

**Low-pressure,
non adjustable
regulators having a
maximum outlet
pressure of less than or
equal to 200 mbar, with
a capacity of less than
or equal to 4 kg/h, and
their associated safety
devices for butane,
propane or their
mixtures**

ICS 23.060.40

National foreword

This British Standard is the UK implementation of EN 12864:2001+A3:2009. It supersedes BS EN 12864:2001 which is withdrawn.

The start and finish of text introduced or altered by CEN amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by **A1** **A1**.

The UK participation in its preparation was entrusted by Technical Committee GSE/24, Dedicated LPG appliances.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Amendments/corrigenda issued since publication

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English version

Low-pressure, non adjustable regulators having a maximum outlet pressure of less than or equal to 200 mbar, with a capacity of less than or equal to 4 kg/h, and their associated safety devices for butane, propane or their mixtures

Détendeurs à réglage fixe, à pression de détente maximale inférieure ou égale à 200 mbar, de débit inférieur ou égal à 4 kg/h, et leurs dispositifs de sécurité associés pour butane, propane ou leurs mélanges

Festeingestellte Druckregelgeräte mit einem Höchstreglerdruck bis einschließlich 200 mbar, und einem Durchfluss bis einschließlich 4 kg/h für Butan, Propan und deren Gemische sowie die dazugehörige Sicherheitseinrichtungen

This European Standard was approved by CEN on 18 October 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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Foreword

This document has been prepared by CEN /TC 181, "Dedicated liquefied petroleum gas appliances", the Secretariat of which is held by AFNOR

This document has to be implemented at national level, either by publication of an identical text or by endorsement, by February 2002, and conflicting national standards have to be withdrawn by February 2002.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this document: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This document only covers type testing.

Items relating to quality assurance systems, production testing and particularly certificates of conformity are not covered by this standard.

It is intended that this text will be the first part of a standard covering different applications of the equipment considered. At the time of issue of this document, two complementary documents are envisaged:

- prEN 13785 : regulators with a capacity not greater than 100 kg/h, having an outlet pressure of not greater than 4 bar, other than those which are the subject of EN 12864, and their associated safety devices for butane, propane or their mixtures ;
- prEN 13786 : automatic change-over devices with a capacity not greater than 100 kg/h, having an outlet pressure of not greater than 4 bar, and their associated safety devices for butane, propane or their mixtures.

WARNING NOTICE – At the date of publication of this standard, annexes G and H are the subject of an amendment.

Foreword to amendment A1

This amendment EN 12864:2001/A1:2003 to EN 12864:2001 has been prepared by Technical Committee CEN /TC 181 Dedicated liquefied petroleum gas appliances, the secretariat of which is held by AFNOR.

This amendment to the European Standard EN 12864 has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

This Amendment to the European Standard EN 12864:2001 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2004, and conflicting national standards shall be withdrawn at the latest by March 2004.

This Amendment modifies EN 12864:2001. It has been prepared to take into account the commentaries received during the formal vote on EN 12864 and to amend the figures of annexes G and H.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A2

This European Standard (EN 12864:2001/A2:2005) has been prepared by Technical Committee CEN/TC 181 "Dedicated liquefied petroleum gas appliances", the secretariat of which is held by AFNOR.

This Amendment to the European Standard EN 12864:2001 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2006, and conflicting national standards shall be withdrawn at the latest by February 2006.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of Directive(s).

This Amendment modifies EN 12864:2001 and EN 12864:2001/A2:2003. It has been prepared to take into account the commentaries received during the formal vote on EN 12864:2001/A1 and to complete the standard to cover regulators intended to be used on boats.

This amendment only states the modifications applicable to the corresponding points of EN 12864:2001 and/or EN 12864:2001/A1:2003 and the points added to those European Standards. The rest of EN 12864:2001 and EN 12864:2001/A1:2003 is unchanged and remain applicable.

The modifications are directly introduced by reference to the corresponding clauses.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A3

This document (EN 12864:2001/A3:2009) has been prepared by Technical Committee CEN/TC 181 "Dedicated liquefied petroleum gas appliances", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2010, and conflicting national standards shall be withdrawn at the latest by February 2010.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This European standard defines the structural and operational characteristics, the safety requirements and test methods, the marking, of low-pressure, non adjustable regulators for butane, propane or their mixtures, referred to in the body of the text as "regulators".

This European Standard covers regulators supplied at vapour pressure by one or several portable cylinders. They are normally directly connected to the cylinder valve or the self closing valve.

The regulators covered by this standard are designed for a maximum outlet pressure of up to and including 200 mbar and a maximum rate of up to and including 4 kg/h.

This European Standard also applies to the safety devices which are supplied as part of the regulators. The characteristics of these devices are given in annex A and B.

The requirements of this European Standard apply generally to regulators used in locations where the temperature likely to be reached during use is between - 20 °C and + 50 °C, + 50 °C being the maximum temperature allowable for the cylinder. When the devices are subjected to temperatures below this range, they shall comply with special requirements defined in annex C.

A2 Regulators designed to be used in caravans, motor caravans and freshwater boats which are subjected to special requirements, are dealt with in annex D.

Regulators designed to be used in seawater boats which are subjected to special requirements, are dealt with in annex M. **A2**

This European standard does not include the installation rules for regulators and their possible associated safety devices. In this matter, reference should be made to national regulations in force in the member countries.

Regulators which are intended to be used with gases containing methylacetylene and propadiene are excluded from the scope of this European Standard.

This European standard only covers type testing.

WARNING NOTICE: The figures in annexes G and H show the types of connections used according to the country of use of the regulators

The top part of these figures (above the horizontal line) applies to the regulator and is normative.

The bottom part of these figures (below the horizontal line) applies to the tap (or the valve) to which the regulator is fitted. This is given as a guide for the tests and is not normative.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 437:1993, *Test gases - Test pressures – Appliance categories*.

EN 549, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*.

A1 EN 560, *Gas welding equipment – Hose connections for equipment for welding, cutting and allied processes*. **A1**

EN 561:1994, *Gas welding equipment – Quick-action coupling with shut off valves for welding, cutting and allied processes.*

prEN 1763-1:1999, *Rubber and plastics tubing, hoses and assemblies for use with commercial propane, commercial butane and their mixtures in the vapour phase – Part 1 : Requirements for rubber and plastics tubing and hoses.*

EN ISO 3166-1, *Codes for the representation of names of countries and their subdivisions – Part 1: Country codes (ISO 3166-1:1997).*

■^{A1} EN ISO 8434-1, *Metallic tube connections for fluid power and general use – Part 1: 24° compression fittings (ISO 8434-1:1994).* ^{A1}

■^{A2} EN ISO 4628-3:2003, *Paints and varnishes – Evaluation of degradation of coatings – Designation of quantity and size of defects, and of intensity of uniform changes in appearance – Part 3: assessment of degree of rusting (ISO 4628-3:2003)*

EN ISO 7253:2001, *Paints and varnishes – Determination of resistance to neutral salt spray (fog) (ISO 7253:1996)* ^{A2}

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads – Part 1 : Dimensions, tolerances and designation.*

ISO 75, *Plastics - Determination of temperature of deflection under load.*

ISO 178, *Plastics - Determination of flexural properties.*

ISO 180, *Plastics - Determination of IZOD impact strength.*

ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads – Part 1 : Dimensions, tolerances and designation.*

ISO 301, *Zinc alloy ingots intended for casting.*

ISO 426-1, *Wrought copper-zinc alloys - Chemical composition and forms of wrought products - Part 1 : Non-leaded and special copper-zinc alloys.*

ISO 426-2, *Wrought copper-zinc alloys - Chemical composition and forms of wrought products - Part 2 : Leaded copper-zinc alloys.*

ISO 527, *Plastics - Determination of tensile properties.*

ISO 565, *Test sieves – Metal wire cloth, perforated metal plate and electroformed sheet - Nominal sizes of openings.*

ISO 1210, *Plastics - Determination of the burning behaviour of horizontal and vertical specimens in contact with a small-flame ignition source.*

ISO 4892-3, *Plastics – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV Lamps.*

ISO 9227, *Corrosion tests in artificial atmospheres - Salt spray tests.*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply :

3.1 General definitions

3.1.1

regulator

device which maintains an outlet pressure constant independent of the variations of the inlet pressure and/or flow rate and/or temperature within defined limits

3.1.2

quick coupling

connection system which allows the fitting of the regulator to the cylinder valve without a threaded connection and without using tools

3.1.3

tap

device for closing the gas flow which requires an intentional manual action (for example on a lever, a knob, etc.)

