

# **Gas Measurement Manual**

**PART THREE  
(REVISED)**

## **ORIFICE METERING**

Prepared by the Transmission Measurement Committee



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## Contents

SECTION 1 – INTRODUCTION TO ORIFICE METERS .....	9
1.1 Scope .....	9
1.2 History .....	9
SECTION 2 – OPERATING PRINCIPLE ORIFICE METERS .....	10
SECTION 3 – DESIGN THE PRIMARY ELEMENT.....	10
3.1 EGM .....	11
3.1.1 Basic Components .....	11
3.1.2 Calculations .....	11
3.1.3 Configuration .....	11
3.1.4 Installation .....	12
3.1.6 Verification and Calibration .....	13
3.1.7 Data Retrieval (Local & Remote) .....	13
3.2 Meter Tube Specifications.....	13
3.2.1 Fully Developed Profile .....	13
3.2.2 Considerations for Designing the Meter Tube .....	15
3.2.2.1 Description .....	15
3.2.2.2 Inside Surface .....	16
3.2.2.3 Meter Tube Diameter .....	17
3.2.2.4 Gasket Seal/Ring Recesses and Protrusion.....	17
3.2.2.5 Orifice Plate Specifications .....	19
3.2.2.5.1 General .....	20
3.2.2.5.2 Orifice Plate Material .....	21
3.2.2.5.3 Orifice Plate Finish .....	21
3.2.2.5.4 Orifice Plate Flatness.....	22
3.2.2.5.5 Orifice Plate Bevel .....	24
3.2.2.5.6 Orifice Plate Thickness (E) .....	24
3.2.2.5.7 Orifice Plate Bore Thickness (e).....	27
3.2.2.5.8 Orifice Plate Bore Edge .....	28
3.2.2.5.9 Orifice Plate Bore Diameter .....	28
3.2.2.5.10 Orifice Plate Eccentricity ( $\epsilon$ ) .....	29
3.2.2.5.11.1 Orifice Flanges .....	32
3.2.2.5.11.2 Orifice Fittings .....	34
3.2.2.5.11.3 OFU Pressure Taps .....	36
3.3 Inspecting the Meter Tube Before Installation .....	38
3.3.1 Meter Tube Dimensional Verification .....	39

3.3.1.1	Meter Tube Length.....	39
3.3.1.2	Meter Tube Internal Surface Finish.....	40
3.3.1.3	Meter Tube Internal Diameter .....	41
3.3.1.4	Pressure Tap Holes .....	42
3.3.1.5	Orifice Plate Eccentricity .....	46
3.3.1.6	Thermowell Wells (Temperature Wells).....	48
3.3.1.7	Example of Meter Tube Inspection Sheet.....	48
<b>SECTION 4 – INSTALLATION AND INSTALLATION EFFECTS ON ORIFICE METERS .....</b>		<b>51</b>
4.1	Introduction.....	51
4.2	Velocity Profile Effects .....	51
4.3	Orifice Meter Installation Effects .....	53
4.3.1	Flow Conditioners.....	53
4.3.2	Orifice Discharge Coefficient.....	55
4.3.3	Installation Effects Tests .....	56
4.3.4	Design Guidelines .....	57
4.4	Installation Effects Associated with Secondary Instrumentation.....	58
4.4.1	Static and Differential Pressure Measurement Installation Effects .....	58
4.4.2	Temperature Measurement Installation Effects .....	59
4.5	Conclusion.....	61
<b>SECTION 5 – COMMISSIONING, VERIFICATION, AND CALIBRATION .....</b>		<b>61</b>
5.1	Commissioning.....	61
5.2	Verification.....	62
<b>SECTION 6 – OPERATIONS AND MAINTENANCE OF TESTING EQUIPMENT AND ORIFICE RECORD .....</b>		<b>64</b>
6.1.	Operating Conditions: Adverse Operating Conditions That Can Introduce Error in Measurement	64
6.1.1	Maintenance .....	64
6.1.1.1	Orifice Plates.....	64
6.1.1.2	Orifice Fittings and Plate Seals.....	65
6.1.1.3	Meter Tubes .....	65
6.1.1.4	Connecting Gauge Lines .....	66
6.1.1.5	Data Recording .....	66
6.1.2	Inspection Schedules .....	67
6.1.2.1	Primary Element.....	67
6.1.3	Possible Measurement Issues .....	67
6.1.3.1	Differential Pressure.....	67
6.1.3.2	Static Pressure .....	68
6.1.3.3	Temperature.....	68

