INSTITUTION OF GAS ENGINEERS AND MANAGERS IGEM/TSP/24/247

Founded 1863
IGEM/GM/8 Part 3 Edition 3 **Royal Charter 1929**
Communication XXXX **Patron: His majesty the King**

Meter installations of flow exceeding 6 m³ per hour

Part 3: Fabrication, installation, testing and commissioning

DRAFT FOR COMMENT

1 This draft Standard IGEM/GM/8 Part 3 Edition 3 has been prepared by a Panel under the chairmanship of David Harper.

2 This Draft for comment is presented to Industry for comments which are required by 4 February 2025, and in accordance with the attached Reply Form.

3 This is a draft document and should not be regarded or used as a fully approved and published Standard. It is anticipated that amendments will be made prior to publication.

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Attached is the Draft for Comment of IGEM/GM/8 Edition 3 – "Meter installations of flow exceeding 6 m^3 per hour" Part 3: Fabrication, installation, testing and commissioning and the associated comment form.

We wish to make it as easy as possible for those of you representing industry bodies to issue the draft to your Members. You can either forward this email with attachment complete or forward it without the attachment and invite them to visit our website via https://www.igem.org.uk/technical/technical-services/comment-on-draft-standards.html where the Draft and Comment Form is posted.

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Meter installations of flow exceeding 6 m3 per hour

Part 3 : Fabrication, installation, testing and commissioning

IGEM/GM/8 Part 3 Edition 3
Communication xxxx

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Meter installations of flow exceeding 6 m³ per hour

Part 3 : Fabrication, installation, testing and commissioning

IGEM/GM/8 Part 3 Edition 3
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DRAFT FOR COMMENT

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SECTION 1 : INTRODUCTION

1.1 This Standard supersedes IGEM/GM/8 Part 3 Edition 2, Communication 1797, which is obsolete.

1.2 This Standard has been drafted by an Institution of Gas Engineers and Managers (IGEM) Panel, appointed by IGEM's Gas Measurement Committee, and has been approved by IGEM's Technical Co-ordinating Committee on behalf of the Council of IGEM.

1.3 IGEM/GM/8 is published in 5 parts:

- Part 1 covering design
- Part 2 covering locations, housings and compounds
- Part 3 covering fabrication, installation, testing and commissioning
- Part 4 covering operation and maintenance
- Part 5 covering notices and labels.

1.4 This Standard covers the fabrication, installation, testing and commissioning of gas supply meter installations (see Sub-Section 2.1) of capacity exceeding $6 m^3 h^{-1}$ and maximum operating pressure (upstream) (MOP_u) not exceeding 38 bar.

With the exception of the few installations of MOP_u exceeding 38 bar, the majority of industrial and commercial meter installations can be designed by following IGEM/GM/6 (for $MOP_u \leq 75$ mbar only) and/or IGEM/GM/8.

Note: IGEM Standards use pressure breaks as adopted in European standards. However, in the UK, the actual limit of pressure for IGEM/GM/6 designs is 75 mbar. In practice, it is rare for a meter installation to have MOP_u lying between 75 mbar and 100 mbar, in the UK.

It is the intention that IGEM/GM/6 be used for the largest proportion of installations that can be covered by "standard designs" for MOP_u not exceeding 75 mbar.

For 75 mbar < $MOP_u \leq$ 38 bar or where an installation is not a "standard design" as specified in IGEM/GM/6, IGEM/GM/8 applies (see also Note 4 to Sub-Section 2.1).

For a turbine meter installation of MOP_u not exceeding 75 mbar, there are no recognised standard designs i.e. IGEM/GM/6 does not apply. It is recommended that IGEM/GM/8 be used for all such installations.

For any meter installation of MOP_u exceeding 38 bar, IGEM/GM/4 applies.

1.5 This Standard applies to new, onshore, installations only. It is not retrospective. However, where work needs to be undertaken on a meter installation, it is recommended that such an installation be brought into line with this Standard. In particular, any unregulated by-pass needs to be removed or a regulator installed in the by-pass.

When re-engineering or replacing legacy meter installations, consideration is to be given to bringing them in line with the standard arrangements contained within IGEM/G/1. Unless all involved parties are in agreement to continue the legacy arrangement, it is expected that if reasonably practicable such existing systems will be modified to meet the recommended approach.

Irrespective of whether an emergency control valve (ECV) is fitted to the inlet of the meter installation, it is recommended that modification work be undertaken in line with this Standard.

1.6 Over recent years ownership and responsibility for new installations covered by this Standard has been liberalised from gas transporters (GTs) to Meter Asset Managers (MAMs) and consumers. The regulation authority, the Office of Gas and Electricity Markets (Ofgem) require that equipment managers and installers are separately accredited for the work they carry out. Approved MAMs have operational and management responsibility while Accredited Meter Installers (AMIs) carry out meter work, installation, modification, repair, maintenance and removal activities, both work to the Retail Energy Code Consolidated Metering Code of Practice (CoMCoP).

Licence conditions make gas suppliers responsible for coordinating the provision of metering services and have placed responsibilities on GTs to underpin the overall safety of the gas supply system from the distribution main to the inlet to the consumer's appliances.

Note: Under these arrangements, a REC accredited MAM does not have to be an AMI, but has an obligation to use an AMI to carry out work on a meter installation or have the work inspected by an AMI within 20 days of the work.

Notwithstanding Sub-Section 1.9, total compliance with IGEM/GM/8 is necessary for installations and modules where the meter installation has to comply with ComCoP. This Standard does not detail the management processes required for compliance with the Pressure Systems Safety Regulations, such guidance is provided by IGEM/GL/5. It is intended that work carried out in accordance with this Standard and IGEM/GL/5 will conform to the requirements of the PSSR.

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

Note: Appendix 11 of IGEM/GM/8 Part 1 shows an explanation of the terms used by setting out the definitions of the terms, explaining the suffixes, the relationship between the terms, and their significance.

1.8 This Standard makes use of the terms "must", "shall" and "should" when prescribing particular requirements:

- the term "must" identifies a requirement by law in Great Britain (GB) at the time of publication
- the term "shall" prescribes a requirement which, it is intended, will be complied with in full and without deviation
- the term "should" prescribes a requirement 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 Code of Practice (ACoPs) or guidance, and reference needs to be made to such statutory legislation or official guidance for information on legal obligations.

1.9 Notwithstanding Sub-Section 1.6, this Standard does not attempt to make the use of any method or specification obligatory against the judgment of the responsible engineer. Where new and better techniques are developed and proved, they are to be adopted without waiting for modification to this Standard. Amendments to this Standard will be issued when necessary, and their publication will be announced in the Journal of the Institution and other sources, as appropriate.

1.10 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 are to:

- 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 are to refer the matter for higher review.

1.11 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 HSG48 and HSG65.

1.12 Requests for interpretation of this Standard in relation to matters within their scope, but not precisely covered by the current text, are to be addressed in writing to:

- Technical Services, The Institution of Gas Engineers and Managers, IGEM House, 26 & 28 High Street, Kegworth, Derbyshire, DE74 2DA, or
- emailed to 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 their obligations.

1.13 This Standard was published in xxxxx 20xx.

SECTION 2 : SCOPE

2.1 This Standard applies to all new, onshore, gas supply meter installations (hereafter referred to as "installations") (and defined in IGEM/G/1) of flow rate (capacity) exceeding 6 $m^3 h^{-1}$ and MOP upstream (MOP_u) not exceeding 38 bar.

Installations with the following types of meter are covered:

- diaphragm
- rotary displacement (RD)
- turbine
- ultrasonic
- thermal mass.

Note 1: For installations of capacity not exceeding 6 $m^3 h^{-1}$, intended to carry Natural Gas (NG), BS 6400-1 or BS 6400-2 apply, as appropriate for MOP_u. For non-domestic premises there are additional legal requirements that may have to be met, e.g. DSEAR.

The requirements of this document may be applied to installations of capacity not exceeding 6 $m^3 h^{-1}$ and MOP_u exceeding 2 bar.

Note 2: For installations of MOP_u exceeding 38 bar, IGE/GM/4 applies and IGEM/TD/13 may be used for the regulation of pressure, however, where the metering pressure is not exceeding 38 bar, this Standard applies to the metering element in accordance with Figures 24–27 of IGEM/GM/8 Part 1. Where IGEM/TD/13 is used, the control and fault pressure ranges have to be acceptable to the consumer, it may be necessary to apply tolerances required by IGEM/GM/8 to IGEM/TD/13 control philosophy.

Note 3: Primarily, IGEM/GM/8 has been produced for primary meters and other meters, used for billing purposes. However, its principles may be applied for other meters, for example appliance check meters or departmental charging meters, when certain requirements may not apply.

Note 4: IGEM/GM/6 provides requirements for "standard designs" of meter installations of MOP_u not exceeding 75 mbar. For other, "non-standard", installations of MOP_u not exceeding 75 mbar, IGEM/GM/8 applies. See also the note within Sub-Section 1.4.

Note 5: For turbine meters and ultrasonic meters (USMs), in addition to IGEM/GM/8, some of the principles of IGEM/GM/4 may apply and further useful information is also included.

Note 6: IGEM/GM/8 does not address the Network pipeline (see IGEM/TD/1, IGEM/TD/3, IGEM/TD/4 and IGEM/G/5, as appropriate). IGEM/GM/8 does not address requirements for a pressure regulating installation (PRI) installed in a Network pipeline that is not part of the meter installation, when IGEM/TD/13 applies.

2.2 This Standard is primarily written to cover installations that are wholly downstream of the outlet of the ECV as recommended in IGEM/G/1 "Standard Arrangements", in which case the installation is not part of the Network. The owner or user of the installation would not, therefore, be a conveyor of gas on the Network and would not be subject to the general duties of the Gas Safety (Management) Regulations (GS(M)R). Similarly, the owner or user of the installation would not be an operator of a pipeline and, therefore, would not be subject to the requirements of the Pipelines Safety Regulations (PSR). However, the installation may be subject to the requirements of the Pressure Systems Safety Regulations (PSSR).

The latest edition of IGEM/G/1 permits new meter installations to be installed upstream of the ECV, particularly where the downstream consumer's system has been defined as being a Network under GS(M)R. Also in some situations, where all parties agree, a legacy meter installation as defined in IGEM/G/1 may be replaced with a configuration that does not conform to the "standard arrangements" given in IGEM/G/1.

IGEM/GM/8 may be applied when installing such new or replacement meter installations that do not have an ECV located on their inlet, but have a valve

within the meter installation, or the consumer's system nominated as the ECV. In such installations, the section of the installation upstream of the ECV is defined as being "Network Pipework" and will be subject to the requirements of GS(M)R, which will have to be complied with in addition to IGEM/GM/8.

Note 1: The responsibilities for the different sections of the system need to be clearly understood, in particular the upstream Network (GT) responsibility will stop at the inlet to the meter installation as defined in IGEM/GM/1.

Note 2: Any part of the meter installation which is subject to the requirements of GS(M)R will have to be operated by an organisation holding a "Public Gas Transporters" licence (or that physically convey gas through pipes but are exempt from the need to hold a PGT licence) and will have to be operated under a suitable safety case, which will need to be agreed with the HSE.

2.3 This Standard applies to installations intended to carry NG (a 2nd family gas as defined by BS EN 437).

Note: The Gas Safety (Installation and Use) Regulations (GS(I&U)R) define "gas" to include 1st, 2nd and 3rd family gases as well as other gases. The principles of IGEM/GM/8 may be used for gases other than NG but suitable adjustments to parameters and requirements will need to be considered by a competent person.

2.4 This Standard addresses the fabrication, installation, testing and commissioning of meter installations.

2.5 All pressures are gauge pressures unless otherwise stated.

2.6 Italicised text is informative and does not represent formal requirements.

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

SECTION 3 : LEGAL AND ALLIED CONSIDERATIONS

3.1 GENERAL

3.1.1 This Standard is set out against a background of legislation in force in GB at the time of publication. The devolution of power to the Scottish, Welsh and Northern Ireland Assemblies means that there may be variations to the legislation described below for each of them and consideration of their particular requirements needs to be made. Similar considerations are likely to apply in other countries and reference to appropriate national legislation will be necessary.

All relevant legislation is to be applied and relevant ACoPs, official Guidance and referenced CoPs, standards, etc. taken into account.

Note: Appendix 2 is relevant in this respect.

Where British Standards, etc. are quoted, equivalent national or international standards, etc. equally may be appropriate.

3.1.2 Persons who design meter installations are required to have a knowledge and understanding of the standards and regulations that apply to ensure that the completed plans will produce a safe and satisfactory installation (see also IGEM/GM/8 Part 1).

Persons who install, commission or maintain meter installations are required to be competent to do so and compliance with GS(I&U)R has to be achieved where those Regulations apply.

At the time of publication, the body with HSE approval to operate and maintain a register of businesses who are "members of a class of persons" is Gas Safe Register. Therefore, all businesses or self-employed gas fitters working on meter installations where GS(I&U)R applies are required to be registered with Gas Safe Register.

Persons deemed competent to carry out gas work are those who hold a current certificate of competence in the type of activity to be conducted such as issued by a certification body accredited by the United Kingdom Accreditation Service (UKAS), to issue certificates of competence under the Nationally Accredited Certification Scheme for Individual Gas Fitting Operatives (ACS).

3.1.3 Any meter installation shall be designed, installed, commissioned and maintained in accordance with the Retail Energy Code Consolidated Metering Code of Practice (CoMCoP).

3.1.4 Any meter of capacity not exceeding 1600 $m^3\ h^{-1}$ used to render a charge is required to be approved and stamped, as deemed by the Gas Act and the Measurement Instruments Directive (MID).

3.1.5 Some GTs operate an approval scheme under their Safety Case arrangements as a pre-requisite for authorising an AMI to set any meter regulator or to break a regulator seal. Therefore, an AMI is required to seek advice from the relevant GT before carrying out such procedures.

3.2 BUILDING REGULATIONS

3.2.1 England and Wales (as Amended)

Building Regulations are Statutory Instruments that are required to be followed when engaged in any building work. They are written in a format of broad

Regulations, setting out simple requirements in a Separate Schedule. Suggested ways of complying with these Regulations are contained in Approved Documents.

The Approved Documents that apply to gas work are:

- A (Structure)
- B (Fire Safety)
- F (Ventilation).

3.2.2 Building Standards (Scotland) Regulations and Amendments

The Building Standards (Scotland) are written directly as Regulations within the Statutory Instrument. The Regulations can be satisfied:

- by compliance with Technical Standards published by the Scottish Government
- conforming with the provisions of "deemed to satisfy" documents, for example British Standards
- other equivalent means.

3.3 CONFINED SPACES REGULATIONS

These Regulations apply to a whole range of confined spaces. The supplier or designer of an enclosure and equipment within it is required to perform a risk assessment of the enclosure with respect to safe access and egress and to give clear instructions to operators on access/egress as well as to what actions to take in the event of a gas alarm occurring. Employers and the self-employed are required to prevent entry into confined spaces unless avoidance is not reasonably practicable and unless there is a system of work which renders the work safe. They are also required to have specific emergency arrangements in place (see HSE guidance L101 for more information).

3.4 CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS (CDM)

These Regulations impose duties on designers, clients (and their agents), developers, principal designer and principal contractors.

Further information is given in L153, which sets out the principles duty holders are required to use in their approach to identifying the measures they need to take to control the risks to health and safety in a particular project.

The general principles of prevention are to:

- avoid risks where possible
- evaluate those risks that cannot be avoided, and
- put in place proportionate measures that control them at source.

Construction includes the alterations, repair, re-decoration, maintenance, de-commissioning or demolition of a structure. It also covers installation, commissioning, maintenance or removal of gas services.

3.5 CONTROL OF ASBESTOS REGULATIONS

3.5.1 These Regulations set out standards for the identification, monitoring and assessment of work that may expose workers to asbestos and the measures needed to control the risk.

3.5.2 Employers cannot carry out any work that exposes, or is likely to expose, employees to asbestos unless an assessment of that exposure has been made.

Employers have to set out steps to be taken to prevent, or reduce to the lowest level reasonably practicable, that exposure. Employers have to carry out medical surveillance of employees if they work over a certain time limit.

Note: As a general rule meter installations incorporating flanged joints predating 1990 will contain asbestos containing gaskets, and installations containing flanged joints as recent as 1995 may contain asbestos containing gaskets.

3.5.3 The Regulations impose a duty on those with responsibilities for the repair and maintenance of non-domestic premises to find out if there are, or may be, asbestos containing materials within them; to record the location and condition of such materials and assess and manage any risk from them, including passing of any information about their location and condition to anyone likely to disturb them.

3.5.4 Further information is available in HSG227. Other ACoP associated with these Regulations is L143.

3.6 CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH REGULATIONS (COSHH)

3.6.1 These Regulations, which reinforce existing statutory obligations under HSWA, impose a duty on employers to protect employees against risks to health, whether immediate or delayed, arising from exposure to substances hazardous to health, either used or encountered, as a result of a work activity. They also impose certain duties on employees.

3.6.2 Under COSHH, work is not to be carried out which is liable to expose employees to hazardous substances unless the employer has made a suitable and sufficient assessment of the risk created by the work and the steps that need to be taken to comply with the Regulations. After assessing the risk, it is necessary to inform employees of the risks and to carry out the appropriate training and instruction to ensure the risks are minimised. In certain cases, control measures such as ventilation or personal protective equipment (PPE) may be necessary and, where provided, they are required to be used.

3.7 DANGEROUS SUBSTANCES AND EXPLOSIVE ATMOSPHERES REGULATIONS (DSEAR)

These Regulations incorporate:

- ATEX Directive 94/9/EC (ATEX 95) – Safety of Apparatus
- ATEX Directive 99/92/EC (137A) – Risks from explosive atmospheres
- Chemical Agents Directive (CAD) 98/24/EC.

These Regulations are concerned with protection against risks from fire, explosion and similar events arising from dangerous substances used or present in the workplace. The Regulations require that risks from dangerous substances are assessed, eliminated or reduced. They contain specific requirements to be applied where an explosive atmosphere may be present and require the provision of arrangements to deal with accidents, emergencies etc. and provision of information, training and use of dangerous substances. The Regulations also require the identification of pipelines and containers containing hazardous substances.

The following publications contain details of the Regulations and their application:

- L138
- INDG 370.

