

# **Gas Measurement Manual**

**PART THREE  
(REVISED)**

## **ORIFICE METERING**

Prepared by the Transmission Measurement Committee



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# 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

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<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>