Form 36

DPC: 18/30372697 DC

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Date: 06 August 2018
Origin: European

Latest date for receipt of comments: 26 September 2018

Project No. 2018/00262

Responsible committee: GSE/24 Dedicated LPG appliances

Interested committees:

Title: Draft BS EN 16129 Pressure regulators, automatic change-over devices, having a maximum regulated pressure of 4 bar, with a maximum capacity of 150 kg/h, associated safety devices and adaptors for butane, propane, and their mixtures.

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at **https://standardsdevelopment.bsigroup.com/**. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex **(e.g. 3.1)**	Paragraph/Figure/ Table/Note	**Type of comment**	**Commend (justification for change) by the MB**	**Proposed change by the MB**	**Secretariat observations on each comment submitted**
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 16129

August 2018

ICS 23.060.40

Will supersede EN 16129:2013

English Version

Pressure regulators, automatic change-over devices, having a maximum regulated pressure of 4 bar, with a maximum capacity of 150 kg/h, associated safety devices and adaptors for butane, propane, and their mixtures

Druckregelgeräte, automatische Umschaltanlagen mit einem höchsten Ausgangsdruck bis einschließlich 4 bar und einem maximalen Durchfluss von 150 kg/h sowie die dazugehörigen Sicherheitseinrichtungen und Übergangsstücke für Butan, Propan und deren Gemische

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 181.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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 CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (prEN 16129:2018) has been prepared by Technical Committee CEN/TC 181 "Dedicated liquefied petroleum gas appliances", the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 16129:2013.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of Regulation 2016/426/EC and of EU Directive 2014/68.

For relationship with Regulation 2016/426/EC and EU Directive 2014/68, see informative Annexes ZA, and ZB.

For installation rules of devices and their possible associated safety devices, reference should be made to national regulations in force in the member countries.

The main changes from the previous version of the standard are:

— Harmonization with pressure equipment directive

— Modification of the wording of both paragraphs 5.3.4.3 and 5.3.4.4 in order to distinguish quick coupling connections from threaded connections

— Reconsideration of the G.56 connection specifications with the possibility to both connect and disconnect in "on" position

— Additional tests regarding to marking durability

— Editorial changes (Definition Butane / Propane / LPG, Performance (FR vs UK versions), marking and instructions)

— Harmonization of pressure definitions and symbols with those given in EN 334

— Rewording of the ZA annex according to the Gas Appliance Regulation 2016/426/EC

1 Scope

This document defines the constructional and operational characteristics, the safety requirements, test methods and the marking of regulators and automatic change-over devices having a maximum regulated pressure of 4 bar, with a maximum capacity of 150 kg/h, for use with butane, propane and their mixtures in the vapour phase.

This document also applies to the safety devices which are included within regulating devices covered by this standard. The characteristics of these safety devices are given in Annexes A and B.

This document also includes the requirements for:

— adaptors for connecting to self-closing valves;

— auxiliary safety devices.

For the purpose of this European Standard:

— regulators and automatic change-over devices are referred to as “regulating devices”;

— regulators, automatic change-over devices and adaptors are referred to as “devices”.

This document does not cover automatic change over devices which do not have a regulating function.

The requirements apply to devices used in locations where the temperature likely to be reached during use is between −20 °C and +50 °C. Additional requirements for devices to be used at temperatures below −20 °C are given in Annex C.

Additional requirements for regulating devices intended to be used in caravans, motor caravans and freshwater boats are given in Annex D.

Additional requirements for regulating devices intended to be used in seawater boats are given in Annex M.

All connections and the countries in which they are used are given in Annexes G and H.

This document defines only specific connections which are not defined in other standards (e.g. EN 15202:2012 for cylinder valve connections).

This document covers:

— Regulating devices fitted with an over-pressure relief valve of a limited flow rate (PRV) (see A.1)

— Regulating devices fitted with an over-pressure shut off safety device (OPSO) (see A.2)

— Regulating devices fitted with a regulated outlet pressure limiter (see A.5)

— Two stage pressure limiting regulating device (see A.6)

which are considered as “safety accessories” and all other devices which are considered as “pressure accessories” according to the Pressure Equipment Directive (2014/68/EU).

Gas pressure regulators according to this document do not have their own source of ignition and therefore are not within the scope of European Directive 2014/34/EU. Any additional component (e.g. proximity switch, travel transducer etc.) should be independently considered in the framework of assemblies as per ATEX Guideline “Guideline on the application of Council directive 94/9/EC of 23rd March 1994 edition June 2009”, Clauses 3.7.3 and 3.7.4.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

<std>EN 437:2003+A1:2009, *Test gases - Test pressures - Appliance categories*</std>

<std>EN 549:1994, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*</std>

<std>EN 561:2002, *Gas welding equipment - Quick-action coupling with shut-off valves for welding, cutting and allied processes*</std>

<std>EN 1563:2011, *Founding — Spheroidal graphite cast irons*</std>

<std>EN 1774:1997, *Zinc and zinc alloys - Alloys for foundry purposes - Ingot and liquid*</std>

<std>EN 10226-1:2004, *Pipe threads where pressure tight joints are made on the threads - Part 1: Taper external threads and parallel internal threads - Dimensions, tolerances and designation*</std>

<std>EN 10226-2:2005, *Pipe threads where pressure tight joints are made on the threads - Part 2: Taper external threads and taper internal threads - Dimensions, tolerances and designation*</std>

<std>EN 12164:2016, *Copper and copper alloys - Rod for free machining purposes*</std>

<std>EN 12165:2016, *Copper and copper alloys - Wrought and unwrought forging stock*</std>

<std>EN 12420:2014, *Copper and copper alloys - Forgings*</std>

<std>EN 12844:1998, *Zinc and zinc alloys — Castings — Specifications*</std>

<std>EN 15202:2012, *LPG equipment and accessories — Essential operational dimensions for LPG cylinder valve outlet and associated equipment connections*</std>

<std>EN 60695-11-10:2013, *Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods*</std>

<std>EN ISO 178:2011, *Plastics — Determination of flexural properties (ISO 178)*</std>

<std>EN ISO 180:2001, *Plastics — Determination of Izod impact strength (ISO 180)*</std>

<std>EN ISO 527-1:2012, *Plastics - Determination of tensile properties - Part 1: General principles (ISO 527-1:2012)*</std>

<std>EN ISO 527-2:2012, *Plastics - Determination of tensile properties - Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2:2012)*</std>

<std>EN ISO 527-3:1995, *Plastics - Determination of tensile properties - Part 3: Test conditions for films and sheets (ISO 527-3:1995)*</std>

<std>EN ISO 527-4:1997, *Plastics - Determination of tensile properties - Part 4: Test conditions for isotropic and orthotopic fibre-reinforced plastic composites (ISO 527-4:1997)*</std>

<std>EN ISO 527-5:2005, *Plastics — Determination of tensile properties – Part 5: Test conditions for unidirectional fibre-reinforced plastic composites Part 5: Test conditions for unidirectional fibre-reinforced plastic composites*</std>

<std>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)*</std>

<std>EN ISO 4892-3:2016, *Plastics - Methods of exposure to laboratory light sources - Part 3: Fluorescent UV lamps (ISO 4892-3:2016)*</std>

<std>EN ISO 9227:2017, *Corrosion tests in artificial atmospheres - Salt spray tests (ISO 9227:2017)*</std>

<std>ISO 565:1990, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*</std>

<std>ISO 7005-1:2011, *Pipe flanges — Part 1: Steel flanges for industrial and general service piping systems*</std>

<std>ISO 7005-2:1998, *Metallic flanges — Part 2: Cast iron flanges*</std>

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

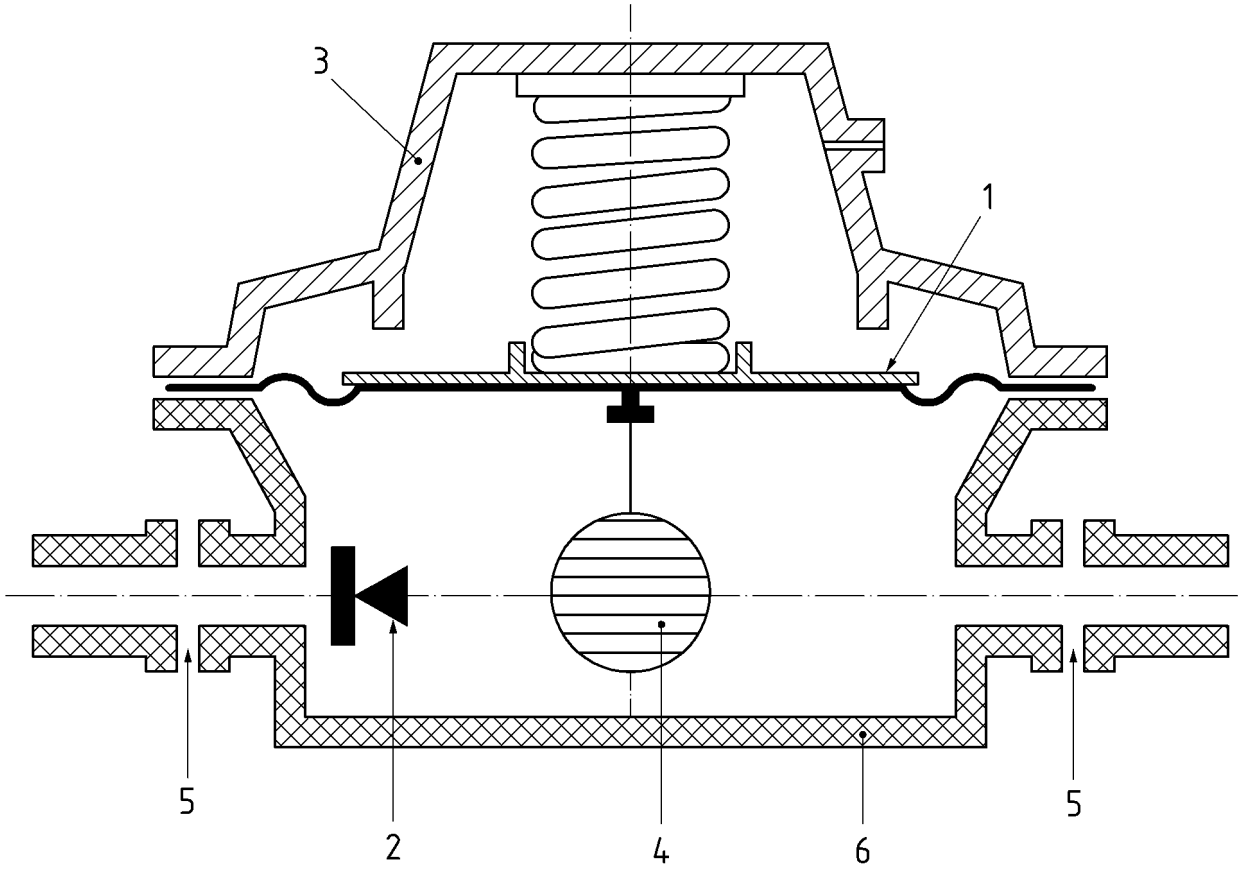
ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 General terms and definitions

3.1.1
regulator
device which maintains a regulated pressure within preset limits, for a defined range of upstream pressure, flow rate and temperature

Note 1 to entry: Figure 1 gives the terminology used in this standard. The design shown is only an example.



Key

1 pressure sensing subassembly (diaphragm and plate)

2 regulation subassembly (seat and valve pad)

3 back pressure subassembly (cover, vent, spring and spring adjustment)

4 mechanical linkage subassembly (levers, linkages)

5 connection subassembly (inlet and outlet connections)

6 body

Figure 1 — Principal parts of a regulator

3.1.2
automatic change over device
regulator which maintains the gas supply continuity by automatically using gas from a "reserve" cylinder or series of cylinders when the supply pressure from a "service" cylinder or series of cylinders preselected by the user drops below a defined value

3.1.3
integral two stage automatic change over device
regulating device combining an automatic change over device and a regulator

3.1.4
regulating device
regulator or automatic change over device or combination of both

3.1.5
adaptor
device which connects another device (e.g. hose) directly to a self-closing cylinder valve and may incorporate an "on/off" or other function but not a pressure regulating function

3.1.6
fixed regulating device
regulating device whose regulated pressure is adjusted by the manufacturer and fixed and whose adjustment cannot be modified by the user

3.1.7
adjustable regulating device
regulating device whose regulated pressure may only be modified by a competent person at the time of installation or during maintenance; it is then fixed

3.1.8
variable regulating device
regulating device whose regulated pressure may be modified by the user with simple manipulation between two fixed limits

3.1.9
automatic change over device system "kit"
system of several regulators designed and adjusted in such a way as to operate like an automatic change over device as in 3.1.2

3.1.10
quick coupling
connection system which allows the fitting of a regulator or adaptor to a cylinder valve without a threaded connection and without using tools

3.1.11
manual closing device
device used on regulators or adaptors for closing the gas flow which requires an intentional manual action (for example on a lever or selector)

3.1.12
Self-closing valve
device fixed on the gas cylinder allowing the automatic shut off of the gas flow, by simple disconnection of the regulator or adaptor from the cylinder valve

3.1.13
valve pad
component part of the regulation subassembly which ensures soundness between the part of the regulator at supply pressure and the part of the regulator at regulated pressure, when the supply pressure is greater or equal to the lock-up pressure

3.1.14
auxiliary safety device
safety device with a separate body which is directly and factory fitted to a regulating device

3.1.15
sealing
any arrangement of any component, for example an adjuster, such that any interference likely to change its setting causes the breaking of the component or sealing material making the interference apparent

3.1.16
nominal diameter
DN
numerical designation common to all the components of the same pipework other than those named by their external diameter or by the size of the thread

Note 1 to entry: It is a whole number used as a reference and related approximately to the manufacturing dimensions.

Note 2 to entry: For PED consideration the DN corresponds to the inlet connection (types G in Table 4)

3.1.17
freely rotating outlet connection
integral outlet connection designed to fully rotate around a defined axis

3.1.18
gas container
gas storage vessel such as gas cylinder, gas cartridge or tank

3.1.19
fresh water boat
boat used only on inland waterways where the water does not normally contain salt (e.g. lakes, canals, non-tidal parts of a river)

3.1.20
sea water boat
boat that may be used in salt water

3.2 Terms and definitions concerning gas and air for tests

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 volumetric mass in the gas phase equal to 2,45 kg/m^3 at reference condition 15 °C and 1 013,25 mbar

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 and at most equal to 16 bar, of mean volumetric mass in the gas phase equal to 1,85 kg/m^3 at reference condition 15 °C and 1 013,25 mbar

Note 1 to entry: Reference propane is that defined as G 31 in EN 437:2003+A1:2009.

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 and at most equal to 16 bar, of mean volumetric mass in the gas phase equal to 2,12 kg/m^3 at reference condition 15 °C and 1 013,25 mbar

3.2.4
reference air
dry air having a volumetric mass of 1,225 kg/m³ in the reference conditions (15 °C and 1 013,25 mbar)

3.3 Terms and definitions concerning pressures

The values of pressures given in the text are to be considered as gauge pressure and are expressed in bar (bar) or millibar (mbar).

3.3.1
supply pressure
p
value of the gas pressure measured at the device inlet

Note 1 to entry: For PED consideration the maximum value of *p* corresponds to PS

3.3.2
regulated pressure
value of the gas pressure measured at the regulating device outlet

3.3.3
nominal regulated pressure
p_d
value of the regulated pressure corresponding:

— either to the "normal pressure" for appliances as defined in EN 437:2003+A1:2009;

— either to the normal pressure for appliances operating outside the scope of EN 437:2003+A1:2009;

— or to an intermediate pressure allowing for the supply of a second or third stage regulator under the conditions fixed

3.3.4
lock up pressure
p_o
maximum pressure obtainable at no flow for all values of the supply pressure given in Clause 6

3.3.5
minimum pressure
p_{Mg}
minimum value of the regulated pressure supplied by the regulating device for all values of the supply pressure and all values of the flow rate

3.3.6
maximum pressure
p_{Mp}
maximum value of the regulated pressure supplied by the regulating device for all values of the supply pressure and all values of the flow rate between the closing area or pilot flow rate and the guaranteed flow rate

3.3.7
minimum intervention pressure of a limiter
p_{lim}
pressure below which a limiter does not operate

3.3.8
change over nominal pressure
p_{di}
value of the nominal regulated pressure of the changeover function, in the case of an integral two stage automatic change over device

3.3.9
supply-reserve indicator
indicator for automatic change over device showing which cylinder(s) is (are) in use

3.4 Terms and definitions concerning flow rates

3.4.1
guaranteed flow rate
M_g
mass flow rate of gas that can be obtained, whatever the value of the supply pressure

Note 1 to entry: The guaranteed flow rate is expressed in grams per hour (g/h) or kilograms per hour (kg/h).

3.4.2
pilot rate
M_p
gas flow rate (15 g/h) of a pressure regulating device up to a maximum guaranteed flow rate of 4 kg/h and a nominal regulated pressure complying with EN 437:2003+A1:2009, necessary for the supply of the ignition system of the appliance, generally called pilot

Note 1 to entry: The pilot flow rate is expressed in grams per hour (g/h).

3.4.3
closing area
for regulating devices over 4 kg/h or for pressures not complying with EN 437:2003+A1:2009, range between 0 % and 5 % of the guaranteed flow rate

4 Types of regulating devices

4.1 Introduction

There are three types of pressure reduction:

a) 1 – Single stage installation:

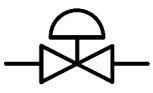


Figure 2 — Single stage installation

1) the supply pressure of the regulating device is equal to the pressure of the gas supply container(s);

2) the regulating device supplies a gas appliance.

b) 2 – Two stage installation:

Figure 3 — Two stage installation

1) the supply pressure of the first regulating device is equal to the pressure of the gas supply container(s);

2) the supply pressure of the second regulating device depends on the regulated pressure of the first regulating device and on the pressure losses in the intermediate line;

3) the second regulating device supplies a gas appliance.

c) 3 – Three stage installation:

Figure 4 — Three stage installation

1) the supply pressure of the first regulating device is equal to the pressure of the gas supply container(s);

2) the supply pressure of the second and the third regulating devices depends on the regulated pressure of the upstream regulating device and on the pressure losses in the intermediate upstream line;

3) the third regulating device supplies a gas appliance.

For two and three stages installations and for interchangeability of regulating devices, the recommended nominal value of intermediate regulated pressures (p_d) are the following: 3 – 1,5 – 1 – 0,75 – 0,5 – 0,4 – 0,3 – 0,15 – 0,075 bar. These settings accommodate a pressure loss of up to 15 % in the interstage pipework.

4.2 Regulating device with a nominal regulated pressure specified by EN 437:2003+A1:2009

Regulating devices with a nominal regulated pressure specified by EN 437:2003+A1:2009 shall be a fixed regulating device (see 3.1.6).

4.3 Regulating device with a nominal regulated pressure not specified by EN 437:2003+A1:2009

These regulating devices can be of the fixed, variable or adjustable type.

5 Constructional characteristics

5.1 General

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

The design shall take into account the:

— minimum supply pressure *p*;

— maximum supply pressure *p* (PS according to PED, if applicable);

— nominal regulated pressure, for regulating devices;

— operating temperature range.

Safety devices and thermal shut off system, if any, incorporated into or fitted to a device covered by this European Standard, shall comply with constructional characteristics, performance characteristics, markings and instructions requirements of respectively Annex A and B.

Any safety device shall not be influenced by the operation of any other safety device.

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

Parts shall be clean internally and externally.

Holes for screws, pins, etc., intended for the assembly of the device components and for their fixing, shall not open into the gas ways. The thickness of the material 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 device, shall be permanently closed metallically.

If the device incorporates a pressure test point or a pressure gauge, the diameter of the hole through the body of the device or the pressure test point shall not exceed 1,5 mm.

Where pressure tight joints are made on threads they shall be in accordance with EN 10226-1:2004, EN 10226-2:2005.

NOTE Compliance with ANSI B1.20.1 (NPT) can be an alternative to the above requirement .

Components capable of modifying the operation of the regulating device shall not go out of adjustment and shall be sealed, except for adjustable and variable regulators parts used to adjust the regulated pressure. In particular, the regulating device body and cover shall be assembled in such a way that separation is not possible without permanent damage to these parts or the sealing.

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

Any manual closing device shall close clockwise.

For variable regulating devices:

— The adjustment range shall be limited by two fixed stops; at zero flow (lock up) it shall not be possible to reduce the regulated pressure below 5 mbar or 1 % of the maximum regulated pressure, whichever the greatest, for any supply pressure and in any orientation of the device.

— In order to reproduce the adjustment, a marking device using numbers may be used (the larger figures corresponding to the greater pressures) or a gauge may be installed to indicate the regulated pressure.

— It shall not be possible to remove the adjuster.

— When adjustment is carried out by rotation, the greater regulated pressures shall be obtained by rotation clockwise.

5.2 Materials

5.2.1 General

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 declared when the device is installed and used in accordance with the instructions. Under these conditions, all components shall withstand the mechanical, chemical and thermal conditions to which they may be submitted during their use, when operating under normal conditions.

The rotating threaded parts of connections, whether they are male or female, shall be made of brass or steel. The materials and manufacturing processes used shall not cause subsequent risk of stress corrosion.

Fixed threaded parts of connections shall be made of metallic material. Non-threaded fixed parts of connections may be made of non-metallic (thermoplastic or thermal setting) material, provided that they comply with the tests specified in Annex E.

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

5.2.2 Body

The body shall be made of metallic material. However, for regulators only, having a regulated pressure of up to 200 mbar and of a flow rate less than 4 kg/h, directly fitted onto the cylinder using a quick coupling with self-closing valve and non-threaded outlet connection, non-metallic (thermoplastic or thermal setting) materials may be used if the characteristics meet the requirements of this standard as well as the complementary special requirements defined in Annex E.

5.2.3 Internal parts

Internal parts and parts of the cover not retaining the pressure (except for connections) may be made of non-metallic (thermoplastic or thermal setting) materials provided that they meet the following requirements:

— the materials used shall meet the requirements of Annex E;

— the whole device shall withstand the various tests specified in the body of the standard.

Any filter shall be manufactured from a corrosion and gas resistant material,

5.2.4 Zinc alloys

Zinc alloys shall only be used if they are ZL3 (Zn Al4) or ZL5 (Zn Al4 Cu1) in accordance with EN 1774:1997.

Zinc alloys casted parts shall only be used if they are ZP3 (Zn Al4) or ZP5 (Zn Al4 Cu1), in accordance with EN 12844:1998.

5.2.5 Brass

Leaded brass shall be CW611N, CW614N or CW617N in accordance with EN 12420:2014, EN 12164:2016 or EN 12165:2016.

Hot stamped brass shall be non-porous and suitable for machining or other processes. Components produced from stamping brass shall not exhibit cold shuts, also known as folds, or surface defects.

Sand-cast brass shall not be used.

Cold drawn brass rods shall only be used for machining after adequate testing for internal cracking, porosity or other inclusions and shall be heat-treated if required.

5.2.6 Steel and cast iron

Components made from stainless steel shall contain not less than 17 % chromium, and not less than 7 % nickel.

Spheroidal graphite cast iron shall comply with EN 1563:2011, with an elongation at fracture of more than 18 %.

Other ductile irons or cast irons shall not be used. Castings shall be free from inclusions and surface defects, which could adversely affect the strength, leak tightness or performance of the device or fitting.

Steel internal parts shall be protected against corrosion.

5.2.7 Elastomeric parts

Elastomeric components shall comply with the requirements defined for material as defined in EN 549: 1994, at least within the temperature range between −20 °C and +50 °C (class A2), including, for diaphragms, the requirements concerning resistance to ozone. In addition, reinforced materials shall comply with the additional requirements defined in Annex F.

Additional elastomeric seals complying with EN 549:1994or additional sealant complying with EN 751-1, EN 751-2 or EN 751-3 may be used.

5.3 Special requirements

5.3.1 Pressure sensing subassembly (regulating devices only)

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

The pressure sensing subassembly shall be designed and manufactured so that the device performance complies with the requirements of Clause 6 in the mounting positions of the regulating device installed as specified in the instructions.

Whatever the position taken by the diaphragm, and whatever the position of the adjusting system for adjustable and variable regulating devices, the spring shall not be fully compressed.

5.3.2 Regulation subassembly (regulating devices only)

At lock-up, the regulation subassembly shall act as a seal between the supply pressure and the regulated pressure. It shall not move unless required to allow gas to pass.

The soundness and function of the regulation subassembly shall not be affected by the tensile strength and bending tests on the connections.

After the test defined in 7.2.4, the valve pad as defined in 3.1.13 shall not be displaced or come out of its housing.

5.3.3 Back pressure subassembly (regulating devices only)

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

Vent holes shall be

— mounted or placed in such a way that the risks of accidental blockage are reduced and to minimize the penetration of rain water, particularly if their cross section is greater than 3 mm^2;

— constructed in such a way that accidental damage to the internal parts of the regulating device, caused by an object inserted through the vent hole, may be reasonably prevented,

when the regulating device is installed in accordance with the installation instructions.

For adjustable regulating devices, after adjustment of the pressure made at the time of installation, it shall be possible to lock and seal the adjuster.

5.3.4 Connection subassembly

5.3.4.1 Filters

First and single stage regulating devices with a cylinder valve connection shall be fitted with an integral filter unless the instructions states that the regulating device shall not be fitted on a gas cylinder.

For first and single stage regulating devices without a cylinder valve connection but intended for use with mobile cylinders where the filter is not integral, the instructions shall state the location of a separate upstream filter.

For other types of regulating devices, the installation instructions shall state the requirements relating to the installation of an upstream filter.

The filter shall be situated on the regulating devices inlet upstream of the valve pad. The filter mesh shall not exceed the recommended dimensions for the 125 opening in accordance with ISO 565:1990, or exceed 0,14 mm diameter in case of perforated sheet.

5.3.4.2 Types of connections

The connections shall be one of the following types:

— For inlet threaded: one of the types from G.1 to G.49.

— For inlet non-threaded nor flanged: one of the types from G.50 to G.99.

— For outlet threaded: one of the types from H.1 to H.49.

— For outlet non-threaded nor flanged one of the type from H.50 to H.99.

— For inlet and outlet: flanged in accordance with ISO 7005-1:2011 and ISO 7005-2:1998, the PN rating shall match the application pressures.

NOTE A range of 49 numbers has been reserved for each type of connection. However, this document does not use all the numbers in this range.

The equivalent dimensions for threaded and flanged connections are given in Table 1.

Table 1 — Connection dimensions

Nominal diameter DN	Thread designation according to EN 10226-1:2004, EN 10226-2:2005 or EN ISO 228-1:2003 or NPT (ANSI B1.20.1)	Nominal dimension of flanges according to ISO 7005-1:2011 or ISO 7005-2:1998
6	1/8	6
8	1/4	8
10	3/8	10
15	1/2	15
20	3/4	20
25	1	25
32	1 1/4	32
40	1 1/2	40
50	2	50

Tables G.2, G.3 and H.2, H.3 show, the inlet and outlet connections used in the various countries. Other types will only be acceptable if they are not interchangeable with the connections specified in Annexes G and H of this European Standard and providing their assembly gives an equivalent degree of safety.

The connection shall be designed in such a way that it ensures the soundness function of the connection under the assembly conditions specified in the instructions. The instructions for maintenance shall specify the use of a spanner when this is necessary for fitting or removing the device.

EN 15202:2012 lists cylinder valve connections where it is possible to connect together but which, when connected, may not be sound or secure in some operating conditions or orientations.

Threaded connections where the seal is made on the thread (G.14, G.18, G.23, H.7, H.11 and H.19) may be used up to a nominal diameter DN 50.

Parallel internal connections threads (G.14 and H.7) in zinc or aluminium are permitted up to and including DN 10 only.