3.1.4

self closing valve

device allowing the automatic shut off of the gas flow by simple disconnection of the regulator

3.1.5

valve pad

component part of the regulation sub-assembly which ensures soundness between the part of the regulator at supply pressure and the part of the regulator at outlet pressure when this is equal to the lock-up pressure

3.1.6

sealing

any arrangement of any device, for example an adjuster, such that any interference likely to change its position causes the breaking of the device or sealing material making the interference apparent

3.2 Definitions concerning gas

3.2.1

butane

mixture of third family gases whose vapour pressure (p_v) at 50 °C is greater than or equal to 4,3 bar and at most equal to 7,5 bar, of mean density in the gas phase equal to 2,4 kg/m³

3.2.2

propane

mixture of third family gases whose vapour pressure (p_v) at 50 °C is greater than or equal to 7,5 bar or at most equal to 16 bar, of mean density in the gas phase equal to 1,85 kg/m³

3.2.3

LPG

mixture of third family gases whose vapour pressure (p_v) at 50 °C is greater than or equal to 4,3 bar or at most equal to 16 bar, of mean density in the gas phase equal to 2,12 kg/m³

3.3 Definitions concerning pressures

The values of pressures given in the text are to be considered as values of relative pressure.

3.3.1

supply pressure

p

value of the gas pressure measured at the manual valve outlet (regulator inlet) or at the self closing valve inlet

NOTE Supply pressure is expressed in bars.

3.3.2

outlet pressure

value of the gas pressure measured at the regulator outlet

3.3.3

nominal outlet pressure

p_d

value of the outlet pressure corresponding to the normal pressure for appliances as defined in 3.6 of EN 437:1993

NOTE Nominal outlet pressure is expressed in millibars.

3.3.4

lock up pressure

p_0

the maximum outlet pressure obtainable at no flow for all values of the supply pressure

NOTE Lock-up pressure is expressed in millibars.

A1 3.3.5

minimal admitted pressure

p_{Mg}

minimal value of the outlet pressure supplied by the regulator for all values of the inlet pressure and all values of the flow rate

3.3.6

maximal admitted pressure

p_{Mp}

maximal value of the outlet pressure supplied by the regulator for all values of the inlet pressure and all values of the flow rate between the pilot rate and the guaranteed rate **A1**

3.4 Definitions concerning rates

3.4.1

guaranteed rate

M_g

the mass flow of gas that can be obtained at the minimum allowed outlet pressure, whatever the value of the supply pressure

NOTE Guaranteed rate is expressed in grams per hour or in kilograms per hour.

3.4.2

pilot rate

M_p

gas rate (15 g/h) necessary for the supply of the ignition system of the appliance, generally called pilot

NOTE Pilot rate is expressed in grams per hour.

3.4.3

lock-up area

range of rates between 0 and pilot rate

3.4.4

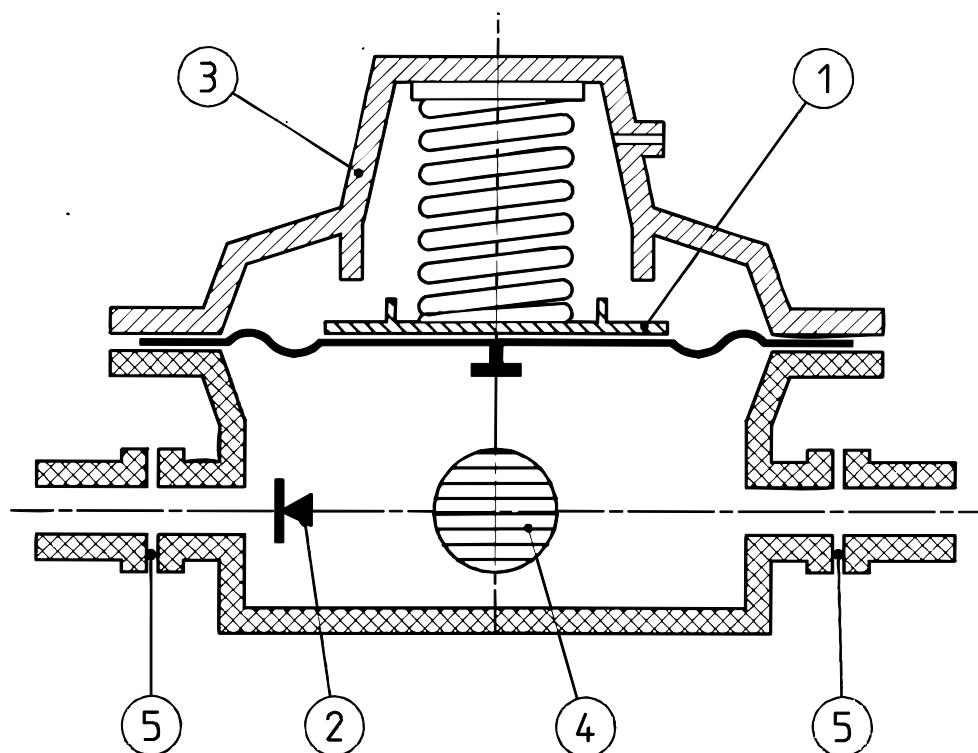
operational area

range of rates between pilot rate and the guaranteed rate

4 Terminology

The terminology used is shown in Figure 1.

The diagram is shown as a guide ; no other method is excluded



Key

1	Pressure sensing sub-assembly	
2	Regulation sub-assembly	
3	Back pressure sub-assembly	
4	Mechanical connection sub-assembly	
5	Connection sub-assembly	

Figure 1 – Regulator diagram

5 Structural characteristics

5.1 General

Regulators shall be designed, manufactured and assembled in such a way that their operation is satisfactory under the installation and service conditions specified by the manufacturer.

Where appropriate, safety devices which are likely to be fitted onto the regulators covered by this European Standard shall be designed and constructed in accordance with provisions of annex A and B.

All the parts of a regulator shall be free from sharp corners or edges capable of causing deterioration, injury or faulty operation.

Parts shall be clean internally and externally.

Holes for screws, pins, etc. intended for the assembly of the regulator components and for their fixing shall not open into the gas ways. The thickness of the wall between these holes and the gas ways shall be at least 1 mm.

Holes necessary for machining which join gas ways to the atmosphere, but which have no influence on the operation of the regulator, shall be permanently sealed by metallic means. Appropriate additional sealing compounds may be used.

Threads shall be suitable for their purpose. In particular, gas-tight threads shall be in accordance with ISO 7-1, where pressure-tight joints are made on the threads.

Devices capable of modifying the operation of the regulator shall not go out of adjustment and shall be sealed. In particular, the body and the cover shall be assembled in such a way that a separation is not possible without permanent damage to these parts or to the sealing.

The operation of moving parts, for example diaphragms or bellows, shall not be impaired by other parts.

5.2 Materials

The quality of materials, the dimensions used and the means of assembling the various components shall be such that the construction and performance characteristics are ensured. Performance characteristics shall not alter significantly during the life expectancy mentioned in the literature when the regulator is installed and used in accordance with the manufacturer's instructions. Under these conditions, all components shall withstand the mechanical, chemical and thermal conditions to which they may be subjected during their use when operating under normal conditions.

The regulator shall withstand the action of organic substances, either of vegetable or animal origin.

The body and the cover shall be made of metallic material. However for regulators directly fitted onto the cylinder using a quick coupling with self closing valve and non threaded outlet connection, thermoplastic or thermosetting materials may be used.

Thermoplastic or thermosetting components used in the regulator construction shall meet the specific requirements of annex E.

Zinc alloys shall only be used if they are of the Zn Al₄ or Zn Al₄ Cu₁ quality in accordance with ISO 301 and, like the thermoplastic or thermosetting components, the zinc alloy items are not exposed to a temperature higher than 80 °C. Brass alloys shall comply with ISO 426-1 or ISO 426-2.

The rotating threaded parts of connections, whether they are male or female, shall be made of brass in accordance with ISO 426-1 or ISO 426-2 or any equivalent standard or of steel. The materials and manufacturing processes used shall not cause subsequent risk of stress corrosion.

Fixed parts of connections shall be made of metallic material. ^(A2) However, for parallel female threaded connections where the seal is made on the thread (types G.14 and H.7 as described in annexes G and H), zinc alloys are only permitted up to and including DN10. ^(A2)

Non threaded fixed parts of connections may be made of thermoplastic or thermosetting material, provided that they meet the test requirements specified in annex E.

The assembly of parts of the gas ways intended to assure soundness shall not be made with solder whose lowest temperature in the melting range, after application, is below 450 °C.

Elastomeric components shall comply with the requirements of EN 549, within the temperature range specified in clause 1, including for diaphragms, the requirements concerning resistance to ozone. In addition, reinforced materials shall comply with the additional requirements defined in annex F.

5.3 Special requirements

5.3.1 Pressure sensing sub-assembly

The dimensions, the shape and the method of assembly of the components of the pressure sensing sub-assembly shall avoid any risk of damaging the diaphragm.

The pressure sensing sub-assembly shall be manufactured in such a way that the operation of the regulator complies with the requirements defined in clause 6 in the mounting positions of the regulator on the installation as specified by the manufacturer in his instructions. The regulator shall meet the lock-up requirements in all other mounting positions.

Whatever the position taken by the diaphragm, the spring shall not be fully compressed.

The diaphragm shall be meet the requirements of the tests described in 7.2.2.2 without rupturing or slipping out of its fixing.

5.3.2 Regulation sub-assembly

At lock-up, the regulation sub-assembly shall act as a seal between the supply pressure and the outlet pressure. It shall not move accidentally in use.

The soundness and function of the regulation sub-assembly shall not be affected by the tensile strength or bending tests on the connections.

After the test carried out in accordance with 7.2.4, the valve pad shall not be displaced or come out of its housing.

