



TYPE APPROVAL CERTIFICATE

N. ELE096216CS002



This is to certify that the product below is found to be in compliance with the applicable requirements of the RINA type approval system.

Description	Ultrasonic Flow measuring system
Type	Proline Prosonic Flow 93P Volume flow measurement of liquids in chemicals or process application 93W Volume flow measurement for standard applications with drinking water, wastewater and process water
Applicant	Endress + Hauser Italia S.p.A. Via Fratelli Di Dio, 7 20063 Cernusco s/N (MI) Italy
Manufacturer	Endress + Hauser Flowtec AG Kaegenstrasse 7 CH-4153 Reinach BL1 Switzerland
Testing Standard	Rules for the Classification of Ships - Part C - Machinery, Systems and Fire protection - Ch.3, Sect.6, Tab.1.

Issued in Genova, September 09, 2016

This certificate is valid until September 09, 2021

RINA Services S.p.A.

Valerio Bonanni



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Application:

The sensors are suited for the non-contact measurement of pure or slightly contaminated liquids, regardless of the pressure or electrical conductivity.

Measuring Principle:

The measuring system operates on the principle of transit time difference. In this measurement method, acoustic (ultrasonic) signals are transmitted between two sensors. The signals are sent in both directions, i.e. the sensor in question works as both a sound transmitter and a sound receiver.

As the propagation velocity of the waves is less when the waves travel against the direction of flow than along the direction of flow, a transit time difference occurs. This transit time difference is directly proportional to the flow velocity.

The measuring system calculates the volume flow of the fluid from the measured transit time difference and the pipe cross-sectional area. In addition to measuring the transit time difference, the system simultaneously measures the sound velocity of the fluid.

Measuring system:

The measuring system consists of one transmitter and two sensors.

The transmitter is used both to control the sensors and to prepare, process and evaluate the measuring signals, and to convert the signals to a desired output variable.

The transmitter is optionally equipped for two-channel operation.

The sensors work as sound transmitters and sound receivers. Depending on the application and version, the sensors can be arranged for measurement via one transverse (sensors are located on opposite sides of the pipe) or two traverses (the sensors are located on the same side of the pipe).

Input

Measured range: Flow velocity (transit time difference proportional to flow velocity)

Measuring range: Typically $v = 0$ to 15 m/s with the specified accuracy

Operable flow range: Over 150:1

Output

Current output

- Galvanically isolated
- Active/passive selectable
 - Active: 0/4 to 20 mA, $R_L < 700 \text{ ohm}$ (for HART: $R_L > 250 \text{ ohm}$)
 - Passive: 4 to 20 mA, max. 30 V DC, $R_i < 150 \text{ ohm}$
- Time constant selectable (0.01 to 100 s)
- Full scale value adjustable
- Temperature coefficient: typ. 0.005 % o.r. /°C (o.r. = of reading)
- Resolution: 0.5 μA

Pulse / frequency output

- Galvanically isolated
- Active/passive selectable
 - Active: 24 V DC, 25 mA (max. 250 mA during 20 ms), $R_L > 100 \text{ ohm}$
 - Passive: open collector, 30 V DC, 250 mA
- Time constant selectable (0.05 to 100 s)
- Frequency output
 - End frequency: 2 to 10000 Hz ($f_{\text{max}} = 12500 \text{ Hz}$)
 - End frequency for EEx ia 2 to 5000 Hz
 - On/off ratio 1:1, pulse width max. 10 s



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- Pulse output
 - Pulse value and pulse polarity selectable
 - Max. pulse width adjustable (0.05 to 2000 ms)
 - As of a frequency of $1 / (2 \times \text{pulse width})$, the on/off ratio is 1:1

PROFIBUS DP interface

- PROFIBUS DP in accordance with EN 50170 Volume 2
- Profile version 3.0
- Data transmission rate: 9.6 kBaud to 12 MBaud
- Automatic data transmission rate recognition
- Signal encoding = NRZ Code
- Function blocks: 8 × Analog Input (AI), 3 × Totalizer
- Output data: volume flow channel 1 or channel 2, sound velocity channel 1 or channel 2, flow velocity channel 1 or channel 2, average volume flow, average sound velocity, average flow velocity, volume flow sum, volume flow difference, totalizer 1 to 3
- Input data: positive zero return (ON/OFF), zero point adjustment, measuring mode, totalizer control
- Bus address adjustable via miniature switches or local display (optional) at the measuring device
- Available output combination