If the connection incorporates a seal, the seal shall:

— be of a distortable material;

— be mounted in such a way that it cannot fall off;

— be easily replaced by a new seal, if necessary, without using special tools and in case of a nut its backward movement shall be sufficient to expose the seal completely;

— comply with Annexes G and H or alternative Annex N;

— be fixed onto the device so as to be subject to all the tests in this standard.

The device shall have only one outlet connection, except that for outdoor use, a cylinder mounted regulator can be fitted with multiple outlets; in this case, it shall comply with the additional requirements of Annex K.

5.3.4.3 Quick coupling devices

It shall not be possible to connect or disconnect the device from the cylinder valve with the gas control in the "on" position. By exception both connexion and disconnection may be possible with the gas control in the "on" position for the G.56 connection.

Only intentional disconnection shall be possible, even when operating the gas opening or closing device.

The open and closed positions shall be marked and clearly visible in the position of use..

When turning off the gas and disconnecting the device 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 device can be disconnected.

External soundness shall be maintained during the operation of fitting or removing the device on the quick coupling valve. Only the escape of the volume of gas contained in the connection is allowed during disconnection.

The closing elements of a quick coupling cylinder valve shall not be used as the regulation subassembly for regulating cylinder pressure directly to the normal pressure for appliances as defined in EN 437:2003+A1:2009.

Regulating devices using the G.56 connection may be designed to have a maximum pressure of 4 bar between the cylinder valve and regulating device. 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 7.3.4.

5.3.4.4 Devices for fitting to a self-closing valve

Devices intended to be fitted to a self-closing valve by means of a thread shall include a manual system of opening and closing of the gas supply at the inlet of the device, if such a feature does not exist on the valve.

The open and closed positions shall be marked and clearly visible in the position of use.. When this is a needle valve, this marking may be an arrow indicating the closing direction (see Figure 5).

Figure 5 — Example of marking

External soundness shall be maintained during the operation of fitting or removing the device on the valve, even if the manual gas opening feature has been left accidentally in the open position. Only the escape of the volume of gas contained in the connection is allowed during disconnection. If this requirement cannot be met, fitting and removing shall only be possible if the gas valve is in the closed position.

The closing elements of a self-closing cylinder valve shall not be used as the regulation subassembly for regulating cylinder pressure directly to the normal pressure for appliances as defined in EN 437:2003+A1:2009.

5.3.5 Change over devices

5.3.5.1 Supply-reserve indicator

A supply-reserve indicator shall be part of the automatic change over device, either integrated or independent.

In any case it shall correspond to the automatic change over device used, in accordance with the instructions for use.

5.3.5.2 Selector for the service cylinder

The automatic change over device shall be fitted with a selector, which is fixed by mechanical means to avoid unintentional dismantling. This selector shall not incorporate any sharp part or sharp edge. It shall be designed with fixed stops at the limit of movement.

The selector shall have an indication arrow or other mark to show which cylinder has been selected as the service cylinder.

5.3.5.3 Non-return Valves

To prevent the leakage of gas from the inlet connection when changing cylinders, the automatic change-over device shall be fitted with non-return valves on each inlet.

Under the test conditions of 7.3.5, the leak shall not exceed 3 500 cm^3/h of air.

5.4 Mechanical strength

5.4.1 Resistance to impact

If the device is designed to be connected directly onto a cylinder valve, it shall be capable of resisting a fall on hard ground under the conditions defined in 7.2.1. After this test, the device shall meet the requirements for soundness and performance as required by 5.5 and Clause 6.

5.4.2 Resistance to pressure

5.4.2.1 The device shall be capable of resisting the pressure test described in 7.2.2.2 without rupture.

When the device is a regulating device, it shall also be capable of resisting the pressure test described in 7.2.2.3, without the diaphragm rupturing or slipping out of its fixing.

After these tests, the device shall meet the soundness requirement specified in 5.5.

5.4.2.2 A regulating device shall be capable of resisting the pressure test described in 7.2.2.4 without rupturing of the body/cover assembly. Distortion or permanent deformation is permitted.

5.4.3 Strength of connections

5.4.3.1 Devices to be fitted on a cylinder

5.4.3.1.1 Strength of the connection/regulator assembly

The fixing of the inlet connection onto the device body, whether it is of the threaded or non-threaded type or in one piece, shall withstand the following tests, under the conditions defined in 7.2.3 (see Table 15):

— a torque of at least 30 N·m in both directions;

— a tensile strength test of 2 000 N.

The fixing of the outlet connection onto the device body, whether it is of the threaded or non-threaded type or in one piece, shall resist the following tests, under the conditions defined in 7.2.3 (see Table 16):

a) for non-threaded hose connections:

   1) a torque of at least 30 N·m in one direction (verification not required for freely rotating connections);

   2) a bending moment of 10 N·m;

   3) a tensile strength test of 2 000 N;

b) threaded unions:

   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·m;

   3) a tensile strength test of 2 000 N.

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 3 and 5 in accordance with Table 14 (see 7.1.4).

No distortion or breakage shall be evident and the devices shall comply with the soundness test described in 5.5 after application of the forces.

5.4.3.1.2 Strength of regulator assembly when fitted onto a cylinder valve

The device when installed as indicated in the installation instructions, shall resist the following tests, under the conditions defined in 7.2.3 (see Table 17):

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, devices with screwed unions intended to be vertically mounted onto the cylinder valve, shall resist a torque of at least 20 N·m in the device 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, for quick coupling connections only.

The mechanical strength required shall be ensured for all the positions of fixing of the device (as indicated in the installation instructions) onto the cylinder.

No distortion or breakage shall be evident and the devices shall comply with the soundness test described in 5.5 after application of the forces.

5.4.3.2 Devices not to be fitted on a cylinder

The device shall be subjected to the tests a), b) and c) below under the conditions defined in 7.2.3. After the tests, there shall be no distortion or breakage and the device shall remain sound according to 5.5.

a) a torque in both directions as specified in Table 2 for threaded and flanged connections;

Table 2 — Torque applicable to threaded connections and flanged connections

DN	Torque for cylindrical threaded connections with elastomer joint N·m	Torque for other threaded connections and flanges N·m
6	15	20
8	20	30
10	35	50
15	50	90
20	85	110
25	100	135
32	125	165
40	130	175
50	140	185

NOTE 1 See Table 4 for corresponding DN values for connections defined in Annexes G and H.

b) a bending moment as given in Table 3.

Table 3 — Bending moment to be applied according to DN

DN	Bending moment (N·m)
6	25
8	35
10	70
15	105
20	225
25	340
32	475
40	610
50	1 100

NOTE 2 See Table 4 for corresponding DN values for connections defined in Annexes G and H.

For automatic change over devices an additional test of a bending moment created by a force of 400 N directed downwards shall be applied at the base of the inlet connection.

Table 4 — Types of connections and corresponding DN

Type of connection	DN
G.1	10
G.2	10
G.3	6
G.4	8
G.5	6
G.6	6
G.7	10
G.8	8
G.9	10
G.10	10
G.11	6
G.12	8
G.13	10
G.14	6 to 50 according to Table 1
G.15	DN of the coupling nut thread

Type of connection	DN
G.17	20
G.18	6 to 50 according to Table 1
G.19	6
G.20	8
G.21	6
G.22	DN of the coupling nut thread
G.23	6 to 50 according to Table 1
G.24	15
G.25	6
G.26	15
G.27	25
G.28	20
G.32	6
G.33	8
G.34	20

Type of connection	DN
H.1	10
H.2	10
H.3	15
H.4	8
H.5	15
H.6	10
H.7	6 to 50 according to Table 1
H.8	DN of the coupling nut thread
H.9	DN of the coupling nut thread
H.10	DN of the coupling nut thread
H.11	6 to 50 according to Table 1
H.12	25
H.13	50
H.14	20
H.15	32

Type of connection	DN
G.16	DN of the coupling nut thread

Type of connection	DN
G.35	10
G.36	10
G.37	DN of the internal thread

Type of connection	DN
H.16	8
H.17	8
H.18	20
H.19	6 to 50 according to Table 1
H.20	10
H.21	25
H.22	DN of the internal thread

c) a tensile strength test of 2 000 N (see Table 15).

For devices with union connection the fixing of the union connection onto the regulator body, whether it is of the threaded or non threaded type or in one piece, shall withstand the following tests, under the conditions defined in 7.2.3:

— a torque of at least 30 N·m in both directions (see Table 15);

— a bending moment created by a force of 400 N directed upwards and whose application point is at the base of the opposite connection (see Table 17);

— a tensile strength test of 2 000 N (see Table 15).

5.5 Soundness

The device shall be sound for all pressures and conditions defined in 7.2.5.1.

Soundness is considered to be satisfactory if the value of the leak measured is less than 15 cm^3/h for devices with a nominal diameter of less than or equal to DN 15 and 30 cm^3/h for devices with a nominal diameter greater than DN 15.

For devices with quick coupling connections, if the device can be mounted in different positions, soundness of the connection shall be ensured in all positions. If the device has a rotating joint this shall be sound in all positions including during rotation.

A manual closing device shall not leak under the test conditions described in 7.2.5.2.

5.6 Mechanical endurance

5.6.1 Regulators

Under the conditions defined in 7.2.6.1 and 7.2.6.2, the regulator shall:

— resist 50 000 cycles of opening/lock up of the valve pad without mechanical failure;

— remain sound in accordance with 5.5;

— meet the performance requirements of Clause 6.

5.6.2 Automatic change over devices

Under the conditions defined in 7.2.6.1 and 7.2.6.3, the automatic change over device shall:

— resist 25 000 cycles on each side of opening/ lock up of the valve pad without mechanical failure;

— remain sound in accordance with 5.5;

— meet the performance requirements of Clause 6.

5.6.3 Devices fitted with a manual closing device

Under the conditions defined in 7.2.6.1 and 7.2.6.4, the device shall:

— resist 5 000 cycles of opening and closing of the manual closing device;

— remain sound in accordance with 5.5.

5.6.4 Quick coupling device

Under the conditions defined in 7.2.6.1 and 7.2.6.5, the quick coupling device shall:

— resist 5 000 cycles of disconnection/connection to the valve for which it is designed;

— remain sound in accordance with 5.5.

5.6.5 Device with freely rotating outlet connection

Under the conditions defined in 7.2.6.1 and 7.2.6.6, the connection shall:

— resist 2 500 cycles of rotation;

— remain sound in accordance with 5.5.

5.7 Resistance to humidity changes

Any material likely to be altered by humidity which may subsequently affect performance or life expectancy shall be submitted to a test 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 device (including any mounting components e.g. wall brackets) is subjected to the tests defined in 7.2.8.

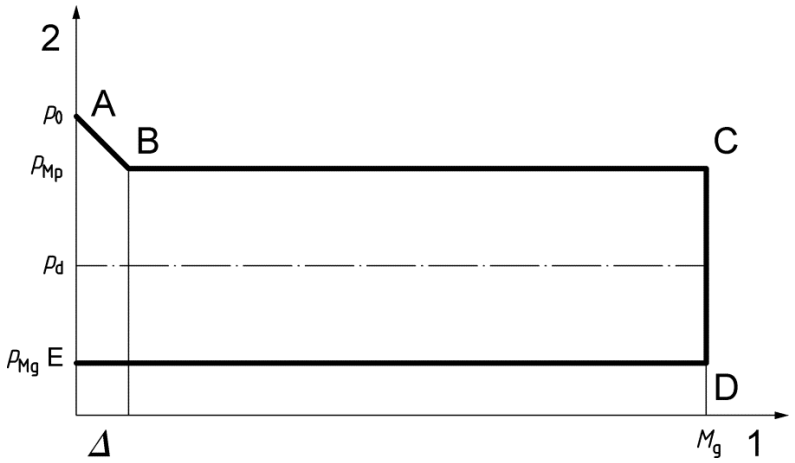
After this test, a visual examination shall reveal no corrosion of parts capable of impairing correct operation (salt deposit resulting from the test is not taken into account). Soundness and performance characteristics (when applicable) shall remain in accordance with the requirements 5.5 and 5.6 respectively.

6 Performance characteristics

6.1 General

Under the test conditions specified in 7.3, the regulating devices operation curves obtained using the method specified in 7.3.2 shall lie within the perimeter ABCDE (see Figure 6) defined by the pressures given in the following tables and the declared guaranteed flow rate. There shall be no audible noise due to unintended vibration.

For automatic change over devices, the above requirement shall be met for both "service" and "reserve" selector positions and for both inlet connections.



Key

Δ = Pilot rate M_p for regulating devices with a regulated pressure specified in EN 437:2003+A1:2009 and a guaranteed flow rate (M_g) less than or equal to 4 kg/h

Δ = 5 % of M_g in all other cases.

1 flow rate (g/h or kg/h)

2 regulated pressure (mbar or bar)

Figure 6 — Operating limits allowed

6.2 Regulators

6.2.1 Supply and regulated pressures for regulators to be used on installations where the final pressure is to EN 437:2003+A1:2009

6.2.1.1 Single stage installation with a fixed regulator

Supply and regulated pressures are given in Table 5.

Table 5 — Pressure characteristics of the regulator based on nominal pressures given in EN 437:2003+A1:2009

Gas	Regulator supply pressure	Regulator regulated pressure mbar				Maximum downstream installation pressure loss	Appliance supply pressure[a] mbar			Appliance categories[a]
	bar	pd	pMg	pMp	p0	mbar	pn	$p$min	$p$max	
Butane	0,3 to 7,5	29	22	35	40	2	29 (28–30)	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–	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	30	27	35	40	2	30	25	35	3P
Propane	1 to 16	37	27	45	50	2	37	25	45	3P and 3+
Propane	1 to 16	37	30	45	50	5	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+

[a] Data taken from EN 437:2003+A1:2009.

6.2.1.2 Two stage installation with fixed or adjustable regulators

6.2.1.2.1 First regulator, fixed or adjustable

Supply pressure:

Butane: minimum: 0,3 or p_d + 0,2 if greater – maximum: 7,5 bar

LPG: minimum: 0,3 or p_d + 0,2 if greater – maximum: 16 bar

Propane: minimum: 1 or p_d + 0,5 if greater – maximum: 16 bar

Regulated pressure:

Table 6 — Regulated pressure

Definition of the pressure		Numerical values given for information							
Nominal regulated pressure (p_d)		3	1,5	1	0,75	0,5	0,4	0,3	0,15
Maximum lock up pressure (p_0)	= p_d × 1,3	3,90	1,95	1,30	0,98	0,65	0,52	0,39	0,20
Maximum pressure (p_{Mp})	= p_d × 1,2	3,60	1,80	1,20	0,90	0,60	0,48	0,36	0,18
Minimum pressure (p_{Mg})	= p_d × 0,7	2,10	1,05	0,70	0,53	0,35	0,28	0,21	0,11
Minimum pressure after limiter	= (p_d × 0,7) – (p_d x 0,3)	1,2	0,6	0,4	0,3	0,2	0,16	0,12	0,06

6.2.1.2.2 Last regulator

Supply pressures:

— Minimum and maximum supplied pressures shall be declared.

— The minimum declared pressure shall be equal or less than those given in Table 7.

— The maximum declared pressure shall be equal or greater than those given in Table 7.

Table 7 — Supply pressures

Definition of the pressure		Numerical values given for information							
Nominal regulated pressure of the upstream regulator (p_d)		3	1,5	1	0,75	0,5	0,4	0,3	0,15
Maximum pressure	= p_d × 1,3	3,90	1,95	1,30	0,98	0,65	0,52	0,39	0,20
Minimum pressure (With 15 % pressure loss)	= p_d × 0,7 × 0,85	1,79	0,89	0,60	0,45	0,30	0,24	0,18	0,09
Minimum pressure (With limiter and 15 % pressure loss)	= ((p_d × 0,7) – (p_d x 0,3)) × 0,85	1,02	0,51	0,34	0,26	0,17	0,14	0,10	0,05

Regulated pressure, see Table 5.

6.2.1.3 Three stage installation with fixed or adjustable regulators

6.2.1.3.1 First regulator

Supply pressure:

Butane: minimum: 0,3 or p_d + 0,2 if greater – maximum: 7,5 bar

LPG: minimum: 0,3 or p_d + 0,2 if greater – maximum: 16 bar

Propane: minimum: 1 or p_d + 0,5 if greater – maximum: 16 bar

Regulated pressure:

Table 8 — Regulated pressure

Definition of the pressure		Numerical value given for information							
Nominal pressure (p_d)		3	1,5	1	0,75	0,5	0,4	0,3	0,15
Maximum lock up pressure (p_0)	= p_d × 1,3	3,90	1,95	1,30	0,98	0,65	0,52	0,39	0,20
Maximum pressure (p_{Mp})	= p_d × 1,2	3,60	1,80	1,20	0,90	0,60	0,48	0,36	0,18
Minimum pressure (p_{Mg})	= p_d × 0,7	2,10	1,05	0,70	0,53	0,35	0,28	0,21	0,11
Minimum pressure after limiter	= (p_d × 0,7) – (p_d x 0,3)	1,20	0,60	0,40	0,30	0,20	0,16	0,12	0,06

6.2.1.3.2 Intermediate regulator

Supply pressures:

— Minimum and maximum supplied pressures shall be declared.

— The minimum declared pressure shall be equal or less than those given in Table 9.

— The maximum declared pressure shall be equal or greater than those given in Table 9.

Table 9 — Supply pressures

Definition of the pressure		Numerical value given for information							
Nominal regulated pressure of the upstream regulator (p_d)		3	1,5	1	0,75	0,5	0,4	0,3	0,15
Maximum pressure	= p_d × 1,3	3,90	1,95	1,30	0,98	0,65	0,52	0,39	0,20
Minimum pressure (With 15 % pressure loss)	= p_d × 0,7 × 0,85	1,79	0,89	0,60	0,45	0,30	0,24	0,18	0,09
Minimum pressure (With limiter and 15 % pressure loss)	= ((p_d × 0,7) – (p_d x 0,3)) × 0,85	1,02	0,51	0,34	0,26	0,17	0,14	0,10	0,05

Regulated pressure:

Table 10 — Intermediate regulated pressure

Definition of the pressure		Numerical value given for information								
Nominal regulated pressure (p_d)		3	1,5	1	0,75	0,5	0,4	0,3	0,15	0,075[a]
Maximum lock up pressure (p_0)	= p_d × 1,3		1,95	1,30	0,98	0,65	0,52	0,39	0,20	0,090
Maximum pressure (p_{Mp})	= p_d × 1,2		1,80	1,20	0,90	0,60	0,48	0,36	0,18	0,86
Minimum pressure (p_{Mg})	= p_d × 0,7		1,05	0,70	0,53	0,35	0,28	0,21	0,11	0,064
[a] For this pressure value, the coefficient 1,3 is replaced by 1,2, the coefficient 1,2 is replaced by 1,15 and the coefficient 0,7 is replaced by 0,85.										

6.2.1.3.3 Last regulator

Table 11 — Supply pressure

Definition of the pressure		Numerical value given for information								
Nominal regulated pressure of the upstream regulator (p_d)		3	1,5	1	0,75	0,5	0,4	0,3	0,15	0,075 a)
Maximum pressure	= p_d × 1,3		1,95	1,30	0,98	0,65	0,52	0,39	0,20	0,090
Minimum pressure (With 15 % pressure loss)	= p_d × 0,7 × 0,85		0,89	0,60	0,45	0,30	0,24	0,18	0,09	0,054
[a] For this pressure value, the coefficient 1,3 is replaced by 1,2 and the coefficient 0,7 is replaced by 0,85.										

Regulated pressure:

See Table 5.

6.2.2 Supply and regulated pressures for fixed or adjustable regulators to be used on installations where the final pressure is not to EN 437:2003+A1:2009

Supply pressure:

- Regulators directly supplied at the gas container pressure:
  - Butane: minimum: 0,3 or p_d + 0,2 if greater – maximum: 7,5 bar
  - LPG: minimum: 0,3 or p_d + 0,2 if greater – maximum: 16 bar
  - Propane: minimum: 1 or p_d + 0,5 if greater – maximum: 16 bar
- Regulators supplied by another regulator:
  - Minimum and maximum supplied pressures shall be declared.

— Regulated pressure:

  — Maximum lock up pressure $p_0 = p_d \times 1,3$

  — Maximum pressure $(p_{Mp}) = p_d \times 1,2$

  — Minimum pressure $(p_{Mg}) = p_d \times 0,7$

The range of an adjustable regulating device shall remain within a tolerance of ± 15 % of the nominal regulated pressure.

6.2.3 Variable regulators

Variable regulators may operate in a regulated pressure range specified by a minimum nominal pressure (p_{dmin}) and a maximum nominal pressure (p_{dmax}). The guaranteed flow rates at the minimum and maximum regulated pressures shall be declared.

Supply pressure:

— Regulators directly supplied at the gas container pressure:

  — Butane: minimum: 0,3 or p_{dmax} + 0,2 if greater – maximum: 7,5 bar

  — LPG: minimum: 0,3 or p_{dmax} + 0,2 if greater – maximum: 16 bar

  — Propane: minimum: 1 or p_{dmax} + 0,5 if greater – maximum: 16 bar

— Regulators supplied by another regulator:

  — Minimum and maximum supplied pressures shall be declared.

The performances shall be checked in the range:

Maximum regulated pressure:

$p_o = p_{dmax} \times 1,3$ or p_{dmax} + 9 mbar if greater

$p_{Mp} = p_{dmax} \times 1,2$ or p_{dmax} + 6 mbar if greater

$p_{Mg} = p_{dmax} \times 0,7$ or p_{dmax} – 9 mbar if less than

Minimum regulated pressure:

$p_o = p_{dmin} \times 1,3$ or p_{dmin} + 9 mbar if greater

$p_{Mp} = p_{dmin} \times 1,2$ or p_{dmin} + 6 mbar if greater

$p_{Mg} = p_{dmin} \times 0,7$ or p_{dmin} – 9 mbar if less than

NOTE The requirement for the minimum regulated pressure is given in 5.1.

6.3 Automatic change over devices

6.3.1 Supply and regulated pressures for automatic change over devices to be used on installations where the final pressure is to EN 437:2003+A1:2009

6.3.1.1 Single stage installation with a fixed integral two stages automatic change over device

Supply pressure:

Butane: minimum: 0,3 or p_{di} + 0,2 if greater – maximum: 7,5 bar

LPG: minimum: 0,3 or p_{di} + 0,2 if greater – maximum: 16 bar

Propane: minimum: 1 or p_{di} + 0,5 if greater – maximum: 16 bar

Regulated pressures are given in Table 5.

6.3.1.2 Two stage installation with a fixed or adjustable automatic change over device and a second stage regulator

6.3.1.2.1 Automatic change over device, fixed or adjustable

Supply pressure:

Butane: minimum: 0,3 or p_{di} + 0,2 if greater – maximum: 7,5 bar

LPG: minimum: 0,3 or p_{di} + 0,2 if greater – maximum: 16 bar

Propane: minimum: 1 or p_{di} + 0,5 if greater – maximum: 16 bar

Regulated pressure:

Table 12 — Regulated pressures

Definition of the pressure		Numerical values given for information							
Nominal regulated pressure(p_d)		3	1,5	1	0,75	0,50	0,40	0,30	0,15
Maximum lock up pressure(p_0)	= p_d × 1,3	3,90	1,95	1,30	0,98	0,65	0,52	0,39	0,20
Maximum pressure (service) (p_{Mp})	= p_d × 1,2	3,60	1,80	1,20	0,90	0,60	0,48	0,36	0,18
Minimum pressure (reserve) (p_{Mg})	= p_d × 0,50	1,50	0,75	0,5	0,375	0,25	0,20	0,15	0,075
Minimum pressure – Reserve after limiter	= (p_d × 0,50) – (p_d x 0,10)	1,20	0,60	0,40	0,30	0,20	0,16	0,12	0,06

6.3.1.2.2 Second stage regulator

Supply pressures:

— Minimum and maximum supplied pressures shall be declared.

— The minimum declared pressure shall be equal or less than those given in Table 13.

— The maximum declared pressure shall be equal or greater than those given in Table 13.

Table 13 — Supply pressures

Definition of the pressure		Numerical values given for information							
Nominal regulated pressure of the upstream automatic change over device (p_d)		3,00	1,50	1,00	0,75	0,50	0,40	0,30	0,15
Maximum pressure	= p_d × 1,3	3,90	1,95	1,30	0,98	0,65	0,52	0,39	0,20
Minimum pressure (No limiter and 15 % pressure loss)	= p_d × 0,50 × 0,85	1,27	0,64	0,42	0,32	0,21	0,17	0,13	0,06
Minimum pressure (With limiter and 15 % pressure loss)	= p_d × 0,50 × 0,85 *x 0,85*	1,02	0,51	0,34	0,26	0,17	0,14	0,10	0,05

Regulated pressures are given in Table 5.

6.3.2 Supply and regulated pressures for fixed or adjustable automatic change over devices to be used on installations where the final pressure is not to EN 437:2003+A1:2009

6.3.2.1 Fixed or adjustable integral two stages automatic change over device

Supply pressure:

Butane: minimum: 0,3 or p_{di} + 0,2 if greater – maximum: 7,5 bar

LPG: minimum: 0,3 or p_{di} + 0,2 if greater – maximum: 16 bar

Propane: minimum: 1 or p_{di} + 0,5 if greater – maximum: 16 bar

Regulated pressures:

Maximum lock up pressure $p_0 = p_d \times 1,3$

Maximum pressure $p_{Mp} = p_d \times 1,2$

Minimum pressure $p_{Mg} = p_d \times 0,7$

6.3.2.2 Fixed or adjustable automatic change over device

Supply pressure:

Butane: minimum: 0,3 or p_d + 0,2 if greater – maximum: 7,5 bar

LPG: minimum: 0,3 or p_d + 0,2 if greater – maximum: 16 bar

Propane: minimum: 1 or p_d + 0,5 if greater – maximum: 16 bar

Regulated pressure:

$p_0 = p_d \times 1,3$

$p_{Mp} = p_d \times 1,2$

$p_{Mg} = p_d \times 0,50$

6.3.3 Automatic change over device with integral variable regulator

Variable automatic change over devices may operate in a regulated pressure range specified by a minimum pressure (p_{dmin}) and a maximum pressure (p_{dmax}).

The guaranteed flow rates at the minimum and maximum regulated pressures shall be declared.

Supply pressure:

Butane: minimum: 0,3 or p_{di} + 0,2 if greater – Maximum: 7,5 bar

LPG: minimum: 0,3 or p_{di} + 0,2 if greater – Maximum: 16 bar

Propane: minimum: 1 or p_{di} + 0,5 if greater – Maximum: 16 bar

Maximum regulated pressure

$p_o = p_{dmax} \times 1{,}3$ or p_{dmax} + 9 mbar if greater

$p_{Mp} = p_{dmax} \times 1{,}2$ or p_{dmax} + 6 mbar if greater

$p_{Mg} = p_{dmax} \times 0{,}5$ or p_{dmax} – 9 mbar if less than

Minimum regulated pressure

$p_o = p_{dmin} \times 1{,}3$ or p_{dmin} + 9 mbar if greater

$p_{Mp} = p_{dmin} \times 1{,}2$ or p_{dmin} + 6 mbar if greater

$p_{Mg} = p_{dmin} \times 0{,}5$ or p_{dmin} – 9 mbar if less than

NOTE The requirement for the minimum regulated pressure is given in 5.1.

6.3.4 Change over pressure

The difference between the minimum service regulated pressure and the maximum reserve regulated pressure shall be greater than 15 % of the nominal regulated pressure.

In case of an integral two stages automatic change over device, the regulated pressures to be considered are the first stage pressures (p_{di}) (change over function).

6.4 Adaptors

Under the test conditions of 7.3.3 at the declared flow rate, the maximum pressure loss through the adaptor shall be less than 0,03 bar.

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 device, with the exception of the soundness test which shall be carried out using air, tests which involve the passage of gas inside a device can be equally carried out with air at (20 ± 5) °C or reference propane.

The equivalence ratio between volumetric flow rates with reference air and reference propane is defined by the formula:

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

7.1.2 Test conditions

Unless stated otherwise, tests shall be carried out at a room temperature of (20 ± 5) °C which remains constant during each test.

