Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Safety Instructions

Proline Prowirl 72, 73

HART/PROFIBUS PB/FOUNDATION Fieldbus
IS (Ex-i Intrinsically safe version)

Division 1
Documentation for hazardous location Cl.I Div.1

Safety instructions for electrical apparatus for explosion-hazardous areas according to FACTORY MUTUAL standards →Page 3

Safety instructions for electrical apparatus for explosion-hazardous areas according to CANADIAN STANDARDS ASSOCIATION →Page 17

XA096D/06/en/12.05
71001367

Endress+Hauser
People for Process Automation

Examples for markings according to FM and CSA:

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

Factory Mutual

Type of Protection

XP	Explosionproof
IS	Intrinsically Safe Apparatus
AIS	Associated Apparatus with Intrinsically Safe Connections
ANI	Associated Nonincendive Field Wiring Apparatus
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 dust examples	Min. ignition temperature [µJ]
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

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

Example: **Class I, Division 1, Group 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 dust examples	Min. ignition temperature [µJ]
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	Mill dust (Class II)	
	Textile fibres (Class III)	

Type of Protection

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

Temperature Class

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

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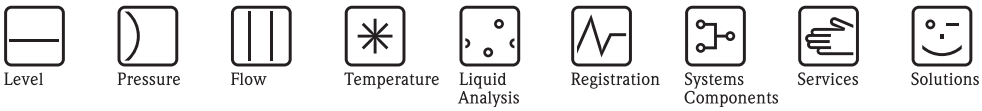


Safety Instructions

Proline Prowirl 72, 73

HART/PROFIBUS PB/FOUNDATION Fieldbus
IS (Ex-i Intrinsically safe version)

Division 1

FM Documentation for hazardous location Cl.I Div.1

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

- BA084D, Proline Prowirl 72 HART
- BA085D, Proline Prowirl 72 PROFIBUS PA
- BA095D, Proline Prowirl 72 FOUNDATION Fieldbus
- BA094D, Proline Prowirl 73 HART
- BA093D, Proline Prowirl 73 PROFIBUS PA
- BA096D, Proline Prowirl 73 FOUNDATION Fieldbus

Table of Contents FM

XA096D/06/en/12.05
71001367

Endress+Hauser
People for Process Automation

General warnings

- Any national regulations pertaining to the installation of devices in hazardous areas must be observed.
- Mounting, electrical installation, commissioning and maintenance of the devices may only be performed by technical staff trained in the area of explosion protection.
- Compliance with all of the technical data of the device (see nameplate) is mandatory.
- Substitution of components may impair intrinsic safety.

Special conditions

- The device must be integrated into the potential equalization system. Potential must be equalized along the intrinsically safe sensor circuits. Further information can be found in the “Potential equalization” chapter on Page 9.

Installation instructions

- The cable entries and openings not used must be sealed tight with suitable components.
- The measuring device must only be used in the permitted temperature class.
  The values of the individual temperature classes can be found in the temperature tables on Page 7.
- The manufacturer's specifications for all devices connected to the intrinsically safe circuits must be taken into consideration.
- To rotate the transmitter housing, please follow the same procedure as for non-Ex versions. The transmitter housing may also be rotated during operation.
- The continuous service temperature of the cable must correspond at least to the temperature range of –40 °F and up to +50 °F above the ambient temperature present (–40 °F ... (T_a +50 °F)).
- All equipment of the measuring system must be included in potential matching (see Page 10).
- The devices may only be used for fluids against which the wetted materials are sufficiently resistant.
- The service connector may not be connected in a potentially explosive atmosphere.
- Install per National Electrical Code. Install intrinsically safe circuits per NEC ANSI/ NFPA 70 and ISA RP 12.6 respecting the explosionproof integrity of the enclosure.

Approvals

General

The system meets the basic safety and health requirements for the design and construction of devices and protection systems designated for use in hazardous areas in accordance with the National Electrical Code.

Certification number

I.D. 3015769

Inspection authority

FM: Factory Mutual Research

Identification

The system identification must contain the following information:

Compact version and remote version (transmitter and sensor)	
Prowirl 72***-******N****A Prowirl 72***-******N****W Prowirl 72***-******N****H Prowirl 72***-******N****K Prowirl 73***-******N****A Prowirl 73***-******N****W Prowirl 73***-******N****H Prowirl 73***-******N****K	 Cl. I, Div. 1 Groups ABCD Cl. II, Div. 1 Groups EFG Cl. III Cl. I, Zone 0 AEx ia Group IIC

Caution!
The installation instructions for the safe use and application of the system must be observed → Page 4.

Description of the measuring system

The measuring system consists of a transmitter and a sensor. Two versions are available:

- Compact version:
  The transmitter and sensor form a mechanical unit.
- Remote version:
  The transmitter and sensor are mounted separate from one another and interconnected by means of a connecting cable (see also "Electrical connections" (→ Page 10) and "Cable specifications for connecting cable" (→ Page 9)).

Device identification

The nameplates, which are provided on the transmitter and sensor in a manner in which they are clearly visible, contain all the relevant information on the measuring system.

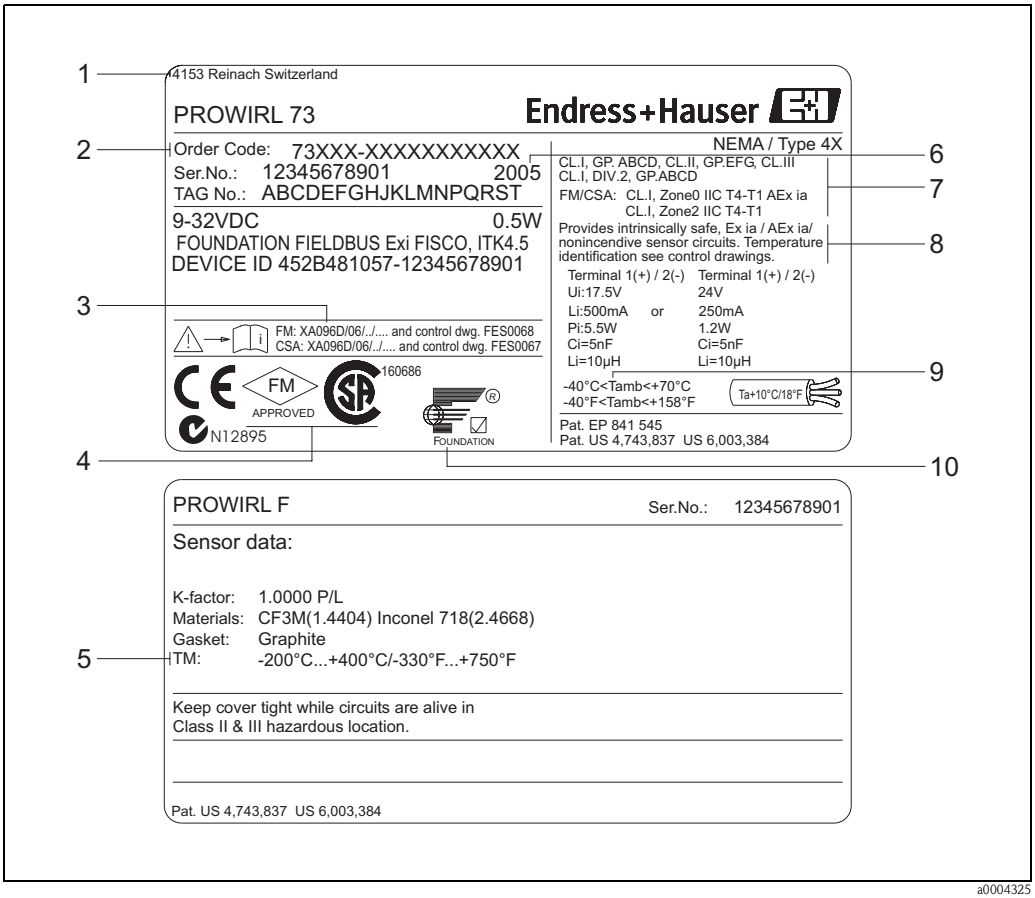
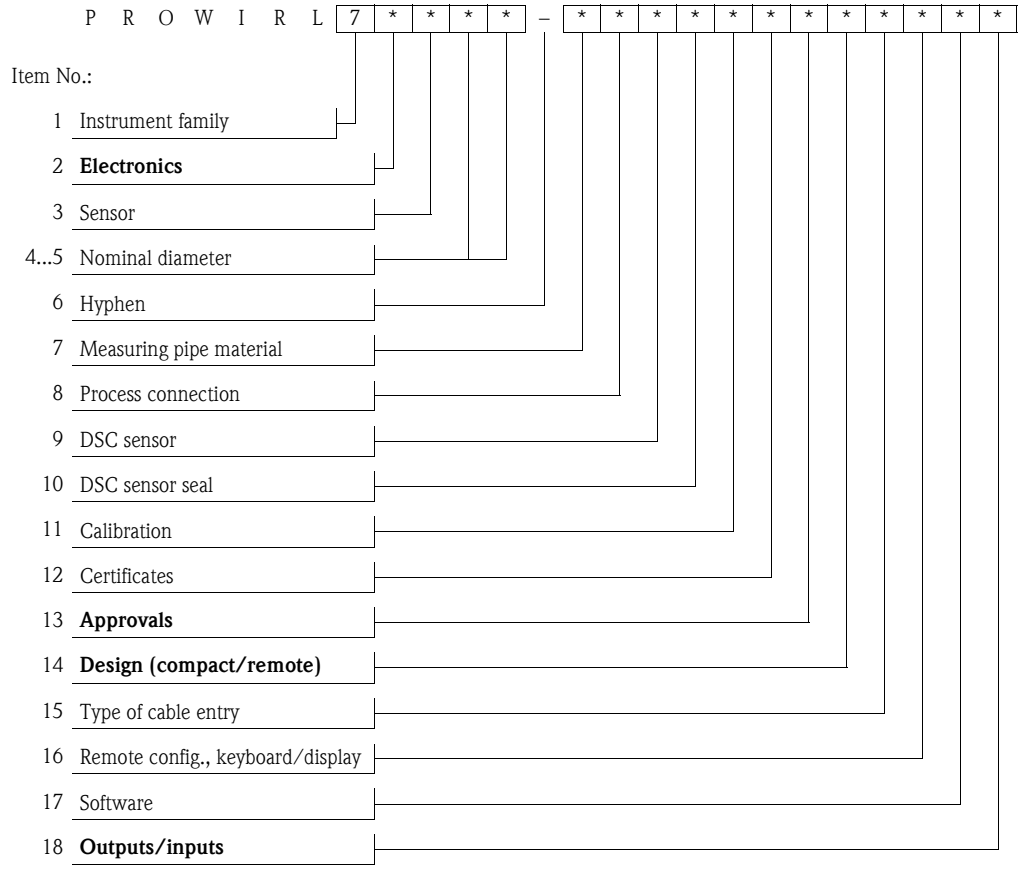


