Safety Instructions

Proline Prowirl 72, 73

HART, PROFIBUS, FOUNDATION Fieldbus

NEPSI Zone 2

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

Contents

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General warnings

- For installation, use and maintenance of the flow meter, the instruction manual and the following standards shall be observed:
  - GB50257-1996 "Code for construction and acceptance of electric device for explosive atmospheres and fire hazard electrical equipment installation engineering"
  - GB3836.13-1997 "Electrical apparatus for explosive gas atmospheres – Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres"
  - GB3836.15-2000 "Electrical apparatus for explosive gas atmospheres – Part 15: Electrical installations in hazardous area (other than mines)"
  - GB3836.16-2006 "Electrical apparatus for explosive gas atmospheres – Part 16: Inspection and maintenance of electrical installation (other than mines)"
- Any maintenance shall be done after power off or the area known to be non-hazardous.
- The flow meter shall not be modified in order to ensure the explosion protection performance of the equipment. Any change may impair safety.
- 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 all of the technical data of the device (see nameplate) is mandatory.
- It is not permissible to connect the service adapter while the atmosphere is considered to be explosive.
- Opening the transmitter housing and the connection housing of the remote version is only permitted for a brief time. During this time, ensure that no dust or water enters the housing.
- Use of the devices is restricted to mediums against which the process-wetted materials are adequately resistant.

Special conditions

- The device must be integrated into the potential equalization system. Potential must be equalized along the intrinsically safe sensor circuits. Further information is provided in the "Potential equalization" section → 9.

Installation instructions

- For operation in Zone 2, make sure that the maximum operating voltage stated on the nameplate is not exceeded by more than 40% as a result of temporary interference.
- 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 → 6.
- Suitable cables and suitable, certified cable glands, cable entries and blanking plugs must be used for measuring devices operated at temperatures below −20 °C.
- The cable entries and openings not used must be sealed tight with suitable components.
- 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 ... (Ta +10 °C)).
- The dielectric strength between the various energy limited circuits must be at least 500 Vrms (affects outputs/inputs: (Prowirl 72****-**********A and Prowirl 73****-**********A)).

⚠ Warning!
For entity concept, the criteria for interconnection between the I/O circuits and the associated circuits is as follow:

- $U_o \leq U_i$
- $I_o \leq I_i$
- $P_o \leq P_i$
- $C_o \geq C_i + C_c$
- $L_o \geq L_i + L_c$

C_c and L_c stand for the distributed capacitance and distributed inductance of the cable.

COC certificates of conformity

COC certificates of conformity

By affixing the certification number the product conforms with the following standards:

- GB3836.1 – 2010
- GB3836.8 – 2003

Certification number:

