub>i</sub>: 0.4...1 mH/km  
 capacitance per unit length C<sub>i</sub>: 80...200 nF/km  
 C = C line/line + 0.5 C line/screen, if both lines 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 fail-safe termination with the following parameters is suitable: R = 90...100 Ω  
 C = 0...0.22 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 length 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.
  - FM approved apparatus must be installed in accordance with manufacturer instructions.
  - FM approved associated apparatus must meet the following requirements:  
 U<sub>o</sub> or V<sub>o</sub> or V<sub>i</sub> ≤ (U<sub>max</sub> and I<sub>o</sub> or I<sub>o</sub> or I<sub>i</sub> ≤ I<sub>i</sub> (I<sub>max</sub>) and P<sub>o</sub> or P<sub>max</sub> ≤ P<sub>i</sub> (P<sub>max</sub>)).  
 The maximum non-hazardous area voltage must not exceed 250 V.  
 The installation must be in accordance with the National Electrical Code NFPA 70 and ANSI/ISA RP 12.08.01 (except chapter 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).
  - Caution: Use only supply wires suitable for 5 K above surrounding temperature.
  - Warning: Substitution of components may impair intrinsic safety.
  - The polarity for connecting + (2) and - (1) is of no importance due to an internal rectifier.
  - Probes made out of special materials like Alloy C22 marked as FMP40-1, ..... or FMP40-2, ..... should be used only in liquids or lightweight solids (e.g. plastic granulate, fly-ash, ...).
  - Maximum permissible tensile force at the rope or rod 2000 N.
  - FMP43 with separable probe in separated mode shall be closed by protective cover.

**Division 2 and Zone 2 installation**  
 Nonincendive, Class I, Div. 2, Groups A, B, C, D, Hazardous Location Installation.  
 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.  
 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 V<sub>max</sub> ≥ V<sub>oc</sub> or V<sub>i</sub>, C<sub>a</sub> ≥ C<sub>i</sub> + C<sub>leak</sub>, L<sub>a</sub> ≥ L<sub>i</sub> + L<sub>leak</sub>.  
 Transmitter non incandive field wiring parameters for these current controlled circuit are as follows:  
 V<sub>max</sub> = 33 V; C<sub>i</sub> ≤ 5 nF; L<sub>i</sub> ≤ 10 µH; I<sub>max</sub> = see note 3.  
 For these current controlled circuit, the parameter I<sub>max</sub> is not required and need not to be aligned with parameter I<sub>sc</sub> and I<sub>t</sub> of the associated nonincendive field wiring apparatus or associated apparatus.  
 Warning: Explosion Hazard - do not disconnect nonincendive field wiring 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.

**Class II, III installation**  
 DIP for Class II and III, Div. 1, Groups E, F, G, Hazardous Location Installation.  
 Installation shall be in accordance with NEC using threaded conduits or other wiring methods in accordance with Article 500 through Article 510.  
 Use a dust tight seal at the conduit entry.



**HAZARDOUS (CLASSIFIED) LOCATION**  
 Class I, Zone 0, IIC  
 Class I, Division 1, 2, Groups A, B, C, D  
 Class II, Division 1, 2, Groups E, F, G  
 Class III, Division 1

Option (1): prepared to connect FM approved remote display type FHX40 from Endress+Hauser.

Levelflex FMP4x - with electronic insert for PROFIBUS PA or FOUNDATION Fieldbus (FISCO-Model)  
 U<sub>i</sub> (V<sub>max</sub>) = 17.5 V  
 I<sub>i</sub> (I<sub>max</sub>) = 500 mA  
 P<sub>i</sub> (P<sub>max</sub>) = 5.5 W  
 C<sub>i</sub> ≤ 5 nF, L<sub>i</sub> ≤ 10 µH  
 Leakage current ≤ 50 µA

Any FM approved Intrinsically Safe Apparatus suitable for FISCO Concept

Any FM approved Termination with R = 90...100 Ω  
 C = 0...0.22 µF

**NON HAZARDOUS LOCATION**  
 Any FM approved Associated or nonincendive field wiring apparatus. Suitable for FISCO Concept

Area of application:  
 The compact instruments are suitable for use in areas subject to explosion caused by gases, vapours or mists.  
 Permissible ambient temperature:  
 Electronic: F12 enclosure:  
 Probes: FMP40, FMP45 or FMP43:  
 -40...+80 °C resp. -40...+176 °F  
 refer Technical Information

