

Gas Measurement Procedures
IGE/GM/4 Edition 2
Communication 1719

Flowmetering practices.
Inlet pressure exceeding 38 bar and not
exceeding 100 bar



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Patron: Her Majesty the Queen



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SECTION 1 : INTRODUCTION

- 1.1 These Procedures are intended to establish a basis of methods and practices for large volume flow meter installations operating on Natural Gas systems within a pressure range exceeding 38 bar and not exceeding 100 bar and which have nominal meter tube diameters of 50 mm and above.
- 1.2 These Procedures have been drafted by a Panel appointed by the Institution of Gas Engineers and Managers' (IGEM's) Gas Measurement Committee, subsequently approved by that Committee and published by the authority of the Council of the Institution.
- 1.3 These Procedures cover similar subject matter to IGE/GM/4 Edition 1, Communication 1637, which is obsolete, but include additional and enhanced information transferred from IGE/GM/1 Edition 2, Communication 1640, which is obsolete, and revisions necessary to align with the Meter Asset Manager Code of Practice (MAMCoP) published by the Office of Gas and Electricity Markets (Ofgem).
- 1.4 These Procedures embrace the overall design of meter installations that use an orifice plate, turbine meter or ultrasonic meter (USM) as the primary measuring device.
- 1.5 Sections are included in these Procedures covering the secondary instrumentation and other equipment which is necessary to compute mass, volume or energy flow passing through the meter.
- 1.6 Sections are also included which deal with those factors in the commissioning, operation and maintenance of meter installations, which are necessary and important to ensure that the accuracy of measurement of the system is sustained over its working life.
- 1.7 Installations covered by these Procedures have, traditionally, been owned by a gas transporter (GT) and installed by an Ofgem Registered Gas Meter Installer (RGMI) or, latterly, an Ofgem Approved Meter Installer (OAMI). With the introduction of competition in metering systems, the market has opened to allow ownership and/or transfer of meter installations to other parties, including meter asset management companies (MAMs).

The de-regulation of the metering market has led to the need for new sets of rules, guidelines and recommendations. This has been addressed by the Ofgem MAMCoP, developed to cover whole life management of gas meter installations. There has also been a review and harmonisation of industry standards and CoPs to reflect the needs of the changing market. The publication of these Procedures is part of this process.

Note: Under the new arrangements, an Ofgem-approved MAM does not have to be an OAMI, but has an obligation to use an OAMI to install a meter.

Notwithstanding Sub-Section 1.16, total compliance with IGE/GM/4 is necessary for installations and modules where the meter installation has to comply with the Ofgem MAMCoP, relevant scope.

- 1.8 New terms, such as "maximum operating pressure" (MOP), "maximum incidental pressure" (MIP) and "operating pressure" (OP) have been introduced to reflect gas pressure terminology used in European standards. These terms will arise in all relevant IGEM technical publications in future and, possibly, in other standards. Other new terms have been introduced to assist in recognition of design information to be transferred between interested parties.

Referring to Figure 1, note how OP is shown to oscillate about the set point (SP). Note also that MOP can be declared at a higher value than OP. The

strength test pressure (STP) has to exceed MIP. This means that, at least with respect to integrity, the meter installation will withstand a fault pressure from the upstream system.

Note: Appendix 13 of IGE/GM/8 Part 1 shows details of these and other new pressure terms and explains them in more depth.

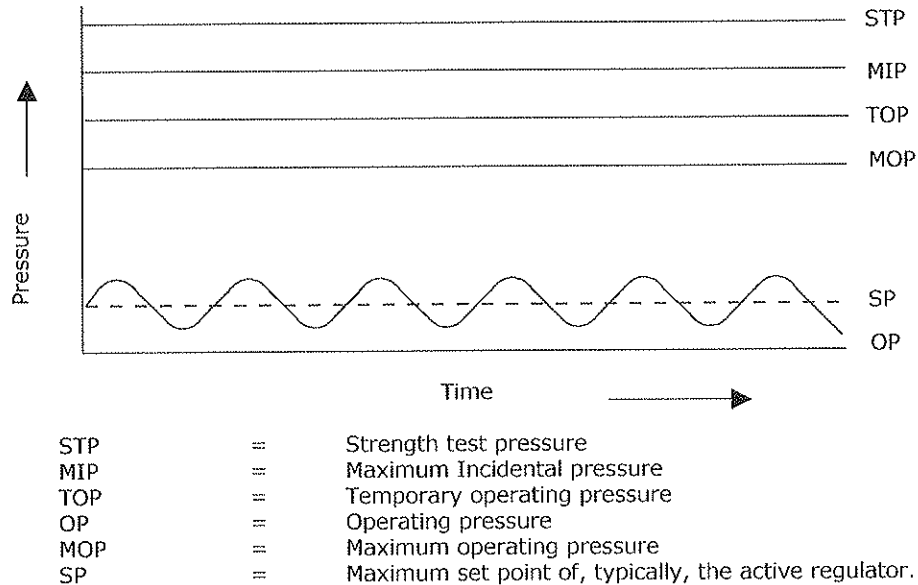


FIGURE 1 - OPERATIONAL PRESSURE LIMITS

1.9 These Procedures make use of the terms “should”, “shall” and “must” when prescribing particular procedures. Notwithstanding Sub-Section 1.16:

- the term “must” identifies a requirement by law in Great Britain (GB) at the time of publication
- the term “shall” prescribes a procedure which, it is intended, will be complied with in full and without deviation
- the term “should” prescribes a procedure which, it is intended, will be complied with unless, after prior consideration, deviation is considered to be acceptable.

