

PROline promag 53 Division 1



Ex documentation for the BA 053D and BA 054D operating instructions according to FACTORY MUTUAL standards



Ex documentation for the BA 053D and BA 054D operating instructions according to CANADIAN STANDARDS ASSOCIATION



Endress + Hauser

The Power of Know How



PROline promag 53 Division 1

Ex documentation for the BA 053D and BA 054D operating instructions

according to **FACTORY MUTUAL** standards



Example: **XP / I / 1 / ABCD**

Type of Protection

XP	Explosionproof
IS	Intrinsically Safe Apparatus
AIS	Associated Apparatus with Intrinsically Safe Connections
ANI	Nonincendive Field Wiring Circuit
PX, PY, PZ	Pressurized
APX, APY, APZ	Associated Pressurization Systems/Components
NI	Nonincendive
DIP	Dust-Ignitionproof
S	Special Protection

Class

I	Class I (Gas)
II	Class II (Dust)
III	Class III (Fibre)

Division

1	Division 1
2	Division 2

Group

FM / NEC	Gases, vapours and dusts (Examples)	Min. ignition temperature [μ J]
A	Acetylene, carbon disulfide (Class I)	0.02
B	Hydrogen, ethyl nitrate (Class I)	0.02
C	Ethylene, isoprene (Class I)	0.06
D	Acetone, ethane, benzene, ethanoic acid, gasolines, diesel oil, aircraft fuel, methane, heating oil, crude oil, hexane, ether (Class I)	0.18
E	Metallic powder (Class II)	
F	Coal dust (Class II)	
G	Mill dust (Class II) Textile fibres (Class III)	

Temperature Class

FM 3611	Maximum surface temperature	
T1	842 °F	450 °C
T2	572 °F	300 °C
T2A	536 °F	280 °C
T2B	500 °F	260 °C
T2C	446 °F	230 °C
T2D	419 °F	215 °C
T3	392 °F	200 °C
T3A	356 °F	180 °C
T3B	329 °F	165 °C
T3C	320 °F	160 °C
T4	275 °F	135 °C
T4A	248 °F	120 °C
T5	212 °F	100 °C
T6	185 °F	85 °C

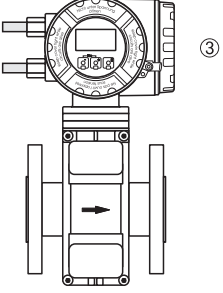
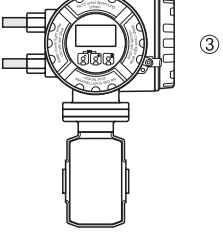
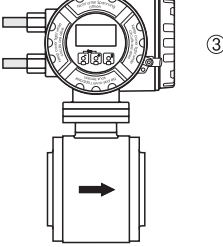
Factory Mutual



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Hazardous area		Safe area
Division 1 / Zone 1	Division 2 / Zone 2	
<p>Promag 53 P = DN 1/2"...12" W = DN 2 1/2"...12"</p> 		
<p>Promag 53 H = DN 1/12"...1"</p> 	<p>Promag 53 H = DN 1 1/2"...4"</p> 	
Division 1 / Zone 1	Division 2 / Zone 2	
Hazardous area		Safe area

F06-53xxxZZ-16-xx-xx-en-000

- Promag 53 PROFIBUS-PA flow measuring system in:
XP-IS-DIP / I,II,III / 1 / ABCDEFG/T5 to T3C
and
XP-IS / I / 1 / IIC / T5 to T3C
 - For ambient and medium temperature ranges, and temperature class, see Page 3.
- ③ Transmitter terminal compartment (XP version) power supply / I/O-cable

Temperature tables

Measuring system Promag 53 PROFIBUS-PA (compact version)

<i>at $T_a = 104\text{ }^\circ\text{F}$</i>		Max. medium temperature [$^\circ\text{F}$] in			
		T5	T4A	T4	T3C
Promag H	DN 1/12"...4"	122	230	266	302
Promag P	DN 1"...8" (PFA lining)	122	230	266	302
Promag P	DN 1/2"...12" (PTFE lining)	122	230	266	–
Promag W	DN 2 1/2"...12" (hard-rubber lining)	122	–	–	–

<i>at $T_a = 113\text{ }^\circ\text{F}$</i>		Max. medium temperature [$^\circ\text{F}$] in			
		T5	T4A	T4	T3C
Promag H	DN 1/12"...4"	122	230	266	–
Promag P	DN 1"...8" (PFA lining)	122	230	266	–
Promag P	DN 1/2"...12" (PTFE lining)	122	230	266	–
Promag W	DN 2 1/2"...12" (hard-rubber lining)	122	–	–	–

<i>at $T_a = 122\text{ }^\circ\text{F}$</i>		Max. medium temperature [$^\circ\text{F}$] in			
		T5	T4A	T4	T3C
Promag H	DN 1/12"...4"	122	230	–	–
Promag P	DN 1"...8" (PFA lining)	122	230	–	–
Promag P	DN 1/2"...12" (PTFE lining)	122	230	–	–
Promag W	DN 2 1/2"...12" (hard-rubber lining)	122	–	–	–

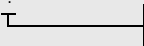


Note!

At the specified medium temperatures, the equipment is not subjected to temperatures impermissible for the temperature class in question.

Approvals

No. / approval type	Description
J. I. 3002554 (See Page 5 for notes on special conditions)	for the electric flow measuring system Promag 53 PROFIBUS-PA Identification: see below

Measuring system Promag 53 PROFIBUS-PA (compact version)		
Promag 53***_*****.		F = PROFIBUS-PA "intrinsically safe"
Promag 53 H	DN 1/12"...4":	XP-IS-DIP / I,II,III / 1 / ABCDEFG / T5 to T3C and XP-IS / 1 / 1 / IIC / T5 to T3C
Promag 53 P	DN 1/2"...12":	XP-IS-DIP / I,II,III / 1 / ABCDEFG / T5 to T3C and XP-IS / 1 / 1 / IIC / T5 to T3C
Promag 53 W	DN 2 1/2"...12":	XP-IS-DIP / I,II,III / 1 / ABCDEFG / T5 to T3C and XP-IS / 1 / 1 / IIC / T5 to T3C

Notified body

The Promag measuring system was tested for approval by the following named entity:

FM: Factory Mutual Research

Special conditions

1. Control room equipment shall not use or generate more than 250 V rms.
2. Ratings for devices connected to terminals Nos. 20 to 27 of the Promag 53 PROFIBUS-PA transmitter must not exceed $U_m = 250$ V and $I_m = 500$ mA: it is impermissible to connect devices with higher ratings to these terminals.
3. Install per National Electrical Code ANSI/NFPA 70.
4. It is not permissible to connect the service adapter in explosive atmospheres.



Caution!

5. Use supply wires suitable for 5 °C above ambient temperature, but at least for 176 °F.

General warnings



Warning!

- Installation, connection to the electricity supply, commissioning and maintenance of the devices must be carried out by qualified specialists trained to work on Ex-rated devices.
- Compliance with national regulations relating to the installation of devices in potentially explosive atmospheres is mandatory, if such regulations exist.
- Open the device only when it is de-energized (and after a delay of at least 10 minutes following shutdown of the power supply).
- The housing of the Ex-rated transmitter can be turned in 90° steps. Whereas the non-Ex version has a bayonet adapter, however, the Ex version has a thread. Recesses for centering the worm screw are provided to prevent inadvertent movement of the transmitter housing.
It is permissible to turn the transmitter housing through a maximum of 180° during operation (in either direction), without compromising explosion protection.
After turning the housing the worm screw must be tightened again.
- The screw cap has to be removed before the local display can be turned, and this must be done with the device de-energized (and after a delay of at least 10 minutes following shutdown of the power supply).

Electrical connections

Power supply connection

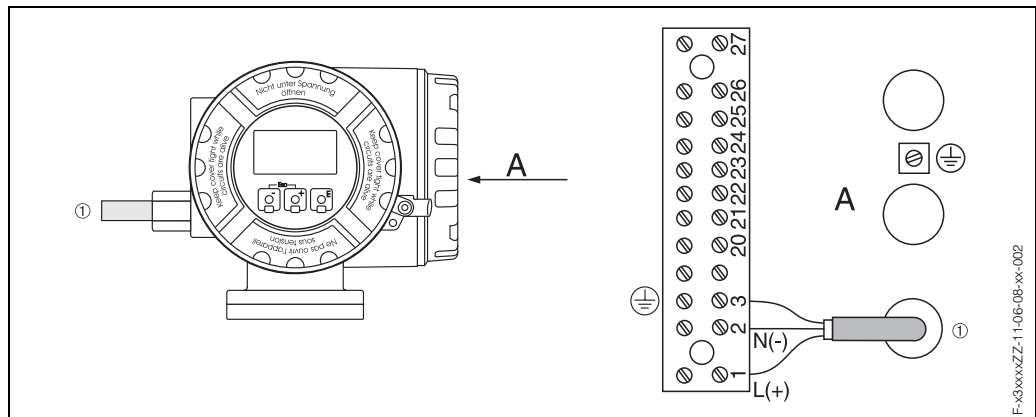


Fig. 1: ① = power supply cable
A = view A

The table below contains the values that are identical for all versions, irrespective of the type code.

