



STANDARDIZATION AND CERTIFICATION OF GAS METERS

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1. Introduction

In a PNG network, Gas Meters are installed at the consumer's premises to record their gas consumption based on which they are billed, much like the meters used in power distribution. The criticality of both these instruments is arguably similar in terms of safety and performance, but while all the electricity meters in India fall under mandatory certification, none of the gas meters currently available in market is BIS certified.

BIS has published IS 14439 (Part-1):1997 and 14439 (Part-2):1998 for "Gas Volume Meters". The project aims to analyse the reasons behind the reluctance/difficulties of manufacturers to opt for BIS certification, analyse the quality of their existing models against the requirements specified in Indian Standard and review IS 14439 against the international standards.

India is witnessing rapid expansion in PNG and CNG service coverage and Government of India has an ambitious target to cover 70% of population¹ under these services. This will consequently lead to entry of new meter manufacturers which calls to supervision of quality of all meters available in market. In view of safety hazard posed by petroleum gases, gas meters may even need to be brought under mandatory certification in future.

¹ [Gas meter manufacturing in India - Ministry of Petroleum And Natural Gas \(mopng.gov.in\)](http://mopng.gov.in)

2. Current Scenario

2.1 Regulation

In India the refining, processing, storage, transportation, distribution, marketing and sale of petroleum products and natural gas are regulated by a statutory body - **Petroleum and Natural Gas Regulatory Board (PNGRB)**, which was constituted under Petroleum and Natural Gas Regulatory Board Act, 2006. The Act provides for the establishment of Petroleum and Natural Gas Regulatory Board to protect the interests of consumers and entities engaged in specified activities relating to petroleum, petroleum products and natural gas and to promote competitive markets and for matters connected therewith or incidental thereto.

Under section 61 of the Petroleum and Natural Gas Regulatory Act, 2006 (19 of 2006), the PNGRB has issued **Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Regulations, 2008**.

2.2 PNGRB Accepted Standards

The technical specification of Metering Equipment is covered under Annexure – II of these regulations. The meters used in city gas networks shall conform to one of the following specifications:

- a) AGA Report No. 3 Orifice Metering of Natural Gas and Other related Hydrocarbon fluids
- b) AGA Report No. 9 Measurement of Gas by Multi-path Ultrasonic Meters
- c) OIML R 137-1&2: Gas meters
- d) BS 1359: Gas meters - Diaphragm gas meters
- e) EN 12480 Gas meters - Rotary displacement gas meters
- f) AGA Report No. 7 Measurement of Gas by Turbine Meters
- g) EN 12261 Gas meters - Turbine gas meters

2.3 Indian Standards

Bureau of Indian Standards has also published corresponding standards for various types of gas metering equipment which are listed below:

- a) IS 15675:2006/ ISO 5167-2:2003 - Flow measurement of natural gas and fluids by orifice plate meters
- b) IS 15674:2006/ ISO/CD 17089, ISO/TR 12765: 1997 - Flow measurement of natural gas by ultrasonic meter
- c) IS 14439: Part 2:1998 - Legal metrology - Gas volume meters: Part 2 Diaphragm gas meters
- d) IS 15673:2006 - Flow measurement of natural gas by rotary piston meters
- e) IS 15676:2006/ ISO 9951 :1993 - Flow measurement of natural gas by turbine meters

3. Scope of Project

Indian and International standards exist for all the types of gas meters available in market viz. – Rotary meters, Turbine meters, Diaphragm meters, Orifice meters and Ultrasonic meters. Because of the favourable combination of accuracy, flow rate range and turndown ratio, Diaphragm Gas meters are most commonly used gas meters used in residential and light industrial applications. Therefore, the scope of this study is limited to Diaphragm Gas meters.

The relevant Indian and International Standards for Diaphragm Gas Meters are:

- a) IS 14439: Part 1:1997 - Legal metrology - Gas volume meters: Part 1 general requirements
- b) IS 14439: Part 2:1998 - Legal metrology - Gas volume meters: Part 2 Diaphragm gas meters
- c) BS EN 1359:2017 - Gas meters - Diaphragm gas meters
- d) OIML R 137-1&2 - Gas meters

OIML R 137 is an “International Recommendation”² issued by International Organization for Legal Metrology which covers technical specifications for all types of Gas Meters. And BS EN 1359 is an International Standard published by British Standards Institution specifically for Diaphragm Gas Meters. Since BIS has also adopted the system of formulating different standards for different meter types, BS EN 1359 was selected for review against international standards.