5.3.3 Back pressure sub-assembly

The support surfaces of the cover and of the body shall be designed in such a way that they retain the diaphragm firmly in its housing and make it capable of resisting the pressure tests defined in 7.2.2.

Vent holes shall be

- arranged or located in such a way to reduce the risks of accidental blockage and to minimize the penetration of rain water, particularly if their cross section is greater than 3 mm²;
- constructed in such a way that accidental damage to the internal parts of the regulator, caused by any object inserted through the vent hole, may be reasonably prevented,

when the regulator is installed in accordance with the instructions.

5.3.4 Connection sub-assembly

5.3.4.1 General

[A1] The regulator shall be fitted with a corrosion and gas resistant filter situated on the regulator inlet upstream of the valve pad. The filter mesh shall not exceed the recommended dimensions for the 125 opening in accordance with ISO 565, or exceed 0,14 mm diameter in case of perforated sheet. **[A1]**

Whatever their type, the connections shall comply with:

a) inlet connections:

- 1) one of the types in Figures G.1 to G.49¹⁾ if they are threaded;
- 2) one of the types in Figures G.50 to G.99¹⁾ if they are not threaded.
- 3) future types will be acceptable providing they are not interchangeable with the connections specified in this European Standard, and providing their assembly gives an equivalent degree of safety;
- 4) **[A1]** for connections made with a rotating nut using a seal the backward movement of the nut shall be sufficient to expose the seal completely. **[A1]**

b) outlet connections :

- 1) one of the types in Figures H.1 to H.49¹ if they are threaded ;
- 2) one of the types in Figures H.50 to H.99¹ if they are non threaded ;
- 3) other connections may be provided as long as the regulator is marketed with a fixed outlet tube ;
- 4) future types will be acceptable providing they are not interchangeable with the connections specified in this European Standard and providing their assembly gives an equivalent degree of safety.

Tables G.1 and G.2, H.1 and H.2 show, for information, the inlet and outlet connections used in the various countries.

The design of the connection shall ensure soundness under the assembly conditions specified in the instructions.

If the connection incorporates a seal it shall

- be mounted in such a way that it cannot fall off ;
- be easily replaced by a new seal, if necessary, without using special tools ;
- be dimensioned in accordance with the indications given in annexes G and H ;
- be fixed onto the regulator so as to be subjected to all the tests in this standard.

No distortion or breakage shall be noted and the regulator shall meet the requirements of the soundness test described in 5.5 after application of the forces defined in 5.4.2 and 5.4.3.

In addition, the manufacturer's instructions shall specify the use of a spanner when this is necessary for fitting or removing the regulator.

The regulator can be fitted with an inlet valve which shall meet the requirements of annex K.

For outdoor use, the regulator can be fitted with multiple outlets; in this case, it shall comply with the requirements of annex I.

5.3.4.2 Quick coupling regulators

It shall be checked that disconnection cannot take place accidentally, especially when operating the gas opening or closing device.

When turning off the gas and disconnecting the regulator is combined in a single control, a single continuous movement of the control shall be prevented by a mechanism which shall be separately operated before the regulator can be disconnected.

5.3.4.3 Regulators for fitting to a self closing valve

For regulators intended to be fitted to a self closing valve either with a thread or with a quick coupling, if the cylinder valve does not include a manual valve as a means of closure, there shall be a tap on the regulator to provide manual opening and closing of the gas supply. The open and closed positions shall be marked and clearly visible in the position of use.

External soundness shall be maintained during the operation of fitting on or removing the regulator from the cylinder valve, even if the manual gas tap has been left accidentally in the open position. Only the escape of the volume of gas contained downstream of the self closing valve is allowed during disconnection. If this requirement cannot be met, fitting and removing shall only be possible if the gas tap is in the closed position.

¹ A range of 49 figures has been reserved for each type of connection. However, the needs of this document do not use all this range.

5.3.4.4 Pressure reducers with G.56 connection

Regulators using the G.56 connection shall be designed to have a maximum pressure of 3 bar between the valve and regulator. This pressure is controlled by a diaphragm in the regulator which acts directly onto the cylinder valve closing mechanism. This requirement is verified in accordance with 7.3.3.

For safety, regulators with the G.56 connection shall not be single stage. 

5.4 Mechanical strength

5.4.1 Resistance to impact

After being tested under the conditions of 7.2.1, the regulator shall satisfy the requirements of 5.5 and clause 6.

Only the distortion due to the fall onto the ground is allowed.

5.4.2 Resistance to pressure

5.4.2.1 The regulator shall withstand the pressure test described in 7.2.2.1 without rupturing.

After this pressure test, the regulator shall meet the soundness requirements specified in 5.5.

5.4.2.2 The regulator shall withstand the pressure test described in 7.2.2.2, without the diaphragm rupturing.

After this pressure test, the regulator shall meet the soundness requirements specified in 5.5.

5.4.2.3 The regulator shall withstand the pressure test described in 7.2.2.3 without any fracturing of the body, cover or fastenings if provided.

Distortion or permanent deformation is permitted.

5.4.3 Strength of connections

5.4.3.1 Strength of the connection/regulator assembly

Whether the fixing of the inlet connection onto the regulator body is of the threaded or non threaded type or in one piece, there shall be no damage or distortion that could affect the safety of the regulator at the end of the tests in 7.2.3 carried out with the following values:

- a torque of at least 30 N.m in both directions (see Table 3) ;
- a bending moment created by a force of 400 N directed upwards and whose application point is at the base of the outlet connection (see Table 5) ;
- a tensile strength test of 2 000 N (see Table 3).

Whether the fixing of the outlet connection onto the regulator body is of the threaded or non threaded type or in one piece, there shall be no damage or distortion that could affect the safety of the regulator at the end of the tests in 7.2.3 Table 4 carried out with the following values:

A1 a) non threaded hose connections

- 1) a torque of at least 30 N.m in one direction (verification not required for one piece connection and for freely rotating connections) ; **A1**
- 2) a bending moment of 10 N.m ;
- 3) a tensile strength test of 2 000 N (verification not required for one piece connection).

b) threaded connections

- 1) a torque of at least 30 N.m in both directions (verification not required for freely rotating connections) ;
- 2) a bending moment of 10 N (not required for one piece connection) ;
- 3) a tensile strength test of 2 000 N (not required for one piece connection).

In addition, for freely rotating connections, the torque necessary for the rotation of the connection shall not be greater than 0,5 N.m at the end of all the tests carried out on the samples in accordance with Table 2 (see 7.1.4).

5.4.3.2 Strength of regulator assembly when fitted onto its cylinder valve

Following the tests in 7.2.3 Table 5 carried out with the regulator fitted to the installation as indicated in the instructions with the following values, there shall be no damage or distortion that could affect the safety of the regulator :

a) a torque in both directions

- 1) of at least 20 N.m for non threaded hose outlet connections (15 N.m for quick coupling connections) ;
- 2) of at least 30 N.m for threaded outlet connections. In addition, regulators with screwed unions vertically mounted onto the cylinder valve shall be subjected to a torque of at least 20 N.m in the regulator plane (15 N.m for quick coupling connections) ;

b) a bending moment created by a force of 400 N directed upwards and whose application point is at the base of the outlet connection ;

c) a tensile strength test of 500 N (verification not required for inlet connections screwed onto the cylinder valve).

The mechanical strength required shall be ensured whatever the position of fixing of the regulator onto the installation.

5.5 Soundness

5.5.1 Soundness of the regulator

The regulator shall be sound for all pressures and requirements of 7.2.5.1.

Soundness is considered to be satisfactory if the leakage is equal to or less than 15 cm³/h.

If the regulator can be mounted in different positions, soundness of the connection shall be ensured in all positions.

If a quick coupling regulator can be rotated, its soundness shall be ensured in all positions and even during rotation.

5.5.2 Soundness of the tap

The tap shall be sound for all pressures and requirements of 7.2.5.2.

After verifying the correct operation of the tap, soundness shall be considered as satisfactory if a leak rate of less than 15 cm³/h has been recorded.

5.6 Mechanical endurance

5.6.1 General

Under the test conditions defined in 7.2.6.1, the regulator shall withstand 50 000 complete valve opening/closing cycles without mechanical failure and remain sound as specified in 5.5.1.

After the endurance test, the regulation curves drawn in accordance with 7.3 shall not differ from the ones drawn before the test by more than $\pm 5\%$.

5.6.2 Special requirements

5.6.2.1 Regulators fitted with a tap

Under the test conditions defined in 7.2.6.2, with the regulator connected to a cylinder valve, the tap shall be operated for 5 000 of the 50 000 opening/closing cycles specified in 5.6.1.

Following this, the regulator connected to a new cylinder valve shall meet the requirements of 5.5.2 and the regulation curves drawn in accordance with 7.3 shall not differ from the ones drawn before the test by more than $\pm 5\%$.

5.6.2.2 Quick coupling regulators

Under the test conditions of 7.2.6.3, the quick coupling regulator shall be connected/disconnected for 5 000 cycles to the cylinder valve for which it is designed.

Following this, the regulator connected to a new cylinder valve shall meet the general requirements of 5.5.1.