PROFIBUS PA interface

- PROFIBUS PA in accordance with EN 50170 Volume 2, IEC 61158-2 (MBP)
- Galvanically isolated
- Data transmission rate, supported baudrate: 31.25 kBit/s
- Current consumption = 11 mA
- Error current FDE (fault disconnection electronic) = 0 mA
- Signal encoding = Manchester II
- Function blocks: 8 × Analog Input (AI), 3 × Totalizer
- Output data: volume flow channel 1 or channel 2, sound velocity channel 1 or channel 2, flow velocity channel 1 or channel 2, average volume flow, average sound velocity, average flow velocity, volume flow sum, volume flow difference, totalizer 1 to 3
- Input data: positive zero return (ON/OFF), operation control, totalizer control, zero point adjustment control, display value
- Bus address can be set via DIP switch on device

FOUNDATION Fieldbus interface

- FOUNDATION Fieldbus H1, IEC 61158-2
- Galvanically isolated
- Data transmission rate, supported baudrate: 31.25 kBit/s
- Current consumption = 12 mA
- Error current FDE (fault disconnection electronic) = 0 mA
- Signal encoding = Manchester II
- Function blocks: 8 × Analog Input (AI), 1 × Discrete Output, 1 × PID
- Output data: volume flow channel 1 or channel 2, sound velocity channel 1 or channel 2, flow velocity channel 1 or channel 2, signal strength channel 1 or 2, average volume flow, average sound velocity, average flow velocity, volume flow sum, difference, volume flow, totalizer 1 to 3
- Input data: positive zero return (ON/OFF), reset totalizer, zero point adjustment control
- Link master function (LAS) is supported

Signals on alarm

- | | |
|-------------------------|--|
| Current output: | failsafe mode selectable |
| Pulse/frequency output: | failsafe mode selectable |
| Relay output: | deenergized " in the event of a fault or if the power supply fails |



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Switching output:

Relay output

- NC or NO contact available
Factory setting: relay 1 = NO contact, relay 2 = NC contact
- Max. 30 V / 0.5 A AC; 60 V / 0.1 A DC
- Galvanically isolated
- Configurable for: error messages, flow direction, limit values

Low flow cutoff:

Switch points for low flow are selectable

Galvanic isolation

All circuits for inputs, outputs, and power supply are galvanically isolated from each other.

Supply voltage

HART

- 85 to 260 V AC, 45 to 65 Hz
- 20 to 55 V AC, 45 to 65 Hz
- 16 to 62 V DC

PROFIBUS DP/PA

- 9 to 32 V DC

FOUNDATION Fieldbus

- 9 to 32 V DC

Sensor: Powered by the transmitter

Performance _ Maximum measured error

Measured error at the measuring point P and W type

The measured error at the measuring point is made up of the measured error of the device (0.5 % o.r.) and the measured error resulting from the installation conditions on site. Given a flow velocity > 0.3 m/s (1 ft/s) and a Reynolds number > 10000, the following are typical error limits:

Nominal diameter	Device error limits	Installation-specific error limits (typical)	Error limits at the measuring point (typical)
DN 15 (½")	±0.5 % o.r. ± 5 mm/s +	± 2.5 % o.r.	±3 % o.r. ± 5 mm/s
DN 25 to 200 (1 to 8")	±0.5 % o.r. ± 7.5 mm/s +	± 1.5 % o.r.	±2 % o.r. ± 7.5 mm/s
> DN 200 (8")	±0.5 % o.r. ± 3 mm/s +	± 1.5 % o.r.	±2 % o.r. ± 3 mm/s

o.r. = of reading

Repeatability: ±0.3 % for flow velocities > 0.3 m/s

Ambient operating conditions_

Transmitter: • Standard: -20 to +60 °C; • Optional: -40 to +60 °C



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Prosonic Flow P Sensor

Prosonic Flow P (DN 15 to 65)

- Standard: -40 to +100 °C; • Optional: -40 to +150 °C

Prosonic Flow P (DN 50 to 4000)

- Standard: -40 to +80 °C; • Optional: 0 to +170 °C

Prosonic Flow W sensor

- Clamp-on: -20 to +80 °C
- Insertion version: -40 to +80 °C

DDU18 sensor (accessories: sound velocity measurement)

- Standard: -40 to +80 °C; • Optional: 0 to +170 °C

DDU19 sensor (accessories: wall thickness measurement)

-20 to +60 °C

Degree of protection

Transmitter IP 67; Sensor IP 67 / 68

DDU18 sensor (accessories: sound velocity measurement)

IP 68 (NEMA 6P)

DDU19 sensor (accessories: wall thickness measurement)

IP 67 (NEMA 4X)

Medium temperature range

Prosonic Flow P sensor

Prosonic Flow P (DN 15 to 65) • Standard: -40 to +100 °C; • Optional: -40 to +150 °C

Prosonic Flow P (DN 50 to 4000) • Standard: -40 to +80 °C; • Optional: 0 to +170 °C

Prosonic Flow W sensor

- Clamp-on: -20 to +80 °C
- Insertion version: -40 to +80 °C

DDU18 sensor (accessories: sound velocity measurement) • Standard: -40 to +80 °C; • Optional: 0 to +170 °C

