

***IGEM/UP/1B Edition 3
Communication 1759***

***Tightness testing and direct purging of
small Liquefied Petroleum Gas/Air, Natural
Gas and Liquefied Petroleum Gas
installations***



*Founded 1863
Royal Charter 1929
Patron: Her Majesty the Queen*



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SECTION 1 : INTRODUCTION

1.1 This Standard supersedes IGE/UP/1B Edition 2, Communication 1714, which is obsolete and BS 5482-1, which is partially superseded.

1.2 This Standard has been drafted by a Panel appointed by the Institution of Gas Engineers and Managers' (IGEM's) Gas Utilization Committee, subsequently approved by that Committee and published by the authority of the Council of the Institution.

1.3 IGE/UP/1 Edition 2 deals with all aspects of strength and tightness testing and direct purging of selected 1st, 2nd and 3rd family gases within its wide scope and at a maximum operating pressure (MOP) not exceeding 16 bar.

IGE/UP/1A Edition 2 deals with the special case of strength and tightness testing and direct purging of volumes not exceeding 1 m³ and operating pressure (OP) not exceeding 40 mbar and using Natural Gas (NG).

IGEM/UP/1B Edition 3 deals with all aspects of tightness testing and direct purging of small Liquefied Petroleum Gas/Air (LPG/Air), NG and Liquefied Petroleum Gas (LPG) installations with or without a meter of maximum badged capacity not exceeding 16 m³ h⁻¹ and supply MOP (MOP_u) not exceeding 2 bar.

Note: In the United Kingdom LPG/Air is typically 1st family gas, NG is 2nd family gas and LPG is a 3rd family gas. NG is lighter than air and LPG/Air and LPG are both heavier than air.

IGEM/UP/1B Edition 3 does cover installations on Caravan and Leisure Accommodation Vehicles (LAVs). For tightness testing of small LPG installations in boats, yachts, crafts and other vessels, PD 5482-3 or BS EN ISO 10239 apply, as appropriate. For volumes exceeding 0.035 m³, IGE/UP/1 Edition 2 applies.

IGEM/UP/1C deals with strength testing, tightness testing and direct purging of meter installations (as defined in IGE/G/1), containing either NG or LPG, of volume not exceeding 1 m³ and MOP not exceeding 7 bar.

Note: IGE/UP/1C is most useful for those NG or LPG meter installations that have a means of isolation on the outlet, are out of scope of IGE/UP/1B and where there is no desire to test the installation pipework downstream of the meter installation.

Figure 1 will assist in selecting the appropriate standard.

Note: For a new system of installation pipework, the onus is on the designer to establish both the maximum incidental pressure (MIP) and MOP. For an existing system of installation pipework, the onus is on the designer/owner of the installation to ensure that any increase in pressure within the installation will not result in OP exceeding MOP of the system and on the gas transporter/meter asset manager (GT/MAM) to ensure that any change in their pressure regimes due to fault conditions will not jeopardise the safety of the downstream installation. This involves effective communication between the GTs/MAMs and installation designers/owners.

1.4 This Standard makes use of the terms "must", "shall" and "should" when prescribing particular requirements. Notwithstanding Sub-Section 1.7:

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

Such terms may have different meanings when used in legislation, or Health and Safety Executive (HSE) Approved Codes of Practice (ACoPs) or guidance, and

reference needs to be made to such statutory legislation or official guidance for information on legal obligations.

1.5 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 professional responsibilities. Employers must:

- have done everything to ensure, so far as is reasonably practicable, that there are no better protective measures that can be taken other than relying on exercise of professional judgement by “responsible engineers”
- have done everything to ensure, so far as 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 beyond 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 that deviate from this, they should refer the matter for higher review.