5.6.2.3 Regulator with freely rotating outlet connection

Under the test conditions of 7.2.6.4, the connection shall be subjected to 2 500 cycles.

After the tests, the regulator shall remain sound in accordance with 5.5.1.

5.7 Resistance to humidity changes

Any material likely to be adversely affected by humidity shall be subjected to a test cycle for resistance to humidity changes as defined in 7.2.7.

The increase in mass between the second and the first weighing shall not exceed 20 % of the initial mass.

The change in mass between the first and the third weighing shall not exceed 5 % of the initial mass.

5.8 Resistance to corrosion

The complete regulator, not connected at the ends, is subjected to the tests described in 7.2.8.

After this test, a visual examination shall reveal no corrosion of parts capable of impairing correct operation (any salt deposit resulting from the test is not taken into account). Performance characteristics shall remain in accordance with the requirements given in clause 6.

6 Performance characteristics

The values of the pressure characteristics, as a function of the nominal outlet pressure, are given in Table 1 prepared on the basis of EN 437:1993 and define the perimeter ABCDE of the operational area for each value of p_d . As an illustration, Figure 2 gives some examples of the operating limits for regulators supplied with butane, LPG or propane.

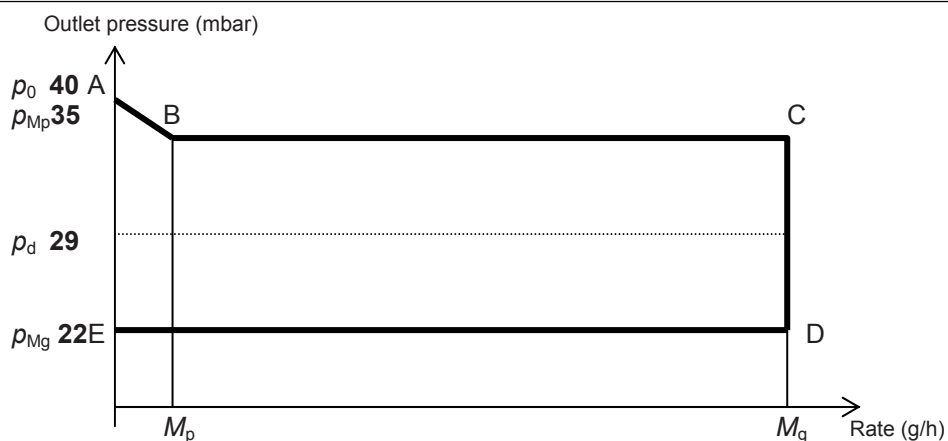
Gas	Regulator inlet pressure p bar	Regulator outlet pressure mbar				Maximum pressure loss mbar	Appliance inlet pressure ¹⁾ (mbar)			Appliance categories ¹⁾
		p_d	p_{Mg}	p_{Mp}	p_0		p_n	p_{min}	p_{max}	
Butane	0,3 to 7,5	29	22	35	40	2	29 (28 to 30)	20	35	3B and 3+
Butane	0,3 to 7,5	50	47,5	57,5	62,5	5	50	42,5	57,5	3+
Butane	0,3 to 7,5	112	65	140	145	5	112	60	140	3+
LPG	0,3 to 16	29	27	35	40	2	29 (28 to 30)	25	35	3B/P
LPG	0,3 to 16	50	47,5	57,5	62,5	5	50	42,5	57,5	3B/P
Propane	1 to 16	37	27	45	50	2	37	25	45	3P and 3+
Propane	1 to 16	50	47,5	57,5	62,5	5	50	42,5	57,5	3P
Propane	1 to 16	67	55	80	85	5	67	50	80	3+
Propane	1 to 16	148	105	180	185	5	148	100	180	3+

1) Data from EN 437:1993, listed here for information purposes.

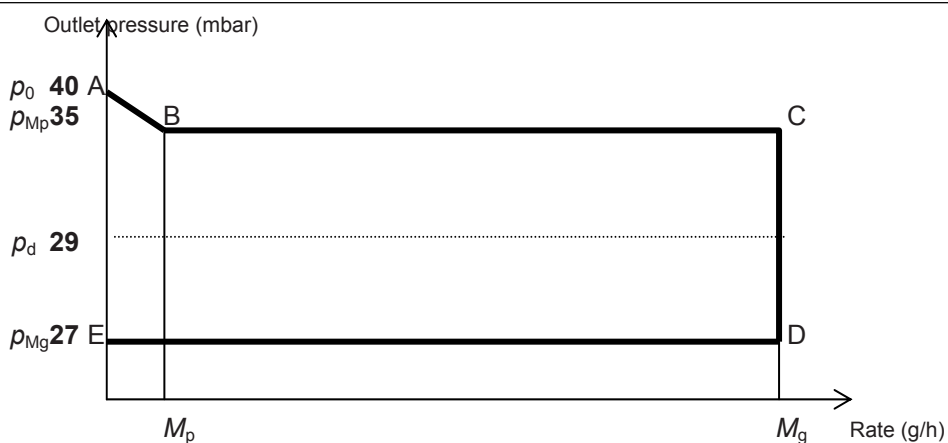
Table 1 – Pressure characteristics of the regulator based on nominal pressures given in EN 437:1993

Under the test conditions defined in 7.3, the regulator operation curves obtained using the method specified in 7.3.2 shall lie within the perimeter ABCDE defined for the nominal outlet pressure for the device (see Figure 2).

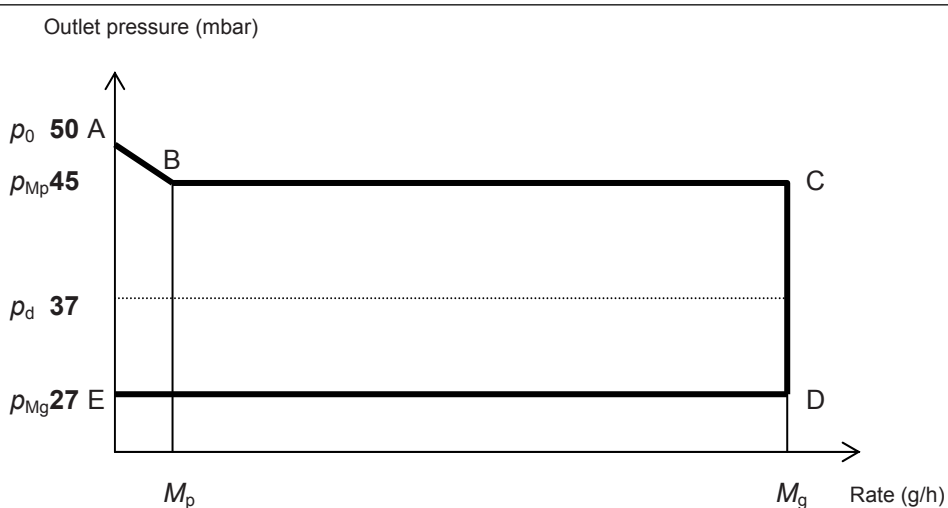
In addition, they shall show no anomaly in the curves which indicates a mechanical fault.



a) Operating limits for $p_d = 29$ mbar butane



b) Operating limits for $p_d = 29$ mbar LPG



c) Operating limits for $p_d = 37$ mbar propane

Figure 2 – Examples of operating limits allowed for regulators

7 Test methods

7.1 General conditions

7.1.1 Type of test gas

Whatever the gas (see 3.2) to be used with the regulator, with the exception of the soundness test which shall be carried out using air, tests which involve the passage of gas inside a regulator may be carried out with air at $(20 \pm 5)^\circ\text{C}$ or with reference propane.

Reference propane is that defined as G 31 in EN 437:1993, the reference air is dry air. The equivalence ratio between air and propane is defined by the formula :

$$q_n(\text{air}) = 1,245\,4 \times q_n(\text{G 31})$$

where air and propane rates are expressed in litres per hour (l/h).

7.1.2 Test conditions

Unless stated otherwise, tests shall be carried out at a room temperature of $(20 \pm 5)^\circ\text{C}$. For each test, the specified temperature shall remain constant in its range of tolerance.

All measurements are corrected to reference conditions : 15°C and 1 013,25 mbar.

If the regulator controls the valve opening, the tests shall be carried out on the valve/regulator assembly and the supply pressure is to be considered as the pressure at the valve inlet.

7.1.3 Equivalence formulae

From the results obtained with the reference gas, the mass rate corresponding to the LPG mixture indicated on the regulator can be calculated, under reference conditions, from the formula :

$$M = q_n \times \rho \times \sqrt{\frac{\rho_g}{\rho}}$$

where

M is the mass rate of the mixture under reference conditions, expressed in kilograms per hour (kg/h);

q_n is the measured volume rate, expressed in cubic metres per hour (m^3/h), of the reference gas used, corrected to reference conditions of 7.1.2, according to the formula :

$$q_n = q_{\text{measured}} \times \frac{288,15}{273,15 + t} \times \frac{p_{\text{atm}}}{1013,25}$$

where

q_{measured} is the actual volume rate measured, in cubic metres per hour (m^3/h);

t is the temperature in degrees Celsius ($^\circ\text{C}$);

p_{atm} is the atmospheric pressure in millibars (mbar);

ρ is the density of the reference gas used under reference conditions, expressed in kilograms per cubic metre (kg/m^3), in accordance with 7.1.1 and 7.1.2 ;

ρ_g is the density of the average liquefied petroleum gases for the appliance, expressed in kilograms per cubic metre (kg/m^3) (see 3.2).