3.8 ELECTRICITY AT WORK REGULATIONS

These Regulations apply to a wide range of electrical work, from overhead power lines to the use of office computers and batteries and include work on gas equipment using electrical energy.

They are concerned with the prevention of danger from electric shock, electric burn, electrical explosion or arcing, or from fire or explosion initiated by electrical energy.

They impose duties on every employer, employee and self-employed person and require that persons engaged in electrical work be competent or be supervised by competent persons.

Note: Further advice is contained in HSR25.

3.9 ENVIRONMENTAL PROTECTION ACT

Everyone who produces, imports, keeps, stores, transports, treats or disposes of waste is required to take all reasonable steps to ensure that waste is managed properly. This duty of care is provided under Section 34 of the Environmental Protection Act 1990 (EPA). It also applies to anyone who acts as a broker and has control of waste. A breach of the duty of care could lead to a penalty of up to £5,000 if convicted in the Magistrates Court or an unlimited fine if convicted in the Crown Court.

3.10 GAS SAFETY (INSTALLATION AND USE) REGULATIONS (GS(I&U)R)

3.10.1 GS(I&U)R are relevant statutory provisions of HSWA setting out general and detailed requirements dealing with the safe installation, maintenance and use of gas systems, including gas fittings, appliances and flues.

3.10.2 GS(I&U)R define the type of work that requires persons carrying out such work, or their employers, to be an "approved class of person", i.e. Gas Safe registered.

3.10.3 GS(I&U)R requires all those undertaking gas work to be competent. L56 provides guidance for those allowed to undertake gas work and the training that needs to be provided. The requirements for training in gas work are set out in IGEM/IG/1.

3.10.4 The installer is required to check the safety of any meter installation they install or work on and take appropriate action where they find faults. Where the premises are let or hired out, the landlord or hirer has special responsibilities to ensure that any installer they use for the gas fitting, service or maintenance or safety is a member of an approved class of persons (see clause 3.4.2) and is competent to carry out such work. If any serious fault is found, the installer is required to inform both the landlord/hirer, as well as the user, so that such faults can be rectified before further use.

3.11 HEALTH AND SAFETY AT WORK ETC. ACT (HSWA)

HSWA applies to all persons involved with work activities, including employers, the self-employed, employees, designers, manufacturers, suppliers etc. as well as the owners of premises. It places general duties on such people to ensure, so far as is reasonably practicable, the health, safety and welfare of employees and the health and safety of other persons such as members of the public who may be affected by the work activity.

3.12 LIFTING OPERATIONS AND LIFTING EQUIPMENT REGULATIONS (LOLER)

These Regulations build on PUWER (see Sub-Section 3.9).

Practical guidance on the Regulations is given in L113.

3.13 MANAGEMENT OF HEALTH AND SAFETY AT WORK REGULATIONS (MHSWR)

In addition to specific duties under GS(I&U)R (see Sub-Section 3.10) MHSWR impose a duty on employers and the self-employed to make assessments of risks to the health and safety of employees, and non-employees affected by their work. They also require effective planning and review of protective measures.

3.14 MANUAL HANDLING REGULATIONS

These Regulations seek to reduce the very large incidence of injury and ill-health arising from the manual handling of loads at work. More than 1 in 4 of all reportable injuries are caused by manual handling. These accidents do not include cumulative injuries, particularly to the back, which can lead to physical impediment or even permanent disablement.

These Regulations place duties upon employers in respect of their own employees. Identical duties are placed on the self-employed in respect of their own safety.

3.15 PRESSURE EQUIPMENT REGULATIONS (PER)

These Regulations cover pressure equipment manufactured and sold throughout the European Community with a maximum allowable pressure greater than 0.5 bar. The Regulations deal with the manufacture, design and supply of pressure equipment. They impose duties on the responsible person.

Note: A "responsible person" is defined as "the manufacturer or his authorised representative established within the Community; or where neither the manufacturer nor his authorised representative is established within the Community, the person who places the pressure equipment or assembly on the market or puts it into service as the case may be."

"Pressure equipment" is defined as "vessels, piping, safety accessories and pressure accessories; where applicable, pressure equipment includes elements attached to pressurised parts, such as flanges, nozzles, couplings, supports, lifting lugs and similar."

The duties on the "responsible person" are to ensure that pressure equipment:

- satisfies the relevant essential requirements
- has undergone the relevant conformity assessment procedure, if applicable
- has had the CE mark affixed by the manufacturer, if applicable
- has had the declaration of conformity drawn up by the manufacturer that the equipment is, in fact, safe.

Note: Not all pressure equipment is covered by PER. There are 21 categories of exceptions, detailed in Schedule 1 of PER.

The relevant conformity assessment procedure is determined by the classification of the pressure equipment according to criteria laid down in the Regulations. The classification system results in equipment being placed in one of five categories depending on the inherent level of hazard within the system.

The category then determines the range of conformity assessment modules relevant to that equipment. The modules are designed to allow the manufacturer to choose between a quality assurance route or type testing.

3.16 PRESSURE SYSTEMS SAFETY REGULATIONS (PSSR)

3.16.1 These Regulations impose duties on designers, importers, suppliers, installers and user or owners to ensure that pressure systems do not give rise to danger. This is done by the correct design installation and maintenance, provision of information, operation within safe operating limits and, where applicable, examination in accordance with a written scheme of examination drawn up or approved by a competent person (as defined by PSSR).

3.16.2 Relevant fluids for the purpose of this document would be natural gas at a pressure greater than 0.5 bar above atmospheric pressure. A pressure system would include bulk storage tanks, pressure vessels, pipelines and protective devices. Once the pressure in the pipework drops below 0.5 barg, and the user/owner can show clear evidence that the system does not contain, and is not liable to contain, a relevant fluid under foreseeable operating conditions, then that part of the system is no longer covered by the Regulations. This is likely to be the case after the pressure relief valve associated with a pressure reducing valve which takes the pressure to below 0.5 barg, for example at the entry to a building.

Note the special requirements placed on protective devices in such systems (see para 110b of L122). The regulations also apply to pipelines and their protective devices in which the pressure exceeds 2 barg (see Sch 1 part 1 item 5 of L122).

3.16.3 More information is available in L122 and some information is presented in the HSE free leaflets INDG 261 and INDG 178.

3.17 PROVISION AND USE OF WORK EQUIPMENT REGULATIONS (PUWER)

3.17.1 Work equipment has a wide meaning and includes tools such as hammers, laboratory apparatus, for example Bunsen burners, ladders, photocopiers, lifting equipment and machinery for use at work.

3.17.2 These Regulations place duties on employers in relation to selection, suitability, maintenance, inspection, installation, instruction and training, prevention of danger and control of equipment.

3.17.3 More information on the Regulations can be found in L22. Free leaflets include INDG 291 and INDG 229.

3.18 REPORTING OF INJURIES, DISEASES AND DANGEROUS OCCURRENCES REGULATIONS (RIDDOR)

3.18.1 RIDDOR require employers, self-employed people or those in control of work premises to report certain work related accidents, diseases and dangerous occurrences.

3.18.2 Other people have duties to report certain gas incidents which may not appear to be work related:

- death, major injury, lost consciousness, or been taken to hospital for treatment to an injury arising out of the distribution, filling, import or supply of NG or LPG are to be reported by the conveyor for NG and the filler, importer or supplier for LPG
- dangerous gas fittings (as defined in RIDDOR) should be reported by a "member of a class of persons". Gas Safe registered engineers are to provide details of any gas appliances or fittings that they consider to be dangerous,

to such an extent that people could die, lose consciousness or require hospital treatment. The danger could be due to the design, construction, installation, modification or servicing of that appliance or fitting, which could cause:

- an accidental leakage of gas
- incomplete combustion of gas or
- inadequate removal of products of the combustion of gas.

3.18.3 Major injuries, death and dangerous occurrences are to be notified immediately, for example by telephone, to the enforcing authority by the "responsible person" as defined by RIDDOR. Report can be made to the Incident Contact Centre:

- for fatal and major injuries only, telephone on 0845 300 9923 (opening hours Monday to Friday 8.30 am to 5 pm) and complete appropriate on-line form
- all other reports at HSE website www.hse.gov.uk.

Complete the appropriate online report form listed below.

- report of an injury
- report of a dangerous occurrence
- report of an injury offshore
- report of a dangerous occurrence offshore
- report of a case of disease
- report of flammable gas incident
- report of a dangerous gas fitting.

The form will then be submitted directly to the RIDDOR database and a copy issued to the person making the report.

On-line written reports are to be submitted within the required timescale (10 days, or 14 days for dangerous gas fittings). Other reports need to be made as soon as practicable and within 10 days of the incident.

3.18.4 INDG 453 contains detailed guidance on RIDDOR, including a full list of injuries etc. that need reporting.

3.18.5 IGEM/GL/8 provides guidance on the reporting and investigation of gas-related incidents.

3.19 THE GAS ACT

The Gas Act, as amended, places duties on either the GT, gas supplier or consumer for meters to be kept in proper order. These duties are to ensure a meter by which the quantity of gas supplied is registered is in proper order for correctly registering the quantity of gas supplied.

The relevant schedule of the Gas Act dealing with these issues is schedule 2B, an extract of which is given in IGEM/GM/8 Part 4.

SECTION 4 : GENERAL OBJECTIVES AND PRINCIPLES

4.1 GENERAL

4.1.1 It is preferable that fabrication, installation, testing and commissioning of a meter installation be a continuous operation but it is recognised that, in many instances, this will not be practicable. If it is necessary to suspend operations before commissioning is completed, the installation shall be left in a safe condition and sealed off by means of caps, plugs, spades or blind flanges, as appropriate (reference should be made to the relevant parts of IGE/UP/1, IGE/UP/1A, IGEM/UP/1B and IGEM/UP/1C, as appropriate).

4.1.2 A competent person should be nominated to take overall control to ensure safe and efficient fabrication, installation, testing and commissioning.

Installation and commissioning work shall only be carried out by trained and competent personnel who are:

- "Gas Safe" registered for the category of work being undertaken
- A fit and proper person within the meaning defined in the standard condition of the Department of Trade, Gas Suppliers License
- Working for a company with appropriate:
  - Accredited Meter Installer (AMI) registration, and
  - Gas Transporter approval (GDN/PM/GT2, see A2.6).

4.1.3 All new works and modifications that fall within the scope of the PSSR shall be subject to the plant modification procedure, IGEM/GL/5. Following design, design appraisal and pressure system user approval, the pressure system user shall record the pressure system and ensure a written scheme of examination is prepared for those components within the pressure system that are required to have an examination.

4.2 QUALITY ASSURANCE

4.2.1 Quality management system

4.2.1.1 A formalised quality management system, which meets a suitable quality standard such as BS EN ISO 9001, should be adopted, to include an appropriate quality manual and quality plan.

4.2.1.2 The quality management system should be certified by an accredited certification body.

4.2.2 Quality plan

4.2.2.1 The quality plan should demonstrate that any installation meets the required technical specification and that design, manufacture, coating, testing and commissioning complies with relevant legislation, standards and CoPs. This should embrace the safety and suitability of any installation for the conditions of use.

4.2.2.2 As a minimum, the quality plan should include:

- design control
- formal arrangements for the notification of any agreed changes
- control of materials and assembly
- control of testing procedures and equipment
- control of commissioning procedures and site personnel
- nominated contacts for issues of:

- production
- technical
- field service.

- product identification and, where required, traceability.

Particular emphasis should be placed on the inspection of materials, welding, coatings and testing. Any workmanship or materials not in accordance with this Standard or the design specification should be rejected.

4.2.3 **Records**

A record of all notifications, materials and test certifications, weld and coating records, all related documents and inspection results shall be kept with the records of the installations.

4.3 WORK PROCEDURES

4.3.1 Before any work commences, it should be established that all materials, components and work procedures are in accordance with the design specifications and that satisfactory material certificates have been provided.

4.3.2 Procedures should be adopted to control and record the transport, receipt, storage, issue and use of materials and components.

4.3.3 Before commissioning, strength and tightness testing, purging and commissioning procedures should be prepared and issued to personnel undertaking the work.

4.4 CARE OF MATERIALS AND EQUIPMENT

4.4.1 Care shall be taken in transporting, storing and installing, meters, regulators, plant and equipment to minimise damage or loss due to:

- ingress of moisture or other contamination
- impact
- vandalism
- mishandling,

and to prevent injury or ill health to workers.

4.4.2 Any meter, meter module or associated equipment should be inspected upon receipt and any damage or suspected damage reported to the Meter Asset Manager (MAM) or equipment supplier.

4.4.3 Pipework, fabrications and components should be protected adequately during handling, transportation and storage. They should be inspected before use and, if any are found to be damaged or defective, they shall not be incorporated unless repairs can be carried out as agreed by those responsible for the design and construction.

4.4.4 Meters and associated instrumentation are precision devices and, as such, should be treated with care.

4.4.5 Any meter and/or associated equipment shall:

- be stored in accordance with the manufacturer's recommendations
- wherever possible, be stored in their original packaging
- be stored in a clean, dry place prior to installation

- be protected in storage from damage with particular attention being paid to indexes, instruments, official seals, etc.
- be secure in storage from the detrimental effects of tampering, interference, vibration, magnetic forces, sunlight or other influences
- be protected against the ingress of foreign material and moisture prior to installation.

4.4.6 Temporary caps, covers, and other protective measures should be retained in position until the component or equipment is ready to be installed.

SECTION 5 : EXCHANGE OF INFORMATION

5.1 GENERAL

5.1.1 Effective fabrication, installation, testing and commissioning of a meter installation is dependent upon all the parties' involved adequately exchanging appropriate information (see Figure 1). The designer of the installation shall provide the information to the personnel involved.

Note: The exchange of information will, in most cases, be a two-way exercise in order to arrive at a workable solution to which all parties agree.

5.1.2 All interested parties should be notified of the date on which commissioning is to be carried out.

5.2 INFORMATION CONCERNING THE NETWORK

5.2.1 Information pertaining to the Network shall be obtained. Such information should include:

- confirmation of a live gas service pipe (for an existing service)
- Network design minimum pressure (DmP_u)
- Network lowest operating pressure (LOP_u)
- Network maximum operating pressure (MOP_u)
- Network maximum incidental pressure (MIP_u) or Network design maximum incidental pressure ($DMIP_u$) whichever is provided
- Network design pressure (DP_u)
- planned or actual nominated energy value of the service
- any constraints that the GT has imposed on the service, meter installation, or the use of any housing or compound.

Note: Often, much of the above information is standard across a GT's Network. Appendix 3 provides guidance on standard Network operating conditions.

5.2.2 If any information pertaining to the size, design, outlet connection detail, position of the ECV etc., on an existing service is not available, the detail shall be obtained, for example from the GT, utility infrastructure provider (UIP), site visit, etc.

5.2.3 Where a meter installation exchange is planned and the ECV is not upstream of the whole meter installation, the MAM shall contact the GT, prior to exchange, in order to relocate the ECV in line with IGEM/G/1.

5.3 INFORMATION CONCERNING FABRICATING AND INSTALLING A METER INSTALLATION

Prior to fabricating or installing a meter installation, the installation designer shall provide the meter installer with the following information, as a minimum:

- details of the design of the installation, sufficient to enable the meter installer to correctly assemble the components

Note 1: It is important that any difficulties in achieving the original design requirements are fed back to the designer from those involved with the fabrication, installation, testing or commissioning processes. Failure to do so may compromise the integrity of the installation.

Note 2: The amount of information that will be required will vary significantly depending upon the size and complexity of the installation. For a small installation of MOP not exceeding 100 mbar, it may be in the form of a parts list and schematic/exploded drawing whereas, for a larger or higher pressure installation, it may be in the form of a detailed design file which includes specifications, drawings, etc.

- confirmation that all relevant pre-delivery strength tests have been successfully completed
- details of any components that may be damaged by STP, for example the meter
- DP, MOP and MIP for all parts of the installation, including (but not limited to) pipework and components such as the meter, regulating and safety equipment, and valves

  Note: If $DMIP_u$ is supplied by the GT, this is used instead of MIP_u.
- the design capacity of the installation
- the settings for the meter, pressure and safety control devices that have been agreed with the gas consumer and approved by the GT. Alternatively, the designer should inform the installer of the agreed metering pressure, the accuracy of the pressure control/safety equipment and the performance envelope that the meter installation has to achieve.

5.4 INFORMATION CONCERNING THE LOCATION OF A METER INSTALLATION AND SUITABLE WORK AREA

Prior to on-site fabricating or installing a meter installation, the meter installer shall obtain the following information, from the installation designer or, if appropriate, from the gas consumer or their representative:

- any relevant drawings e.g. a site drawing, and any other drawings as appropriate, indicating the position of the proposed installation or, where a drawing is not otherwise required, a suitable record of details of the location
- civil engineering requirements, including details of any concrete base and housing to be constructed
- the location of the installation as agreed between the GT, supplier/shipper, designer and consumer, and whether the proposed housing, is a purpose-built housing, an outside compound, or an existing building
- a hazardous area drawing for the proposed installation (if available)
- details of any nearby ignition sources, building air intakes or other potential hazards, for example power lines, etc. that could affect commissioning
- details of any hazardous area that may impinge on the installation other than that which is a consequence of the presence of the installation itself
- any relevant restrictions that may apply to the location of the installation, for example restricted vehicular access, planning constraints, etc.
- any relevant restriction that may affect the type of work that can be undertaken at the location of the installation.

