Manual of Petroleum Measurement Standards Chapter 22.3

Testing Protocol for Flare Gas Metering

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Introduction

This document defines the testing and reporting protocols for a flare gas meter within a Flare Flow Meter System (FFMS). This protocol is designed to supply industry with a comparable description of the capabilities of flare gas meters for gaseous fluid flow measurement. The following are objectives of this Testing Protocol.

— Provide information about relative performance characteristics of the flare gas meter under a standardized testing protocol over an expected operating range with a standardized reporting format. (See 6.1 for determination of the expected operating range.)

— Facilitate both the understanding and the introduction of new technologies.

— Provide a standardized vehicle for manufacturers to validate the meter's performance.

— Quantify the uncertainty of these devices and define the operating and installation conditions for which the stated uncertainties apply.

To accomplish these objectives, in addition to the base testing requirements defined in this document, the end user should define any application specific requirements not covered by the base testing requirements such as the following.

— Expected operating range of the meter where this exceeds the base testing requirement operating range.

— Upstream flow disturbances not addressed by the base testing requirements.

— Criteria needed to comply with regulatory requirements.

When specifying additional testing requirements, the end user should insure that all parameters affecting the meter's performance are identified, but not limited to, items described in Section 6.

The facility selected to perform the tests has to be able to correlate the test fluid to the fluids to be measured at the expected process conditions.

Examples of flare gas meters covered in this standard include, but are not limited to differential pressure flow meters, optical meters, thermal flow meters, ultrasonic flare meters, vortex shedding meters.

If a meter has been tested under another API *MPMS* Chapter 22 testing protocol that covers the entire expected operating range for this application testing the influence parameters listed in Section 5 and the ranges defined in 6.4, then additional testing is optional. Reporting and testing protocols for test facilities are included to ensure that the performance characteristics of each meter are compared with identical conditions as set forth in this standard.

Testing Protocol for Flare Gas Metering

1 Scope

The scope of the standard is to describe a testing protocol for flare gas meters. This includes a discussion of the testing to be performed, how the test data should be analyzed, and how an uncertainty is determined from the testing of the meter. The scope does not include the general guidelines to flare gas metering that are covered under *MPMS* Chapter 14.10.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced documents (including any amendments) applies.

API *Manual of Petroleum Measurement Standards (MPMS),* Chapter 14.3 Part 1, *Concentric, Square-Edged Orifice Meters—Part 1: General Equations and Uncertainty Guidelines*

ISO/IEC Guide 98-3:2008 [1], *Uncertainty of Measurement—Part 3: Guide to the Expression Uncertainty in Measurement (GUM: 1995)*

ISO/IEC 17025; 2005, *General requirements for the competence of testing and calibration laboratories*

3 Terms and Definitions

For the purposes of this document, the following definitions apply.

3.1
accuracy
The ability of a measurement instrument to indicate values closely approximating the true value of the quantity measured.

3.2
adiabatic expansion
Expansion of gas that occurs without loss or gain of heat.

3.3
calibration
The process or procedure of adjusting an instrument, such as a meter, so that its indication or registration is in satisfactorily close agreement with a reference standard.

3.4
D
The published inside pipe diameter.

3.5
dynamic performance
A general expression for the relationship between the volume or mass registered by a meter and the true value after a change in flow rate, flowing temperature or flowing pressure.

[1] International Electrotechnical Commission, 3, rue de Varembé, P.O. Box 131, CH-1211, Geneva 20, Switzerland, www.iec.ch.