

Issued by	NMi Certin B.V.
In accordance with	<ul style="list-style-type: none"> – WELMEC guide 8.8 “General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring instruments under the MID”. – OIML R117-1 Edition 2007 (E) “Dynamic measuring systems for liquids other than water”.
Producer	Emerson Process Management Flow B.V. Neonstraat 1 6718 WX Ede The Netherlands
Measuring instrument	<p>A Measurement sensor (Coriolis sensor), intended to be used as a part of a measuring instrument.</p> <p>Manufacturer : Micro Motion</p> <p>Type : Fxxx, see paragraph 1.2 of Description</p> <p>Destined for the measurement of : Liquid petroleum and related products, potable liquids, liquid chemicals and liquefied gasses under pressure with densities between 450 and 1100 kg/m³</p> <p>$Q_{min} - Q_{max}$: see paragraph 1.2 of Description</p> <p>Minimum measured quantity : see paragraph 1.2 of Description</p> <p>Accuracy class : 0,3; 0,5 and 1,0</p> <p>Environment classes : M3 / E3</p> <p>Temperature range liquid : -10 °C / +50 °C</p> <p>Temperature range ambient : -40 °C / +55 °C</p> <p>Further properties and test results are described in the annexes:</p> <ul style="list-style-type: none"> – Description TC7050 revision 6; – Documentation folder TC7050-4.
Remarks	<ul style="list-style-type: none"> – This revision replaces the previous versions, including its documentation folder; – The measurement sensor is approved for measuring mass. Some versions are also approved for measuring density and volume. See paragraph 1.2 of the description for details.
Issuing Authority	NMi Certin B.V. 29 July 2013
	C. Oosterman Head Certification Board

1 General information on the measurement transducer

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

This Evaluation Certificate is the positive result of the applied voluntary, modular approach, for a component of a measuring instrument, as described in WELMEC guide 8.8.

The complete measuring system must be covered by an EC type-examination Certificate.

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, which is 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 Evaluation Certificate TC7050, the sensor has the following characteristics:

Mass measurement

Maximum Q_{max} [kg/min]
for all classes

Minimum Q_{min} [kg/min]
for accuracy class 0,3

Minimum Q_{min} [kg/min]
for accuracy class 0,5

Minimum Q_{min} [kg/min]
for accuracy class 1,0

Maximum pressure
[bar(g)]

Minimum Measured
Quantity sensor [kg]

Diameter in- and outlet
[mm]

Sensor type Fxxx (xxx represents a number relating to the diameter of the sensor)				
F050 _y)	F100 _y)	F200 _y)	F300 _y)	
68	272	725	2268	
9	36	116	362	
4,5	18	58	181	
2,3	36	58	181	
100 (1) 148 (2) 345 (3)	100 (1) 148 (2)	100 (1) 148 (2)	100 (1) 148 (2)	
5	10	20	200	
12,5	25	50	80	

Notes:

- y) indicates the type of material the meter is build of.
(1) : y) = S and A **(3)** : y) = P
(2) : y) = H and B.
- All sensor types can be used bi-directional.
- The F-sensors can only be used in combination with the electronic flow transmitters mentioned in, and constructed according to Evaluation Certificate number TC7057.

Volume measurement

- The F050, F100 and F200 sensor are also approved for the measurement of density and volume.
- The applicable values for Q_{max} , Q_{min} and MMQ in volume units are defined as:
 - Q_{max} volume = Q_{max} mass / maximum product density;
 - Q_{min} volume = Q_{min} mass / minimum product density ;
 - MMQ volume = MMQ mass / minimum product density.
- Note: Meant are the minimum and maximum product density that can be expected for the actual product that is being measured and not the minimum and maximum product density as defined below under "Measuring volume and density".

- 1.2.2 Pressure correction and Temperature correction
- Pressure correction
 - a. Depending on the sensor characteristics, a dynamic pressure correction by means of a pressure transmitter is required when the pressure variation in the final application has an effect of more than 1/5 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 1/5 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 (7050/6-01).
 - 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).
- 1.2.3 FD correction.
FD represents the corrected tube period that is calculated while fluid flows through the sensor. The FD value must be separately determined during calibration.
- 1.2.4 LD Optimisation
See document 7050/2-01 about details when the LD Optimisation is enabled or not.
- 1.3 Essential Shapes**
- Inscriptions.
On the measurement sensor, clearly visible, at least the following is inscribed:
 - This Evaluation Certificate number: TC7050.
 - The sensor designation (type)
 - Serial number.
 - Seals.
The measurement sensor is not sealed.

2 Conditions for Conformity Assessment

- Before taken into use the measurement sensor has to be calibrated on the product it is going to measure, at (if possible) operating temperature and pressure. This calibration can be performed on site or at a test place. In the latter case the relevant parameter settings have to be registered and checked at the initial verification on site.
- If a measurement sensor is intended to be used with multiple liquids without adjustments, the sensor has to be calibrated on all applicable liquids, while the accuracy requirements are met for all products.
- If the measurement sensor is applied in a measuring instrument:
 - If the sensor is used bi-directional, the examination in one direction is sufficient.
- 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.

3 Test results

An overview of performed tests is given in the test reports:

- No. CPC- 607073-02 issued by NMI Certin B.V.;
- No. CPC- 700915-01 issued by NMI Certin B.V.;
- No. CPC- 9200685-1 issued by NMI Certin B.V.;
- No. CPC- 11200060-01 issued by NMI Certin B.V.;
- No. NMI- 11200345-2 issued by NMI Certin B.V.;
- No. NMI- 10201042-1 issued by NMI Certin B.V.