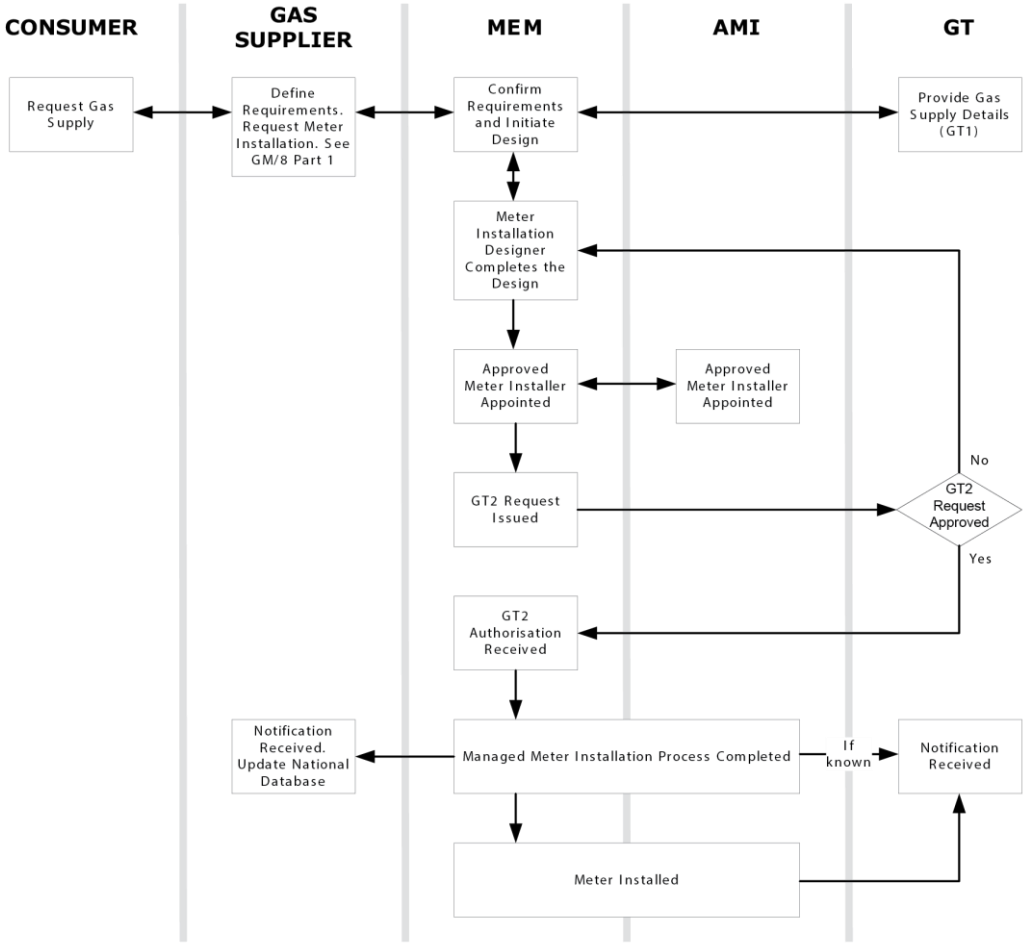


FIGURE 1 - TYPICAL INFORMATION FLOWS

SECTION 6 : PLANNING AND PREPARATION

6.1 PLANNING

6.1.1 The need and responsibility for any civil work and fabrication shall be established at an early stage in the planning process.

Note: Guidance on managing new works, modifications and repairs is given in IGEM/GL/5.

6.1.2 Prior to construction work, any necessary planning permission must have been obtained, and this shall be carried out by the consumer or site owner, as appropriate.

6.1.3 Prior to attending site the following actions should be undertaken, as appropriate:

- ensure that the correct equipment and materials are available
- establish if there are any:
  - restrictions that the consumer might impose that will affect the work to be undertaken
  - consumer identified hazards to take into account
  - special access requirements
  - specific materials, tools, equipment or keys etc. required.

6.1.4 Prior to arriving on site, consideration shall be given to gaining access to the location, delivery and positioning of the installation components, or module and any equipment (including lifting equipment).

6.2 TOOLS AND EQUIPMENT

6.2.1 Tools and equipment must be checked to ensure they are fit for purpose prior to use, i.e.:

- in good condition
- working correctly.

6.2.2 Damaged or faulty tools or equipment must not be used and arrangements made for their replacement or repair (if appropriate).

6.2.3 Calibrated (or tested) equipment shall be checked to ensure that it is within date. Out of date equipment shall not be used.

6.3 SAFE HANDLING OF EQUIPMENT

6.3.1 A safe means of handling, that will not result in damage, shall be identified for each item of equipment. If the proposed location prevents this, a more appropriate location shall be identified and agreed with the supplier, consumer and GT prior to undertaking any installation work.

Note: Normally, this will be the installation designer's responsibility.

6.3.2 Where necessary, lifting equipment shall be used and consideration shall be given to:

- prevention of damage to overhead services
- proximity of overhead cables
- load-bearing characteristics of the ground and the susceptibility of underground services to damage
- maximum safe working loads and radius of operation

- use of slings or other equipment designed to avoid damage to pipes, equipment or coatings.

6.4 HAZARDOUS AREAS

6.4.1 Any hazardous area that may affect the installation, testing or commissioning process shall be determined and appropriate precautions taken during these operations.

Note 1: Such areas may exist as a result of:
- *adjacent gas consumer-operated processes*
- *the testing/commissioning process (which may require gas to be manually vented)*
- *the presence and operation of the commissioned installation.*

Note 2: Areas that may become hazardous as the result of the presence of flammable gas are classified in the UK as Zone 0, 1, 2, 0 NE, 1 NE or 2 NE and are defined in BS EN 60079 and IGEM/SR/25.

Note 3: Some information on test equipment selection is provided in IGE/UP/1.

Test equipment shall have the appropriate certification for the zone in which it will be used.

6.4.2 A hazardous area drawing or equivalent shall be produced and maintained as a record to enable the correct selection and siting of electrical equipment (and other potential sources of ignition) to be undertaken for:
- the commissioning process
- initial installation
- operation
- any future modifications.

Note: Further information on the production of a suitable hazardous area drawing is provided in IGEM/GM/7B, IGE/SR/23 or IGEM/SR/25 as appropriate.

6.5 SUITABILITY OF THE PROPOSED LOCATION AND HOUSING

6.5.1 The proposed location and housing shall be in accordance with the relevant requirements in IGEM/GM/8 Part 2. Prior to commencing any assembly or on-site fabrication, the suitability of the proposed location and housing shall be verified.

6.5.2 All parts of any meter installation should be located as far as is practicable from any adjacent electricity meters or associated switchgear, and in no circumstances shall the distance be less than 150 mm.

Note: This is not intended to preclude the use of suitably-protected and certified electrical instrumentation in connection with the meter.

6.6 EMERGENCY ARRANGEMENTS IN THE EVENT OF A GAS ESCAPE OR A DANGEROUS SITUATION

Emergency arrangements shall be in place to take into account the primary objectives, which are to:
- ensure the safety of the public and personnel
- prevent damage to the installation and other property
- minimise the extent and effects of the emergency.

Reference shall be made to Appendix 5.

6.7 RESPONSE ARRANGEMENTS IN THE EVENT OF A FAILURE OF GAS SUPPLY OR A MAJOR FAULT

6.7.1 Suitable arrangements for the response to a failure of gas supply or major fault should be prepared in advance of commissioning the meter installation. These arrangements should be kept up to date and available for the guidance of all personnel connected with operation and maintenance.

The arrangements should cover the reasonably foreseeable urgent situations arising from the supply of gas to or from the installation, or resulting from leakage. They should detail the arrangements for alerting other persons who may be affected by the situation.

6.7.2 Arrangements and communications should be such that, in the event of an urgent situation arising, sufficient supervisory and maintenance personnel can be alerted and immediately dispatched to the installation(s) concerned.

6.7.3 Arrangements should be in place to cover urgent situations arising outside normal working hours and these should include procedures for calling out personnel.

6.7.4 Periodic tests or exercises should be carried out to confirm the effectiveness of the response arrangements.

6.7.5 Arrangements should be reviewed, and amended as necessary, as a result of testing and of any practical experience gained during real situations.

SECTION 7 : SITE SAFETY

7.1 GENERAL

7.1.1 The safe fabrication, installation, inspection and examination of works should be ensured. All necessary notifications should be made and measures taken for the protection of personnel, members of the public, property and the environment that might be affected by the work.

7.1.2 Arrangements should be made to obtain authorisations and permits to work, where required.

Note: Guidance on permits to work is provided in HSG250.

7.1.3 Attention must be paid to relevant statutory requirements (see Section 3).

The health and safety at work of all personnel must, so far as is reasonably practicable, be ensured by the provision of suitable instruction, training and equipment.

Asbestos containing materials may be present in the building construction or in gaskets within any existing meter installation. Reference shall be made to any asbestos register and appropriate risk assessments completed and precautions taken.

Note: As a general rule meter installations incorporating flanged joints predating 1990 will contain asbestos containing gaskets, and installations containing flanged joints as recent as 1999 may include asbestos containing gaskets.

7.1.4 Appropriate personal protective equipment must be worn at all times when undertaking work on site.

7.1.5 In areas classified as hazardous (see IGEM/GM/7B or IGEM/SR/25, as appropriate) any equipment to be used must be correctly certified for the position of use.

Note 1: IGEM/GM/7B and IGEM/SR/25 provide guidance on calculating hazardous areas for live installations in normal operation.

Note 2: It is important to consider the hazardous area present at the time that the work was being undertaken. When working on a meter installation, it is possible to undertake a live assessment of the conditions and make additional checks, for example atmosphere checks with certified equipment, to render a safe working area.

7.1.6 Appropriate supervision should be provided to ensure that all necessary safety precautions are taken for the protection of personnel, members of the public and property that might be affected by the works.

7.2 ARRIVAL ON SITE

7.2.1 On arrival on site, the following actions shall be carried out in a safe and professional manner:

- report to the appropriate consumer, or their representative, and notify them of your presence on site and the purpose of the visit
- in the case of building sites contact the site agent and ask to be advised of any relevant health, safety and environmental issues regarding the site e.g. risk assessment, special instructions, induction etc.
- where applicable, enter the date and time of visit in the site log book and, where appropriate, notify the company's system operator of your presence on site
- undertake any site safety induction required and, while on site, comply with any site-specific safety requirements advised by the consumer and/or MAM

- identify the location of the correct meter installation (or site of the proposed installation) and obtain any key(s) required to gain access
- park any vehicle in a safe area, with consideration to other road/site users
- in the event of a smell of gas, take appropriate action (see Appendix 5)
- gain familiarity with the installation location and its surroundings, identify the means of access/egress and note any local instructions and specific hazards which need to be taken into consideration during the site visit, for example low overhead cables.

7.2.2 Where required by the consumer, risk assessments and method statements shall be provided.

7.3 TAMPERING OR UNAUTHORISED OFFTAKE OF GAS

Where there is evidence of tampering or unauthorised offtake of gas, this shall be reported to the appropriate organisation. This will, normally, be the GT but may be the gas supplier/shipper. Any related advice given by the GT/supplier/shipper should be followed.

Note: Important evidence could be destroyed if any work is carried out before an investigation is made. If available, use a camera to gain photographic evidence.

SECTION 8 : SITE ENVIRONMENT

8.1 GENERAL

8.1.1 Work must be conducted within the framework of relevant environmental legislation, and shall be in accordance with associated guidance and CoPs.

8.1.2 Consideration shall be given to the identification and minimisation of emissions to air, surface and ground water courses and also the disturbance of all land involved in works. Disturbance to natural resources shall be minimised.

8.2 NOISE ABATEMENT

8.2.1 Although a certain amount of noise is inherent in all work activities on site, the best practicable methods shall be employed to minimise noise emissions to acceptable levels.

Special consideration shall be given to the following:

- designing out noise-generating operations before work starts
- siting and, possibly, screening of plant and equipment
- use of acoustically treated powered tools, compressors and generators
- avoidance of work outside normal working hours
- controlling noise when venting.

Note: Further guidance on noise assessment and measures to reduce noise is provided in IGEM/GM/8 Part 1.

8.3 CHEMICALS AND FLUIDS

Fuels, lubricants and chemicals shall be stored, used and disposed of in such a way as to minimise the possibility of any injury or ill health to workers or the public, or environmental impact (see Sub-Section 3.6).

8.4 WASTE

Waste is defined in the Environment Act 2021 as, a material that the holder has discarded, this includes unintentional, involuntary, and accidental actions. (reference https://www.gov.uk/guidance/check-if-your-material-is-waste#when-a-material-is-waste--discard).

Note: A material will not become Waste if all the following apply:

- it is used for the same purpose for which it was designed – the use can't be subordinate or incidental to the original use
- the previous holder intended for it to be reused
- no repair, or no more than minor repair, is required to it when it is transferred from the previous holder to the new holder, and the previous holder knows this
- any necessary repair is going to be done
- its use is lawful
- it is not managed in a way that indicates that it is waste, for example it is not transported or stored in a way that could cause it to be damaged.

The production of waste should be minimised by:

- deliver only what is needed
- avoid damage to, and deterioration of, materials
- select materials that can be reused or recycled

- transporting reusable material in a way that allows it to be readily reused with no or only minor treatment.

If you have waste, the following shall be undertaken:

- segregate and remove suitable waste materials for recycling, metals, cardboard, plastics
- ensure that the person who takes control of your waste is licensed to do so
- take steps to prevent it from escaping from your control
- store it safely and securely
- prevent it from causing environmental pollution or harming anyone
- if you intend to pass the waste on to someone else, describe the waste in writing and prepare a transfer note.

SECTION 9 : CIVIL ENGINEERING

9.1 SITE ASSESSMENT

9.1.1 For installations requiring civil engineering work, an inspection and survey of the intended site should be made to assess the practicability of all aspects of construction work, including temporary access, working areas and support for structures and excavations.

Note: IGEM/GL/5 provides details of a suitable management process.

9.1.2 Where heavy items of plant are to be located, consideration shall be given to exploratory work by means of trial holes and/or the employment of specialists.

Note: Guidance may be obtained from appropriate standards such as BS 1377, BS 5930 and BS 6031.

9.1.3 The location of buried pipes, valves, cables, services and other plant should be established prior to commencement of work.

Note 1: Special precautions may be required if the works are in the vicinity of existing gas pipes, and other plant.

Note 2: IGEM/SR/18 provides guidance on working in the vicinity of pipelines and IGEM/SR/29 provides guidance on locating underground plant. HSG47 provides a guide to safe practices to avoid dangers from underground services.

9.1.4 Consideration shall be given to the possibility of flooding of excavations, etc.

9.2 ALIGNMENT AND LEVELS

The datum point and co-ordinates should be indicated clearly on the drawing and, before site work commences, these items should be established securely and identified on site. Regular checks should be made thereafter to ensure that all measurements are made relative to these references.

9.3 CIVIL ENGINEERING WORKS

9.3.1 Any base required for the meter installation should be in place before the ECV and the meter installation are installed.

9.3.2 The design of the base shall take account of ground conditions, the weight of the installation, the housing and any other external forces.

The thickness of a base shall take account of the length of holding bolts, ensuring that they do not protrude through the bottom of the concrete.

9.3.3 Any base to be constructed with provision for future below-ground pipework, for example slots left in the initial slab to be infilled later, shall be designed to take account of these and the infill reinforcement detailed accordingly.

9.3.4 For prefabricated housings, it may be beneficial and practical, to install the installation on the base prior to assembling/installing the housing. However, any housing shall be in place prior to the installation being commissioned.

Note: For a traditionally constructed housing, this is not desirable.

9.3.5 Materials and design used in the construction shall be in accordance with IGEM/GM/8 Part 2.

9.4 CIVIL ENGINEERING WORKMANSHIP

9.4.1 Workmanship should be carried out in accordance with, as appropriate:

- BS 1186
- BS 8000-4
- BS 8000-6
- BS 8000-16.

9.4.2 Joinery should be stored and protected from weather at all times, until it has been treated and fixed.

9.4.3 The bottom of doors, backs of door frames and linings, fascias, skirtings, etc. should be treated prior to them being incorporated into the works.

9.5 HOLDING DOWN/FIXING BOLTS

9.5.1 Any bolts should be as specified on the designer's drawings.

They should be designed to resist the combined forces due to uplift and shear and spaced at a maximum of 1 m centres around the perimeter of the enclosure.

9.5.2 Where proprietary bolts are to be used, consideration shall be given to the bolt supplier's/manufacturer's detailed requirements with respect to bolt capacity and depth, minimum concrete edge distance and minimum bolt centres.

9.5.3 Rag bolts, indented bolts and the like shall not be used where tensile loads are to be resisted.

SECTION 10 : PRE-INSTALLATION CHECK

10.1 Before starting work, the following actions shall be carried out:

- undertake an appropriate site-specific risk assessment and apply any control measures

  Note: The risk assessment is to be reviewed from time to time or where conditions change and revised if necessary.

- wear all appropriate PPE and as advised by any signs displayed on site and as a result of the risk assessment
- do not take any equipment that may be a potential ignition source into a hazardous area
- identify any unsafe situation and if gas related, deal with it in accordance with the IGEM/G/11 GIUSP;
  - open all meter housing doors and any compound gates, and check that they are held securely in the open position, and that they are clear, so allowing safe access/egress in an emergency
- do not undertake work unless there is a satisfactory means of escape
- where instrumentation outputs and/or alarms are telemetered or where required by local rules, contact the control centre
- check that the ventilation to the installation is adequate
- identify the correct service pipe and ECV
- check that it is the correct meter installation for inspection, for example MPRN and meter serial number
- confirm service pipe label details where attached to the ECV.

10.2 Prior to commencing work to connect an installation to a service, an appropriate pressure gauge and fittings should be used to verify the gas supply pressure is within the range expected, and thereby verify the suitability of the installation for the service.

SECTION 11 : FABRICATION AND WELDING OF PIPEWORK AND COMPONENTS

11.1 PLANNING

11.1.1 The amount of on-site fabrication involved varies immensely. In general, fabrication of components off-site has significant benefits. As such, on-site fabrication work should be kept to a minimum.

Note: This can be achieved by:

- *use of prefabricated and pre-tested modules - the only fabrication work required will be concerned with the mounting of the module on the foundations and connecting the module to the outlet of the ECV.*

  Installing the meter module prior to installing the Network pipeline will significantly ease the process of connecting the Network pipeline and ECV to the meter installation.

- *use of prefabricated pre-tested components - removes the need for welding and on-site strength testing.*

11.1.2 Prior to commencing on-site fabrication, the meter installer (in agreement with the consumer or their representative) shall identify an area that is appropriate for the anticipated fabrication activities.

11.2 MATERIALS SELECTION AND TESTING

11.2.1 Selection of pipe material, flanges, welding methods and corrosion protection procedures shall be as specified by the designer (see IGEM/GM/8 Part 1).

11.2.2 Any gas fitting, fastening or other component used during construction shall be in accordance with IGEM/GM/8 Part 1.

11.2.3 Where radiography is to be carried out, it shall be carried out in accordance with an appropriate standard, such as BS EN ISO 17636. During construction, arrangements shall be made for the scrutiny of all radiographic images.