7.1.4 Test samples

For the tests, the manufacturer shall supply six identical regulators.

These regulators shall carry a number from 1 to 6 and shall undergo the series of tests defined in Table 2 in the order indicated.

NOTE Details concerning sampling are outside the scope of this standard and are to be agreed between the manufacturer and the certification body.

Subclause	Test	Regulator number ¹⁾					
		1	2	3	4	5	6
7.2.2.1 7.2.2.2 7.2.2.3	Resistance to pressure : ▪ Inlet ▪ Outlet ▪ Mechanical strength	X X	X				
7.2.5	Soundness	x		X	x	x	x
7.3	Performance (before)			X	x	x	x
7.2.1	Resistance to impact			X			
7.2.3	Mechanical strength of connections				X		
7.2.6	Endurance					X	
7.2.8	Resistance to corrosion						X
7.2.5	Soundness			X	x	x	x
7.3	Performance (after)			X	x	x	X

1) Test 7.2.4 is carried out on a separate regulation sub-assembly to be supplied in addition to the six complete regulators.

Table 2 - Order of tests

7.2 Verification of structural characteristics

7.2.1 Resistance to impact

A complete regulator in which the connections have not been protected is dropped from a height of one metre in any position once onto a hard floor (for example, a concrete area).

The requirements given in 5.4.1 shall be verified.

7.2.2 Resistance to pressure

During the whole duration of the tests described in 7.2.2.1, 7.2.2.2 and 7.2.2.3, the temperature of the regulator and of the test medium shall be maintained at $(50 \pm 2) ^\circ\text{C}$ for appliances considered in annex E and at room temperature $(20 \pm 5) ^\circ\text{C}$ for other appliances.

NOTE Tests intended to be carried out with water may be carried out with air or with nitrogen provided that adequate safety measures are taken.

7.2.2.1 A regulator is connected by its inlet or the inlet of the self-closing valve to a pipe supplied with water. After reaching the required temperature, the outlet connection is blocked and the pressure of water is increased to 1,75 times the maximum supply pressure. The duration of the test pressure application shall not be less than 15 min.

At the end of this test, the requirements of 5.4.2.1 shall be met.

When the regulator includes more than one regulating stage, this test is performed, the test pressure applied on the inlet of any successive stage being equal to the outlet pressure applied according to 7.2.2.2 on the immediately preceding stage.

NOTE An additional test sample may be supplied for the purpose of this test, if necessary.

7.2.2.2 The same regulator (as in 7.2.2.1) is connected by its outlet to a pipe supplied with air or nitrogen. After reaching the required temperature, the pressure of air or nitrogen is increased to 25 % of the maximum supply pressure. The duration of the test pressure application shall not be less than 15 min during which the leak measured at the regulator shall not exceed 50 cm³/h.

When the device has a safety pressure relief valve, this test shall be carried out by blocking the pressure relief valve or by suppressing its function.

When the regulator includes more than one regulating stage, this test is performed, the test pressure applied on the outlet of any successive stage being equal to 25 % of the supply pressure of the first stage.

At the end of this test, the requirements of 5.4.2.2 shall be met.

7.2.2.3 Another regulator is connected by its outlet to a pipe supplied with water. The inlet connection, the vent and any other orifice opening to the atmosphere are blocked or not machined. The diaphragm may be pierced at the end of the test.

After reaching the required temperature, the water pressure is increased to the maximum supply pressure. The duration of the test pressure application shall not be less than 15 min. This test is intended to check the mechanical strength of the cover/body assembly, therefore leakage at joints shall be disregarded during the test.

At the end of this test, the requirements of 5.4.2.3 shall be met.

7.2.3 Mechanical strength of connections

Tests for mechanical strength shall be carried out using a dynamometric device allowing the measurement of forces with an accuracy of ± 5 %.

For the torque test, a system which neutralizes bending moments should be used (if a torque wrench is used, it is desirable that this is double handed).

The regulator is fixed at the points indicated in the drawings in Tables 3, 4 and 5.

The duration of application of the torques and forces shall be 1 min.

For the tests carried out in accordance with Table 5,

- for regulators with threaded connections, the connection shall be mounted on its valve as indicated in the instructions ;
- for regulators with quick couplings, if the inlet connection rotates, the tensile strength test of 15 N.m is not necessary; if the connection is locked in the original position, the regulator shall be tested as such.

In all cases the requirements of 5.4.3 shall be met.

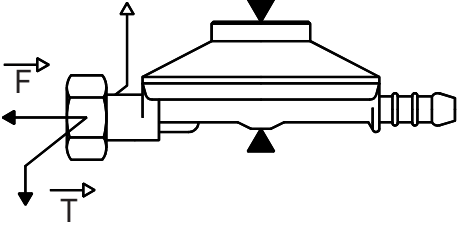
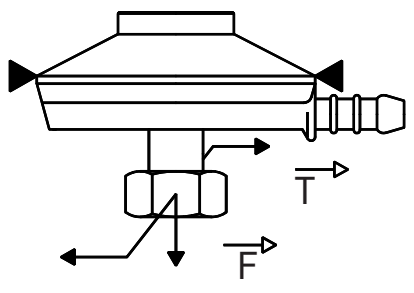
Test diagram	Force	Value	Monobloc
	T F	30 N.m 2 000 N	
	T F	30 N.m 2 000 N	

Table 3 - Mechanical strength test on inlet connections (union/regulator connection)

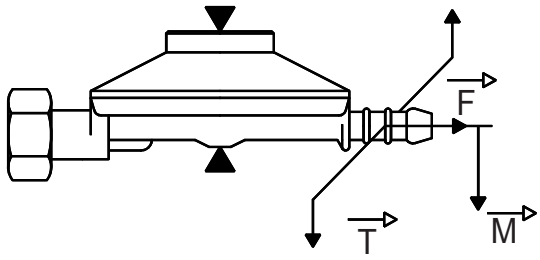
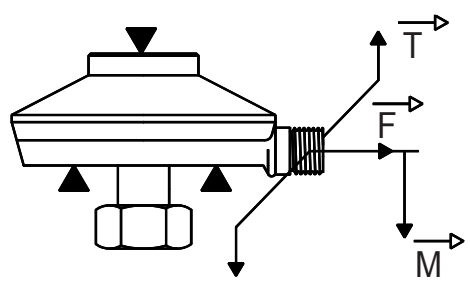
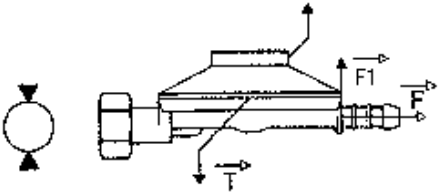
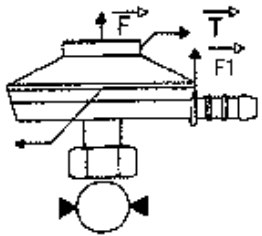
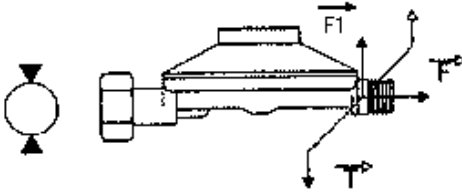
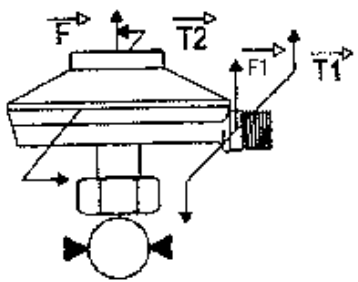
Test diagram	Force	Value	Monobloc
	T F M	30 N.m 2 000 N 10 N.m	10 N.m
	T F M	30 N.m 2 000 N 10 N.m	30 N.m
Key:  regulator fixing points ; T = torque; F = tensile strength; M = bending moment			

Table 4 – Mechanical strength test on outlet connections (union/regulator connection)

**Table 5 – Mechanical strength tests for the regulator assembly mounted on its cylinder valve
(self closing valve or manual valve)**

Test diagram	Type of inlet connection		
	Force	Threaded	Quick connection
	T F F1	20 N·m 400 N	15 N·m 500 N 400 N
	T F F1	20 N·m 400 N	15 N·m 500 N 400 N
	T F F1	30 N·m 400 N	30 N·m 500 N 400 N
	T1 T2 F F1	30 N·m 20 N·m 400 N	30 N·m 15 N·m 500 N 400 N

Key : ▶ ◀ Regulator fixing point T, T1, T2 Torque F, Tensile strength, F1, Bending strength

○ Valve

T and T2 are not applied if the regulator is freely turning on its cylinder valve. 

7.2.4 Valve pad retention

The regulation sub-assembly is placed in a pressurized container filled with liquid propylene in such a way that the assembly is immersed completely.

After 72 h at $(20 \pm 5) ^\circ\text{C}$, the container is emptied and the sub-assembly is taken out.