Temperature class with/without display VU331	Permissible maximum ambient temperature of the electronic compartment (Ta) (enclosure F12)					
	FMP40 with 3/4" probe, compact connection	FMP40 with 3/4" probe, remote electronic with distance tube	FMP40 with 1 1/2" probe, compact	FMP40 with 1 1/2" probe, remote electronic with distance tube	FMP40 with remote electronic with flexible tube	FMP43 compact or separable, remote cable
T6	+ 80 °C	+ 80 °C	+ 55 °C	+ 55 °C	+ 60 °C	+ 60 °C
T5	+ 95 °C	+ 70 °C	+ 70 °C	+ 70 °C	+ 60 °C	+ 60 °C
T4	+ 130 °C	+ 70 °C	+ 75 °C	+ 75 °C	+ 75 °C	+ 75 °C
T3	+ 150 °C	+ 80 °C	+ 80 °C	+ 80 °C	+ 80 °C	+ 80 °C
(functional)*	+ 80 °C	+ 75 °C	+ 75 °C	+ 80 °C	+ 65 °C	+ 80 °C

Note: the applicable temperature of probe must be within their specified limits;  
 \* functional means max. permissible process temperature

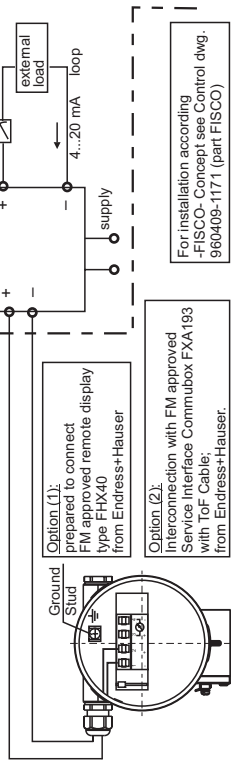
Temperature class with/without display VU331	Permissible max. ambient temperature of the electronic compartment (Ta) (enclosure F12)	
	FMP45 type A (AT version)	FMP45 with remote electronic with flexible tube
T6	+ 80 °C	+ 59 °C
T5	+ 95 °C	+ 60 °C
T4	+ 130 °C	+ 74 °C
T3	+ 150 °C	+ 75 °C
(functional)*	+ 80 °C	+ 77 °C
T2	+ 250 °C	+ 80 °C
T2	+ 290 °C	+ 80 °C
(functional)*	+ 80 °C	+ 80 °C
T1	+ 400 °C	+ 80 °C

Note: the applicable temperature of probe must be within their specified limits;  
 \* functional means max. permissible process temperature

**Functional ratings:**  
 These ratings do not supersede Hazardous Locations values  
 I<sub>nom</sub> ≤ 33 V  
 I<sub>nom</sub> = 15 mA

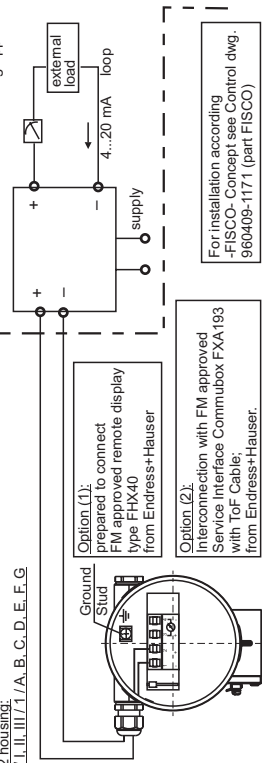
**HAZARDOUS LOCATION**  
Class I, Zone 0, IIC  
Class II, Div. 1, 2, Groups E, F, G  
Class III

F12 housing:  
IS / I, II, III / 1, A, B, C, D, E, F, G

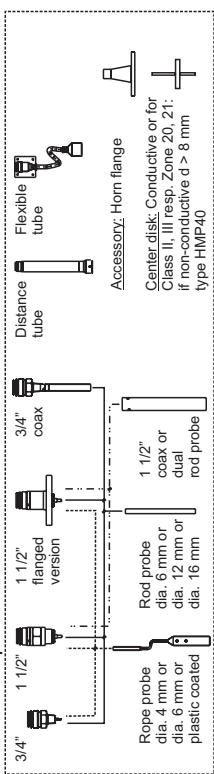


**NON HAZARDOUS LOCATION**

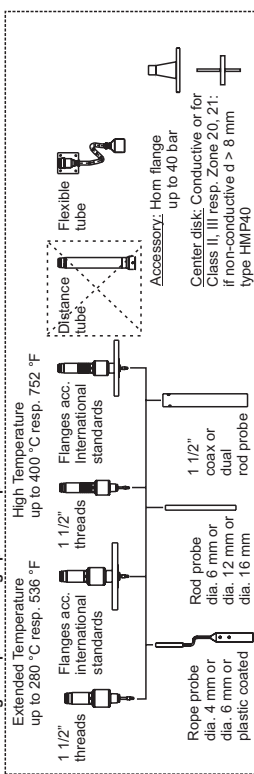
Any FM approved associated apparatus or associated nonincendive field wiring apparatus