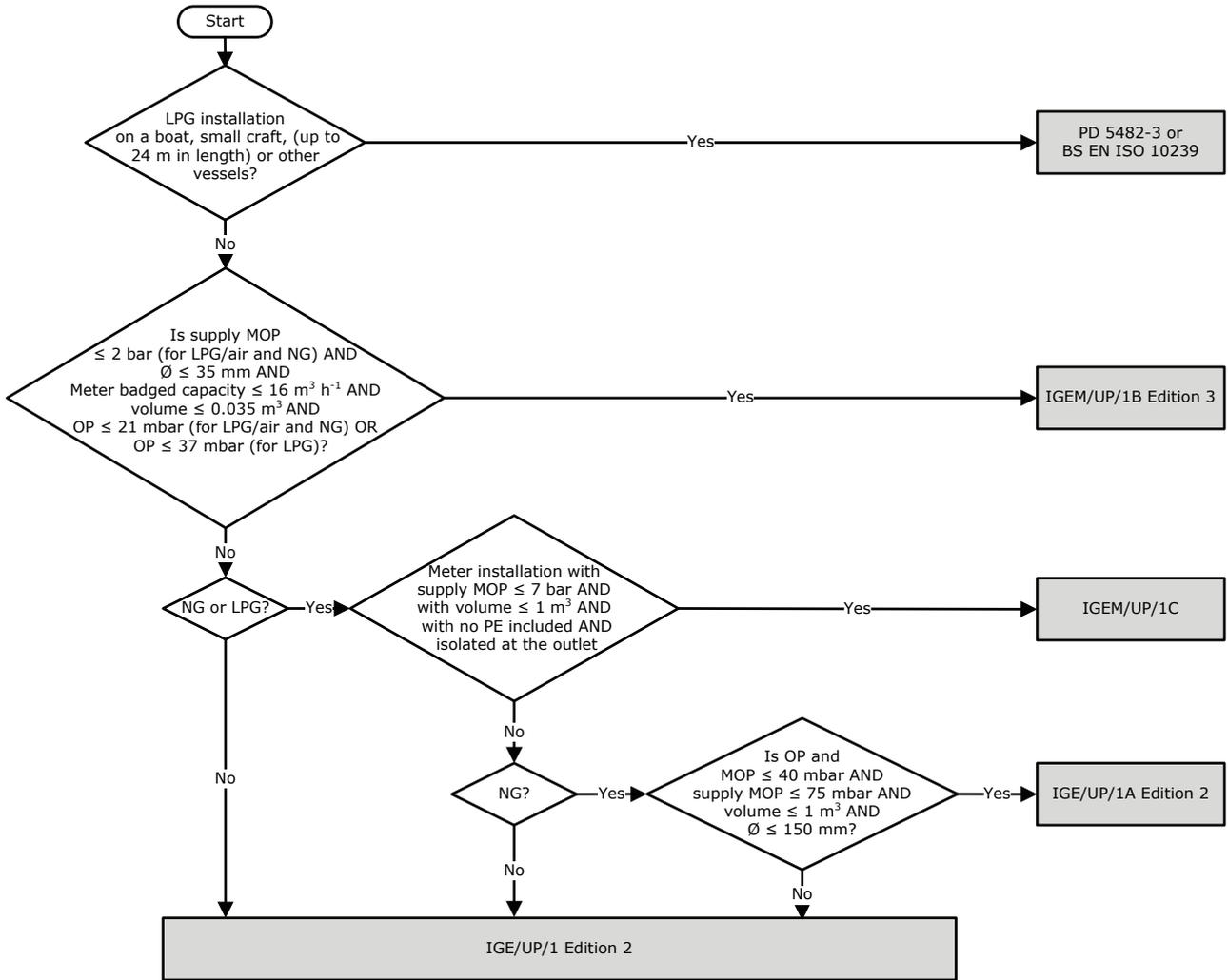
1.6 It is widely accepted that the majority of accidents at work generally are in some measure attributable to human as well as technical factors in the sense that actions by people initiated or contributed to the accidents, or people might have acted better to avert them.

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 cognisance be taken of HSG48 and HSG65.