6.1.3.4	Relative Density .....	68
6.1.3.5	Compressibility .....	68
6.1.3.6	Supercompressibility .....	69
6.1.3.7	Density .....	71
6.1.3.8	Expansion Correction .....	71
6.1.4	Summary .....	71
6.2.	Test & Inspection Testing Equipment .....	71
6.2.1	General.....	71
6.2.2	Primary Element.....	72
6.2.2.1	Micrometers, Inside and Outside .....	72
6.2.2.2	Vernier Calipers.....	73
6.2.2.3	Digital Calipers .....	73
6.2.2.4	Steel Scales and Tapes .....	74
6.2.2.5	Tap Hole Gage .....	74
6.2.2.6	Profilometer .....	74
6.2.3	Secondary Element.....	76
6.2.3.1	Manometers .....	76
6.2.3.2	Dead Weight Testers.....	77
6.2.3.3	Digital Pressure Gauges .....	78
6.2.3.4	Analog Pressure Gauges .....	78
6.2.3.5	Barometer.....	79
6.2.3.6	Thermometer.....	79
6.2.4	Special Kits and Hands Tools .....	79
SECTION 7 – ORIFICE VOLUME CALCULATIONS AND REPORTS .....		80
7.1	General.....	80
7.1.1	Legacy Technology .....	80
7.1.2	Modern Technology .....	80
7.1.3	Applicable Industry Standards .....	81
7.2	Contract Provisions .....	82
7.3	Field Reports.....	83
7.3.1	Orifice Meter Verification and Calibration Report.....	84
7.3.2	Design, Installation, and Commissioning Reports .....	89
7.3.3	Orifice Meter Tube Inspection Report .....	90
7.3.4	EGM Configuration Report.....	91
7.3.5	Flow Diagrams - Site Facility Diagrams .....	92
7.4	Orifice Meter Calculations .....	93
7.4.1	Orifice Calculation Standards.....	93

7.4.2	Manual Calculation Method.....	95
7.4.3	On-Site Volume Calculation.....	96
7.4.4	Calculation Standards.....	98
7.5	Data Collection and Off-Site Data Processing.....	100
7.5.1	Data Collection and Polling.....	100
7.5.1.1	Manual reading and recording data from a local display.....	100
7.5.1.2	EGM Periodic Records (QTR).....	101
7.5.1.3	Local Laptop Download of On-Site EGM Volumes.....	102
7.5.1.4	Remote Communications - Polling of real-time data.....	102
7.5.1.5	Remote Communications - Polling for Collection of Historical QTR Records.....	103
7.5.1.6	Considerations and Common Issues with Polling Systems.....	104
7.5.2	Back-Office Measurement Systems.....	105
7.5.2.1	Functions found in Back-office Measurement Systems.....	105
SECTION 8 – DEFINITIONS.....		107
APPENDIX A.....		114
SECTION A: CHART RECORDERS.....		114
A.1	Design.....	117
A.1.1	Differential Gage Devices.....	117
A.1.1.1	Mercury Manometer.....	117
A.1.1.2	Bellows Manometer.....	117
A.1.2	Pressure Element.....	118
A.1.2.1	Temperature Element.....	119
A.1.2.2	Gage Lines.....	119
A.1.2.3	Charts.....	120
A.1.2.4	Chart Drives.....	121
A.1.2.5	Pens.....	121
A.1.2.6	Ink.....	122
A.2	Installation.....	122
A.2.1	Location.....	122
A.2.2	Leveling.....	122
A.2.3	Housing.....	123
A.2.4	Gage Piping.....	123
A.2.5	Prevention of Freezing.....	124
A.2.6	Installation Records.....	124
A.3	Testing.....	124
A.3.1	Pressure and Leak Testing.....	124
A.3.2	Testing Flow Recorders.....	125