At the time when it is taken out of the container and during the ten minutes which follow, the assembly is checked and shall comply with the requirements of 5.3.2 concerning the valve pad.

7.2.5 Soundness

7.2.5.1 Soundness of the regulator

This test can be carried out according to the methods used in the laboratories provided that these methods give results that can be reproduced.

The measurement shall be expressed with a maximum accuracy of 20 % on the measured value.

In the event of disagreement, the method described in annex J shall be used.

The regulator is connected through its inlet connection to a pipe supplied with air at a pressure of 150 mbar, then at a pressure of 8,25 bar for butane regulators and 17,6 bar for propane and LPG regulators. The test duration shall not be less than 2 min, after reaching the pressure.

In each case, the connection is made on a union valve or tap identical to that for which the regulator is designed.

If the regulator is fitted with a manual closing device, this shall be in the open position.

The regulator is then connected through its outlet connection to a pipe supplied with air at a pressure of 150 mbar. For regulators designed to operate at a pressure of 112 mbar or 148 mbar, the test pressure shall be 220 mbar. The test duration shall not be less than 1 min, after reaching the pressure.

When the regulator is fitted with a freely rotating outlet connection, the tests shall be carried out in any position of the outlet connection.

The requirements of 5.5.1 shall be met.

7.2.5.2 Soundness of the tap

A thin, flexible hose is fitted to the regulator outlet. The regulator is connected to its cylinder valve.

The valve being in the "closed" position and at the supply pressure p , the gas flow ceases with the absence of bubbles when the flexible hose is dipped not more than 50 mm into water at least for 2 min.

The test shall be carried out for two values of the supply pressure p , equal to the values of minimum and maximum pressures to be used with the device under test.

The requirements of 5.5.2 shall be met.

7.2.6 Mechanical endurance

7.2.6.1 General

The regulator is connected

- at its inlet to a pipe supplied with air at a pressure of 1,4 bar for butane regulators and 7,5 bar for propane and LPG regulators at a temperature of $(20 \pm 5) ^\circ\text{C}$;
- at its outlet, to a jet giving a rate equal to 20 % of the guaranteed rate.

Quick acting valves are installed upstream and downstream of the regulator.

The valves are connected to an appropriate timer in such a way that when one of the valves opens, the other closes with a length of complete cycle of approximately 5 s.

The test shall be carried out in such a way that the diaphragm becomes completely relaxed and the valve pad stays on its seat for a period of at least 1 s.

The requirements of 5.6.1 shall be met.

7.2.6.2 Regulator fitted with a tap

The life test on the tap shall be carried out at ambient temperature in accordance with the following method :

- the regulator is subjected to the same test conditions as specified in 7.2.6.1 ;
- the tap shall withstand 5 000 opening/closing cycles, each cycle including rotation from the closed position up to the fully open position, with the application of a torque of 0,3 N.m in the open and closed positions. The frequency shall be (6 ± 2) cycles/min.

At the end of these 5 000 cycles, the tap shall be closed with a torque of 0,5 N.m and soundness shall be verified with air at minimum and maximum working pressures and at minimum and maximum temperatures.

The same test shall be carried out with an opened tap (injector blocked).

The requirements of 5.6.2.1 shall be met.

7.2.6.3 Regulator with quick coupling

The regulator is connected to a new cylinder valve and 5 000 disconnection/connection cycles are carried out, each cycle lasting approximately 5 s.

If the coupling is designed in such a way as to open the cylinder valve automatically, the test shall be carried out at a pressure of 0,5 times the maximum supply pressure.

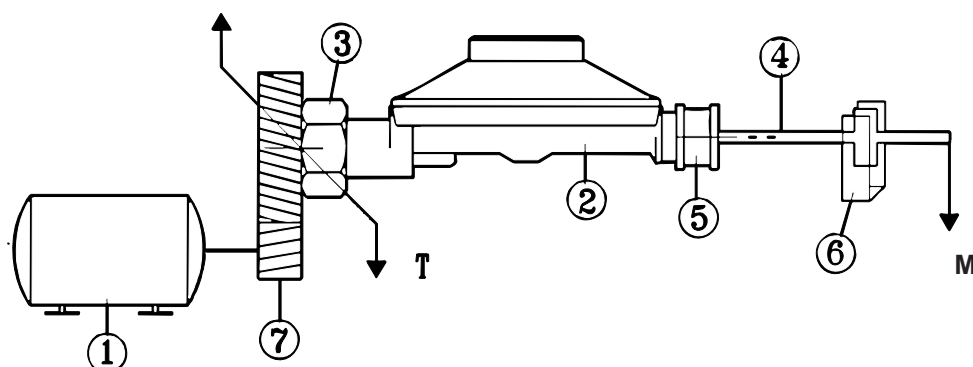
After the disconnection/connection test, the forces described in 5.4.3.2 b) and c) shall be applied to the regulator.

The requirements of 5.6.2.2 shall be met.

7.2.6.4 Regulator with a freely rotating outlet connection

Under the conditions described in Figure 3, the outlet connection shall be subjected to a bending moment of 0,5 N.m and the regulator shall be subjected to 2 500 rotation cycles.

At the end of this test, the requirements of 5.6.2.3 shall be met.



The regulator (2) is fixed onto the gear (7) via its connection (3). On the freely rotating outlet (5), a connecting rod (4) is fitted enabling the application of the bending moment M of 0,5 N.m. The rod (4) is locked in rotation but left free in the direction of the bending moment using a device (6).

The motor (1), by reversing its direction of rotation, subjects the regulator to the following cycle (with a torque T of 0,3 N.m maximum) :

- 1/2 turn to the right in 5 s ;
- a pause for 3 s ;
- 1/2 turn to the left in 5 s.

Figure 3 - Endurance test for regulators with a freely rotating outlet connection

7.2.7 Resistance to humidity changes

A sample is taken of any material likely to be affected structurally and dimensionally by variations in humidity.

It is submitted to the following test cycle :

- drying in an oven at 50 °C for 12 h ;
- weighing to an accuracy of 0,1 mg ;
- immersion in distilled water at 20 °C for 24 h ;
- removal from the water, removal of the excessive water from the surface with filter paper ;
- weighing to an accuracy of 0,1 mg ;
- drying in an oven at 50 °C for 24 h ;
- weighing to an accuracy of 0,1 mg.

At the end of this test, the requirements of 5.7 shall be met.

7.2.8 Resistance to corrosion

The whole regulator, not connected at the ends, is tested according to ISO 9227. Other test methods leading to equivalent results, for example the method described in informative annex L, are allowed.

With the test chamber in a steady state, the device is placed in the position of use recommended by the manufacturer in the instructions and left for 96 h.

At the end of this test the requirements of 5.8 shall be met.

7.3 Verification of performance characteristics

7.3.1 General

The tests are carried out whilst maintaining the regulator and gas at the temperatures shown in Table 6.

Performance tests shall be carried out in the normal position(s) of use of the regulator as recommended by the manufacturer in his instructions. These tests, as well as the soundness test, shall be carried out before and after the endurance test.

In addition, in all other positions of the regulator, the outlet pressure shall not exceed the lock-up pressure p_0 .

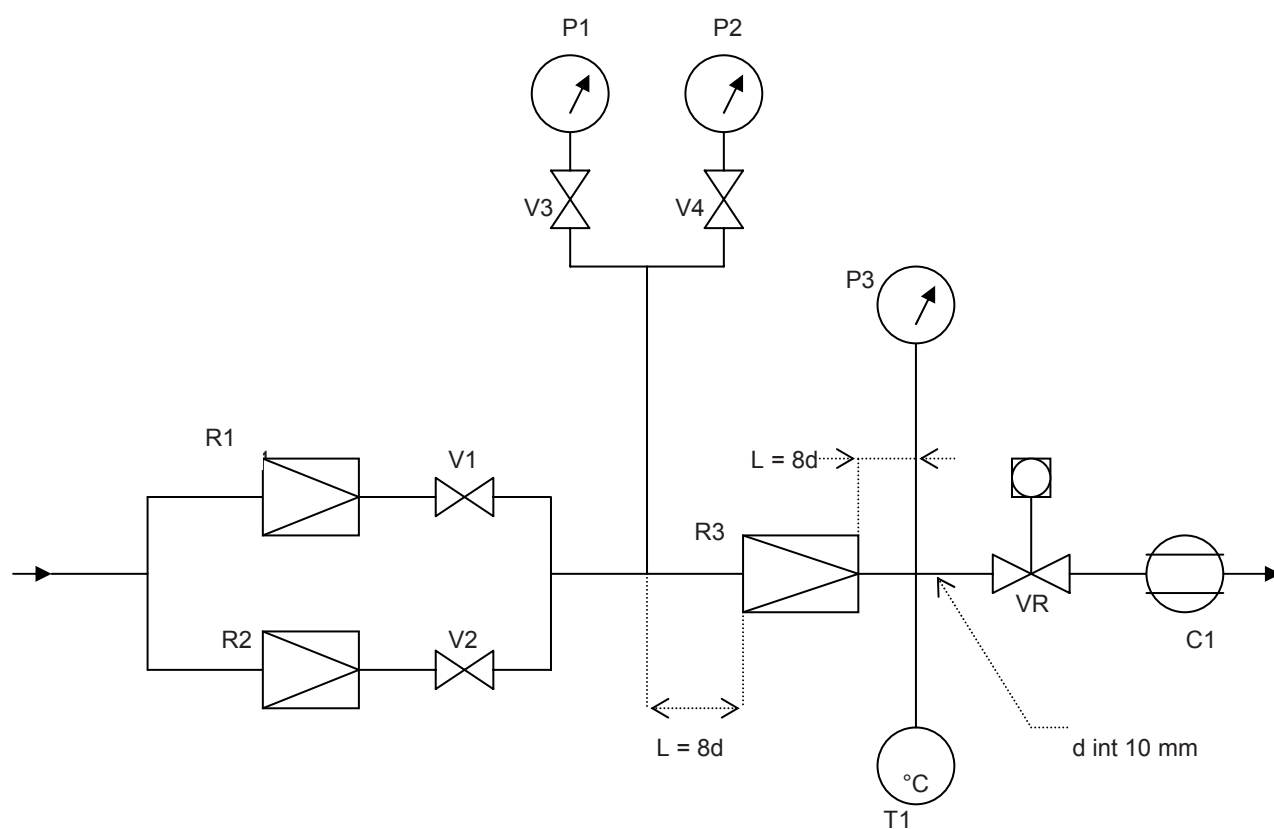
Performance tests may be carried out using calibrated orifices or rate meters. For information purposes, Figures 4 to 6 give examples of appropriate test arrangements.