Transmitter Promag 53

Terminals	1	2	3
	L (+)	N (-)	
Designation	Power supply ①		Ground
Functional values	AC: U = 85...260 V or AC: U = 20...55 V or DC: U = 16...62 V Power consumption: 15 VA / 15 W		
Intrinsically safe circuit	no		
U _{max} =	260 V AC		

Input/output circuit

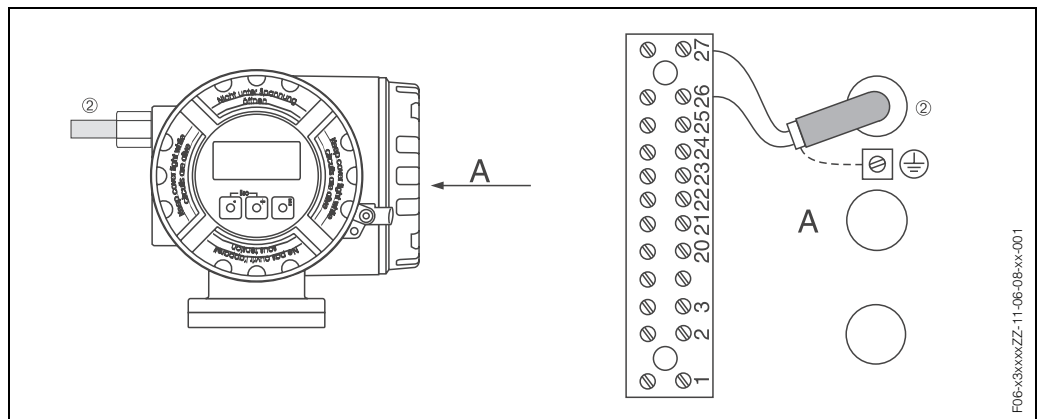


Fig. 2: Ⓜ = bus cable
A = view A



Note!

The table below contains the values that are not identical for all versions, in other words which depend on the type code (type of device). Always remember to compare the type code in the table with the code on the nameplate of your device.

Transmitter Promag 53*.*****F**

Terminals	20	21	22	23	24	25	26	27
	+	-	+	-	+	-	+	-
Designation							PROFIBUS-PA Ⓜ	
Functional values: U _B = operating voltage I _B = base current							U _B = 9...32 V DC I _B = 11 mA	
Intrinsically safe circuit							yes	
U _i =							30 V DC	
I _i =							500 mA	
P _i =							5.5 W	
L _i =							10 μH	
C _i =							5 nF	

Explanation of the FISCO model (PROFIBUS-PA)

The FISCO model makes possible the interconnection of intrinsically safe apparatus and one intrinsically safe associated apparatus, without having to have separate certification for respective connections.

The criteria for the intrinsic safety of an interconnection (bus segment) is given under the following interrelationships:

- U_i , I_i and P_i of the field device is $\geq U_o$, I_o and P_o of the associated equipment (segment coupler).
- C_i and L_i of the field device is ≤ 5 nF and 10 μ H.
- There is only one source within an interconnection (bus segment). This source is normally the associated equipment (segment coupler), which terminates the cable.
- Every field device takes a constant base current (approx. 11 mA) and behaves as a passive current sink. When the field device transmits, no power is fed into that bus segment.
- Independently powered devices (four-core device) must ensure galvanic isolation from the bus segment.
- At each end of the trunk cable an approved line terminator is suitable. (In most of the times, one terminator is integrated in the associated equipment).
- Cable parameters and length restrictions are respected (see Page 10).
 - Maximum net elongation (0.621 mile)
 - Maximum spur length (30 yd)
 - Specific inductance (0.64...1.6 mH/mile)
 - Specific capacitance (128...322 nF/mile)
 - Loop resistance (24.1...241 Ω /mile)

Service adapter

The service adapter is exclusively for connection to E+H approved service interfaces.



Warning!

It is not permissible to connect the service adapter in explosive atmospheres.

Device fuse



Warning!

Use only fuses of the following types; the fuses are installed on the power supply board:

- Voltage 20...55 V AC / 16...62 V DC:
fuse 2.0 A slow-blow, disconnect capacity 1500 A
(Schurter, 0001.2503 or Wickmann, Standard Type 181 2.0 A)
- Voltage 85...260 V AC:
fuse 0.8 A slow-blow, disconnect capacity 1500 A
(Schurter, 0001.2507 or Wickmann, Standard Type 181 0.8 A)

Potential equalisation with shielding grounded at both ends

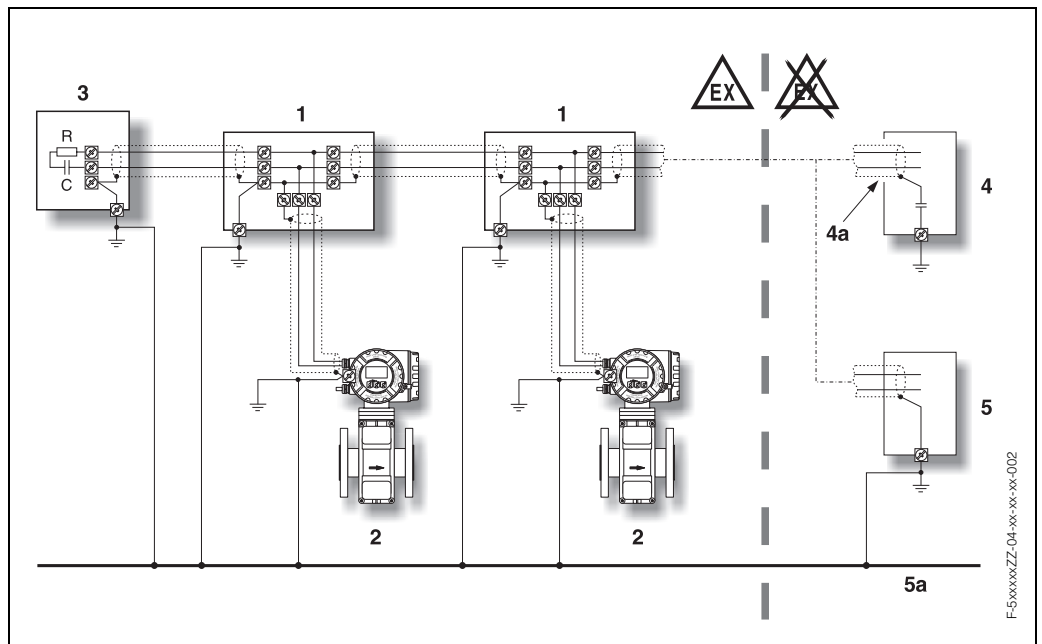


Fig. 3: Examples of the connection of potential equalisation lines

- 1 = distributor/T-Box
- 2 = Promag 53 bus devices for hazardous area
- 3 = bus termination: $R = 90...100 \Omega$, $C = 0...2.2 \mu F$
- 4 = PROFIBUS power supply variant 4a
- 4a = shielding connected via capacitor
- 5 = PROFIBUS power supply variant 5a
- 5a = potential equalisation line led out

Variant 4/4a:

With capacitive grounding of the shielding in the safe area the potential equalisation line does not need to be led out of the safe area.

Use small capacitors (e.g. 1 nF, 1500 V, dielectric strength, ceramic).

The total capacitance connected at the shielding must not exceed 10 nF.

Variant 5/5a:

Potential equalisation line is led out of the safe area.

Cable entries

For number reference see the figure on Page 2.

- ③ Cable entries for the transmitter terminal compartment (XP version)
power supply / I/O-cable: (Promag 53***-****N*****)
Thread 1/2" NPT.

Make sure that the XP cable entries are secured to prevent working loose.

