

Issued by	NMi Certin B.V. Hugo de Grootplein 1 3314 EG Dordrecht The Netherlands																
In accordance with	The "Metrologiewet" (Stb 2006, 137) as Dutch implementation of the Directive 2004/22/EC on measuring instruments (MID).																
Applicant	Emerson Process Management Flow B.V. Neonstraat 1 6718 WX Ede The Netherlands																
In respect of	A measurement sensor (Coriolis sensor), intended to be used as a part of a measuring instrument.																
	<table border="0"> <tr> <td style="padding-right: 20px;">Manufacturer</td> <td>: Micro Motion</td> </tr> <tr> <td>Designation</td> <td>: CMFxxxxy; DS600 (see paragraph 1.2 of the description for the meaning of xxxy)</td> </tr> </table>	Manufacturer	: Micro Motion	Designation	: CMFxxxxy; DS600 (see paragraph 1.2 of the description for the meaning of xxxy)												
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	In the description TC7056 revision 5 the additional characteristics are given.																
Description and Documentation	The measurement sensor is approved for measuring mass, density and volume and is described in the description number TC7056 revision 5 and documented in the documentation folder number TC7056 - 6, appertaining to this Evaluation Certificate.																



Evaluation certificate

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Remarks An overview of the performed tests is given in Annex 1 appertaining to this Evaluation Certificate.
This revision 5 replaces the previous revision 4. The documentation folder TC7056 - 6 replaces the previous documentation folder TC7056-5.

The Notified Body no. 0122
NMI Certin, 11 November 2009


C. Oosterman
Head Certification Board

1 General information on the measurement sensor

All properties of the measurement sensor, whether mentioned or not, may not be in conflict with the Legislation.

This Evaluation certificate is the positive result of the applied voluntary, modular approach, as agreed within WELMEC (European Cooperation in Legal Metrology) for a component of a measuring instrument, according to annex MI-005 (Measuring systems for the continuous and dynamic measurement of quantities of liquids other than water) of the directive 2004/22/EC (MID).

The complete measuring instrument must be covered by an EC-type examination certificate.

This Evaluation certificate confirms that the involved equipment complies with the applicable essential requirements of the European directive 2004/22/EC (MID).

This Evaluation certificate is valid for the Micro Motion sensors, as described in paragraph 1.2 of the description and may only be used in combination with the electronics/indication, as specified in Evaluation certificate number TC7057.

This revision 5 is issued because:

- Revision of the LD compensation for sensors CMF400; DS600; CMFHC2 and CMFHC3, which is now always enabled for liquid hydrocarbons.

1.1 Essential Parts

- Measurement sensor, see the accompanying Documentation folder.
Essentially, the measurement sensor consists of a housing in which two parallel measuring tubes are mounted. On the measurement tubes, three coils are mounted: one drive-coil and two pick-off coils.
The drive coil, controlled by an external device, sets the measurement tubes in a vibrating motion. The pick-off coils generate signals representative for the frequency of motion of the measurement tubes.
The resonant frequency depends, among other things, on the density of the liquid in the measurement tubes.
The time difference between the signals from both pick-off coils depends on the mass flow of the liquid through the measurement tubes.
Processing of the measurement signals is performed by the same external device that controls the drive coil.
- In- and outputs
The measurement sensor is equipped with several in- and outputs:
 - Drive current input, for setting the measurement tubes in a vibrating motion.
 - 2 Pick-off outputs, generating sinusoidal millivolt signals.
 - One 3-wire Pt-100 output, for the measurement of measurement tube temperature.

1.2 Essential Characteristics

1.2.1 Flow characteristics

Beside the characteristics stated on page 1 of this TC7056 Revision 5, the meter has the following characteristics:

