

OIML Member State
The Netherlands

Number R137/2012-A-NL1-20.16
Project number 2533860
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Issuing authority

NMi Certin B.V.
Person responsible: M. Boudewijns

Applicant and
Manufacturer

KROHNE Altometer
Kerkeplaat 12
3313 LC Dordrecht
The Netherlands

Identification of the
certified type

A ultrasonic gas meter
Types: ALTOSONIC V12
ALTOSONIC V12 Check
ALTOSONIC V12D
ALTOSONIC V12D Check

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 or 1,0 (depending on meter type, piping configuration and flow disturbance, see table 1 and 2 on the next page for a detailed overview)

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.

This certificate and supporting reports comply with the requirements of OIML-CS-PD-07 clause 6.2.

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24 December 2020

Certification Board

NMi Certin B.V.
Thijssseweg 11
2629 JA Delft
The Netherlands
T +31 88 636 2332
certin@nmi.nl
www.nmi.nl

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

- No. CVN-710381-01 Rev. 1a dated 25 March 2009 that includes 45 pages;
- No. NMI-14200114-01 dated 29 October 2014 that includes 18 pages;
- No. NMI 1902254-01 dated 21 December 2018 that includes 33 pages;
- No. NMI-1901377-01 dated 8 October 2019 that includes 22 pages;
- No. NMI-2408281-01 dated 31 January 2020 that includes 17 pages.
- No. NMI-2533860-01 dated 24 December 2020 that includes 12 pages.

Characteristics of the measuring instrument

The general characteristics of the family of instruments are presented in table 1 (ALTOSONIC V12), table 2 (ALTOSONIC V12D) and table 3 (both meter types). Table 4 presents the operating ranges per transducer type (both meter types). The flow characteristics are presented in table 5 (ALTOSONIC V12) and table 6 (ALTOSONIC V12D).

Both meter types, ALTOSONIC V12 and ALTOSONIC V12D, can also be equipped with an additional non-metrological relevant index, meter types: ALTOSONIC V12 Check and ALTOSONIC V12D Check.

Table 1 General characteristics ALTOSONIC V12 and ALTOSONIC V12 Check

Characteristics				
Path configuration	ALTOSONIC V12	Metrological relevant	5 horizontal reflecting measuring paths	
		Optional, non-metrological relevant	Optional, 1 vertical reflecting measuring path	
	ALTOSONIC V12 Check	Metrological relevant	5 horizontal reflecting measuring paths	
		Non-metrological relevant	1 vertical reflecting measuring path	
Accuracy class	ALTOSONIC V12, ALTOSONIC V12 Check	Mild flow disturbances	10D - USM	0,5
			2D - FC - 3D - USM	0,5
	Severe flow disturbances	2D - FC - 3D - USM	0,5	
		10D - USM	1,0	

Table 2 General characteristics ALTOSONIC V12D and ALTOSONIC V12D Check

Characteristics				
Path configuration	ALTOSONIC V12D	Metrological relevant	5 horizontal direct measuring paths	
		Optional, non-metrological relevant	Optional, 1 vertical reflecting measuring path	
	ALTOSONIC V12D Check	Metrological relevant	5 horizontal direct measuring paths	
		Non-metrological relevant	1 vertical reflecting measuring path	
Accuracy class	ALTOSONIC V12D, ALTOSONIC V12D Check	Mild flow disturbances	2D - FC - 8D - USM	1,0
		Severe flow disturbances	2D - FC - 8D - USM	1,0

Remarks regarding table 1 and 2: see next page.

Remarks regarding table 1 and 2:

- xxD = Minimal length of straight inlet/outlet piping (where x can be 0..9).
- FC = Flow conditioner.
- USM = Ultrasonic gas meter.

Hereinafter:

- the ALTOSONIC V12 & ALTOSONIC V12 Check are also referred to as ALTOSONIC V12 (Check);
- the ALTOSONIC V12D & ALTOSONIC V12D Check are also referred to as ALTOSONIC V12D (Check).