Such terms may have different meanings when used in legislation, or Health and Safety Executive (HSE) Approved Codes of Practice (ACoPs) or guidance, and reference needs to be made to such statutory legislation or official guidance for information on legal obligations.

1.10 The fundamental considerations in selecting metering elements with regard to meter accuracy are the suitability of the type chosen for the nature of the load and the ability of the meter size chosen to give a sufficiently high degree of integrated accuracy consistent with the economic situation for which the measurement is being carried out.

1.11 A meter may leave the test facility with a known high performance potential but is susceptible to mishandling, poor storage conditions and mechanical damage during transportation, storage, installation and commissioning.

1.12 The performance of an installed meter is dependent on the design of the system in which it operates. Meter accuracy will be degraded if the gas is not sufficiently free from solid and liquid contaminants.

All meters are affected to some degree by flow and pressure disturbances

caused by pipework configuration and fittings (particularly regulators) adjacent to the meter. Even if the meter has been installed in a well-designed system, its accuracy can be adversely affected by unsatisfactory operation arising from carelessness, ignorance, and inadequate operating facilities and maintenance.

- 1.13 These Procedures stipulate standards of good practice, but compliance does not confer immunity from relevant legal and statutory requirements, particularly those relating to the use of meters for the sale of gas.

If all the procedures in this document are fulfilled in any particular installation, the metering accuracy of that installation will be both predictable and of a realistic commercial standard.

- 1.14 The primary responsibility for compliance with legal duties rests with the employer. The fact that certain employees, for example "responsible engineers", are allowed to exercise their professional judgement does not allow employers to abrogate their primary responsibilities. Employers must:

- have done everything to ensure, so far as it is reasonably practicable, that "responsible engineers" have the skills, training, experience and personal qualities necessary for the proper exercise of professional judgement
- have systems and procedures in place to ensure that the exercise of professional judgement by "responsible engineers" is subject to appropriate monitoring and review
- not require "responsible engineers" to undertake tasks which would necessitate the exercise of professional judgement that is not within their competence. There should be written procedures defining the extent to which "responsible engineers" can exercise their professional judgement. When "responsible engineers" are asked to undertake tasks which deviate from this, they should refer the matter for higher review.

- 1.15 It is now widely accepted that the majority of accidents in industry generally are in some measure attributable to human as well as technical factors in the sense that actions by people initiated or contributed to the accidents, or people might have acted in a more appropriate manner to avert them.

It is therefore necessary to give proper consideration to the management of these human factors and the control of risk. To assist in this, it is recommended that due regard be paid to HS(G)48.

- 1.16 Notwithstanding Sub-Section 1.9, these Procedures do not attempt to make the use of any method or specification obligatory against the judgement of the responsible engineer. New and improved practices may be adopted prior to these Procedures being updated. Amendments to these Procedures will be issued when necessary, and their publication will be announced in the Journal of the Institution and other publications as appropriate.

- 1.17 Requests for interpretation of these Procedures in relation to matters within their scope, but not precisely covered by the current text, should be addressed to Technical Services, IGEM, Charnwood Wing, Holywell Park, Ashby Road, Loughborough, Leicestershire, LE11 3GH, email technical@igem.org.uk and will be submitted to the relevant Committee for consideration and advice, but in the context that the final responsibility is that of the engineer concerned. If any advice is given by or on behalf of IGEM, this does not relieve the responsible engineer of any of his or her obligations.

SECTION 2 : SCOPE

2.1 These Procedures give guidance on the specification, design, installation and operation of meter installations for high accuracy flow measurement of piped Natural Gas operating within the pressure range exceeding 38 bar and not exceeding 100 bar.

2.2 These Procedures cover the following types of meter:

- orifice meters
- turbine meters
- ultrasonic meters (USMs).

Note 1: The general principles may be applicable to other types of meter (see clause 4.2.4).

Note 2: The legal status of each type is different and this may affect the choice of meter.

2.3 These Procedures apply to installations supplied with Natural Gas (NG), Liquefied Natural Gas (LNG) and Simulated Natural Gas (SNG) in the gaseous phase only where the gas temperatures at the meter are within the range of $-20\text{ }^{\circ}\text{C}$ to $75\text{ }^{\circ}\text{C}$.

Note: They do not apply to installations supplied with Liquefied Petroleum Gas (LPG) or LPG/air systems, although the general philosophy and principles are relevant. For operations with other gases, for example air, oxygen or nitrogen, or outside these temperature limits, the manufacturers of individual items of equipment need to be consulted.

2.4 The field application of these Procedures is, primarily, aimed at meter installations that require high accuracy measurement, including:

- onshore installations where high accuracy measurement is necessary in the transfer of gas between shippers, suppliers and users, as appropriate, for example at compressor stations
- installations used at offtakes from high pressure gas transmission systems
- installations used for control purposes and plant monitoring at compressor stations, and LNG and high pressure gas storage facilities.

2.5 IGE/GM/8 gives guidelines on gas meter installations for $\text{MOP} \leq 38$ bar. These Procedures give more detailed guidance for $\text{MOP} > 38$ bar and may be used to supplement IGE/GM/8 for turbine meters and USMs.

2.6 For information on pressure regulation associated with meter installations of $\text{MOP} > 38$ bar and ≤ 100 bar, reference should be made to IGE/TD/13. For $\text{MOP} > 100$ bar, similar principles should be applied and expert advice sought.

2.7 All pressures quoted in these Procedures are gauge pressure unless otherwise stated.

2.8 Italicised text is informative and does not represent formal Procedures.

2.9 Appendices are informative and do not represent formal Procedures unless specifically referenced in the main sections via the prescriptive terms "should", "shall" or "must".