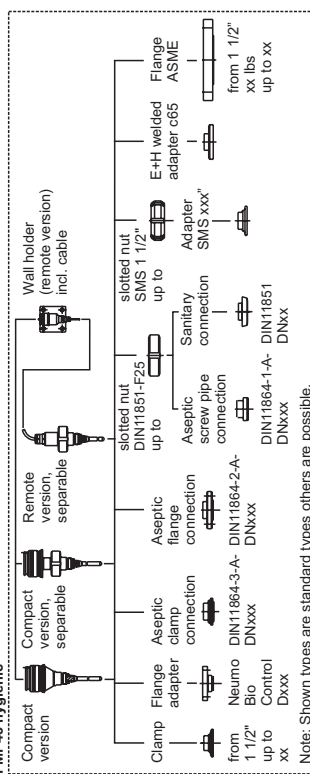
**FMP40 standard probes**



**FMP45 high temperature/high pressure probes**



**FMP43 hygienic**



**Area of application:**  
The compact instruments are suitable for use in areas subject to explosion caused by gases, vapours or mists.  
**Permissible ambient temperature:**  
F12 enclosure:  
Electronic: FMP40, FMP45 or FMP43  
Probes:  
-40...+80 °C resp. -40...+176 °F  
refer Technical Information

**Notes:**  
**Intrinsically safe installation**

- Control room equipment may not use or generate over 250 Vrms.
- Use FM Approvals Entity-Approved intrinsic safety barrier with Voc or Vt ≤ Vmax, Isc or It ≤ Imax, Ca ≥ Ci + Ccable, La ≥ Li + Lcable barrier must be incapable of delivering more than defined value (Pmax) to a matched load.
- Transmitter entity parameters are as follows: 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.
- Installation should be in accordance with ANSI / ISARP12.06.01.
- Installation of intrinsically safe systems for Hazardous (Classified) locations and the National Electrical code (ANSI / NFPA 70).
- Intrinsic safety barrier manufacturer's installation drawing must be followed when installing this equipment.
- Intrinsic safety barrier manufacturer's safety barrier(s) must be FM Approvals Approved.
- Use supply wires suitable for 5 K above surrounding ambient.
- Probes made out of special materials like Alloy C22 marked as FMP40-1,..... or FMP40-2,..... should be used only in liquids or lightweight solids (e.g. plastic granulate, fly-ash, ...). Maximum permissible tensile force at the rope or rod 2000 N.
- FMP43 with separable probe in separated mode shall be closed by protective cover.

**Division 2 and Zone 2 installation**

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

**Class II, III installation**

- DIP for Class II and III, Div. 1, Groups E, F, G, Hazardous Location Installation.
- Installation shall be in accordance with NEC using threaded conduits or other wiring methods in accordance with Article 500 through Article 510. 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 maximum ambient temperature of the electronic compartment (Ta) (enclosure F12)					
		FMP40 with 3/4" probe, compact	FMP40 with 3/4" probe, remote electronic	FMP40 with 1 1/2" probe, compact	FMP40 with 1 1/2" probe, remote electronic with distance tube	FMP40 with remote electronic with flexible tube	FMP43 compact or separable, remote cable
T6	+ 80 °C + 60 °C	+55 °C +60 °C	+55 °C +60 °C	+55 °C +60 °C	+80 °C +60 °C	+55 °C +60 °C	+60 °C +60 °C
T5	+ 95 °C + 75 °C	+70 °C +75 °C	+70 °C +75 °C	+70 °C +75 °C	+70 °C +75 °C	+70 °C +75 °C	+75 °C +75 °C
T4	+130 °C + 80 °C	+75 °C +80 °C	+75 °C +80 °C	+75 °C +80 °C	+80 °C +80 °C	+70 °C +80 °C	+80 °C +80 °C
T3 (functional)*1	+150 °C + 80 °C	+75 °C +80 °C	+75 °C +80 °C	+75 °C +80 °C	+80 °C +80 °C	+65 °C +80 °C	+80 °C +80 °C

Note: the applicable temperature of probe must be within their specified limits;  
\*1 functional means max. permissible process temperature

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) (enclosure F12)		
		FMP45 type A (XT version)	FMP45 type B or C (HT version)	FMP45 with remote electronic with flexible tube
T6	+ 80 °C + 60 °C	+58 °C +60 °C	+58 °C +60 °C	+60 °C +60 °C
T5	+ 95 °C + 75 °C	+73 °C +75 °C	+74 °C +75 °C	+75 °C +75 °C
T4	+130 °C + 80 °C	+76 °C +80 °C	+77 °C +80 °C	+80 °C +80 °C
T3 (functional)*1	+150 °C +195 °C + 80 °C	+74 °C +72 °C +80 °C	+76 °C +80 °C +80 °C	+80 °C +80 °C +80 °C
T2 (functional)*1	+250 °C + 80 °C	+69 °C +80 °C	+73 °C +80 °C	+80 °C +80 °C
T2 (functional)*1	+290 °C + 80 °C	280 °C +80 °C	+71 °C +80 °C	+80 °C +80 °C
T1 (functional)*1	+400 °C + 80 °C	not allowed	+66 °C +80 °C	+80 °C +80 °C

Note: the applicable temperature of probe must be within their specified limits;  
\*1 functional means max. permissible process temperature