# TYPE APPROVAL CERTIFICATE

## N. ELE096316CS

**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* | **Vortex Flow measuring system** |
| *Type* | **PROline Prowirl D200, F200, O200, R200** |
| *Applicant* | **Endress + Hauser Italy S.p.A.**<br>**Via Fratelli Di Dio, 7**<br>**20063 Cernusco s/N (MI)**<br>**Italy** |
| *Manufacturer* | **Endress + Hauser Flowtec AG**<br>**Kaegenstrasse, 7**<br>**CH-4153 Reinach BL1**<br>**Reinach BL1**<br>**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, June 13, 2016**.

This certificate is valid until **June 13, 2021**

Valerio Bonanni

**RINA Services S.p.A.**

***Valerio Bonanni***

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**Application:**
Measurements of the volume flow of gases, liquids or steam, based on the Vortex principle.

**Measuring Principle:**
Vortex meters work on the principle of the *Karman vortex street*. When fluid flows past a bluff body, vortices are alternately formed on both sides with opposite directions of rotation. These vortices each generate a local low pressure. The pressure fluctuations are recorded by the sensor and converted to electrical pulses. The vortices develop very regularly within the permitted application limits of the device. Therefore, the frequency of vortex shedding is proportional to the volume flow.

**Measuring system** consists of **Transmitter** type **Prowirl 200** and **Sensors** type **D, F, O, R**

Two devices versions are available:
• Compact version – transmitter and sensor form a mechanical unit.
• Remote version - transmitter and sensor are mounted in separate locations.

**Prowirl 200 material:**
• Compact or remote version, aluminum coated: Aluminum, AlSi10Mg, coated
• Compact or remote version, stainless: For maximum corrosion resistance: stainless steel CF-3M (316L, 1.4404)

**Prowirl 200 configuration:**
• Via four-line local display with key operation or via four-line, illuminated local display with touch control and guided menus ("Make-it-run" wizards) for applications
• Via operating tools (e.g. FieldCare)

**Output Signals:**
• Current output 1: 4-20 mA HART (passive) ; Current output 2: 4-20 mA (passive)
Assigned measured variable :
*Volume flow, Corrected volume flow, Mass flow, Flow velocity,Temperature, Calculated saturated steam pressure, Total mass flow, Energy flow, Heat flow difference*

• Pulse output:
Passive, Open Collector (35V dc 50mA) _ Pulse width adjustable 5 to 2000ms_ Max Pulse Rare 100 impulse /s
Assigned measured variable:
*Total volume flow,Total corrected volume flow, Total mass flow, Total energy flow, Total heat flow difference*

• Frequency output:
Adjustable 0 to 1000 Hz
Assigned measured variable:
*Volume flow, Corrected volume flow, Mass flow, Flow velocity, Temperature, Calculated saturated steam pressure, Steam quality, Total mass flow, Energy flow, Heat flow difference*

• Switch output:
Binary, conductive or non- conductive
Assignable functions:
*Off, On, Diagnostic behavior, Limit value, Volume flow, Corrected volume flow, Mass flow, Flow velocity, Temperature Calculated saturated steam pressure, Steam quality, Total mass flow, Energy flow, Heat flow difference, Reynolds number Totalizer 1-3, Status, Status of low flow cut off.*

**Communications:**
FOUNDATION Fieldbus: signal encoding: Manchester Bus Powered / 31.25 Kbit/s, Voltage mode
PROFIBUS PA: signal encoding: Manchester Bus Powered / 31.25 Kbit/s, Voltage mode

**Signal on alarm**:
Depending on the interface , failure information is displayed as follows:
*Current output: _ HART device diagnostic; Pulse/ frequency/ switch output; Foundation Fieldbus; PROFIBUS PA; Local display.*

**Diagnostic functions:**
The following minimum and maximum values are tracked in the measuring device and saved for diagnostic purposes:
*Frequency, Temperature, Velocity, Pressure*

**Sensor Prowirl** type **D**
Disc (wafer version):
• Nominal diameter range: DN 15 to 150 (½ to 6")
• Materials: Measuring tubes: stainless steel, 1.4408 (CF3M)