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

If the device controls a cylinder valve opening, the tests shall be carried out on the cylinder valve/device assembly.

7.1.3 Equivalence formulas

From the results obtained with one of the reference gases, the mass rate corresponding to the type of gas declared can be calculated, under reference conditions, from the formula:

$$M_g = q_n \times \rho \times \sqrt{\rho_g / \rho}$$

where

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

ρ is the mean volumetric mass of the reference gas used under reference conditions, expressed in kilograms per cubic metre (kg/m³), in accordance with 7.1.1 and 7.1.2;

ρ_g is the mean volumetric mass of the gas in the gaseous phase, expressed in kilograms per cubic metre (kg/m³) (see 3.2), in reference conditions: 15 °C, 1 013,25 mbar.

q_n is the measured volume rate, expressed in cubic metres per hour (m³/h), of the reference gas used, corrected to reference conditions of 7.1.2, according to the formula:

$$q_n = q_{(measured)} \times \frac{288,15}{273,15+t} \times \frac{p_a}{1013,25}$$

where

$q_{measured}$ is the actual volume rate measured, in cubic metres per hour (m³/h);

t is the temperature in degree Celsius (°C);

p_a is the atmospheric pressure in millibar (mbar).

7.1.4 Test samples

The samples to be tested shall include any integral safety device and means of mounting.

For the tests, six identical devices shall be tested in the order specified in Table 14.

After those tests, the devices are dismantled and requirements of 5.1 to 5.3 shall be visually and dimensionally checked.

Table 14 — Order of tests

Test method	Requirement	Test	Device number					
			1	2	3	4	5	6
Initial check								
7.2.2	5.4.2	Resistance to pressure	X	X				
7.2.3	5.4.3	Mechanical strength of connections						X
7.2.5	5.5	Soundness (before)	X	X	X	X	X	X
7.2.4	5.3.2	Valve pad retention	X	X				
7.3	6	Verification of performance characteristics (before)			X	X	X	
	8	Marking, packaging, instructions	X	X			X	

Test method	Requirement	Test	Device number					
			1	2	3	4	5	6
Tests								
7.2.6	5.6	Mechanical endurance			X			
7.2.1	5.4.1	Resistance to impact				X		
7.2.8	5.8 and 8.2.2	Resistance to corrosion					X	
E.3.1 a)		UV resistance		X				
Final check								
7.2.5	5.5	Soundness (after)			X	X	X	X
7.3	6	Verification of performance characteristics (after)			X	X	X[a]	X
	8.2.2	Durability of marking		X			X	
[a] Test at – 20 °C is not carried out for this check								

7.1.5 Tolerances of measurements

Except where otherwise stated in the particular clauses, measurements shall be carried out using equipment with maximum tolerances indicated below:

a) Atmospheric pressure ± 5 mbar;

b) Gas pressure ± 2 % full scale;

c) Water pressure ± 5 % full scale;

d) Air and Gas rate ± 5 % full scale;

e) Temperatures:

— Ambient ± 1 K;

— Water ± 2 K;

— Air and Gas ± 2 K;

f) Mass ± 0,2 % full scale;

g) Torque ± 5 % full scale;

h) Force ± 5 % full scale,

7.2 Verification of constructional characteristics

7.2.1 Resistance to impact

A complete device is dropped once from a height of one metre in no specific orientation onto a hard floor (for example a concrete area).

Exposed sealing faces which may incur damage that affects the sealing only, due to this test, may be protected. The protection method shall not affect any other aspect of the test.

The requirements given in 5.4.1 shall be verified; only the distortion due to the fall onto the ground is allowed.

7.2.2 Resistance to pressure

7.2.2.1 General

Throughout the entire duration of the tests described in 7.2.2.2, 7.2.2.3 and 7.2.2.4, the temperature of the device and of the supply water shall be maintained at (20 ± 2) °C (or (50 ± 2) °C for devices according to Annex E).

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

When the device has a safety device in accordance with Annex A, this safety device shall be sealed or disabled.

7.2.2.2 A device is connected by its inlet to its corresponding Annex G connection which is supplied with water. When the device is fitted with a manual closing device this shall be in the "on" position. 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 (1,75 × maximum value of p). The test shall not last less than 15 min after the application of the pressure.

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

7.2.2.3 When the device is a regulating device, the device tested in 7.2.2.2 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 1,5 times the maximum regulated pressure with a minimum of 0,5 bar. The test shall not last less than 15 min after the application of the pressure period during which the leak at the regulator measured shall not exceed 50 cm^3/h.

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

7.2.2.4 A second test sample 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. For test purposes, the diaphragm may be pierced to allow for the free passage of water.

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

After this test, the requirements of 5.4.2.2 shall be met.

7.2.2.5 When two stages of regulation are integral in the regulating device, these two stages shall be tested independently by neutralizing each time the appropriate upstream or downstream regulation.

In case of double stage regulating device, the intermediate pressure shall be declared.

In case of regulating device using an automatic change over device as a first stage, the intermediate pressure is p_{di}.

7.2.3 Mechanical strength of connections

7.2.3.1 General

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

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

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

7.2.3.2 Adaptors and regulator intended to be directly connected to a cylinder valve

The points where the device is held and the test values are those shown in Tables 15, 16 and 17.

Table 15 — Mechanical strength test on inlet connections

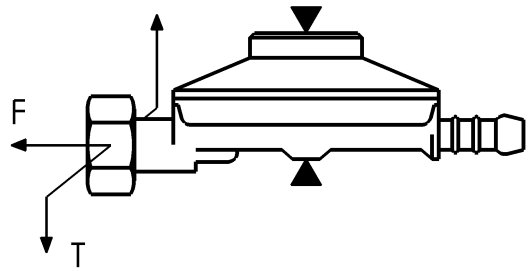
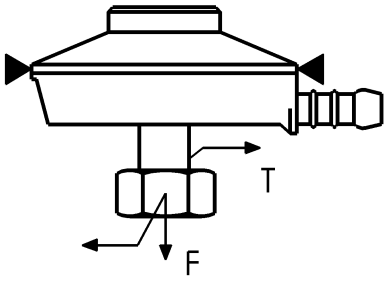
Test diagram	Type	Value	
	T F	30 N·m 2 000 N	
	T F	30 N·m 2 000 N	
Key ▲▼▶◀ device holding points ; T = torque; *F* = pulling force;			

Table 16 — Mechanical strength test on outlet connections

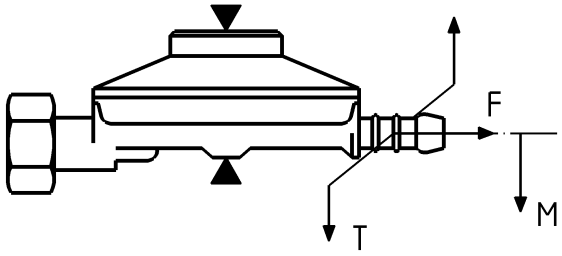
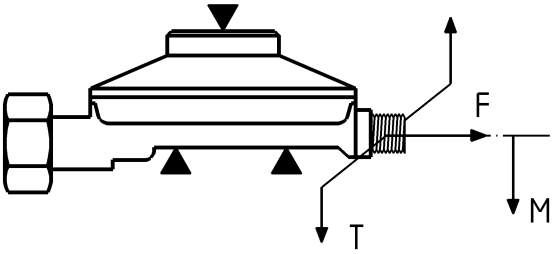
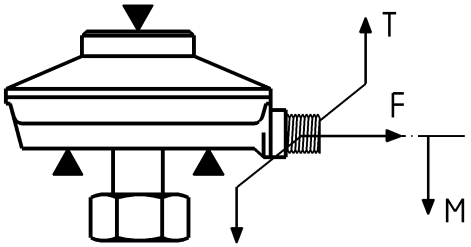
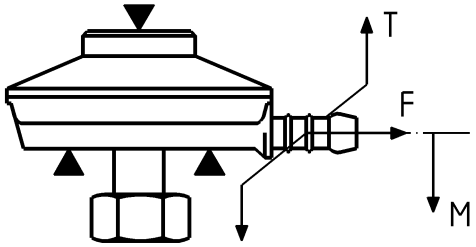
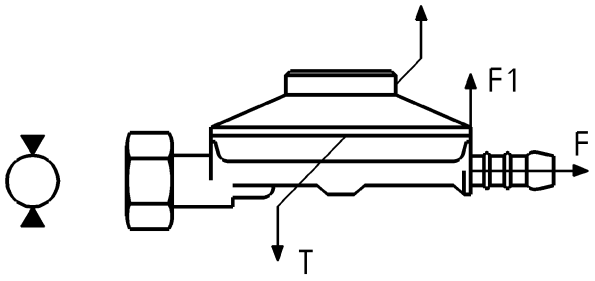
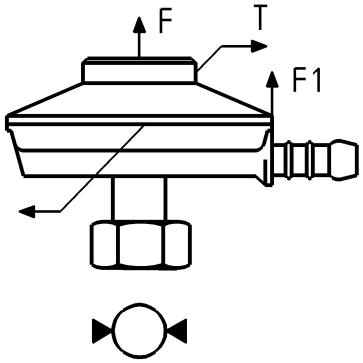
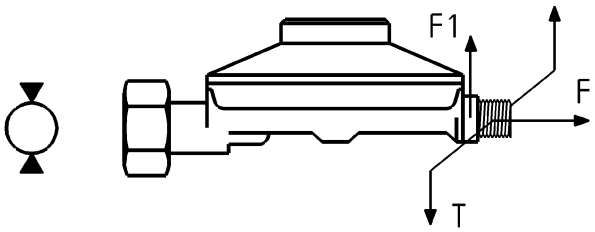
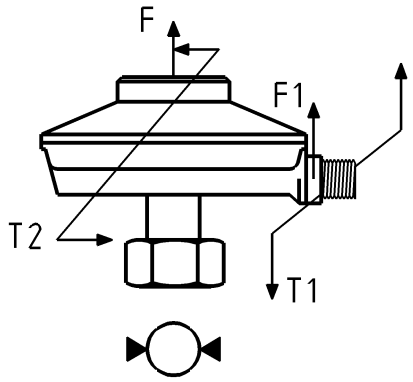
Test diagram	Type	Value
	T F M	30 N·m 2 000 N 10 N·m
		
	T F M	30 N·m 2 000 N 10 N·m
		
Key ▲▼ device holding points ; T = torque; F = pulling force; M = bending moment		

Table 17 — Mechanical strength tests for the device assembly mounted on its cylinder valve

Test diagram	Type	Value for threaded inlet connection	Value for quick coupling 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

Test diagram	Type	Value for threaded inlet connection	Value for quick coupling connection
	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 points *F* = pulling force ○ valve F1 = bending force T, T1, T2 = torque. T and T2 are not applied if the regulator is freely turning on its cylinder valve.			

For the tests given in Table 17:

— devices with threaded connections, shall be mounted on the valve as indicated in the installation instructions;

— for devices with free rotating quick coupling connection, the torque test of 15 N·m is not required.

7.2.3.3 Regulating devices which are not intended to be directly connected to a cylinder valve

7.2.3.3.1 Torque test

Requirements of 5.4.3 shall be checked with the device installed in accordance with the instructions.

The torque applied shall be in accordance with Table 2, for both the inlet and outlet connections using a torque wrench and a counter spanner on the corresponding part of the regulator body.

7.2.3.3.2 Bending moment test

The force for the required bending moment given in Table 3 shall be applied taking the mass of the pipe into consideration.

If the connections are of different sizes the minimum requirement is that the lower bending moment value is achieved.

The force which generates the bending moment is applied at a distance of 40 × DN (in mm) from the connection to be tested.

The test shall be carried out on all inlet and outlet connections.

Example of suitable test rigs are described in Figure 7.

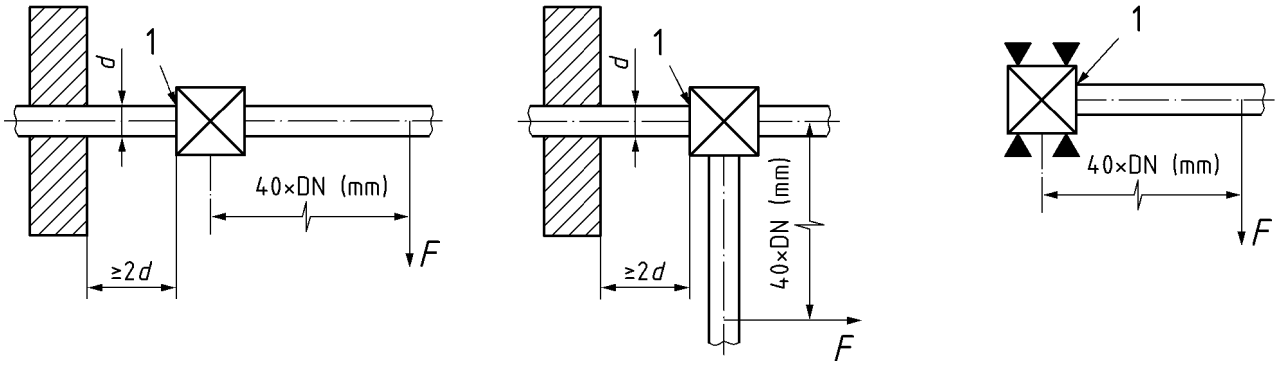
Depending on the geometry a) or b) can be used.

If the connections are of different sizes:

— the minimum requirement is that the lower bending moment value is achieved for both connections, using test rigs a) or b) (or equivalent test rig);

— for testing the largest connection, a complementary test using c) (or equivalent) may be necessary.

In all cases the requirements of 5.4.3 shall be met.



a) in line connections **b) 90° connections** **c) blocked body**

Key

d external diameter

1 connection under test

Figure 7 — Test rig for bending test

7.2.4 Valve pad retention

The valve pad in position in its housing is placed in a pressurized container filled with liquid propene in such a way that the assembly is immersed completely.

After 72 h at (20 ± 5) °C, the container is emptied, the valve pad and its housing are taken out.

At the time when it is taken out of the container and during the 10 min which follow, the assembly is checked and shall comply with the requirements of the last paragraph of 5.3.2 concerning the valve pad.

7.2.5 Soundness

7.2.5.1 Soundness of the device

A method of applying the test is given in Annex J.

The measurement shall have an accuracy of ± 10 % of the maximum permitted value and shall last for not less than 2 min.

The device is connected through its inlet connection to air at a pressure of 150 mbar, then at a pressure of 1,1 times the maximum supply pressure with the outlet blocked.

The device connection and tightening torque shall be as specified by the installation instructions.

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

If it is a regulating device, it is then connected through its outlet connection to air at a pressure of 1,5 times the regulated pressure with a minimum of 150 mbar.

When the device is fitted with a freely rotating inlet and/or outlet connection, all tests shall be carried out in three equi-spaced positions.

The requirements of 5.5 shall be met.

When the device has a safety device in accordance with A.1 or A.2, this safety device shall be sealed or disabled. Where the disabling of the PRV safety device (A.1) is impracticable, the test pressure may be reduced to 1,1 times p_o.

7.2.5.2 Soundness of the manual closing device

The manual closing device shall be in the “closed” position.

The device is connected through its inlet connection to air at the minimum supply pressure then at a pressure of 1,1 times the maximum supply pressure.

The test shall not last less than 2 min during which time the requirements of 5.5 shall be met.

7.2.6 Mechanical endurance

7.2.6.1 General

The device is connected:

— at its inlet to a pipe supplied with air at a pressure of 1,4 bar for butane devices and 7,5 bar for propane and LPG devices directly supplied by the gas container pressure, and at the middle value of the supply pressure range for other devices;

— at its outlet, to a calibrated orifice giving a rate equal to 20 % (or 100 % for regulating devices with UPSO (A.3)) of the guaranteed flow rate.

7.2.6.2 Regulators

Cycles are carried out as follows:

a) interruption of the outlet flow to induce lock up;

b) restoration of the outlet flow;

c) interruption of inlet flow to ensure that the diaphragm is completely relaxed.

Each cycle should allow the diaphragm to flex and for the valve pad to be held on its seat for at least 1 s. Minimum cycle time shall be at least 5 s.

The requirements of 5.6.1 shall be met.

7.2.6.3 Automatic change over devices

Cycles are carried out as follows:

a) both inlets are supplied with air;

b) interruption of the outlet flow to induce lock up;

c) restoration of the outlet flow;

d) interruption of inlet flow to ensure that the diaphragm is completely relaxed;

e) every 50 cycles, the manual change-over selector is rotated, applying a torque of 0,3 N·m greater than the minimum torque required to rotate the selector.

Each cycle should allow the diaphragm to flex and for the valve pad to be held on its seat for at least 1 s. Minimum cycle time shall be at least 5 s.

The requirements of 5.6.2 shall be met.

7.2.6.4 Regulating devices fitted with UPSO

For regulating devices fitted with an under-pressure shut off safety device (UPSO (A.3)), the test cycle described in 7.2.6.2 and 7.2.6.3 is modified as follows:

— calibrated orifice shall deliver the guaranteed flow rate;

— no interruption of inlet flow.

7.2.6.5 Device fitted with a manual closing device

The device is connected as in 7.2.6.1.

Each cycle includes rotation from the closed position to the fully open position, with the application of a torque of 0,3 N·m in the open and closed positions. The cycle time shall be at least 5 s.

At the end of this test, the manual closing device shall be closed with a torque of 0,5 N·m and soundness shall be verified in accordance with 7.2.5.2.

Then the manual closing device shall be opened with a torque of 0,5 N·m and the outlet blocked. The soundness shall be verified in accordance with 7.2.5.2.

The requirements of 5.6.3 shall be met.

7.2.6.6 Device with quick coupling

The device is connected to a new valve, and each disconnection and connection cycle shall last at least 5 s.

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

After this test, the forces described in 5.4.3.1.2 b) and c) shall be applied to the device.

The requirements of 5.6.4 shall be met.

7.2.6.7 Device with a freely rotating outlet connection

As illustrated in Figure 8, the device (2) is fixed onto the gear (7) via its connection (3). On the outlet (5) a connecting rod (4) is placed 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 guide (6).

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

— 1/2 turn to the right in 5 s;

— an interval of 3 s;

— 1/2 turn to the left in 5 s.

At the end of this test, the requirements of 5.6.5 shall be met.

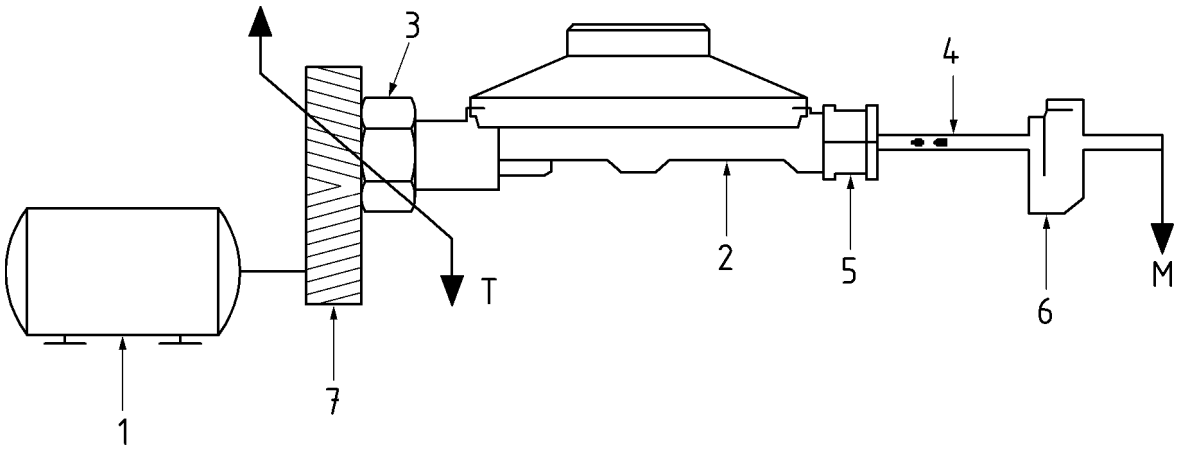


Figure 8 — Endurance test for devices with a freely rotating outlet connection

7.2.7 Resistance to humidity changes

A sample is taken of any material capable of being altered in its structure and dimensional characteristics by humidity.

It is submitted to the following test cycle:

— drying in an oven at 50 °C for (12,0 ± 0,5) h;

— weighing;

— immersion in distilled water at 20 °C for (24,0 ± 0,5) h;

— removal from the water, superficial removal of the excessive water with filter paper;

— weighing;

— drying in an oven at 50 °C for (24,0 ± 0,5) h;

— weighing.

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

7.2.8 Resistance to corrosion

The sample used for this test shall be a complete device with its connections.

The test is carried out in accordance with EN ISO 9227:2017, with a duration of 96 h. Other test methods leading to equivalent results, for example the method described in informative Annex I, are allowed.

The test chamber being in a steady-state, the device is placed in one of the positions of use recommended by the installation instructions.

For a regulating device this test shall be carried out, with the device cycling using air applied to the outlet connection at a pressure of 0 mbar for (20 ± 2) seconds and p_0 for (20 ± 2) seconds, the inlet connection being blocked.

For a non-regulating device this test shall be carried out with its inlet and outlet blocked.

At the end of this test, the requirements of 5.8 and 8.2.2 shall be met.

7.3 Verification of performance characteristics

7.3.1 General

Tests shall be carried out whilst maintaining the device and gas at the temperatures shown in Table 18.

Performance tests shall be carried out:

— For regulating devices intended to be directly connected to a gas container (cylinder or tank) valve, in the normal position(s) of use of the regulating device as recommended by the installation instructions. In addition, in all other positions of the regulating device, the outlet pressure shall not exceed the lock-up pressure p_0.

— For other regulating devices, in the installation position or positions recommended by the installation instructions.

Performance tests may be carried out using calibrated orifices or flow meter(s); see Figures 9 and 10.

The diameter of the pipework used shall be sufficiently large to avoid pressure losses and dynamic pressure which could influence the results. Whatever the method used, tests are carried out with increasing flow rates from 0 to the guaranteed flow rate, then for decreasing flow rates from the guaranteed flow rate to 0 flow.

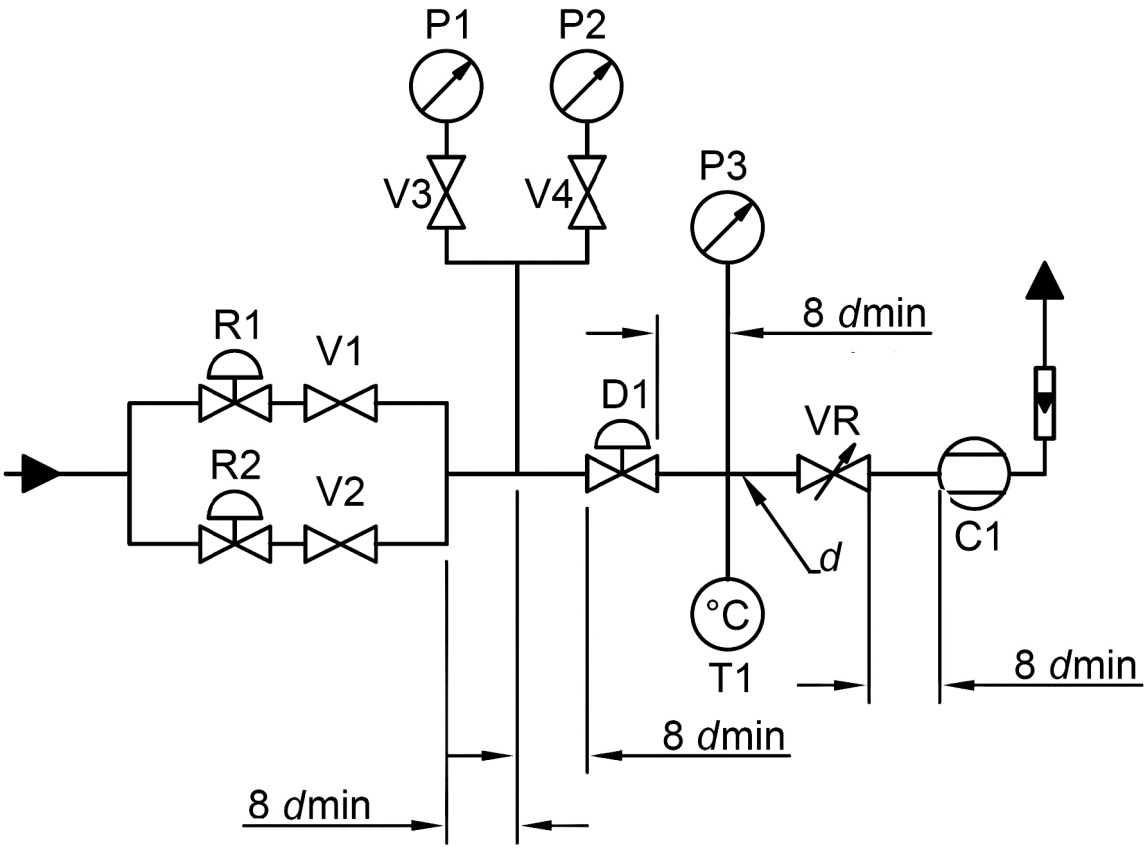
To measure the lock-up pressure, the following method shall be used:

— the flow rate shall be 50 % of the guaranteed flow rate;

— the flow rate adjuster is closed over 2 s duration;

— the lock up pressure is measured 5 s after the flow rate adjuster has been completely closed.

All the points obtained in this way give the regulation curve for the supply pressure considered.

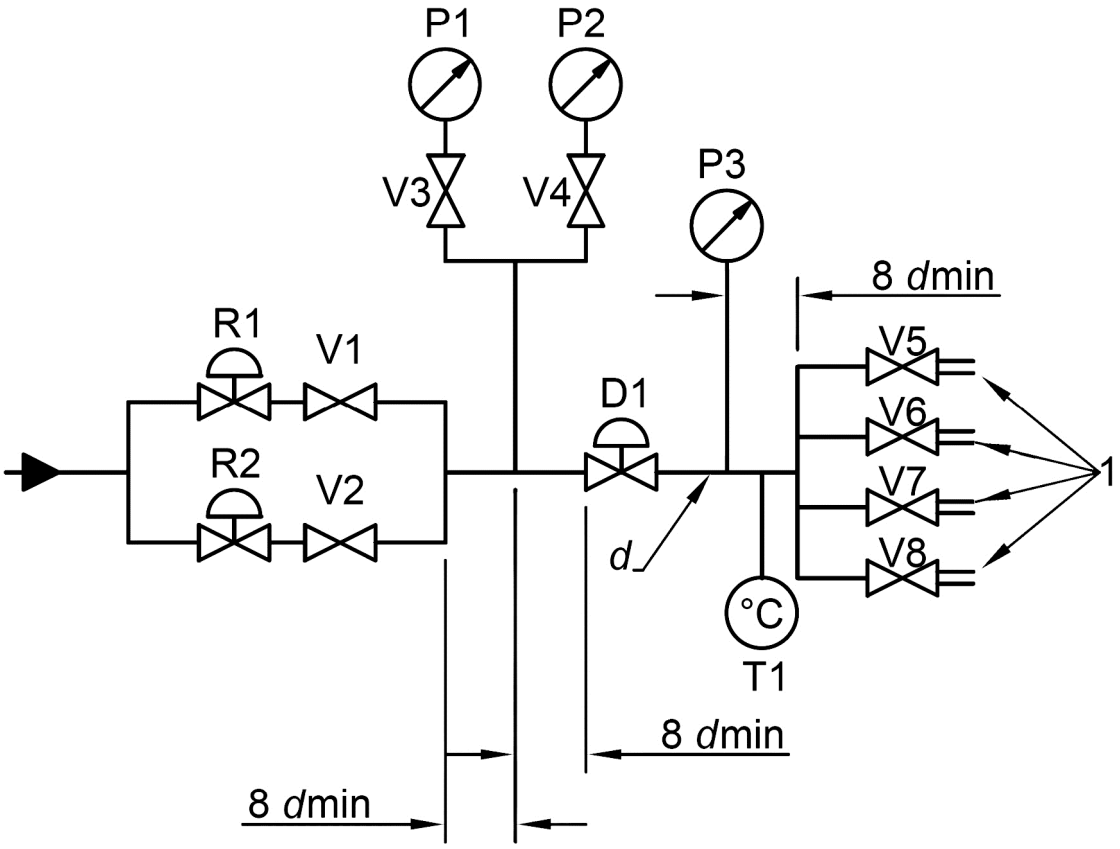


Key

R1, R2	supply adjustment regulators
V1, V2	ball valves (DN ≥ inlet DN of D1, minimum DN 10)
V3, V4	ball valves
P1, P2	upstream pressure gauge (class 0,1)
D1	device under test
P3	downstream pressure gauge (class 0,1)
T1	thermometer (accuracy 1°C)
VR	flow rate adjuster
C1	flow meter
d	diameter for pipework downstream the device under test (≥outlet DN of D1, minimum DN 10)

NOTE The supply equipment (R1/V1, R2/V2) is given as a guide.