1.7 Notwithstanding Sub-Section 1.4, this Standard does not attempt to make the use of any method or specification obligatory against the judgement of the responsible engineer. Where new and better techniques are developed and proved, they should 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 publications as appropriate.

1.8 Requests for interpretation of this Standard in relation to matters within their scope, but not precisely covered by the current text, should be addressed in writing to Technical Services, IGEN, IGEN House, High Street, Kegworth, Derbyshire, DE74 2DA 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 IGEN, this does not relieve the responsible engineer of any of his or her obligations.

1.9 This Standard was published in March 2012.

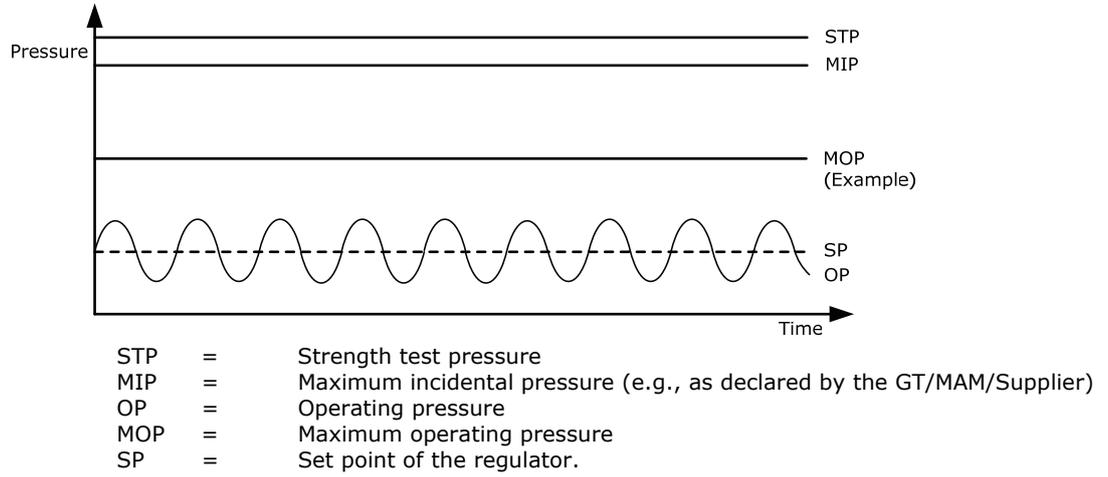


≤	less than or equal to	MOP	Maximum Operating Pressure	mbar	millibar
∅	nominal diameter	NG	Natural Gas	mm	millimetre
V	volume	OP	Operating pressure	m ³	cubic metre
		LPG	Liquefied petroleum gas		

Note 1: If it is preferred IGE/UP/1 Edition 2 can be used rather than IGE/UP/1A Edition 2, IGEM/UP/1B Edition 3 or IGEM/UP/1C or PD 5482-3 or BS EN ISO 10239. It is necessary to check the scope of referenced Standards before proceeding.

Note 2: Operating pressures listed are nominal for the installations and will vary around the regulator set point (see Figure 2).

FIGURE 1 - ALGORITHM TO SELECT TESTING AND PURGING STANDARDS



Note: This is extracted from IGEM/TD/13 and simplified for the purposes of IGEM/UP/1B.

FIGURE 2 - RELATIVE PRESSURE LEVELS

SECTION 2 : SCOPE

2.1 This Standard applies to LPG/Air, NG, and LPG installations as illustrated in Figure 3.

2.2 This Standard applies to any section of installation pipework, including meters, having the following:

- MOP at the outlet of the emergency control valve (ECV) not exceeding 2 bar for NG and LPG/Air and
- a nominal bore of not greater than 35 mm (DN32, R1¼) and
- a maximum badged capacity through the primary meter of not exceeding $16 \text{ m}^3 \text{ h}^{-1}$ and
- a maximum installation volume (IV) supplying an individual dwelling or non domestic premises of 0.035 m^3 and
- LPG/Air Installations - OP at the outlet of the primary meter and any point in the section to be tested not exceeding 21 mbar or
- NG Installations - OP at the outlet of the primary meter and any point in the section to be tested not exceeding 21 mbar or
- LPG Installations - OP at the outlet of the final stage regulator and any point in the section to be tested not exceeding 37 mbar.