Fig. 1: Example for nameplates of a transmitter and a sensor

1 Production location
2 Type code (for an exact explanation of the type code, see the following section)
3 Applicable Ex documentation
4 Label of notified body: Factory Mutual Research
5 Maximum medium temperature
6 Year of manufacture
7 Type of protection and explosion group for the measuring system
8 Warning
9 Ambient temperature range
10 Communication type

Type code

The type code describes the exact design and equipment level of the measuring system.
It can be read off the nameplate of the transmitter and sensor and is structured as follows:



Electronics (Item No. 2 in type code → Page 6)

*	Transmitter	Electronics/housing
2	Prowirl 72	Intrinsically safe transmitter electronics
3	Prowirl 73	

Approvals (Item No. 13 in type code)

*	Approval	Sensor	Compact	Remote
N	Cl. I, Div. 1 Groups ABCD Cl. II, Div. 1 Groups EFG Cl. III Cl. I, Zone 0 AEx ia IIC	Prowirl F Prowirl W	DN 1/2"...12" DN 1/2"...6"	DN 1/2"...12" DN 1/2"...6"

Type (compact/remote; Item No. 14 in type code → Page 6)

*	Type	Application/zone	
A, J	Compact	Cl. I, Div. 1 Groups ABCD Cl. II, Div. 1 Groups EFG Cl. III Cl. I, Zone 0 AEx ia IIC	Outputs/inputs A/W [1]: T1-T6 Outputs/inputs H/K [1]: T1-T4
E, F, K, L	Remote	**Transmitter**	
		Cl. I, Div. 1 Groups ABCD Cl. II, Div. 1 Groups EFG Cl. III Cl. I, Zone 0 AEx ia IIC	Outputs/inputs A/W [1]: T1-T6 Outputs/inputs H/K [1]: T1-T4
		Sensor	
		Prowirl F DN 1/2"...12" Prowirl W DN 1/2"...6"	Cl. I, Div. 1 Groups ABCD Cl. II, Div. 1 Groups EFG Cl. III Cl. I, Zone 0 AEx ia IIC Outputs/inputs A/W [1]: T1-T6 Outputs/inputs H/K [1]: T1-T4

[1] Item No. 18 in type code → Page 6

Outputs/inputs (Item No. 18 in type code → Page 6)

*	Approval	
A, W	Cl. I, Div. 1 Groups ABCD Cl. II, Div. 1 Groups EFG Cl. III Cl. I, Zone 0 AEx ia IIC	Temperature Class: T1-T6
H, K	Cl. I, Div. 1 Groups ABCD Cl. II, Div. 1 Groups EFG Cl. III Cl. I, Zone 0 AEx ia IIC	Temperature Class: T1-T4

✎ Note!
A detailed explanation of these values with regard to the inputs and outputs available, as well as a description of the associated terminal assignments and connection data is provided on Page 9 onwards.

Compact version temperature table

Maximum fluid temperature [°F] depending on the ambient temperature T_a and the DSC sensor used (Item No. 9 in the type code → Page 6).

	T_a	T6 (185 °F)	T5 (212 °F)	T4 (275 °F)	T3 (392 °F)	T2 (572 °F)	T1 (842 °F)
Prowirl 72***-**0*********	–40 °F ... +104 °F	176	203	266	374	536	536
	–40 °F ... +140 °F	–	203	266	374	536	536
	–40 °F ... +158 °F	–	–	266	374	536	536
Prowirl 72***-**1********* Prowirl 72***-**2********* Prowirl 72***-**3********* Prowirl 72***-**6********* Prowirl 73***-**4********* Prowirl 73****-*7*********	–40 °F ... +104 °F	176	203	266	374	554	824
	–40 °F ... +140 °F	–	203	266	374	554	824
	–40 °F ... +158 °F	–	–	266	374	536	536

Dependency of the minimum fluid temperature T_{med} on the DSC sensor:

T_{med} –328 °F	T_{med} –58 °F	T_{med} –40 °F
Prowirl 72***-**1********* Prowirl 72***-**2********* Prowirl 72***-**3********* Prowirl 73***-**4********* Prowirl 73***-**7*********	Prowirl 72F***-**6*********	Prowirl 72***-**0*********

⚠ Warning!
For devices with outputs Prowirl 72***-**********H/K and 73***-**********H/K, temperature classes T5 and T6 are not permitted.

Remote version temperature table

Sensor

Maximum fluid temperature [°F] depending on the ambient temperature T_a and the DSC sensor used (Item No. 9 in the type code → Page 6).

	T_a	T6 (185 °F)	T5 (212 °F)	T4 (275 °F)	T3 (392 °F)	T2 (572 °F)	T1 (842 °F)
Prowirl 72***-**0*********	–40 °F ... +104 °F	176	203	266	374	536	536
	–40 °F ... +140 °F	–	203	266	374	536	536
	–40 °F ... +185 °F	–	–	266	374	536	536
Prowirl 72***-**1********* Prowirl 72***-**2********* Prowirl 72***-**3********* Prowirl 72***-**6********* Prowirl 73***-**4********* Prowirl 73****-*7*********	–40 °F ... +104 °F	176	203	266	374	554	824
	–40 °F ... +140 °F	–	203	266	374	554	824
	–40 °F ... +185 °F	–	–	266	374	554	824

Dependency of the minimum fluid temperature T_{med} on the DSC sensor:

T_{med} –328 °F	T_{med} –58 °F	T_{med} –40 °F
Prowirl 72***-**1********* Prowirl 72***-**2********* Prowirl 72***-**3********* Prowirl 73***-**4********* Prowirl 73***-**7*********	Prowirl 72F***-**6*********	Prowirl 72***-**0*********

⚠ Warning!
For devices with outputs Prowirl 72***-**********H/K and 73***-**********H/K, temperature classes T5 and T6 are not permitted.

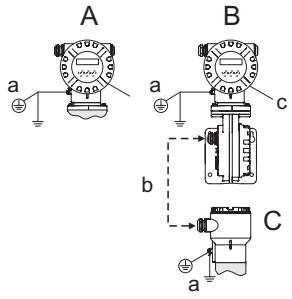
Transmitter

The minimum ambient temperature is –40 °F.
The maximum ambient temperature [°F] depending on the device used is:

	T6 (185 °F)	T5 (212 °F)	T4 (275 °F)	T3 (392 °F)	T2 (572 °F)	T1 (842 °F)
Prowirl 72***-**********A Prowirl 72***-**********W Prowirl 73***-**********A Prowirl 73***-**********W	104	140	176	176	176	176
Prowirl 72***-**********H Prowirl 72***-**********K Prowirl 73***-**********H Prowirl 73***-**********K	–	–	176	176	176	176

Design of the measuring system

Compact/remote version design



A Transmitter housing (compact/remote version)
B Transmitter housing (remote version)
C Sensor connection housing (remote version)

a Screw terminal for connecting to potential matching system
b Remote version connecting cable (see also Page 9)
c Terminal/electronics compartment cover (see below)
d –

Fig. 2 A0004112

Terminal assignment and connection data → Page 11

Potential matching

Caution!

- There must be potential matching along the circuits (inside and outside the hazardous area).
- The transmitter must be safely included in the potential matching system by means of the screw terminal (c) on the outside of the transmitter housing or by means of the corresponding ground terminal in the connection compartment (f).
- Alternatively, the sensor and the transmitter (compact version) or the connection housing of the sensor can be included in the potential matching system by means of the pipeline if a ground connection, performed as per the specifications, is ensured.

Cable entries

Thread for cable entry M20x1.5 or ½"-NPT or G ½", as required.

Connecting cable cable specifications

The sensor cable connection between the sensor and the transmitter has intrinsically safe explosion protection.

The maximum capacitance per unit length of the cable connection is 300µF/ft (1µF/km).
The maximum inductance of the cable is 0.3 mH/ft (1 mH/km).

The cable supplied by Endress+Hauser (max. 98 ft (30 m)) complies with these values.

Electrical connections

Connection compartment (terminal assignment, see tables on Page 11)

4...20 mA HART
(connection with a cable)

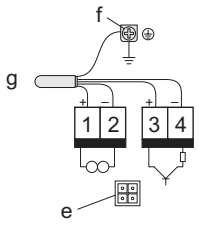


Fig. 3 A0004027

4...20 mA HART
(connection with two cables)

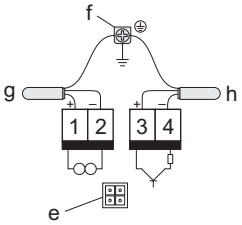


Fig. 4 A0004028

4...20 mA HART
(PFM connection with Prowirl 72)

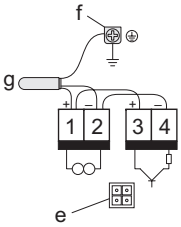


Fig. 5 A0004029

PROFIBUS PA

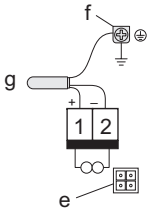


Fig. 6 A0004030

FOUNDATION Fieldbus

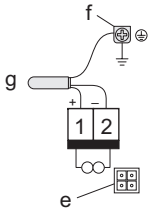


Fig. 7 A0004030

e Service connector (see also Page 12)

f HART ground terminal: if the potential matching is routed via the cable and if two cables are used, both cables must be connected to the potential matching system if a connection is not already established externally.
PROFIBUS and FOUNDATION Fieldbus: between the stripped fieldbus cable and the ground terminal, the cable shielding must not exceed 2" in length

g HART (one cable): cable for supply voltage and/or pulse output
HART (two cables): cable for supply voltage
PROFIBUS: cable of input and output circuits)
FOUNDATION Fieldbus: cable of input and output circuits

h Optional pulse/frequency output, can also be operated as a status output (not for PROFIBUS PA and FOUNDATION Fieldbus)

✎ Note!