All non-destructive examination (NDE) and non-destructive testing (NDT) should be witnessed and recorded.

11.3 WELDING

11.3.1.1 On-site fabrication must only be undertaken in a "safe area".

Note: Further guidance from HSE bulletin STSU1 regarding mild steel welding fumes.

11.3.2 When undertaking on-site fabrication, suitable precautions shall be taken with regard to protecting the public and personnel from the activity. General welding practice shall be in accordance with BS EN 1011-1 or BS EN 1011-2, as appropriate.

11.3.3 Prior to welding, the welding procedure specification should be agreed and welding procedure tests and welder qualification tests shall be completed satisfactorily. BS EN 1011-1 or BS EN 1011-2, as appropriate, shall be applied.

11.3.4 For MOP exceeding 7 bar, welding shall be carried out to an appropriate standard such as BS 4515 (for pipe welding) and BS 2633 (for steel pipework). Where components of different material specifications are to be jointed, the welding procedure shall comply with that specified for the material with the higher yield.

11.3.5 For MOP not exceeding 7 bar, welding and inspection shall be carried out to an appropriate standard such as BS 2971.

11.3.6 Fittings shall match and be compatible with the chosen pipe wall thickness and material grade.

11.3.7 For welds for connections to impulse and instrumentation pipework, the edge of the socket weld shall not be closer than 15 mm from any part of any other weld which should be increased to 50 mm for MOP exceeding 7 bar. All other welds shall not be closer to each other than 150 mm or one pipe diameter, whichever is the lesser.

11.3.7 In certain circumstances, for example where the pipe wall is exceptionally thick, heat treatment of site fabrications may be necessary. Reference should be made to an appropriate standard such as PD 5500 (for welded pressure vessels) and the treatment should be to appropriate standards such as the procedures laid down in BS 4515 (for welding pipelines) or BS 2633 (for steel pipework), where appropriate.

11.3.8 Following pipework fabrication, all welding slag shall be removed and internal wall surfaces cleaned. If there is any doubt about the cleanliness and freedom from scale, consideration shall be given to internal blasting and the application of an appropriate protective coating.

11.3.9 External surfaces should be inspected to ensure that they are free from imperfections, for example notches, arc strikes, spatter, corrosion, etc.

11.3.10 Following fabrication, the component shall be strength tested in accordance with IGE/UP/1, IGE/UP/1A or IGEM/UP/1C, as appropriate, and any water used during testing removed.

Note: Normally, it is beneficial to strength test on-site fabricated components prior to assembly, particularly when being used in conjunction with pre-strength tested components or a meter module.

SECTION 12 : ASSEMBLY AND INSTALLATION

12.1 PREPARATION

12.1.1 Any installation shall be assembled in as clean an environment as practicable, with particular care being taken to ensure that debris does not enter pipework or components.

12.1.2 Where possible, assembly and installation should be a continuous process. Therefore, all of the installation components and tools required for both activities should be to hand on site, prior to commencing work.

12.1.3 The external surfaces of pipework and fittings should be inspected to ensure freedom from imperfections, for example notches, arc strike, weld spatter corrosion.

12.1.4 The bore of pipework and fittings should be inspected to ensure freedom from weld protrusions, slag and extraneous material. Any obstruction shall be removed.

12.1.5 For an RD or turbine meter, where on-site fabrication will be required, a commissioning filter/strainer shall be installed, as specified in IGEM/GM/8 Part 1.

Note: A commissioning filter/strainer is advisable where assembly or fabrication takes place on site. It is not required when components will be assembled in a clean workshop environment and the installation is delivered to site as a prefabricated module with both the inlet and outlet connections capped.

12.2 HANDLING OF METERS AND ASSOCIATED EQUIPMENT

12.2.1 Meters and associated instrumentation are precision devices and shall be handled with care.

12.2.2 Any meter or item of associated equipment that is too heavy to manhandle shall be lifted by mechanical means in a manner in accordance with manufacturer's instructions and as required by the Lifting Operations and Lifting Equipment Regulations (LOLER).

12.2.3 Any meter and item of associated equipment shall be inspected upon receipt. Any suspicion of damage shall be reported to the MAM or equipment supplier.

12.3 STORAGE OF METERS AND ASSOCIATED EQUIPMENT

12.3.1 For any meter and associated equipment, consideration shall be given to the following:

- storage in accordance with any manufacturer's recommendations
- wherever possible, store in original packaging
- store in a clean, dry place prior to installation
- protect in storage from damage, particular attention being paid to indexes, instruments, official test seals, etc.
- secure in storage from the detrimental effects of tampering, interference, vibration, magnetic forces, sunlight or other influences
- protect against the ingress of foreign material and moisture before installation.

12.4 GENERAL

12.4.1 The pipework system should be assembled such that the completed system conforms to the specified requirements of the engineering design. Care shall be taken to ensure the correct positioning, orientation and accessibility of any:

- meter
- regulator, slam-shut valve and creep relief adjustment
- meter by-pass valve (MBV)
- isolation valves
- electrical equipment, including conversion and correction devices
- auxiliary equipment, including temperature and pressure sensing points.

12.4.2 The ECV will normally be installed by or on behalf of the GT. However, the meter installer shall ensure that the installation components and pipework are installed in such a manner as not to inhibit access to, or operation of, the ECV.

12.4.3 When making the connection to the ECV, any additional pipework shall be as short and straight as possible. Any resultant pressure drop shall be considered in the design of the meter installation.

Note: IGEM/G/1 defines the meter installation as commencing at the outlet of the ECV.

12.4.4 Care should be taken to ensure that undue stresses caused by welding and/or bolting of flanges are not induced. In particular:

- pipework should be assembled away from "fixed" points
- final bolting-down and grouting of large items of plant and supports should not take place until all pipework has been erected
- jacks, pulley blocks and similar practices should not be used to force pipework alignment.

12.4.5 Appropriate pipe supports should be provided as each pipe run is assembled, in order to minimise stress being placed on the pipework and components.

Note: Refer to IGEM/GM/8 Part 1, Section 15 for further information.

12.4.6 Pipe and equipment supports shall be designed, constructed and installed in accordance with IGEM/GM/8 Part 1. Supports shall not be welded to the pipework, flanges or components. Precautions should be taken to prevent corrosion at the point of contact of the support and the pipework by effectively coating and insulating the interface.

12.4.7 When constructing and fitting pipe supports, care should be taken to obtain accurate location and alignment to prevent stresses being imposed on the pipework and components.

12.4.8 Where necessary, lifting equipment must be used to handle pipes and equipment during assembly.

12.4.9 Pipework shall be assembled using flanged or screwed joints, as appropriate and as specified in IGEM/GM/8 Part 1 and Sub-Sections 12.4 and 12.5.

12.4.10 On completion of assembly and installation, the installation shall be visually inspected and any damage repaired. Any annular space around pipes, cable entries and ducts that communicate with the meter installation and any other compartment or room shall be sealed against the ingress of fluids.

12.4.11 Where an installation is installed and not fully commissioned, a warning label providing the information as given in Figure 2 shall be attached in a visible location on or near the isolation valve.

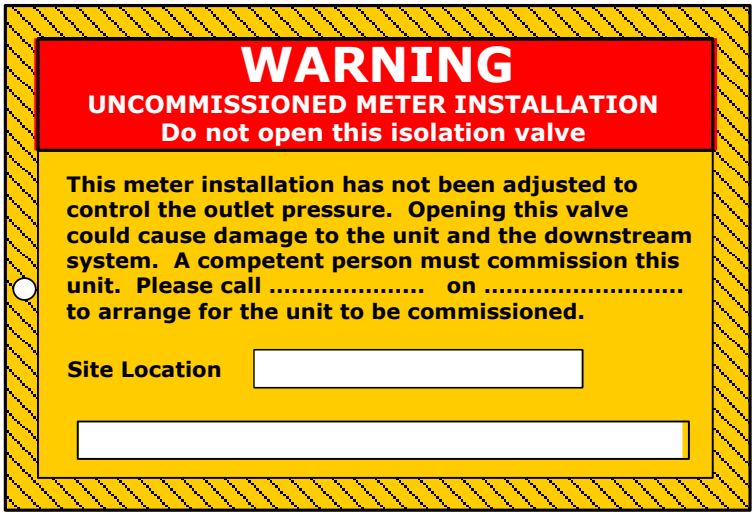


FIGURE 2 - TYPICAL LABEL FOR A METER INSTALLATION THAT HAS NOT BEEN COMMISSIONED

12.5 FLEXIBLE CONNECTIONS

12.5.1 Where flexible connections are used, they shall be installed in accordance with the limitations specified in IGEM/GM/8 Part 1 and the manufacturer's instructions. In the case of semi-rigid connections, the degree of bend imposed shall not be such as to result in adjacent corrugations touching.

12.5.2 Flexible connections and joints shall be located where they are protected against physical damage and are readily accessible, and do not pass through walls.

12.5.3 Flexible connections and joints shall not be used to compensate for misalignment of pipes or components.

12.6 SCREWED PIPEWORK

12.6.1 Pipe shall be:

- for MOP $\leq$ 2 bar, to BS EN 10255 Grade 235GT M or H wall thickness, API 5L-Gr B
- for 2 bar < MOP $\leq$ 38 bar, to API 5L-Gr B

12.6.2 Fittings shall conform to BS 143 and BS 1256, BS EN 10241, BS EN 10242, BS 3799, or IGEM/GM/PRS/1, as appropriate for the application and MOP.

Note: Proprietary fittings are available. Where considered of equivalent quality, they will need to comply with an equivalent standard.

12.6.3 Threads shall conform to BS 746, BS EN 10806 or BS EN 10226, as appropriate.

BS 746 threads shall be limited to 75 mbar, 2" NB and shall only be used for connections to:

- ECV, if it has a compatible thread
- LP Regulator
- diaphragm, thermal mass or ultrasonic meters $Q_{max} \leq 40\ m^3\ h^{-1}$.

BS EN 10806 threads should only be used for the connection of the screwed outlet connection on the ECV and to the regulator or SSV assembly (where they are supplied with this thread).

Note 1: Other threads are permitted for auxiliary pilots and instrumentation equipment.

Note 2: BS 746 is the specification for the threads on "gas meter unions and adaptors", which are typically used on diaphragm meter connections, the outlet of small angle pattern regulators, smaller sizes of semi-rigid connections, and valves for pressures not exceeding 75 mbar.

12.6.4 It should be ensured that connecting male and female threads are compatible.

12.6.5 For MOP not exceeding 7 bar, threads should be specified as either taper male/parallel female, or taper male/taper female. Taper male/parallel female threads are non-preferred.

12.6.6 For MOP exceeding 7 bar, threads shall be specified as taper male/taper female.

12.6.7 Parallel/parallel threads shall not be used.

12.6.8 Joints shall be sealed with a suitable jointing material applied to the threads only. Joints shall not be turned back for alignment purposes, but dismantled and remade.

12.6.9 Jointing compounds shall conform to BS EN 751, or BS 6956-5.

12.6.10 Polytetrafluoroethylene (PTFE) thread sealing tape or string shall conform to BSEN751.

Note: The scope of BS EN 751-3 covers threads on pipework up to 50 mm nominal bore. The tape manufacturer can provide details of appropriate wrapping technologies for pipe diameters exceeding 50 mm.

12.6.11 Jointing paste shall not be used as the sealant on screwed meter connections of RD meters.

12.7 BOLTS AND FLANGED JOINTS

12.7.1 Flanged joints shall be made incorporating an appropriate gasket as specified in IGEM/GM/8 Part 1. Jointing paste or compounds shall not be used to seal flanges.

12.7.2 Thread forms on stud bolts should be kept free from mechanical damage or corrosion, damaged or corroded stud bolts should not be used.

Note: A suitable thread lubricant will reduce the torque necessary to produce a gas-tight joint.

12.7.3 Bolts should be tightened carefully in the correct sequence to achieve an equally distributed force on all joints and gaskets. Stud bolts should be of such length as to give at least one thread clear of the nut. Care shall be taken to ensure that maximum torque levels for components are not exceeded.

12.7.4 The faces of raised-faced (RF) flanges should be to an acceptable standard, with regard to both flatness and surface finish, to match the gasket chosen.

12.7.5 For ring-type joints, rust should not be evident on either the ring or the mating surfaces of either flange.

12.7.6 Care shall be taken in the storage of ring-type joints and RF gaskets to ensure they are in an acceptable condition prior to use.

12.8 IMPULSE PIPEWORK

12.8.1 All impulse and auxiliary pipework shall be installed in accordance with IGEM/GM/8 Part 1, paying particular attention to ensuring that all impulse pipework is of adequate strength, properly supported, and positioned to reduce the risk of mechanical damage.

12.8.2 Impulse and auxiliary pipework shall be installed in such a way as to enable commissioning, testing and purging without breaking compression fittings.

12.8.3 Sufficient connections shall be installed in the auxiliary rail to facilitate easy removal of components and pipework for maintenance purposes.

12.9 ELECTRICAL INSTALLATION

12.9.1 Where a meter is in a hazardous area, the secondary instrumentation and lighting etc. shall be appropriately certified for use in the designated area.

12.9.2 Any electrical equipment, cabling, bonding, earthing and lightning protection devices, associated with a meter installation, shall be designed, constructed and installed in accordance with appropriate standards, procedures and must be in accordance with European Directives and The Electricity at Work Regulations.

Close reference should be made to IGEM/GM/5 and IGEM/GM/7A when considering connection of gas metering instrumentation and electrical outputs.

12.9.3 Any cable should be installed on a cable tray, in a duct or conduit (see clause 6.5.2).

12.9.4 Cables should not pass through ventilators.

12.9.5 Fuses should be of the high rupturing capacity (HRC) type.

12.9.6 Any metallic part, including stairways and supports, should be fitted with an equipotential bond.

12.9.7 Any electrical equipment should be installed and maintained in accordance with statutory requirements (see Section 3 and BS 7671).

SECTION 13 : BY-PASSES FOR EQUALISATION AND TESTING

13.1 During commissioning and/or testing, it may be necessary to install a small, temporary, by-pass around valves, ancillaries and pressure regulators. Where components are by-passed, consideration shall be given to the strength of the pipework downstream of the component being by-passed and precautions shall be taken to protect the downstream section of pipework from a pressure for which it has not been designed.

Note: A temporary by-pass may be required for any one of a number of reasons, for example:
- *to maintain the pressure to the downstream system*
- *to equalise the pressure around components when tightness testing*
- *to provide a means of slowly pressurising downstream of a closed valve.*

13.2 If a by-pass is used for equalisation of pressure across a device, or for testing purposes, a valve should be installed which should close automatically if it is not held open manually.

13.3 If, as part of the commissioning and/or testing process, it is necessary to by-pass a pressure regulator and the downstream system is not capable of withstanding the maximum pressure likely to occur in the Network, any temporary by-pass used should incorporate a means of pressure control and safety systems that offer the same level of protection as the regulator being by-passed.

Note: A typical example where a temporary regulator by-pass would not be fitted with pressure control and safety devices is where the by-pass has been fitted to allow the pressure either side of a regulator to equalise for the purposes of strength or tightness testing.

13.4 A pressure gauge should be fitted downstream of any temporary by-pass. The gauge should be readable from the point of operation of the by-pass.

13.5 Any temporary by-pass shall be removed as part of the commissioning procedure, and any joints made checked for tightness.

13.6 Care shall be taken when pressurising or depressurising a meter. For an RD meter, the rate of change of pressure shall not exceed 350 mbar s^{-1}.

SECTION 14 : STRENGTH TESTING AND TIGHTNESS TESTING

14.1 Any installation shall be subjected to strength and tightness tests. Testing shall be carried out prior to the application of paint or other protective coatings and before the installation is put into service.

Note 1: Certain sections of a meter installation may need to be tested at different pressures to that of other sections, according to their DP.

Note 2: Combined strength and tightness testing (see IGE/UP/1) is valid only if no component is removed from the installation for strength testing.

Note 3: Pre-assembled modules/fabrications will have to be strength and tightness tested prior to the application of paint. Following installation, a further tightness test will be required on site.

14.2 Testing shall be in accordance with, as appropriate:

- IGE/UP/1
- IGE/UP/1A
- IGEM/UP/1C.

The requirements in this Section supplement or replace the above Standards.

Note 1: IGE/UP/1 covers installations (and pipework) of MOP not exceeding 16 bar. However, its principles may be extended to installations of MOP exceeding 16 bar, when the ratio of STP to MOP or MIP needs to be as if for the range 7 bar < MOP ≤ 16 bar.

Note 2: IGE/UP/1A applies to the strength and tightness testing (and purging) of installations where the pipework volume including any meter does not exceed 1 m^3; OP at the inlet to the meter does not exceed 40 mbar; the pipework diameter does not exceed 150 mm and the pressure at the inlet to the regulator does not exceed 75 mbar.

14.3 Meters, regulators and associated equipment should not be subjected to an on-site hydrostatic test. They should have been tested by the manufacturer at the factory.

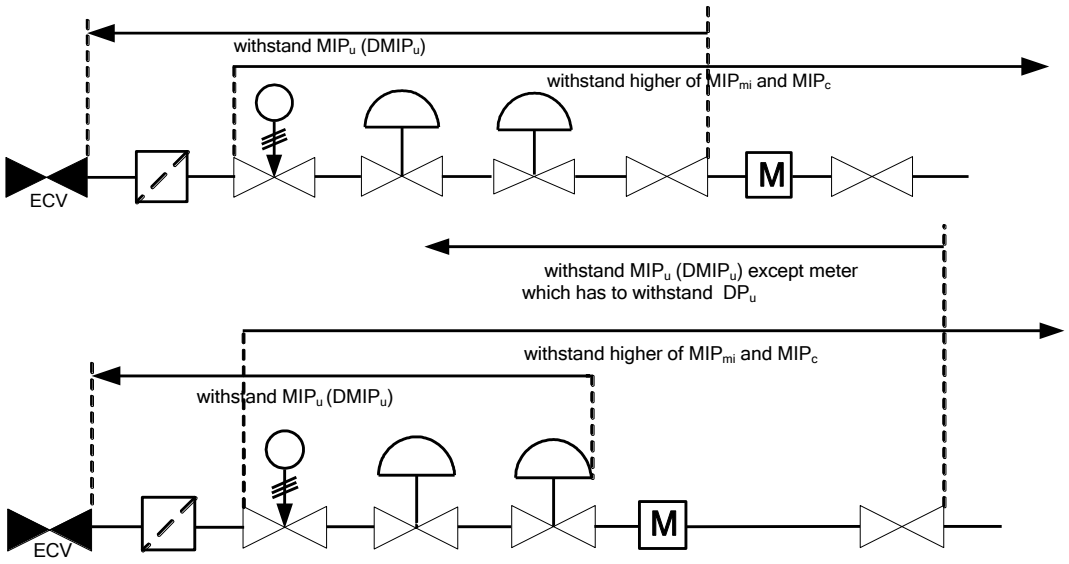
14.4 IGE/UP/1, UP/1A and UP/1C base the strength and tightness test pressures on a multiple of MOP or MIP. This is based on the assumption that MOP will always equal DP but this will not always be the case. When calculating STP and the tightness test pressure (TTP) the following shall be applied:

- upstream of the pressure break; DP shall be used in place of MOP used in IGE/UP/1 etc. and DMIP shall be used rather than MIP
- downstream of the pressure break; DP shall be used rather than MOP used in IGE/UP/1, etc. but MIP shall be used as in IGE/UP/1, etc.

