ASME MFC-11–2006
(Revision of ASME MFC-11M–2003)

Measurement of Fluid Flow by Means of Coriolis Mass Flowmeters

REAFFIRMED 2014

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AN AMERICAN NATIONAL STANDARD

The American Society of
Mechanical Engineers

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The American Society of Mechanical Engineers
Three Park Avenue • New York, NY 10016

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This Standard will be revised when the Society approves the issuance of a new edition. There will be no addenda issued to this edition.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard. Interpretations are published on the ASME Web site under the Committee Pages at http://cstools.asme.org as they are issued.

The American Society of Mechanical Engineers
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FOREWORD

Coriolis flowmeters cover a family of devices with varying designs that depend on the Coriolis force generated by the fluid (liquid or gas) flowing through oscillating tube(s). The primary purpose of Coriolis flowmeters is to measure mass flow. However, some of these flowmeters also measure liquid density and temperature of the oscillating tube wall. From the measurements, the mass flow of liquid or gas, liquid density, liquid volume flow, and other related quantities can be determined. This Standard was approved by the American National Standards Institute (ANSI) on July 13, 2006.

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Measurement of Fluid Flow in Closed Conduits

(The following is the roster of the Committee at the time of approval of this Standard.)

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General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions, and attending committee meetings. Correspondence should be addressed to:

Secretary, MFC Standards Committee
The American Society of Mechanical Engineers
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Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Interpretations. Upon request, the MFC Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the MFC Standards Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

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MEASUREMENT OF FLUID FLOW BY MEANS OF CORIOLIS MASS FLOWMETERS

1 SCOPE

ASME MFC-11 establishes common terminology and gives guidelines for the selection, installation, calibration, and operation of Coriolis flowmeters for the determination of mass flow, density, volume flow, and other parameters. The content of this Standard is applied to the flow measurement of liquids, gases, mixtures of gases, multiphase flows, and miscible and immiscible mixtures of liquids.

2 TERMINOLOGY, SYMBOLS, REFERENCES, AND BIBLIOGRAPHY

Paragraph 2.1 lists definitions from ASME MFC-1M used in ASME MFC-11.

Paragraph 2.2 lists definitions specific to this Standard.

Paragraph 2.3 lists symbols (see Table 2.3) used in this Standard (see notes and superscripts).

Paragraph 2.4 lists abbreviations (see Table 2.4) used in this Standard.

Paragraph 2.5 lists references used in this Standard and a bibliography.

2.1 Definitions Copied From ASME MFC-1M

accuracy: the degree of freedom from error, the degree of conformity of the indicated value to the true value of the measured quantity.

calibration:

(a) the process of comparing the indicated flow to a traceable reference standard

(b) the process of adjusting the output of a device to bring it to a desired value, within a specified tolerance for a particular value of the input.

cavitation: the implosion of vapor bubbles formed after flashing when the local pressure rises above the vapor pressure of the liquid. See also *flashing*.

Coriolis flowmeter: a device consisting of a flow sensor and a transmitter which measures the mass flow by means of the Coriolis force generated by flowing fluid through oscillating tube(s); it may also provide measurements of density and temperature.

cross-talk: if two or more Coriolis flowmeters are to be mounted close together, interference through mechanical coupling may occur. This is often referred to as cross-talk. The manufacturer should be consulted for methods of avoiding cross-talk.

density calibration factor(s): calibration factor(s) associated with density measurement.

drive system: means for inducing the oscillation of the tube(s).

flashing: the formation of vapor bubbles in a liquid when the local pressure falls to or below the vapor pressure of the liquid, often due to local lowering of pressure because of an increase in the liquid velocity. See also *cavitation*.

flow calibration factor(s): calibration factor(s) associated with mass flow measurement.

flow sensor: a mechanical assembly consisting of an oscillating tube(s), coil drive system, oscillating tube deflection measurement-sensor(s), flanges/fittings, and housing.

housing: environmental protection of the flow sensor.

oscillating tube(s): tubes(s) through which the fluid to be measured flows.

rangeability: Coriolis flowmeter rangeability is the ratio of the maximum to minimum flowrates or Reynolds number in the range over which the flowmeter meets a specified uncertainty and/or accuracy.

repeatability of measurement (qualitative): the closeness of agreement among a series of results obtained with the same method on identical test material, under the same conditions (same operator, same apparatus, same laboratory, and short intervals of time).

repeatability of measurement (quantitative): the value below which the absolute difference between any two single test results obtained under the same conditions, [see *repeatability of measurement (qualitative)*], may be expected to lie with a specified probability. In the absence of other indications, the probability is 95%.

reproducibility (quantitative): the closeness of agreement between results obtained when the conditions of measurement differ; for example, with respect to different test apparatus, operators, facilities, time intervals, etc.

NOTE: The following three paragraphs are included to help with understanding the definitions of repeatability and reproducibility.

(a) Repeatability is a quantified measure of the short term stability of a flowmeter. Repeatability can be determined from successive tests of the meter, over short periods of time, without changing the test conditions. Repeatability can be quantified in terms of the standard deviation or the max./min. differences in these results.

(b) Reproducibility is a quantified measure of the longer-term stability of a flowmeter. Reproducibility can be determined from