Cable specifications for PROFIBUS-PA

	Cable type A (reference)	Cable type B
<i>Cable construction</i>	twisted pair, shielded	one or more twisted pairs, fully shielded
<i>Core cross-section (nominal)</i>	0.00124 sq. in. (AWG 18)	0.00049 sq. in. (AWG 22)
<i>Loop resistance (direct current)</i>	70.80 Ω /mile	180.24 Ω /mile
<i>Impedance at 31.25 kHz</i>	100 Ω \pm 20%	100 Ω \pm 30%
<i>Attenuation constant at 39 kHz</i>	4.83 dB/mile	8.05 dB/mile
<i>Capacitive unsymmetry</i>	3.22 nF/mile	3.22 nF/mile
<i>Envelope delay distortion (7.9...39 kHz)</i>	2.74 μ s/mile	-
<i>Degree of voltage of shielding</i>	90%	-
<i>Max. bus segment length (incl. spur lines)</i>	0.621 mile	0.621 mile
<i>Specific inductance</i>	0.64...1.6 mH/mile	
<i>Specific capacitance</i>	128...322 nF/mile	
<i>Loop resistance</i>	24.1...241 Ω /mile	
<i>Max. spur length</i>	\leq 30 yd	

Technical data

Differences in dimensions and weights due to the use of an XP housing:

- Height + 0.6 inch more than the standard version (see Operating Instructions)
- Weight + approx. 4.4 lbs more than the standard version (see Operating Instructions)

Device identification

Promag 53 PROFIBUS-PA transmitter and W/P/H sensor

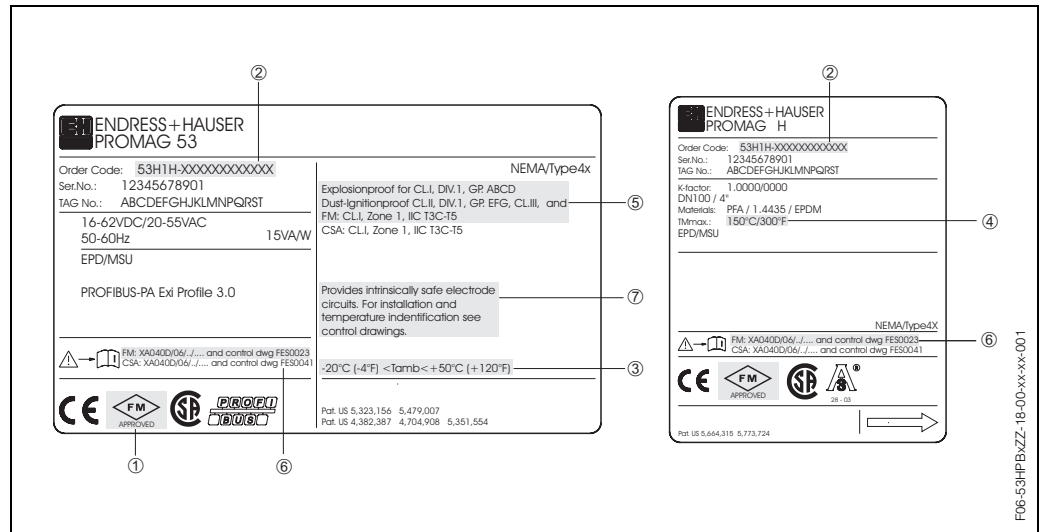


Fig. 4: Nameplate of transmitter and nameplate of sensor (example)

Key to nameplates (Figure 5)

No.	Meaning	No.	Meaning
①	Label of the notified body: Factory Mutual	⑤	Type of protection and explosion group for the Promag 53 PROFIBUS-PA measuring system
②	Type code	⑥	Applicable Ex documentation
③	Ambient temperature range	⑦	Warning
④	Maximum medium temperature		

Control drawings

Endress+Hauser Reinach hereby declares that the product is in conformity with the requirements of the FACTORY MUTUAL standards.

Hazardous Locations
Class I Division 1 Groups ABCD or Class I Zone 1 Groups IIC and Class II and III Division 1 Groups EFG

Promag 5. W / P Promag 5. H

PROMAG 50 P / H and PROMAG 53 W / P / H
XP / I / 1 / ABCD; DIP / II, III / 1 / EFG
AIS / I, II, III / 1 / ABCDEFG
FM Cl. I, Zone 1, Group IIC

Temperature table

Max. ambient temperature	Max. medium temperature depending temperature classes		
	T5	T4A	T4
50 °C / 122°F	50 °C / 122°F	110 °C / 230°F	
45 °C / 113°F	50 °C / 122°F	110 °C / 230°F	130 °C / 266°F
40 °C / 104°F	50 °C / 122°F	110 °C / 230°F	130 °C / 266°F
			150 °C / 302°F

Max. allowed medium temperature depending liner material

Liner material	Max. medium temperature
PU (polyurethan)	60 °C / 140°F
HG (hard rubber)	80 °C / 176 °F
PTFE	130 °C / 266°F
PFA	150 °C / 302°F

Keine Änderungen ohne vorherige Factory Mutual Genehmigung

WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.

Notes:

- Control room equipment shall not use or generate more than 250 V rms.
- Caution: Use supply wires suitable for 5 °C above ambient temperature, but at least for 80 °C / 176°F.
- Class II Group G: The surface temperature of the apparatus cannot exceed 165 °C / 329°F.
- Install per NEC ANSI/NFPA 70 Article 500

Änderungen:		Ersteller: FES / ID 1006	
A	27.09.00 / Bn	F	
B		G	
C		H	
D		J	
E		K	

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FM Control Drawing Div. 1 / Zone 1 Class I Zone 1

PROMAG 5x compact version

Gezeichnet	4. Jan. 2000	UD
Geprüft		
Ex-geprüft	27.09.00	Bn
Gesehen		

FES0023-0000F0A 1/5

HAZARDOUS LOCATIONS
Cl. I Div. 1 Groups A,B,C,D
Cl. I Zone 1 Group IIC
Cl. I Div. 2 Group A,B,C,D
Cl. I Zone 2 Group IIC
Cl. II, III Div. 1 Group E,F,G

NON HAZARDOUS LOCATIONS

Notes:
Intrinsically safe signal output:
1) Wire intrinsically safe circuits per ISA RP 12.6. or in conduit per NEC ANSI/NFPA 70.
2) **WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.**
3) Control room equipment may not use or generate more than 250 V rms.
PROMAG Type: 5*-*****F**
Terminals: 26 (+), 27 (-) (Profibus PA):
Passive intrinsically safe PROFIBUS PA circuit:
For connecting the intrinsically safe circuit (PROFIBUS PA) according to the FISCO-CONCEPT see page 4 of this control document.

Keine Änderungen ohne vorherige Factory Mutual Genehmigung

Nonintrinsically safe signal output:

- Transmitter circuit wiring in conduit in accordance with NEC ANSI/NFPA 70.
- WARNING: EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 1.**
- Control room equipment may not use or generate over 250 Vrms.

PROMAG Type: 5*-*****H**
Terminals 26 (+), 27 (-) (PROFIBUS PA)
V ≤ 32 V, I = 10 mA

PROMAG Type: 5*-*****J**
Terminals 24 (+5V), 25 (GND), 26 (DPA), 27 (DPB) (PROFIBUS DP)
Terminals: +5V, GND, DPA, DPB
V = 5 V, I = 100 mA

Änderungen:		Alle gesetzlichen Urheberrechte vorbehalten.		Ersetzt durch:	
A	27.09.00 / Bn	F		Erstellt für:	
B		G		Ersteller: FES / ID 1006	
C		H		File: M:ZEICHN\G\FES0023\000411C.DOC	
D		J			
E		K			

FM Control Drawing Div. 1 / Zone 1 PROMAG 5. W / P / H PROFIBUS PA / IS installation PROFIBUS PA / DP non-IS installation

Massstab	4. Jan. 2000	UD
%		
Geprüft		
Ex-geprüft	27.09.00	Bn
Gesehen		

FES0023-0000F0A 2/5

HAZARDOUS LOCATIONS
 Cl. I Div. 1 Groups A,B,C,D
 Cl. I Zone 1 Group IIC
 Cl. I Div. 2 Group A,B,C,D
 Cl. I Zone 2 Group IIC
 Cl. II, III Div. 1 Group E,F,G

NON HAZARDOUS LOCATIONS

Notes:

Intrinsically safe signal output:

- 1) Wire all intrinsically circuits per ISA RP 12.6. or in conduit per NEC ANSI/NFPA 70
- 2) **WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.**
- 3) Control room equipment may not use or generate more than 250 Vrms.