PFM output (pulse/frequency modulation) for Prowirl 73: connection as illustrated in Fig. 3 or Fig. 4; only together with flow computer RMC or RMS 621

Connecting the supply voltage or signal cable

The terminal assignment and the connection data for the supply voltage are identical for all devices, regardless of the device version (type code).

✎ Note!
A graphic illustration of the electrical connections is provided on Page 10.

Terminal assignment /connection data

Terminals		**1 (+)**	**2 (–)**
Prowirl 72**-**********W** **Prowirl 73****-**********W**		Transmitter power supply / 4...20 mA HART	
Intr. safe circuit		IS	
Safety-related values	U_{max}	30 V	
	I_{max}	300 mA	
	P_i	1 W	
	L_i	0	
	C_i	5.25 nF	

Terminals		**1 (+)**	**2 (–)**	**3 (+)**	**4 (–)**
Prowirl 72**-**********A** **Prowirl 73****-**********A**		Transmitter power supply / 4...20 mA HART		Optional pulse/status output	
Intr. safe circuit		IS		IS	
Safety-related values	U_{max}	30 V		30 V	
	I_{max}	300 mA		300 mA	
	P_i	1 W		1 W	
	L_i	0		0	
	C_i	5.25 nF		0	

Terminals		**1 (+)**	**2 (–)**
Prowirl 72**-**********H** **Prowirl 73****-**********H**		PROFIBUS PA	
Intr. safe circuit		IS	
Functional values	U_B	9...32 V DC	
	I_B	16 mA	
	P	≤ 1 W	
Safety-related values	U_{max}	17.5 V	
	I_{max}	500 mA	
	P_i	5.5 W	
	L_i	≤ 10 µF	
	C_i	≤ 5 nF	

or

1 (+)	**2 (–)**
PROFIBUS PA	
IS	
9...32 V DC	
16 mA	
≤ 1 W	
24 V	
250 mA	
1.2 W	
≤ 10 µF	
≤ 5 nF	

Terminals		**1 (+)**	**2 (–)**
Prowirl 72**-**********K** **Prowirl 73****-**********K**		FOUNDATION Fieldbus	
Intr. safe circuit		IS	
Functional values	U_B	9...32 V DC	
	I_B	16 mA	
	P	≤ 1 W	
Safety-related values	U_{max}	17.5 V	
	I_{max}	500 mA	
	P_i	5.5 W	
	L_i	≤ 10 µF	
	C_i	≤ 5 nF	

or

1 (+)	**2 (–)**
FOUNDATION Fieldbus	
IS	
9...32 V DC	
16 mA	
≤ 1 W	
24 V	
250 mA	
1.2 W	
≤ 10 µF	
≤ 5 nF	

Service connector

The service connector (for connection, see Fig. 3...Fig. 7, e) is only used to connect service interfaces approved by Endress+Hauser.

Only the “PROLINE EX TWO-WIRE CABLE” connecting cable can be used to connect a Prowirl 72 or 73 with the service interface FXA 193.

⚠ Warning!
The service connector may not be connected in a potentially explosive atmosphere.

Technical data

Dimensions

The dimensions of the Ex transmitter housing and the sensor correspond to the standard versions. Please refer to the Technical Information for these dimensions.

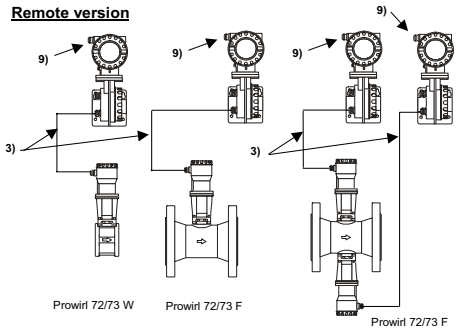
✎ Note!
Associated “Technical Information”:
Prowirl 72F, 72W, 73F, 73W → TI070D

Control drawings

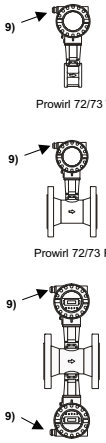
Endress+Hauser Reinach hereby declares that the product is in conformity with the requirements of the FACTORY MUTUAL standards.

Hazardous Locations
Class I Division 1 Groups ABCD or Class I Zone 0 Group IIC
and Class II and III Division 1 Groups EFG

Remote version



Compact version



Sensor:

PROWIRL 7** **-**1***N*****, PROWIRL 7** **-**2***N*****, PROWIRL 7** **-**3***N*****, PROWIRL 7** **-**4***N*****, PROWIRL 7** **-**6***N*****, PROWIRL 7** **-**7***N*****, PROWIRL 7** **-**C***N*****, PROWIRL 7** **-**F***N*****, PROWIRL 7** **-**H***N*****:

	Max. medium temperature					
	T6 **2)**	T5 **2)**	T4	T3	T2	T1
Ta = 104°F	176°F	203°F	266°F	374°F	554°F	824°F
Ta = 140°F	---	203°F	266°F	374°F	554°F	824°F
Ta = 185°F	---	---	266°F	374°F	554°F	824°F

PROWIRL 7** **-**0***N*****, PROWIRL 7** **-**5***N*****,
PROWIRL 7** **-**B***N*****, PROWIRL 7** **-**G***N*****:

	Max. medium temperature				
	T6 **2)**	T5 **2)**	T4	T3	T2 - T1
Ta = 104°F	176°F	203°F	266°F	374°F	536°F
Ta = 140°F	---	203°F	266°F	374°F	536°F
Ta = 185°F	---	---	266°F	374°F	536°F

Transmitter:

PROWIRL 7** **-******N*****:

	T6 **2)**	T5 **2)**	T4 - T1
Ta =	104°F	140°F	176°F

PROWIRL 7** **-**1***N*****, PROWIRL 7** **-**2***N*****, PROWIRL 7** **-**3***N*****, PROWIRL 7** **-**4***N*****, PROWIRL 7** **-**6***N*****, PROWIRL 7** **-**7***N*****, PROWIRL 7** **-**C***N*****, PROWIRL 7** **-**F***N*****, PROWIRL 7** **-**H***N*****:

	Max. medium temperature					
	T6 **2)**	T5 **2)**	T4	T3	T2	T1
Ta = 104°F	176°F	203°F	266°F	374°F	554°F	824°F
Ta = 140°F	---	203°F	266°F	374°F	554°F	824°F
Ta = 158°F	---	---	266°F	374°F	554°F	824°F

PROWIRL 7** **-**0***N*****, PROWIRL 7** **-**5***N*****,PROWIRL 7** **-**B***N*****, PROWIRL 7** **-**G***N*****:

	Max. medium temperature				
	T6 **2)**	T5 **2)**	T4	T3	T2 - T1
Ta = 104°F	176°F	203°F	266°F	374°F	536°F
Ta = 140°F	---	203°F	266°F	374°F	536°F
Ta = 158°F	---	---	266°F	374°F	536°F

Notes:

1) Assignment of additional Control Drawings according to I/O options:

Drawing-No.	Model Codes:
FES0068-0001 C	Prowirl 7* **-******N****A and Prowirl 7* **-******N****W
FES0068-0002 C	
FES0068-0003 C	Prowirl 7* **-******N****H and Prowirl 7* **-******N****K
FES0068-0004 C	
FES0068-0005 C	

2) Temperature class T6 and T5 is not allowed for versions of Profibus PA and Fieldbus Foundation (not for PROWIRL 7** **-******N****H and PROWIRL 7** **-******N****K).
3) Max. cable length for intrinsically safe sensor installation (remote version) 100m / 320ft for using cable parameters L_{Cable} = 1mH/km / 0.3µH/ft and C_{Cable} = 1µF/km / 300nF/ft
4) Caution: Use supply wires suitable for 50°F above maximum ambient temperature
5) Caution: Surface temperature of transmitter enclosure can exceed 158°F depending on ambient temperature or medium temperature
6) Dust tight seals must be used at conduit entries for Class II and III installation
7) Fieldbus cable connectors are suitable for Class I, Div. 1 and 2, Groups ABCD (see FES0068-0005)
8) Prowirl 72 and Prowirl 73 transmitter is intended for installation to Service Interface FXA 193 when using the PROLINE EX-ZWEILEITER-KABEL (blue cable)
9) Prowirl 72/73 is a Dual Seal Device in accordance to ANSI/ISA-12.27.01-2003

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	C	10.12.03 / Bn	H		noch dritten Personen und Konkurrenzfirmen	Ersteller: FES/Bn		
	D		J		zugängig gemacht werden.	File: M:\ZEICHNG\...\031210c.doc **ID 1113**		
	E		K					

FM CONTROL DRAWING
PROWIRL 72, PROWIRL 73 (IS and NI)
Compact Version, Remote version

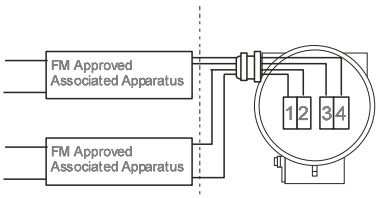
Massstab	Gezeichnet	23.09.02	Bn
	Geprüft		
	Ex-geprüft	10.12.03	Bn
	Gesehen		

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

FES0068 C

Nonhazardous Location

Hazardous Classified Locations
Class I Division 1 Groups ABCD
Class I Zone 0 Group IIC
Class II and III Div. 1 Groups EFG



Instrinsically safe installation

1) Control room equipment may not use or generate over 250 Vrms.
2) Wire all circuits for power supply per NEC ANSI/NFPA 70 and ISA RP 12.06.01
3) Use entity approved safety barrier or other associated equipment that satisfy the following conditions:
$V_{oc} \leq V_{max}$, $I_{sc} \leq I_{max}$, $C_a \geq C_i + C_{cable}$, $L_a \geq L_i + L_{cable}$ transmitter entity parameters are as follows:
Terminals 1 and 2 (Hart, current output)

V_{max}	I_{max}	P_i	C_i	L_i
30 V	300 mA	1 W	5.3 nF	0

Terminals 3 and 4 (Pulse)