- GYJ12.1483

Inspection body

NEPSI, National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation

Description of measuring system

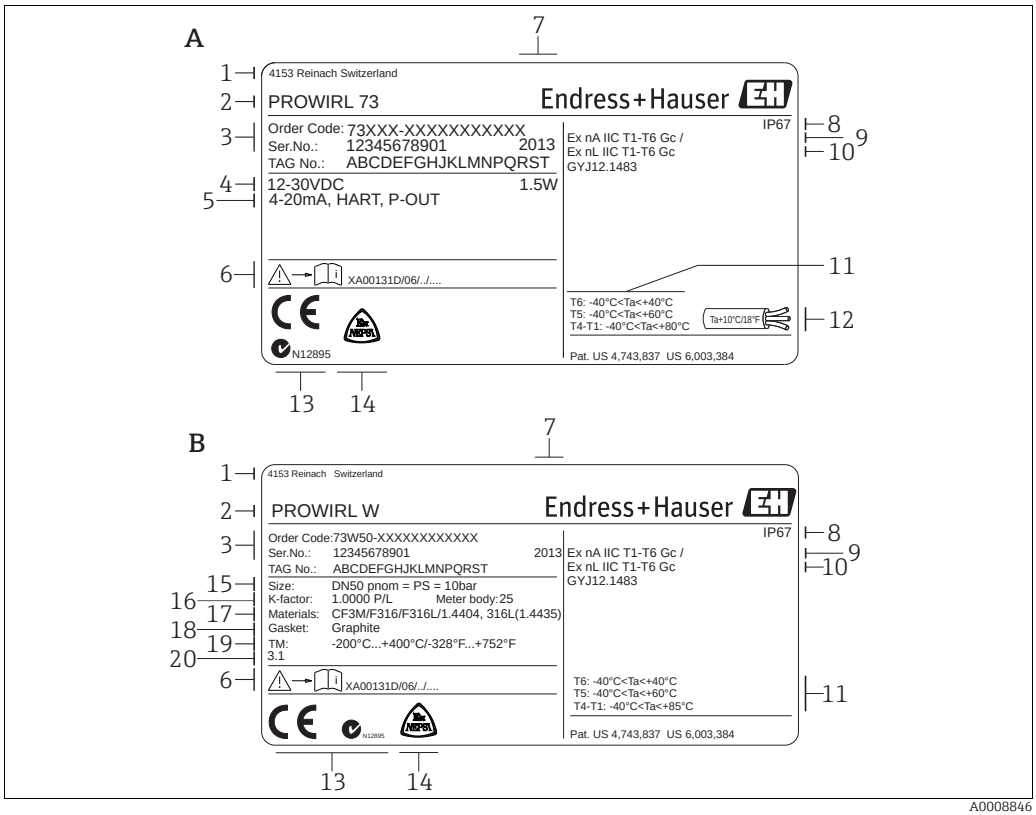
The measuring system consists of transmitters and sensors.

Two versions are available:

- Compact version: transmitters and sensors form a mechanical unit.
- Remote version: transmitters and sensors are installed separately and connected to each other via connecting cables.

Nameplates

The nameplates, which are mounted in a clearly visible position on the transmitter and sensor, contain all of the relevant information about the measuring system.



A0008846

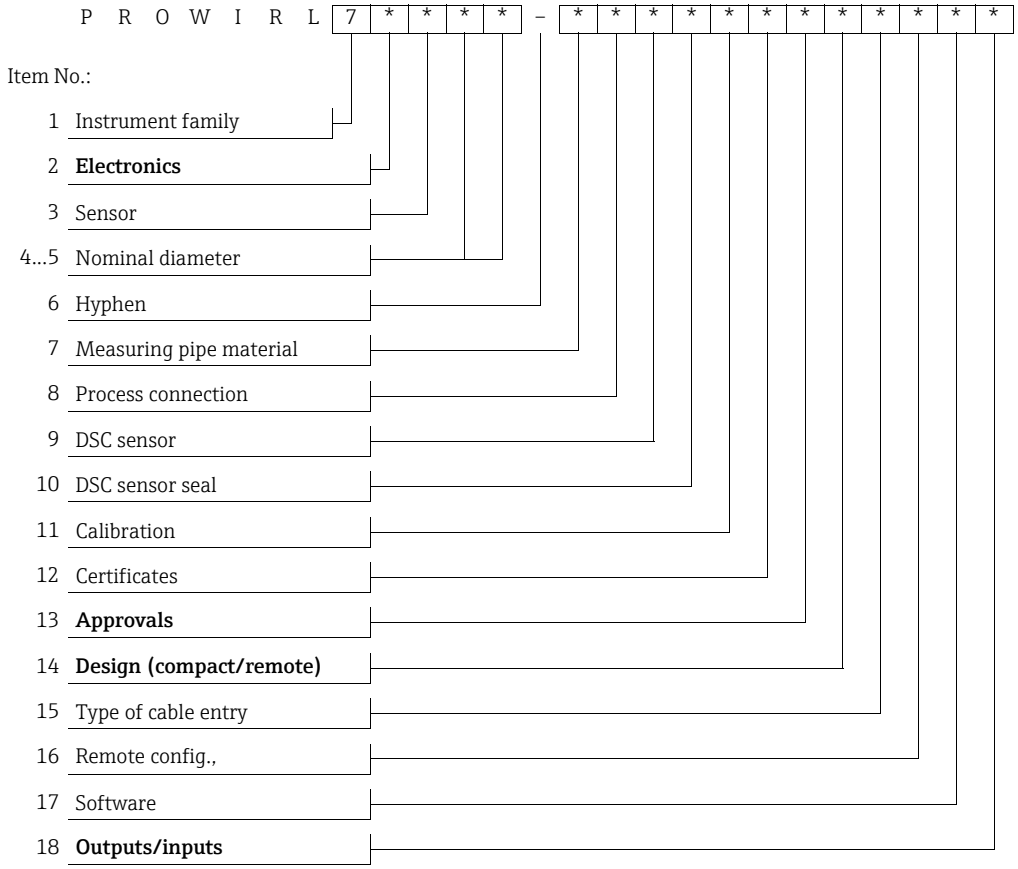
Fig. 1: Example for nameplates of a transmitter and of a sensor, remote version