Figure 9 — Performance tests: Flow rate method



Key

1	calibrated orifices
R1, R2	supply adjustment regulator
V1 to V8	ball valves
P1, P2	upstream pressure gauge (class 0,1)
D1	device under test
P3	downstream pressure gauge (class 0,1)
T1	thermometer (accuracy: 1 °C)
d	diameter for pipework downstream the device under test (≥outlet DN of D1, minimum DN 10)
NOTE	The supply equipment (R1/V1, R2/V2) is given as a guide.

Figure 10 — Performance tests: calibrated orifice method

7.3.2 Plotting of the performance curves for regulating devices

7.3.2.1 General

The performance curves are plotted under appropriate supply conditions:

— for first or single stage regulating devices, the pressure values are those of Table 18, starting with maximum pressures;

— for second or third stage regulating devices, the supply pressure values are the minimum and maximum marked on the regulating device and declared in the instructions for the whole temperature range given in Table 18.

Table 18 — Performance curves – Supply conditions

Type of gas	Temperature °C	Pressure bar
Butane	+50 ± 2	7,5
	+20 ± 5	0,3 or p_d + 0,2 if greater – 7,5
	0 ± 2	0,3 or p_d + 0,2 if greater
LPG	+50 ± 2	16
	+20 ± 5	0,3 or p_d + 0,2 if greater – 16
	−20 ± 2	0,3 or p_d + 0,2 if greater
Propane	+50 ± 2	16
	+20 ± 5	1 or p_d + 0,5 if greater – 16
	−20 ± 2	1 or p_d + 0,5 if greater

For temperatures other than 20 °C, the curve will be limited:

— to the guaranteed flow rate for regulating devices with a guaranteed flow rate ≤ 4 kg/h;

— to 10 % of the guaranteed flow rate (but not less than 4 kg/h) for regulating devices with a guaranteed flow rate > 4 kg/h.

Each curves shall be plotted at least with six points corresponding to: *0 % of* M_g, *Pilot rate* M_p*;25 %, 50 %, 75 % and 100 % of* M_g.

All the curves define the typical operational range of the regulating device. If the points of the curve are distributed abnormally, additional tests shall be carried out at intermediate supply pressures, to ensure that all operational points are well within the typical range.

7.3.2.2 Additional test procedure for automatic change over devices

When testing an automatic change over device, the regulation curves are plotted according 7.3.2.1 for each inlet and for each position of the manual change over selector.

In each case the other inlet supply shall not be connected.

The requirements shall be met for each of these four curves.

When testing an integral two stage automatic change over device, the requirements of 6.3.3 are checked on the curves of regulated pressure of the first stage (change over function).

7.3.3 Performances of adaptors

The adaptor is connected to an air supply with an inlet pressure of 0,3 bar, at (20 ± 5) °C and flow tested using one of the methods given in 7.3.1 at the guaranteed flow rate.

The requirements of 6.4 shall be met.

7.3.4 Verification of first stage pressure for G.56 connection regulating devices

The regulating device is installed on a valve as described in Figure 11 (valve with 5 $^{+0,1}_{-0}$ mm orifice, spring closing force (10 ± 1) N).

With a pilot rate and a test pressure at 5 bar, the pressure between the cylinder valve and regulating device is measured to confirm the requirement of 5.3.4.4.

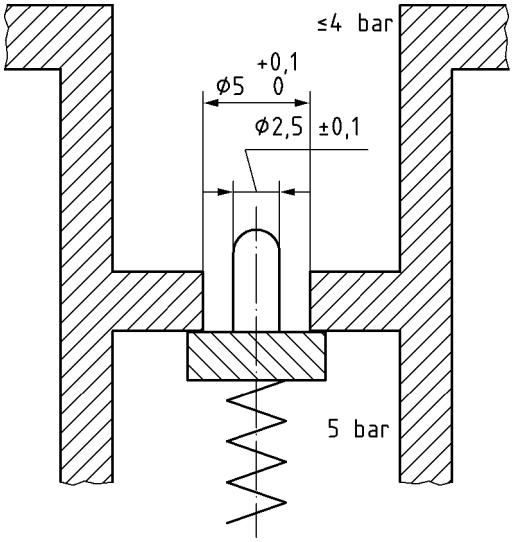


Figure 11 — Test valve for G.56 connection

7.3.5 Soundness of the non-return valve

This test shall be carried out with a (0,4 ± 0,05) mm orifice connected to the outlet connection allowing air to flow constantly through the test.

Each inlet connection shall be supplied in turn with air at pressures of 300 mbar and 8,25 bar for butane, 1 bar and 17,6 bar for propane and 300 mbar and 17,6 bar for LPG mixtures. The opposite non-return valve shall be checked for soundness with the manual change over device in both service and reserve positions.

The requirements of 5.3.5.3 shall be met.

8 Marking, packaging, instructions

8.1 General

Instructions and the information and warnings carried on the device and its packaging shall be written in the official language or languages of the country where the device is to be sold.

NOTE Particular marking, packaging and instruction requirements are stated in annexes.

8.2 Marking of the device

8.2.1 Marking

The device shall carry in a legible and visible fashion, the following information:

a) manufacturer's name or logo and, possibly, trademark;

b) trade name of the device, with marking in letters or figures allowing the identification of the device;

c) type of gas: “butane” or “propane” or “LPG” (not required for adaptor); the marking “butane/propane” or “propane/butane” is not allowed;

d) minimum and maximum supply pressures, expressed in bar (bar) or millibar (mbar);

e) maximum allowable pressure (PS according to PED), if applicable;

f) the operating temperature range of the device;

g) nominal regulated pressure (for fixed or adjustable regulating devices) or range of pressure (for variable regulating devices), expressed in bar (bar) or millibar (mbar);

h) for regulated pressures specified in EN 437:2003+A1:2009, the pressure loss for which the regulating device is designed: ΔP2 or ΔP5;

i) guaranteed flow rate in kilograms per hour (kg/h); For variable regulating devices the guaranteed flow rates at the minimum and maximum regulated pressures.

j) date of manufacture indicated by the last two figures of the year;

k) an arrow to show the direction of the flow of gas, where necessary;

l) type of its connections (inlet/outlet) i.e "G.52 / H.1";

m) If a device inlet connection fits more than one cylinder valve, all types of inlet connection shall be marked. For instance, as a G.5 fits both G.4 and G.12, the device shall be marked with G.4, G.5 and G.12.

n) change over pressure (p_{di}) for integral two stage automatic change over devices in bar (bar) or millibar (mbar);

o) open and closed positions where applicable;

p) reference of this standard.

Additional markings are indicated in annexes when applicable.

Any additional information given in instructions shall not lead to confusion with the indications required by this standard.

8.2.2 Durability of the marking

After the following tests carried out on two different samples (one for each test), the marking shall remain legible and if a label is used it shall remain firmly attached:

- Sample n° 5: Resistance to corrosion (7.2.8)
- Sample n° 2: UV resistance (E.3.1 a))

8.3 Packaging

The device shall be protected against entry of foreign material by packaging. This packaging shall indicate in a clear and unambiguous fashion the type of gas (not required for adaptor), the nominal regulated pressure (not required for adaptor) and possible limits of use, in particular the type of connection of the gas container valve (cylinder or tank) to which the device may be fitted where applicable.

8.4 Instructions for installation, use and maintenance

Each device shall be accompanied by instructions intended for the installer, manufacturer of gas appliance (in case incorporation in a gas appliance), user, which, in addition to the items in 8.2 (with the exception of the date of manufacture of the device), shall specify:

a) clear explanation of the information marked on the product (8.2) (e.g: pictogram, letters, codes, manufactured date)

b) the address of the manufacturer and of the importer if the manufacturer is outside EU;

c) the assembly conditions, in particular the use of a filter, the preferred position, and the instructions concerning the use of a spanner;

d) the installation, safety and soundness conditions, in particular with regard to the sealing means and their condition;

e) the absence of regulating function for adaptors;

f) the meaning of the marking ΔP2 or ΔP5 when applicable;

g) the conditions of use and maintenance, which will mention the following statement: "In normal conditions of use, in order to ensure correct operation of the installation it is recommended that this device is changed within 10 years of the date of manufacture."

   10 years is a recommendation which may be replaced by national rules or code of practice taking into account integral safety devices service conditions and maintenance schemes.

h) the installation conditions, including for regulating devices:

   1) the statement such as "when the regulator (or change over device) is to be used outdoors, it shall be positioned or protected against direct penetration by any trickling water";

   2) orientation of any diaphragm vent to avoid any water accumulation on the atmospheric side of the diaphragm;

   3) when applicable, the relevant instructions to electrically isolate the regulator (or change over device) when mounted on to a wall;

i) for automatic change over devices:

   1) the necessary details to install a supply-reserve indicator;

   2) operation to carry out when changing the cylinder in order to avoid leakage hazards.

j) for regulators only, a warning such as: "When the regulator is installed downstream of another regulator, the supply pressure range shall be correct for the regulated pressure range of the upstream regulator, plus any pressure losses in the interconnecting pipe work.";

k) specific instruction given in annexes when applicable;

l) for regulating devices with regulated pressures specified in EN 437:2003+A1:2009, that the downstream installation pressure loss shall not exceed the ΔP value marked on the device.

m) for regulating devices which may be directly supplied at tank or cylinder pressure and which may not be directly connected to the outlet of the tank or cylinder valve, a statement such as: "This regulating device shall not be positioned lower than the tank or cylinder outlet valve, to avoid gas vapour which may have re-liquefied from draining into the regulator. Pipes and hoses used to connect to the inlet of the regulating device, shall slope continuously back to the tank or cylinder.".

When the instructions are printed on the packaging of the device, they shall be easily removable so that they may be kept by the user.

Annex A
(normative)

Special requirements for devices fitted with pressure or flow rate operated safety functions

A.1 Regulating devices fitted with an over-pressure relief valve of a limited flow rate (PRV)

A.1.1 Definition

An over-pressure relief valve is a safety device which vents gas to the atmosphere when the gas pressure reaches a set pressure. It closes when the pressure is reduced to below the set pressure. This valve is closed during normal operation.

A.1.2 Constructional characteristics

The relief valve shall be integral with the regulating device or be an auxiliary safety device.

It may be part of the pressure sensing subassembly of the regulating device. The adjustment of the set point shall be protected against any unauthorised modification.

For designs where gas is discharged via the pressure sensing subassembly, the respective cross sectional area of the valve, vent holes and connection pipework to the atmosphere shall be chosen in such a way that no unacceptable rise in pressure can occur within the pressure subassembly.

If the regulating device is intended to be used inside a building, enclosure or other potentially hazardous area 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 Rp 1/8 internal thread. The tube connecting to the atmosphere may also be used as a vent.

The discharge orifice shall be protected against rain water.

A.1.3 Performance characteristics

A.1.4 Regulating devices with regulated pressures specified in EN 437:2003+A1:2009

The opening pressure of the relief valve shall be between 20 % above the maximum allowable lock up pressure and 150 mbar, except for regulating devices designed to operate with pressures of 112 mbar or 148 mbar where 150 mbar is replaced by 300 mbar.

The opening pressure shall be within ± 20 % of the nominal operating pressure.

At a pressure of 10 % greater than the opening measured pressure, the flow rate shall be at least 0,01 m^3/h (air, under the reference conditions) or 0,1 % of the regulating device guaranteed flow rate (whichever is the greater).

At a pressure of 10 % greater than the opening measured pressure, the maximum flow rate shall not exceed 0,2 m^3/h (air, under the reference conditions) or 5 % of the regulating device guaranteed flow rate (whichever is the greater).

A.1.5 Regulating devices with regulated pressures other than those specified in EN 437:2003+A1:2009

The opening pressure of the relief valve shall be at least 20 % above the maximum allowable lock up pressure.

The opening pressure shall be within ± 20 % of the nominal operating pressure.

If a particular relief device flow rate is required by the regulation of the country of destination, it shall be within ± 30 % of the nominal flow rate.

A.1.6 Test methods

Only soundness through outlet connection tests, behaviour in operation and discharge are verified for the relief valve, all the strength and soundness through inlet connection tests being carried out in compliance with the requirements for the regulating device.

Tests shall be carried out under the following conditions:

a) Soundness test through outlet connection before opening.

The relief valve is tested at 10 % above the maximum lock-up pressure (P_0). 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 leak measured complies with 5.5.

b) Opening and closing pressures and flow rate:

Pressure tests shall be carried out at the following temperatures:

1) (- 20 ± 2) °C for propane and LPG, (0 ± 2) °C for butane;

2) (+ 20 ± 5) °C ; and

3) (+ 50 ± 2) °C,

Flow rate test shall be carried out at (+ 20 ± 5) °C.

The pressure is increased slowly until the relief valve discharges 2 l/h (air, under the reference conditions) or 0,02 % of the regulating device guaranteed flow rate (whichever is the greater). The corresponding pressure is the opening pressure of the PRV and shall be recorded and meet the requirements of A.1.3.1 or A.1.3.2. The pressure is then slowly increased up to a value of 10 % above this opening pressure and the flow rate is measured. This flow rate shall meet the requirements of A.1.3.1 or A.1.3.2, if required.

The pressure is then decreased slowly until 10 % above lock up pressure (P_0). The soundness is considered satisfactory if the value of leak measured complies with 5.5.

A.1.7 Regulating device marking

In addition to the information required in 8.2, the regulating device fitted with a relief valve shall be marked “PRV”. Where the regulating device capacity is greater than 4 kg/h, the nominal operating pressure shall also be marked in mbar or bar.

Where required by a particular national regulation, the nominal relief device flow rate shall be marked in g/h or kg/h of the declared gas.

A.1.8 Instructions

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

— state that a pressure relief valve of a limited flow rate is incorporated in the regulating device;

— give a clear explanation of the pressure relief valve operation, and all necessary information for its installation and use including the explanation of the meaning of "PRV" (Pressure Relief Valve) in the language(s) of the destination countries of the regulating device;

— specify that connection to the outside shall be carried out when a regulating device fitted with a relief valve is to be used in a building, enclosure or other potentially hazardous area; they shall provide all necessary information on this connection and in particular the dimensions of the tube (minimum diameter and maximum length).

A.2 Regulating devices fitted with an over-pressure shut off safety device (OPSO)

A.2.1 Definition

Shut off safety device, triggered by an excessive regulated pressure, which causes the complete shut off of the gas flow for all values of supply 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 been rectified.

The manual device which enables the restoration of the gas flow is called the resetting device.

A.2.2 Constructional characteristics

A.2.2.1 General

The shut off device may be either integral with the regulating device or be an auxiliary safety device. In any case, the constructional requirements for the shut off device are the same as those for the regulating device.

The shut off device closing mechanism, measuring device and external impulse tube if any, shall be independent of the regulating mechanism.

The shut off device closing mechanism, shall have only two positions, fully open and fully closed. This mechanism is triggered by over pressure, closing instantly.

The resetting device shall be protected against any intervention which could impair the operation of the over pressure shut off.

After shut off, the gas flow shall remain cut off at any supply pressure below the maximum supply pressure and shall be sound according to 5.5 at pressures and temperatures given in Table 18.

A.2.2.2 Closing force

The force which ensures the closing of the valve from the open position shall be at least equal to the resistance due to the maximum gas pressure and to the weight of relevant internal parts, plus five times the frictional force.

When the closing device is in the closed position, the closing force shall be at least equal to the force due to maximum supply pressure and to the weight of relevant internal parts plus twice the frictional force.

The frictional force is measured according to A.2.4.1; other forces are either measured or calculated.

A.2.2.3 Diaphragm strength

The diaphragm shall be designed and/or incorporated in such a way that it withstands a pressure equal to the maximum supply pressure.

A.2.3 Performance characteristics

A.2.3.1 Regulating devices with regulated pressures specified in EN 437:2003+A1:2009

The operating pressure of the over pressure shut off device shall be between 20 % above the maximum allowable lock up pressure and 150 mbar, except for regulating devices designed to operate with pressures of 112 mbar or 148 mbar where 150 mbar is replaced by 300 mbar.

The operating pressure shall be within ± 15 % of the nominal operating pressure.

A.2.3.2 Regulating devices with regulated pressures other than those specified in EN 437:2003+A1:2009

The operating pressure of the over pressure shut off device shall be greater than 20 % above the maximum allowable lock up pressure.

The operating pressure shall be within ± 15 % of the nominal operating pressure.

A.2.4 Test methods

A.2.4.1 Frictional force

The frictional force is measured with the closing spring removed and the valve in the open position.

Prior to testing, the mechanism is held at (20 ± 5) °C for 24 h.

The over-pressure shut off device shall be oriented so the weight of the components does not influence the measurement. The mechanism is moved in the direction of closure and the force needed to initiate the motion is recorded.

The test is first carried out at atmospheric pressure, the measured force F1 is the frictional force at the atmospheric pressure.

The test is then carried out at the maximum supply pressure, the measured force F2 is a force combining friction and the effect of maximum supply pressure. The effect of the maximum supply pressure on a cross section area of the mechanism is calculated: F3. The frictional force at maximum supply pressure is F4 = F2 – F3.

The frictional force *F* equals to the highest value of F4 or F1.

A.2.4.2 Performance test

The test shall be carried out at the temperatures, supply pressures and regulator positions indicated in 7.3.2.1.

The device under test is supplied with air through its impulse tube. The pressure is slowly increased until the device shuts off. The test shall be performed five times.

Each operating pressure shall be within the limits specified in A.2.3.

After shut off, the leakage flow rate shall not exceed 15 cm^3/h for regulating devices with a nominal connection diameter of less than or equal to DN 15 and 30 cm^3/h for regulating devices with a nominal connection diameter greater than DN 15.

A.2.4.3 Test for diaphragm strength

First a performance test as defined in A.2.4.2 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 supply pressure.

This pressure shall be maintained for 10 min.

Another performance test shall then be carried out as defined in A.2.4.2. The measured values for the operating pressures shall not vary from the values recorded during the previous test by more than 10 %.

A.2.5 Regulating device marking

In addition to the information required in 8.2, the regulating device fitted with an over pressure shut off shall be marked with "OPSO" followed by its nominal operating pressure in mbar or bar.

A.2.6 Instructions

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

— where appropriate, state that an over pressure shut off device is incorporated in the regulating device;

— give a clear explanation of the over pressure shut off device operation, and all necessary information for its installation and use including the explanation of the meaning of "OPSO" (Over-Pressure Shut Off) in the language(s) of the destination countries of the regulating device;

— state the nominal operating pressure;

— when required by a particular national regulation, state the maximum operating pressure.

A.3 Regulating devices fitted with an under-pressure shut off safety device (UPSO)

A.3.1 Definition

Shut off safety device, triggered by a lack of regulated pressure, which causes the complete shut off of the gas flow for all values of supply pressure.

The components which provide the regulating function may also provide this safety function.

The restoration of the gas flow shall only be possible by manual intervention when the conditions which cause the safety device to operate have been rectified.

The manual device which enables the restoration of the flow is called the resetting device.

A.3.2 Constructional and performance characteristics

The shut-off device shall not be influenced by the operation of any other safety device.

The shut-off device shall shut off the gas flow only when the pressure measured downstream of the regulating device is equal to or greater than:

— the minimum pressure required at the appliance's inlet (column "p_{min}" in Table 5) for EN 437:2003+A1:2009 regulated pressures;

— the pressure marked according to A.3.4 for non-EN 437:2003+A1:2009 regulated pressures.

It shall be designed in such a way that, without manual intervention, it can only be in the fully open position or fully closed position. If the resetting device also acts as a manual closing valve using a rotating handle, the sense of shutting off the gas shall be clockwise.

If the resetting device has no other function and if it is accessible, it shall be protected against any intervention which could impair the regulating device's normal operation when it is reset.

A.3.3 Test methods

Tests shall be carried out at temperatures and pressures given in 7.2.3.1 with the regulating device installed according to the instructions.

The regulating device is supplied with air at the maximum supply pressure and the outlet flow rate is adjusted to be equivalent to the guaranteed flow rate. Then the supply pressure is reduced to the pressure at which the shut-off device shuts off.

At the time of the shut off, the regulated pressure shall be:

— equal to or greater than the minimum pressure required at the appliance's inlet (column "p_{min}" in Table 5) for EN 437:2003+A1:2009 regulated pressures;

— the pressure marked according to A.3.4 with a tolerance of ± 10 % for non EN 437:2003+A1:2009 regulated pressures.

In the closed position, the supply pressure is reduced to zero. Then the supply pressure is slowly increased to maximum. The under pressure shut off shall remain closed during this test, and it is checked that the leakage rate complies with 5.5.

A.3.4 Regulating device marking

In addition to the information required in 8.2, the regulating device fitted with an under pressure shut off shall be marked with "UPSO" (Under-Pressure Shut Off).

For regulated pressures not in accordance with EN 437:2003+A1:2009, the UPSO nominal operating pressure shall also be marked.

A.3.5 Instructions

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

— where appropriate, state that an under pressure shut off device is incorporated in the regulating device;

— give a clear explanation of the under pressure shut off device operation, and all necessary information for its installation and use including the explanation of the meaning of "UPSO" (Under-Pressure Shut Off) in the language(s) of the destination countries of the regulating device.

A.4 Regulating devices fitted with an excess flow valve (EFV)

A.4.1 Definition

The excess flow valve is a safety device integral with the regulating device or an auxiliary safety device which causes the shut off of the gas flow for values of flow rate greater than the guaranteed flow rate for example when the downstream hose or pipe is disconnected.

The restoration of the gas flow may be by manual or automatic intervention, when the conditions which caused the safety device to operate have been rectified.

A.4.2 Performance characteristics

A.4.2.1 General requirements

The EFV shall not be influenced by the operation of any other safety device.

For devices intended to be directly connected to the gas cylinder, the following requirements shall be met with the device in its normal position and then with inclinations of +10° and −10° in the plane where the operation of the EFV is most influenced.

For automatic resetting EFV's, a maximum residual flow between 30 g/h and 60 g/h corresponding to the declared gas according to the national regulations is permitted.

For manual resetting EFV's, a maximum residual flow between 15 cm^3/h and 200 cm^3/h of air according to the national regulations is permitted.

If a manual closing device is integral with the regulating device, it is recommended that a two position manual closing device is used: one for full opening and one for complete closure in order to not influence the excess flow function.

A.4.2.2 Requirements for regulating devices with regulated pressures specified in EN 437:2003+A1:2009

The EFV shall not shut off the gas for a flow rate less than 110 % of the guaranteed flow rate. It shall shut off the gas under the test conditions given in A.4.3.2.1 for the pressure loss given in Table 5 at the guaranteed flow rate.

A.4.2.3 Requirements for regulating devices with regulated pressures not specified in EN 437:2003+A1:2009

The EFV shall shut off the gas for a flow rate between 110 % and 130 % of the guaranteed flow rate.

For variable pressure regulators this last requirement shall be met at the minimum declared regulated pressure.

A.4.3 Test methods

A.4.3.1 General

For regulating devices intended to be directly connected on a gas cylinder, the performance test (A.4.3.2), residual flow test (A.4.3.3) and re-setting test (A.4.3.4) are carried out at two angles of 10° as described in A.4.2.1.

For regulating devices not intended to be directly connected on a gas cylinder, the performance test (A.4.3.2), residual flow test (A.4.3.3) and re-setting test (A.4.3.4) are carried out in the most unfavourable position of those stated in the instructions.

Performance tests (A.4.3.2), residual flow tests (A.4.3.3), re-setting tests (A.4.3.4) are carried out in this order before and after the endurance tests (A.4.3.5) on one single sample.

The test is carried out after resistance to impact, resistance to pressure and mechanical strength of connection tests given in 7.2.1 to 7.2.3.

The test is carried out both at the minimum and maximum supply pressures at (20 ± 5) °C.

A.4.3.2 Performance tests

A.4.3.2.1 Regulating devices with regulated pressures specified in EN 437:2003+A1:2009

The regulating device 1 is connected to a downstream test rig as described in Figure A.1.

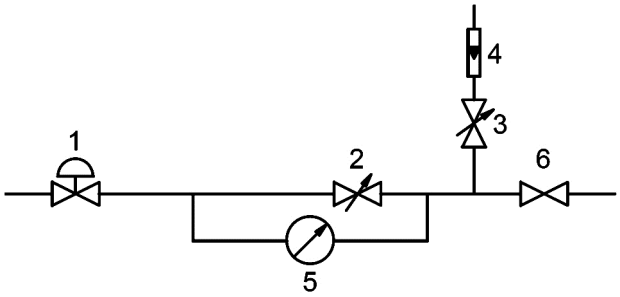
Valve 6 shall have sufficient flow capacity to obtain closure of the excess flow valve.

Valve 6 is closed.

The flow rate is adjusted to the guaranteed flow rate while achieving the maximum pressure loss given in Table 5 for the corresponding outlet pressure using both valves 2 and 3.

The flow rate is then adjusted to 110 % of the guaranteed rate using valve 3. The excess flow valve shall not close.

Valve 6 is then opened and the excess flow valve shall close.



Key

1 regulating device with EFV under test	4 flow meter
2 pressure loss adjustment valve	5 pressure loss measurement
3 flow rate adjustment valve	6 excess flow activation valve

Figure A.1 — Test rig

A.4.3.2.2 Regulating devices with regulated pressures not specified in EN 437:2003+A1:2009

The regulating device 1 is connected to a downstream test rig as described in Figure A.2.

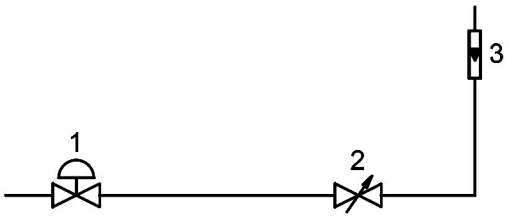
Valve 2 shall have sufficient flow capacity to obtain closure of the excess flow valve.

The flow rate is adjusted to the guaranteed flow rate with the minimum supply pressure using valve 2.

The flow rate is then adjusted to 110 % of the guaranteed flow rate using valve 2. The excess flow valve shall not close.

The flow rate is then increased using valve 2. The excess flow valve shall close before the flow rate reaches 130 % of the guaranteed flow rate.

The test is then repeated at the maximum supply pressure.



Key

1 regulating device with EFV under test	3 flow meter
2 flow rate adjustment valve	

Figure A.2 — Test rig

A.4.3.3 Residual flow test

The measured flow rate shall be lower than the residual flow rate specified in A.4.2.

The test is carried out at the following supply pressure:

a) For single and first stage regulating devices:

   1) butane 1,7 bar;

2) propane 6,8 bar;

3) LPG 3,2 bar.

b) For second and third stage regulating devices at the minimum and maximum values of supply pressure given in the instruction.

A.4.3.4 Re-setting test

A.4.3.4.1 Automatic re-setting excess flow valves

Using the test rig A1, with the nominal supply pressure given in A.4.3.3, the regulating device shall be tested to confirm automatic reset.

— Valve 2 is set as in A.4.3.2.1.

— Valve 3 is closed.