Note 1: There are some existing NG installations, where MOP_o exceeds 75 mbar that have been installed without the facility of a meter inlet valve (MIV). These installations are not within the scope of IGEM/UP/1B but advice on testing and purging is given in Appendix 4.

Note 2: Installations of larger volume are rare in domestic premises. However, if there is any doubt, it is advisable to calculate IV in accordance with Appendix 7 before using this Standard.

Note 3: LPG service pipework is not within scope of this Standard and is covered by UKLPG Code of Practice 22.

Note 4: Propane and Butane installations typically operate at 37 mbar and 28 mbar.

Note 5: The scope of this Standard limits the IV to 0.035 m^3 . For example, the following installations have a volume less than 0.035 m^3 :

- 25 m of 35 mm copper pipework (assuming U6 fitted)
- 10 m of 35 mm copper pipework (assuming U16 fitted)
- 20 m of 32 mm corrugated stainless steel tube (CSST) pipework (assuming U6 fitted)
- 8 m of 32 mm CSST pipework (assuming U16 fitted).

2.3 This Standard covers tightness testing and direct purging of pipework containing either LPG/Air, NG, or LPG.

Note 1: There are Standards for other installation locations which are not individual dwellings – PD 5482-3, or BS EN ISO 10239 or IGE/UP/1 apply, as appropriate (see Figure 1).

Note 2: Historically, BS 6891 (which preceded IGE/UP/1B Edition 1 for "soundness testing") and IGE/UP/1B Edition 1 and 2 have not required strength testing. This philosophy continues for IGEM/UP/1B Edition 3 (for components of $MOP \leq 75 \text{ mbar}$) as there is no significant case evidence for introducing strength testing, the risk associated with failure of integrity is comparatively low (due to low energy contained) and the available materials and methods of construction are such as to give confidence that integrity will be assured. Steps are given in the tightness test section to check that jointing has been correctly carried out.

- 2.4 This Standard applies to tightness testing in the following circumstances:
- new installations
 - alteration to, replacement of, or re-use of, existing installations
 - new extensions to existing pipework
 - prior to any work on existing installations
 - where there is a known or suspected gas escape
 - where there has been a complete loss of supply pressure i.e. upstream of the ECV, or of installation pressure
 - routine testing of existing installations
 - immediately before purging of installations (except when taking components permanently out of service).

Note: This Standard may not need to be applied when carrying out routine maintenance, such as servicing.

- 2.5 This Standard applies to direct purging in the following circumstances:
- new installations
 - alteration to, replacement of, or re-use of, existing installations
 - new extensions to existing installations
 - where there has been a complete loss of installation pressure
 - where there is the possibility of air being present in an installation.

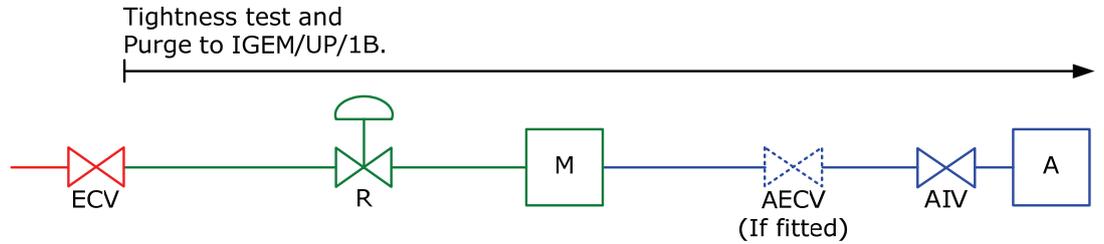
Note 1: This Standard may not need to be applied when carrying out routine maintenance, such as servicing.