PROMAG Type: 5*-*****G**
Terminals: 26, 27 (Foundation Fieldbus):
 Intrinsically safe circuit:

V_{max} / U_i	I_{max} / I_i	P_{max} / P_i	C_i	L_i
30 V	500 mA	5.5 W	≤ 5 nF	≤ 10 μ H

Connect to entity approved associated apparatus with
 I_{sc} , I_i or $I_0 \leq I_{max}$ or I_i and
 V_{oc} , V_i or $U_0 \leq V_{max}$ or U_i
 $(P_0 \leq P_{max}$ or $P_i)$
 Cable parameters for Intrinsic Safety:
 $C_{cable} \leq C_a / C_0 - \Sigma C_i$
 $L_{cable} \leq L_a / L_0 - \Sigma L_i$ or
 $L/R_{cable} \leq L/R_{Associated Apparatus}$ and L_i of each I.S. apparatus ≤ 10 μ H

Keine Änderungen ohne vorherige Factory Mutual Genehmigung

Nonintrinsically safe signal output:

- 4) Transmitter circuit wiring in conduit in accordance with NEC ANSI/NFPA 70.
- 5) **WARNING: EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 1.**
- 6) Control room equipment may not use or generate over 250 Vrms.

PROMAG Type: 5*-*****K**
Terminals 26,27 (FIELDBUS FOUNDATION NON I.S.):
 $V \leq 32$ V, $I = 10$ mA

Änderungen:	A	B	C	D	E	F	G	H	I	J	K

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 Ersteller: FES / ID 1006
 File: M:ZEICHNUNG\FES0023\000411C.DOC

FM Control Drawing Div. 1 / Zone 1
PROMAG 5. W / P / H
Fieldbus Foundation I.S. installation

FES0023-0000FOA 3/5

FISCO CONCEPT

The FISCO Concept allows interconnection of intrinsically safe apparatus to associated apparatus not specially examined in such combination. The criteria for interconnection is that the voltage (U_i or V_{max}), the current (I_i or I_{max}), and the power (P_i or P_{max}) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (U_0 , V_{oc} or V_i), the current (I_0 , I_{sc} or I_i) and the power (P_0 or P_{max}) levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance (C_i) and inductance (L_i) of each apparatus (other than the termination) connected to the fieldbus must be less than or equal to 5 nF and 10 μ H 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_0 (or V_{oc} or V_i) of the associated apparatus is limited to a range of 14V to 24Vd.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 a leakage current of 50 μ A 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 parameter in the following range:

Loop Resistance R' :	15...150 Ohm/km
Inductance per unit length L' :	0.4...1 mH/km
Capacitance per unit length C' :	80...200 nF

$C' = C'_{line}/line + 0.5 C'_{line}/screen$, if both lines are floating, or
 $C' = C'_{line}/line + C'_{line}/screen$, if the screen is connected to one line

Length of trunk cable: ≤ 1000 m
 Length of spur cable: ≤ 30 m
 Length of splice: ≤ 1 m

At each end of the trunk cable an approved infallible line termination with following parameters is suitable:
 $R = 90...100$ Ohm $C = 0...2.2$ μ F

One of the allowed terminations might already be integrated in the associated apparatus. The number of passive apparatus 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 trunk and all spur cables), the inductance and the capacitance of the cable will not impair the intrinsic safety of the installation.

Notes:

Intrinsically safe Class I, Div. 1, Groups A,B,C,D

1. Approved associated apparatus must be installed in accordance with manufacturers instructions.
2. FM approved associated apparatus must meet the following parameters:
 U_0 or V_{oc} or $V_i \leq U_i$ (V_{max}) and I_0 or I_{sc} or $I_i \leq I_i$ (I_{max}) and P_0 or $P_{max} \leq P_i$ (P_{max})
3. The maximum non-hazardous area voltage must not exceed 250V
4. The installation must be in accordance with the National Electrical Code NFPA 70, and ANSI/ISA-Rp 12.6, (except chapter 5).
5. Multiple earthing of screen is allowed only, if high integrity equipotential system is realized between the points of bonding (see drawing No. FES 0014).
6. Caution: Use only supply wires suitable for 5°C above surrounding temperature.
7. Warning : Substitution of components may impair intrinsic safety.
8. The polarity for connection PA+ (26) and PA- (27) is of no importance due to an internal rectifier.

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

NONHAZARDOUS LOCATION

PROMAG 5*-*****F**
PROFIBUS PA: PA+(26) PA-(27) (FISCO-Model)

$U_i (V_{max}) = 30$ V $C_i \leq 5$ nF
 $I_i (I_{max}) = 500$ mA $L_i \leq 10$ μ H
 $P_i (P_{max}) = 5.5$ W

Leakage current: ≤ 50 μ A

Apparatus provides galvanic isolation up to 250V rms between fieldbus circuit and any other circuit

Temperature Classification: **T6**
 Max. ambient Temperature: **50°C / 122°F**

Any FM Approved Intrinsic Safe Apparatus suitable for FISCO Concept

Any FM Approved Termination with $R = 90...100\Omega$ $C = 0...2.2 \mu F$

Keine Änderungen ohne vorherige Factory Mutual Genehmigung

Nonintrinsically safe signal output:

- 4) Transmitter circuit wiring in conduit in accordance with NEC ANSI/NFPA 70.
- 5) **WARNING: EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 1.**
- 6) Control room equipment may not use or generate over 250 Vrms.

PROMAG Type: 5*-*****K**
Terminals 26,27 (FIELDBUS FOUNDATION NON I.S.):
 $V \leq 32$ V, $I = 10$ mA

Änderungen:	A	B	C	D	E	F	G	H	I	J	K

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Ersetzt durch:
 Ersatz für: **ID 1006**
 Ersteller: FES / ID 1006
 File: M:ZEICHNUNG\FES0023\001027C.DOC

FM Control Drawing Div. 1 / Zone 1
PROMAG 5. W / P / H
Intrinsically safe PROFIBUS PA
FISCO-Concept

FES0023-0000FOA 4/5

Endress + Hauser

13

NON HAZARDOUS LOCATION

ENTITY APPROVED Barrier
 V_{oc} Barrier I_{sc} Barrier
 C_a Barrier L_a Barrier

ENTITY APPROVED Supply
 $V_{max} = 30V$
 $P_{max} = 600mW$

HAZARDOUS LOCATION
 Cl. I, II, III Div. 1 Group A,B,C,D,E,F,G or
 Cl. I Div. 2 Group A,B,C,D, and Cl.II,III Div.1 Group E,F,G

IS - HART
 IS - Passive frequency
 Power Supply

Notes:

- 1) Use supply wires suitable for 5 °C above surrounding ambient, but at least for 80°C / 176°F.
- 2) Wire all intrinsically circuits per ISA RP 12.6. or in conduit per NEC ANSI/NFPA 70
- 3) **WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.**
- 4) Control room equipment may not use or generate more than 250 Vrms.

Intrinsically safe signal output:

- 2) Wire all intrinsically circuits per ISA RP 12.6. or in conduit per NEC ANSI/NFPA 70
- 3) **WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.**
- 4) Control room equipment may not use or generate more than 250 Vrms.

PROMAG Type: 53* **.....S
Terminals: 26, 27 (HART current output):
 Active intrinsically safe circuit.

V_{oc} / U_o	I_{sc} / I_o	P_{max} / P_o	C_a / C_o	L_a / L_o
21.8 V	90 mA	490 mW	0.15 µF	4.1 mH

V_{max} / U_i	I_{max} / I_i	P_{max} / P_i	C_i	L_i
30 V	10 mA	300 mW	6 nF	0

Cable parameters for Intrinsic Safety:
 $C_{cable} \leq 0.15 \mu F$ if V_{oc} (of Barrier) $\leq 21.8 V$
 $C_{cable} \leq C_a$ Barrier - 6 nF if V_{oc} (of Barrier) $\geq 21.8 V$
 $L_{cable} \leq 4.1 mH$

Terminals 24, 25 (Passive intrinsically safe circuit):

V_{max} / U_i	I_{max} / I_i	P_{max} / P_i	C_i	L_i
30 V	300 mA	600 mW	6 nF	0

Entity approved supply must meet the following requirements:
 V_{oc}, V_i or $U_o \leq V_{max}$ P_{max} or $P_o \leq P_{max} / P_i$
 Cable parameters for Intrinsic Safety:
 $C_{cable} \leq C_a (C_o) - 6 nF$ $L_{cable} \leq L_a (L_o)$

PROMAG Type: 53* **.....T
Terminals: 26, 27 (HART current output):
 Passive intrinsically safe circuit:

V_{max} / U_i	I_{max} / I_i	P_{max} / P_i	C_i	L_i
30 V	100 mA	1.25 W	6 nF	negligible

Connect to entity approved Barrier with
 V_{oc}, V_i or $U_o \leq V_{max} / U_i$
 I_{sc}, I_i or $I_o \leq I_{max} / I_i$

Cable parameters for Intrinsic Safety:
 $C_{cable} \leq C_a$ Barrier OR C_o Barrier - 6 nF
 $L_{cable} \leq L_a$ Barrier OR L_o Barrier

