OIML Certificate

Issuing authority	NMi Certin B.V.
Person responsible:	C. Oosterman

Applicant and Manufacturer	Emerson Process Management Micro Motion Inc. 7070 Winchester Circle Boulder, CO 80301 United States of America

Identification of the certified type	A **density sensor** (a sensor as a part of a densitometer) Type: CDM100M; CDM100P

Characteristics	See page 2

This OIML Certificate is issued under scheme B

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.

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** 25 April 2019 C. Oosterman Head Certification Board

OIML Certificate

OIML Member State
The Netherlands

Number R 117/2007-B-NL1-19.07
Project number 2172717
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The conformity was established by the results of tests and examinations provided in the associated report(s):

− No. NMi-12200566-01 dated 13 April 2015 that includes 114 pages.
− No. NMi-2172717-01 dated 25 April 2019 that includes 28 pages.

Characteristics of the density sensor:

In the metal housing of the density sensor, two parallel tubes are mounted which are set into a vibrating motion by a drive coil which is controlled by the transmitter. The two pick-off coils generate signals representative for the frequency of motion of the measurement tubes. The resonance frequency depends, among other things, on the density of the liquid in the measurement tubes. The transmitter can output this resonance frequency either directly or via serial communication.

For software version 2.11 onwards, the transmitter when connected to an external pressure and temperature transmitter via HART is capable of calculating the line density and also converting it to density at reference conditions. These density values can be outputted via RS-485 Modbus serial communication, BELL 202 HART protocol or 4 … 20 mA analog signal.

The line density is calculated using Mobrey/Solatron density formulas and are converted into density at reference conditions using the following conversion methods.

Conversion of measured density to density at reference conditions (0kPa, 15°C) is carried out using:
- Table 53A for generalized crude oils;
- Table 53B for generalized products;
- Table 53D for generalized lubricating oils;

as specified in API Manual of Petroleum Measurements Standards, Chapter 11, Physical Properties Data, Section 1 (also known as ASTM D1250-07).
Conversion of measured density to density at reference conditions (0kPa, 20°C) is carried out using:
- Table 59A for generalized crude oils;
- Table 59B for generalized products;
- Table 59D for generalized lubricating oils;

as specified in API Manual of Petroleum Measurements Standards, Chapter 11, Physical Properties Data, Section 1 (also known as ASTM D1250-07).

Apart from the above density calculations the density sensor is also capable of concentration measurement calculations of alcohol according to OIML R22, density conversion for Fatty Acid Methyl Ester (FAME) according to EN14214:2008 + A1:2009 and density conversion for Methyl Ester.

Note: If in case the time period signal of the device is used as the output, the density sensor, along with the pressure and temperature sensor needs to be then connected to a flow computer. The actual density calculations and density conversion will then take place in the flow computer.

For software version 2.10 and lower, together with the calibration constants, a flow computer, to which the density sensor is connected and to which optionally external process pressure and temperature transmitters are connected, can calculate the liquid density under line conditions and/or under standard conditions.

The construction of the measuring instrument is recorded in the Documentation folder no. TC8272-2.

The metrological characteristics are given below:

Type	:	CDM100M (Stainless Steel)
		CDM100P (Nickel alloy C22 (N06022))
Density range	:	630 – 1300 kg/m^3
Accuracy class	:	0,3
Environment classes	:	M2 / E2
Temperature range ambient	:	-10 – +55 °C condensing; open and closed locations
Temperature range liquid	:	-10 – +60 °C
Maximum pressure	:	100 bar(g)
Viscosity range	:	0,6 – 8,5 mPa·s
Maximum flow rate	:	10 kg/min
Power supply	:	24 VDC, either from flow computer or external power supply
Software version	:	1.62 with checksum ED596201
		1.64 with checksum 628A6935
		2.00 with checksum 8C64F133
		2.02 with checksum 2936EF98
		2.10 with checksum AEA67C3D
		2.11 with checksum A0162290

External Supply 1:

Type	:	QUINT PS/1AC/24 VDC/3.5
Environment classes	:	M2 / E2
Power supply	:	100 – 240 VAC, 50 – 60 Hz

External Supply 2:

Type	:	QUINT PS/24 VDC/24 VDC/5
Environment classes	:	M2 / E2
Power supply	:	24 VDC