**Sensor Prowirl** type **F**
Flanged version:
• Nominal diameter range: DN 15 to 300 (½ to 12")
• Materials:
– Measuring tubes: stainless steel, 1.4408 (CF3M)
– Process connections DN 15 to 150 (½ to 6"): stainless steel, 1.4404 (F316, F316L)
– Fully cast construction for DN 200 to 300 (8 to 12"): stainless cast steel, 1.4408 (CF3M)
– Version for "harsh process, wetted parts": cast alloy CX2MW similar to Alloy C22/2.4602

**Sensor version - Direct Measured variable**
Option 1 *"Volume flow, basis"*
Option 2 *"Volume flow, high-temperature/low temperature"*:
Option 3 *"Mass flow (integrated temperature measurement)"*: Volume flow , Temperature

**Sensor Prowirl** type **O**
Flanged version for use in high process pressures up to PN 250/Class 1500:
• Nominal diameter range: DN 15 to 150 (½ to 6")
• Two versions with different pressure rating ranges are available:
– High pressure version: PN 63 to 160/Class 600/40K
– Ultra-high pressure version: PN 250/Class 900 to 1 500
• Materials for PN 63 to 160/Class 600/40K:
Fully cast construction: stainless cast steel, multiple certifications, 1.4408 (CF3M)
• Materials for PN 250:
Fully cast construction: stainless steel, 1.4571 similar to F316 Ti
• Materials for Class 900 to 1 500:
Fully cast construction: stainless steel, F316/F316L similar to 1.4404
• Butt-weld version available for PN 250/Class 600 to 1500, DN 15 to 150 (½ to 6")

**Sensor version - Direct Measured variables**
Option 4 *"Volume flow, Alloy 718"*
Option 5 *"Volume flow, titanium"*: Volume flow
Option 6 *"Mass flow, Alloy 718"*: – Volume flow, Temperature

**Sensor Prowirl** type **R**
Flanged version with integrated nominal diameter reduction:
• Two versions with a different nominal diameter range are available:
– "R-type" with single inner diameter line size reduction: DN 25 to 200 (1 to 8")
– "S-type" with double inner diameter line size reduction: DN 40 to 250 (1½ to 10")
• Materials:
– Measuring tubes: stainless steel, 1.4408 (CF3M)
– Process connections: stainless steel, 1.4404 (F316, F316L)

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**Sensor version - Direct Measured variable:**
Option 1 *"Volume flow, basis"* and
Option 2 *"Volume flow, high-temperature/low temperature"*: Volume flow
Option 3 *"Mass flow (integrated temperature measurement)"*: Volume flow, Temperature

**Measuring ranges / Performance / Accuracy :** Please refer to the manufacturer instruction manual

**Equipment and protective systems intended for use in potentially explosive atmospheres – Directive 94/9/EC**

| | |
|---|---|
| **Model :** | **Vortex Flow Meters type Proline Prowirl D200, F200, O200, R200** |
| **Certification Authority :** | **DEKRA Certification B.V. The Netherlands** |
| **EC-Type Examination Certificate:** | **DEKRA 13ATEX0091 annex 1 issue n. 2** |

***Safety standard complied with:***

| | |
|---|---|
| EN 60079-0: 2012 | General requirements |
| EN 60079-1:2007 | Flameproof enclosure "d" |
| EN 60079-26:2007 | Protection level (EPL) Ga |
| EN 60079-11:2012 | Intrinsic safety "i" |
| EN 60079-31:2009 | Protection by enclosure "t |

***Marking:***

| | |
|---|---|
| II 1G | Ex ia IIC T6…T1 Ga |
| II 1/2 G | Ex ia IIC T6…T1 Ga/Gb or Ex d [ia] IIC T6…T1 Ga/Gb |
| II 2G | Ex ia IIC T6…T1 Gb or Ex d [ia] IIC T6…T1 Gb |
| II 1/3 G | Ex ic [ia] IIC T6…T1 Ga/Gc |
| II 3 (1) G | Ex nA [ia Ga] IIC T6…T1 Gc or Ex ic [ia Ga] IIC T6…T1 Gc |
| II 2 D | Ex tb IIIC T xx°C Db |
| II 2 (1) D | Ex tb [ia Da] IIIC Txx °C Db |