V_{max}	I_{max}	P_i	C_i	L_i
30 V	300 mA	1 W	0	0

4) **WARNING**: SUBSTITUTION OF COMPONENTS MAY IMPAIR INSTRINSIC SAFETY.
5) Ex ia is defined as Intrinsically Safe

Functional ratings:
These ratings do not supersede Hazardous Location values.
Terminal 1 and 2:HART current output
U_{nom} = 12 ... 36 V
I_{nom} = 4 ... 20 mA (max. 25 mA)
Terminal 3 and 4 :Pulse output
$U_{nom} \leq$ 36 V, I_{nom} = 15 mA

Notes:

This page applies to model code:
Prowirl 7* **-*****N****A, Prowirl 7* **-*******N****W**

Division 2 and Zone 2 installation

6) Installation shall be in accordance with NEC using threaded conduit or other wiring methods in accordance with articles 500 to 510.
7) 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
$V_{max} \geq V_{oc}$ or V_t, $C_a \geq C_i + C_{cable}$, $L_a \geq L_i + L_{cable}$
Transmitter parameters are as follows:

Terminals 1 and 2 (Hart, current controlled circuit)

V_{max}	Imax	C_i	L_i
36 V	See note 8	5.3 nF	0

Terminals 3 and 4 (Pulse. voltage controlled circuit)

V_{max}	Imax	C_i	L_i
36 V	See note 8	0	0

8) For these current and voltage controlled circuits, the parameter Imax is not required and need not to be aligned with parameter I_{SC} and I_t of the associated nonincendive field wiring or associated apparatus.
9) **WARNING**: EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2 OR CLASS I, ZONE 2.

Class II, III installation (without barrier)

10) Installation of transmitter circuit wiring according to NEC using threaded conduit or other wiring methods in accordance with articles 500 to 510.

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	C	10.12.03 / Bn	H		noch dritten Personen und Konkurrenzfirmen	Ersteller: FES/Bn		
	D		J		zugängig gemacht werden.	File: M:\ZEICHNG\...\031210c.doc **ID 1113**		
	E		K					

FM CONTROL DRAWING
PROWIRL 72, PROWIRL 73 (IS and NI)
Current output, Hart, Pulse
ENTITY INSTALLATION

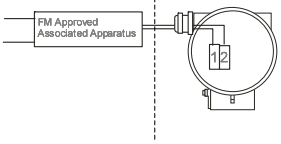
Massstab	Gezeichnet	23.09.02	Bn
	Geprüft		
	Ex-geprüft	10.12.03	Bn
	Gesehen		

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

FES0068-0001 C

This page applies to model code: **Prowirl 7* **-******N****H and Prowirl 7* **-******N****K**

Non Hazardous Locations | **Hazardous Locations** Class I Division 1 Groups ABCD or Class I Zone 0 AEx ia IIC and Class II and III Division 1 Groups EFG



Instrinsically safe installation:

1) Control room equipment may not use or generate over 250 Vrms.
2) Wire all circuits for power supply per NEC ANSI/NFPA 70 and ISA RP 12.06.01
3) Use entity approved safety barrier or other associated equipment that satisfy the following conditions: $V_{oc} \leq V_{max}$, $I_{sc} \leq I_{max}$, $C_a \geq C_i + C_{cable}$, $L_a \geq L_i + L_{cable}$
   Transmitter entity parameters are as follows: Terminals 1 and 2

	V_{max}	I_{max}	P_i	C_i	L_i
	17.5 V	500 mA	5.5 W	≤ 5 nF	≤ 10 µH
or	24 V	250 mA	1.2 W	≤ 5 nF	≤ 10 µH

4) The transmitter is suitable for installation in accordance with the Fielbus Intrinsically Safe Concept (FISCO), see also FES0068-0003.
5) **WARNING**: SUBSTITUTION OF COMPONENTS MAY IMPAIR INSTRINSIC SAFETY.
6) Ex ia is defined as Intrinsically Safe

Division 2 and Zone 2 installation:

7) Installation shall be in accordance with NEC using threaded conduit or other wiring methods in accordance with articles 500 to 510.
8) 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 $V_{max} \geq V_{oc}$ or V_t, $C_a \geq C_i + C_{cable}$, $L_a \geq L_i + L_{cable}$
   Entity parameters are as follows: Terminals 1 and 2 (current controlled circuit)

V_{max}	I_{max}	C_i	L_i
36 V	See note 9	≤ 5 nF	≤ 10 µH

9) For this current controlled circuit, the parameter Imax is not required and need not to be aligned with parameter I_{SC} and I_t of the associated nonincendive field wiring or associated apparatus.
10) The transmitter is suitable for installation in accordance with the Fielbus Non-incendive Concept (FNICO), see also FES0068-0004.
11) **WARNING:** SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I DIVISION 2 OR CLASS I ZONE 2.

Class II, III installation

12) Installation of transmitter circuit wiring according to NEC using threaded conduit or other wiring methods in accordance with articles 500 to 510.

Functional ratings:

These ratings do not supersede Hazardous Location values.
Terminals 1 and 2 (Fieldbus):
U_{nom} = 9 ... 32 V, I_{nom} = 16 mA

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	D		J		noch dritten Personen und Konkurrenzfirmen	Ersteller: FES/Bn
	E		K		zugängig gemacht werden.	File: M:\ZEICHNG\..\031210c.doc **ID 1113**

FM CONTROL DRAWING (IS and NI) PROWIRL 72, PROWIRL 73 Fieldbus Foundation and Profibus PA IS installation, Entity - Concept	Massstab	Gezeichnet	23.09.02	Bn
		Geprüft		
		Ex-geprüft	10.12.03	Bn
		Gesehen		

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

FES0068-0002 C

This page applies to model code: **Prowirl 7* **-******N****H and Prowirl 7* **-******N****K**

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) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (Uo or Voc), the current (Io or Isc) and the power (Po) 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 of the associated apparatus has to be limited to the 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 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:

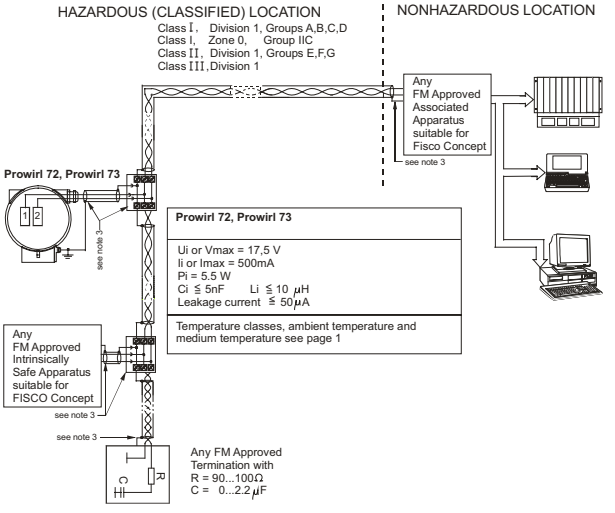
- loop resistance R' : 15 .... 150 Ω/km
- inducance per unit length L' : 0.4 .... 1 mH/km
- capacitance per unit length C' : 80 .... 200 nF/km
- C' = C' line/line + 0.5 C' line/screen, if both lines are floating or
- C' = C' line/line + C' line/screen, if the screen is connected to one line
- length 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 associated apparatus has to be installed within 30 m from the end of the trunk cable.

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.



Notes:

Intrinsically safe installation

1) Be aware of multiple earthing of the screen. The screen must be connected in accordance with ISA RP 12.06.01

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	E		K		zugängig gemacht werden.	File: M:\ZEICHNG\..\031210c.doc **ID 1113**

FM CONTROL DRAWING PROWIRL 72, PROWIRL 73 (IS) Div. 1 / Zone 0 FISCO (fieldbus intrinsically safe concept)	Massstab	Gezeichnet	23.09.02	Bn
		Geprüft		
		Ex-geprüft	10.12.03	Bn
		Gesehen		

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

FES0068-0003 C

This page applies to model code: **Prowirl 7* **-******N****H and Prowirl 7* **-******N****K**

FNICO (fieldbus nonincendive concept)

The concept allows interconnection of nonincendive apparatus to associated apparatus not specifically examined in such combination. The criteria for interconnection is that the voltage (Ui or Vmax), which nonincendive apparatus can receive and remain nonincendive, must be equal or greater than the voltage (Uo or Voc), which can be delivered by the associated apparatus. 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 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 nonincendive fieldbus circuit remains passive.

The cable used to interconnect the devices needs to have the parameters in the following range:

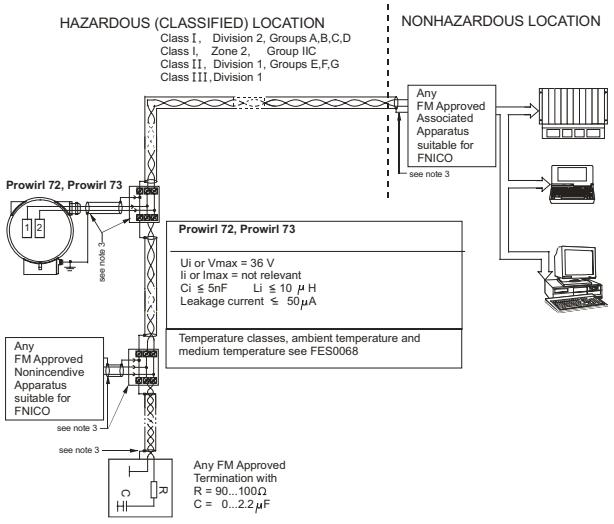
loop resistance R'	: 15 .... 150 Ω/km
inducance per unit length L'	: 0.4 .... 1 mH/km
capacitance per unit length C'	: 80 .... 200 nF/km
C' = C' line/line + 0.5 C' line/screen, if both lines are floating or	
C' = C' line/line + C' line/screen, if the screen is connected to one line	
length of spur cable	: ≤ 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 associated apparatus has to be installed within 30 m from the end of the trunk cable.

The number of passive devices connected to the bus segment is not limited due to NI 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.