A Transmitter nameplate
B Sensor nameplate

1 Production site
2 Transmitter or sensor type
3 Order code and serial number
4 Power supply and power consumption
5 Output
6 Associated Ex documentation
7 Year of manufacture
8 Type of protection
9 Type of enclosure protection
10 Number of the NEPSI certificate of conformity
11 Ambient temperature range
12 Maximum cable temperature
13 C-Tick symbol
14 NEPSI Symbol
15 Nominal diameter/nominal pressure
16 Calibration factor/zero point
17 Materials in contact with the medium
18 Sensor seal material
19 Fluid temperature range
20 Additional specification, e.g. 3.1

Type code

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



Electronics (Item No. 2 in type code →🖹 5)

*	Transmitter	Electronics/housing
2	Prowirl 72	▪ Ex nA IIC T1 ~ T6 Gc or Ex nL IIC T1 ~ T6 Gc (Item 18: A, W) ▪ Ex nA IIC T1 ~ T4 Gc or Ex nL IIC T1 ~ T4 Gc (Item 18: H, K)
3	Prowirl 73	

Approvals (Item No. 13 in type code →🖹 5)

*	Approval
7	Ex nA IIC / Ex nL IIC

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

*	Type
A, J	Compact
E, F, K, L	Remote

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

*	Approval
A, W	Ex nA IIC T1 ~ T6 Gc or Ex nL IIC T1 ~ T6 Gc
H, K	Ex nA IIC T1 ~ T4 Gc or Ex nL IIC T1 ~ T4 Gc

✎ Note!
- The vortex flometers (compact and remote version) are designed for type of protection Ex nA II. Nevertheless, when respecting the safety parameters, the vortex flowmeter comes to be suitable for type of protection Ex nL IIC.
- A detailed explanation of these values, regarding the available outputs and inputs, as well as a description of the associated terminal assignments and connection data →🖹 10 onwards.

Temperature table compact version

Maximum fluid temperature [°C] depending on the ambient temperature T_a and the DSC sensor used (Item No. 9 in the type code →🖹 5).

	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	195	280	280
	−40 °C ... +60 °C	–	95	130	195	280	280
	−40 °C ... +70 °C	–	–	130	195	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	195	290	440
	−40 °C ... +60 °C	–	95	130	195	290	440
	−40 °C ... +70 °C	–	–	130	195	290	440

Dependency of the minimum fluid temperature T_M on the DSC sensor:

T_M −200 °C	T_M −50 °C	T_M −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.

Temperature table remote version

Sensor

Maximum fluid temperature [°C] depending on the ambient temperature T_a and the DSC sensor used (Item No. 9 in the type code →🖹 5).