The test durations shall be as specified in IGE/UP/1, etc.

14.5 Where different parts of an installation have different DPs, the strength testing requirements of each part of the installation shall be determined separately and tested accordingly (see Figure 3).

14.6 Where pneumatic strength testing is to be carried out, it shall be done using either air or an inert gas. Fuel gas shall not be used.



Note: Where the GT states a DMIP, use this rather than MIP_u.

FIGURE 3 - ILLUSTRATION OF STRENGTH REQUIREMENTS

14.7 Before hydrostatic pressurisation, care should be taken to ensure that there is no air or gas in the system (but see Sub-Section 14.3).

After hydrostatic testing, each part shall be thoroughly dried before the meter, regulators, etc. are bolted in place, and particular care shall be taken to drain any low points where water could accumulate.

Note: Failure to remove all of the test fluid or thoroughly dry the pipework/equipment prior to re-assembly may result in damage to meters, regulators and associated equipment. There are a number of different methods of drying that may be employed, for example swabs, drying agents, etc, all of which will be more effective if the sections are designed/selected for testing in such a way as to facilitate the effective draining of the vast majority of the test fluid. If in any doubt about how to remove the test fluid, seek expert advice prior to undertaking the test.

14.8 It is not necessary to re-check the system for strength after dismantling and re-assembly providing there have been no mechanical changes likely to affect strength, for example welding or fitting of untested parts.

14.9 Pneumatic tightness testing should be carried out on the entire meter installation with no components omitted. If a section is tested by combining the strength and tightness tests with (pre-tested) components removed, or any joints are disturbed through, for instance, the removal of a temporary by-pass, then once the components are replaced the entire installation shall be re-pressurised and the disturbed joints tested at OP with leak detection fluid (LDF).

Note: Before a pneumatic tightness test, an appropriate strength test has to be carried out.

14.10 Certificates to show that pre-assembled modules have successfully completed strength and tightness tests shall accompany such modules on their delivery. Such modules shall successfully complete an additional tightness test subsequent to their installation.

14.11 When de-pressurising the system following a pneumatic test, the pressure shall be released in a controlled manner. This shall be carried out using a suitable pressure let-down valve provided with vent pipework that vents to a safe location and at the opposite end to where the pressure was applied.

Note: When venting down, it is important to vent inert gas into a well-ventilated open area to avoid any risk of asphyxiation.

SECTION 15 : PRE-COMMISSIONING CHECKS

The following shall be checked, as appropriate:

- the ECV is accessible and operable
- all valved tappings have been fitted with appropriate plugs
- the main filter element(s) is installed
- for RD and turbine meter installations, appropriate commissioning strainer(s) have been fitted

  Note: A commissioning strainer is fitted on the inlet to RD and turbine meters to protect the meter during commissioning. For metering pressures not exceeding 75 mbar, an open ended strainer is acceptable. For pressures exceeding 75 mbar, a closed end strainer is required. The commissioning strainer has to be removed following commissioning. Factory assembled modules do not require a commissioning strainer to be fitted.

- components have been installed so that the flow direction matches the direction marked on them
- the meter index, official meteorological seals and other parts of the installation are intact and undamaged
- the alignment of inlet and outlet pipework is satisfactory and does not transfer any load to the meter
- for an RD meter, the rotational axis is level within the tolerances specified by the manufacturer
- the meter and associated pipework is adequately supported
- any RD meter has been shown to rotate freely
- suitable test points have been installed on the meter (to facilitate future maintenance)
- that lubricant of the correct type and quantity has been added to the meter in accordance with the manufacturer's instructions.

  Note: Particular care is required with RD meters.

SECTION 16 : PURGING

16.1 The installation shall be purged and commissioned but only after passing a strength and tightness test (see Section 14).

16.2 The installation shall be purged in accordance with, as appropriate,

- IGE/UP/1
- IGE/UP/1A
- IGEM/UP/1C.

The requirements in this Section supplement or replace the above Standards.

Note 1: IGE/UP/1 covers installations (and pipework) of MOP not exceeding 16 bar. However, its principles may be extended to installations of MOP exceeding 16 bar.

Note 2: IGE/UP/1A applies where the pipework volume, including any meter, does not exceed 1 m^3; OP at the inlet to the meter does not exceed 40 mbar; the pipework diameter does not exceed 150 mm and the pressure at the inlet for the regulator does not exceed 75 mbar.

Note 3: IGE/SR/23 provides further guidance on the venting of Natural Gas.

16.3 The purging procedure shall ensure that all pipework is purged and that, wherever possible, sequential purging is employed. On more complex installations, it is recommended that, with the meter inlet valve (MIV) and any MBV closed, each regulator stream is purged through the regulator stream outlet header.

16.4 Where a MBV is not fitted, the meter should be purged slowly through the MIV to the meter outlet valve (MOV). The maximum flow rating of the meter shall not be exceeded during any commissioning activity.

Note: The use of a valve rider to pressurise the downstream installation may be beneficial. On a large and/or high pressure installation, operating a line valve with one side pressurized and the other depressurised can subject the downstream equipment to a damaging pressure wave. The valve rider (see Figure 4) provides a means of gently raising the downstream pressure (see Section 13).

16.5 Where a MBV is fitted, it should be opened and the outlet spool should be purged through the by-pass with the MIV and MOV closed. The meter should be purged slowly through the MIV, and out through the purge point between the MIV and MOV. It should be ensured the MOV and MBV are closed.

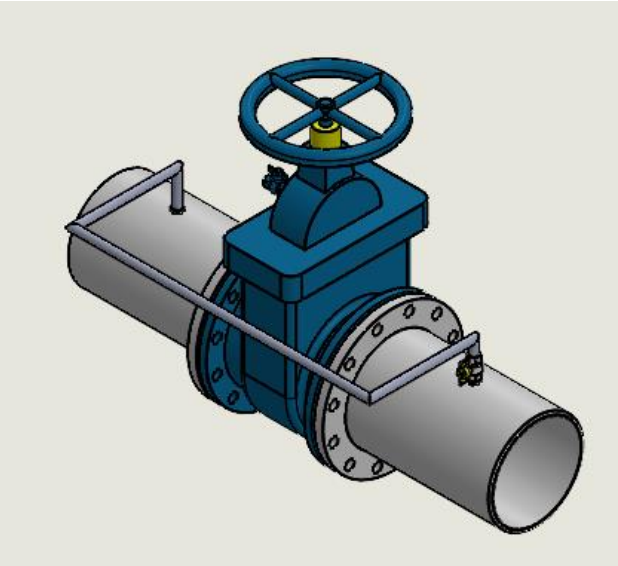


FIGURE 4 - TYPICAL VALVE BY-PASS

SECTION 17 : INITIAL FUNCTIONAL CHECKS

17.1 Tests should be conducted on all equipment, including regulators, slam-shut valves (SSVs), relief valves, auxiliary control systems and valves, to ensure their correct operation.

Note: The purpose of the initial functional test is to confirm satisfactory operation and ensure that the settings of the regulator(s), SSV(s), relief valve(s) and auxiliary control system(s) are as close as possible, to the desired set point.

17.2 The tests should be undertaken in accordance with the manufacturer's instructions for the individual components, as close as possible to normal operating conditions.

For components preset by the manufacturer, the test is to validate the correct setting. Adjustment should be made only if the performance falls well outside of the tolerances shown in Tables 1 or 2 (see Section 18), as appropriate, or the information provided by the designer.

Note: If only a very small flow rate is available to undertake this initial functional test, the performance characteristic of components may mean that a correctly-set component will fail this initial test.

17.3 Wherever possible, functional tests should be carried out without passing gas through the relevant meter, for example by using a temporary vent stack and/or a remote pressure source.

17.4 Care shall be taken when pressurising or depressurising a meter. For an RD meter, the rate of change of pressure shall not exceed 350 mbar s^{-1}.

SECTION 18 : COMMISSIONING

18.1 GENERAL

18.1.1 Where applicable the pressure system user must ensure that each written scheme of examination is reviewed and certified by the competent person as defined in PSSR before the pressure system is commissioned.

18.1.2 Prior to commissioning, written procedures should be prepared (see Sub-Section 18.3) and issued for each installation. The procedures should be carried out whenever an installation is commissioned, wholly or in part.

18.1.3 Interested parties should be notified of the date on which commissioning is to be carried out. On large, complex, installations, it is essential to commission the installation with a gas load connected. This will necessitate the co-operation of the consumer, their contractor, gas supplier and GT.

18.1.4 Commissioning procedures should take account of the requirements of the consumer's downstream equipment and ensure that:

- the correct functioning of all components is verified by the operative in accordance with the manufacturer's instructions for the individual component
- pressure safety systems are set and tested before commissioning the regulator(s)
- the regulator(s) is/are shown to be in full control before the outlet valves are opened and before leaving site
- the set point of any pilot, controller and regulator is checked for each stream, if possible, under flow conditions
- load changes are possible without oscillation i.e. that the main regulator controls smoothly at the anticipated load, especially on/off loads.

18.1.5 The manufacturer's recommendations for commissioning each item of equipment shall be observed in all cases.

18.1.6 Pressure gauges should be utilised to monitor the pressure at appropriate points in the installation during the commissioning process.

18.1.7 Any commissioning strainer shall be removed following completion of commissioning (see Section 20).

18.2 SET POINTS

18.2.1 The regulator(s) and safety device(s) shall be adjusted to the set points specified by the installation designer in accordance with IGEM/GM/8 Part 1 and the GT authorisation document.

Note: The setting and sealing of regulators can only be undertaken by an ~~O~~AMI authorised by the relevant GT, and the set points have to be aligned with those authorised by the GT.

18.2.2 Unless otherwise agreed with the supplier, shipper, GT, and consumer, the metering pressure shall be 21 mbar.

Note: On an installation with a metering pressure of 21 mbar, the designer has to assume that "standard" appliances will be connected at some stage, unless the consumer specifically advises otherwise (see IGEM/GM/8 Part 1 for an explanation of "standard" appliances).

Unless it has been specifically agreed between the supplier, shipper, GT, and consumer, and the consumer has advised that they will not be connecting "standard" appliances downstream of the installation, the regulators and safety devices should be set in accordance with Table 1 and Table 2, as appropriate.

Where non-standard pressures have been agreed the devices shall be set in accordance with the parameters on the GT authorisation document and consumer warrant.

An example of pressure settings for a simple direct-acting regulator/meter module are given in Appendix 6.1.

18.2.3 For an installation with a metering pressure exceeding 21 mbar, the designer shall provide the details of the metering pressure and the operational limits that the meter installation is to achieve, in which case the regulators and safety devices shall be set up as follows.

The set points of regulating and safety equipment should be set at a minimum of 10% of the installation's total capacity. If practicable, the installation inlet pressure should be at about its normal level or the midpoint of its normal range.

For active only regulator systems (MOP not exceeding 2 bar):

- set the SSV such that the downstream pressure does not exceed MIP_{mi}
- set the relief valve above the active regulator set pressure taking into account the performance of the relief valve and the accuracy class of the active regulator to ensure the relief valve does not open under normal operation of the active regulator, including lock-up
- set the active regulator at the desired set point to achieve the contracted metering pressure (P_m).

For active/monitor regulator systems (MOP exceeding 2 bar):

- set the SSV such that the downstream pressure does not exceed MIP_{mi}
- set the relief valve above the monitor regulator set pressure taking into account the performance of the relief valve and the accuracy class of the monitor regulator to ensure the relief valve does not open under normal operation of the monitor regulator, including lock-up
- with the active regulator fully open, set the monitor regulator above the active regulator set point and ensure steady control (TOP_{mi}) and that the MOP of the downstream and consumer's system is not exceeded (MOP_c) and that good combustion can be maintained
- set the active regulator at the desired set point to achieve the contracted metering pressure (P_m).

An example of pressure settings for a simple direct-acting regulator/meter module are given in Appendix 6.2.

The SSV set point plus its accuracy group tolerance (MIP) shall not exceed STP of the downstream system.

18.2.4 Consideration shall be given to checking the set points once the installation is operating under normal load conditions.

EQUIPMENT	CRITERIA	SINGLE STREAM		
		Set point (mbar)	Tolerance (mbar)	Functional check (mbar)
SSV*	Set point (SP)	47.5	± 2.5	Up to 50
Creep relief *	Set point (SP)	35.0	± 3.5	Up to 38.5
Monitor regulator*	Max lock-up			Up to 31
	Set point (SP)	23.0	+1.0/-0.0	
	Regulator Accuracy		$0.05Q_{max}$ SP +2.1	Up to 26.1
			Q_{max} SP –2.1	Over 20.9
Active regulator	Max lock-up			Up to 29
	Set point (SP)	21.0	+1.0/-0.0	
	Regulator accuracy		$0.05Q_{max}$ SP +2.1	Up to 24.1
			Q_{max} SP –2.1	Over 18.9

**Note:* *Not all equipment will be required on all installations. The requirements for safety equipment and creep reliefs are detailed in IGEM/GM/8 Part 1.*

TABLE 1 - SET POINTS AND OPERATING TOLERANCES FOR A SINGLE STREAM METER INSTALLATION WITH 21 mbar METERING PRESSURE

EQUIPMENT	CRITERIA	2ND STREAM		LEAD STREAM*[1,2]	
		Requirement (mbar)	Device tolerance (mbar)	Requirement (mbar)	Device tolerance (mbar)
SSV*	Set point (SP)	47.5	± .2.5	47.5	± 2.5
Creep relief*	Set point (SP)	35.0	± .3.5	35.0	± 3.5
Monitor regulator*	Max lock-up	30.0	None	31.0	None
	Set point (SP)	22.0	+1.0/-0.0	23.0	+1.0/-0.0
	Control accuracy	$0.05Q_{imax}$ SP	+2.0	$0.05Q_{imax}$ SP	+2.0
		Q_{imax} SP	-2.0 mbar	$0.05Q_{imax}$ SP	-2.0
Active regulator	Max lock-up	28.5	None	29.5	None
	Set point (SP)	21.0	+0.5/-0.0	21.5	+1.0/-0.0
	Control accuracy	$0.05Q_{imax}$ SP	± 2.0	$0.05Q_{imax}$ SP	+2.0
		Q_{imax} SP	-2.0	Q_{imax} SP	-2.0

**Note:[1]* *Not all equipment will be required on all installations. The requirements for safety equipment and creep reliefs are detailed in IGEM/GM/8 Part 1.*

**Note:[2]* *Where an installation has twin streams for security of supply, during normal operation both streams may feed but each stream has to be capable of supplying the installation's maximum load while maintaining a safe pressure at the outlet of the installation (typically 15 mbar).*

TABLE 2 - SET POINTS AND OPERATING TOLERANCES FOR A TWIN STREAM METER INSTALLATION WITH 21 mbar METERING PRESSURE

18.3 SETTING PROCEDURE

18.3.1 All valves on the installation shall be in the closed position before starting.

18.3.2 Manufacturers' documentation relating to health and safety, and any other relevant health and safety documents, shall be understood and acted upon as appropriate.

18.3.3 Manufacturers' instructions shall be followed, whether they are for individual components or pre-assembled installations, and shall take precedence over the remaining clauses of this Sub-Section.

18.3.4 The commissioning engineer shall familiarise themselves with the method of adjustment of all equipment and the procedure for re-setting any SSV, before commencing the commissioning process.

18.3.5 The set points of all pilots, controllers and regulators should be rechecked for each stream on load, preferably at high flow (towards Q_{imax}), and at low flow (towards 0.05 Q_{imax}).

18.3.6 While commissioning pressure regulating and safety equipment, care should be taken to ensure that the meter is not subjected to excessive differential pressures, high flow rates, or transient conditions.

Note: Excessive pressure differentials may cause serious damage to the meter. Where provided, the use of a meter by-pass is recommended. If a by-pass is not fitted, and such conditions are likely to exist during commissioning, it may be beneficial to commission the regulator installation prior to fitting the meter.

18.3.7 The maximum flow rating of the meter shall not be exceeded.

Note 1: Unless due care is taken, this can easily occur during commissioning, particularly when the meter does not have a by-pass fitted.

Note 2: When commissioning a meter, it is important to be aware of any unusual noise or high differential pressure, as this may indicate a fault.

18.3.8 If gas is not already passing through the meter, the meter shall be brought into service using the requirements given in Sub-Sections 18.4 and 18.5, as appropriate.

18.4 METER COMMISIONING

18.4.1 Caution shall be exercised when pressurising a meter.

Note: An excess differential pressure across the meter may result in serious damage of the measuring unit which may significantly affect the accuracy and may not be apparent.

18.4.2 When placing into service a diaphragm meter without a by-pass at OP exceeding 75 mbar, a temporary commissioning by-pass shall be installed.

Note: Usually, diaphragm meters are not used at metering pressures above 75 mbar in the UK.

18.4.3 The following procedure shall be adopted to commission a meter with a by-pass fitted (see Figure 5):

- with the MIV and MOV closed, slowly open the MBV to pressurise the downstream pipework
- slowly open the MIV
- wait for the pressure to equalise
- slowly open the MOV
- slowly close the MBV while monitoring the downstream pressure.