Note 2: This Standard refers throughout to purging when there is the possibility air may be present in the gas installation. The principles may be used when there could be other gases in the installation other than the gas with which the installation is currently supplied, for example when an installation is converted from one fuel gas to another, but suitable adjustments to stated parameters and procedures will need to be considered by a competent person.

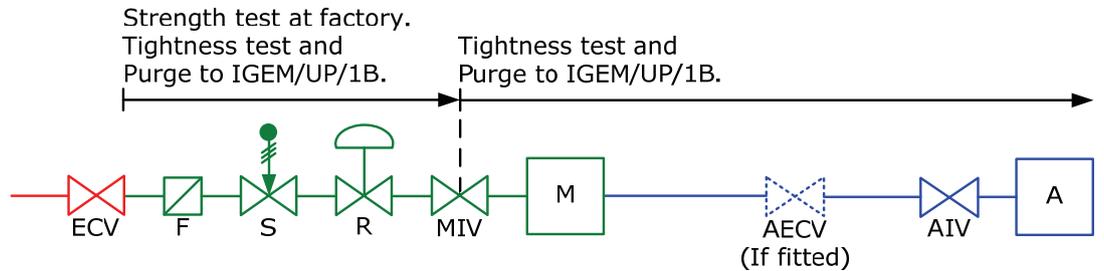
2.6 All pressures quoted are gauge pressures unless otherwise stated.

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

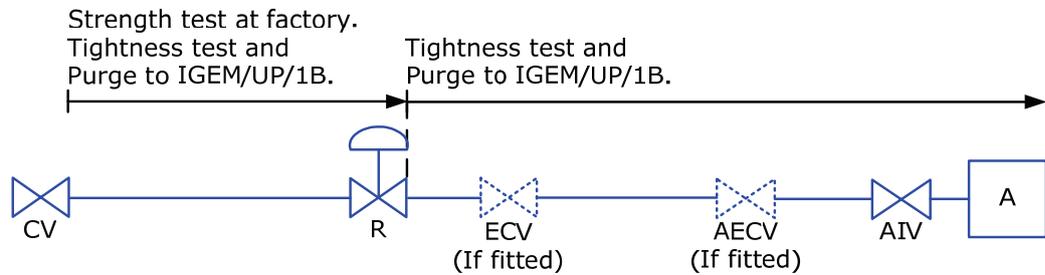
2.8 Appendices are informative and do not represent formal requirements unless specifically referenced in the main sections via the prescriptive terms "must", "shall" or "should".



(a) Typical installation. $MOP_u \leq 75$ mbar



(b) Typical installation. $75 \text{ mbar} < MOP_u \leq 2 \text{ bar}$



(c) Typical LPG cylinder installation

ECV	emergency control valve	—	Network
CV	cylinder valve	—	meter installation
F	filter	—	installation pipework
R	regulator	<	less than
MIV	meter inlet valve	≤	less than or equal to
M	meter		
A	appliance		
AECV	additional emergency control valve		
AIV	appliance isolation valve		
MOP_u	supply MOP		
S	safety device (see BS 6400).		

Note 1: Certain installations will incorporate an under pressure shut-off device.

Note 2: A meter installation may not be fitted on LPG installations.

Note 3: Where a component or sub-assembly (meter installation component, meter "skid" unit, etc.) has been pre-tested and not subsequently modified (such as by cutting threads or welding) and has appropriate certificates of conformity available, the strength testing of such a component/assembly need not be undertaken but a visual examination of joints, general condition, suitability, etc. is recommended prior to installing and subsequent tightness testing as for a new installation. Permanent marking, for example by manufacturer's badging/stamping, may be deemed as certification of conformity.

FIGURE 3 - TYPICAL INSTALLATIONS