The diameter of the pipework used shall be sufficiently large to avoid creating pressure drops which could influence the results.

Whatever the method used, tests are carried out starting with the maximum pressures, with flow rates increasing from the pilot rate to the guaranteed rate, then decreasing from the guaranteed rate to closure at zero flow.

The regulator shall lock-up when the flow is reduced to zero from nominal flow conditions (0,5 times the guaranteed flow rate M_g) over a period of 2 s. Lock-up shall be achieved not more than 60 s after cessation of flow.

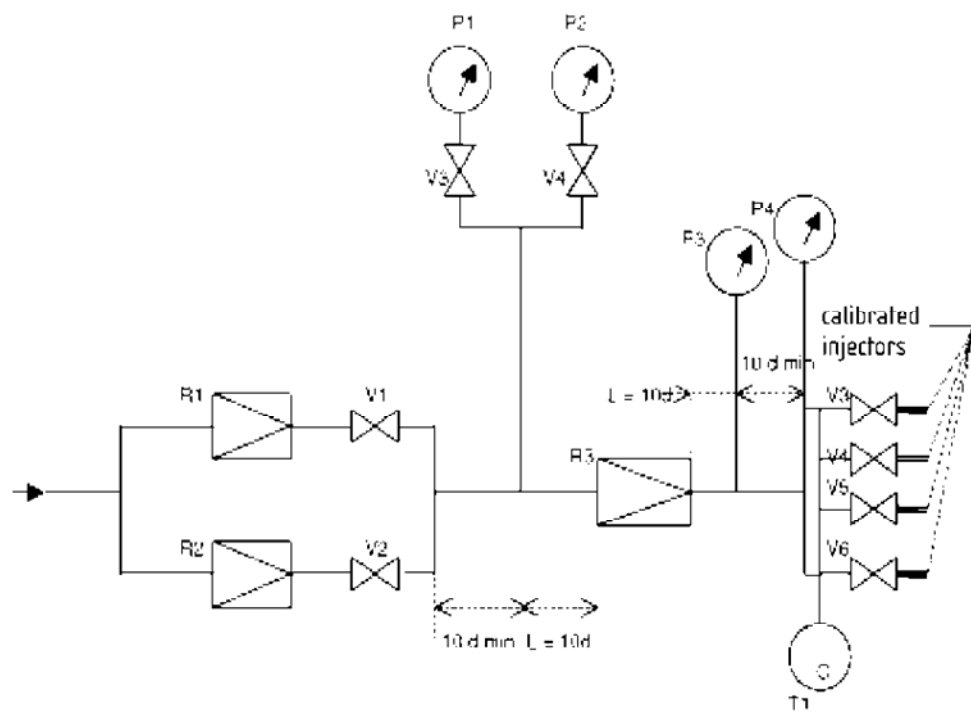
All the points obtained in this way give the regulation curve for the inlet pressure considered. However, at extreme temperatures, only the operational points corresponding to the lock-up, the pilot rate and the guaranteed rate are recorded.



Key

R1, R2	Supply adjustment regulators
V1 to V4	Ball valves (DN 10)
P1, P2	Measuring devices of upstream pressure (accuracy 0,1 mbar)
R3	Regulator under test
P3	Measuring device of downstream pressure (accuracy 0,1 mbar)
T1	Thermometer (accuracy 1°C)
VR	Rate adjuster
C1	Rate measuring device

Figure 4 – Performance tests: volume rate method

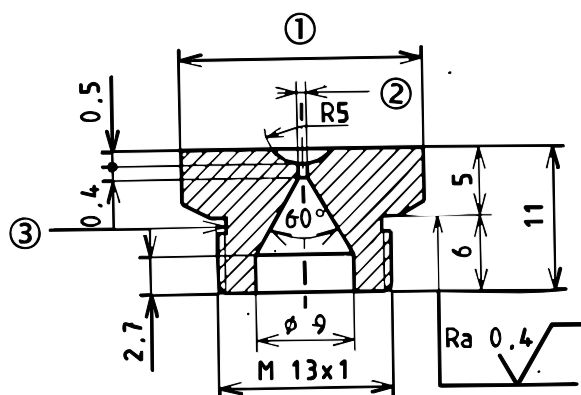


Key

- R1, R2 Supply adjustment regulators
- V1 to V6 Ball valves (DN 10)
- P1, P2 Measuring devices of upstream pressure (accuracy 0,1 mbar)
- R3 Regulator under test
- P3, P4 Measuring devices of downstream pressure (accuracy 0,1 mbar)
- T1 Thermometer (accuracy : 1 °C)
- 1 Calibrated injectors

Figure 5 – Performance tests: calibrated injectors method (principle)

Dimensions in millimetres



Key

- ① Hexagon / Flats 16
- ② Boring diameter
- ③ Root clearing

Injector detail

Injector n°	G 30 at 28 mbar	
	Diameter (mm)	Measured rate (g/h)
1	0,25	16,5
2	0,65	102
3	0,90	241,5
4	1,35	559,5
5	1,85	1 050
6	2,50	1 740
7	3,00	2 400
8	4,00	3 180
NOTE The above values are approximate and given only for guidance.		

Table of injectors

Figure 6 – Performance tests: Example of implementation of the calibrated injectors method

7.3.2 Performance tests

Plotting the regulation curves and/or recording the operational points are carried out under the supply conditions given in Table 6.

Type of gas	Temperatures °C	Pressures bar
Butane	+ 50 ± 2	7,5
	+ 20 ± 5	0,3 - 7,5
	0 ± 2	0,3
LPG	+ 50 ± 2	16
	+ 20 ± 5	0,3 - 16
	- 20 ± 2	0,3
Propane	+ 50 ± 2	16
	+ 20 ± 5	1 - 16
	- 20 ± 2	1

Table 6 – Regulation curves – Supply conditions

7.3.3 Verification of first stage pressure for G.56 connection

The regulator is installed on a valve as described in Figure 7 (valve with $(5 \pm 0,1)$ mm orifice, spring closing force (10 ± 1) N)

With a pilot rate and a test pressure at 4 bar, the pressure between the cylinder valve and regulator is measured to confirm the requirement of 5.3.4.4. 

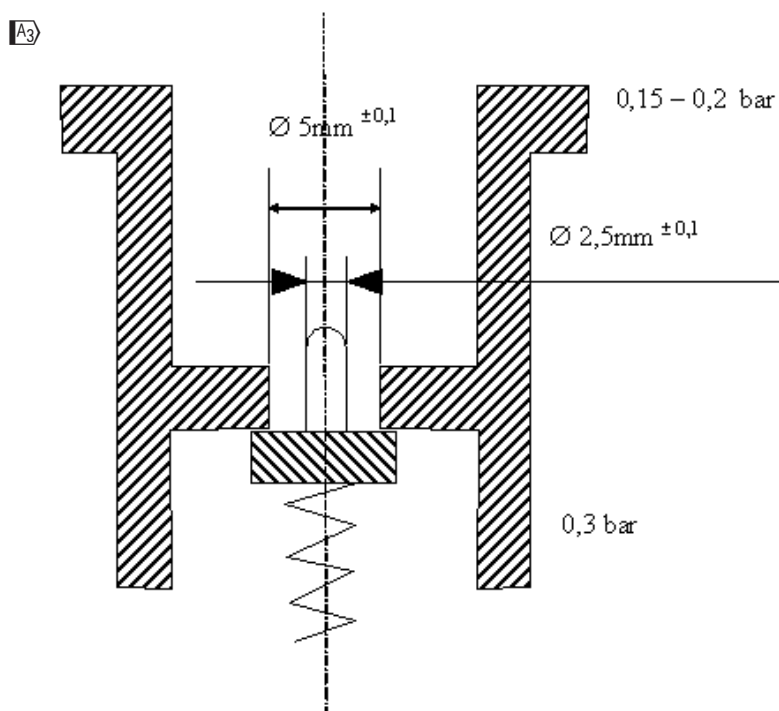


Figure 7 - Testing valve for G.56 connection A3

8 Marking – Packaging – Instructions

8.1 General

The instructions and the information and warnings carried on the regulator and its packaging shall be written in the official language or languages of the destination country of the regulator.