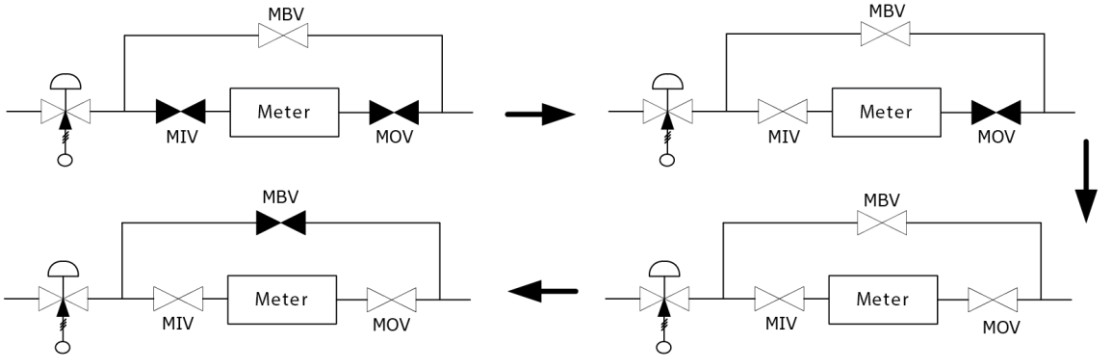


FIGURE 5 – COMMISSIONING A METER INSTALLATION, BY-PASS FITTED

18.4.4 The following procedure shall be adopted to commission a meter installation without a by-pass fitted (see Figure 6):

- slowly open the MIV
- wait for the pressure to equalise
- slowly open the MOV.

Note 1: It is essential to maintain a low differential pressure across the meter and ensure that the flow through the meter, in terms of actual volume, is kept below Q_{max} for the meter, thus preventing damage to the meter.

Note 2: The use of a valve rider to pressurise the downstream installation may be beneficial.

Note 3: The differential pressure across a USM is very low or zero, so they are not susceptible to damage by rapid rises in flow. However, it is considered to be good practice to follow the same procedure as used for RD and turbine meters to eliminate any possibility of damage.

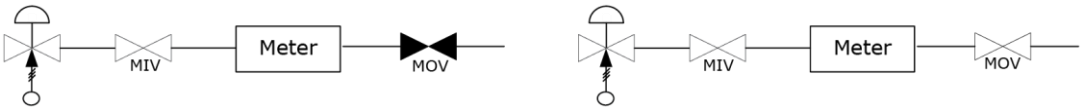


FIGURE 6 – COMMISSIONING A METER INSTALLATION, BY-PASS NOT FITTED

18.5 INSTRUMENT COMMISSIONING

18.5.1 All instruments shall be commissioned in accordance with the manufacturer's instructions.

18.5.2 Any volume converter or flow computer shall be commissioned and its function checked in accordance with IGEM/GM/5.

18.5.3 Where a flow computer is used to normalise the error curve of a meter, the meter characteristics shall be made available to enable the data to be input into the flow computer.

18.5.4 Prior to connecting and commissioning instrumentation, the following checks should be carried out, as appropriate:

- electrical instrumentation and equipment are constructed and installed in accordance with IGEM/GM/5, IGEM/GM/7A, BS 7671 and BS EN 60079, as appropriate
- instruments are located in a suitable environment and are not subjected to vibration or similar effects
- necessary test points and proving facilities have been provided and are operable

- electronic equipment satisfies the relevant safety requirements for their particular location and application. Certificates should be examined to confirm equipment's suitability, as appropriate
- power supplies, fuses and cabling are appropriate for their required duty
- instruments and ancillary equipment are securely mounted
- impulse lines are clear before connection to the instrument. Instrument impulse lines shall not be vented through the instrument. As soon as pipework is pressurised, it should be tested for tightness
- temperature-sensing elements are correctly installed and thermowells are filled with suitable heat conducting paste or fluid
- instrumentation is adequately protected against the effects of weather, including sunlight
- instrumentation seals are present and fixed appropriately
- pressure-sensing instruments are pressurised slowly and equalisation valves used where they are provided
- electrical supplies to the instruments are connected
- any annular spaces around pipes, cable entries and ducts communicating with the metering and any other compartment/room are sealed against the ingress of fluids.

18.5.5 The calibration of each instrument should be checked in accordance with the manufacturer's instructions.

18.6 CATHODIC PROTECTION (CP) SYSTEMS

18.6.1 As soon as possible, any CP system should be commissioned in accordance with an appropriate standard such as BS EN 13636.

18.6.2 Where an impressed current system is used, electrical checks should be made to verify the correct output polarity.

18.6.3 If required, a close internal potential survey (CIPS) of the entire system should be undertaken as soon as possible after complete commissioning of the CP system in order to:

- fully validate that protection levels are adequate
- provide a finger print of the protection levels achieved.

18.6.4 The continued effective operation of a system is totally dependent upon a satisfactory level of monitoring and maintenance, and this should form part of the installation management system.

18.7 PAINTING, NOTICES, LABELS AND SEALS

18.7.1 Following testing, the meter installation pipework and framework shall be painted and/or appropriate corrosion protection measures taken as specified in IGEM/GM/8 Part 1.

Note: Meters, regulators and valves are supplied suitably finished and, therefore, additional painting is not necessary. This will avoid blockage of regulator breather holes and covering the meter index and identification plate.

18.7.2 Any stainless steel pipework and fittings shall not be painted.

18.7.3 Any bolted joints fitted with flange protectors should be filled with grease or suitable anti-corrosion mastic.

18.7.4 Notices and labels shall be displayed in accordance with IGEM/GM/8 Part 5 (See Appendix 4 for information on Sealing).

18.7.5 Any regulator, safety device, etc. that is accessible to the consumer shall be fitted with an appropriate seal to prevent tampering, for example AMI or manufacturers.

18.7.6 Any volume converter sensing line valve shall be sealed in the open position.

18.7.7 Any MBV shall be sealed in the closed position and a warning notice fitted in accordance with IGEM/GM/8 Part 5.

18.7.8 Any connection that is not utilised upstream of the meter, and which is accessible to the consumer, should be sealed to prevent tampering.

18.7.9 Any seal used shall be both readily identifiable and of a non-repairable type.

18.7.10 Where a seal has an identifying reference number, this should be noted on the job report form and kept with the site records.

18.8 FINAL CHECKS

18.8.1 With the meter and associated instrumentation operating, they should be observed for signs of faulty operation such as excessive noise, mechanical binding, slipping, overheating, vibration, fault or error displays.

18.8.2 If any fault is identified, action should be taken to rectify the situation, for example, in the case of regulator instability, where minor adjustments to the set points can be made.

18.8.3 Any faulty equipment identified should be replaced and the defect reported.

18.8.4 On leaving the site, it shall be ensured that all doors and gates are locked, the site is left in a safe and secure condition and return any key(s) required to gain access.

18.8.5 The consumer should be informed that the commissioning engineer is leaving site.

SECTION 19 : HANDOVER INFORMATION AND RECORDS

19.1 A comprehensive set of commissioning records and documentation relating to the installation shall be kept.

19.2 A copy of any operational documents should be retained by the MAM at a central location. An additional copy should be retained by the MAM's operational service provider.

19.3 The design engineer, installer or commissioning engineer should inform the MAM of the information listed below along with any other relevant details.

Note: A site manual is not required for low risk installations that require little maintenance.

19.3.1 In addition to the information provided to the ME~~A~~M by the installation designer, which is listed in IGEM/GM/8 Part 1, the following information should be recorded, as appropriate:

- the design basis for the installation
- the results of any risk assessments carried out
- design calculations such as stress analysis, pressure ratings, system capacities, equipment working parameters, etc.
- site layout (as built) including details of hazardous area zoning
- equipment requirements, specifications, manuals and performance parameters, including those for the gas system, electrical equipment, instrumentation, telemetry, etc.
- detailed installation (as built) diagrams
- detailed electrical and instrumentation (as built) diagrams
- planning approval for the site (where appropriate)
- detail of the data transmission chain
- record of the completed written scheme of examination
- commissioning records for IGEM/GL/5
- completed non-routine and/or routine procedures.

19.3.2 A complete set of construction records should be prepared and retained. This should include, as appropriate:

- material and component certificates
- welding procedures and qualifications
- strength and tightness test results
- failures
- repairs
- re-tests
- charts
- radiographs or other NDE/NDT reports
- other appropriate information.

19.3.3 A record of all strength and tightness tests carried out should be prepared for every installation and retained until superseded, including:

- the authorised person responsible for the test
- the date of the test
- the manufacturer of the installation
- identification of the section to which the test relates
- DP

- the pressure reached during testing and the time for which this pressure was maintained
- the test medium
- the inspection method
- the test results
- a reference to the testing procedure.

The above information should be retained in the form of an appropriately completed test certificate as described in IGE/UP/1 and IGE/UP/1A.

19.3.4 Records of all the commissioning processes and results should be maintained, including:

- operational settings of adjustable/programmable equipment
- records of monitored parameters such as pressure, flow, temperatures, alarms, etc.
- any statutory records for plant and other equipment
- manufacturers' instructions
- full meter details
- installation and commissioning instructions
- meter calibration curves (where appropriate)
- compliance statements
- CP.

19.3.5 Records should be maintained of all corrosion control methods, including:

- type of internal coating
- type of external factory or field applied coating
- disposition and type of CP components and bonds
- CP monitoring results
- state of interference bonds
- results of close interval potential inspection surveys
- remedial work.

Note: An asset management system may require additional specific information.

SECTION 20 : POST-COMMISSIONING CHECKS

20.1 After a volume of gas, significant in relation to the capacity of the installation, has passed through the installation, post-commissioning checks shall be undertaken. Typically, these should be done between one and three months after the installation has been commissioned but may be at the first scheduled maintenance visit.

20.2 Checks and adjustments (as appropriate) shall be carried out, as detailed below:

- ensure that noise is not excessive when the installation is operating above 20% of maximum capacity
- with the installation operating at normal load check and adjust (as necessary) the set point of each regulator. Where fixed factor conversion is applied, ensure that the set pressure is accurate
- check that the regulator(s) is/are controlling the pressure of the gas at the meter in a stable manner
- check that the meter index is still operating
- check that the uncorrected volume of gas recorded on any conversion system agrees with the volume registered by the meter to within the tolerance stated in IGEM/GM/5
- check the integrity of all seals and ensure that any MBV is sealed in the closed position
- ensure that all appropriate notices and labels are correctly sited and that the necessary details have been entered (see IGEM/GM/8 Part 5).

20.3 Any commissioning strainer installed upstream of the meter shall be removed. Appropriate procedures shall be followed while undertaking this work.

Note: This will, typically, require the removal of a spool piece. Thus, there will be a need to isolate the appropriate section of pipe, purge the isolated section to air/inert gas, remove the spool and filter, replace the spool, purge back to gas and undertake an appropriate tightness test.

20.4 With the meter and instrumentation operating, equipment and instruments should be carefully observed for signs of faulty operation such as unexplained noise, overheating and effects of vibration. Any defects should be reported to the MAM.

APPENDIX 1 : GLOSSARY, ACRONYMS, ABBREVIATIONS, SUBSCRIPTS, UNITS AND SYMBOLS

A1.1 GLOSSARY

All definitions are given in IGEM/G/4 which is freely available by downloading a printable version from IGEM's website www.igem.org.uk.

Standard and legacy gas metering terms are given in IGEM/G/1 which is freely available by downloading a printable version from IGEM's website www.igem.org.uk

A1.2 ACRONYMS AND ABBREVIATIONS

ACoP	Approved Code of Practice
ACS	Nationally Accredited Certification Scheme for Individual Gas Fitting Operatives.
AMI	approved meter installer
CAD	Chemical Agents Directive
CDM	Construction (Design and Management) Regulations
CIPS	close internal potential survey
CoP	Code of Practice
COSHH	Control of Substances Hazardous to Health Regulations
CP	cathodic protection
DMIP	design maximum incidental pressure
DmP	design minimum pressure
DP	design pressure
DSEAR	Dangerous Substances and Explosive Atmospheres Regulations
ECV	emergency control valve
EPA	Environmental Protection Act
GB	Great Britain
GIUSP	Gas industry unsafe situations procedures
GS(I&U)R	Gas Safety (Installation and Use) Regulations
GS(M)R	Gas Safety (Management) Regulations)
GT	gas transporter
HRC	high rupturing capacity
HSE	Health and Safety Executive
HSWA	Health and Safety at Work, etc. Act
IGEM	Institution of Gas Engineers and Managers
LDF	leak detection fluid
LOLER	Lifting Operations and Lifting Equipment Regulations
LOP	lowest operating pressure
LPG	liquid petroleum gas
MAM	Meter Asset Manager
CoMCoP	Consolidated metering Code of Practice for meter equipment asset managers and meter installers
MBV	meter by-pass valve
MHSWR	Management of Health and Safety at Work Regulations
MID	Measurement Instruments Directive
MIIV	meter installation inlet valve
MIP	maximum incidental pressure
MIV	meter inlet valve
MOP	maximum operating pressure
MOV	meter outlet valve
MPRN	meter point reference number
NDE	non-destructive examination
NDT	non-destructive testing
NG	natural gas
NRV	non-return valve

Ofgem	Office of Gas and Electrical Markets
OP	operating pressure
PER	Pressure Equipment Regulations
P_m	metering pressure
PPE	personal protective equipment
PRI	pressure regulating installation
PSR	Pipelines Safety Regulations
PSSR	Pressure Systems Safety Regulations
PUWER	Provision and Use of Work Equipment Regulations
PTFE	polytetrafluroethylene
Q	flow rate
RD	rotary displacement
REC	Retail Energy Code
RF	raised face
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
SP	set point
SIIV	stream inlet isolation valve
SSV	slam-shut valve
STP	strength test pressure
TOP	temporary operating pressure
TTP	tightness test pressure
UIP	Utility Infrastructure Provider
UK	United Kingdom
UKAS	United Kingdom Accreditation Service
USM	ultrasonic meter.

A1.3 SUBSCRIPTS

c — refers to the consumer's system downstream of the meter installation, for example MIP_c is the MIP that the consumer's system may put back onto the meter installation and DmP_c is the minimum pressure at which the consumer's system can operate while maintaining adequate pressure at appliances.

imax — installation maximum

m — meter

max — maximum

mi — refers to the downstream side of the meter installation, and is a function of the design of the meter installation, for example MIP_{mi} is the MIP to which the consumer's system will be subjected by the meter installation i.e. resulting from the operation of a SSV, and DmP_{mi} is the minimum pressure that the meter installation will provide under extreme conditions i.e. operating with the supply pressure at DmP_u and maximum load.

u — refers to the upstream Network, for example MIP_u is the MIP that the Network may apply to the meter installation as a result of a fault on the upstream district pressure regulating station and DmP_u is the minimum pressure that may occur at the end of any service (pipe) at the time of system design flow rate under extreme gas supply and maintenance conditions.

A1.4 UNITS AND SYMBOLS

$ft^3\ hr^{-1}$	cubic feet per hour
m	metre
m^3	cubic metre
mbar	millibar
mbar s^{-1}	millibar per second
mm	millimetre
$m^3\ h^{-1}$	cubic metre per hour
s	second
>	greater than
≤	less than or equal to
<	less than
^oC	degree Celsius.

APPENDIX 2 : REFERENCES

This Standard is set out against a background of legislation in force in GB at the time of publication. Similar considerations are likely to apply in other countries and reference to the appropriate national legislation will be necessary. The following list is not exhaustive.

Where British Standards, etc. are quoted, equivalent national or international standards, etc. equally may be appropriate.

Care is to be taken to ensure that the latest editions of the relevant documents are used.

A2.1 LEGISLATION

This sub-appendix lists legislation referred to in this Standard as well as legislation not referenced but which may be applicable.

- Control of Pollution Act 1974, as amended
- Environment Act 1995
- Environment Act 2021
- Environmental Protection Act 1990
- Gas Act 1986 (as amended by the Gas Act 1995 and incorporating stand-alone provisions of the Utilities Act 2000)
- Health and Safety at Work etc. Act 1974
- Noise and Statutory Nuisance Act 1993
- Town and Country Planning Act 1990
- Transport Act 2000
- Building Regulations 2010 as amended 2016
- Building Regulations 2010 (Wales) as amended 2016
- Building Standards (Scotland) (Amendment) Regulations 2001
- Building Regulations (Amendment) Act (Northern Ireland) 2009
- Confined Spaces Regulations 1997
- Construction (Head Protection) Regulations 1989
- Construction (Design and Management) Regulations 2015
- Construction (Health, Safety and Welfare) Regulations 1996
- Control of Asbestos at Work Regulations 2002
- Control of Substances Hazardous to Health (Amendment) Regulations 2004
- Dangerous Substances and Explosive Atmospheres Regulations 2002
- Electricity at Work Regulations 1989 and Memorandum of Guidance 1989
- Gas (Calculation of Thermal Energy) Regulations, 1996 as amended
- Gas Meter Regulations, 1983
- Gas Safety (Installation and Use) Regulations 1984; 1994, as amended; 1998, as amended
- Gas Safety (Management) Regulations 1996 as amended
- Health and Safety at Work etc. Act 1974, as amended
- Lifting Operations and Lifting Equipment Regulations 1998
- Management of Health and Safety at Work Regulations 1992, as amended
- Manual Handling Operations Regulations 1992
- Manual Handling Regulations 1995
- Measuring Instruments (EEC Requirements)(Gas Volume Meters) (Amendment) Regulations 1979, as amended

- Noise at Work Regulations 1989
- Personal Protective Equipment at Work Regulations 1992, as amended
- Pipelines Safety Regulations 1996, as amended
- Pressure Equipment (Amendment) Regulations 2002, as amended
- Pressure Equipment (Safety) Regulations 2016
- Pressure Systems Safety Regulations 2000
- Provision and Use of Work Equipment Regulations 1992; 1998
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013
- The Measuring Instruments (Gas Meters) Regulations 2006
- Workplace (Health, Safety and Welfare) Regulations 1992.