— Valve 6 is open.

— Ensure that EFV is closed.

— Close valve 6.

After a time corresponding to 2 min per litre of the test rig volume (from the regulating device under test up to valves 3 and 6), valve 3 is opened slowly and the guaranteed flow rate shall be re-established.

A.4.3.4.2 Manual re-setting excess flow valves

Using the test rig A1, with the nominal supply pressure given in A.4.3.3, the regulating device shall be tested to confirm manual reset.

— Valve 2 is set as in A.4.3.2.1.

— Valve 3 is closed.

— Valve 6 is open.

— Ensure that EFV is closed.

— Close valve 6.

The re-setting device is activated for 5 s, valve 3 is then opened slowly and the guaranteed flow rate shall be re-established.

A.4.3.5 Endurance test

The regulating device 1 to be tested is installed on a test rig as described in Figure A.3 and supplied with air at the supply pressures given in A.4.3.3.

— Valve 2 is opened.

— Valve 5 is closed.

— Valve 3 is adjusted to obtain 50 % of the guaranteed flow rate.

The endurance test sequence shall be as follows:

— Valve 5 is opened to create an excess flow.

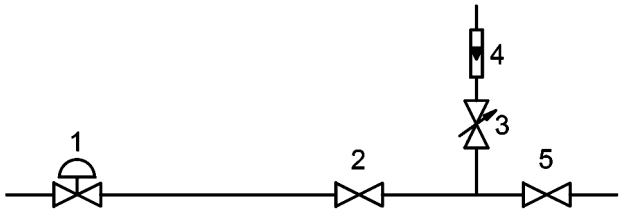
— After the EFV has closed valves 2 and 5 are closed.

— The EFV is reset.

— Valve 2 is opened.

After 1 000 shut off cycles, the regulating device is checked for compliance with the requirements of A.4.3.2 and A.4.3.3.

Where the excess flow valve re-setting device incorporates sealing elements through the body of the regulating device, a leakage test in accordance with 7.2.5.1 shall then be carried out and the requirement of 5.5 shall be met.



Key

1 regulating device with EFV under test
2 valve
3 flow rate adjustment valve
4 flow meter
5 excess flow activation valve

Figure A.3 **— Endurance test rig**

A.4.3.6 Resistance to impact test

For regulating devices intended to be directly connected on a gas cylinder, the excess flow valve shall operate after the test for resistance to impact carried out as described in 7.2.1 after the EFV endurance test.

A.4.4 Regulating device marking

In addition to the information required in 8.2, the regulating device fitted with an excess flow valve shall be marked with “EFV”.

A.4.5 Instructions

In addition to the information given in 8.4, the instructions shall clearly indicate:

a) when used on a cylinder, the excess flow valve may close if the gas cylinder is moved during use;

b) close the valve (on the supply line, the cylinder, or regulating the device) in the event of operation of the excess flow valve, and only open it after having rectified the cause of the EFV operating;

c) when the valve (on the supply line, the cylinder, or the regulating device) has intermediate positions between fully open and fully closed, the valve shall always be in the fully open position so as to allow the operation of the excess flow valve;

d) the value of the maximum residual flow rate in case of automatic resetting EFV's;

e) the explanation of the excess flow device operation, and method of re-setting;

f) all necessary information for its installation and use including the explanation of the meaning of "EFV" (Excess Flow Valve) in the language(s) of the destination countries of the regulating device.

A.5 Regulating devices fitted with a regulated outlet pressure limiter

A.5.1 Definition

A safety device installed downstream of the regulating function of a first stage regulating device, which in the event of a failure of the regulating function, limits the downstream pressure to a maximum specified value without shutting off the gas flow.

The pressure limiter may be either integral with the first stage regulating device or an auxiliary safety device or be independent. When independent the pressure limiter is a regulator which shall meet these additional requirements.

A.5.2 Constructional and performance characteristics

A.5.2.1 In all cases, the constructional requirements are the same as those applicable to the regulating device.

A mechanism may be provided to indicate an intervention of the limiter (i.e: test point, gauge…).

A.5.2.2 As long as the upstream pressure remains below the minimum intervention pressure of the limiter (p_{lim}), the limiter shall not act.

The minimum intervention pressure of a limiter shall be equal to or greater than maximum regulated pressure of the regulator p_{Mp} as defined in Clause 6.

If the upstream pressure is greater than p_{lim} whatever the flow rate, the limiter shall maintain the regulated pressure at a value not exceeding 120 % of p_{lim}.

A.5.2.3 The pressure limiter shall not present a pressure loss greater than:

— 30 % of the nominal regulated pressure (p_d) for regulators;

— 10 % of the nominal regulated pressure (p_d) for automatic change over devices.

A.5.3 Test method

A.5.3.1 Test conditions

For an integral limiter, for the verification of the constructional characteristics and operating performances it shall be possible to independently test the limiting pressure and regulating functions. If required, samples shall be adapted for this purpose.

A.5.3.2 Verification of the minimum intervention pressure p_{lim}

The regulating function being neutralized, an orifice or a valve ensuring 5 % of the guaranteed flow rate at the nominal regulated pressure shall be fitted downstream of the limiter.

At the start of the test, the downstream and upstream pressures are equal.

The limiter inlet pressure is slowly increased by steps of 50 mbar starting at the nominal regulated pressure.

At each step, the flow is stopped and the upstream and downstream pressures are measured.

When the downstream pressure is at least 5 % lower than the upstream pressure, this indicates that the limiter is in operation and this pressure is recorded.

The requirement is met if this value is greater than p_{lim}.

A.5.3.3 Measurement of the maximum limited pressure

This test is a continuation from the test described in A.5.3.2.

The upstream pressure is still increased from p_{lim} up to the maximum inlet pressure defined in 6.2.2 by at least five steps.

The requirement is met if the downstream pressure never exceeds 120 % of $p_{lim.}$

A.5.3.4 Measurement of the pressure loss

The regulating function being neutralized (in the case of a regulator with integral limiter), the pressure limiter is connected to differential pressure measurement equipment upstream and downstream and is supplied at the minimum regulated pressure of the regulating device (p_{min}) as defined in Clause 6.

The pressure loss shall be less than the values specified in A.5.2.3 at the guaranteed flow rate.

A.5.4 Marking

A.5.4.1 Integral limiter

In addition to the information required in 8.2, the regulating device shall be marked with “LIM” and the minimum intervention pressure of the limiter (p_{lim}).

A.5.4.2 Independent limiter

In addition to the information required in 8.2 (except the nominal regulating pressure), the following marking shall be added on the limiter:

— “REG LIM” for a limiter intended to be fitted with a regulator,

— “ACO LIM” for a limiter intended to be fitted with a changeover device,

and the minimum intervention pressure of the limiter (p_{lim}).

A.5.5 Instructions

A.5.5.1 General

In addition to the provisions of 8.4, the instructions shall give a clear explanation of the limiting function, and all necessary information for its installation and use.

A.5.5.2 Integral limiter

The instructions shall state that the regulating device is fitted with a limiter and that no additional limiter shall be installed downstream.

The instructions shall give the explanation of the meaning of “LIM” (limiting function) in the language(s) of the destination countries of the regulating device.

A.5.5.3 Independent limiter

The instructions shall state that the limiter shall not be installed downstream of a regulating device incorporating a limiter.

The instructions shall give in the language(s) of the destination countries, the meaning of:

— "REG LIM" (Limiter for regulator);

— "ACO LIM" (Limiter for automatic change over device).

A.6 Two stage pressure limiting regulating device

A.6.1 Description

A combination of two regulators in series for installations where the final pressure is specified in EN 437:2003+A1:2009. Both regulators are capable of accepting full inlet pressure. Should one of the regulators fail, the downstream pressure shall not exceed 150 mbar for all values of the inlet pressures and of the flow rate.

In this condition, the downstream pressure is limited by one regulating stage only.

These devices shall not be used for nominal pressures of 112 mbar and 148 mbar.

A.6.2 Constructional and performance characteristics

The design has to be in conformity with the requirements of this standard. Both regulators shall be independent, having their own pressure sensing and regulation subassemblies. The housing of both stages may be separate or common. If separate units are used, the connections between both shall be assembled in such a way that separation is not possible without permanent damage.

An indicator may be provided to show a failure.

If one of the two regulators fails, the downstream pressure shall not exceed 150 mbar.

A.6.3 Test methods

The first regulating device is blocked in the full open position. The inlet pressure is fixed to the minimum supply pressure. The flow rate is varied from 0 % to 100 % of the guaranteed flow rate.

The inlet pressure is increased to the maximum supply pressure and the flow rate is varied from 0 % to 100 % of the guaranteed flow rate.

This test is repeated with the second regulating device blocked in the full open position and the first regulating device in the normal operating condition.

The outlet pressure for all tests shall not exceed 150 mbar.

A.6.4 Marking

In addition to the information required in 8.2, the safety regulating device shall be marked with "S2SR" and the limiting pressure.

A.6.5 Instructions

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

— state that the regulating device is a two stage safety regulator;

— give a clear explanation of the two stage safety regulator operation, and all necessary information for its installation and use including the explanation of the meaning of "S2SR" (Safety two Stages Regulator) in the language(s) of the destination countries of the regulating device; in particular a statement explaining that should one stage fail the downstream pressure will be between nominal operating pressure and 150 mbar and the regulator shall be replaced;

— explain the function of the indicator (when fitted) and that the gas supply shall be shut off when the indicator is activated.

A.7 Additional diaphragm

A.7.1 Description

Diaphragm added to a regulating device to limit the relief of gas to the atmosphere in case of a defect of the main diaphragm.

This additional diaphragm shall be used in conjunction with an over pressure shut off safety valve (OPSO, see A.2).

A.7.2 Constructional characteristics

A.7.2.1 General

The additional diaphragm is located at the atmospheric side of the main diaphragm allowing the free movement of the main diaphragm and the parts moved by the movement of the main diaphragm itself.

There shall be a small orifice in the additional diaphragm to allow the correct operation of the main diaphragm (e.g. venting of any trapped gas due to porosity).

The regulating devices designed to operate with pressures of 112 mbar or 148 mbar shall not be fitted with a safety diaphragm.

A.7.2.2 Additional diaphragm strength

The additional diaphragm shall be designed and/or incorporated in such a way that it withstands a pressure equal to the maximum supply pressure. The additional diaphragm shall withstand, without rupture or slipping out of its fixing, the tests described in A.7.4.1.

A.7.2.3 Leakage through orifice

During the test described in A.7.4.1, the maximum leakage through the orifice in the additional diaphragm shall not exceed 30 l/h air.

A.7.3 Performance characteristics

In the event that the main diaphragm fails, the additional diaphragm shall not take control of the regulation so that the OPSO operates due to over pressure. The test is described in A.7.4.2.

The additional diaphragm shall not influence the function of the main diaphragm, the OPSO or other safety devices.

A.7.4 Test methods

A.7.4.1 Test for diaphragm strength and leakage through orifice

With the main diaphragm destroyed, the regulating device is supplied through its outlet at the maximum supply pressure of the regulator (p). The requirements of A.7.2.2 and A.7.2.3 shall be met.

A.7.4.2 Performance test

With the main diaphragm destroyed, the regulating device is supplied through its inlet at the minimum supply pressure given in the instructions. The OPSO shall close.

This test shall be repeated with the maximum supply pressure given in the instructions. The OPSO shall close.

A.7.5 Marking

In addition to the information required in 8.2, the regulating device fitted with an additional diaphragm shall be marked with “AD”.

A.7.6 Instructions

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

— state that regulating device is fitted with an additional diaphragm;

— give a clear explanation of the additional diaphragm operation, and all necessary information for its installation and use including the explanation of the meaning of “AD” (Additional Diaphragm) in the language(s) of the destination countries of the regulating device; In particular a statement explaining that in case of main diaphragm rupture the regulator shall be replaced.

Annex B
(normative)

Special requirements for devices fitted with a thermal shut off system

B.1 Thermal shut off valve

B.1.1 Definition

A thermal shut off valve is a safety device which permanently closes the flow of gas above a certain temperature limit. All components, including the thermal valve, are designed in a way to guarantee soundness and strength up to a certain temperature above the activating temperature.

B.1.2 Constructional characteristics

The thermal shut off valve shall be integral with the regulating device or be an auxiliary safety device.

The closing device which closes under thermal action and all the parts necessary for its operation shall be either integral with the regulating device or a separate thermal shut off valve. The thermal shut off element shall be independent from the regulation subassembly.

All the components which are placed upstream of the thermal shut off valve, as well as the valve itself, shall be made of materials resistant to a temperature of 650 °C and at the maximum supply pressure.

B.1.3 Performance characteristics

The thermal shut off valve shall shut off the gas supply at a temperature between 80 °C and 100 °C.

Under the test conditions described in B.1.4, no leak or faulty operation of the device/valve assembly shall be noted before the activation of the closing device.

The valve shall remain in the closed position after the activation of the device.

B.1.4 Test methods

The test shall be carried out on two complete devices using nitrogen.

The device fitted with a thermal shut off valve is placed in an oven as shown in Figure B.1 and operated at maximum supply pressure given in Table 18 or the declared maximum operating pressure for a separate valve, at a flow rate equal to 50 % of the nominal flow rate.

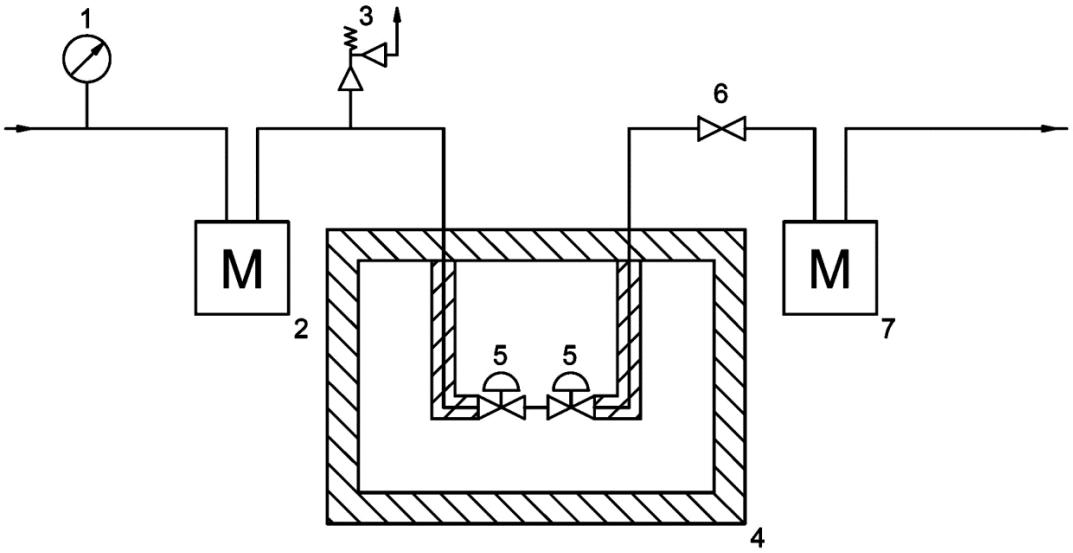
The temperature inside the oven is increased so as to reach:

— a final temperature of (650 ± 20) °C in a period of 15 min (1st sample);

— a final temperature of (650 ± 20) °C in a period of 2 h (2nd sample).

During the rise in temperature, it shall be confirmed that the valve closes between the temperature limits given in B.1.3.

When the temperature reaches 650 °C this temperature and the supply pressure are maintained for 30 min. During this 30 min period, the shut off valve shall not leak more than 35 l of nitrogen (70 l/h) (under normal conditions).



Key

1 gauge – pressure test point
2 gas meter
3 pressure relief valve
4 oven
5 devices under test
6 isolating and adjusting valve
7 gas meter

Figure B.1— Diagram of the test bench for the regulator fitted with a thermal shut off valve

B.1.5 Marking

In addition to the information required in 8.2, the device shall be marked with "T".

B.1.6 Instructions

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

— state that a thermal shut off device is incorporated in the device;

— give a clear explanation of the thermal shut off device operation, and the meaning of "T" (Thermal).

B.2 Thermal spindle on devices for self-closing valve connection

B.2.1 Definition

Integral device which permanently closes the self-closing cylinder valve above a certain temperature limit.

B.2.2 Constructional characteristics

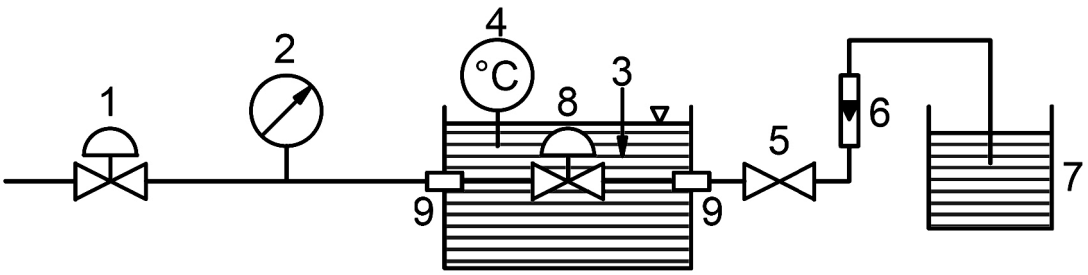
The thermal spindle deforms or melts when the target temperature is reached, resulting in the gas flow shutting off.

B.2.3 Performance characteristics

When the device is under the influence of the temperature, the thermal spindle shall act and shut off the gas flow at a temperature between 100 °C and 150 °C.

B.2.4 Test methods

The device fitted with a thermal spindle is placed in a test bench as shown in Figure B.2. It is connected to a self-closing cylinder valve supplied with air at maximum supply pressure given in Table 18 and a flow rate through the device is adjusted to (100 ± 20) l/h. The oil is heated to 100 °C and stabilized for 15 min.



Key

1	regulating device	6	flow meter
2	manometer	7	vessel filled with water
3	vessel filled with oil	8	device under test
4	thermometer	9	connections
5	valve		

Figure B.2 — Diagram of the test bench for the thermal spindle

After this stabilization period, the flow rate through the device shall remain at (100 ± 20) l/h for 2 min to prove that the self closing valve has not closed.

The temperature of the oil is increased at a rate of 0,5 °C per minute until the cylinder valve closes. This shall be before the temperature reaches 150 °C.

B.2.5 Marking

In addition to the information required in 8.2, the device shall be marked with “TSP” on the device.

B.2.6 Instructions

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

— state that a thermal spindle is incorporated in the device;

— give a clear explanation of the thermal spindle operation, and the meaning of “TSP” (Thermal Spindle Protection) marked on the device.

Annex C
(normative)

Special requirements for devices under extreme temperature conditions (temperatures below −20 °C)

C.1 Scope

This annex applies to devices which may be used under extreme temperature conditions (temperatures below - 20 °C).

C.2 Requirements

C.2.1 Material

Bodies, covers and connections shall be made of metallic materials.

C.2.2 Extreme temperature test

All the specifications requested in this standard at - 20 °C shall be met at −30 °C after conditioning according to C.3.

C.3 Conditioning

The device is left at a temperature of - 40 °C for 24 h.

Its temperature is then raised to - 30 °C.

C.4 Marking

Any device meeting the requirements of this annex shall carry, in addition to the information specified in 8.2, an indication of its suitability for use in extreme temperature conditions as part of the marking "- 30 °C".

C.5 Instructions

In addition to the provisions of 8.4, the instructions shall give a clear explanation of the marking "- 30 °C".

Annex D
(normative)

Regulating devices for gas cylinders to supply appliances installed in caravans, motor caravans or freshwater boats

D.1 Scope

The purpose of this annex is to describe the specifications and test methods applicable to regulating devices which can be used to supply appliances installed in caravans, motor caravans or freshwater boats.

Regulating devices for use in seawater boats are specified in Annex M.

This Annex D is applicable when the vehicle or boat is equipped with appliances operating in category $I_{3B/P(30)}$, supplied by means of gas cylinders within the temperature and pressure ranges specified in Clauses 1 and 6.

In the following text "caravan regulating devices" is used either for caravan or freshwater boat regulating devices.

In this annex "freshwater boats" refers to category D "sheltered waters boats" as described in Directive 94/25/EC, i.e. boats designed for voyages on small lakes, rivers, and canals where conditions up to, and including, wind force 4 and significant wave heights up to, and including, 0,5 m may be experienced.

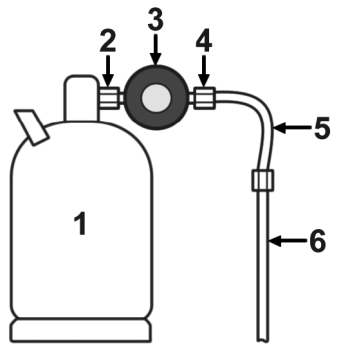
NOTE In this annex, "caravans and motor caravans" refer to the definition given in EN 13878.

D.2 Installations and connections

When the regulating device is not directly fixed on the cylinder valve, means shall be provided to attach the regulator to the wall.

The automatic change over device function can also be carried out by an assembly of regulators, forming an "automatic change over device system" as defined in 3.1.9.

Only the connections described in the following figures shall be used:



Key

1 cylinder

2 inlet connection (any inlet connection referring to EN 15202:2012 in Table G.1)

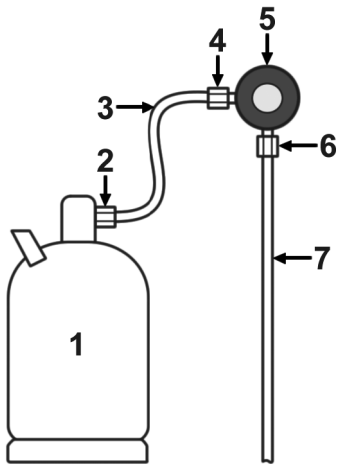
3 cylinder mounted regulator

4 outlet connection H.1 (M 20 × 1,5) or H.4 (threaded connection 1/4 LH)

5 low pressure hose

6 rigid pipework

Figure D.1 — Cylinder mounted regulator



Key

1 cylinder

2 cylinder valve

3 high pressure hose (with adaptor for self-closing cylinder valve)

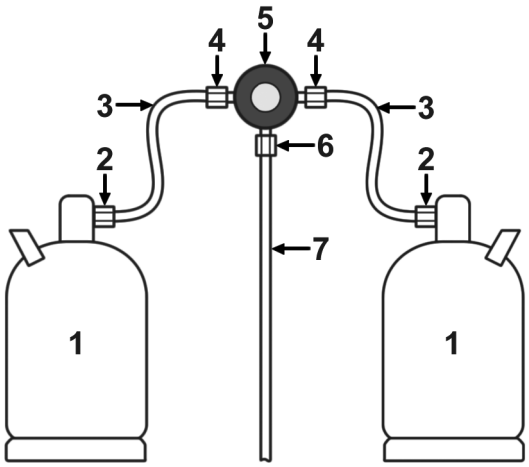
4 regulator inlet connection G.13 (M 20 × 1,5), G.15 (compression fitting 8 mm or 10 mm) or G.67 (Male part of EN 561:2002)

5 wall mounted regulator

6 outlet connection H.1 (M 20 × 1,5) or H.9 (compression fitting 8 or 10 mm)

7 rigid pipework

Figure D.2 — Wall mounted regulator



Key

1 cylinder

2 cylinder valve

3 high pressure hose (with adaptor for self-closing cylinder valve)

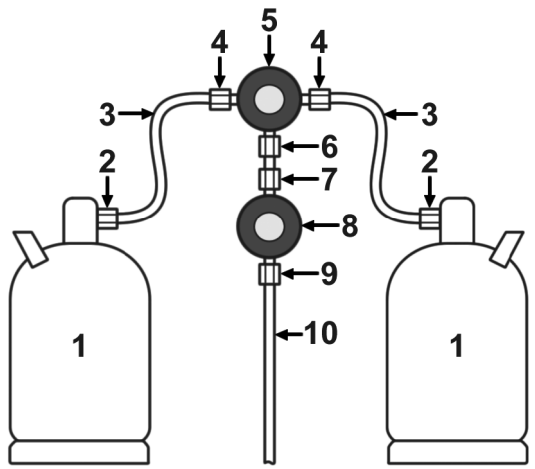
4 automatic change over device inlet connection G.13 (M 20 × 1,5), G.15 (compression fitting 8 mm or 10 mm) or G.67 (Male part of EN 561:2002)

5 wall mounted automatic change over device

6 outlet connection H.1 (M 20 × 1,5) or H.9 (compression fitting 8 mm or 10 mm)

7 rigid pipework

Figure D.3 — Wall mounted automatic change over device (type 1)



Key

1 cylinder

2 cylinder valve

3 high pressure hose (with adaptor for self-closing cylinder valve)

4 automatic change over device inlet connection G.13 (M 20 × 1,5), G.15 (compression fitting 8 mm or 10 mm) or G.67 (Male part of EN 561:2002)

5 wall mounted automatic change over device, intermediate pressure

6 outlet connection H.20 (M 20 × 1,5)

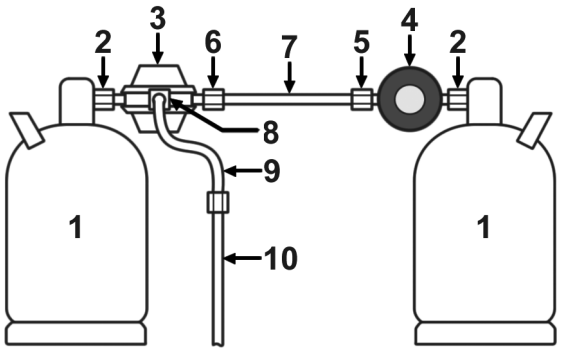
7 regulator inlet connection G.13 (M 20 × 1,5)

8 regulator low pressure

9 regulator outlet connection H.1 (M 20 × 1,5) or H.9 (compression fitting 8 mm or 10 mm)

10 rigid pipework

Figure D.4 — Wall mounted automatic change over device (type 2)



Key

1 cylinder

2 inlet connection any inlet connection referring to EN 15202:2012 in Table G.1

3 part 1 of the automatic change over system (intermediate and low pressure)

4 part 2 of the automatic change over system (intermediate regulated pressure)

5 H.6 (Threaded connection 3/8 LH)

6 G.11 (Threaded connection 3/8 LH)

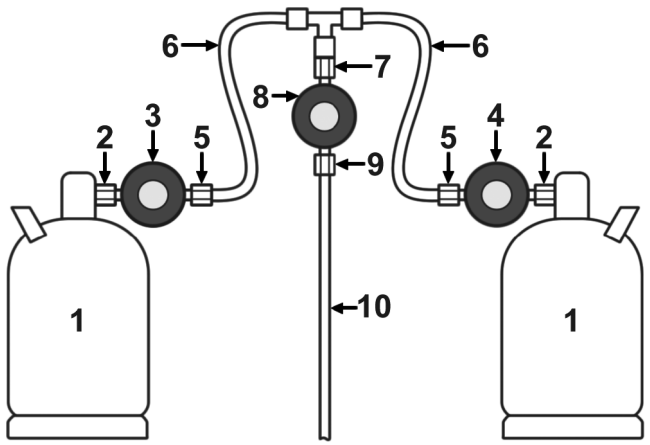
7 intermediate pressure hose

8 outlet connection H.1 (M 20 × 1,5), H.4 (threaded connection 1/4 LH) or H.9 (compression fitting 8 mm or 10 mm)

9 low pressure hose

10 rigid pipework

Figure D.5 — Cylinder mounted automatic change over system (type 1)



Key

1 cylinder

2 inlet connection any inlet connection referring to EN 15202:2012 in Table G.1

3 part 1 of the automatic change over system intermediate pressure regulator 1

4 part 2 of the automatic change over system intermediate pressure regulator 2

5 outlet connection H.6 (threaded connection G3/8 LH), or H.1 (M20 × 1,5)

6 intermediate pressure hose

7 inlet connection low pressure regulator G.11 (threaded connection G3/8 LH) or G.13 (M20 × 1,5)

8 part 3 of the automatic change over system low pressure regulator

9 outlet connection H.9 (compression fitting 8 mm or 10 mm) or H.1 (M20 × 1,5)

10 rigid pipework

Figure D.6 — Cylinder mounted automatic change over system (type 2)

D.3 Pressures and flow rate

The operating characteristics of the caravan regulating devices are given in Table D.1.