DDU19 sensor (accessories: wall thickness measurement): -20 to +60 °C

Transmitter

- Wall-mounted housing: powder-coated die-cast aluminum
- Field housing: powder-coated die-cast aluminum

Sensor Prosonic Flow P/W (where applicable)

DN 15 to 65 (½ to 2½"); DN 50 to 4000 (2 to 160")

- Sensor holder: stainless steel 1.4308/CF-8
- Sensor housing: stainless steel 1.4301/304
- Strapping bands/bracket: stainless steel 1.4301/304
- Sensor contact surfaces: chemically stable plastic

Sensor (accessories)

Prosonic Flow DDU18; Prosonic Flow DDU19

- Sensor holder: stainless steel 1.4308/CF-8
- Sensor housing: stainless steel 1.4301/304
- Strapping bands/bracket: stainless steel 1.4301/304
- Sensor contact surfaces: chemically stable plastic



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Human interface - Display elements

- Liquid crystal display: illuminated, four lines each with 16 characters
- Custom configuration for presenting different measured values and status variables
- 3 totalizers

Remote operation

Operation Via • HART • PROFIBUS DP/ PA • FOUNDATION Fieldbus

Equipment and protective systems intended for use in potentially explosive atmospheres – Directive 94/9/EC
Supplement accordant with Annex III number 6

Model: Flow measuring system type Prosonic Flow 9*P**- *****
Certification Authority DEKRA EXAM GmbH
EC- type Examination Certificate: DMT 01 ATEX E 064 5th Supplement

The Essential Health and Safety Requirements are assured by compliance with:

EN 60079-0:2012 + A11:2013	General requirements
EN 60079-1:2007	Flameproof enclosure “d”
EN 60079-7:2007	Increased safety “e”
EN 60079-11:2012	Intrinsic safety “I”
EN 60079-31:2009	Protection by enclosure “t”

Transmitter Marking:

Type	Marking Gas	Marking Dust
Prosonic Flow 9*P**-*****B****p With p = A, B, C, D, E, H, J, K, L, M, N, P, Q, V, W, 0, 1, 2, 3, 4, 5, 6, 7, 8 or 9	II 2G Ex d [ia] IIC T6 Gb	II 2D Ex tb [ia] IIIC T85°C Db IP 6X
Prosonic Flow 9*P**-*****D****p With p = A, B, C, D, E, H, J, K, L, M, N, P, Q, V, W, 0, 1, 2, 3, 4, 5, 6, 7, 8 or 9	II 2G Ex d e [ia] IIC T6 Gb	
Prosonic Flow 9*P**-*****B****p With p = F, G, R, S, T or U	II 2(1) G Ex d [ia Gb] [ia Ga] IIC T6 Gb	II 2(1) D Ex tb [ia Db] [ia Da] IIIC T85°C Db IP6x
Prosonic Flow 9*P**-*****D****p With p = F, G, R, S, T or U	II 2(1) G Ex d e [ia Gb] [ia Ga] IIC T6 Gb	

Sensor Marking:

Type	Marking Gas	Marking Dust
Prosonic Flow 9*P**-*****	II 2G Ex ib IIC T6...T1 Gb	II 2D Ex ib IIIC T****°C Db
Prosonic Flow DDU 18-***		
Prosonic Flow DDU 18-50091703		
Prosonic Flow DDU 18-50091704		
Prosonic Flow DDU 19-A***		
Prosonic Flow DDU 19- 50091713		



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Type designation:

Flow measuring system type Proline Prosonic Flow 93 ***_*****

Prosonic Flow 9 3 ***_*****

Pos.n.

1 Instrument family

2 Electronics

3 Sensor

4 Mounting type

5 Hyphen

6 Flow sensor

7 Sensor holder

8 Installation set

9 Sensor cable

10 Cable entry sensor

11 Calibration

12 Approvals

13 Housing

14 Cable entry

15 Power supply, display

16 Software configuration

17 Outputs / Inputs

Technical Information

Proline Prosonic Flow 93P_ Ultrasonic Flow Measuring System: doc. n. TI 0083EN/06/EN/13.11

Proline Prosonic Flow 93W_ Ultrasonic Flow Measuring System: doc. n. TI 0084EN/06/EN/13.11

Test reports

Paconsult report n. 06-1365E (15/03/2007; *E+H EMC report* n. FES_ E-07_004-GL (19.3.2007)

Remarks:

Safety parameters to be in accordance with EC- type Examination Certificate **DEKRA Exam GmbH**

EC- type Examination Certificate: DMT 01 ATEX E 064 as amended



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Installation and use to be in accordance with the manufacturer instructions.

For each equipment, before delivery on board, accuracy test Certificate to be provided, based on accredited calibration rigs that are traced to ISO 17025.