A2.2 **HSE ACOPs and GUIDANCE**

- EH40 Occupational exposure limits. Guidance
- HSG47 Avoiding danger from underground services. Guidance
- HSG48 Reducing error and influencing behaviour Guidance
- HSG65 Managing for Health and Safety
- HSG224 Managing Health and Safety in Construction. Construction (Design and Management) Regulations. ACoP and Guidance
- HSG227 A comprehensive guide to managing asbestos in premises
- HSG250 Guidance on permit-to-work systems: A guide for the petroleum, chemical and allied industries
- HSG253 Safe isolation of plant
- L21 Management of Health and Safety at Work. ACoP and Guidance
- L22 Safe Use of Work Equipment. ACoP and Guidance
- L27 Managing and working with asbestos. ACoP and Guidance
- L56 Safety in the Installation and Use of Gas Systems and Appliances. ACoP and Guidance
- L73 Reporting of Injuries, Diseases and Dangerous Occurrences Regulations. Guidance
- L80 Gas Safety (Management) Regulations. 1996 (as amended). Guidance
- L101 Safe work in confined spaces
- L113 Safe Use of Lifting Equipment. ACoP and Guidance
- L122 Pressure Systems Safety Regulations. Guidance
- L138 Design of plant, equipment and workplaces; Dangerous Substances and Explosive Atmospheres Regulations 2002. ACoP and Guidance
- L153 Construction (Design and management) Regulations 2015 ACoP
- HSR25 Electricity at Work Regulations. Guidance
- INDG 178 Written Schemes of Examination
- INDG 229 Using Work Equipment Safely
- INDG 261 Pressure Systems – a brief guide to safety
- INDG 291 Simple guide to the Provision and Use of Work Equipment Regulations

- INDG 370 Controlling fire and explosion risks in the workplace A brief guide to the Dangerous Substances and Explosive Atmospheres Regulations 2002
- INDG 453 Reporting accidents and incidents at work.

A2.3 **INSTITUTION OF GAS ENGINEERS AND MANAGERS**

- IGEM/GL/8 Edition 4 Reporting and investigation of gas related incidents
- IGEM/GM/4 Edition 3 Flowmetering practices. Inlet pressures exceeding 38 bar and not exceeding 100 bar
- IGEM/GM/5 Edition 4 Selection, installation and use of electronic gas meter volume conversion systems
- IGEM/GM/6 Edition 3 Standard non-domestic meter installations. Flow rate exceeding 6 $m^3 h^{-1}$ and inlet pressure not exceeding 100 mbar
- IGEM/GM/7A Edition 2 Electrical connections for gas metering equipment
- IGEM/GM/7B Edition 2 Hazardous area classification for gas metering equipment
- IGEM/GM/8 Part 1 Edition 3 Non domestic meter installations. Flow rate exceeding 6 $m^3 h^{-1}$ and inlet pressure not exceeding 38 bar. Design
- IGEM/GM/8 Part 2 Edition 3 Non domestic meter installations. Flow rate exceeding 6 $m^3 h^{-1}$ and inlet pressure not exceeding 38 bar. Location and housing
- IGEM/GM/8 Part 4 Edition 3 Non domestic meter installations. Flow rate exceeding 6 $m^3 h^{-1}$ and inlet pressure not exceeding 38 bar. Operation and maintenance
- IGEM/GM/8 Part 5 Edition 3 Non domestic meter installations. Flow rate exceeding 6$m^3 h^{-1}$ and inlet pressure not exceeding 38 bar. Notices and labels
- IGEM/TD/1 Edition 6 Steel pipelines for high pressure gas transmission
- IGEM/TD/1 Edition 6 Supplement 1 Handling, transport and storage of steel pipe, bends etc.
- IGEM/TD/3 Edition 5 PE and steel pipelines for gas distribution
- IGEM/TD/4 Edition 5 Gas services
- IGEM/TD/13 Edition 3 Pressure regulating installations for transmission and distribution systems
- IGE/UP/1 Edition 2 RWA Strength and tightness testing and purging of industrial and commercial gas installations
- IGE/UP/1A Edition 2 RWA Strength and tightness testing and purging of small, low pressure industrial and commercial Natural Gas installations
- IGEM/UP/1B Edition 3 Tightness testing and direct purging of small Natural Gas installations
- IGEM/UP/1C Strength testing, tightness testing and direct purging of industrial and commercial meter installations
- IGEM/SR/18 Edition 3 Safe working practices to ensure the integrity of gas pipelines and associated installations

- IGE/SR/23 Venting of Natural Gas
- IGEM/SR/25 Edition 2 Hazardous area classification of Natural Gas installations
- IGEM/G/1 Edition 2 Defining the end of the network, a meter installation and installation pipework
- IGEM/G/5 Edition 3 Gas in flats and other multi-dwelling buildings
- IGEM/G/11 Edition 2 Gas Industry Unsafe Situations Procedure
- IGEM/GL/5 Edition 3 Procedures for managing new works, modifications and repairs

A2.4 **BRITISH STANDARDS (abbreviated titles)**

- BS 21 Pipe threads for tubes and fittings - Withdrawn
- BS 143 & 1256 Threaded pipe fittings
- BS 746 Fittings for low pressure gas meters
- BS 1186-1/2 Timber joinery
- BS 1377 Testing soils
- BS 2633 Class I arc welding of ferritic steel pipework
- BS 2971 Class II arc welding of carbon, steel pipework
- BS 3799 Steel pipe fittings, screwed and socket welding
- BS 4515 Welding of steel pipelines
- BS 5200 Hydraulic connections
- BS 5292 Jointing materials and compounds Withdrawn
- BS 5930 Site investigations
- BS 6031 Earthworks
- BS 6400-1 Domestic-sized meter installations – low pressure Natural Gas
- BS 6400-2 Domestic-sized meter installations – medium pressure Natural Gas
- BS 6956 Jointing compounds
- BS 7361 Cathodic protection
- BS 7671 IET Wiring Regulations
- BS 8000 Workmanship on building sites
- BS EN 437 Test gases
- BS EN 751-3 Sealing materials for metallic threaded joints
- BS EN 1011 Welding of metallic materials
- BS EN 1127 Explosion prevention
- BS EN 1435 Non-destructive (radiographic) examination of welds
- BS EN 10208 Steel pipes for pipelines Withdrawn
- BS EN 10226-1 Pipe threads
- BS EN 10241 Steel threaded pipe fittings
- BS EN 10266-2 Pipe threads
- BS EN 10241 Steel threaded pipe fittings
- BS EN 13636 Cathodic protection of buried metallic tanks and related piping
- BS EN 60079 Electrical apparatus for explosive gas atmospheres

- BS EN ISO 9001 Quality systems
- PD 5500 Unfired fusion welded pressure vessels.

A2.5 **RETAIL ENERGY CODE COMPANY**

- CoMCoP Consolidated metering Code of Practice for meter asset managers and meter installers.

A2.6 **MISCELLANEOUS (abbreviated titles)**

- API 5L Linepipe
- GDN/PM/GT2 Management Procedure for Requesting a Gas Transporter to:
  - authorise the setting and sealing of regulators
  - authorise the installation of a meter by-pass
  - approve a meter housing design.

APPENDIX 3 : REGULATED NETWORK STANDARD OPERATING CONDITIONS

PRESSURE TIER	PRESSURES AT THE OUTLET OF THE ECV				
	DESIGN MINIMUM PRESSURE (DmP)	LOWEST OPERATING PRESSURE (LOP)	MAXIMUM OPERATING PRESSURE (MOP)	DESIGN PRESSURE (DP)	DESIGN MAXIMUM INCIDENTAL PRESSURE (DMIP)
Low	19 mbar	25 mbar See Note 1	75 mbar	75 mbar	200 mbar
Medium[35]	35 mbar	35 mbar	185 mbar	2.0 bar	2.7 bar
Medium[65]	65 mbar	75 mbar	250 mbar	2.0 bar	2.7 bar
Medium[105]	105 mbar	105 mbar	1.1 bar	2.0 bar	2.7 bar
Medium[180]	180 mbar	180 mbar	1.6 bar	2.0 bar	2.7 bar
Medium[270]	270 mbar	280 mbar	2.0 bar	2.0 bar	2.7 bar
Intermediate	See Note 2	See Note 2	See Note 2	7.0 bar	9.31 bar
High	See Note 2	See Note 2	See Note 2	See Note 2	MOP + 10%

Note 1: Operating pressures of 21.5 mbar may occur, during normal operation, at the outlet of the ECV on parts of low pressure networks. However, experience has shown that low pressure meter installations will provide a satisfactory outlet pressure when designed for an inlet pressure of 25 mbar and a maximum pressure absorption of 4 mbar determined at an inlet design minimum pressure of 19 mbar. Both BS 6400-1 and -2 and IGEM/GM/6 use these design criteria and, therefore, 25 mbar is used in this table for consistency with these metering standards.

Note 2: On intermediate and high pressure Networks, the applicant has to confirm with the GT the operational pressures at the outlet of the particular service (pipe) ECV.

APPENDIX 4 : SEALING PROCEDURES

A4.1 If a meter has a maximum flow rate not exceeding 1600 $m^3 h^{-1}$ std at 15°C and 1013.25 mbar, it can only be installed and used if it has been type approved and stamped (that is, sealed in accordance with Section 17 of the Gas Act 1995 as amended or European Council Directive 71/318).

A4.2 The sealing of meter installation components by accredited organisations (~~O~~AMIs, etc.), performing works at, or on, a meter installation is indicative of good industry practice and ensures that:

- accredited organisation obligations are adhered to
- customer or third party tampering is discouraged
- customer or third party tampering is visible.

A4.3 It is a requirement of the AMI ComCoP that approved meter installers shall ensure that the meter to be installed has been sealed to indicate that it is approved and stamped either under the Gas Act or under equivalent EU regulations as mentioned above.

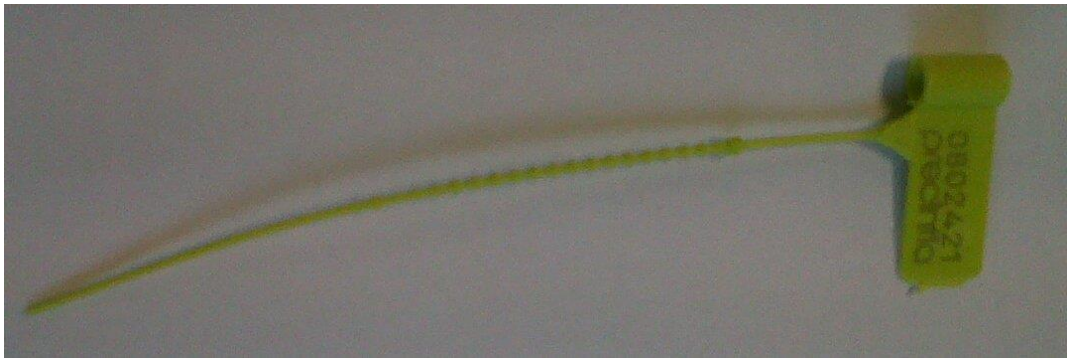
A4.4 The AMI, when commissioning a meter, has to set the meter regulator outlet pressure to the pressure agreed between the GT, shipper, supplier and gas user. Wherever possible, it is better to install meter regulators that are factory preset to the correct pressure.

A4.5 The seal has to be of such construction that it is irreparable and readily identifiable, and may be applicable to the following components:

- MBVs
- meter regulators and any associated pressure protection device(s)
- branch connections
- volume conversion systems
- non stamped meters.

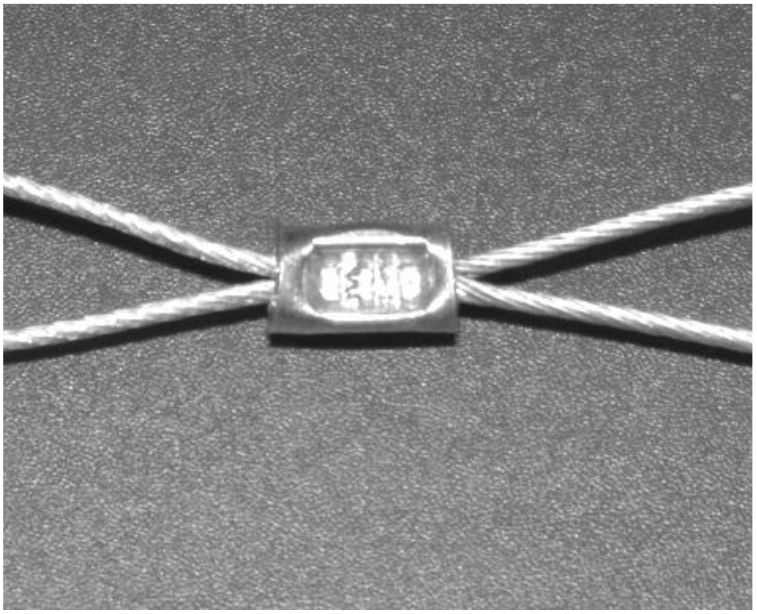
A4.6 Seals that are considered suitable for use within the gas industry include:

- "Gas" click together with serrated wire (see Figure 7)
- metal ferrule seals used with smooth wire and secured with a crimping tool (see Figure 8)
- pull through nylon cable tie type seals with identity number (see Figure 11)
- wire and locking drum type
- self adhesive tamper evident seal.



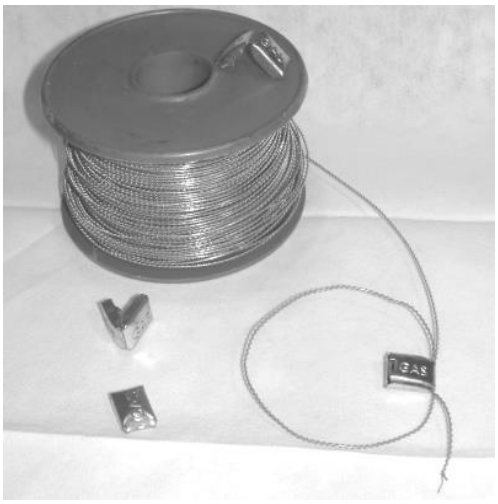
Note: Does not require the use of any special tools. The tail of the tie is not to be cut off as this acts as a security indicator confirming that the seal has not been re-made. Can be marked with the user's identification and, when so marked, can be used to seal meter regulators and safety equipment.

FIGURE 7 – TYPICAL NYLON SELF-LOCKING SEAL



Note: Requires the use of a special crimping tool which stamps onto the seal identification characters and number. Can be marked with the user's identification and when so marked can be used to seal meter regulators and safety equipment. Where sealed by AMI, the AMI No. needs to be included.

FIGURE 8 – SEALING FERRULE, SMOOTH WIRE AND CRIMPING TOOL



Note: Does not require the use of any special tools but does require the use of serrated wire. Not suitable for sealing meter regulators and safety equipment, as it does not carry the user's identification.

FIGURE 9 – CLICK TOGETHER SEAL AND SERRATED WIRE

FIGURE 10 – SELF ADHESIVE TAMPER EVIDENT SEAL

FIGURE 11 – OTHER SEALING EXAMPLES

Note: Example of a valve spindle cover, being fitted to a gate valve to facilitate sealing a meter by-pass with a wire and ferule seal.

FIGURE 12 – SPINDLE COVER

APPENDIX 5 : EMERGENCY GUIDELINES

GENERAL RULES

The following are the general rules that need to be followed when any person attending a premises discovers a gas escape or dangerous situation, and cannot immediately resolve the problem:

- extinguish all sources of ignition (e.g. no smoking, no naked flames, or use of mobile phones in the vicinity of the leak etc.)
- do not operate any electrical switches or appliances
- if the gas escape is suspected to be within the building, open doors and windows to ventilate the building
- advise all personnel in the affected area of the gas escape and advise them of all of the actions above
- evacuate where:
  - occupant safety is at risk, or
  - persons are overcome by gas vapours or products of combustion.
- make every effort to inform the responsible person e.g. the site manager, site supervisor or appropriate person in authority, of the gas escape or dangerous situation
- advise the responsible person:
  - of the severity of the leak
  - the risks that it presents, and
  - recommend that they turn off the supply at the meter.
- the responsible person may need to decide whether to turn off the gas supply, however, if in the absence of a person in authority and if in your judgment, an IMMEDIATE danger exists you are to turn off the supply of gas

  Note 1: Consideration needs to be given to the process and the risk that may result in isolating the supply, in the circumstances where no responsible person is available. Further guidance can be found in the GIUSP IGEM/G/11.

  Note 2: Where the ECV is sited in a basement, the advice given by the National Gas Emergency Service is not to enter the basement, due to the potential risk of asphyxiation.

- reiterate the advice given in the first three bullets above
- report the gas emergency immediately and personally on 0800 111 999, informing the user this has been done.

  Note 1: When reporting the gas escape or dangerous situation and its location within the premise, give full details of the nature of the escape or dangerous situation and its location within the premise; including the name and contact information for the responsible person.

  Note 2: In the event of a suspected or actual theft of gas, where it is safe to do so the emergency service/gas supplier needs to be notified at the time that the escape is called in.

APPENDIX 6 : EXAMPLES ILLUSTRATING HOW TO DETERMINE THE SET POINTS FOR THE PRESSURE CONTROL AND SAFETY SYSTEM

The following examples illustrate the process of establishing the set points for the pressure control and safety system within a meter installation.

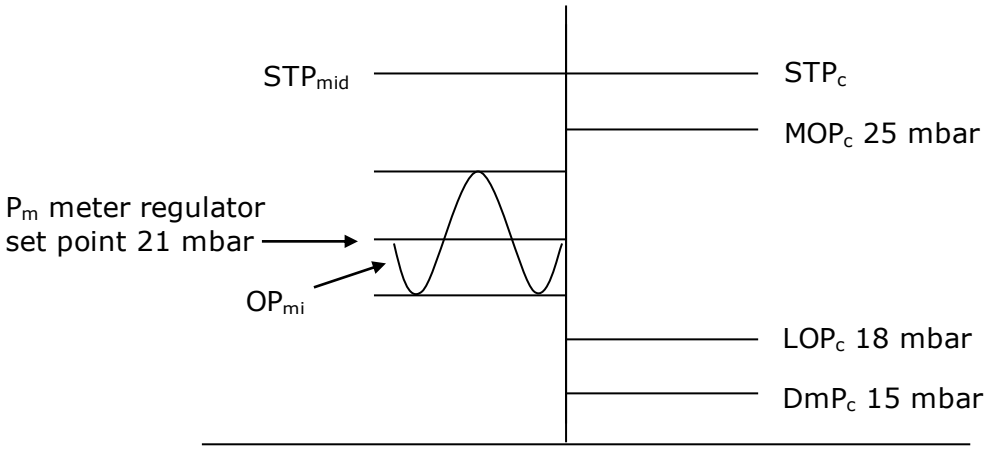
A6.1 EXAMPLE 1

A non-domestic meter installation, Q_{imax} = 65 $m^3 h^{-1}$ and MOP_u not exceeding 75 mbar. The metering pressure P_m has been agreed to be 21 mbar.

