OIML Certificate

Number R137/2012-A-NL1-20.11 revision 6
Project number 3600874

OIML Member State
The Netherlands

Issuing authority	NMi Certin B.V. Person responsible: M.Ph.D. Schmidt
Applicant and Manufacturer	Pietro Fiorentini S.p.A. Via E.Fermi, 8/10 36057 Arcugnano (VI) Italy
Identification of the certified type	An **ultrasonic gas meter** Type: FSN-4P
Characteristics	See page 2 and further

This OIML Certificate is issued under scheme A

This Certificate attests the conformity of the above identified type (represented by the sample(s) identified in the OIML Type Evaluation Report) with the requirements of the following Recommendation of the International Organization of Legal Metrology (OIML):

R 137-1 (2012) "Gas meters"

Accuracy class 0,5 and/or 1,0 (depending on installation conditions & Q_{min} flow rate)

This Certificate relates only to the metrological and technical characteristics of the type of measuring instrument covered by the relevant OIML International Recommendation identified above. This Certificate does not bestow any form of legal international approval.

Important note: Apart from the mention of the Certificate's reference number and the name of the OIML Member State in which the Certificate was issued, partial quotation of the Certificate and of the associated OIML Type Evaluation Report(s) is not permitted, although either may be reproduced in full.

Issuing Authority **NMi Certin B.V., OIML Issuing Authority NL1**
6 July 2023

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The conformity was established by the results of tests and examinations provided in the associated reports:

- No. NMi-16200107-01R1 dated 15 December 2016 that includes 52 pages.
- No. NMi-1901574-01 dated 2 November 2017 that includes 13 pages.
- No. NMi-2258343-01 dated 20 September 2019 that includes 17 pages.
- No. NMi-2258343-02 dated 23 April 2020 that includes 11 pages.
- No. NMi-2587679-01 dated 25 March 2021 that includes 14 pages.
- No. NMi-2607480-01 dated 26 April 2021 that includes 36 pages.
- No. NMi-3603909-01 dated 24 April 2023 that includes 30 pages.
- No. NMi-2658517-01 dated 6 July 2023 that includes 18 pages.
- No. NMi-3600874-01 dated 6 July 2023 that includes 30 pages.

Characteristics of the measuring instrument
In Table 1 the general characteristics of the measuring instrument are presented.
Table 2 gives an overview of the general characteristics of the family of instruments.

Table 1 General characteristics

Destined for the measurement of	Gas volume		
Environmental classes	M1 / E2 for class 0,5 M2 / E2 for class 1,0		
Accuracy class	See table 2		
Maximum pressure	153 bar(a)		
Ambient temperature range	-25 … +55 °C		
Gas temperature range	-25 … +55 °C		
Designed for	Condensing humidity		
Orientation	All orientations		
Power supply voltage	18..28 V DC		
Transducer type	USM 3” & 4” (V2): Type FSN-L3-25 USM nominal size ≤12”: Type UIM-U2 USM nominal size >12”: Type UIM-U5		
Software identification	Part	Software version	Checksum
	Main version / FPGA version	1.0.4 / 1.0.1	77A54A9D
	Main version / FPGA version	1.0.6 / 1.0.4	43F6D289
	Main version / FPGA version	1.0.7 / 1.0.4	544882BB
	Main version / FPGA version	2.0.1 / 2.0.1	67D31506
	Main version / FPGA version	2.3.1 / 2.3.0	3C12C30A
	Main version / FPGA version	2.4.1 / 2.3.0	B87E9BB9
	Main version / FPGA version	2.5.0 / 2.3.0	94AC0AE9

	Main version / FPGA version	2.7.0 / 2.3.0	2A8D6FB7
	Main version / CFPGA version/ DFPGA version	3.0.1 / 2.0.0.20 / 2.0.0.11	440DC1CC

The meter consists of a cylindrical spool piece with 4 horizontal paths. Multiple configurations can be combined in a single housing:

- 4 paths configuration Single meter;
- 4+1 configuration 4 pay and 1 check;
- 4+2 configuration 4 pay and 2 check;
- 4+3 configuration 4 pay and 3 check;
- 4+4 configuration Either as Pay and check or as 2 separate meters.

The 3" & 4" Variant 2 meter is only configurable as 4 paths single meter.

When the meter is equipped with a double meter configuration, the pay and check meter shall have a different indicator. A clear distinction between Pay and check indicator shall be present, both meters must have their own nameplate with unique serial number.