Table 3 General characteristics ALTOSONIC V12 (Check) and ALTOSONIC V12D (Check)

Meter type	ALTOSONIC V12 (Check) and ALTOSONIC V12D (Check)			
Maximum pressure	See table 4			
Ambient temperature range	-40 °C / +55 °C			
Gas temperature range	See table 4			
Intended for the measurement of	Natural gas			
Designed for	Condensing humidity			
Orientation	Horizontal, vertical up and vertical down (all orientations)			
Flow direction	Bi-directional			
Path angle	60° ... 80°			
Power supply voltage	24 V DC			
Software identification: - Version number - Checksum	KAFKA 2.0.0.0 D4F94254	KAFKA 2.0.0.1 F0591D45	KAFKA 2.0.0.2 0EE46EDA	KAFKA 2.0.0.3 0x3834247E

Table 4 Operating ranges of the instrument per used transducer type

The gas temperature range and maximum operating pressure of the instrument is limited to the ranges as indicated below based on transducer type.

Transducer type ^[2] ALTOSONIC V12 (Check) and ALTOSONIC V12D (Check)	Gas temperature range $T_{min} \dots T_{max}$ [°C]	Maximum pressure P_{max} [bar(g)]	Sound frequency [kHz]	
G5.00	-20 ... +70 ^[1]	150	270	
G5.01		431		
G5.02		204		
G5.03		431		
G6.00	-20 ... +100 ^[1]	150		
G6.01		431		
G6.02		204		
G6.03	431			
G7.01	-20 ... +100 ^[1]	150		330
G7.04		100		150

Remarks regarding table 4: see next page.

Remarks regarding table 4:

- [1] The maximum gas temperature also depends on the chosen Q_{\min} as specified in table 5 or 6. The resulting limiting value for T_{\max} is normative.
- [2] For severe flow disturbances the transducers are flush mounted (no protrusion inside the meter housing).

Table 5 General characteristics of the family of instruments - ALTOSONIC V12 (Check)

ALTOSONIC V12 (Check)								
Diameter Nominal	Minimum Q_{\min} $T_{\text{gas}} \leq 50 \text{ }^\circ\text{C}$ [m ³ /h]	Minimum Q_{\min} $T_{\text{gas}} \leq 100 \text{ }^\circ\text{C}$ [m ³ /h]	Maximum Q_{\max} <u>Mild & Severe</u> disturbance <u>G5.00...G6.03</u> transducers [m ³ /h]	Maximum Q_{\max} <u>Mild</u> disturbance <u>G7.01 and G7.04</u> transducers [m ³ /h]	Maximum Q_{\max} <u>Severe</u> disturbance <u>G7.01 and G7.04</u> transducers [m ³ /h]	Minimum Q_t [m ³ /h]	$P_{\min}^{[4]}$ [barg]	P_{\max} [barg]
4" (100 mm)	10	12	775	1.010	910	39	1,0	According table 4
6" (150 mm)	16	30	1.800	2.280	2.050	90	1,5	
8" (200 mm)	20	45	3.100	4.000	3.600	155	2,0	
10" (250 mm)	25	80	4.300	6.000	5.400	215	2,5	
12" (300 mm)	35	120	6.400	8.200	7.380	320	3,0	
14" (350 mm)	45	150	8.100	10.500	9.450	405	3,5	
16" (400 mm)	60	195	10.100	13.000	11.700	505	4,0	
18" (450 mm)	100	240	12.400	16.000	14.400	620	4,5	
20" (500 mm)	150	285	14.700	19.000	17.100	735	5,0	
24" (600 mm)	180	375	19.400	25.000	22.500	970	6,0	
26" (650 mm)	250	500	21.700	28.000	25.200	1085	7,0	
28" (700 mm)	300	600	24.800	32.000	28.800	1240	7,0	
30" (750 mm)	400	800	27.100	35.000	31.500	1355	7,0	

Remarks regarding table 5:

- [1] If higher values are chosen for Q_{\min} or Q_t and/or lower values for Q_{\max} , it has to be taken into account that:
 - If ratio $Q_{\max} / Q_{\min} \geq 50$ then: $Q_{\max} / Q_t \geq 10$
 - If ratio $Q_{\max} / Q_{\min} \geq 5$ and < 50 then: $Q_{\max} / Q_t \geq 5$
- [2] The maximum Q_{\max} depends on the transducer type and installation conditions (mild or severe flow disturbances).
- [3] The maximum operating pressure (P_{\max}) depends on the installed transducer according table 4.
- [4] Regarding p_{\min} and p_{\max} see also the section "Installation conditions, working pressure" on page 6.