	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	195	280	280
	−40 °C ... +60 °C	–	95	130	195	280	280
	−40 °C ... +85 °C	–	–	130	195	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	195	290	440
	−40 °C ... +60 °C	–	95	130	195	290	440
	−40 °C ... +85 °C	–	–	130	195	290	440

Dependency of the minimum fluid temperature T_M on the DSC sensor:

T_M −200 °C	T_M −50 °C	T_M −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	T5	T4	T3	T2	T1
Prowirl 72***-******H****A Prowirl 72***-******H****W Prowirl 73***-******H****A Prowirl 73***-******H****W	40	60	80	80	80	80
Prowirl 72***-******H****H Prowirl 72***-******H****K Prowirl 73***-******H****H Prowirl 73***-******H****K	–	–	80	80	80	80

Gas explosion protection

Determine the temperature class for gas in relation to the ambient T_a and medium temperature T_M

Example
Device: compact version, Prowirl 72 F
DCS Sensor: Basic version
Max. ambient temperature: T_a = 60 °C
Max. medium temperature: T_M = 98 °C

	Ta	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	195	280	280
	<−40 °C ... +60 °C>	–	95	130	195	280	280
	−40 °C ... +70 °C	–	–	130	195	280	280
Prowirl 72***-**1*********	−40 °C ... +40 °C	80	95	130	195	290	440
Prowirl 72***-**2*********							
Prowirl 72***-**3*********	−40 °C ... +60 °C	–	95	130	195	290	440
Prowirl 72***-**6*********							
Prowirl 72***-**4*********	−40 °C ... +70 °C	–	–	130	195	290	440
Prowirl 72***-**7*********							

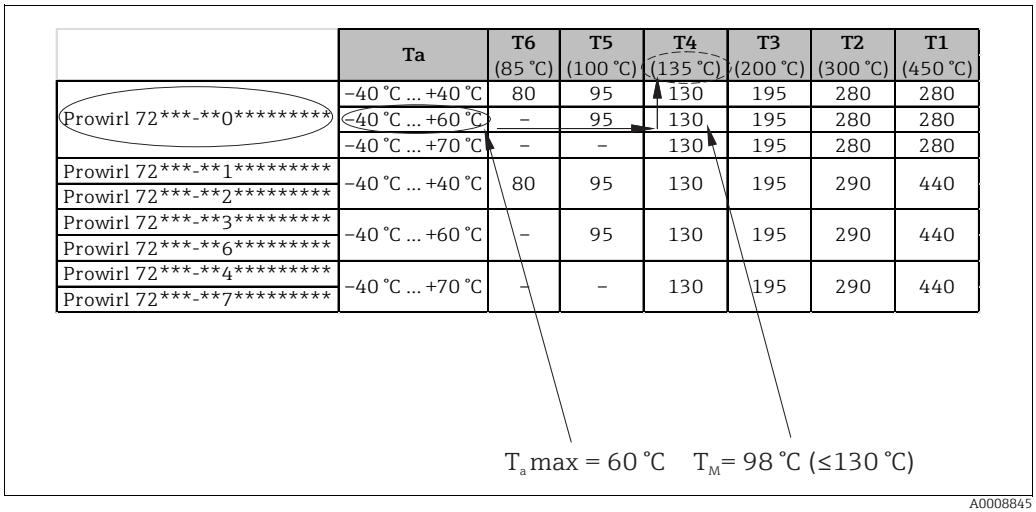


Fig. 2: Procedure for calculating the max. surface temperature

1. In the associated temperature table (remote version), the selection of the measuring device (Prowirl 72 F), and the ambient temperature T_a (60 °C) determine the line in which the max. medium temperature can be found.
2. The fluid temperature T_M (98 °C), which is smaller or equal to the max. fluid temperature, determines the column, i.e. the temperature class, for gas (98 °C ≤130 °C → T4).

Design of measuring system

Compact/remote version design

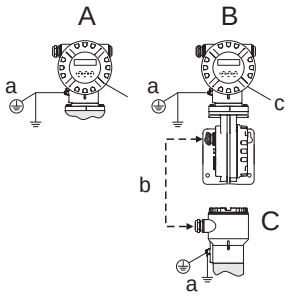


Fig. 3 A0004112

A Transmitter housing (compact/remote version)
B Transmitter housing (remote version)
C Sensor connection housing (remote version)
a Screw terminal for connecting to potential equalization system
b Remote version connecting cable (see also below)
c Terminal/electronics compartment cover (see below)
d –

Terminal assignment and connection data → 10.