Notes:

Nonincendive field wiring installation

1) Be aware of multiple earthing of the screen. The screen must be connected in accordance with ISA RP 12.06.01

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	C	10.12.03 / Bn	H			File: M:\ZEICHNG\...\031210c.doc **ID 1113**
	D		J			
	E		K			

FM CONTROL DRAWING PROWIRL 72, PROWIRL 73 (NI) Div. 2 / Zone 2 FNICO (fieldbus nonincendive concept)	Massstab	Gezeichnet	23.09.02	Bn
		Geprüft		
		Ex-geprüft	10.12.03	Bn
		Gesehen		

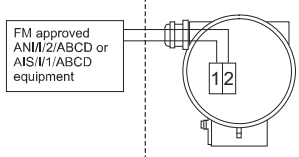
Flowtec AG, Kaegenstrasse 7, CH-4153 Reinach BL1, Postfach

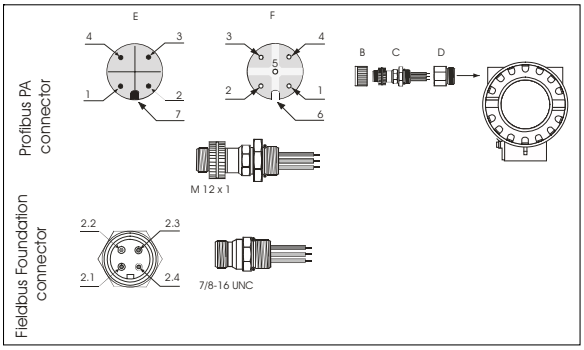
FES0068-0004 C

This page applies to model code: **Prowirl 7* **-******N****H and Prowirl 7* **-******N****K with Fieldbus Cable Connector**

Non Hazardous Locations

Hazardous Locations
Class I, Division 1 and 2 Groups ABCD or Class I Zone 0 and Zone 2 Groups IIC,





B = Protection cap for connector, C = Fieldbus connector, D = Thread adapter
E = Connector on housing (male), F = Connector (female)

Pin assignment:

Profibus PA
1 = Brown wire, PA+ (terminal 26)
2 = Not connected
3 = Blue wire, PA- (terminal 27)
4 = Black wire, ground
5 = Female connector not assigned
6 = Positioning groove
7 = Positioning key

Fieldbus Foundation
2.1 = Brown wire, FF+ (terminal 26)
2.2 = Blue wire, FF- (terminal 27)
2.3 = Not connected
2.4 = Yellow/green wire, ground

Notes:

1) Fieldbus cable connectors are suitable for Class I, Div. 2, Groups ABCD and Class I Zone 2 Groups IIC, if non-incendive circuits are connected.
2) Fieldbus cable connectors are suitable for Class I, Div. 1, Groups ABCD and Class I Zone 0 Groups IIC, if intrinsically safe circuits are connected.

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	C	10.12.03 / Bn	H			File: M:\ZEICHNG\...\031210c.doc **ID 1113**
	D		J			
	E		K			

FM CONTROL DRAWING PROWIRL 72, PROWIRL 73 Fieldbus Cable Connector IS/NI installation	Massstab	Gezeichnet	23.09.02	Bn
		Geprüft		
		Ex-geprüft	10.12.03	Bn
		Gesehen		

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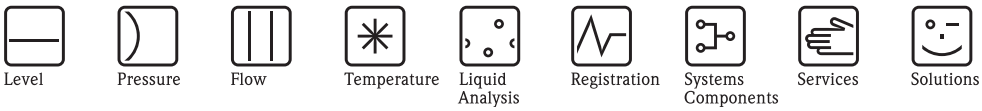
FES0068-0005 C



Safety Instructions

Proline Prowirl 72, 73

HART/PROFIBUS PB/FOUNDATION Fieldbus
IS (Ex-i Intrinsically safe version)

Division 1
Documentation for hazardous location Cl.I Div.1

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

- BA084D, Proline Prowirl 72 HART
- BA085D, Proline Prowirl 72 PROFIBUS PA
- BA095D, Proline Prowirl 72 FOUNDATION Fieldbus
- BA094D, Proline Prowirl 73 HART
- BA093D, Proline Prowirl 73 PROFIBUS PA
- BA096D, Proline Prowirl 73 FOUNDATION Fieldbus

Table of Contents CSA

XA096D/06/en/12.05
71001367

Endress+Hauser
People for Process Automation

General warnings

- Any national regulations pertaining to the installation of devices in hazardous areas must be observed.
- Mounting, electrical installation, commissioning and maintenance of the devices may only be performed by technical staff trained in the area of explosion protection.
- Compliance with all of the technical data of the device (see nameplate) is mandatory.
- Substitution of components may impair intrinsic safety.

Special conditions

- The device must be integrated into the potential equalization system. Potential must be equalized along the intrinsically safe sensor circuits. Further information can be found in the “Potential equalization” chapter on Page 23.

Installation instructions

- The cable entries and openings not used must be sealed tight with suitable components.
- The measuring device must only be used in the permitted temperature class.
  The values of the individual temperature classes can be found in the temperature tables on Page 21.
- The manufacturer's specifications for all devices connected to the intrinsically safe circuits must be taken into consideration.
- To rotate the transmitter housing, please follow the same procedure as for non-Ex versions. The transmitter housing may also be rotated during operation.
- The continuous service temperature of the cable must correspond at least to the temperature range of –40 °C to +10 °C above the ambient temperature present (–40 °C ... (T_a +10 °C)).
- All equipment of the measuring system must be included in potential matching (see Page 24).
- The devices may only be used for fluids against which the wetted materials are sufficiently resistant.
- The service connector may not be connected in a potentially explosive atmosphere.
- Install per National Electrical Code. Install intrinsically safe circuits per CEC and ISA RP 12.6 respecting the explosionproof integrity of the enclosure.

Approvals

General

The system meets the basic safety and health requirements for the design and construction of devices and protection systems designated for use in hazardous areas in accordance with the Canadian Electrical Code.

Certification number

160686-135901

Inspection authority

CSA: Canadian Standards Association

Identification

The system identification must contain the following information:

Compact version and remote version (transmitter and sensor)	
Prowirl 72***-******N****A Prowirl 72***-******N****W Prowirl 72***-******N****H Prowirl 72***-******N****K Prowirl 73***-******N****A Prowirl 73***-******N****W Prowirl 73***-******N****H Prowirl 73***-******N****K	 Cl. I, Div. 1 Groups ABCD Cl. II, Div. 1 Groups EFG Cl. III Cl. I, Zone 0 AEx ia Group IIC

Caution!
The installation instructions for the safe use and application of the system must be observed → Page 18.

Description of the measuring system

The measuring system consists of a transmitter and a sensor. Two versions are available:

- Compact version:
  The transmitter and sensor form a mechanical unit.
- Remote version:
  The transmitter and sensor are mounted separate from one another and interconnected by means of a connecting cable (see also Operating Instructions, “Electrical connections” (Page 11) and “Cable specifications for connecting cable” (Page 13)).

Device identification

The nameplates, which are provided on the transmitter and sensor in a manner in which they are clearly visible, contain all the relevant information on the measuring system.

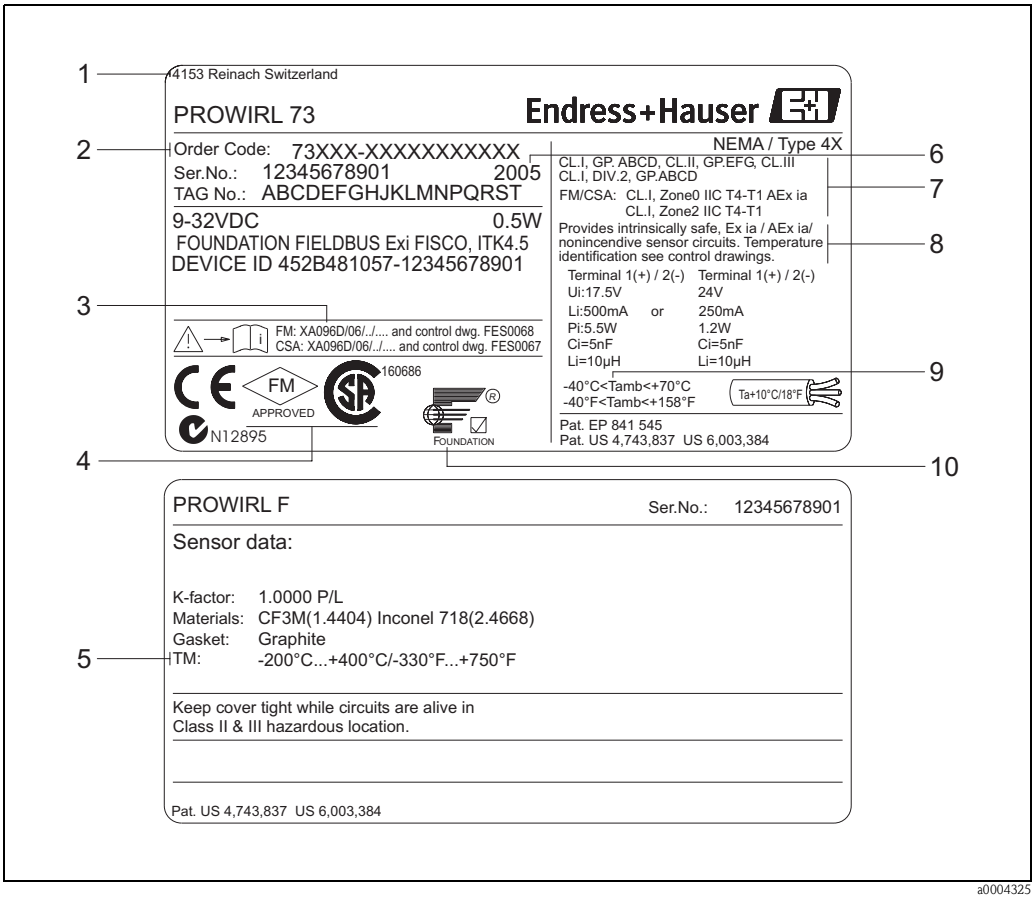
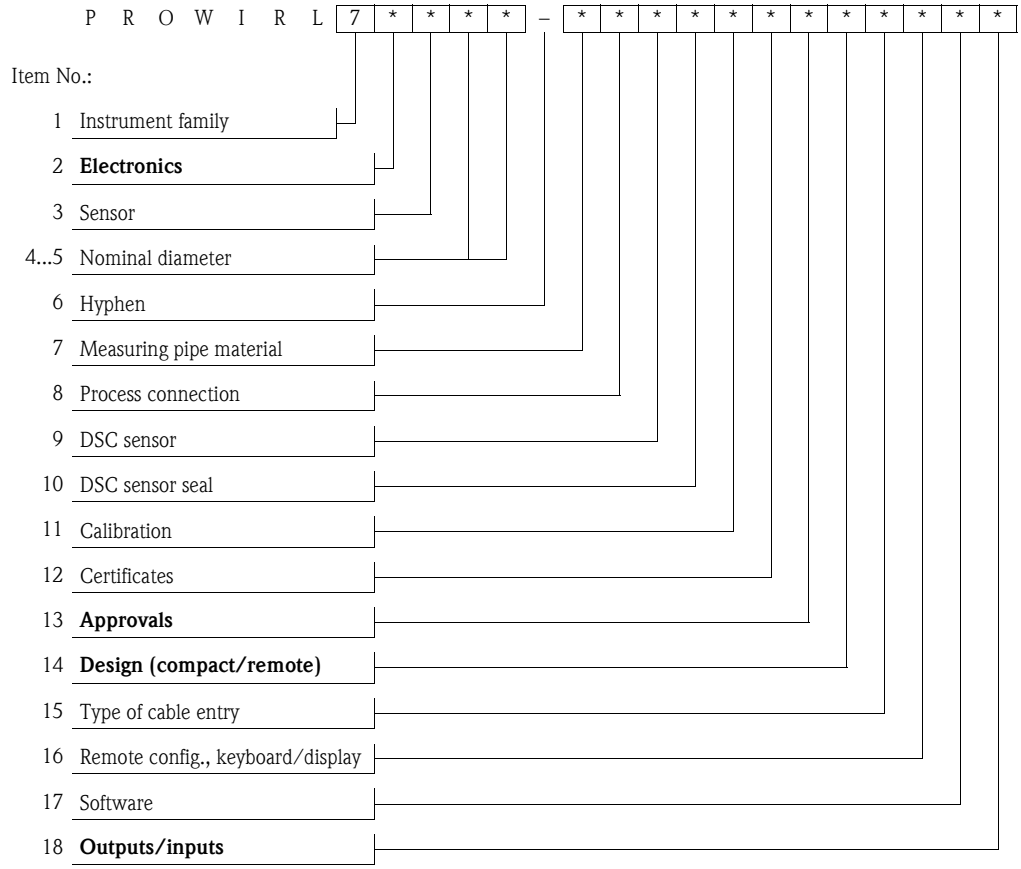