² [What is the OIML? — English](#)

4. Findings

4.1 Market Survey

There are very few manufacturers for PNG Gas meters in India. Major meter suppliers in India are supplying through their overseas manufacturing facilities by the way of importing. Most of the international OEMs are marketing PNG gas meters through their authorized distributors in India. PSUs like IGL have recently started to look at international partnerships to establish a manufacturing setup in India.³

The list of leading manufacturers supplying gas meters for India is given below:

- a) Itron India Private Limited, India
- b) Raychem RPG Pvt Ltd, India in collaboration with George Wilson Industries, UK
- c) AEM, Romania
- d) Hangzhou Beta Meter Co., China
- e) Chongqing Actaris M.I. Co. Ltd., China

The list of companies purchasing gas meters is given below:

- a) Indraprastha Gas Ltd.
- b) Maharashtra Natural Gas Limited
- c) Mahanagar Gas Limited
- d) Gujarat Gas Limited
- e) Mahesh Gas Ltd.
- f) Unison Enviro Pvt Ltd.
- g) Adani Gas Ltd
- h) Charotar Gas Sahakari Mandali Ltd
- i) Gujarat Gas Limited
- j) IRM Energy Pvt. Ltd
- k) Sabarmati Gas Ltd
- l) Vadodara Gas Limited
- m) Bhagyanagar Gas Limited
- n) Godavari Gas Pvt.Ltd
- o) Megha Engineering & Infrastructures Ltd
- p) Indian Oil-Adani Gas Pvt. Ltd.

4.2 Industry Interaction

Since the distribution and sale of natural gas is regulated by PNGRB, Gas Meters are not made available in retail markets for end consumers. Meters are manufactured and supplied only against orders received from PNG distribution companies and are installed in the

³ [Gas meter manufacturing in India - Ministry of Petroleum And Natural Gas \(mopng.gov.in\)](http://mopng.gov.in)

consumer premises by distribution companies themselves. As per the provisions of regulations issued by PNGRB, Diaphragm Gas Meters currently installed by distribution companies in India are all conforming international standards i.e. either BS EN 1359 or OIML R 137. Manufacturers have not adopted Indian Standards for Gas Meters primarily because the regulations do not permit so.

4.3 Shortcomings of Indian Standards

Comparison of IS 14439 against EN 1359 highlights the deficiencies of Indian Standard vis-à-vis the currently accepted international standards. While IS 14439 covers the essential performance requirements of Diaphragm Gas Meters, Test Methods for these requirements have not explicitly been described in IS 14439. Moreover, EN 1359 covers many additional requirements with respect to construction, durability and markings which are not covered in IS 14439. These additional requirements are listed in Table 1.

4.4 BIS Technical Committee

Standards for Flow Measurement of Natural Gases is formulated by PGD 26 - Weights & Measures Sectional Committee of Production & General Engineering Department. A review of the composition of PGD 26 shows that all major stakeholders are adequately represented, including Petroleum and Natural Gas Regulatory Board, M/s Itron India Pvt Ltd, M/s Raychem RPG Pvt Ltd, M/s Mahanagar Gas Ltd, M/s Indraprasth Gas Ltd.

It has also been observed that standards for Gas Meters other than Diaphragm type have been harmonized with International Standards as listed below:

Indian Standard	International Standard	Specification
IS 15675:2006	ISO 5167-2:2003	Flow measurement of natural gas and fluids by orifice plate meters
IS 15674:2006	ISO/CD 17089, ISO/TR 12765: 1997	Flow measurement of natural gas by ultrasonic meter
IS 15676:2006	ISO 9951 :1993	Flow measurement of natural gas by turbine meters