As the installation is supplied by a low pressure network (MOP not exceeding 75 mbar) the pressure control system will consist simply of a meter regulator which may be factory preset.

Summary of set points for Example 1

Active set point (P_m) = 21 mbar



A6.2 EXAMPLE 2

A non-domestic meter installation;
Q_{imax} = 160 $m^3 h^{-1}$ and 75 mbar < $MOP_u \leq$ 2 bar.

The gas consumer has not provided any information concerning the downstream system, but P_m has been agreed to be 21 mbar. As such, the designer and the engineer setting the regulators have to assume that the consumer will be using "standard appliances" and the following pressures will apply to the downstream system.

STP_c = 50 mbar
MOP_c = 25 mbar
LOP_c = 18 mbar
DmP_c = 15 mbar

As the installation is fed from a medium pressure network
(75 mbar < $MOP_u \leq$ 2 bar), the pressure control system will consist of an active regulator, SSV and creep relief.

The SSV has to be set to a value low enough that it will always maintain MIP_{mi} below STP_c. The Accuracy Group of the SSV will have to be established. Normally, this will be stamped on the device. For this application, IGEM/GM/8 Part 1 indicates a preferred Accuracy Group of 5%. This means that the SSV will shut off limiting the pressure to within $\pm$5% of the set point.

i.e. maximum SSV set point = STP_c – 5% (STP_c) or
= MIP_{mi} – 5% (MIP_{mi})
= 50 mbar – 2.5 mbar = 47.5 mbar.

Therefore, the SSV should be adjusted to shut at a maximum of 47.5 mbar (see Table 1). To avoid nuisance firing of the SSV and/or venting of the creep relief, the regulator relief and SSV set points need to be set as far apart as is permissible. As such, it is normally beneficial to set the SSV as high as possible.

To avoid nuisance venting of the creep relief, it has to be set above the regulator lock up pressure which, for P_m = 21 mbar, could be as high as 29 mbar.

Lock up pressure = P_m + accuracy tolerance + lock up allowance + setting tolerance

Lock up pressure = P_m + 10%P_m + (5 mbar or 5%P_m, whichever is greater) + 1 mbar

Note: Round up to the nearest mbar.

(See IGEM/GM/8 Part 1 clause 9.3.2 and Sub-Section 9.4, and Part 3 Table 1).

However, the creep relief has to be set low enough to avoid nuisance firing of the SSV, i.e. lower than the SSV set point less Accuracy Group tolerance. Therefore, if the SSV is set to 47.5 mbar, the creep relief has to be fully open at a pressure lower than:

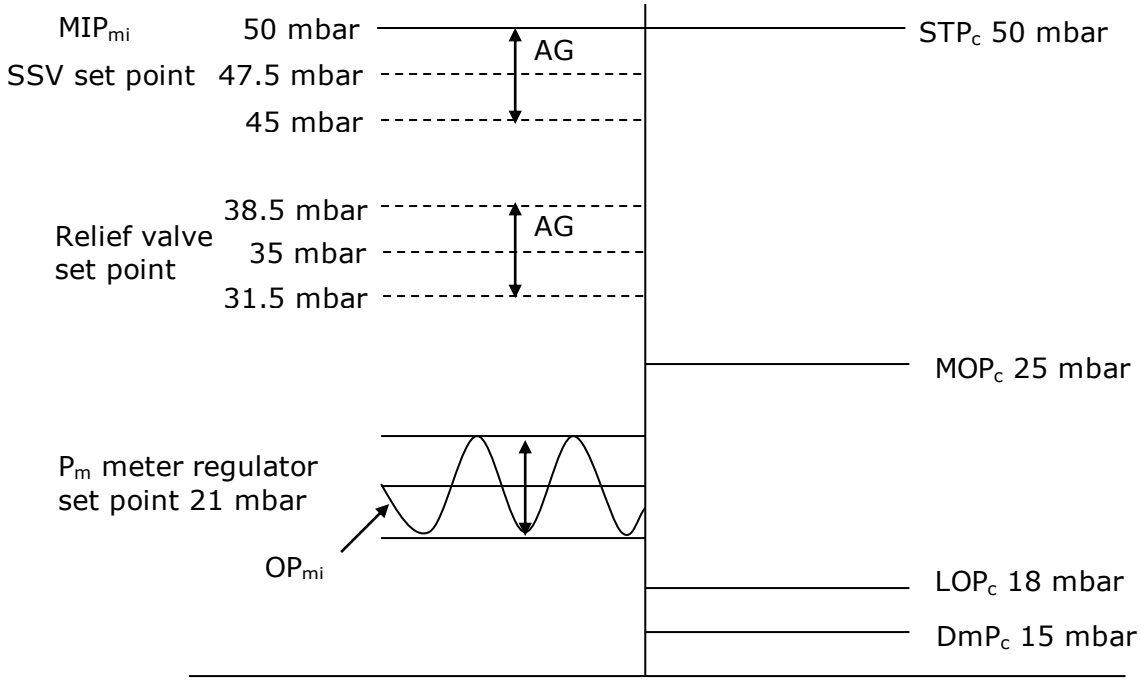
47.5 mbar – 5% of SSV set point = 45 mbar.

Therefore, the creep relief has to be set at a pressure between 29 mbar and 45 mbar, and such that, allowing for the tolerance on its operation (typically 10% of set point for low pressures – usually stamped on the device) it will not cause either nuisance venting from the creep relief or firing of the SSV. For example, it may be set at 35 mbar (see Table 1).

The active meter regulator set point is 21 mbar (P_m).

Summary of set points for Example 2

	Control/activation range	Lock up
Active set point (P_m) = 21 mbar	19 – 24 mbar	29 mbar
Creep relief set point = 35 mbar	31.5 – 38.5 mbar	
SSV set point = 47.5 mbar	45 – 50 mbar	



A6.3 **EXAMPLE 3**

A new non-domestic meter installation;
Q_{imax} = 1076 $m^3 h^{-1}$, 75 mbar < MOP ≤ 2 bar. The gas consumer has advised the following pressures apply to the downstream system, which feeds a mixture of boilers and plant but also supplies a small compressor:

STP_c = 4 bar
MIP_c = 3.5 bar
MOP_c = 25 mbar
P_m = 21 mbar
LOP_c = 18 mbar
DmP_c = 15 mbar

As the installation is fed from a medium pressure Network
(75 mbar < MOP ≤ 2 bar) the pressure control system will consist of an active regulator, SSV and a creep relief.

The SSV has to be set to a value low enough that it will always maintain MIP_{mi} below STP_c. The Accuracy Group of the SSV will have to be established – usually stamped on the device. For this application, IGEM/GM/8 Part 1 indicates a preferred Accuracy Group of 5%. This means that the SSV will shut off limiting the pressure to within ±5% of the set point.

i.e. maximum SSV set point = STP_c – 5%(STP_c) or MIP_{mi} – 5%(MIP_{mi})

= 4 bar – 200 mbar = 3.8 bar.

To avoid nuisance SSV firing and/or venting of the creep relief, it is normally beneficial to set the SSV as high as permissible. However, to do so in this case with such a large difference between STP_c and P_m would result in an excessively high SSV setting, and could cause other problems within the meter installation (for example ruptured regulator diaphragms).

To avoid nuisance venting of the creep relief, it has to be set above the regulator lock up pressure which, for P_m = 21 mbar, would not be expected to exceed 29 mbar.

However, the creep relief has to be set low enough to avoid nuisance firing of the SSV, i.e. lower than the SSV set point less Accuracy Group tolerance. If the SSV was set to 3.8 bar, the creep relief has to vent at a pressure lower than:

3.8 bar – 5% of SSV setting = 3.6 bar.

If the creep relief is set at 35 mbar as in Sub-Section 18.2, the tolerance on its operation (typically 10% of set point for low pressures) would result in a range of operation from 31.5 mbar to 38.5 mbar, illustrating that the possible SSV setting of 3.8 bar is excessive.

Therefore, a reasonable compromise has to be struck between providing a good separation between the device set points and having the SSV set excessively high.

In this case, setting the SSV at 70 mbar would be reasonable. This would result in an operating tolerance for the SSV from 66.5 – 73.5 mbar.

MIP_{mi} = SSV set point +5% SSV set point

MIP_{mi} = 70 + 3.5 mbar = 73.5 mbar.

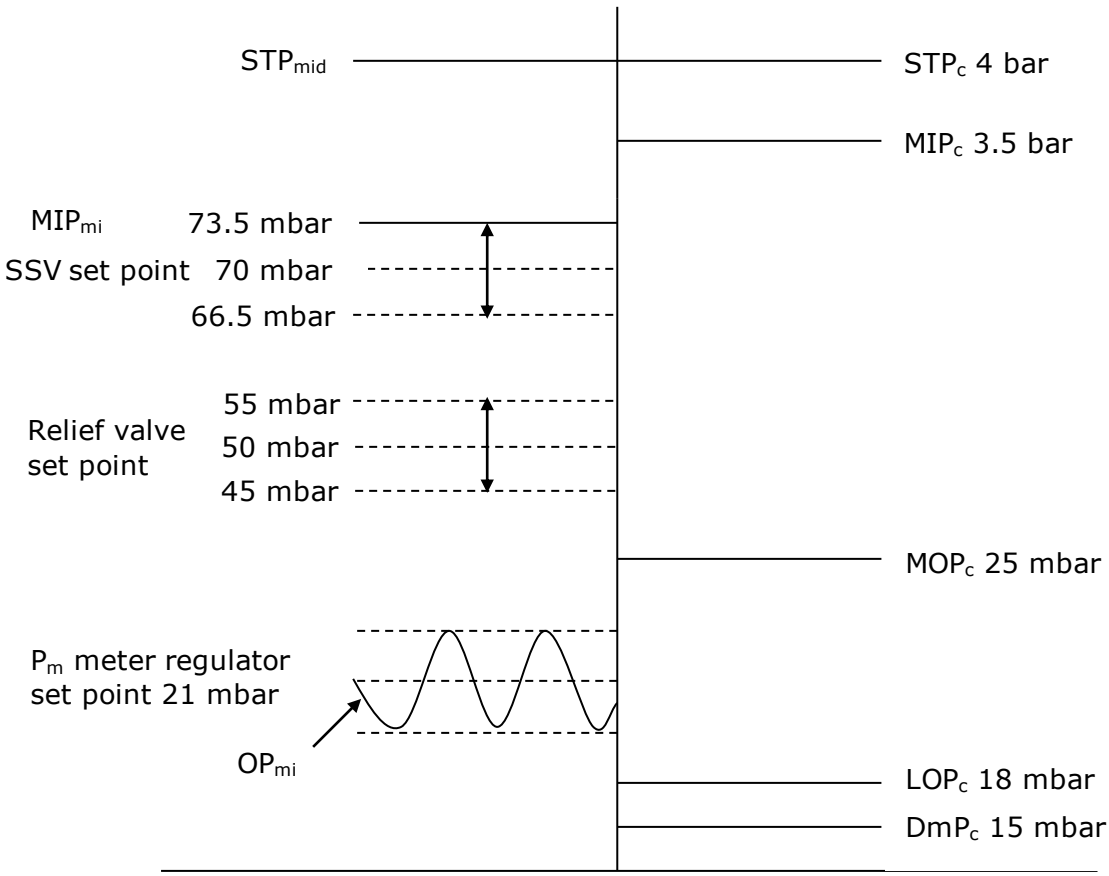
With the SSV set at 70 mbar, the creep relief would have to be set at a pressure between 29 mbar and 66.5 mbar, such that, allowing for the tolerance on its operation (typically 10% of set point for low pressures) it will not cause either nuisance venting from the creep relief or firing of the SSV. For example, 50 mbar.

The active meter regulator set point is 21 mbar (P_m).

Summary of set points for Example 3

	Control/activation range	Lock up
Active set point (P_m) = 21 mbar	19 – 24 mbar	29 mbar
Creep relief set point = 50 mbar	45 – 55 mbar	
SSV set point = 70 mbar	66.5 – 73.5 mbar	

In this example, the very large difference between STP_c and the P_m results in a wide range of acceptable settings for the creep relief and SSV. Notwithstanding other considerations that have to be taken into account, for example strength of regulator diaphragms.



APPENDIX 7 : EXAMPLES ILLUSTRATING A METHOD OF SETTING THE PRESSURE CONTROL AND SAFETY SYSTEM

There are many acceptable ways of complying with the requirements of Section 18 for setting the pressure control and safety system. The following examples illustrate one acceptable method.

A7.1 EXAMPLE 1

A non-domestic meter installation, Q_{imax} = 65 $m^3 h^{-1}$ and MOP_u not exceeding 75 mbar. The metering pressure P_m has been agreed to be 21 mbar.

No further information has been provided concerning the downstream system. As such, the designer and the engineer setting the regulators have to assume that the consumer will be using "standard appliances".

As the installation is supplied by a low pressure network (MOP_u not exceeding 75 mbar) the pressure control system will simply consist of a meter regulator, which may be factory preset.

Factory preset

If the regulator has a manufacturer's seal on it, it should have been factory preset. Undertake a functional check to verify the setting. Establish a means of providing a flow rate in excess of 10% Q_{imax} and measure the pressure at the meter inlet. For 21 mbar, the metering pressure should be between 19 mbar and 24 mbar (see Table 1).

If the meter inlet pressure is found to be outside this tolerance, adjust the regulator (in accordance with the manufacturer's instructions) to bring it within the allowable band.

Note: At high flows and low inlet pressures, a correctly set regulator will generally tend towards the lower end of the tolerance band, whereas, at low flows and high inlet pressures the pressure at the meter inlet will tend towards the high end of the tolerance band.

Set in the field

If the regulator does not have a manufacturer's seal, it is most likely not preset and will need to be adjusted to the desired set point.

Note: At high flows and low inlet pressures, a correctly set regulator will generally tend towards the lower end of the tolerance band, whereas, at low flows and high inlet pressures the pressure at the meter inlet will tend towards the high end of the tolerance band.

A7.2 EXAMPLE 2

A non-domestic meter installation;
Q_{imax} = 160 $m^3 h^{-1}$ and 75 mbar < $MOP_u \leq$ 2 bar.

The installation is fed from a medium pressure Network
(75 mbar < MOP ≤ 2 bar), the pressure control system will consist of an active regulator, SSV and a creep relief.

The set points have to be determined from the information available (see Appendix 6 and clause 18.2).

With the regulator stream isolation valves closed, provide a means to admit pressure to the regulator downstream diffuser. This may be either by utilising an air pump, nitrogen source, or (once purged) by fitting a temporary rider (incorporating a means of controlling pressure and flow) from a tapping on the

installation inlet to the diffuser. Connect a means of monitoring the pressure in the regulator downstream diffuser.

Gradually increase the pressure in the downstream diffuser. Note the pressure at which the creep relief vents and make any necessary adjustment. If necessary, the pressure may be lowered using one of the vent points. Repeat the process a number of times to provide confidence that the creep relief is reliably venting at the desired set pressure.

Block the outlet of the creep relief, for example with an appropriate plug. The pressure in the downstream diffuser can now be increased and the pressure at which the SSV fires noted. Lower the pressure and make any necessary adjustment. Repeat the process a number of times to provide confidence that the SSV is firing at the desired set pressure.

Unblock the creep relief and reconnect the vent pipe.

Back off the regulator to its minimum possible setting and, with the SIOV closed, open the SIIV very slowly while monitoring the pressure in the downstream diffuser.

Once the SIIV is fully opened, adjust the regulator to the approximate desired set pressure by using a vent point to establish a small flow.

Note: As the flow rate is small, it is recommended that the regulator be set at the high end of the allowable tolerance.

Gradually open the SIOV while monitoring the meter inlet pressure.

Note: It is extremely important that this process is undertaken slowly; otherwise, there is a risk of damage to the meter.

Once the consumer's system has been purged and a means of providing a higher flow of gas established, the regulator can be adjusted (in accordance with the manufacturer's instructions) to the desired set point.

Note: At high flows and low inlet pressures, a correctly set regulator will, generally, tend towards the lower end of the tolerance band. At low flows and high inlet pressures, the pressure at the meter inlet pressure will tend towards the high end of the tolerance band.

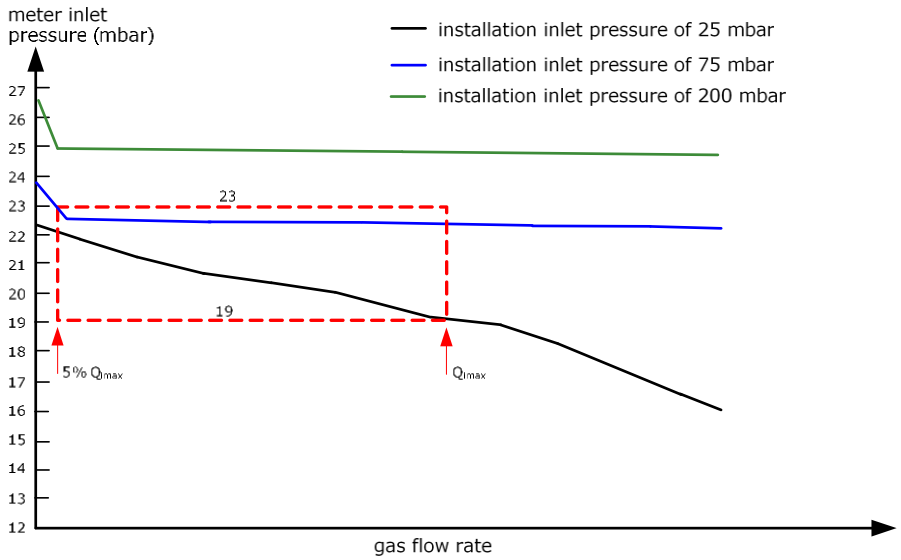


FIGURE 13 - METER INLET PRESSURE VERSUS FLOW RATE (ILLUSTRATIVE)

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