**Type designation**

| | |
|---|---|
| Proline Prowirl D 200 : | code 7D2abb - ccdefghiiik + #**# |
| Proline Prowirl F 200 : | code 7F2abb - ccdefghiiik + #**# |
| Proline Prowirl R 200 : | code 7R2abb - ccdefghiiik + #**# |
| Proline Prowirl O 200 : | code 7O2abb - ccdefghiiik + #**# |

a = Generation
B = Prowirl D/F/R/O 200
bb = Size – combination of numbers and letters for sizes up to DN300 (2 digits)

cc = Approval code

| | | | |
|---|---|---|---|
| BA | = | II 1 G | Ex ia IIC T6…T1 Ga |
| BB | = | II 1/2 G | Ex ia IIC T6…T1 Ga/Gb |
| BC, TC | = | II 1/2 G | Ex d [ia] IIC T6…T1 Ga/Gb |
| BD | = | II 1/3 G | Ex ic [ia] IIC T6…T1 Ga/Gc |
| BG, C4 | = | II 3(1) G | Ex nA [ia Ga] IIC T6…T1 Gc [1)] |
| BH | = | II 3 (1) G | Ex ic [ia Ga] IIC T6…T1 Gc [1)] |
| BJ | = | II 2 G | Ex ia IIC T6…T1 Gb |
| BK | = | II 2 G | Ex d [ia] IIC T6…T1 Gb |
| B2, C5 | = | II 1/2 G | Ex ia IIC T6-T1 Ga/Gb |
| | | II 2 D | Ex tb IIIC T **°C Db |
| | | II2(1)D | Ex tb [ia Da] IIIC T** °C Db [1)] |
| B3, C6 | = | II 1/2 G | Ex d [ia] IIC T6…T1 Ga/Gb |
| | | II 2D | Ex tb IIIC T **°C Db |
| | | II 2 (1) D | Ex tb [ia Da] IIIC T** °C Db [1)] |

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d = I/O interface
- A = 4-20 mA HART
- B = 4-20 mA HART + pulse/frequency/switch output
- C = 4-20 mA HART + 4-20mA
- D = 4 - 20 mA HART + pulse/frequency/switch output + 4 - 20 mA input
- E = Foundation Fieldbus + pulse/frequency/switch output
- G = Profibus PA + pulse/frequency/switch output
- X = Sensor only

e = Display operation
L, M = prepared for FHX 50
Any other single number or letter

f = Enclosure
any single number or letter

g = Cable gland
any single number or letter

h = Sensor version
any single number or letter

iii = Process connection
any triple numbers or letters

k = Calibration
any single number or letter

l = Customer version
any single number or letter

** = Option (no, two or multiples of two digits)
any combination of numbers and letters

# = Additional options, not relevant for safety

Note 1: Approval code for Flowmeters with Display code e = L or M only

**Ambient temperature range**: -40 °C to +70 °C [1)2)] - compact Flowmeters
-40 °C to +75 °C [1)2)] - remote Flowmeters, Transmitter
-60 °C to +85 °C - remote Flowmeters, Sensor

**Process temperature range**: -200 °C to +440 °C

Note 1: Minimum temperature -60 °C for Flowmeters with approval code cc = BG or C4 in combination with I/O interface codes d = A, d = B and d = D;
minimum temperature -50 °C for remote Flowmeter, transmitter and compact Flowmeters with all approval codes other than cc = BG and C4 in combination with I/O interface codes d = A, d= B and d = D
Note 2: Maximum temperature restricted to +65 °C for transmitters with I/O code d = D

**Reference documents:**

| | |
|---|---|
| Proline Prowirl D200 | doc. n. TI01083D/06/EN/05.15 |
| Proline Prowirl F200 | doc. n. TI01084D/06/EN/05.15 |
| Proline Prowirl O200 | doc. n. TI01085D/06/EN/04.14 |
| Proline Prowirl R200 | doc. n. TI01086D/06/EN/05.15 |

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**Test reports:**
Paconsult report Nr. 15-6583B (June 9th, 2015)
Paconsult report Nr. 15-6583 (June 3rd, 2015)
MeßTechnikNord GmbH report Nr. 07472.062.15 V1.1 (30/04/2015)
Endress+Hauser report nr. 970003925 (15/07/2013)
Endress+Hauser report nr. 970003926 (17/07/2013)
Endress+Hauser report nr. 970003927 (19.07.2013)
Endress+Hauser report nr. 970003928 (19.07.2013)

**General remarks**
Safety parameters to be in accordance with EC- type Examination certificate DEKRA 13ATEX0091

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.