Terminals 24, 25 (Passive intrinsically safe circuit):

V_{max} / U_i	I_{max} / I_i	P_{max} / P_i	C_i	L_i
30 V	300 mA	600 mW	6 nF	0

Entity approved apparatus must meet the following requirements:
 V_{oc}, V_i or $U_o \leq V_{max}$ P_{max} or $P_o \leq P_{max} / P_i$
 Cable parameters for Intrinsic Safety:
 $C_{cable} \leq C_a (C_o) - 6 nF$ $L_{cable} \leq L_a (L_o)$

Keine Änderungen ohne vorherige Factory Mutual Genehmigung

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	B		G		Ersetzt für:
	C		H		Ersteller: FES / ID 1006
	D		I		File: M32promag04519810010271u.doc
	E		K		

FM CONTROL DRAWING Cl.1, Div. 1
PROMAG 5. W / P / H
Entity concept Comdul HART IS

Massstab

Gezeichnet	27.09.00	Bn
Geprüft		
Ex-geprüft	27.09.00	Bn
Gesehen		

Flowtec AG, Kaegenstrasse 7, CH-4153 Reinach BL1, Postfach

FES0023-0000F0A **5/5**



**Supplementary
documentation**

TI 046D/06

TI 047D/06

TI 048D/06

USA

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Fax. (07621) 975 345

PROline promag 53 Division 1

**Ex documentation
for the BA 053D and BA 054D operating instructions
according to CANADIAN STANDARDS ASSOCIATION**



Example: **Class I, Division 1, Groups ABCD**

Canadian Standards Association

Class		
I	Class I (Gas)	
II	Class II (Dust)	
III	Class III (Fibre)	

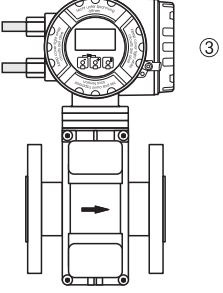
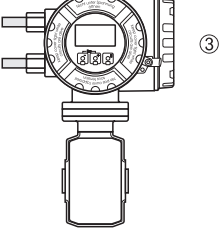
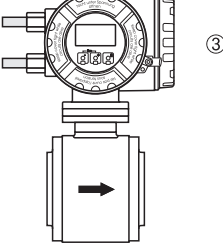
Division	
1	Division 1
2	Division 2

Group		
CSC / NEC	Gases, vapours and dusts (Examples)	Min. ignition temperature [μ J]
A	Acetylene, carbon disulfide (Class I)	0.02
B	Hydrogen, ethyl nitrate (Class I)	0.02
C	Ethylene, isoprene (Class I)	0.06
D	Acetone, ethane, benzene (Class I)	0.18
E	Metallic powder (Class II)	
F	Coal dust (Class II)	
G	Grain dust (Class II)	
	Textile fibres (Class III)	

Type of Protection	
	Explosionproof
	Intrinsically Safe Apparatus
	Associated Apparatus with Intrinsically Safe Connections
	Nonincendive Field Wiring Circuit
	Pressurized
	Associated Pressurization Systems/Components
	Nonincendive
	Dust-Ignitionproof
	Special Protection

Temperature Class		
CSA	Maximum surface temperature	
T1	450 °C	842 °F
T2	300 °C	572 °F
T2A	280 °C	536 °F
T2B	260 °C	500 °F
T2C	230 °C	446 °F
T2D	215 °C	419 °F
T3	200 °C	392 °F
T3A	180 °C	356 °F
T3B	165 °C	329 °F
T3C	160 °C	320 °F
T4	135 °C	275 °F
T4A	120 °C	248 °F
T5	100 °C	212 °F
T6	85 °C	185 °F



Hazardous area		Safe area
Division 1 / Zone 1	Division 2 / Zone 2	
<p>Promag 53 P = DN 15...300 W = DN 65...300</p> 		
<p>Promag 53 H = DN 2...25</p> 	<p>Promag 53 H = DN 40...100</p> 	
Division 1 / Zone 1	Division 2 / Zone 2	
Hazardous area		Safe area

F06-53-xxxZZ-16-xx-xx-en-001

- Promag 53 PROFIBUS-PA flow measuring system in:
Explosionproof and Dust-Ignitionproof for
Class I, Groups ABCD or Class I, Zone I, Group IIC
Class II, Groups EFG
Class III
- For ambient and medium temperature ranges, and temperature class, see Page 3.

③ Transmitter terminal compartment
power supply / I/O-cable

Temperature tables

Measuring system Promag 53 PROFIBUS-PA (compact version)

<i>at $T_a = 40\text{ °C}$</i>		Max. medium temperature [°C] in			
		T5	T4A	T4	T3C
Promag H	DN 2...100	80	95	130	150
Promag P	DN 25...200 (PFA lining)	80	95	130	150
Promag P	DN 15...300 (PTFE lining)	80	95	130	–
Promag W	DN 65...300 (hard-rubber lining)	80	–	–	–

<i>at $T_a = 45\text{ °C}$</i>		Max. medium temperature [°C] in			
		T5	T4A	T4	T3C
Promag H	DN 2...100	80	95	130	–
Promag P	DN 25...200 (PFA lining)	80	95	130	–
Promag P	DN 15...300 (PTFE lining)	80	95	130	–
Promag W	DN 65...300 (hard-rubber lining)	80	–	–	–

<i>at $T_a = 50\text{ °C}$</i>		Max. medium temperature [°C] in			
		T5	T4A	T4	T3C
Promag H	DN 2...100	80	95	–	–
Promag P	DN 25...200 (PFA lining)	80	95	–	–
Promag P	DN 15...300 (PTFE lining)	80	95	–	–
Promag W	DN 65...300 (hard-rubber lining)	80	–	–	–

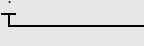


Note!

At the specified medium temperatures, the equipment is not subjected to temperatures impermissible for the temperature class in question.

Approvals

No. / approval type	Description
Approval 160686-1111289 (See Page 5 for notes on special conditions)	for the electric flow measuring system Promag 53 PROFIBUS-PA Identification: Explosionproof and Dust-Ignitionproof for Class I, Groups ABCD or Class I, Zone I, Group IIC Class II, Groups EFG Class III

Measuring system Promag 53 PROFIBUS-PA (compact version)	
Promag 53***-***** 	F = PROFIBUS-PA "intrinsically safe"
Promag 53 H DN 2...100: Promag 53 P DN 15...300: Promag 53 W DN 65...300:	See description above

Notified body

The Promag measuring system was tested for approval by the following named entity:

CSA: Canadian Standards Association

Special conditions

1. Control room equipment shall not use or generate more than 250 V rms.
2. Ratings for devices connected to terminals Nos. 20 to 27 of the Promag 53 PROFIBUS-PA transmitter must not exceed $U_m = 250$ V and $I_m = 500$ mA: it is impermissible to connect devices with higher ratings to these terminals.
3. Install per Canadian Electrical Code.
4. It is not permissible to connect the service adapter in explosive atmospheres.



Caution!

5. Use supply wires suitable for 5 °C above ambient temperature, but at least for 80 °C.

General warnings



Warning!

- Installation, connection to the electricity supply, commissioning and maintenance of the devices must be carried out by qualified specialists trained to work on Ex-rated devices.
- Compliance with national regulations relating to the installation of devices in potentially explosive atmospheres is mandatory, if such regulations exist.
- Open the device only when it is de-energized (and after a delay of at least 10 minutes following shutdown of the power supply).
- The housing of the Ex-rated transmitter can be turned in 90° steps. Whereas the non-Ex version has a bayonet adapter, however, the Ex version has a thread. Recesses for centering the worm screw are provided to prevent inadvertent movement of the transmitter housing.
It is permissible to turn the transmitter housing through a maximum of 180° during operation (in either direction), without compromising explosion protection. After turning the housing the worm screw must be tightened again.
- The screw cap has to be removed before the local display can be turned, and this must be done with the device de-energized (and after a delay of at least 10 minutes following shutdown of the power supply).