Table D.1 — Operating characteristics of caravan regulating devices

Gas	Supply pressures of caravan regulating devices (bar)	Regulated pressures of caravan regulating devices (mbar)				Maximum downstream installation pressure loss (mbar)	Appliance supply pressures[a] (mbar)			Appliance categories [a]
		p_d	p_{Mg}	p_{Mp}	p_0		p_n	p_{min}	p_{max}	
LPG	0,3 to 16	30	30	35	40	5	29 (28–30)	25	35	$I_{3B/P}$

[a] For information, data from EN 437:2003+A1:2009.

These characteristics are verified in accordance with the provisions described in 7.3 of this standard.

The guaranteed flow rate shall not exceed 1,5 kg/h.

D.4 Pressure safety functions

The caravan regulating devices shall contain a pressure safety function which effectively limits the pressure in the installation to a value below 150 mbar.

This requirement may be fulfilled by:

— an over pressure relief valve according to A.1;

— an over pressure shut off valve according to A.2;

— a two stage pressure limiting regulating device according to A.6.

If an excess flow valve is fitted on the regulating device, it shall fulfil the requirements of A.4 using the pressure loss given in Table D.1 instead of Table 5.

Other safety functions, as described in Annexes A and B of this standard, may be included in the supply system, in so far as their structure and operation do not affect the operation of the over pressure safety device.

D.5 Automatic change over system ("kit")

Kits shall be supplied as a complete assembly or as an assembly of parts which, once assembled, will be equivalent to an integral automatic change over regulating device meeting the requirements of this European Standard. If special tools are specified for the assembly of this system, they shall be supplied with the kit.

All the connections used in the automatic change over system shall be designed so as to prevent interchange ability with other devices which are not designed to be used in the system and to prevent parts of the system from being used independently.

All regulators included in the assembly are fixed type.

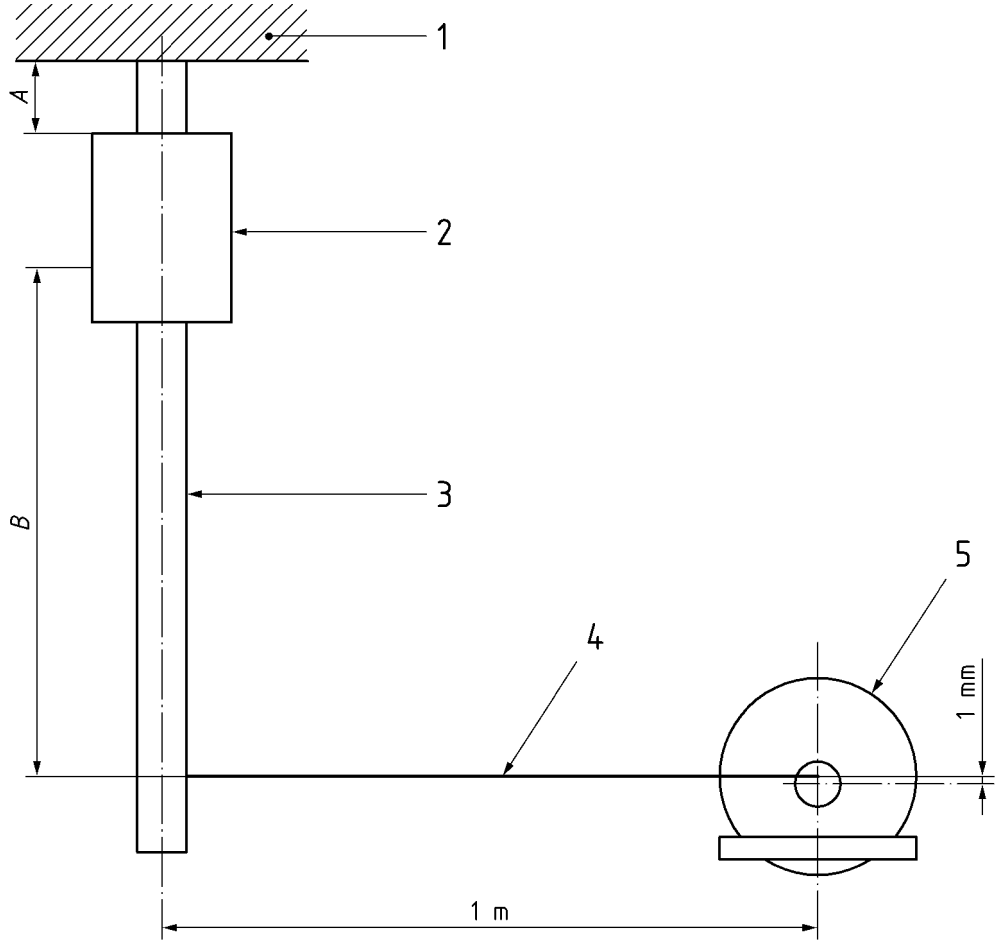
The whole kit shall fulfil the performance requirements for automatic change over devices given in Clause 6.

Each part of the kit shall fulfil all the other requirements given in Clause 5.

Requirements of 5.3.5.2 are not mandatory for these change over device systems.

D.6 Resistance to vibration

Caravan regulating devices shall withstand and remain sound, when subjected to stress from vibrations of 20 Hz. This requirement is verified by a vibration test of 15 min duration, using the assembly shown in Figure D.7. This test is followed by verification of soundness in accordance with 5.5 of this standard.



Key

1 regulating device anchoring point
2 pressure regulating device
3 metallic tube fitted to the outlet of the regulator
4 rod
5 motor (Rotation speed: 900 rpm to 1 500 rpm)
A = 3 times the external diameter of the tube
B = 800 mm

Figure D.7 — Test assembly for checking the resistance to vibrations of the caravan regulating devices

D.7 Marking

In addition to the information specified in Clause 8 and Annex A of this European Standard, the marking and packaging of the caravan, motor caravans and freshwater boat regulating device shall include the marking "caravan(e)".

In addition, automatic change over system, when the two stages of regulation are identified separately:

— all the parts of the system will bear a common marking making obvious that they are different parts of a same system;

— first stage of regulation shall only indicate the values of the supply pressure as information on the pressure;

— second stage of regulation shall only indicate the regulated pressure 30 mbar as information on the pressure;

— nominal rate shall be indicated in the information of the second stage of regulation.

D.8 Instructions

In addition to the information specified in Clause 8 and Annex A of this European Standard, instructions shall include a warning of the type “This regulating device is intended for use in caravans, motor caravans and freshwater boats”.

The instructions of the caravan or freshwater boat regulating device shall include the following warnings:

— “This regulating device is not suitable for seawater boats”;

— “For possible usage in caravan holiday homes national regulation shall be respected.”

The installation instructions shall include all information necessary for the correct and safe assembly of the supply system.

For automatic change over systems, the instructions shall state that in case of replacement all parts shall be replaced all together.

Annex E
(normative)

Complementary test requirements for non-metallic thermoplastic or thermal setting materials used in the construction of devices

E.1 Scope

The requirements in this annex cover devices made of non-metallic materials in accordance with 5.2.2

E.2 Materials

The material for the body and/or cover and/or connections shall be polybutylene terephtalate (PBTP), with a 20 % to 30 % mass of glass fibre or an equivalent material. The characteristics of the material used shall not be lower than the values given in Table E.1.

Table E.1 — Minimum characteristics of non-metallic materials

Property	Standard	Unit	Test method/ conditions	Minimum value
Mechanical				
Elongation at break	EN ISO 527 (all parts)	%	23 °C	1
Bending resistance	EN ISO 178:2011	N/mm^2	23 °C	150
Shock resistance	EN ISO 180:2001	kJ/m^2	Method 1 at 23 °C	30
Thermal				
Dimensional stability	EN ISO 75 (all parts)	°C	Method A 1,80 MPa	190

Table E.2 summarizes the possibilities for using non-metallic materials on devices.

Table E.2 — Use of non-metallic materials

		Non-metallic	
		PBTP or equivalent	Other
Body and cover which retain pressure		Yes Only for regulators, having a regulated pressure of up to 200 mbar and of a flow rate smaller than 4 kg/h, directly fitted onto the cylinder using a quick coupling with self-closing valve and non-threaded outlet connection	No
Internal parts and cover not retaining the pressure except connections		Yes	Yes
Connections	threaded fixed parts	No	No
	non-threaded fixed parts	Yes Only for regulators, having a regulated pressure of up to 200 mbar and of a flow rate smaller than 4 kg/h, directly fitted onto the cylinder using a quick coupling with self-closing valve and non-threaded outlet connection	No
Other (buttons,…)		Yes	Yes

E.3 Special requirements

E.3.1 Accelerated ageing

Devices incorporating one or several external parts made of non-metallic materials shall be subjected to the accelerated ageing test before carrying out the tests required by the standard.

Before carrying out the test cycles indicated below, the inlet and outlet of the device shall be sealed.

a) First cycle: UV

The device shall be tested in accordance with EN ISO 4892-3 method A, cycle 1 during 1000 h..

The condensation level correspond to (90 ± 5) % humidity.

The device shall be fixed, in its normal operating position, onto a support which rotates so as to expose all sides to the energy.

b) Second cycle: thermal choc

The device shall be placed in a cryostatic cell at a temperature of (−25 ± 2) °C.

The test cycle shall include the following stages:

1) The device shall be kept in the cell for 10 min.

2) The device shall then be withdrawn from the cell and maintained at room temperature for a period *t* such that 2 min ≤ *t* < 3 min.

3) The device shall then be placed in a thermostatic room at (55 ± 2) °C where it shall be maintained for 10 min.

4) Finally the device shall be removed and maintained at room temperature for a period *t* such that 2 min ≤ *t* < 3 min.

The device shall be subjected to five test cycles.

E.3.2 Resistance to hydrocarbons

A sample of non-metallic parts, which are likely to come into contact with butane, propane or their mixtures, shall be weighed, then immersed for ($72\ ^{0}_{-2}$) h into pentane at (20 ± 5) °C. At the end of this period, the parts shall be withdrawn from pentane and wiped with absorbent paper.

Parts shall be weighed after 2 min, then 24 h after their withdrawal from pentane.

Check that:

— 2 min after the withdrawal from pentane, the increase in weight is less than 0,3 % of the initial mass;

— 24 h after the withdrawal from pentane, the loss in mass is less than 0,3 % of the initial mass.

E.3.3 Resistance to cracking under stress and when chemical agents are present

E.3.3.1 If glues or lubricants are used, they shall be compatible with the materials used.

E.3.3.2 If assembly components (screws, rivets, inserts…) are essential for fixing, materials shall be such that the stresses created do not cause any cracking or deterioration of the material with time. It shall be checked that the maximum values of stresses applicable to materials are not exceeded.

E.3.4 Characteristics relating to fire resistance

The body and/or the cover and/or the connections and non-metallic parts of the device in contact with gas insulated from the atmosphere shall be made of materials belonging to self-extinction class FV-0 in compliance with EN 60695-11-10:2013.

All the other external parts of the device which are made of non-metallic materials shall belong to class FV-2 in accordance with EN 60695-11-10:2013.

The self-extinction class for the minimum thickness of the part to be tested shall be certified.

E.4 Special conditions for carrying out the tests mentioned in the body of the standard

E.4.1 Resistance to impact (see 5.4.1 and 7.2.1)

These tests shall be carried out at a temperature of (−20 ± 2) °C.

E.4.2 Mechanical resistance of connections (see 5.4.3 and 7.2.3)

These tests shall be carried out at (−20 ± 2) °C and at (+50 ± 2) °C.

The duration of application of the forces and torques shall not be less than 15 min.

E.4.3 Soundness (see 5.5 and 7.2.5)

For devices incorporating components which isolate an enclosure containing gas from the atmosphere and made of non-metallic materials, this test shall be carried out under the following conditions:

a) at (+50 ± 2) °C under the pressure conditions defined in 7.2.5;

b) at (0 ± 2) °C for butane devices, under the following pressure conditions:

   1) through the inlet connection, 0,5 bar;

   2) through the outlet connection, 150 mbar (or 220 mbar);

c) at (−20 ± 2) °C for propane and LPG devices, under the following pressure conditions:

   1) through the inlet connection, 1 bar;

   2) through the outlet connection, 150 mbar (or 220 mbar).

E.5 Sampling and order of tests

The order of tests shall be that of Table 14 (see 7.1.4), however the ageing test of E.3.1 shall be carried out first in the case where the device incorporates external parts made of non-metallic materials.

Annex F
(normative)

Requirements for elastomeric reinforced diaphragms

The reinforced material shall not show any sign of delamination when examined using two times magnification, during or after any of the tests carried out in accordance with EN 549: 1994.

In addition, it shall not show any blisters in excess of 2 mm diameter, immediately after the 72 h immersion in liquid propene (95 % minimum propene) at (20 ± 5) °C.

If necessary, the corresponding test may be carried out by limiting the contact with liquid propene to active surfaces of the diaphragm using an adequate test assembly.

Annex G
(normative)

Inlet connections

The different types of threaded and non-threaded inlet connections are listed in Table G.1 which indicates their designation and whether if they are described in this standard or in other standards.

Connections used in different countries are given in Tables G.2 and G.3.

NOTE According to information given by the national standardization bodies.

Types G.1 to G.49 are threaded inlet connections and types G.50 to G.99 are non-threaded inlet connections.

Table G.1 — Designation of connection and relation to this EN or other standards

Type	Designation	EN 16129	Other standards
G.1	Threaded connection 20 × 1,814 LH – Spanner tightened		EN 15202:2012
G.2	Threaded connection 21,7 × 1,814 LH – 60°– Hand tightened		EN 15202: 2012
G.3	Threaded connection M 16 × 1,5 RH – Hand tightened		EN 15202: 2012
G.4	Threaded connection W 21,8 × 1,814 LH – 55°– Spanner tightened		EN 15202: 2012
G.5	Threaded connection W 21,8 × 1,814 LH – 55°– Spanner tightened		EN 15202: 2012
G.6	Threaded connection W 22 × 1,155 LH – Hand tightened		EN 15202: 2012
G.7	Threaded connection G 5/8 LH – Spanner tightened		EN 15202: 2012
G.8	Threaded connection 21,8 × 1,814 – LH - Spanner tightened		EN 15202: 2012
G.9	Threaded connection/Nut 0,885 NGO[a] LH – Spanner tightened		EN 15202: 2012
G.10	Threaded connection 0,885 NGO[a] LH – Rubber nose		EN 15202: 2012
G.11	External threaded connection G 3/8 LH		EN 560:2005
G.12	Threaded connection W 21,8 × 1,814 LH – Hand tightened		EN 15202: 2012
G.13	External threaded connection M 20 × 1,5 RH	X	
G.14	Internal threaded connection EN 10226-1:2004 (Rp)		EN 10226-1:2004
G.15	Compression fittings 8 and 10 mm of L series of EN ISO 8434-1		EN ISO 8434-1
G.16	Nut EN ISO 228-1:2003 spheroconical connection	X	
G.17	Nut G 3/4 flat seal tank connection	X	

Type	Designation	EN 16129	Other standards
G.18	Internal threaded connection NPT		ANSI/ASME B1.20.1
G.19	Threaded connection W 21,8 × 1,814 LH – Hand tightened		EN 15202: 2012
G.20	Nut G 1/4 LH spheroconical connection		EN 560:2005
G.21	Threaded connection W 14,8 × 1/18 – Hand tightened		EN 15202: 2012
G.22	Compression fittings 12, 15, 18, 22, 28, and 35 mm of L series of EN ISO 8434-1		EN ISO 8434-1
G.23	Internal threaded connection EN 10226-2:2005 (Rc)		EN 10226-2:2005
G.24	Nut G 1/2 LH spheroconical connection		EN 560:2005
G.25	Threaded connection G 3/8 LH EN ISO 228-1:2003 – Spanner tightened		EN 15202: 2012
G.26	Nut G 3/4 spheroconical connection junction DN16	X	
G.27	Nut G 1 1/4 spheroconical connection junction DN25	X	
G.28	Nut G 3/4 flat seal line connection	X	
G.32	M 14 × 1,5 self closing connection		EN 15202: 2012
G.33	G 3/8 LH		EN 15202: 2012
G.34	External threaded connection G 3/4 flat seal line	X	
G.35	Cartridge boss valve connection		EN 417 and EN 521:2006
G.36	Nut M 20 × 1,5 flat seal connection	X	
G.37	Internal threaded EN ISO 228-1:2003 O-ring connection	X	
G.50	Quick coupling – Diameter 16		EN 15202: 2012
G.51	Quick coupling – Diameter 19		EN 15202: 2012
G.52	Quick coupling – Diameter 20		EN 15202: 2012
G.53	Quick coupling – Diameter 21		EN 15202: 2012
G.54	Quick coupling – Diameter 22		EN 15202: 2012
G.55	Quick coupling – Diameter 24,5		EN 15202: 2012
G.56	Quick coupling – Diameter 35		EN 15202: 2012
G.57	Quick coupling for threaded valves 21,7		EN 15202: 2012
G.58	Quick coupling – Diameter 24,4		EN 15202: 2012
G.59	Quick coupling – Diameter 27		EN 15202: 2012
G.60	Quick coupling – Diameter 25,4		EN 15202: 2012
G.61	Quick coupling bayonet connection		EN 15202: 2012
G.67	Quick coupling type F of EN 561:2002 Male part		EN 561:2002

[a] NGO – "National Gas Outlet" conform to ANSI/CGA V-1.

Table G.2 — Threaded inlet connections used in the various countries (see 5.3.4.2)

Type	Threaded connections																																
Country Code [a]	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17	G.18	G.19	G.20	G.21	G.22	G.23	G.24	G.25	G.26	G.27	G.28	G.32	G.33	G.34	G.35	G.36	G.37
AT	x		x	x	x	x						x																				x		
BE		x	x		x					x													x									x		
BG																																x		
CH		x	x								x		x										x								x	x	
CY																																x		
CZ			x	x	x				x		x			x	x	x	x			x			x	x	x							x		
DE			x	x	x				x		x	x	x	x	x	x	x		x	x		x	x	x	x							x	x	x
DK			x	x		x																	x									x		
EE																																x		
ES			x										x	x					x		x		x									x	x	
FI																							x									x		
FR		x	x										x	x			x						x			x	x	x			x	x	x	
GB							x	x	x					x				x					x			x			x			x		
GR	x		x											x	x							x	x									x		
HU																																x		
IE																							x									x		
IS																																x		
IT	x		x											x			x						x									x		

Type	Threaded connections																																
Country Code [a]	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17	G.18	G.19	G.20	G.21	G.22	G.23	G.24	G.25	G.26	G.27	G.28	G.32	G.33	G.34	G.35	G.36	G.37
LT																																x		
LU																																x		
LV																																x		
MT																																x		
NO																													x			x		
NL			x		x																		x									x		
PL																														x		x		
PT			x						x	x								x					x						x			x		
RO																																x		
SE			x																													x		
SI	x			x	x							x												x	x	x				x		x		
SK																																x		
[a] Country codes are in accordance with EN ISO 3166-1.																																		

Table G.3 — Non-threaded inlet connections used in the various countries (see 5.3.4.2)

Type / Country code [a]	Non-threaded connections												
	G.50	**G.51**	**G.52**	**G.53**	**G.54**	**G.55**	**G.56**	**G.57**	**G.58**	**G.59**	**G.60**	**G.61**	**G.67**
AT													
BE			x							x			
BG													
CH													
CY													
CZ													
DE													x
DK	x	x	x	x	x		x						
EE													
ES							x[b]						
FI													
FR			x				x	x		x			
GB			x	x	x		x			x			
GR			x		x	x			x				
HU													
IE							x						
IS													
IT			x		x	x			x				
LT													
LU													
LV													
MT													
NO													
NL										x			
PL													

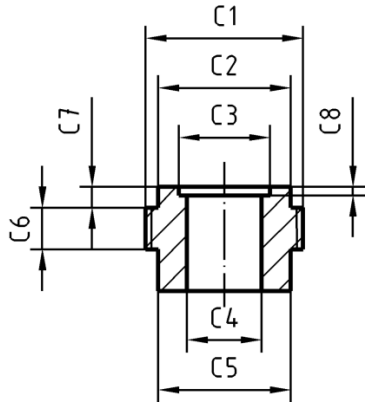
Type / Country code [a]	Non-threaded connections												
	G.50	**G.51**	**G.52**	**G.53**	**G.54**	**G.55**	**G.56**	**G.57**	**G.58**	**G.59**	**G.60**	**G.61**	**G.67**
PT			x		x		x				x	x	
RO													
SE							x						
SI		x	x	x	x					x			
SK													

[a] Country codes are in accordance with EN ISO 3166-1.

[b] Only regulators where both the connection and disconnection in "on" position is possible (see 5.3.4.3).

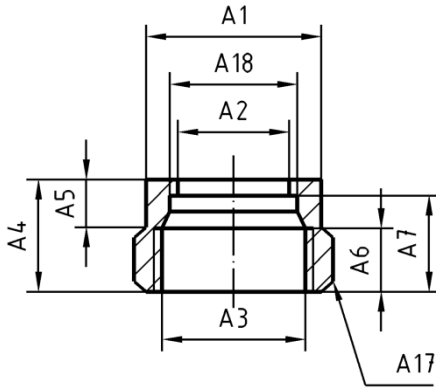
NOTE Tables G.2, G.3 can be incomplete or include data that is not fully up to date. This is because the CEN/TC 181 Secretariat has not received the relevant information from the CEN member countries concerned prior to the publication of this European Standard.

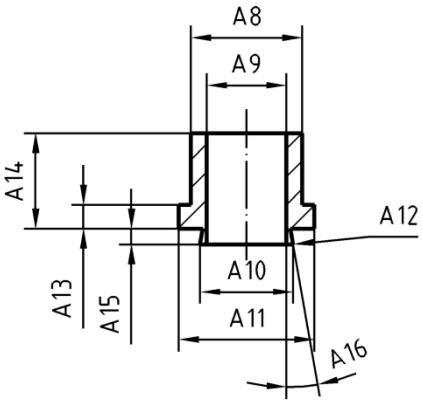
Specific queries concerning updated information should be directly addressed to the relevant CEN member country.

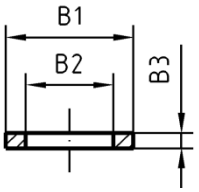


Same as H1

Device
C1 = M20 × 1,5
C2 = Ø17,8-Ø17,9
C3 = Ø12,6-Ø12,7
C4 = Ø12,6 max.
C5 = Ø17,4-Ø17,6
C6 = 7 min.
C7 = 1,5–1,7
C8 = 1,2–1,5







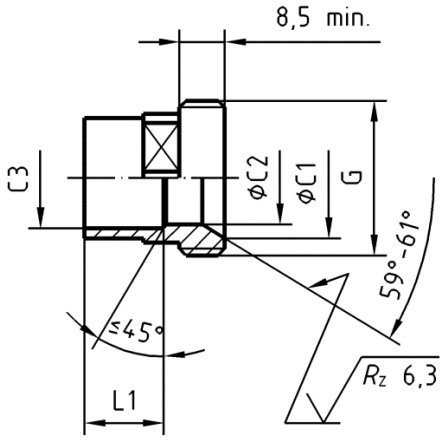
Connector
A1 = Ø22,7-Ø22,9
A2 = Ø15,2-Ø15,3
A3 = M20 × 1,5
A4 = 14,4–14,6
A5 = 6,4–6,6
A6 = 8,9–9,1
A7 = 11,9–12,1
A8 = Ø15-Ø15,1
A9 = Ø10 max.
A10 = Ø12,4-Ø12,5
A11 = Ø17,8-Ø17,9
A12 = 0,3–0,4
A13 = 2,9–3,1
A14 = 12,4 min.
A15 = 2,0–2,2
A16 = 5°-6°
A17 = 23 A/F
A18 = Ø18 min
Seal
B1 = Ø16,7-Ø17,0
B2 = Ø11,7-Ø12,0
B3 = 1,7–2,0
NBR or equivalent
A2/H3 EN 549: 1994

NOTE "A/F" means across flat.

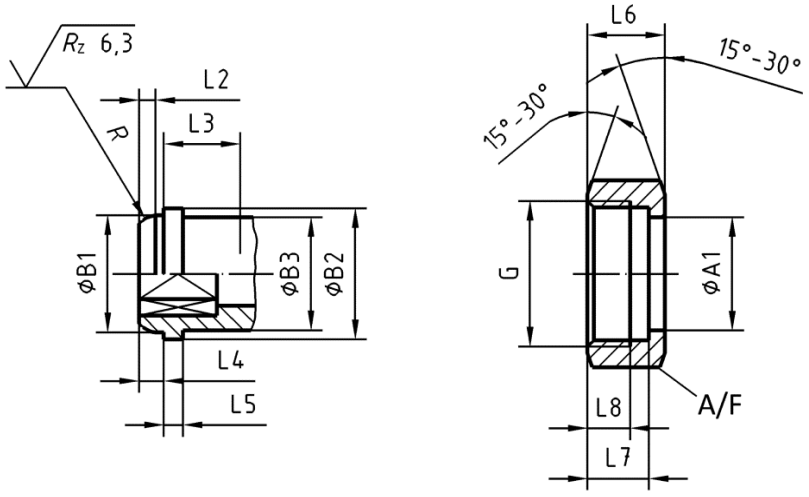
Figure G.1 — Type G.13 — External threaded connection M 20 × 1,5 RH

Dimensions in millimetres

Connector



Device



G	C1			C2	C3			L1		
	Nominal	min.	max.	max.	Nominal	min.	max.	Nominal	min.	max.
G 3/4	21,5	21,4	21,6	17	10	10,065	10,155	9	7,8	10,2
G 3/4	21,5	21,4	21,6	17	12	12,065	12,155	10	8,6	11,4
G 3/4	21,5	21,4	21,6	17	15	15,065	15,155	12	10,6	13,4
G 3/4	21,5	21,4	21,6	17	18	18,065	18,155	14	12,6	15,4
G 1	25,7	27,4	27,6	21	22	22,075	22,185	17	15,4	18,6
G 1	25,7	27,4	27,6	21	28	28,075	28,185	20	18,4	21,6

G	B1			B3	B2		L5	L4	L3	L2	R
	Nominal	min.	max.		Nominal min.	max.	min.		min.		
G 3/4	21	20,9	21,1	21	23,5	23,7	3,5	4,5	15	3	4
G 1	27,5	27,4	27,6	26,5	29,5	29,7	4	5,5	17	4,5	5

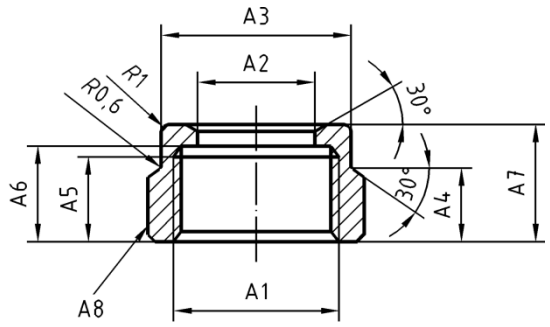
G	L6 Nominal	L7 Nominal	L8 min.	A1	A/F min.
G 3/4	15	12	8,5	21,5	30
G 1	17	13	10	27,5	37

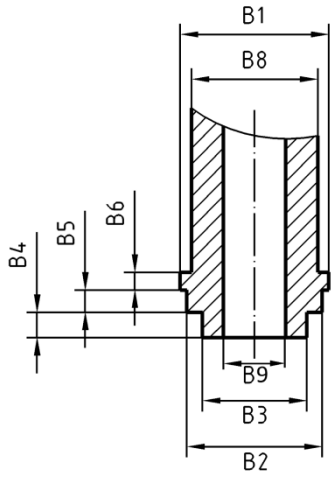
NOTE 1 L3 is the minimum length of dimension B3 to allow movement of the nut on L6.