Cable entries

Thread for cable entry M20 × 1.5 or ½"-NPT or G ½", as required.

Cable specification

You can find information about the cable specification in the associated Operating Instructions.

Potential equalization

Caution!
- There must be potential equalization along the circuits (inside and outside the hazardous area).
- The transmitter must be safely included in the potential equalization 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 equalization system by means of the pipeline if a ground connection, performed as per the specifications, is ensured.

Electrical connection

Connection compartment

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

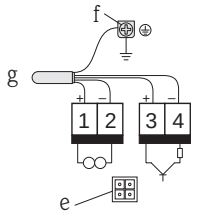


Fig. 4 A0004027

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

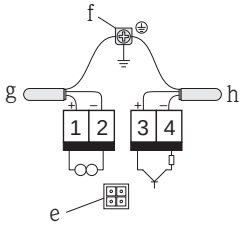


Fig. 5 A0004028

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

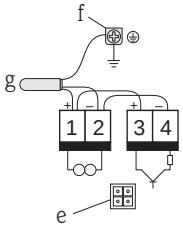


Fig. 6 A0004029

PROFIBUS PA

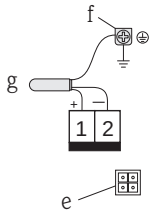


Fig. 7 A0004030

FOUNDATION Fieldbus

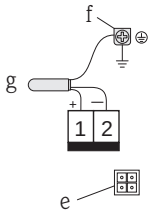


Fig. 8 A0004030

e Service connector → 10

f HART ground terminal: if the potential equalization is routed via the cable and if two cables are used, both cables must be connected to the potential equalization system if a connection is not already established to screw terminal (a).
PROFIBUS and FOUNDATION Fieldbus: between the stripped fieldbus cable and the ground terminal, the cable shielding must not exceed 5 mm 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 → 4 or → 5; 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 → 9.

Terminal assignment /connection data

Terminals		1 (+)	2 (–)	3 (+)	4 (–)
Prowirl 72*-**********A **Prowirl 72***-**********W **Prowirl 73***-**********A **Prowirl 73***-**********W		Transmitter power supply / 4...20 mA HART		Optional pulse/status output	
Functional values	U	≤ 30 V		≤ 30 V	
	P	≤1 W		≤ 1 W	

Terminals		1 (+)	2 (–)
Prowirl 72*-**********H **Prowirl 73***-**********H		FOUNDATION Fieldbus	
Functional values	U_B	9...30 V DC	
	I_B	16 mA	
	P_B	≤1 W	

Terminals		1 (+)	2 (–)
Prowirl 72*-**********K **Prowirl 73***-**********K		PROFIBUS PA	
Functional values	U_B	9...30 V DC	
	I_B	16 mA	
	P_B	≤ 1 W	

The vortex flometers (compact and remote version) are designed for type of protection Ex nA II. Nevertheless, when respecting the following safety parameters, the vortex flowmeter comes to be suitable for type of protection Ex nL IIC.

Code	Type of output	Terminals	U_i	I_i	P_i	C_i	L_i
A, W	4...20 mA (HART)	1 (L+), 2 (–)	36 V	300 mA	1 W	5.28 nF	0 mH
	Pulse output	3 (P+), 4 (P–)	36 V	300 mA	1 W	0 nF	0 mH
H, K	PROFIBUS PA or FOUNDATION Fieldbus	1 (L+), 2 (L–)	35 V	600 mA	8.5 W	≤ 5 nF	≤ 10 µH

For code H and K the safe parameters meet all requirements for a FNICO Field Device (IEC60079-27).

Service adapter

The service connector (for connection → 4...→ 8, 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 respective Technical Information for these dimensions:

- Prowirl 72F, 72W, 73F, 73W →TI070D

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