Electrical connections

Power supply connection

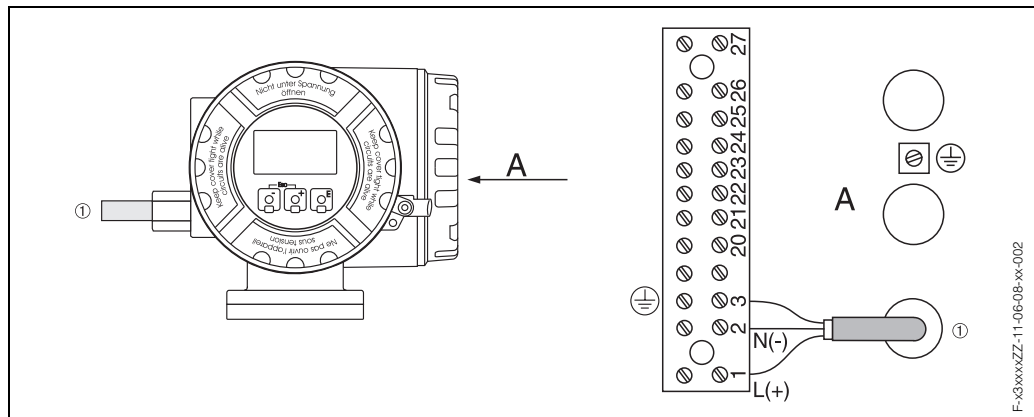


Fig. 1: ① = power supply cable
A = view A

The table below contains the values that are identical for all versions, irrespective of the type code.

Transmitter Promag 53

Terminals	1	2	3
	L (+)	N (-)	
Designation	Power supply ①		Ground
Functional values	AC: U = 85...260 V or AC: U = 20...55 V or DC: U = 16...62 V Power consumption: 15 VA / 15 W		
Intrinsically safe circuit	no		
U _{max} =	260 V AC		

Input/output circuit connections

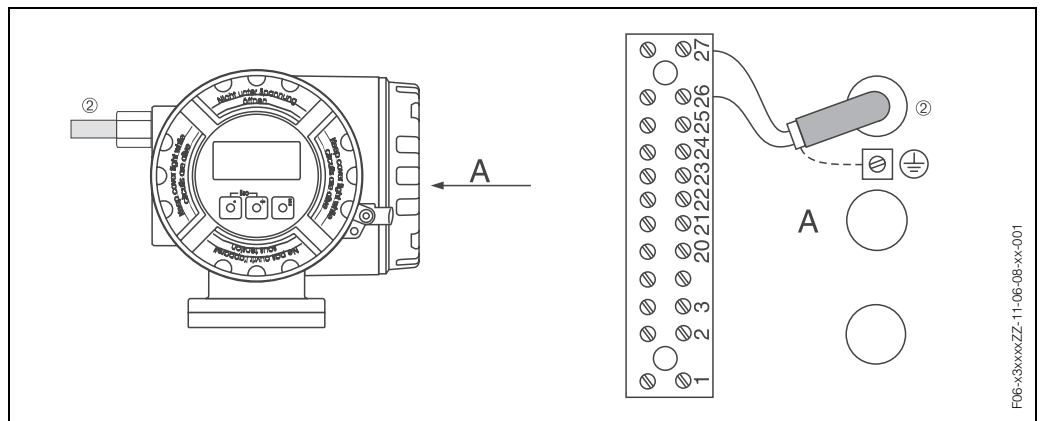


Fig. 2: Ⓜ = bus cable
A = view A



Note!

The table below contains the values that are not identical for all versions, in other words which depend on the type code (type of device). Always remember to compare the type code in the table with the code on the nameplate of your device.

Transmitter Promag 53***.*****F

Terminals	20	21	22	23	24	25	26	27
	+	-	+	-	+	-	+	-
Designation							PROFIBUS-PA Ⓜ	
Functional values: U_B = operating voltage I_B = base current							$U_B = 9...32$ V DC $I_B = 11$ mA	
Intrinsically safe circuit							yes	
$U_i =$							30 V DC	
$I_i =$							500 mA	
$P_i =$							5.5 W	
$L_i =$							10 μ H	
$C_i =$							5 nF	

Explanation of the FISCO model (PROFIBUS-PA)

The FISCO model makes possible the interconnection of intrinsically safe apparatus and one intrinsically safe associated apparatus, without having to have separate certification for respective connections.

The criteria for the intrinsic safety of an interconnection (bus segment) is given under the following interrelationships:

- U_i , I_i and P_i of the field device is $\geq U_o$, I_o and P_o of the associated equipment (segment coupler).
- C_i and L_i of the field device is ≤ 5 nF and 10 μ H.
- There is only one source within an interconnection (bus segment). This source is normally the associated equipment (segment coupler), which terminates the cable.
- Every field device takes a constant base current (approx. 11 mA) and behaves as a passive current sink. When the field device transmits, no power is fed into that bus segment.
- Independently powered devices (four-core device) must ensure galvanic isolation from the bus segment.
- At each end of the trunk cable an approved line terminator is suitable.
(In most of the times, one terminator is integrated in the associated equipment).
- Cable parameters and length restrictions are respected (see Page 10).
 - Maximum net elongation (1000 m)
 - Maximum spur length (30 m)
 - Specific inductance (0.4...1 mH/km)
 - Specific capacitance (80...200 nF/km)
 - Loop resistance (15...150 Ω /km)

Service adapter

The service adapter is exclusively for connection to E+H approved service interfaces.



Warning!

It is not permissible to connect the service adapter in explosive atmospheres.

Device fuse



Warning!

Use only fuses of the following types; the fuses are installed on the power supply board:

- Voltage 20...55 V AC / 16...62 V DC:
fuse 2.0 A slow-blow, disconnect capacity 1500 A
(Schurter, 0001.2503 or Wickmann, Standard Type 181 2.0 A)
- Voltage 85...260 V AC:
fuse 0.8 A slow-blow, disconnect capacity 1500 A
(Schurter, 0001.2507 or Wickmann, Standard Type 181 0.8 A)

Potential equalisation with shielding grounded at both ends

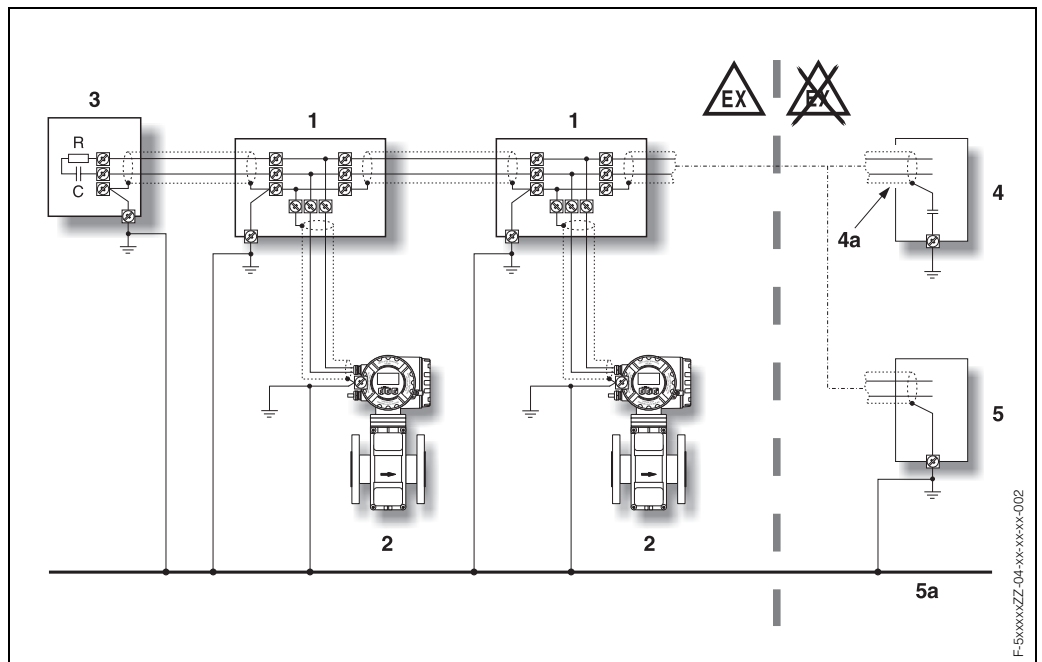


Fig. 3: Examples of the connection of potential equalisation lines

- 1 = distributor/T-Box
- 2 = Promag 53 bus devices for hazardous area
- 3 = bus termination: $R = 90 \dots 100 \Omega$, $C = 0 \dots 2.2 \mu F$
- 4 = PROFIBUS power supply variant 4a
- 4a = shielding connected via capacitor
- 5 = PROFIBUS power supply variant 5a
- 5a = potential equalisation line led out

Variant 4/4a:

With capacitive grounding of the shielding in the safe area the potential equalisation line does not need to be led out of the safe area.

Use small capacitors (e.g. 1 nF, 1500 V, dielectric strength, ceramic).

The total capacitance connected at the shielding must not exceed 10 nF.

Variant 5/5a:

Potential equalisation line is led out of the safe area.

Cable entries

For number reference see the figure on Page 2.

