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Contents

1 Scope ................................................................................................................................. 1
1.1 General ............................................................................................................................. 1
1.2 Construction and Installation Requirements ................................................................. 1
2 Normative References ....................................................................................................... 1
3 Terms, Definitions, and Symbols ...................................................................................... 2
3.1 Definitions ....................................................................................................................... 2
3.2 Symbols/Nomenclature ................................................................................................. 4
4 Orifice Plate Specifications ............................................................................................... 6
4.1 General ............................................................................................................................. 6
4.2 Orifice Plate Faces .......................................................................................................... 6
4.3 Orifice Plate Bore Edge ................................................................................................. 8
4.4 Orifice Plate Bore Diameter ($d_{in}$, $d_{t}$) and Roundness .................................................. 8
4.5 Orifice Plate Bore Thickness ($e$) .................................................................................. 10
4.6 Orifice Plate Thickness ($\varepsilon$) ................................................................................. 10
4.7 Orifice Plate Bevel ($\theta$) ............................................................................................. 13
5 Meter Tube Specifications ............................................................................................... 13
5.1 Description ...................................................................................................................... 13
5.2 Orifice Plate Holders ...................................................................................................... 17
5.3 Orifice Fittings Considerations ...................................................................................... 18
5.4 Pressure Taps ................................................................................................................ 19
5.5 Flow Conditioners ......................................................................................................... 21
6 Installation Requirements ................................................................................................ 23
6.1 General ............................................................................................................................. 23
6.2 Orifice Plate .................................................................................................................... 23
6.3 Meter Tube ...................................................................................................................... 31
6.4 Acceptable Pulsation Environment ............................................................................... 31
6.5 Thermometer Wells ...................................................................................................... 32
6.6 Insulation ........................................................................................................................ 32

Annex A (informative) Research Projects and Tests Conducted Between 1922 and 1999 ............ 33
Annex B (informative) Orifice Meter Inspection Guidelines .................................................. 52
Annex C (normative) Specific Installation Calibration Test .................................................... 56
Annex D (normative) Flow Conditioner Performance Test .................................................... 58
Annex E (normative) Maximum Allowable Orifice Plate Differential Pressure ....................... 62

Figures
1 Symbols for Orifice Plate Dimensions ............................................................................... 6
2a Orifice Plate Departure from Flatness (Measured at Edge of Orifice Bore and Within Inside Pipe Diameter) ......................................................................................... 7
2b Alternative Method for Determination of Orifice Plate Departure from Flatness (Departure from Flatness = $h_2 - h_1$) ................................................................. 7
Contents

2c Maximum Orifice Plate Departure from Flatness ................................................................. 7
3 Allowable Variations in Pressure Tap Hole Location ............................................................ 19
4 1998 Uniform Concentric 19-Tube Bundle Flow Straightener ................................................. 22
5 Eccentricity Measurements (Sample Method) ......................................................................... 24
6 Orifice Meter Tube Layout for Flanged or Welded Inlet ......................................................... 27

Tables
1 Roundness Tolerance for Orifice Plate Bore Diameter, \( d_m \) ......................................................... 9
2 Linear Coefficient of Thermal Expansion ............................................................................. 9
3 Orifice Plate Thickness and Maximum Allowable Differential Pressure Based on the Structural Limit .................................................................................................................. 11
4 Example Meter Tube Internal Diameter—Roundness Tolerances Within First Mean Meter Tube Diameter Upstream of Orifice Plate ................................................................. 16
5 Example Meter Tube Internal Diameter Roundness Tolerances—All Upstream Meter Tube Individual Internal Diameter Measurements ........................................................................... 17
6 Maximum Tolerance of Orifice Plate Bore Eccentricity (\( \varepsilon_x \)) ........................................... 25
7 Orifice Meter Installation Requirements Without a Flow Conditioner ...................................... 28
8a Orifice Meter Installation Requirements With 1998 Uniform Concentric 19-Tube Bundle Flow Straightener for Meter Tube Upstream Length of \( 17D_i \leq UL < 29D_i \) ........................................... 29
8b Orifice Meter Installation Requirements With 1998 Uniform Concentric 19-Tube Bundle Flow Straightener for Meter Tube Upstream Length of \( UL \geq 29D_i \) ........................................... 30
E-1 Maximum Allowable Calculated Differential Pressure Across 304/316SS Orifice Plate at 150 °F ........ 63
1 Scope

1.1 General

This document establishes design and installation parameters for measurement of fluid flow using concentric, square-edged, flanged tapped orifice meters.

1.2 Construction and Installation Requirements

This document outlines the various design parameters that shall be considered when designing metering facilities using orifice meters. The mechanical tolerances found in this document encompass a wide range of orifice diameter ratios for which experimental results are available.

For all existing installations, the decision to upgrade to meet the requirements of this standard shall be at the discretion of the parties involved. The parties should be cognizant that if a meter installation is not upgraded to meet this standard, measurement bias errors may exist due to inadequate flow conditioning and upstream straight pipe lengths.

Use of the calculation procedures and techniques shown in the API MPMS Ch.14.3.1/AGA Report No. 3, Part 1 and API MPMS Ch.14.3.3/AGA Report No. 3, Part 3, with existing equipment is recommended, since these represent significant improvements over the previous methods. The uncertainty levels for flow measurement using existing equipment may be different from those quoted in API MPMS Chapter 14.3.1/AGA Report No. 3, Part 1.

Use of orifice meters at the extremes of their diameter ratio ($\beta_r$) ranges should be avoided whenever possible. Good metering design and practice tend to be somewhat conservative. This means that the use of the tightest tolerances in the mid-diameter ratio ($\beta_t$) ranges would have the highest probability of producing the best measurement. An indication of this is found in the section on uncertainty in API MPMS Chapter 14.3.1/AGA Report No. 3, Part 1.

This standard is based on $\beta_t$ between 0.10 and 0.75. Minimum uncertainty of the orifice plate coefficient of discharge ($C_d$) is achieved with $\beta_t$ between 0.2 and 0.6 and orifice bore diameters greater than or equal to 0.45 inch. Diameter ratios and orifice bore diameters outside of this range may be used; the user should consult the uncertainty section in API MPMS Chapter 14.3.1/AGA Report No. 3, Part 1 for limitations.

Achieving the best level of measurement uncertainty begins with, but is not limited to, proper design. Two other aspects of the measurement process have to accompany the design effort; otherwise it is of little value. These aspects are the application of the metering system and the maintenance of the meters, neither of which is considered directly in this standard. These aspects cannot be governed by a single standard as they cover metering applications that can differ widely in flow rate, fluid type, and operational requirements. The user shall determine the best meter selection for the application and the level of maintenance for the measurement system under consideration.

2 Normative References

No other document is identified as indispensable or required for the application of this standard.