Fig. 1: Example for nameplates of a transmitter and a sensor

1 Production location
2 Type code (for an exact explanation of the type code, see the following section)
3 Applicable Ex documentation
4 Label of notified body: Factory Mutual Research
5 Maximum medium temperature
6 Year of manufacture
7 Type of protection and explosion group for the measuring system
8 Warning
9 Ambient temperature range
10 Communication type

Type code

The type code describes the exact design and equipment level of the measuring system.
It can be read off the nameplate of the transmitter and sensor and is structured as follows:



Electronics (Item No. 2 in type code → Page 20)

*	Transmitter	Electronics/housing
2	Prowirl 72	Intrinsically safe transmitter electronics
3	Prowirl 73	

Approvals (Item No. 13 in type code)

*	Approval	Sensor	Compact	Remote
N	Cl. I, Div. 1 Groups ABCD Cl. II, Div. 1 Groups EFG Cl. III Cl. I, Zone 0 AEx ia IIC	Prowirl F Prowirl W	DN 15...300 DN 15...150	DN 15...300 DN 15...150

Type (compact/remote; Item No. 14 in type code → Page 20)

*	Type	Application/zone	
A, J	Compact	Cl. I, Div. 1 Groups ABCD Cl. II, Div. 1 Groups EFG Cl. III Cl. I, Zone 0 AEx ia IIC	Outputs/inputs A/W [1]: T1-T6 Outputs/inputs H/K [1]: T1-T4
E, F, K, L	Remote	**Transmitter**	
		Cl. I, Div. 1 Groups ABCD Cl. II, Div. 1 Groups EFG Cl. III Cl. I, Zone 0 AEx ia IIC	Outputs/inputs A/W [1]: T1-T6 Outputs/inputs H/K [1]: T1-T4
		Sensor	
		Prowirl F DN 15...300 (1/2"...12") Prowirl W DN 15...150 (1/2"...6")	Cl. I, Div. 1 Groups ABCD Cl. II, Div. 1 Groups EFG Cl. III Cl. I, Zone 0 AEx ia IIC Outputs/inputs A/W [1]: T1-T6 Outputs/inputs H/K [1]: T1-T4

[1] Item No. 18 in type code → Page 20

Outputs/inputs (Item No. 18 in type code → Page 20)

*	Approval	
A, W	Cl. I, Div. 1 Groups ABCD Cl. II, Div. 1 Groups EFG Cl. III Cl. I, Zone 0 AEx ia IIC	Temperature Class: T1-T6
H, K	Cl. I, Div. 1 Groups ABCD Cl. II, Div. 1 Groups EFG Cl. III Cl. I, Zone 0 AEx ia IIC	Temperature Class: T1-T4

✎ Note!
A detailed explanation of these values with regard to the inputs and outputs available, as well as a description of the associated terminal assignments and connection data is provided on Page 23 onwards.

Compact version temperature table

Maximum fluid temperature [°C] depending on the ambient temperature T_a and the DSC sensor used (Item No. 9 in the type code → Page 20).

	T_a	T6 (85 °C)	T5 (100 °C)	T4 (135 °C)	T3 (200 °C)	T2 (300 °C)	T1 (450 °C)
Prowirl 72***-**0*********	–40 °C ... +40 °C	80	95	130	190	280	280
	–40 °C ... + 60 °C	–	95	130	190	280	280
	–40 °C ... + 70 °C	–	–	130	190	280	280
Prowirl 72***-**1********* Prowirl 72***-**2********* Prowirl 72***-**3********* Prowirl 72***-**6********* Prowirl 73***-**4********* Prowirl 73****-*7*********	–40 °C ... + 40 °C	80	95	130	190	290	440
	–40 °C ... + 60 °C	–	95	130	190	290	440
	–40 °C ... + 70 °C	–	–	130	190	290	440

Dependency of the minimum fluid temperature T_{med} on the DSC sensor:

T_{med} –200 °C	T_{med} –50 °C	T_{med} –40 °C
Prowirl 72***-**1********* Prowirl 72***-**2********* Prowirl 72***-**3********* Prowirl 73***-**4********* Prowirl 73***-**7*********	Prowirl 72F***-**6*********	Prowirl 72***-**0*********

⚠ Warning!
For devices with outputs Prowirl 72***-**********H/K and 73***-**********H/K, temperature classes T5 and T6 are not permitted.

Remote version temperature table

Sensor

Maximum fluid temperature [°C] depending on the ambient temperature T_a and the DSC sensor used (Item No. 9 in the type code → Page 20):

	T_a	T6 (85 °C)	T5 (100 °C)	T4 (135 °C)	T3 (200 °C)	T2 (300 °C)	T1 (450 °C)
Prowirl 72***-**0*********	–40 °C ... + 40 °C	80	95	130	190	280	280
	–40 °C ... + 60 °C	–	95	130	190	280	280
	–40 °C ... + 85 °C	–	–	130	190	280	280
Prowirl 72***-**1********* Prowirl 72***-**2********* Prowirl 72***-**3********* Prowirl 72***-**6********* Prowirl 73***-**4********* Prowirl 73****-*7*********	–40 °C ... + 40 °C	80	95	130	190	290	440
	–40 °C ... + 60 °C	–	95	130	190	290	440
	–40 °C ... + 85 °C	–	–	130	190	290	440

Dependency of the minimum fluid temperature T_{med} on the DSC sensor:

T_{med} –200 °C	T_{med} –50 °C	T_{med} –40 °C
Prowirl 72***-**1********* Prowirl 72***-**2********* Prowirl 72***-**3********* Prowirl 73***-**4********* Prowirl 73***-**7*********	Prowirl 72F***-**6*********	Prowirl 72***-**0*********

⚠ Warning!
For devices with outputs Prowirl 72***-**********H/K and 73***-**********H/K, temperature classes T5 and T6 are not permitted.

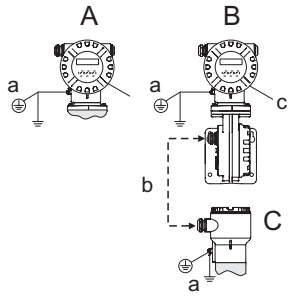
Transmitter

The minimum ambient temperature is –40 °C.
The maximum ambient temperature [°C] depending on the device used is:

	T6 (85 °C)	T5 (100 °C)	T4 (135 °C)	T3 (200 °C)	T2 (300 °C)	T1 (450 °C)
Prowirl 72***-**********A Prowirl 72***-**********W Prowirl 73***-**********A Prowirl 73***-**********W	40	60	80	80	80	80
Prowirl 72***-**********H Prowirl 72***-**********K Prowirl 73***-**********H Prowirl 73***-**********K	–	–	80	80	80	80

Design of the measuring system

Compact/remote version design



A Transmitter housing (compact/remote version)
B Transmitter housing (remote version)
C Sensor connection housing (remote version)

a Screw terminal for connecting to potential matching system
b Remote version connecting cable (see also Page 23)
c Terminal/electronics compartment cover (see below)
d –

Fig. 2 A0004112

Terminal assignment and connection data → Page 25

Potential matching

Caution!

- There must be potential matching along the circuits (inside and outside the hazardous area).
- The transmitter must be safely included in the potential matching system by means of the screw terminal (c) on the outside of the transmitter housing or by means of the corresponding ground terminal in the connection compartment (f).
- Alternatively, the sensor and the transmitter (compact version) or the connection housing of the sensor can be included in the potential matching system by means of the pipeline if a ground connection, performed as per the specifications, is ensured.

Cable entries

Thread for cable entry M20x1.5 or ½"-NPT or G ½", as required.

Connecting cable cable specifications

The sensor cable connection between the sensor and the transmitter has EEx ia explosion protection.