8.2 Marking of the regulator

A1 The regulator shall carry in a durable, compatible with its life time, legible and visible fashion the following information: A1

- manufacturer's name or identification symbol ;
- tradename of the regulator, with marking in letters or figures allowing the identification of the regulator;
- type of gas: butane, propane or LPG;
- nominal outlet pressure, expressed in millibars (mbar);
- guaranteed rate in kilograms per hour (kg/h);
- date of manufacture indicated by the last two figures of the year or identification of the production batch;

NOTE An anticipation period of three months for the beginning of the calendar year of production is allowed.

- where necessary, an arrow to show the direction of the flow of gas ;
- a reference to this standard "EN 12864".

A1 It is recommended to mark, in a durable, compatible with its life time, legible and visible fashion, on the regulator the type of its connections (inlet/outlet) i.e "G.52 / H.1". **A1**

Any additional information given by the manufacturer shall not lead to confusion with the information required by this European Standard.

8.3 Packaging

The regulator shall be protected against the ingress of foreign matter by packaging which shall indicate in a clear and unambiguous manner the type of gas, the nominal outlet pressure and possible limits of use, in particular the type and the size of the cylinder valve to which the regulator may be fitted.

8.4 Instructions for use and maintenance

Each regulator shall be accompanied by instructions intended for the user, which, in addition to the information specified in 8.2, shall specify:

- the manufacturer's address and, if necessary, his agent ;
- the assembly conditions, in particular the preferred position recommended by the manufacturer and the instructions concerning the use of a spanner ;
- the installation, safety and soundness conditions, in particular with regard to the seal and its good condition ;
- the conditions of use, which will mention the following statement: "In normal conditions of use, in order to ensure the correct operation of the installation, it is recommended that this regulator is changed within 10 years of the date of manufacture" ;
- the installation conditions, which will include a statement such as "When the device is to be used outdoors, it shall be positioned or protected against direct penetration by any trickling water" ;
- **A1** if any, a description of the operation of the safety devices (see annexes A and B); **A1**
- the statement "Do not move the cylinder during operation" ;
- for regulators which do not meet the additional requirements of annex D, a warning "This regulator is not for use in caravans and motor caravans";
- **A1** an information relating to the type of the connections inlet/outlet of the regulator;
- a warning on the necessity to check the compatibility with the connections of equipment's fitted upstream (i.e cylinder valve) and downstream (i.e flexible hose) of the regulator. **A1**

If the instructions are printed on the regulator packaging, they shall be easily removable so that they shall be suitable for retention by the user.

Annex A (normative)

Special requirements for regulators fitted with pressure or rate operated safety devices

A.1 Regulators fitted with an overpressure relief valve of a limited flow rate

A.1.1 Definition

An overpressure relief valve is a device (possibly with a vent tube) for the discharge of gas which opens to the outside as soon as the gas pressure reaches a set pressure and closes when the monitored pressure has dropped. The pressure relief valve is closed during normal operation.

It allows, for example, the overpressure in the installation downstream the regulator to be limited in case of a limited failure in closing the regulation sub-assembly or a partial re-liquefaction of gas.

A.1.2 Structural characteristics

The relief valve is integral with the regulator.

It may be part of the pressure sensing sub-assembly of the regulator. The adjustment of the set-point shall be protected against any unauthorized modification and sealed.

For designs where gas is discharged via the pressure sensing sub-assembly, the respective cross sectional area of pressure relief valve, vent hole and connection pipework to the atmosphere shall be chosen so as to meet the requirements of the operating test stated in A.1.4.

If the regulator is intended to be used inside dwellings and if the national regulations require the relief discharge to be directed to the outside, the device shall incorporate a component enabling connection to a relief, for example via an R_p 1/8 internal thread. The discharge orifice shall be protected against rain water. The tube connecting to the atmosphere may also be used as a vent.

A.1.3 Performance characteristics

The opening pressure of the pressure relief valve shall be between twice the nominal outlet pressure and 150 mbar for ambient temperatures between - 20 °C for propane and LPG, 0 °C for butane and + 50 °C.

Regulators designed for the 112 / 148 mbar pressure couple shall not incorporate a pressure relief valve.

A.1.4 Test methods

Only internal soundness tests, behaviour in operation and discharge are verified for the pressure relief valve, all the strength and external soundness tests being carried out in compliance with the requirements for the regulator.

— Internal soundness test before opening

The outlet pressure is increased to 1,8 times the nominal outlet pressure. The test shall be carried out at a room temperature of (20 ± 5) °C. The relief valve shall be sound at that pressure, soundness is considered satisfactory if the value of any leak measured is below 15 cm³/h ;

— Behaviour during operation and discharge

For ambient temperatures of :

- $(-20 \pm 2) ^\circ\text{C}$ for propane and LPG, $(0 \pm 2) ^\circ\text{C}$ for butane;
- $(+20 \pm 5) ^\circ\text{C}$; and
- $(+50 \pm 2) ^\circ\text{C}$,

the outlet pressure is increased up to a value of 150 mbar. The pressure relief valve shall open between twice the nominal pressure and 150 mbar. At the upper limit pressure, the gas rate released shall be between 0,01 m³/h and 0,2 m³/h (air, under the reference conditions) ;

— Soundness after closure

After the opening and subsequent closure of the relief valve, the pressure is reduced to 1,8 times the nominal outlet pressure and soundness is checked under the same conditions as before opening.

A.1.5 Marking

In addition to the information given in 8.2, the regulator fitted with a pressure relief valve of a limited flow rate shall carry the marking "PRV".

A.1.6 Instructions for use and maintenance

In addition to the provisions of 8.4, the instructions shall:

- state that a pressure relief valve of a limited flow rate is included in the regulator ;
- give a clear explanation of the pressure relief valve operation and all necessary information for its installation and use;
- when applicable, specify that vent connection shall be made to the outside according to the national regulations in force.

A.2 Regulators fitted with an overpressure shut off device

A.2.1 Definition

An overpressure shut off device is a device, integral with the regulator, which causes the complete shut off of the gas flow for all the values of pressure defined in A.2.3.

The regulator manual device which enables the restoration of the gas flow is called a re-setting device.

A.2.2 Structural characteristics

A.2.2.1 General

The shut off device may be either integral with the regulator or a permanently attached component to it. In any case, the structural requirements for the shut off device are the same as those for the regulator.

The shut off device shall have its own closing system, its own measuring device and its own measuring pipework which shall not be influenced by the operation of a safety relief valve.

If the re-setting device has no other function and is accessible, it shall be protected against any intervention which could impair operation in the sense of a rise in pressure of the regulator when it is reset.

A.2.2.2 Closing force

The force which ensures the closing of the system from the open position shall be at least equal to the resistance due to:

- the gas pressure, tested at zero pressure and the maximum inlet pressure ;
- the weight of the moving parts, considered in the most unfavourable conditions as specified by the manufacturer ;
- the maximum friction forces considered in the most unfavourable temperature and pressure conditions.

When the closing system is in the closed position, the closing force shall be at least equal to the resistance force plus twice the friction force.

A.2.2.3 Diaphragm strength

The diaphragm shall be designed and/or incorporated in such a way that, after shut off, it withstands a pressure equal to the maximum inlet pressure.

A.2.3 Performance characteristics

The device shall interrupt the gas flow before the pressure measured downstream of the regulator reaches 150 mbar.

Whatever the adjustment chosen, the operating pressure measured may vary within ± 20 mbar due to changes in the temperature or the inlet pressure.

The restoration of the gas flow shall only be possible by manual intervention when the conditions which cause the shut off device to operate have disappeared.

Regulators designed to operate with the pressure couple 112 / 148 mbar shall not be fitted with an overpressure shut off device.

A.2.4 Test methods

A.2.4.1 Test for the components transmitting the closing forces

It is checked, by calculation or test, that components transmitting the closing forces withstand the values specified in A.2.2.2.

A.2.4.2 Test for diaphragm strength

Firstly, a performance test as defined in A.2.4.3 shall be carried out at (20 ± 5) °C.

The diaphragm of the shut off device shall then be subjected to a test pressure equal to the maximum inlet pressure.

This pressure shall be maintained for 10 min.

Another performance test shall then be carried out as defined in A.2.4.3. The values given for the operating pressures shall not vary from the values recorded during the previous test by more than 10 %.

A.2.4.3 Performance test

The first test shall be carried out at (20 ± 5) °C.

The regulator under test is supplied with compressed air through its outlet connection. The supply pressure is increased up to the pressure at which the device energizes.

At the time of the shut off, the pressure shall be less than 150 mbar.

After shut off, check that the gas flow remains cut off at any pressure below the maximum supply pressure.