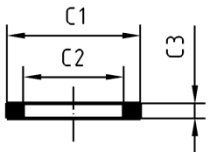
NOTE 2 "A/F" means across flat.

Figure G.2 — Type G.16 — Nut EN ISO 228-1:2003 spheroconical connection

Dimensions in millimetres







Device

A1 = G3/4 EN ISO 228 -1:2003

A2 = Ø20,4 –20,6

A3 = Ø30 min.

A4 = 11,5 min.

A5 = 12,85 – 13,15

A6 = 14,85 - 15,15

A7 = 17,85 – 18,15

A8 = A/F 32 hex

B1 = Ø23,7 - Ø23,8

B2 = Ø21,9 – Ø22

B3 = Ø17 – Ø17,1

B4 = 4,5 min. – 12 max.

B5 = 2,85 – 3,15

B6 = 2,85 – 3,15

B7 = 18 min vertically from the bottom of B5

B8 = Ø19,8 – Ø20,2

B9 = 15 max

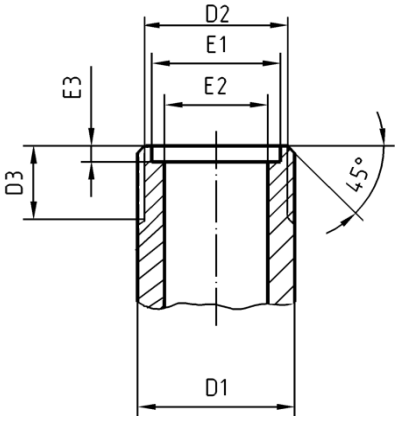
Seal - Black

C1 = Ø21,8 – Ø22

C2 = Ø16,4 – Ø16,6

C3 = 2,3 – 2,5

NOTE "A/F" means across flat.



Connector

D1 = G3/4 EN ISO 228-1:2003

D2 = Ø 23,65 – Ø23,95

D3 = 13 min.

E1 = Ø22,2 – Ø22,3

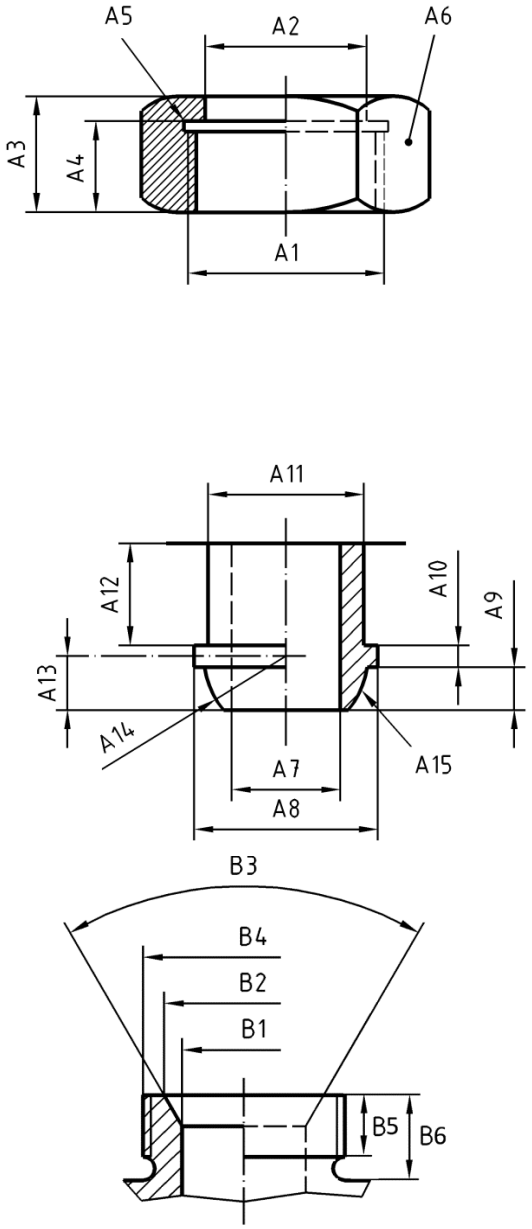
E2 = Ø17,2 – Ø17,3

Depth 12 min.

E3 = 2,35 – 2,65

Figure G.3 — Type G.17 — Nut G 3/4 flat seal tank connection

Dimensions in millimetres



Device
A1 = G3/4 EN ISO 228-1:2003
A2 = Ø21,4 – Ø21,6
A3 = 15,2 – 15,8
A4 = 11,4 – 11,8
A5 = see [a]
A6 = 32 A/F
A7 = Ø14,9 – Ø15,1
A8 = Ø23,9 – Ø24,1
A9 = 5,5 – 5,7
A10 = 2,4 – 2,6
A11 = Ø20,9 – Ø21,3
A12 = 13,5 min.
A13 = 7 – 7,2
A14 = R11,1 – R11,3
A15 = $^{Ra\,0,8}\sqrt{ES}$

Connector
B1 = Ø15,7 – Ø16,3
B2 = Ø20,9 – Ø21,1
B3 = 59° - 61°
B4 = G3/4B
EN ISO 228-1:2003
B5 = 8,3 – 8,7
B6 = 11,3 – 11,7

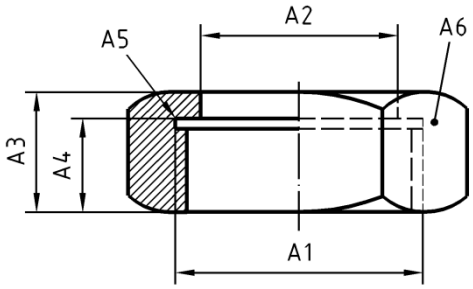
[a] Optional groove, if exists, the Ø should not exceed the external thread Ø. It can be replaced by an imperfect thread.

NOTE 1 ES = static tightness.

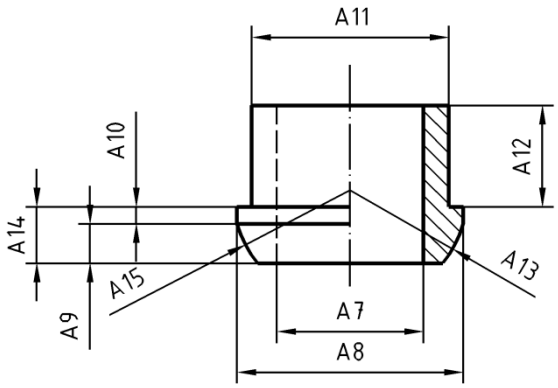
NOTE 2 "A/F" means across flat.

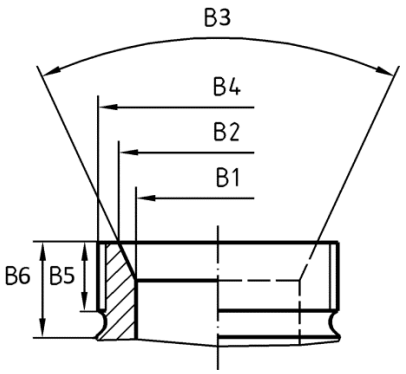
Figure G.4 — Type G.26 — Nut G 3/4 spheroconical connection junction DN16

Dimensions in millimetres



Device
A1 = G1
1/4 EN ISO 228-1:2003
A2 = Ø33,85 – Ø34,15
A3 = 20,2 – 20,8
A4 = 15,4 – 15,8
A5 = see [a]
A6 32 A/F
A7 = Ø25,7 – Ø26,3
A8 = Ø38,4 – Ø38,8
A9 = 5,9 – 6,1
A10 = 3,4 – 3,6
A11 = Ø33,3 – Ø33,7
A12 = 17,5 min.
A13 = R18,9 – R19,1
A14 = 11 – 11,2
A15 = Ra 0,8





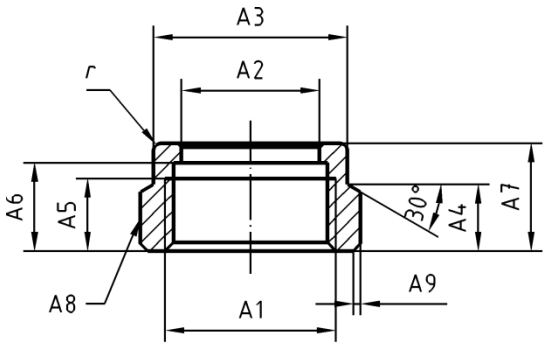
Connector
B1 = Ø25,7 – Ø26,3
B2 = Ø34,85 – Ø35,15
B3 = 59° - 61°
B4 = G1 1/4B
EN ISO 228-1:2003
B5 = 11,3 – 11,7
B6 = 14,3 – 14,7

[a] Optional groove, if exists, the Ø should not exceed the external thread Ø. It can be replaced by an imperfect thread.

NOTE "A/F" means across flat.

Figure G.5 — Type G.27 — Nut G 1 1/4 spheroconical connection junction DN25

Dimensions in millimetres



Device

A1 = EN ISO 228-1:2003 - G 3/4

A2 = 21,4 - 21,5

A3 = Ø29,8 - Ø30,2

A4 = 10,3 - 10,7

A5 = 11,3 - 11,7

A6 = 13,8 - 14,2

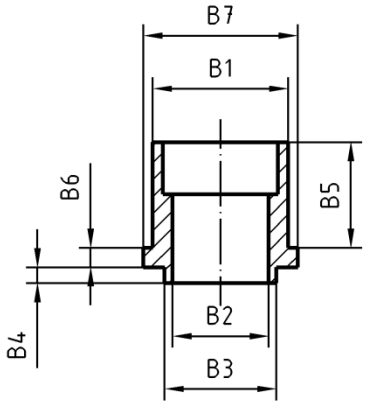
A7 = 16,8 - 17,2

A8 = 32 A/F

Rounded angles Ø34,5 (optional)

A9 = 1,20 X 45°

r = 1



B1 = Ø20,9 - Ø21

B2 = 14,8 - 15,2

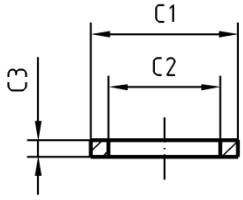
B3 = 16,8 - 17,2

B4 = 2,4 - 2,5

B5 = 16,5 min

B6 = 2,8 - 3,2

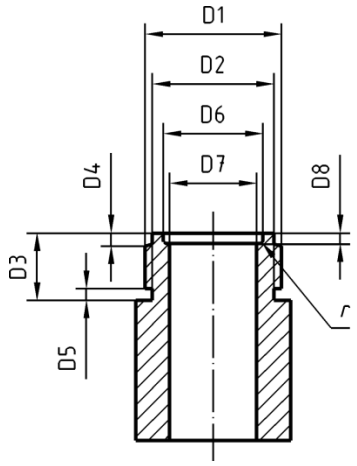
B7 = Ø23,9 - Ø24



C1 = Ø22,8 - Ø23

C2 = Ø16,5 - Ø16,7

C3 = 2,5 - 2,7



Connector

D1 = EN ISO 228-1:2003 - G 3/4 B

D2 = Ø23,4 - Ø23,8

D3 = 13 mini

D4 = 2,3 - 2,7

D5 = 2,3 – 2,7

D6 = Ø18,8 - Ø19,2

D7 = Ø16,8 - Ø17,2

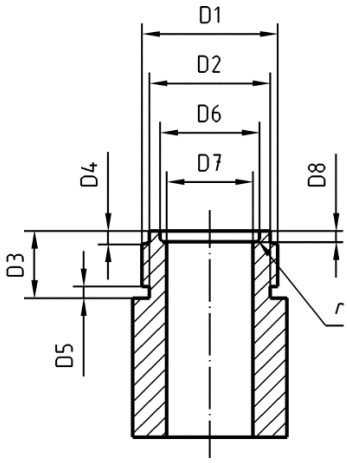
D8 = 2,5 mini

r = 0,50 min

NOTE “A/F” means across flat.

Figure G.6 — Type G.28 — Nut G 3/4 flat seal line connection

Dimensions in millimetres



Device

D1 = EN ISO 228-1:2003 - G 3/4 B

D2 = Ø23,4 - Ø23,8

D3 = 13 mini

D4 = 2,3 - 2,7

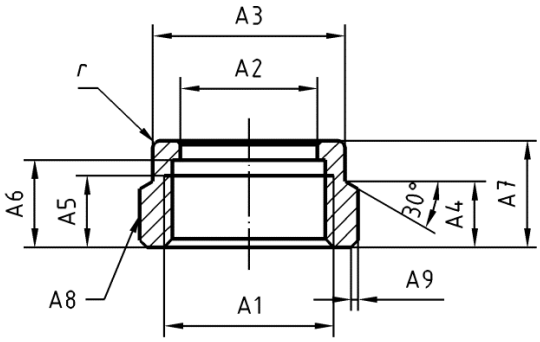
D5 = 2,3 – 2,7

D6 = Ø18,8 - Ø19,2

D7 = Ø16,8 - Ø17,2

D8 = 2,5 mini

r = 0,50 min



Connector

A1 = EN ISO 228-1:2003 - G 3/4

A2 = 21,4 - 21,5

A3 = Ø29,8 - Ø30,2

A4 = 10,3 - 10,7

A5 = 11,3 - 11,7

A6 = 13,8 - 14,2

A7 = 16,8 - 17,2

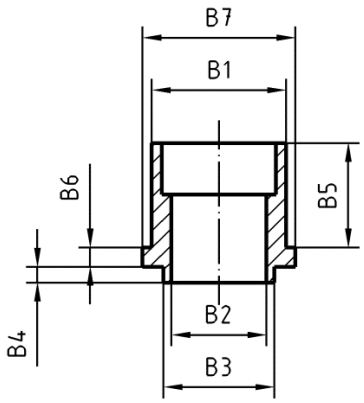
A8 = 32 A/F

Rounded angles Ø34,5

(Optional)

A9 = 1,20 – 45°

r = 1



B1 = Ø20,9 - Ø21

B2 = 14,8 - 15,2

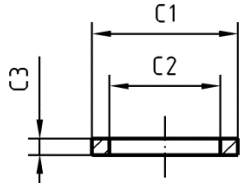
B3 = 16,8 - 17,2

B4 = 2,4 - 2,5

B5 = 16,5 mini

B6 = 2,8 - 3,2

B7 = Ø23,9 - Ø24



NOTE "A/F" means across flat.

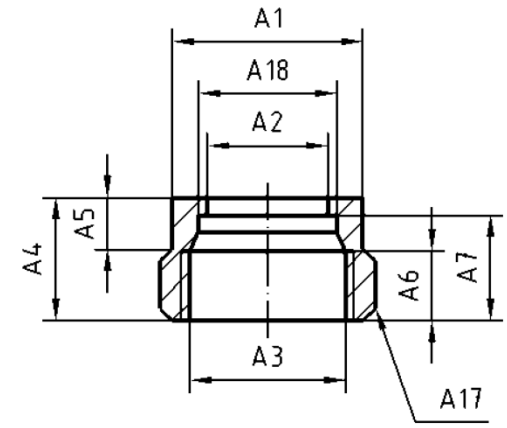
C1 = Ø22,8 - Ø23

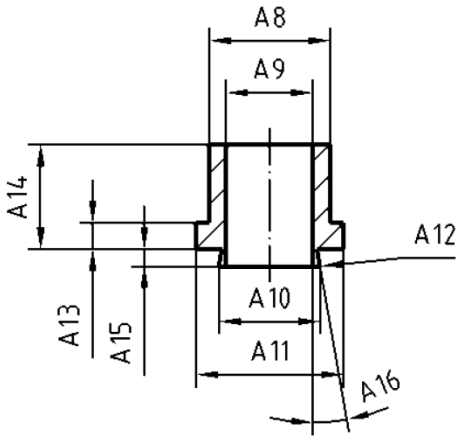
C2 = Ø16,5 - Ø16,7

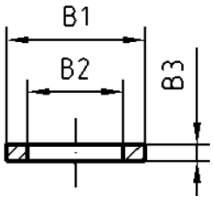
C3 = 2,5 - 2,7

Figure G.7 — Type G.34 — External threaded connection G3/4 flat seal line

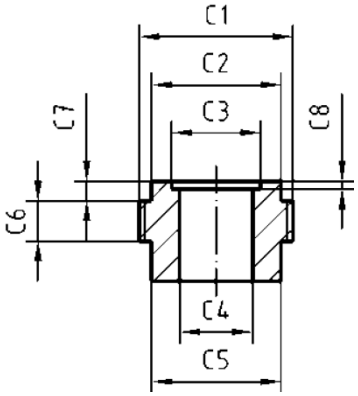
Dimensions in millimetres







Device
A1 = Ø22,7 – Ø22,9
A2 = Ø15,2 – Ø15,3
A3 = M20 × 1,5
A4 = 14,4 – 14,6
A5 = 6,4 – 6,6
A6 = 8,9 – 9,1
A7 = 11,9 – 12,1
A8 = Ø15 – Ø15,1
A9 = Ø10 max.
A10 = Ø12,4 – Ø12,5
A11 = Ø17,8 – Ø17,9
A12 = 0,3 – 0,4
A13 = 2,9 – 3,1
A14 = 12,4 min.
A15 = 2,0 –2,2
A16 = 5° - 6°
A17 = 23 A/F
Seal
B1 = Ø16,7 – Ø17,0
B2 = Ø11,7 – Ø12,0
B3 = 1,7 – 2,0
NBR or equivalent
A2/H3 EN 549

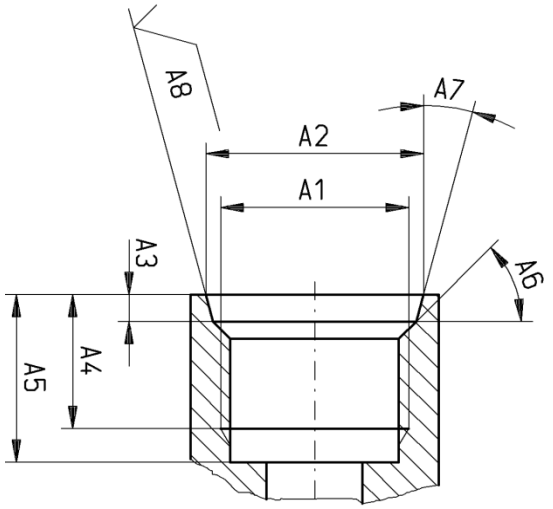


Connector
C1 = M20 × 1,5
C2 = Ø17,8 – Ø17,9
C3 = Ø12,6 – Ø12,7
C4 = Ø12,6 max.
C5 = Ø17,4 – Ø17,6
C6 = 7 min.
C7 = 1,5 – 1,7
C8 = 1,2 – 1,5

Figure G.8 — Type G.36 — Nut M 20 × 1,5 flat seal connection

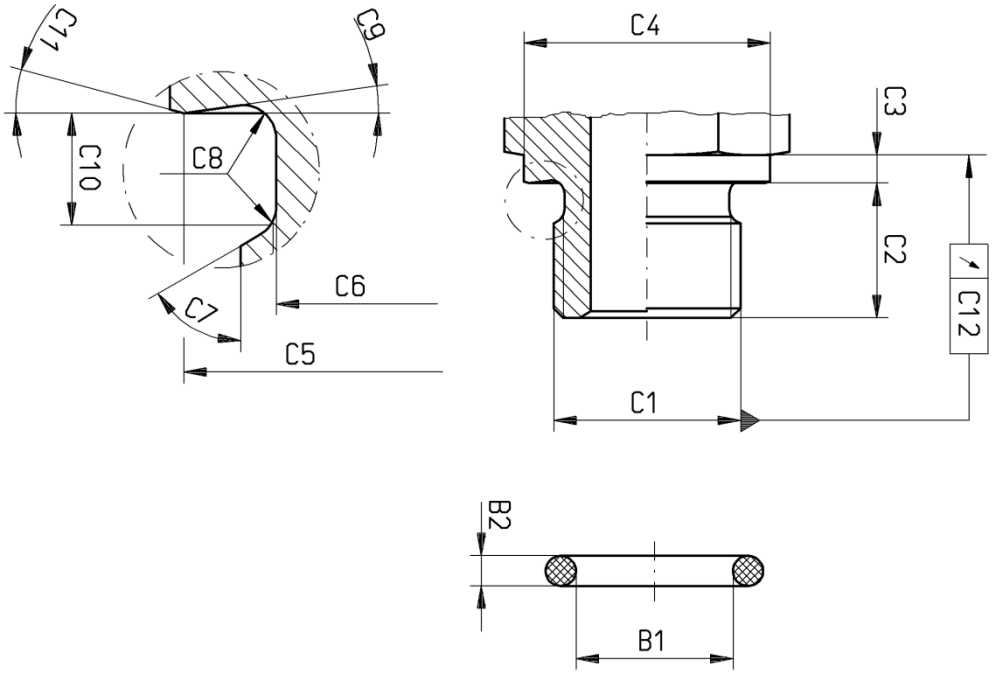
Dimension in millimetres

Device



	A1	A2	A3	A4	A5	A6	A7	A8 max.
G 1/4	Ø14,0-Ø14,1	1,9 – 2,1	12 - 13	14 - 15	44° - 46°	11° – 13°	R_a 3,2	
G 3/8	Ø19,3-Ø19,4	2,4 - 2,6	14° - 16 °					
G 1/2	Ø22,7-Ø22,8	2,8 – 3,0	14 - 15	16 - 17				
G 3/4	Ø30,0-Ø30,1	16 - 17	18 - 19					
G 1	Ø36,0-Ø36,1	3,2 - 3,4	18 - 19	21 - 22				

Connector



Seal

A1/C1	B1	B2
G1/4	Ø10,32–Ø10,68	Ø1,72–Ø1,88
G3/8	Ø13,81–Ø14,19	Ø2,61–Ø2,79
G1/2	Ø17,65–Ø18,07	Ø2,53–Ø 2,71
G3/4	Ø23,16–Ø23,64	Ø3,43–Ø3,63
G1	Ø27,72–Ø28,28	Ø3,40–Ø3,60

C1/A1	C2	C3 min.	C4	C5	C6	C7 min.	C8 min.	C9	C10	C11	C12
G 1/4	11,8 – 12,2	2	Ø17,6-Ø18,0	Ø16,5-Ø17,0	Ø11,0-Ø11,2	30° –60°	R 1,2	6,5° – 9,5°	3,0 – 3,3	13,5° - 16,5°	0,1
G 3/8		2,5	Ø21,6-Ø22,0	Ø20,5-Ø21,0	Ø14,5-Ø14,7						
G 1/2	13,8 – 14,2	3	Ø25,6-Ø26,0	Ø24,5-Ø25,0	Ø18,2-Ø18,4				4,0 – 4,3		
G 3/4	15,8 – 16,2		Ø31,6-Ø32,0	Ø29,5-Ø30,0	Ø23,7-Ø23,9						0,2
G 1	17,8 – 18,2		Ø38,6-Ø39,0	Ø36,5-Ø37,0	Ø29,7-Ø29,9		R 1,6		5,0 – 5,3		

Figure G.9 — Type G.37 — Internal threaded EN ISO 228-1:2003 O-ring connection

Annex H
(normative)

Outlet connections

The different types of threaded and non-threaded outlet connections are listed in Table H.1 which indicates their designation and whether if they are described in this standard or in other standards.

Connections used in different countries are given in Tables H.2 and H.3.

NOTE According to information given by the national standardization bodies.

Types H.1 to H.49 are threaded outlet connections and types H.50 to H.99 are non-threaded outlet connections.

Table H.1 — Designation of connection and relation to this EN or other standards

Type	Designation	EN 16129	Other standards	Same drawing as
H.1	External threaded connection M 20 × 1,5 RH	X		G.13
H.2	External threaded G3/8 flat seal connection	X		
H.3	External threaded G1/2 flat seal connection	X		
H.4	External threaded connection G 1/4 LH spheroconical connection		EN 560:2005	G.20
H.5	External threaded connection G 1/2 LH spheroconical connection		EN 560:2005	G.24
H.6	External threaded connection G 3/8 LH		EN 560:2005	G.11
H.7	Internal threaded connection EN 10226-1:2004 (Rp)		EN 10226-1:2004	G.14
H.8	Compression fittings 12, 15, 18, 22, 28, and 35 mm of L series of EN ISO 8434-1		EN ISO 8434-1	G.22
H.9	Compression fittings 8 and 10 mm of L series of EN ISO 8434-1		EN ISO 8434-1	G.15
H.10	External threaded connection EN ISO 228-1:2003 spheroconical connection	X		G.16
H.11	Internal threaded connection NPT		ANSI/ASME B1.20.1	G.18
H.12	External threaded connection G 1 1/4 flat seal DN 25 connection	X		
H.13	External threaded G 2 1/4 flat seal connection	X		
H.14	External threaded connection gas meter flat seal cal .20 connection	X		

Type	Designation	EN 16129	Other standards	Same drawing as
H.15	External threaded connection gas meter flat seal cal .32 connection	X		
H.16	External threaded 21,8 × 1,814 LH 55° flat seal connection	X		
H.17	External threaded 21,7 × 1,814 LH 60° flat seal connection	X		
H.18	External threaded connection G 3/4 flat seal line	X		G.34
H.19	Internal threaded connection EN 10226-2:2005 (Rc)		EN 10226-2:2005	G.23
H.20	External threaded connection M 20 × 1,5 flat seal connection	X		G.36
H.21	External threaded connection 37 × 2,309 55° flat seal connection	X		
H.22	Internal threaded EN ISO 228-1:2003 O-ring connection	X		G.37
H.50	Hose nozzle D10 × L23,5 connection	X		
H.51	Hose nozzle D13,5 × L23 connection	X		
H.52	Hose nozzle D14 × L48 connection	X		
H.53	Hose nozzle D10 × L29 connection	X		
H.54	Hose nozzle D14 × L44 connection	X		
H.55	Hose nozzle D6,73 × L20,3 connection	X		
H.56	Quick coupling type F of EN 561:2002 female part connection		EN 561:2002	

Table H.2 — Threaded outlet connections used in the various countries (see 5.3.4.2)

Type	Threaded connections																				
Country code [a]	H.1	H.2	H.3	H.4	H.5	H.6	H.7	H.8	H.9	H.10	H.11	H.12	H.13	H.14	H.15	H.16	H.17	H.18	H.19	H.20	H.21	H.22
AT					x	x	x	x	x										x			
BE																			x			
BG																						
CH	x			x		x			x										x	x		

Type	Threaded connections																				
Country code [a]	H.1	H.2	H.3	H.4	H.5	H.6	H.7	H.8	H.9	H.10	H.11	H.12	H.13	H.14	H.15	H.16	H.17	H.18	H.19	H.20	H.21	H.22
CY																						
CZ				x	x	x	x	x	x	x									x			
DE				x	x	x	x	x	x	x									x			X
DK																			x			
EE																						
ES	x															x			x	x		
FI																						
FR	x				x		x					x	x	x	x		x	x	x	x		
GB	x					x	x		x		x								x		x	
GR		x	x					x			x								x			
HU																						
IE																			x			
IS																						
IT		x	x				x	x											x			
LT																						
LU																						
LV																						
MT																						
NO																						
NL																			x			
PL																						
PT	x																		x			
RO																						
SE																						
SI		x	x	x	x	x	x	x	x	x				x	x				x			
SK																			x			

[a] Country codes are in accordance with EN ISO 3166-1.