- ③ Cable entries for the transmitter terminal compartment (XP version)
power supply / I/O-cable: (Promag 53***-****N*****)
Thread 1/2" NPT.

Make sure that the XP cable entries are secured to prevent working loose.

Cable specifications for PROFIBUS-PA

	Cable type A (reference)	Cable type B
<i>Cable construction</i>	twisted pair, shielded	one or more twisted pairs, fully shielded
<i>Core cross-section (nominal)</i>	0.8 mm ² (AWG 18)	0.32 mm ² (AWG 22)
<i>Loop resistance (direct current)</i>	44 Ω/km	112 Ω/km
<i>Impedance at 31.25 kHz</i>	100 Ω ±20%	100 Ω ±30%
<i>Attenuation constant at 39 kHz</i>	3 dB/km	5 dB/km
<i>Capacitive unsymmetry</i>	2 nF/km	2 nF/km
<i>Envelope delay distortion (7.9...39 kHz)</i>	1.7 μs/km	-
<i>Degree of voltage of shielding</i>	90%	-
<i>Max. bus segment length (incl. spur lines)</i>	1000 m	1000 m
<i>Specific inductance</i>	0.4...1.0 mH/km	
<i>Specific capacitance</i>	80...200 nF/km	
<i>Loop resistance</i>	15...150 Ω/km	
<i>Max. spur length</i>	≤ 30 m	

Technical data

Differences in dimensions and weights due to the use of an XP housing:

- Height + 0.6 inch more than the standard version (see Operating Instructions)
- Weight + approx. 4.4 lbs more than the standard version (see Operating Instructions)

Device identification

Promag 53 PROFIBUS-PA transmitter and W/P/H sensor

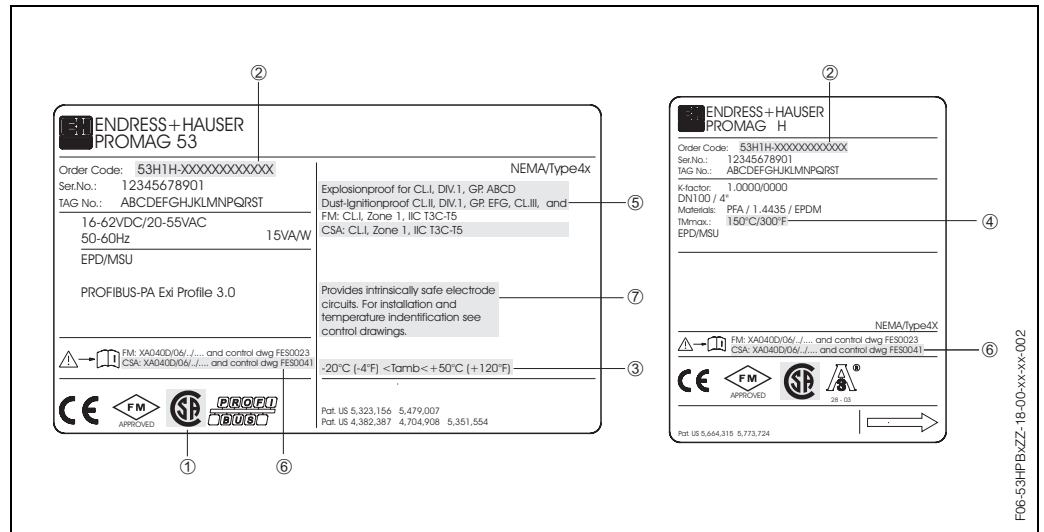


Fig. 4: Nameplate of transmitter and nameplate of sensor (example)



Key to nameplates (Figure 5)

No.	Meaning	No.	Meaning
①	Label of the notified body: Canadian Standards Association	⑤	Type of protection and explosion group for the Promag 53 PROFIBUS-PA measuring system
②	Type code	⑥	Applicable Ex documentation
③	Ambient temperature range	⑦	Warning
④	Maximum medium temperature		

Control drawings

Endress+Hauser Reinach hereby declares that the product is in conformity with the requirements of the CADADIAN STANDARDS ASSOCIATION.

Hazardous Locations
Class I Division 1 Groups ABCD or Class I Zone 1 Groups IIC
and Class II and III Division 1 Groups EFG

Promag 5. W / P
Promag 5. H

PROMAG 50 P / H and PROMAG 53 W / P / H

Temperature table

Max. ambient temperature	Max. medium temperature depending temperature classes			
	T5	T4A	T4	T3C
50 °C / 122°F	50 °C / 122°F	110 °C / 230°F		
45 °C / 113°F	50 °C / 122°F	110 °C / 230°F	130 °C / 266°F	
40 °C / 104°F	50 °C / 122°F	110 °C / 230°F	130 °C / 266°F	150 °C / 302°F


Max. allowed medium temperature depending liner material

Liner material	Max. medium temperature
PU (polyurethan)	60 °C / 140°F
HG (hard rubber)	80 °C / 176°F
PTFE	130 °C / 266°F
PFA	150 °C / 302°F

WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.

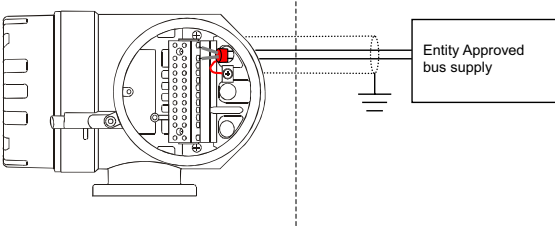
Notes:

- Control room equipment shall not use or generate more than 250 V rms.
- Caution: Use supply wires suitable for 5 °C above ambient temperature, but at least for 80 °C / 176°F.
- Class II Group G: The surface temperature of the apparatus cannot exceed 165 °C / 329°F.
- Install per Canadian Electrical Code

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CSA Control Drawing Div. 1 / Zone 1 Class I Zone 1 PROMAG 5x compact version				Gezeichnet 12.04.00 Bn Geprüft Ex-geprüft 28.09.00 Bn Gesehen
 Flowtec AG, Kaegenstrasse 7, CH-4153 Reinach BL1, Postfach				FES0041-0000C0A 1/5

HAZARDOUS LOCATIONS
Cl. I Div. 1 Groups A,B,C,D
Cl. I Zone 1 Group IIC
Cl. I Div. 2 Group A,B,C,D
Cl. I Zone 2 Group IIC
Cl. II, III Div. 1 Group E,F,G

NON HAZARDOUS LOCATIONS



Notes:

Intrinsically safe signal output:


- Wire intrinsically safe circuits per ISA RP 12.6. or in conduit per Canadian Electrical Code.
- WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.**
- Control room equipment may not use or generate more than 250 V rms.

PROMAG Type: 5**,*****F**
Terminals: 26 (+), 27 (-) (Profibus PA):
Passive intrinsically safe PROFIBUS PA circuit:
For connecting the intrinsically safe circuit (PROFIBUS PA) according to the FISCO-CONCEPT see page 4 of this control document.

Nonintrinsically safe signal output:

- Transmitter circuit wiring in accordance with Canadian Electrical Code.
- WARNING: EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 1 OR CLASS I, ZONE 1**
- Control room equipment may not use or generate over 250 Vrms.

PROMAG Type: 5**,*****H**
Terminals 26 (+), 27 (-) (PROFIBUS PA)
V ≤ 32 V, I = 10 mA
PROMAG Type: 5**,*****J**
Terminals 24 (+5V), 25 (GND), 26 (DPA), 27 (DPB) (PROFIBUS DP)
Terminals: +5V, GND, DPA, DPB
V = 5 V, I = 100 mA

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CSA Control Drawing Div. 1 / Zone 1 PROMAG 5. W / P / H PROFIBUS PA / IS installation PROFIBUS PA / DP non-IS installation				Gezeichnet 12.04.00 Bn Geprüft Ex-geprüft 28.09.00 Bn Gesehen
 Flowtec AG, Kaegenstrasse 7, CH-4153 Reinach BL1, Postfach				FES0041-0000C0A 2/5

HAZARDOUS LOCATIONS
 Cl. I Div. 1 Groups A,B,C,D
 Cl. I Zone 1 Group IIC
 Cl. I Div. 2 Group A,B,C,D
 Cl. I Zone 2 Group IIC
 Cl. II, III Div. 1 Group E,F,G

NON HAZARDOUS LOCATIONS

Notes:

Intrinsically safe signal output:

- 1) Wire all intrinsically circuits per ISA RP 12.6. or in conduit per Canadian Electrical Code Part I
- 2) **WARNING:** SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
- 3) Control room equipment may not use or generate more than 250 Vrms.

