ANSI B109.5
April 2024

Self-Operated Diaphragm-Type Natural Gas Service Regulators

For Nominal Pipe Size up to and including 2 inches (50 mm) and inlet pressures up to 125 psig (861.8 kPa) with outlet pressure of 20 psig (138 kPa) or less not covered in ANSI B109.4

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PREFACE

This publication presents a basic standard for the safe and reliable operation and the substantial and durable construction of self-operated diaphragm-type natural gas service regulators for nominal pipe size up to and including 2 inches (50 mm) and smaller with outlet pressure up to 20 psig (138 kPa) and less. This work is the result of years of experience that has been supplemented by extensive research. The standard is intended to meet the minimum design, material, performance and testing requirements for efficient use of service regulators.

It is recognized that during any transition period to the metric system, sizes and dimensions need to be expressed in either the metric system or the inch-pound system or both. In this document, both systems are used with the inch-pound units given preference. In most cases, a soft conversion from existing inch-pound values is shown. Soft conversion implies a change in nomenclature only. In this document, the alternative nomenclatures (metric and inch-pound) are shown by using parentheses and can be used interchangeably.

Nothing in this standard is to be considered as in any way indicating a measure of quality beyond compliance with the provisions it contains. It is designed to allow the construction and performance of service regulators that may exceed the various provisions specified in any respect. In this standard's preparation, recognition was intended to be given to the possibility of improvement, through the ingenuity of design or otherwise. As progress takes place, revisions may become necessary. Whenever such revisions are believed desirable, recommendations should be forwarded to the Chairman of ANSI B109 Committee, American Gas Association, 400 N. Capitol St., NW, Washington, DC 20001

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HISTORY OF DEVELOPMENT OF THE STANDARD FOR SELF-OPERATED DIAPHGRAM-TYPE GAS SERVICE REGULATORS

The first edition of the ANSI B109.4 Standard for Self-Operated Diaphragm-Type Natural Gas Regulators (nominal pipe size 1-1/4 inches and smaller with outlet pressure of 2 psi and less) was approved in April 1998. The standard was subsequently revised in December 2016 (second edition) and October 2021 (third edition).

In early-2020 the B109 Committee began discussion of the need for a new standard for regulators not covered by the B109.4 Standard, i.e., commercial and industrial regulators. In May 2020 the Committee submitted a Project Initiation Notification (PINS) to begin development of a new standard project to address self-operated diaphragm-type regulator with nominal pipe size up to 2 inches (50 mm). This new standard would be designated as B109.5 Standard.

The B109 Committee established the B109.5 Task Group at their virtual Fall 2020 meeting. This new B109.5 Task Group began meeting virtually in early-2021 and continued development throughout 2021 and 2022.

The B109 Committee approved the standard for submittal to ANSI for endorsement as an American National Standard on April 15, 2024. The first edition was approved on April 16, 2024.

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2024

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1.0 Scope

This standard shall apply to the minimum design, material, performance, and testing requirements of natural gas service regulators up to and including 2 inches (50 mm) not covered in ANSI B109.4 and inlet pressures up to 125 psig (861.8 kPa). These regulators are used to control the gas delivery pressure (also referred to as set pressure or P2) to pressures at 20 psig or less (138 kPa). This standard shall apply only to regulators manufactured after the approval date of this standard.

This standard includes overpressure protection options including internal relief valves (IRVs), self-operated integral slam shut valves, integral monitors, and internal monitors.

2.0 Definitions

Regulator Accuracy: The deviation in outlet pressure from the set point.

Slam-Shut Accuracy Group: The deviation in outlet pressure from the setpoint measured as a percentage.

Bypass: A device, usually internal to the slam shut, that allows the equalization of pressure across the slam shut valve in order to reset it from a closed position.

Casings: The casing is a pressure retaining part of the regulator which encloses either the spring and/or diaphragm assembly.

Diaphragm: A flexible element used to sense the outlet pressure and, in combination with the loading spring and linkage, to position the valve to control the downstream pressure.

Diaphragm Case or Casing: The housing for the diaphragm usually consists of an atmospheric or ambient casing and a gas or fuel casing. The gas or fuel casing and the diaphragm form the gas or fuel chamber. The atmospheric or ambient casing and the diaphragm form the atmospheric or ambient chamber. The diaphragm seals and separates the gas or fuel chamber from the atmospheric or ambient chamber. The atmospheric or ambient chamber houses the loading spring and vents into the atmosphere.

Diaphragm Plate: A rigid disk in contact with the diaphragm, which transmits the force of the loading mechanism (weights, springs, etc.) to the diaphragm.

Droop: The drop in outlet pressure from set point with respect to increasing gas flow rate.

Fixed-Factor Regulation: Regulator accuracy held to typically +/- 1% absolute (ABS) of set pressure or P_2, which will allow a utility to meter gas without doing pressure correction at the meter.

Full relief: A relief valve with sufficient capacity to provide a full layer of over pressure protection for the regulator's full capacity at specified conditions.

Hysteresis: Characteristic used to describe a deviation in the regulator performance based on internal friction, the diaphragm material and flow. This may also be referred to as regulator dead band.

Inlet Pressure, Rated: The highest inlet pressure allowed to be supplied to the regulator.

Inlet Pressure, Maximum: The highest inlet pressure to which tests have been conducted to determine that the regulator will control the outlet pressure within acceptable limits.