Table 1: Comparison of Indian Standard vis-à-vis International Standards

Requirement	BS EN 1359:2017		IS 14439 (Part-1):1997 & IS 14439 (Part-2):1998
(1)	(2)		(3)
	Cl. Ref.		
Minimum storage Temperature range	4.3	-20 deg C to 60 deg C	No such temperature range specified
Climatic Environment	4.4	Requirements for meters suitable for open locations specified	No such requirement covered
Errors of indication	5.1	Test Method described in Cl. 5.1.2	Stringent requirements; Test method not described
Pressure Absorption	5.2	Test Method described in Cl. 5.2.2	Same requirements; Test method not described
Starting Flow Rate	5.3	Requirements and Test Method	No such requirement covered
Metrological stability	5.4	Requirements and Test Method	No such requirement covered
Overload Flow Rate	5.5	Requirements and Test Method	No such requirement covered
Environment and Humidity	5.6	Requirements and Test Method	No such requirement covered
Influence of other devices	5.7	Requirements and Test Method	No such requirement covered
External Leak Tightness	6.3.3	Test Method described in Cl. 6.3.3.2	Test Method not described
Resistance to Internal Pressure	6.3.4	Test Method described in Cl. 6.3.4.2	Test Method not described
Threads and Flanges for pipes	6.3.6.2	Requirements for threads and flanges specified	No such requirement covered
Bending Moment	6.3.6.3.2	Requirements and Test Method	No such requirement covered
Resistance to vibration	6.3.7	Requirement, apparatus and Test Method described	Test Method not described
Resistance to impact	6.3.8	Requirements and Test Method	No such requirement covered
Resistance to mishandling	6.3.9	Requirements and Test Method	No such requirement covered

Scratch resistance for external protective coating	6.4.2.1	Requirements and Test Method	No such requirement covered
Adhesion test of external protective coating	6.4.2.2	Requirements and Test Method	No such requirement covered
Impact resistance for external protective coating	6.4.2.3	Requirements and Test Method	No such requirement covered
Chemical resistance of external protective coating	6.4.2.4	Requirements and Test Method	No such requirement covered
Resistance to salt spray test	6.4.2.5	Requirements and Test Method	No such requirement covered
Resistance to humidity	6.4.2.6	Requirements and Test Method	No such requirement covered
Adhesion test of internal protective coating	6.4.3.1	Requirements and Test Method	No such requirement covered
Impact resistance for internal protective coating	6.4.3.2	Requirements and Test Method	No such requirement covered
Chemical resistance of internal protective coating	6.4.3.3	Requirements and Test Method	No such requirement covered
Resistance to humidity	6.4.3.4	Requirements and Test Method	No such requirement covered
Resistance to storage temperature range	6.5	Requirements and Test Method	No such requirement covered
Devices to prevent reverse flow	6.6.5	Test Method described	Test Method not described
Resistance to high temperature	6.6.6	Requirements and Test Method	No such requirement covered
Built-in temperature conversion device	6.6.7	Requirements and Test Method	No such requirement covered
Endurance Test	7.1.2.2	Test Method described	Test Method not described
Index windows and surround	7.2.2	Requirements and Test Method	No such requirement covered
Diaphragm and components in gas path	7.3	Requirements and Test Method	No such requirement covered
Ultraviolet Exposure test on markings	8.3.2	Requirements and Test Method	No such requirement covered

5. Roadmap to Certification

- a) Since the Indian Standards IS 14439 (Part-1):1997 and IS 14439(Part-2):1998 are not currently at par with International Standard BS EN 1359:2017 being utilized by industry, Indian Standards need to be revised and harmonized with International Standards, as done for all other types of gas meters i.e. IS 15675:2006/ ISO 5167-2:2003; IS 15674:2006, ISO/CD 17089, ISO/TR 12765: 1997 and IS 15676:2006/ ISO 9951 :1993. Requirements in Column (1) of Table 1 may be included in revised standard so as to create a more comprehensive specification.
- b) In line with the philosophy of One Nation One Standard⁴, inclusion of Indian Standards may be advocated in *Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Regulations, 2008*, through an amendment. PNGRB is already a member of BIS Technical Committee which will ensure that concerns of PNGRB are addressed while formulating revised standard. The Regulations already prescribe Indian Standards for many other components like steel tubes, electrical equipment, earthing, hose etc.
- c) Although the meters are currently being supplied by only a few large manufacturers Ministry of Petroleum & Natural Gas estimates the number of manufacturers to increase in future. In order to effectively monitor the quality of gas meters supplied by all manufacturers, they may be brought under the Product Certification scheme of BIS. Labs already testing gas meters as per BS EN 1359 or OIML R-137 may be recognized for Indian Standards as well.

⁴ [Piyush Goyal calls for 'One Nation One Standard' for lab testing \(businesstoday.in\)](https://www.businesstoday.in)

6. References

- a) [Gas meter manufacturing in India - Ministry of Petroleum And Natural Gas \(mopng.gov.in\)](http://mopng.gov.in)
- b) [What is the OIML? — English](#)
- c) [Piyush Goyal calls for 'One Nation One Standard' for lab testing \(businesstoday.in\)](#)
- d) OIML R 137-1&2: Gas meters
- e) BS EN 1359:2017 - Gas meters - Diaphragm gas meters