The maximum capacitance per unit length of the cable connection is 1µF/km.
The maximum inductance of the cable is 1 mH/km.

The cable supplied by Endress+Hauser (max. 30 m) complies with these values.

Electrical connections

Connection compartment (terminal assignment, see tables on Page 25)

4...20 mA HART
(connection with a cable)

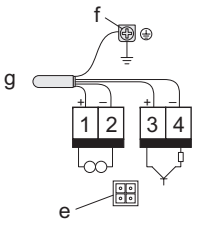


Fig. 3 A0004027

4...20 mA HART
(connection with two cables)

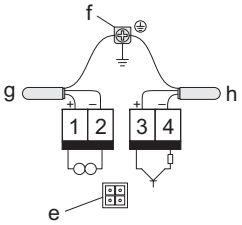


Fig. 4 A0004028

4...20 mA HART
(PFM connection with Prowirl 72)

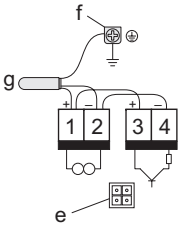


Fig. 5 A0004029

PROFIBUS PA

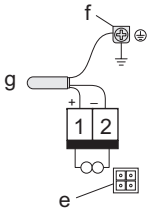


Fig. 6 A0004030

FOUNDATION Fieldbus

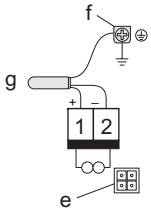


Fig. 7 A0004030

e Service connector (see also Page 26)

f HART ground terminal: if the potential matching is routed via the cable and if two cables are used, both cables must be connected to the potential matching system if a connection is not already established externally.
PROFIBUS and FOUNDATION Fieldbus: between the stripped fieldbus cable and the ground terminal, the cable shielding must not exceed 5 mm (2") in length

g HART (one cable): cable for supply voltage and/or pulse output
HART (two cables): cable for supply voltage
PROFIBUS: cable of input and output circuits)
FOUNDATION Fieldbus: cable of input and output circuits

h Optional pulse/frequency output, can also be operated as a status output (not for PROFIBUS PA and FOUNDATION Fieldbus)

✎ Note!

PFM output (pulse/frequency modulation) for Prowirl 73: connection as illustrated in Fig. 3 or Fig. 4; only together with flow computer RMC or RMS 621

Connecting the supply voltage or signal cable

The terminal assignment and the connection data for the supply voltage are identical for all devices, regardless of the device version (type code).

✎ Note!
A graphic illustration of the electrical connections is provided on Page 24.

Terminal assignment /connection data

Terminals		**1 (+)**	**2 (–)**
Prowirl 72**-**********W** **Prowirl 73****-**********W**		Transmitter power supply / 4...20 mA HART	
Intr. safe circuit		IS	
Safety-related values	U_{max} (U_i)	30 V	
	I_{max} (I_i)	300 mA	
	P_i	1 W	
	L_i	0	
	C_i	5.25 nF	

Terminals		**1 (+)**	**2 (–)**	**3 (+)**	**4 (–)**
Prowirl 72**-**********A** **Prowirl 73****-**********A**		Transmitter power supply / 4...20 mA HART		Optional pulse/status output	
Intr. safe circuit		IS		IS	
Safety-related values	U_{max} (U_i)	30 V		30 V	
	I_{max} (I_i)	300 mA		300 mA	
	P_i	1 W		1 W	
	L_i	0		0	
	C_i	5.25 nF		0	

Terminals		**1 (+)**	**2 (–)**	or	**1 (+)**	**2 (–)**
Prowirl 72**-**********H** **Prowirl 73****-**********H**		PROFIBUS PA			PROFIBUS PA	
Intr. safe circuit		IS			IS	
Functional values	U_B	9...32 V DC			9...32 V DC	
	I_B	16 mA			16 mA	
	P	≤ 1 W			≤ 1 W	
Safety-related values	U_{max} (U_i)	17.5 V			24 V	
	I_{max} (I_i)	500 mA			250 mA	
	P_i	5.5 W			1.2 W	
	L_i	≤ 10 µF			≤ 10 µF	
	C_i	≤ 5 nF			≤ 5 nF	

Terminals		**1 (+)**	**2 (–)**	or	**1 (+)**	**2 (–)**
Prowirl 72**-**********K** **Prowirl 73****-**********K**		FOUNDATION Fieldbus			FOUNDATION Fieldbus	
Intr. safe circuit		IS			IS	
Functional values	U_B	9...32 V DC			9...32 V DC	
	I_B	16 mA			16 mA	
	P	≤ 1 W			≤ 1 W	
Safety-related values	U_{max} (U_i)	17.5 V			24 V	
	I_{max} (I_i)	500 mA			250 mA	
	P_i	5.5 W			1.2 W	
	L_i	≤ 10 µF			≤ 10 µF	
	C_i	≤ 5 nF			≤ 5 nF	

Service connector

The service connector (for connection, see Fig. 3...Fig. 7, e) is only used to connect service interfaces approved by Endress+Hauser.

Only the “PROLINE EX TWO-WIRE CABLE” connecting cable can be used to connect a Prowirl 72 or 73 with the service interface FXA 193.

⚠ Warning!
The service connector may not be connected in a potentially explosive atmosphere.

Technical data

Dimensions

The dimensions of the Ex transmitter housing and the sensor correspond to the standard versions. Please refer to the Technical Information for these dimensions.

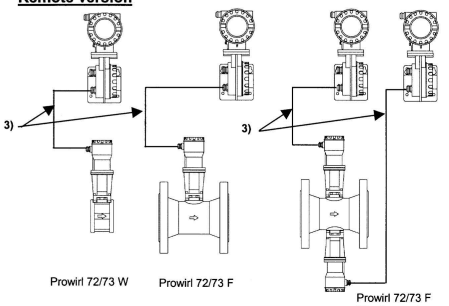
✎ Note!
Associated “Technical Information”:
Prowirl 72F, 72W, 73F, 73W → TI070D

Control drawings

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

Hazardous Locations
Class I Division 1 Groups ABCD or Class I Zone 0 Group IIC
and Class II and III Division 1 Groups EFG

Remote version



Compact version

PROWIRL 7** **-**1***N*****, PROWIRL 7** **-**2***N*****, PROWIRL 7** **-**3***N*****,
PROWIRL 7** **-**4***N*****, PROWIRL 7** **-**6***N*****, PROWIRL 7** **-**7***N*****,
PROWIRL 7** **-**C***N*****, PROWIRL 7** **-**F***N*****, PROWIRL 7** **-**H***N*****:

	Max. medium temperature					
	T6 2)	T5 2)	T4	T3	T2	T1
Ta = 40°C	80°C	95°C	130°C	190°C	290°C	440°C
Ta = 60°C	---	95°C	130°C	190°C	290°C	440°C
Ta = 70°C	---	---	130°C	190°C	290°C	440°C

PROWIRL 7** **-**0***N*****, PROWIRL 7** **-**5***N*****, PROWIRL 7** **-**B***N*****,
PROWIRL 7** **-**G***N*****:

	Max. medium temperature				
	T6 2)	T5 2)	T4	T3	T2 - T1
Ta = 40°C	80°C	95°C	130°C	190°C	280°C
Ta = 60°C	---	95°C	130°C	190°C	280°C
Ta = 70°C	---	---	130°C	190°C	280°C

Notes:

1) Assignment of Control Drawings:

Drawing-No.	Model Codes:
FES0067 C	Prowirl 7* **-******N****
FES0067-0001 C	Prowirl 7* **-******N****A and Prowirl 7* **-******N****W
FES0067-0002 C	Prowirl 7* **-******N****H and Prowirl 7* **-******N****K
FES0067-0003 C	Prowirl 7* **-******N****H and Prowirl 7* **-******N****K
FES0067-0004 C	Prowirl 7* **-******N****H and Prowirl 7* **-******N****K

2) Temperature class T6 and T5 is not allowed for versions of Profibus PA and Fieldbus Foundation
(not for PROWIRL 7** **-******N****H and PROWIRL 7** **-******N****K)
3) Max. cable length for intrinsically safe installation 100m for using cable parameters L_{Cable} = 1mH/km and C_{Cable} = 1µF/km
4) Caution: Use supply wires suitable for 10°C above maximum ambient temperature
5) Caution: Surface temperature of transmitter enclosure can exceed 70°C depending on ambient temperature or medium temperature
6) Dust tight seals must be used at conduit entries for Class II and III installation
7) Fieldbus cable connectors are suitable for Class I, Div. 2, Groups A,B,C,D if non-incendive circuits are connected (see FES0067-0004 C)
8) Prowirl 72 and Prowirl 73 transmitter is intended for installation to Service Interface FXA 193 when using the PROLINE EX-ZWEILEITER-KABEL (blue cable)

Sensor:

PROWIRL 7** **-**1***N*****, PROWIRL 7** **-**2***N*****, PROWIRL 7** **-**3***N*****,
PROWIRL 7** **-**4***N*****, PROWIRL 7** **-**6***N*****, PROWIRL 7** **-**7***N*****,
PROWIRL 7** **-**C***N*****, PROWIRL 7** **-**F***N*****, PROWIRL 7** **-**H***N*****,

	Max. medium temperature					
	T6 2)	T5 2)	T4	T3	T2	T1
Ta = 40°C	80°C	95°C	130°C	190°C	290°C	440°C
Ta = 60°C	---	95°C	130°C	190°C	290°C	440°C
Ta = 85°C	---	---	130°C	190°C	290°C	440°C

PROWIRL 7** **-**0***N*****, PROWIRL 7** **-**5***N*****,
PROWIRL 7** **-**B***N***** and PROWIRL 7** **-**G***N*****:

	Max. medium temperature				
	T6 2)	T5 2)	T4	T3	T2 - T1
Ta = 40°C	80°C	95°C	130°C	190°C	280°C
Ta = 60°C	---	95°C	130°C	190°C	280°C
Ta = 85°C	---	---	130°C	190°C	280°C

Transmitter:

PROWIRL 7** **-******N*****:

	T6 2)	T5 2)	T4 - T1
Ta =	40°C	60°C	80°C

Aenderungen:						
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	E		K		zugängig gemacht werden.	File: M:\ZEICHNG\...\031210c.doc **ID 1113**