Table 6 General characteristics of the family of instruments - ALTOSONIC V12D (Check)

ALTOSONIC V12D (Check)								
Diameter Nominal	Minimum Q_{min}	Minimum Q_{min}	Maximum Q_{max}	Maximum Q_{max}	Maximum Q_{max}	Minimum Q_t	$P_{min}^{[4]}$	P_{max}
	$T_{gas} \leq 50\text{ °C}$	$T_{gas} \leq 100\text{ °C}$	<u>Mild & Severe</u> disturbance <u>G5.00...G6.03</u> transducers	<u>Mild</u> disturbance <u>G7.01/G7.04</u> transducers	<u>Severe</u> disturbance <u>G7.01/G7.04</u> transducers			
	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[barg]	[barg]
4" (100 mm)	10	12	775	1.010	950	39	1,0	According to table 4
6" (150 mm)	16	30	1.800	2.280	2.130	90	1,5	
8" (200 mm)	20	45	3.100	4.000	3.750	155	2,0	
10" (250 mm)	25	80	4.300	6.000	5.650	215	2,5	
12" (300 mm)	35	120	6.400	8.200	7.700	320	3,0	
14" (350 mm)	45	150	8.100	10.500	9.850	405	3,5	
16" (400 mm)	60	195	10.100	13.000	12.200	505	4,0	
18" (450 mm)	100	240	12.400	16.000	15.000	620	4,5	
20" (500 mm)	150	285	14.700	19.000	17.800	735	5,0	
24" (600 mm)	180	375	19.400	25.000	23.450	970	6,0	
26" (650 mm)	250	500	21.700	28.000	26.250	1085	7,0	
28" (700 mm)	300	600	24.800	32.000	30.000	1240	7,0	
30" (750 mm)	400	800	27.100	35.000	32.800	1355	7,0	

Remarks regarding table 6:

- [1] If higher values are chosen for Q_{min} or Q_t and/or lower values for Q_{max} , it has to be taken into account that:
 - If ratio $Q_{max} / Q_{min} \geq 50$ then: $Q_{max} / Q_t \geq 10$
 - If ratio $Q_{max} / Q_{min} \geq 5$ and < 50 then: $Q_{max} / Q_t \geq 5$
- [2] The maximum Q_{max} depends on the transducer type and installation conditions (mild or severe flow disturbances).
- [3] The maximum operating pressure (P_{max}) depends on the installed transducer according table 4.
- [4] Regarding p_{min} and p_{max} see also the section "Installation conditions, working pressure" on page 6.

Installation conditions:*Installation requirements*

Any components which could affect the gas flow must be avoided within the prescribed inlet pipe length. The inlet pipe must be designed as a straight pipe section of the same nominal diameter as the gas meter. The necessary straight pipe length is stated on the name plate of the meter.

The installation requirements, based on accuracy class and mild and/or severe flow disturbance are specified in table 1 and 2. The used flow conditioner (if applicable) is of type: "KROHNE flow conditioner".

Working pressure

The spool piece and the transducers can be used up to the specified pressure in table 4 (p_{\max} depending on transducer type).

The two pressures, at which the meter shall be calibrated, without intermediate adjustment over its full flow rate range during initial verification ($p_{\min \text{ calibration}}$ and $p_{\max \text{ calibration}}$), shall be equal to the operating pressure range (p_{\min} and p_{\max}) as given on the type plate.

In case the claimed P_{\min} of the meter is ≥ 10 bar, and $P_{\max} - P_{\min} \leq 30$ bar, only 1 calibration pressure ($p_{\text{calibration}}$) is necessary.

For a maximum working pressure (p_{\max}) of the ultrasonic gas meter above 60 bar(a), a maximum calibration pressure ($p_{\max \text{ calibration}}$) of around 60 bar(a) is allowed since this is the highest possible test pressure at any test location traceable to (inter)national standards.

Meter in series

It is allowed to install the ALTOSONIC V12 (Check) and ALTOSONIC V12D (Check) meters in series with another ultrasonic meter by directly connecting the outlet of the first meter to the inlet of the second meter, while applying the following conditions:

- Both meters are calibrated at the same time, being mounted together;
- The installation conditions of both meter types are fulfilled.

Reduced bore

In case the ALTOSONIC V12 (Check) or ALTOSONIC V12D (Check) is applied in series with a reduced bore meter, the following condition is also applicable:

- If the ALTOSONIC V12 (Check) or ALTOSONIC V12D (Check) is mounted on the second position then the angle of inclination of the reduced bore shall be less than 7°.