Mass measurement

	Sensor type CMFxxx (xxx represents a number relating to the diameter of the sensor)						
	CMF010 y)	CMF025 y)	CMF050 y)	CMF100 y)	CMF200 y)	CMF300 y)	CMF400 M
Maximum Q_{max} [kg/min] for all classes	1,8	36	110	450	1450	4500	6800
Minimum Q_{min} [kg/min], for accuracy class 0.5, 1.0 and 2.5	0,017 (3) 0,033 (4)	0,23	1,36	5,7	18	57	680 (1) 340 (2)
Minimum Q_{min} [kg/min], for accuracy class 0.3	0,033 (3) 0,067 (4)	0,46	2,72	11,4	36	114	680
Maximum pressure [bar(g)]	125 (5) 225 (6) 413 (4)	103 (5) 190 (6)	103 (5) 185 (6)	100 (5) 170 (6)	108 (5) 190 (6)	119 (5) 185 (6)	103 (5) 197 (6) 205 (4)
Minimum Measured Quantity sensor [kg]	0,05	0,5	5	10	20	200	500
Diameter in- and outlet [mm]	2,5	6	12	25	50	80	100

Mass measurement

	Sensor type					
	DS600 S	CMFHC3 y)	CMFHC2 y)			
Maximum Q_{max} [kg/min] for all classes	10.800	22.000	12.600			
Minimum Q_{min} [kg/min], for accuracy class 0.5, 1.0 and 2.5	570	1134	500			
Minimum Q_{min} [kg/min], for accuracy class 0.3	1140	2268	1000			
Maximum pressure [bar(g)]	43	102 (5) 206 (7)	102 (5) 206 (7)			
Minimum Measured Quantity sensor [kg]	1000	1000	1000			
Diameter in- and outlet [mm]	150	200	150			

Notes:

- y) indicates the type of material the meter is build of.
- The sensor CMF400 did get a mechanical improvement, therefore the following distinction applies:
 - (1):** serial number up to 411000; **(2):** serial number higher than 411000
 - (3):** y) = H, L or M; **(4):** y) = P (high pressure version)
 - (5):** y) = A, L or M; **(6):** y) = B, C, E or H
 - (7):** y) = Y
- Pressure correction of the CMF400 sensor for density shall be made if density and/or volume are used for custody transfer applications.
- All sensor types can be used bi-directional.

Volume measurement

- The applicable values for Q_{max} , Q_{min} and MMQ in volume units are defined as:
 - Q_{max} volume = Q_{max} mass / minimum product density;
 - Q_{min} volume = Q_{min} mass / maximum product density ;
 - MMQ volume = MMQ mass / maximum product density.
- The CMF010 sensor is not approved for measuring volume.

1.2.2 Pressure correction and Temperature correction

- Pressure correction
 - A) Depending on the sensor characteristics, a dynamic pressure correction by means of pressure transmitter is required when the pressure variation in the final application has an effect of more than 1/10 of the Maximum Permissible Error (MPE) for that application.
 - B) When the sensor is calibrated at another average pressure than the average pressure in the final application (e.g. water calibration at low pressure), the corresponding pressure effect due to the pressure difference has to be considered. When the pressure effect is more than 1/10 of the MPE, then a pressure correction is required, either static (configured in electronics) or dynamic (pressure transmitter).
 - C) The pressure coefficient values for the different sensors and the pressure values at which the correction has to take place for the different accuracy classes are mentioned in the documentation folder TC7056/2-1.
- Temperature correction

In the flow transmitter (see Evaluation Certificate TC7057) a temperature correction is applied depending on the connected sensor type.
 Temperature correction for the sensor behaviour due to process temperature variations takes automatically place by default, based on the integral temperature sensor and the configured temperature coefficients in the electronics.

 - The temperature dependency on mass flow is called mass Flow Temperature coefficient FT (in % per 100 °C).
 - The temperature dependency on density is called mass Density Temperature coefficient DT (in % per 100 °C).
- Individual determination of the flow sensor Flow Temperature coefficient FT by the manufacturer is mandatory when the process temperature is outside -100 °C and +100 °C.
- Individual determination of the flow sensor Flow Temperature coefficient FT and the Density Temperature coefficient DT by the manufacturer is mandatory for %alcohol applications.

1.2.3 LD compensation

Because the manufacturer has shown that factory calibration on water is representative for all liquids, the LD compensation must be enabled for the sensors CMF400; DS600; CMFHC2 and CMFHC3 for the measurement of liquid hydrocarbons.
 For all other products, the LD compensation is described in document TC7056/6-1.

1.3 Essential Shapes

- Inscriptions.

On the measurement sensor, clearly visible, at least the following is inscribed:

 - This Evaluation Certificate number: TC7056.
 - The sensor designation (type)

- In case of the CMF400 sensor, the serial number.
- Sealing.
The measurement sensor is not sealed.