PROMAG Type: 5**_*****G**
Terminals: 26, 27 (Foundation Fieldbus):
 Intrinsically safe circuit:

V_{max} / U_i	I_{max} / I_i	P_{max} / P_i	C_i	L_i
30 V	500 mA	5.5 W	≤ 5 nF	≤ 10 μ H

Connect to entity approved associated apparatus with I_{sc} or $I_o \leq I_{max}$ or I_i and V_{oc} or $U_o \leq V_{max}$ or U_i ($P_o \leq P_{max}$ or P_i)
 Cable parameters for Intrinsic Safety:
 $C_{cable} \leq C_a / C_o - \Sigma C_i$
 $L_{cable} \leq L_a / L_o - \Sigma L_i$ or $L/R_{cable} \leq L/R_{Associated Apparatus}$ and L_i of each I.S. apparatus ≤ 10 μ H

Nonintrinsically safe signal output:

- 4) Transmitter circuit wiring in accordance with Canadian Electrical Code.
- 5) **WARNING:** EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 1 OR CLASS I, ZONE 1.
- 6) Control room equipment may not use or generate over 250 Vrms.

PROMAG Type: 5**_*****K**
Terminals: 26, 27 (FIELDBUS FOUNDATION NON I.S.)
 $V \leq 32$ V, $I = 10$ mA

A	28.09.00 / Bn	F
B		G
C		H
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E		K

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Gezeichnet: 12.04.00 Bn
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 Ex-geprüft: 28.09.00 Bn
 Gesehen:

CSA Control Drawing Div. 1 / Zone 1
PROMAG 5. W / P / H
Fieldbus Foundation I.S. installation

FES0041-0000C0A
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FISCO CONCEPT

The FISCO Concept allows interconnection of intrinsically safe apparatus to associated apparatus not specially examined in such combination. The criteria for interconnection is that the voltage (U_i or V_{max}), the current (I_i or I_{max}), and the power (P_i or P_{max}) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (U_o or V_{oc}), the current (I_o or I_{sc}) and the power (P_o or P_{max}) levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance (C_i) and inductance (L_i) of each apparatus (other than the termination) connected to the fieldbus must be less than or equal to 5 nF and 10 μ H 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_o or V_{oc} of the associated apparatus is limited to a range of 14V to 24V 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 a leakage current of 50 μ A 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 parameter in the following range:

Loop Resistance R' :	15...150 Ohm/km
Inductance per unit length L' :	0.4...1 mH/km
Capacitance per unit length C' :	80...200 nF

$C' = C_{line}/line + 0.5 C'_{line}/screen$, if both lines are floating, or
 $C' = C_{line}/line + C'_{line}/screen$, if the screen is connected to one line

Length of trunk cable: ≤ 1000 m
 Length of spur cable: ≤ 30 m
 Length of splice: ≤ 1 m

At each end of the trunk cable an approved infallible line termination with following parameters is suitable:
 $R = 90...100$ Ohm $C = 0...2.2$ μ F

One of the allowed terminations might already be integrated in the associated apparatus. The number of passive apparatus 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 trunk and all spur cables), the inductance and the capacitance of the cable will not impair the intrinsic safety of the installation.

Notes:
Intrinsically safe Class I, Div.1, Groups A,B,C,D

1. Approved associated apparatus must be installed in accordance with manufacturers instructions.
2. CSA approved associated apparatus must meet the following parameters:
 U_o or $V_{oc} \leq U_i$ (V_{max}) and I_o or $I_{sc} \leq I_i$ (I_{max}) and P_o or $P_{max} \leq P_i$ (P_{max})
3. The maximum non-hazardous area voltage must not exceed 250V
4. The installation must be in accordance with the Canadian Electrical Code
5. Multiple earthing of screens is allowed only, if high integrity equipotential system is realized between the points of bonding (see drawing No. FES 0014).
6. Caution: Use only supply wires suitable for 5°C above surrounding temperature.
7. Warning : Substitution of components may impair intrinsic safety.
8. The polarity for connection PA+ (26) and PA- (27) is of no importance due to an internal rectifier.

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

NONHAZARDOUS LOCATION

PROMAG 5**_*****F**
PROFIBUS PA: PA+(26) PA-(27) (FISCO-Model)
 U_i (V_{max}) = 30 V $C_i \leq 5$ nF
 I_i (I_{max}) = 500 mA $L_i \leq 10$ μ H
 P_i (P_{max}) = 5.5 W

Leakage current : ≤ 50 μ A

Apparatus provides galvanic isolation up to 250V rms between fieldbus circuit and any other circuit

Temperature Classification:
 Max. ambient Temperature: 50°C / 122°F

Any CSA Approved Termination with $R = 90...100$ Ω $C = 0...2.2$ μ F

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CSA Control Drawing Div. 1 / Zone 1
PROMAG 5. W / P / H
Intrinsically safe PROFIBUS PA
FISCO Concept

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Endress + Hauser

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NON HAZARDOUS LOCATION

CSA Certified Barrier or Associated Apparatus
 V_{OC} / U_O Barrier I_{SC} / I_O Barrier
 C_a / C_O Barrier L_a / L_O Barrier

CSA Certified Barrier or Associated Apparatus
 $V_{max} = 30V$
 $P_{max} = 600 mW$

HAZARDOUS LOCATION
 Cl. I, II, III Div. 1 Group A,B,C,D,E,F,G or
 Cl. I Div. 2 Group A,B,C,D, and Cl.II,III Div.1 Group E,F,G

IS - HART
 IS - Passive frequency
 Power Supply

Notes:
 1) Use supply wires suitable for 5 °C above surrounding ambient, but at least for 80°C / 176°F.
 2) Wire all intrinsically circuits per Canadian Electrical Code
 3) **WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.**
 4) Control room equipment may not use or generate more than 250 Vrms.

Intrinsically safe signal output:

PROMAG Type: 53* **_***T**
Terminals: 26, 27 (HART current output):
 Active intrinsically safe circuit:

V_{OC} / U_O	I_{SC} / I_O	P_{max} / P_O	C_a / C_O	L_a / L_O
21.8 V	90 mA	490 mW	0.15 μF	4.1 mH

Terminal 26, 27 (HART current output):
 Active intrinsically safe circuit:

V_{max} / U_i	I_{max} / I_i	P_{max} / P_i	C_i	L_i
30 V	10 mA	300 mW	6 nF	0

Cable parameters for Intrinsic Safety:
 $C_{cable} \leq 0.15 \mu F$ if V_{OC} / U_O (of Barrier) $\leq 21.8 V$
 $C_{cable} \leq C_a / C_O$ Barrier - 6 nF if V_{OC} / U_O (of Barrier) $\geq 21.8 V$
 $L_{cable} \leq 4.1 mH$

Terminals 24, 25 (Passive intrinsically safe circuit):

V_{max} / U_i	I_{max} / I_i	P_{max} / P_i	C_i	L_i
30 V	300 mA	600 mW	6 nF	0

Entity approved supply must meet the following requirements:
 V_{OC} or $U_O \leq V_{max} / U_i$ P_{max} or $P_O \leq P_{max} / P_i$
 Cable parameters for Intrinsic Safety:
 $C_{cable} \leq C_a (C_O) - 6 nF$ $L_{cable} \leq L_a (L_O)$

PROMAG Type: 53* **_***T**
Terminals: 26, 27 (HART current output):
 Passive intrinsically safe circuit:

V_{max} / U_i	I_{max} / I_i	P_{max} / P_i	C_i	L_i
30 V	100 mA	1.25 W	6 nF	negligible

Connect to entity approved Barrier with
 V_{OC} or $U_O \leq V_{max} / U_i$
 I_{SC} or $I_O \leq I_{max} / I_i$
 Cable parameters for Intrinsic Safety:
 $C_{cable} \leq C_a$ Barrier or C_O Barrier - 6 nF
 $L_{cable} \leq L_a$ Barrier or L_O Barrier

Terminals 24, 25 (Passive intrinsically safe circuit):

V_{max} / U_i	I_{max} / I_i	P_{max} / P_i	C_i	L_i
30 V	300 mA	600 mW	6 nF	0

Entity approved apparatus must meet the following requirements:
 V_{OC} or $U_O \leq V_{max}$ P_{max} or $P_O \leq P_{max} / P_i$
 Cable parameters for Intrinsic Safety:
 $C_{cable} \leq C_a (C_O) - 6 nF$ $L_{cable} \leq L_a (L_O)$

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CSA CONTROL DRAWING Cl.1, Div. 1
PROMAG 5. W / P / H
Entity concept Commodul HART IS

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Flowtec AG, Kaegestrasse 7, CH-4153 Reinach BL1, Postfach

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**Supplementary
documentation**

TI 046D/06
TI 047D/06
TI 048D/06

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