OIML Certificate

OIML Member State
The Netherlands

Number R137/2012-A-NL1-23.06 revision 1
Project number 3794851

Issuing authority	NMi Certin B.V. Person responsible: M.Ph.D. Schmidt
Manufacturer	Emerson Process Management Flow B.V. Neonstraat 1 6718 WX Ede The Netherlands
Identification of the certified type	A **Coriolis Gas Meter** Manufacturers mark: Micro Motion Type: CMFxxx with 5700 transmitter Destined for the measurement of Gaseous, including CO_2 and Natural gas.
Characteristics	See following pages

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 1,0

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.

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 Reports is not permitted, although either may be reproduced in full.

Issuing Authority **NMi Certin B.V., OIML Issuing Authority NL1**
13 February 2025

Certification Board

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

- No. NMi-14200115-01 dated 04 December 2015 that includes 68 pages;
- No. NMi-14200115-04 dated 15 January 2016 that includes 15 pages;
- No. NMi-14200115-05 dated 15 January 2016 that includes 15 pages;
- No. NMi-2571596-01 dated 30 September 2021 that includes 38 pages;
- No. NMi-2571596-02 dated 30 September 2021 that includes 32 pages;
- No. NMi-3699942-01 dated 12 December 2023 that includes 28 pages;
- No. NMi-3794851-01 dated 13 February 2025 that includes 20 pages.

Characteristics of the measuring instrument
In Table 1 the general characteristics of the measuring instrument are presented.
In Table 2 the characteristics of the family of instruments are presented.

The gas meter consists of:

- Measurement sensor:
  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 is controlled by an external device and sets the measurement tubes in a vibrating motion in its natural frequency. The time difference between the signals from both pick-off coils depends on the mass flow of the fluid through the measurement tubes. Processing of the measurement signals is performed by the same external device that controls the drive coil. The natural frequency depends on the density of the gas in the measurement tubes and is therefore a way to determine the density of the fluid.

- 5700 transmitter
  The 5700 transmitter has two options. Either it uses an integral core processor, in which case it is connected directly to a flow sensor, or it is connected to a core processor, in which case it is not equipped with an integral core processor. The flow transmitter hardware can be found in documentation folder no. TC8519.

Table 1 General characteristics

Minimum – maximum flow rate	Depending on the sensors type, see details below
Maximum pressure	Depending on the sensors type, see details below
Environmental classes	M3 / E3
Ambient temperature range	-40 … +55 °C; non-condensing humidity
Gas temperature range	-40 °C / +150 °C for CMF200/300/350/400/HC2/HC3/HC4
Orientation	Horizontal and Vertical orientation
Power supply voltage	6- 24V DC or 196 – 240V AC
Intended for the measurement of	Gaseous, including CO_2 and Natural gas
Density range	1,4 - 450 kg/m^3

Software identification 5700 transmitter	Version number: 4.4X Checksum: 171C5EDA Version number: 4.5X Checksum: A630F399
Software identification core processor	Version number: 5.6X Checksum: 5BE64A27

Table 2 General characteristics of the family of instruments

Model	Maximum Mach number	n [-]	Internal diameter of tubes [mm]	Q_t [kg/h]	Minimum Q_{min} [kg/h]	Maximum Q_{max} [kg/h]	Maximum P_{max} [bar]	
							A/M/L (y)	B/H/P/Y (y)
CMF025 y)	0,30	2	5,23	≤ 1/5 Q_{max}	10,9	See Formula 1	103	190
CMF050 y)	0,30	2	8,76		7,8		103	185
CMF100 y)	0,30	2	16,4		47,0		103	170
CMF200 y)	0,25	2	27		65,0		108	190
CMF300 y)	0,25	2	44,7		220,0		119	185
CMF350 y)	0,25	2	57,4		415,0		102	155
CMF400 y)	0,25	2	73		985,5		103	197
CMFHC2 y)	0,20	2	88,9		1472,5		102	206
CMFHC3 y)	0,20	2	114,3		3178,0		102	206
CMFHC4 y)	0,20	2	142,88		4982,5		102	206
Remark: y) Indicates the type of material the meter is built of								

$$Q_{max} = M * n * A * SOS_{gas} * \rho_{act} * 3600 \quad (1)$$

where:

Q_{max} – is maximum mass flow rate for the gas [kg/h],
$A = \pi * d^2/4$; the d is an internal diameter of the measuring tube [m²],
M – is a maximum Mach number for the meter [-],
SOS_{gas} – is a speed of sound for the gas at operating conditions [m/s],
ρ_{act} – is the actual gas density at operating conditions [kg/m³].
n – is the number of tubes [-].

Parameters M, n and d can be chosen from table 2.

Installation conditions:
The Measurement sensor and 5700 transmitter should be electronically sealed. The flow transmitter 5700 should also be set with the following programmable parameters as described here below:

- Security mode settings;
- Low flow cut off settings;
- Damping settings;
- Slug flow settings;
- Last measured value fault time out settings.

The verification in one direction is sufficient, if the measurement is used bi-directional.

Provisions for performing initial and subsequent verification

A water calibration can be accepted based on the NMi procedure C-SP-HW-280 for Custody Transfer in gas applications performing:

- a zero-mass flow setting at the water calibration facility;
- a mass flow accuracy test at the water calibration facility.

A zero-mass flow verification can also be used for subsequent verifications.
The NMi procedure C-SP-HW-280 is described based on factory tests, as it has been proven that the mass accuracy on water is representative for mass accuracy on gases.

Operation conditions:

Pressure correction, Temperature correction and Gas density-based correction application:

- Pressure correction
  - A) Depending on the sensor characteristics, pressure correction might be required. When the sensor is calibrated at an average pressure different 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).
  - B) Dynamic pressure correction by means of pressure transmitter is required when the pressure variation in the final application has an effect of more than 1/5 of the Maximum Permissible Error (MPE) for that application.
  - 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 no.10020 /12-01.

- Temperature correction
  Temperature correction due to process temperature variations takes place automatically by default, based on the integral temperature sensor and the configured temperature coefficients in the electronics. In the flow transmitter (see Evaluation Certificate TC8519) a temperature correction is applied depending on the connected sensor type, according to documentation no. 10020/11-02.
  The temperature dependency on mass flow is called mass Flow Temperature coefficient FT (in % per 100 °C).

- Gas density-based correction for velocity of sound influences
  The velocity of sound influences the mass output of the Coriolis meters that have high operating frequencies and/or large tube diameters. Correction to the mass output takes place automatically after the setting is activated in the flow transmitter.
  In the flow transmitter a gas density-based correction can be applied depending on the connected sensor type, according to document no. 10020/11-03.

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Production location
The measuring instrument is produced at one of the following production locations:

- *Emerson Automation Solutions Flow Measurement*, 7070 Winchester Circle, Boulder, Colorado 80301, USA.
- *Emerson Process Management Flow Technologies Co.*, Ltd Asia Flow Technology Center, 111 Xing Min South Road Jiangning District Nanjing, Jiangsu Province, 211167, China.
- *F-R Technologias de Flujo, S.A. de C.V.*, Avenida Miguel de Cervantes #111, Complejo Industrial Chihuahua, 31136, Chihuahua, Chihuahua, Mexico.
- *Emerson Process Management Flow B.V.,* Neonstraat 1, 6718 WX Ede, The Netherlands.
- *Emerson SRL*, Str. Emerson Nr.4, Parcul Industrial, Tetarom 2, 400641, Cluj-Napoca, Romania.

Certificate history:

Revision	Date	Description of the modification
0	12 December 2023	-
1	13 February 2025	CMF025-CMF100 sensors have been added, editorial changes to improve readability