



Certificate number : 39330627
Project number : 604133
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Applicant Micro Motion Inc.
7070 Winchester Circle
Boulder, CO 80301
USA

Submitted A test installation for the calibration of coriolis mass flow meters.

Installation name : TSM3A
Test liquid : water

The test installation mainly consist of:

- a storage tank with water,
- a frequency controlled centrifugal pump and a control valve,
- a section for meters under test,
- six coriolis mass flow reference meters (RM):

Model	Serial number	Max. flow [kg/min]	Min. flow [kg/min]
CMF100	490529	280	70
CMF200	490637	600	280
CMF300	11005158	2280	600
CMF400A	411024	3175	2280
CMF400AC	411024 & 411565	6350	3175
CMF400ABC	411024, 411564 & 411565	8500	6350

- a temperature- and pressure transmitter,
- a computer data acquisition system.

The test installation is in use for the calibration of coriolis mass flow meters using the flying start-stop method. During a test the sum of mass pulses of both the reference meter(s) and the meter under test are collected. The mass indication of the reference meter(s) is the "mass reference".

Test method The test method is described on page 2 of 3.

Period of Investigation February 2007.

Results The results are presented on page 2 of 3.

Dordrecht, 21 February 2008
NMI Van Swinden Laboratorium B.V.

F.M. Smits
Section Liquid Flow & Volume

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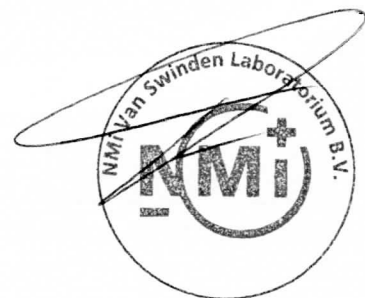
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- Test method** The Calibration Measurement Capabilities (CMC) were determined in accordance with the Guide to the Expression of Uncertainty in Measurement. The method is reported in the addendum to this certificate, called "Calibration and Measurement Capability of TSM3A", version 1; 27 February 2007, edited by Mr. M. Lee from Micro Motion Inc., Boulder, USA . This addendum was verified and hallmarked by NMI Van Swinden Laboratorium B.V..
- Results** The Calibration Measurement Capability of TSM3A for mass, is less than or equal to 0,033% for a minimum of three measurements when determining Flow Calibration Factor (FCF) and for single measurement verifications.
The Calibration Measurement Capability of TSM3A for density, is less than or equal to 0,13 kg/m³.
- The reported uncertainty of measurement is based on the standard uncertainty of measurement multiplied by a coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with the Guide to the Expression of Uncertainty in Measurement (GUM).
- Usages of CMC** The Calibration Measurement Capability is only valid if the following criteria are fulfilled:
- the testing time is at least 30 seconds,
 - the minimum amount of generated pulses by the coriolis mass flow meter during the test is 15000.
- Traceability** All instruments used in the test installation were verified to be traceable to primary and/or (inter)nationally accepted measurement standards.
Netherlands Meetinstituut (NMI – Nederlands Meetinstituut) is the National institute of metrology in the Netherlands. NMI Van Swinden Laboratorium B.V. (NMI VSL) is part of NMI and appointed by Dutch Law and Royal Decision as the National Standards institute.
The calibration services of NMI Van Swinden Laboratorium B.V. provide a direct link to international accepted physical standards to achieve comparability and reliability of measurement data by proven traceability.
NMI Van Swinden Laboratorium B.V. has an accreditation certificate from The Dutch Accreditation Council RvA as being in compliance with ISO/IEC 17025:1999. NMI VSL accreditation number is K999.





Nederlands Meetinstituut

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Remarks

- The Calibration Measurement Capability is defined according ISO 5168 as the uncertainty that is achieved when calibrating an ideal flow meter under normal conditions; the uncertainty contribution from variations of the meter under test (type A contributions) and zero stability are not included in the CMC.
- When an initial verification of a custody transfer flow meter is performed on this test installation, the applied legal regulations require that the testing time is increased to at least 60 seconds.
- The so called zero calibration of meter under test cannot be performed during the verification run. If this zero calibration has to be done for any reason at that time all verification flow-rates must be repeated.
- This certificate is not valid if the reference meters are modified or replaced. The temperature and pressure measurements may be replaced as long as the uncertainties as mentioned in the addendum are granted.