Table 2 General characteristics of the family of instruments

Diameter		**Class 0,5 or 1,0** Depending on installation conditions			**Class 1,0**	
		Unidirectional or Bidirectional meter			Unidirectional meter	
Nominal size [-]	Inner diameter [mm]	V_{max} [m/s]	V_{min} [m/s]	V_t [m/s]	V_{min} [m/s]	V_t [m/s]
3"/ DN80 (V2)[1]	70 ~ 80	35,00			0,51	1/10 V_{max}
4"/ DN100 (V2)[1]	80 ~ 105	33,50				
3" / DN80 (V1)[1]	70 ~ 80	35,00	0,51	1/10 V_{max}	-	-
4" / DN100(V1)[1]	80 ~ 105	33,50	0,51		-	-
6" / DN150	130 ~ 155	30,00	0,40		0,24	1/10 V_{max}
8" / DN200	180 ~ 210	30,00	0,30			
10" / DN250	230 ~ 260	30,00				
12" / DN300	270 ~ 320	30,00				
14" / DN350	300 ~ 345	30,00				
16" / DN400	350 ~ 390	30,00				
18" / DN450	380 ~ 440	30,00				
20" / DN500	450 ~ 490	30,00				
24" / DN600	520 ~ 590	29,00				
30" / DN750	680 ~ 740	28,00				

Remarks:
[1] There are 2 variants of the 3" and 4" meter the class 1,0 Variant 2 (V2) is distinguishable by the squarish nature of the meter body while the FioSonic Original Variant 1 (V1) is distinguishable by the more rounded body see construction body drawings 11816/3-04 for Variant 1 and Variant 2.

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The corresponding flow rates can be calculated as follows:

$$Q = v \cdot \frac{1}{4} \cdot \pi \cdot D^2 \cdot 3600$$

Where:
Q = flow rate [m³/h]
v = velocity [m/s]
D = internal diameter [m]

Higher values of Q_{min} and lower values of Q_{max} are allowed on condition that $Q_{min} \leq 0{,}05\ Q_{max}$ and $Q_{max} / Q_t \geq 5$.

Installation conditions:

Installation of the gas meter
The meter needs to be installed according one of the following configurations for mild and/or severe flow disturbance:

- Mild and severe flow disturbance, **class 0,5**:
  - Upstream: a minimum of 5D + NOVA 50E + 10D of straight pipe.
    Downstream: a minimum of 4D straight pipe.
    The flow conditioner shall be a NOVA 50E compliant design.

- Mild and severe flow disturbance, **class 0,5**:
  - Upstream: a minimum of 5D + PTB Flow conditioner + 5D of straight inlet pipe.
    Downstream: a minimum of 3D straight pipe.
    The flow conditioner shall be a PTB compliant design.

- Mild flow disturbance, **class 1,0**:
  - Upstream: a minimum of 2D + TI TWIN type flow conditioner + 3D of straight inlet pipe.
    Downstream: a minimum of 3D straight pipe.
    The TI TWIN type flow conditioner shall be a PTB & NOVA 50E compliant design.

The detailed installation requirements and the construction of the TI TWIN type flow conditioner are recorded in EU-Type examination certificate T11816.

Thermowell
A thermowell may be mounted at 2D - 5D from the outlet of the meter.

Bi-directional flow measurement
During conformity assessment it is sufficient to verify a bi-directional meter in one direction only. For bi-directional flow measurement the outlet pipe and flow conditioner shall be identical to the inlet. The installation of a temperature sensor is at 2–5D from the outlet of the meter. For bi-directional applications an additional temperature sensor can be installed 2–5D upstream of the meter. For bi-directional applications the meter and pipe spools including the thermo well(s), shall be calibrated as a meter package during the examination for putting into use of the gas meter.

For bidirectional meters V_{min} limitations apply, see table 2.

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Alternative welded configuration of the gas meter
The central meter body can be welded directly onto the flanges or to inlet and outlet pipes. The welding may not cause more than a 3% diameter step. The meter shall be installed as stated in "Installation of the gas meter". The central meter body, including welded piping or welded flanges, shall be calibrated as a meter package during the examination for putting into use of the gas meter.

Maintenance
A transducer path pair can be exchanged without deterioration of the metrological performance.

The electronics mainboard can be exchanged without deterioration of the metrological performance.

Revision history

Revision	Date	Description of the modification
Initial	15 June 2020	Initial issue
1	26 March 2021	Update with TI TWIN type flow conditioner
2	26 April 2021	Q_{max}/Q_{min} of specific meter sizes updated to 1:125 ratio
3	11 March 2022	Update SW Version 2.5.0
4	6 March 2023	Update SW Version 2.7.0
5	24 April 2023	Fix Table 2
6	6 July 2023	Update SW Version 3.0.1