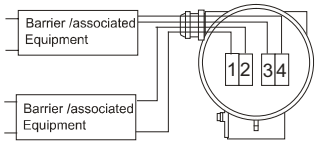
CSA CONTROL DRAWING
PROWIRL 72, PROWIRL 73 (IS and NI)
Compact Version, Remote version

Massstab			
Gezeichnet	23.09.02	Bn
Geprüft		
Ex-geprüft	10.12.03	Bn
Gesehen		

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

FES0067 C

Hazardous Locations
Class I Division 1 Groups ABCD or Class I Zone 0 Group IIC
and Class II and III Division 1 Groups EFG



Instrinsically safe installation

1) Control room equipment may not use or generate over 250 Vrms.
2) Wire all circuits for power supply per ISA RP 12.06.01
3) Use entity approved safety barrier or other associated equipment that satisfy the following conditions:
$V_{oc} \le V_{max}$, $I_{sc} \le I_{max}$, $C_a \ge C_i + C_{cable}$, $L_a \ge L_i + L_{cable}$ transmitter entity parameters are as follows:
Terminals 1 and 2 (Hart, current output)

V_{max}	I_{max}	P_i	C_i	L_i
30 V	300 mA	1 W	5.3 nF	0

Terminals 3 and 4 (Pulse)

V_{max}	I_{max}	P_i	C_i	L_i
30 V	300 mA	1 W	0	0

4) **WARNING**: SUBSTITUTION OF COMPONENTS MAY IMPAIR INSTRINSIC SAFETY.
5) Ex ia is defined as Intrinsically Safe

Notes:

This page applies to model code:
Prowirl 7* **-*****N****A and**
Prowirl 7* **-*****N****W**

Division 2 and Zone 2 installation (without barrier)

6) Installation of transmitter circuit wiring according to Canadian Electrical Code using threaded conduit or other wiring methods in accordance with rule 18.
7) **WARNING**: EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2 OR CLASS I, ZONE 2.
8) Terminal 1 and 2
Supply voltage: HART 12 ... 30 V
Signal current: 4 ... 20 mA (max. 25 mA)
9) Terminal 3 and 4
Pulse Output: max. 30 V, max. 30 mA
10) For non-incencive installation see parameters as listed in note 3)

Class II, III installation (without barrier)

11) Installation of transmitter circuit wiring according to Canadian Electrical Code using threaded conduit or other wiring methods in accordance with rule 18.

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	E		K		zugängig gemacht werden.	File: M:\ZEICHNG\...\031210c.doc **ID 1113**

CSA CONTROL DRAWING
PROWIRL 72, PROWIRL 73 (IS and NI)
Current output, Hart, Pulse
ENTITY INSTALLATION

Massstab			
Gezeichnet	23.09.02	Bn
Geprüft		
Ex-geprüft	10.12.03	Bn
Gesehen		

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

FES0067-0001 C

This page applies to model code: **Prowirl 7* **-******N****H and Prowirl 7* **-******N****K**

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) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (Uo or Voc), the current (Io or Isc) and the power (Po) 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 of the associated apparatus has to be limited to the 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 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
inducance 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

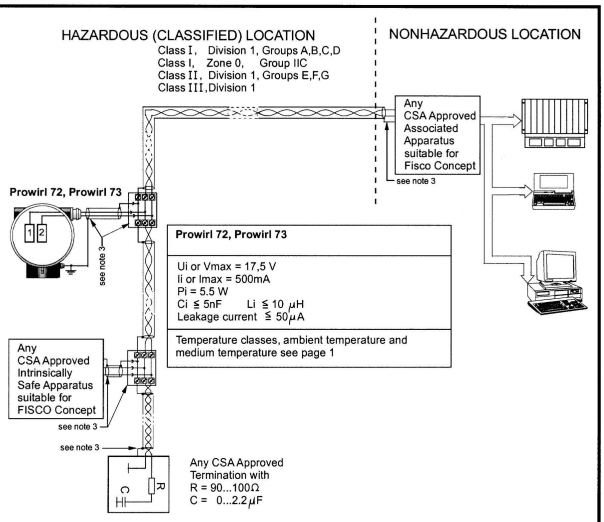
length of spur cable	: ≤ 30 m
length of trunk cable	: ≤ 1 km
length of splice	: ≤ 1 m

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 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.



Notes:

Intrinsically safe installation

1) Control room equipment may not use or generate over 250 Vrms.
2) Wire all circuits for power supply per Canadian Electrical Code Part I.
3) Be aware of multiple earthing of the screen. The screen must be connected in accordance with ISA RP 12.06.01
4) WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.

Division 2 and Zone 2 installation

5) Installation of transmitter circuit wiring according to Canadian Electrical Code using threaded conduit or wiring methods in accordance to rule 18.
6) WARNING: EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.

Class II installation

7) Transmitter circuit wiring in conduit in accordance with the Canadian Electrical Code Part I

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	C	10.12.03 / Bn	H			noch dritten Personen und Konkurrenzfirmen	Ersteller: FES/Bn		
	D		J			zugänglig gemacht werden.	File: M:\ZEICHNG\...\031210c.doc	ID 1113	
	E		K				Massstab	Gezeichnet	23.09.02	Bn
CSA CONTROL DRAWING								Geprüft		
PROWIRL 72, PROWIRL 73 (IS)								Ex-geprüft	10.12.03	Bn
Div. 1 / Zone 0								Gesehen		
FISCO - Concept										

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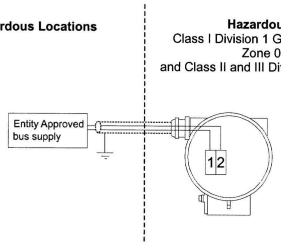
FES0067-0002 C

This page applies to model code: **Prowirl 7* **-******N****H and Prowirl 7* **-******N****K**



Instrinsically safe installation:

1) Control room equipment may not use or generate over 250 Vrms.
2) Wire all circuits for power supply per ISA RP 12.6.
3) Use entity approved safety barrier or other associated equipment that satisfy the following conditions:
$V_{oc} \leq V_{max}$, $I_{sc} \leq I_{max}$, $C_a \geq C_i + C_{cable}$, $L_a \geq L_i + L_{cable}$ transmitter entity parameters are as follows:

V_{max}	I_{max}	P_i	C_i	L_i
17.5 V	500 mA	5.5 W	≤ 5 nF	≤ 10 µH
or 24 V	250 mA	1.2 W	≤ 5 nF	≤ 10 µH

4) **WARNING**: SUBSTITUTION OF COMPONENTS MAY IMPAIR INSTRINSIC SAFETY.
5) Ex ia is defined as Intrinsically Safe

Division 2 and Zone 2 installation (without barrier):

6) Control room equipment may not use or generate over 250 Vrms.
7) Installation of transmitter circuit wiring according to Canadian Electrical Code using threaded conduit or wiring methods in accordance to rule 18.
8) Wire all circuits for power supply per ISA RP 12.06.01
9) Terminals 1 and
   V ≤ 30 V, I ≤ 40 mA
   For non-incencive installation see parameters as listed in note 3)

10) **WARNING:** SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I DIVISION 2 AND CLASS I ZONE 2.

Class II, III installation (without barrier)

11) Transmitter circuit wiring in conduit in accordance with the Canadian Electrical Code.

Aenderungen:						Alle gesetzlichen Urheberrechte vorbehalten.	Ersetzt durch:		
	A	24.03.03 / Bn	F			Diese Zeichnung darf ohne unsere			
	B	08.09.03 / Bn	G			Genehmigung weder vervielfältigt werden	Ersatz für:		
	C	10.12.03 / Bn	H			noch dritten Personen und Konkurrenzfirmen	Ersteller: FES/Bn		
	D		J			zugänglig gemacht werden.	File: M:\ZEICHNG\...\031210c.doc	ID 1113	
	E		K				Massstab	Gezeichnet	23.09.02	Bn
CSA CONTROL DRAWING								Geprüft		
PROWIRL 72, PROWIRL 73 (IS and NI)								Ex-geprüft	10.12.03	Bn
Fieldbus Foundation and Profibus PA								Gesehen		
IS installation, Entity - Concept										

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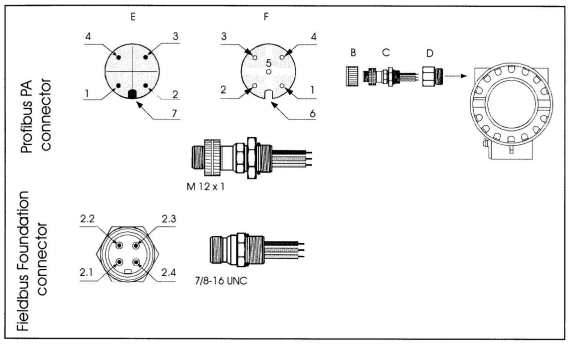
FES0067-0003 C



This page applies to model code: **Prowirl 7* **-******N****H and Prowirl 7* **-******N****K with Fieldbus Cable Connector**

Notes:

1) Fieldbus cable connectors are suitable for Class I, Div. 2, Groups A,B,C,D and Class I, Zone 2 Group IIC if non-incendive circuits are connected

B = Protection cap for connector, C = Fieldbus connector,
D = Thread adapter E = Connector on housing (male),
F = Connector (female)

Pin assignment:
Profibus PA
1 = Brown wire, PA+ (terminal 26)
2 = Not connected
3 = Blue wire, PA- (terminal 27)
4 = Black wire, ground
5 = Female connector not assigned
6 = Positioning groove
7 = Positioning key

Fieldbus Foundation
2.1 = Brown wire, FF+ (terminal 26)
2.2 = Blue wire, FF- (terminal 27)
2.3 = Not connected
2.4 = Yellow/green wire, ground

Aenderungen:						Ersetzt durch:
	A	24.03.03 / Bn	F			Ersatz für:
	B	08.09.03 / Bn	G			Ersteller: FES/Bn
	C	10.12.03 / Bn	H			File: M:\ZEICHNG\...\031210c.doc ID 1113
	D		J			
	E		K			

CSA CONTROL DRAWING PROWIRL 72, PROWIRL 73 (IS and NI) Fieldbus Cable Connector NI installation	Massstab	Gezeichnet	23.09.02	Bn
		Geprüft		
		Ex-geprüft	10.12.03	Bn
		Gesehen		
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