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The Netherlands

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Issuing authority
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Applicant and
Manufacturer KROHNE Altometer
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Identification of the
certified type A **measuring device**, intended to be used as a part of a measurement
instrument.
Type: ALTOSONIC 5 UFC and UFC 5

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 117-1, 2007 "Dynamic measuring systems for liquids other than water"
Accuracy class 0,3

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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Issuing Authority

NMi Certin B.V., OIML Issuing Authority NL1
20 December 2021

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

- NMI-13200516-01 dated 24 April 2015 that includes 60 pages.
- NMI-14200268-1 rev 1 dated 1 May 2015 that includes 63 pages.
- NMI-3215561-01 dated 20 December 2021 that includes 14 pages.

Characteristics of the measuring instrument

In Table 1 the general characteristics of the measuring instrument are presented.
The construction of the measuring instrument is recorded in the Documentation folder no. TC8548-3.

Table 1 General characteristics

Minimum – maximum flow rate	See Table 2
Minimum measured quantity	See Table 2
Maximum pressure	See Table 4
Accuracy class	0,3
Environmental classes	M2 / E2
Ambient temperature range	-25 / +55 °C
Product temperature range	Stainless steel housing: -200 °C ... +250 °C Carbon steel housing: -40 °C ... +250 °C The temperature limits of the transducers shall not be exceeded, see Table 4 for details.
Intended for the measurement of	See Table 3
Power supply voltage	24V DC
Software identification	See Table 6 and Table 7 for the measurement transducer.

The complete family of meters consists of one family (which are of similar construction) and have the following flow characteristics indicated in Table 2.

Table 2 General characteristics of the family of meters.

Meter size	DN100	DN150	DN200	DN250	DN300
Minimum flow rate [m ³ /h]	10	12	60	60	60
Maximum flow rate [m ³ /h]	375	750	1750	2250	3125
MMQ [m ³]	1	2	5	5	5
Minimum Reynolds number	23	19	70	56	46
Diameter in/outlet [mm]	100	150	200	250	300

Meter size	DN350	DN400	DN450	DN500	DN600
Minimum flow rate [m ³ /h]	60	150	150	150	150
Maximum flow rate [m ³ /h]	3750	4500	5800	7000	10000
MMQ [m ³]	5	5	5	5	10
Minimum Reynolds number	40	87	77	70	58
Diameter in/outlet [mm]	350	400	450	500	600

Parts of the measuring instrument

The conformity of the following parts was established by the results of tests and examinations provided in the associated report(s):

Part: Measurement sensor (ultrasonic sensor)
 Producer: KROHNE Altometer
 Type: ALTOSONIC 5 UFS 5-R-...-Ex, see Table 4 under heading "Name" for more information regarding the exact type.
 Documentation folder: TC8722-2
 Reports: NMI-13200516-01 dated 24 April 2015 that includes 60 pages.
 NMI-3215561-01 dated 20 December 2021 that includes 14 pages.

Table 3 General characteristics of the measurement sensor type ALTOSONIC 5 UFS 5

Flow rate range	See Table 2
MMQ	See Table 2
Maximum pressure	See Table 4
Environmental classes	M2 / E2
Ambient temperature range	-25 °C / +55 °C
Product temperature range	See Table 4
Intended for the measurement of	liquid petroleum and related products, liquids food and chemical products in liquid state, with viscosities between 0,1 mm ² /s and 1500 mm ² /s.
Number of sounds paths	8 (including 1 path for diagnostics)
Sound frequency	1 MHz; 2 MHz
Path angle	45° ± 10°

The ultrasonic transmitters/receivers are available in four standard versions and their high-pressure variant. Making a total of eight possible transducers.

Table 4 Characteristics of the ultrasonic transmitters/receivers of the measurement sensor type ALTOSONIC 5 UFS 5

Version	Name	Tmin [°C]	Tmax [°C]	Pmax [bar(g)]	Max Visc [cSt]
Standard (STD) ^{F or W}	UFS 5-R-EX	- 40	+ 120	160	230
Low Temperature (LT) ^W	UFS 5-R-LT-Ex	- 200	+ 120	160	230
High Temperature (HT) ^W	UFS 5-R-HT-Ex	- 40	+ 250	135	230
High Viscosity (HV) ^F	UFS 5-R-HV-Ex	- 40	+ 120	160	1500

Notes:

- The maximum pressure for the specific application depends on the used type of transducer and flange size.

W Welded transducer

F Flanged transducer

Part: Measurement transducer (flow converter)

Producer: KROHNE Altometer

Type: UFC 5

Documentation folder: TC8548-3

Reports: No. NMI-14200268-1 rev 1 dated 1 May 2015 that includes 63 pages.

Table 5 General characteristics of the measurement transducer type UFC 5

Environmental classes	M3 / E2
Ambient temperature range	-40 °C / +55 °C
Software identification	See Table 6 and Table 7

The measurement transducer UFC 5 drives the transmitters/receivers of the connected measurement sensor, type ALTOSONIC 5 UFS 5, make KROHNE Altometer, and processes the return signal.

The transit times of both sound signals (upstream and downstream) are measured. From the time difference between the two transit times, the velocity of the liquid is determined. The values can be transmitted to other instruments by:

- Frequency output
- KROHNE serial protocol using MODBUS over RS485 or TCP/IP

Table 6 Software version of the measurement transducer type UFC 5

Version	CRC	Version	CRC	Version	CRC
05.1.2.3	1A30E4CA	05.1.4.3	12FE819C	05.1.5.6	3C9BC5BC
05.1.3.0	2A7C0E34	05.1.5.1	F1CB11D6	05.1.6.0	CC523BD8
05.1.3.1	3E58AF51	05.1.5.5	B1448BAA		

The Version CRC checksum is calculated over all used parts: Main App, DSP2, FPGA, APB, UFX. By checking the CRC checksum in combination with the software version, a check is performed that all used parts are correct for the released product version.

Table 7 Software version of the MCD tool

Version	CRC MCD tool software version	CRC MCD tool configuration
3.0.0.6	9CA6602D	14BE2F29
3.0.0.7	6732C409	14BE2F29

The software versions and checksums can be visualized by means of a program called MCD tool, in the "Object tree details" under the chapter 1.3 "Approvals". The MCD tool is available from the manufacturer.

Certificate history:

This revision replaces the previous version.

Revision	Date	Description of the modification
Initial	10 July 2020	-
1	23 July 2021	Addition of carbon steel housing for the meter body and the use of flanged standard type transducers.
2	20 December 2021	Extension of the maximum viscosity to 230 cSt for the STD, LT and HT transducers.