A.3.2.1	Selection of Test Charts .....	125
A.3.2.2	Zeroing Differential Under Pressure.....	125
A.3.2.3	As Found .....	126
A.3.2.4	Calibration .....	126
A.3.2.5	As Left .....	126
A.3.2.6	Calibration Instrument Corrections.....	126
A.3.2.7	Setting Arc and Time Lag.....	127
A.3.2.8	Calibration of Temperature Recorder Element .....	127
A.4	Interpretation of Orifice Meter Records .....	127
A.4.1	General.....	127
A.4.2	Chart Calculation.....	128
A.4.2.1	Coefficient for Orifice Meter .....	128
A.4.2.2	Calculation Factors.....	129
A.4.3	Manual Calculation Method.....	131
A.4.3.1	Linear Charts .....	131
A.4.3.2	Square Roots Charts.....	131
A.4.4	Planimeter Method .....	137
A.4.5	Integration Method .....	138
A.4.5.1	Manually Traced Charts .....	138
A.4.5.2	Optical Chart Scanner .....	139
A.5	Analysis of Orifice Meter Charts.....	139
A.5.1	Effect of Pulsation on Orifice Meters .....	143
A.5.2	Pulsation Detecting Devices .....	144
A.5.3	Possible Corrective Measures .....	146
A.6	Outdoor Environmental Problems .....	147
A.6.1	Cold Ambient Temperatures .....	147
A.6.2	High Temperature, Rain, and Humidity.....	147
A.6.3	Corrosive Atmospheres.....	148
A.6.4	Wind .....	148
A.6.5	Requirement for Secondary Equipment.....	148
A.6.6	Differential Pressure.....	149
A.6.7	Data Recording .....	149
A.7	Secondary Element.....	149
A.7.1	Manometers .....	150

## SECTION 1 – INTRODUCTION TO ORIFICE METERS

### 1.1 Scope

This manual provides instructions related to the principle of operation, typical operating characteristics, and applications of Orifice Meters as well as installation, calibration, testing, and maintenance procedures, and computations used in the calculations of flow for the measurement of natural gas. Typical applications include measuring single-phase gas flow found in production, process, transmission, storage, distribution, and end use gas measurement systems.

This manual also provides practical formulas for reference and training of new entrants to the industry, as well as measurement office and non-technical individuals unfamiliar with natural gas orifice meter measurement. It is intended for use in conjunction with API MPMS 14.3/AGA Report No.3 – Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids, API MPMS 21.1-Flow Measurement Using Electronic Metering Systems-Section 1: Electronic Gas Measurement, and technical manuals produced by meter manufacturers. The general guidance provided in this manual is not intended to replace or supersede the meter design-specific information provided by the manufacturer. This manual is not intended for use as a standard and is not intended for reference in a tariff or other regulatory documents.

### 1.2 History

The history of orifice metering began in the early 1900's. The first test data was done by the U.S. Geological Survey, and in 1913 the first "Handbook of Natural Gas" was published. The Handbook has been around for over 100 years.

Orifice meters are used to measure the flow rate of fluids in pipes. The first orifice used for steam-flow measurement was furnished to Hodgson in 1910 by Holbrook Gaskell of the United Alkali Company.<sup>1</sup> The history of orifice meters and their calibration, construction, and installation is covered in a report by the Joint Committee on Orifice Coefficients of the American Gas Association and the American Society of Mechanical Engineers.<sup>2</sup>

The orifice meter consists of a flat plate that has a square-edged hole accurately machined in it and placed concentrically in a pipe. As fluid flows passes through the pipe plate hole, the flow suddenly contracts it undergoes velocity change causing a pressure

<sup>1</sup> [https://link.springer.com/chapter/10.1007/978-3-319-16880-7\\_1](https://link.springer.com/chapter/10.1007/978-3-319-16880-7_1)

<sup>2</sup> <https://babel.hathitrust.org/cgi/pt?id=wu.89080453087&seq=4>