2 Conditions for Approval

- Verification procedure
For the initial verification the NMI procedure C-SP-HW-280 is applied with the title 'Procedure C-SP-HW-280 for the MID conformity assessment for the Micro Motion Flow meter when used for custody transfer in gas applications (annex MI-002) and liquid applications (annex MI-005)'.
The initial verification is based on:

- a water calibration, which includes:
 - a mass flow test
 - a zero mass flow verification
 - if applicable a density test
- In the field a zero mass flow verification and if applicable a density verification.
Note: this part of the procedure can also be used for subsequent verifications.

This procedure is justified because of the fact that tests have proven that the mass and density accuracy on water is representative for mass and density accuracy on other liquids.

- The use of this Evaluation Certificate is limited to:
Other parties may use this Evaluation Certificate only with the written permission of Emerson Process Management Flow B.V., Neonstraat 1, 6718 WX Ede, the Netherlands.



Annex 1

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Performed tests on the measurement sensor:

TEST	PART	TYPE	TEST REPORT	TEST HOUSE	REMARKS
Accuracy and minimum measured quantity on: water, gasoline and gas oil.	Measurement sensors plus RFT flow transmitter	CMFxxx + RFT	Various	NMi Certin B.V.	According to test procedures of that time
Climate and EMC / CE	Measurement sensor plus RFT flow transmitter	CMFxxx + RFT	B3	NMi Certin B.V.	According to test procedures of that time
Accuracy and minimum measured quantity on: water and Isopar. Plus separate tests for the electronics	CMF400 plus MVD transmitter	CMF400	CVN/201269	NMi Certin B.V.	According OIML R117
Extended temperature tests	Measurement sensor	CMF200	CVN-207999-01	NMi Certin B.V.	
Accuracy tests on water and oil to determine minimum flow rate	CMF100 plus MVD transmitter	CMF100	CVN-410178-01	NMi Certin B.V.	According OIML R117
Accuracy tests on water and oil to determine minimum flow rate	CMF200 with MVD transmitter	CMF200	CVN-410178-02	NMi Certin B.V.	According OIML R117
Accuracy tests on water and oil to determine minimum flow rate	CMF300 with MVD transmitter	CMF300	CVN-410178-03	NMi Certin B.V.	According OIML R117
Accuracy tests on water and oil to determine minimum flow rate	CMF400 with MVD transmitter	CMF400	CVN-410178-04	NMi Certin B.V.	According OIML R117
EMC tests	CMF025 with MVD transmitter	CMF025	CVN-607580-1	NMi Certin B.V.	According OIML R117-1
Accuracy tests on Cryogenic Nitrogen	CMF200 with MVD transmitter	CMF200	C-SP/603876	NMi Certin B.V.	According OIML R81
Acceptance of oil metering	DS600 with RFT9739	DS600	92-EIB-RPT-015	TNO	
Long term stability of Micro Motion Coriolis meters on Crude Import Measurement	DS600 with RFT9739	DS600	IP Conference	NEREFCO/ SGS	



Annex 1

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TEST	PART	TYPE	TEST REPORT	TEST HOUSE	REMARKS
Accuracy tests on water and oil to determine minimum flow rate	CMFHC3 with MVD transmitter	CMFHC3	CPC-802620-1	Emerson ^(*) , Ede, the Netherlands; SPSE ^(*) , Fos-sur-Mer, France	According OIML R117-1
Accuracy tests on water and diesel	CMF010 with MVD transmitter	CMF010	.. ^[1]	NMi Certin B.V.	According OIML R117-1
Accuracy on Naphta and Fuel	CMFHC2 with MVD transmitter	CMFHC2	CPC-9200041-1	SPSE ^(*) , Fos-sur-Mer, France	According OIML R117-1
Accuracy on Water and liquefied Nitrogen	CMF100 with MVD transmitter	CMF100	CPC-9200087-1	Emerson ^(*) , Ede, the Netherlands; NIST ^(*) , Boulder, USA	According OIML R117-1 According OIML R81
Over time more test results have been gathered; published in many Certificates and Test reports					

^(*) The tests were witnessed by NMI Certin B.V.

^[1] The test results are stored in the technical file at NMI Certin B.V.