Table H.3 — Non-threaded outlet connections used in the various countries (see 5.3.4.2)

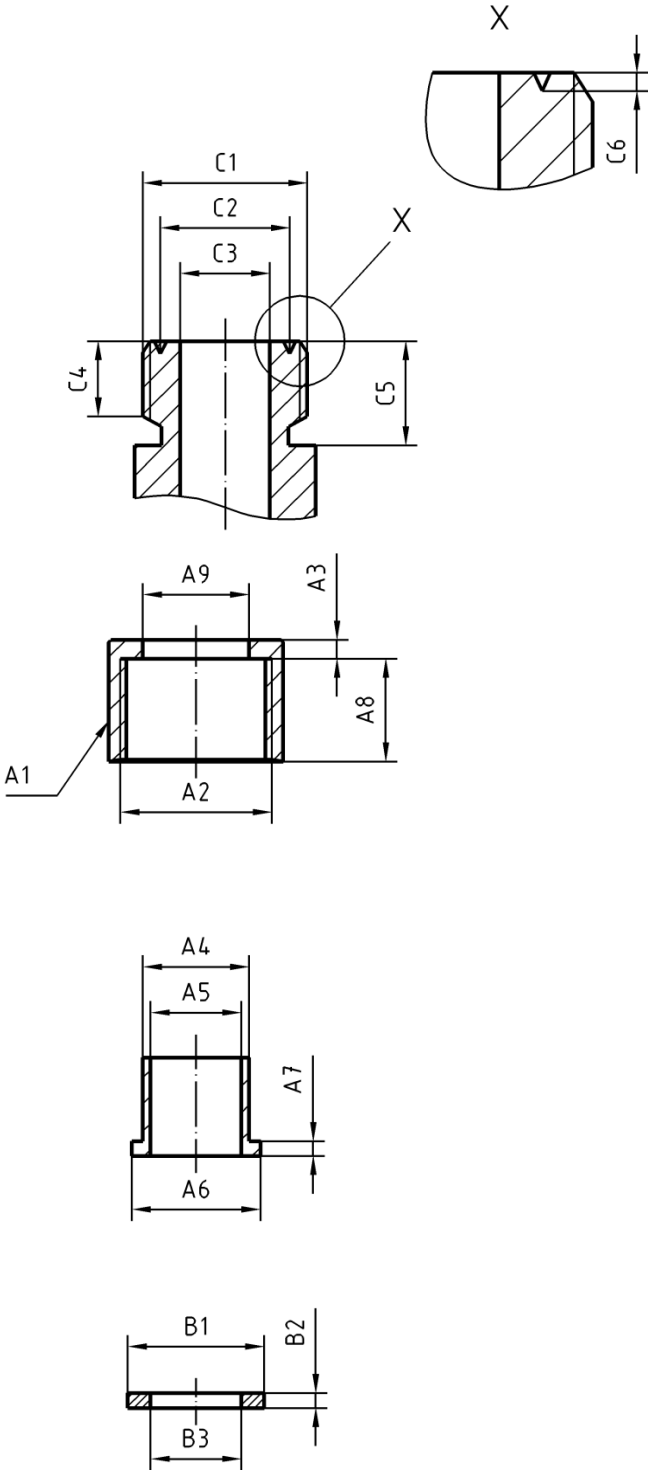
Type Country code [a]	**Non-threaded connections**						
	H.50	**H.51**	**H.52**	**H.53**	**H.54**	**H.55**	**H.56**
AT							
BE	**x**						
BG							
CH	**x**						
CY							
CZ							
DE							**x**
DK		**x**					
EE							
ES							
FI							
FR	**x**						
GB	**x**					**x**	
GR			**x**				
HU							
IE							
IS							
IT	**x**			**x**			
LT							
LU							
LV							
MT							
NO							
NL							
PL							
PT	**x**	**x**	**x**				
RO							
SE		**x**					
SI	**x**						
SK							

[a] Country codes are in accordance with EN ISO 3166-1.

NOTE Tables H.2, H.3 may be incomplete or include data that is not fully up to date. This is because the CEN/TC 181 Secretariat has not received the relevant information from the CEN member countries concerned prior to the publication of this European Standard.

Specific queries concerning updated information should be directly addressed to the relevant CEN member country.

Dimensions in millimetres

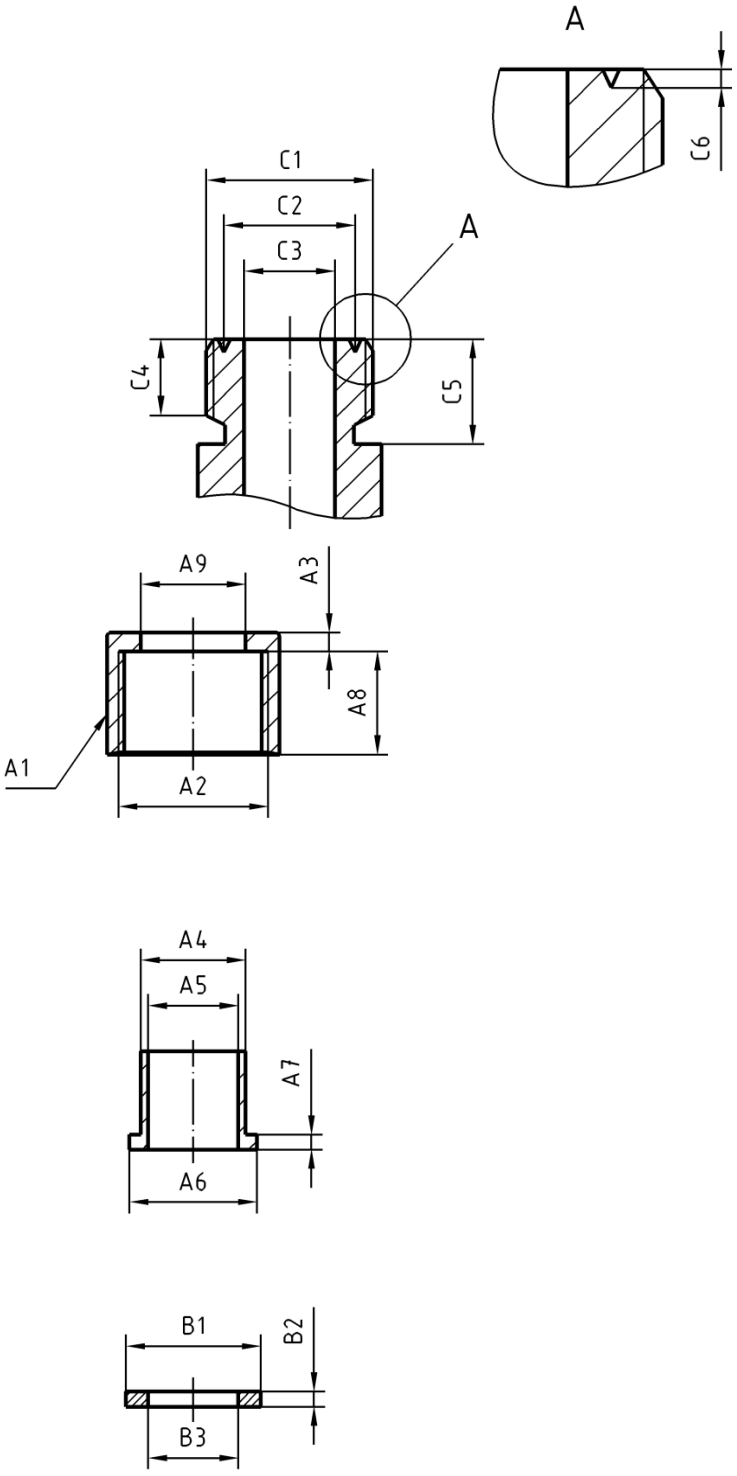


Device
C1 = G3/8 EN ISO 228-1:2003
C2 = Ø12,3 – Ø12,5
C3 = Ø9,9 – Ø10,1
C4 = 9 min.
C5 = 12 min.
C6 = 0,5 × 90°

Connector
A1 = 19 A/F
A2 = G3/8 EN ISO 228-1:2003
A3 = 1,5 min.
A4 = Ø12,9 – Ø13,1
A5 = Ø9,9 – Ø10,1
A6 = Ø14,0 – Ø14,2
A7 = 1,4 – 1,6
A8 = 10,5 – 13,5
A9 = Ø13,2 – Ø13,3
Seal
B1 = Ø14,0 – Ø14,2
B2 = 2,0 – 2,2
B3 = Ø9,8 – Ø10,0
NBR or equivalent
A2/H3 EN 549: 1994

Figure H.1 — Type H.2 — External threaded G3/8 flat seal connection

Dimensions in millimetres



Device
C1 = G1/2 EN ISO 228-1:2003
C2 = Ø15,1 – Ø15,3
C3 = Ø11,9 – Ø12,1
C4 = 10 min.
C5 = 13,5 min.
C6 = 0,5 × 90°

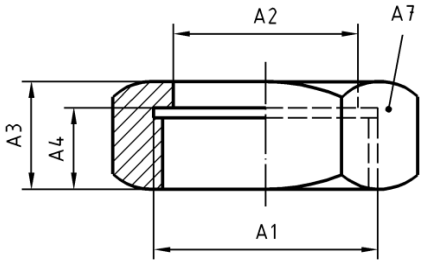
Connector
A1 = 24 A/F
A2 = G1/2 EN ISO 228-1:2003
A3 = 1,5 min.
A4 = Ø14,9 – Ø15,1
A5 = Ø11,9 – Ø12,1
A6 = Ø17,8 – Ø18
A7 = 1,4 – 1,6
A8 = 11,5 – 14,5
A9 = Ø15,2 – Ø15,5
Seal
B1 = Ø17,8 – Ø18
B2 = 2,0 – 2,2
B3 = Ø11,8 – Ø12,0
NBR or equivalent
A2/H3 EN 549: 1994

Figure H.2 — Type H.3 — External threaded G1/2 flat seal connection

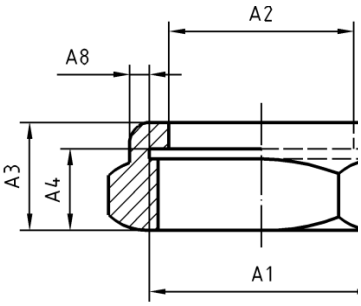
Dimensions in millimetres

Device

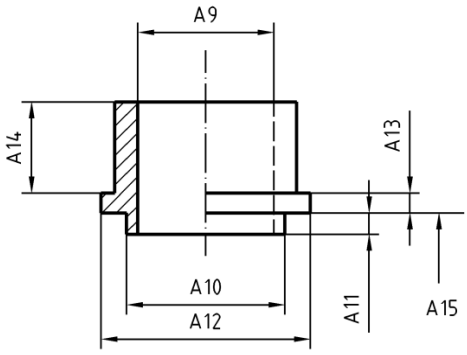
Type 1: Nut



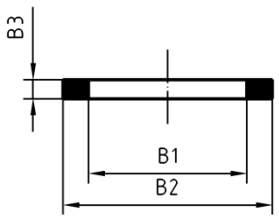
Type 2: Crimped nut



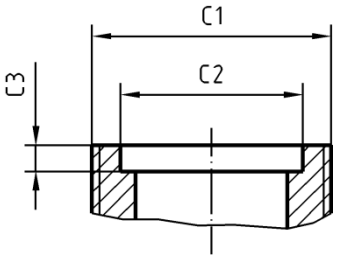
A1 = G1 1/4" EN ISO 228-1:2003
A2 = Ø33,85 – Ø34,15
A3 = 20,2 – 20,8
A4 = 15,4 – 15,8
A5 = 12,5 – 13,5
A6 = see [a]
A7 = 6 pans 32 S/P
A8 = 3 min.
A9 = Ø25,7 – Ø26,3
A10 = Ø29,9 – Ø30,1
A11 = 3,9 – 4,1
A12 = Ø38,4 – Ø38,8
A13 = 3,4 – 3,6
A14 = 17,5 min.
A15 = $\sqrt[Ra\,6,3]{ES}$



Synthetic fibre seal –
Elastomer
B1 = Ø30,1 – Ø30,4
B2 = Ø38,2 – Ø38,8
B3 = 1,8 – 2,2



Elastomer seal EN 549: 1994A2/H3
B1 = Ø29,1 – Ø29,7
B2 = Ø37,2 – Ø37,8
B3 = 2,3 – 2,7



Connector
C1 = G1" 1/4 EN ISO 228-1:2003
C2 = Ø30,4 – Ø30,6
C3 = 4,9 – 5,1

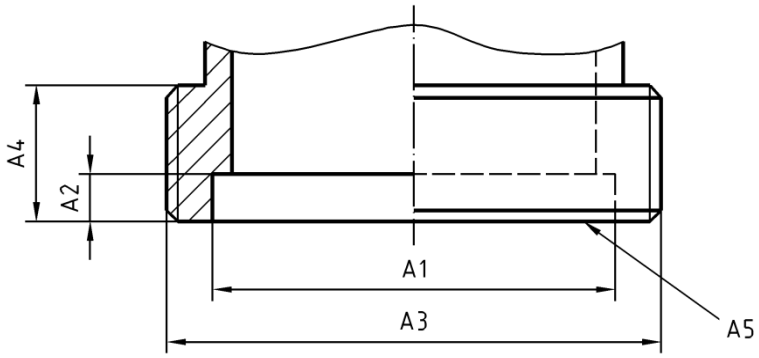
[a] Optional groove, if exists, the Ø should not exceed the external thread Ø. It can be replaced by an unperfect thread.

NOTE ES = static tightness.

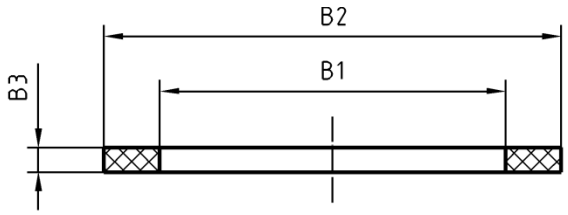
Figure H.3 — Type H.12 — External threaded connection G 1 1/4 flat seal DN 25 connection

Dimensions in millimetres

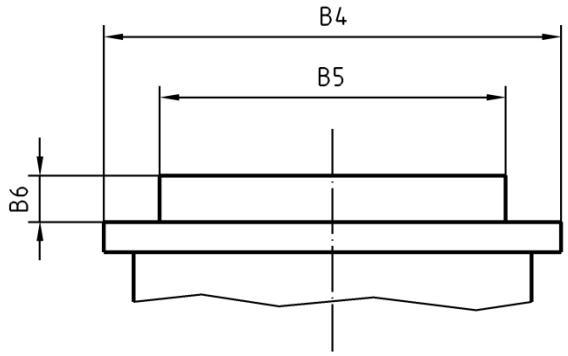
Device

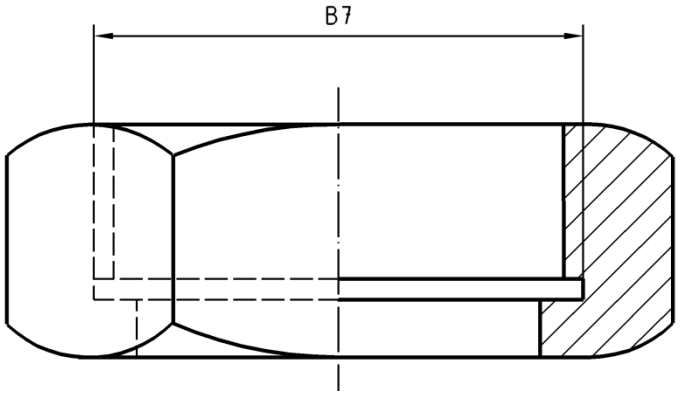


A1 = Ø53,4 – Ø53,8
A2 = 5,9 – 6,1
A3 = 2 1/4B EN ISO 228-1:2(
A4 = 17,9 – 18,1
A5 = $^{Ra\,6,3}\sqrt{ES}$



Seal
B1 = Ø53,2 – Ø53,8
B2 = 65,7 – 66,3
B3 = 2,3 – 2,7
Connector
B4 = Ø65,8 – Ø66,2
B5 = Ø52,8 – Ø53,2
B6 = 4,9 – 5,1
Nut
B7 = 2 1/4 EN ISO 228-1:20(

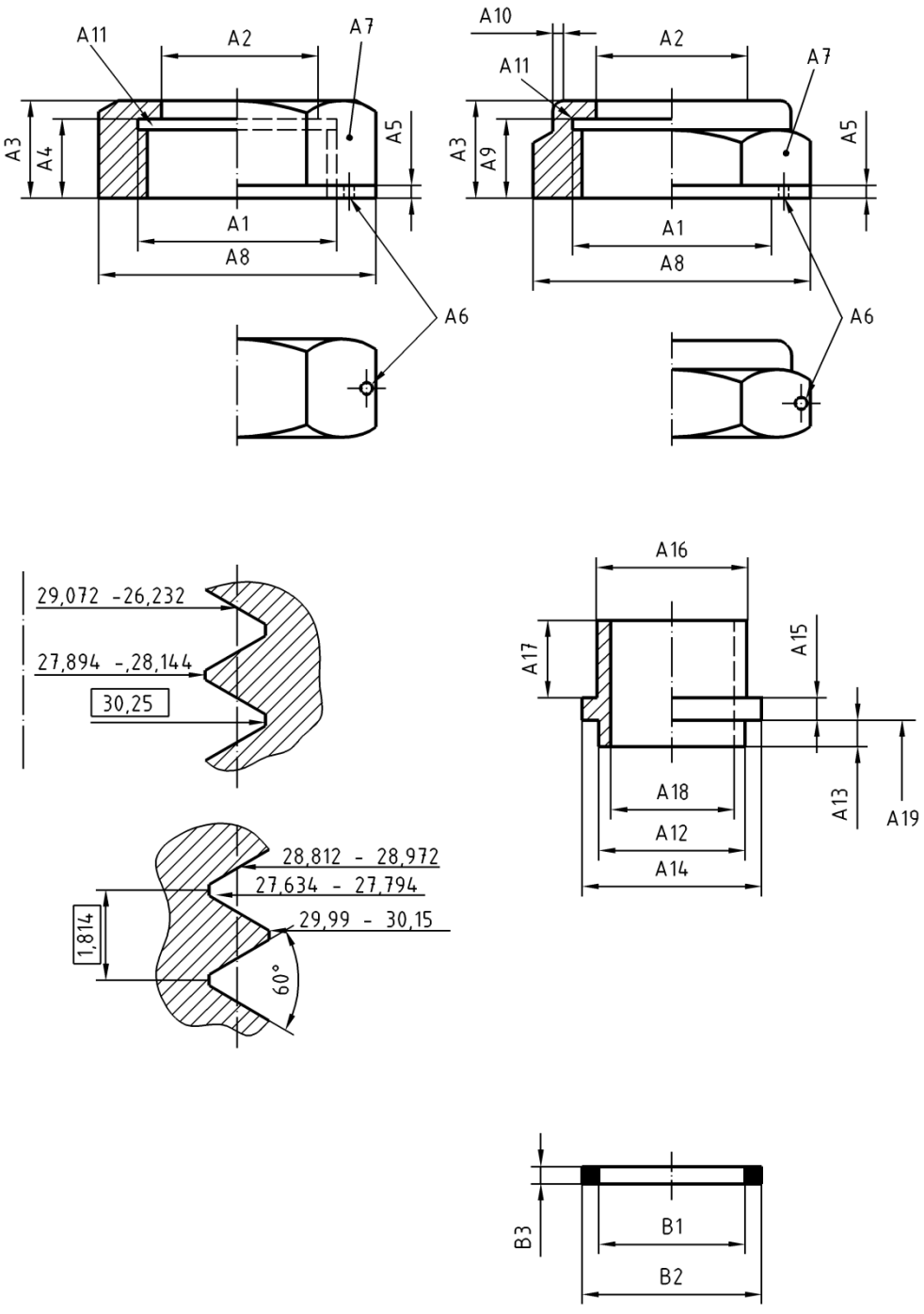




NOTE ES = static tightness.

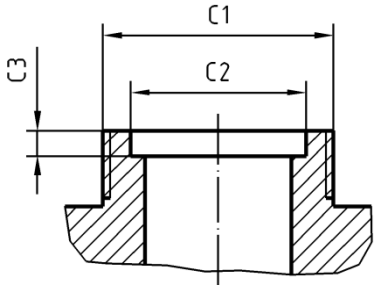
Figure H.4 — Type H.13 — External threaded G 2 1/4 flat seal connection

Dimensions in millimetres



A1 = NOTE 1
A2 = Ø22,8 – Ø23,2
A3 = 14,2 – 14,8
A4 = 11,8 – 12,2
A5 = 1,7 – 2,3
A6 = NOTE 2
A7 = 6 pans 32 S/P
A8 = NOTE 3
A9 = 11,6 – 12,4
A10 = 2 min.
A11 = see [a]
A12 = Ø21,8 – Ø22,2
A13 = 3,8 – 4,2
A14 = Ø27,3 – Ø27,7
A15 = 2 8 – 3,2
A16 = Ø21,8 – Ø22,2
A17 = 12 min.
A18 = Ø18,2 – Ø18,8
A19 = $\overset{Ra\,6,3}{\sqrt{ES}}$
Synthetic fibre seal – Elastomer
B1 = Ø22,3 – Ø22,6
B2 = Ø27,2 – Ø27,8
B3 = 1,8 – 2,2
Elastomer seal
EN 549: 1994A2/H3
B1 = Ø21,1 – Ø21,7
B2 = Ø26 – Ø26,6
B3 = 2,3 – 2,7

Figure H.5 — Type H.14 — External threaded connection gas meter flat seal cal .20 connection *(1 of 2)*



Connection
C1 = Gas meter thread meter thread DN 2
C2 = Ø23,1 – Ø23,5
C3 = 4,8 – 5,2

NOTE 1 Gas meter thread cal. 20.

NOTE 2 2 or 3 holes Ø 1,5 or 2 (2 holes at 180° or 3 at 120°).

NOTE 3 To the manufacturer's choice.

NOTE 4 ES = static tightness.

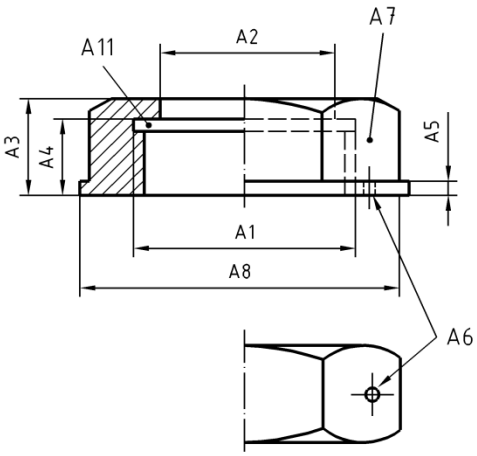
[a] Optional groove, if exists, the Ø should not exceed the external thread Ø. It can be replaced by an imperfect thread.

Figure H.5 — Type H.14 — External threaded connection gas meter flat seal cal .20 connection *(2 of 2)*

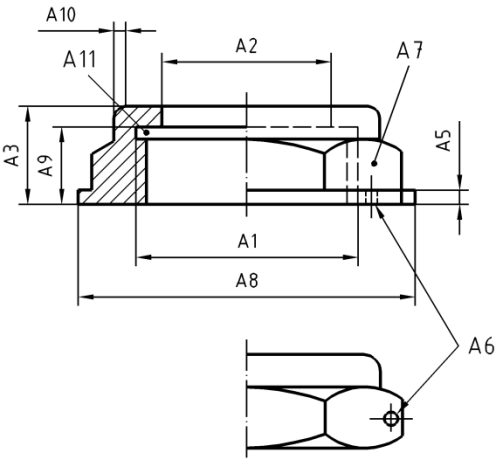
Dimensions in millimetres

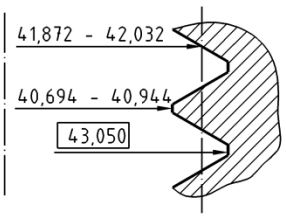
Device

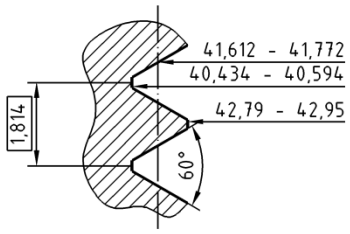
Nut for build up socket

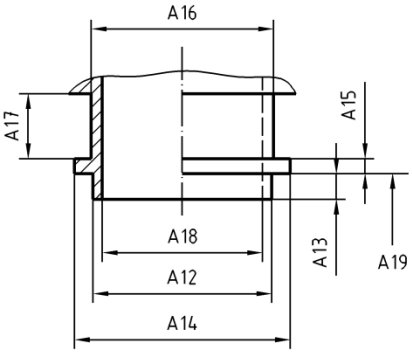


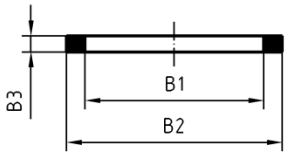
Crimped nut for incorporated sock









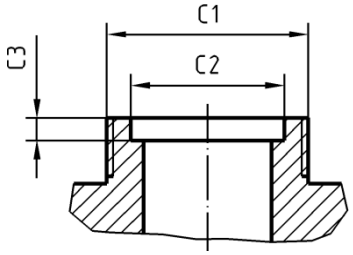


A1 = NOTE 1
A2 = Ø34,8 – Ø35,2
A3 = 17,2 – 17,8
A4 = 13,8 – 14,2
A5 = 2,7 – 3,3
A6 = NOTE 2
A7 = 6 ou 8 pans 50 S/P
A8 = NOTE 3
A9 = 13,6 – 13,4
A10 = 2 min.
A11 = [a]
A12 = Ø33,3 – Ø33,7
A13 = 4,8 – 5,2
A14 = Ø40,1 – Ø40,5
A15 = 2 8 – 3,2
A16 = Ø33,8 – Ø34,2
A17 = 15 min.
A18 = Ø29,7 – Ø30,3
A19 = $^{Ra\,6,3}\sqrt{ES}$

Synthetic fibre seal – Elastomer
B1 = Ø33,9 – Ø34,2
B2 = Ø39,7 – Ø40,3
B3 = 1,8 – 2

Elastomer seal EN 549: 19 A2/H3
B1 = Ø32,7 – Ø33,3
B2 = Ø38,5 – Ø39,1
B3 = 2,3 – 2,7

Figure H.6 — Type H.15 — External threaded connection gas meter flat seal cal .32 connection *(1 of 2)*



Connector
C1 = Gas meter thread meter thread DN 32
C2 = Ø23,1 – Ø23,5
C3 = 4,8 – 5,2

NOTE 1 Gas meter thread cal. 32.

NOTE 2 2 or 3 holes Ø 1,5 or 2 (2 holes at 180° or 3 at 120°).

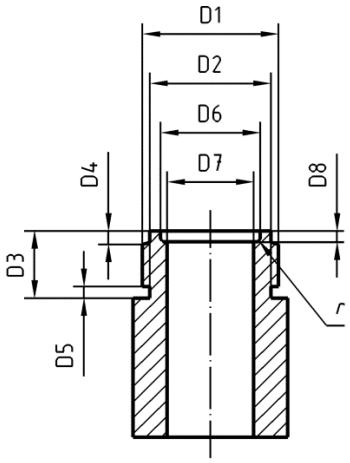
NOTE 3 To the manufacturer choice.

NOTE 4 ES = static tightness.

[a] Optional groove, if exists, the Ø should not exceed the external thread Ø. It can be replaced by an unperfect thread.

Figure H.6 — Type H.15 — External threaded connection gas meter flat seal cal .32 connection *(2 of 2)*

Dimensions in millimetres



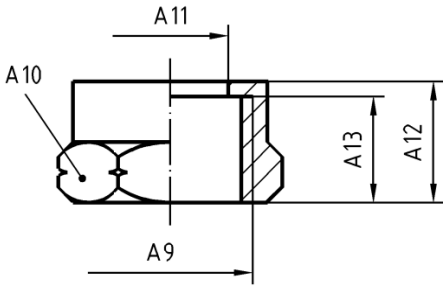
Device

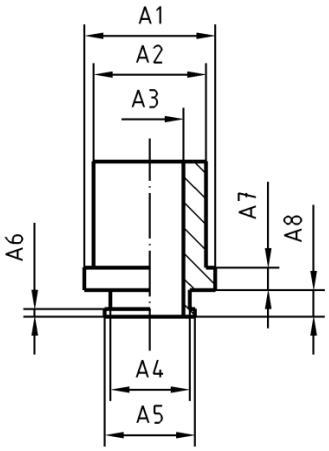
C1 = 21,8 × 1,814 L.H 55°

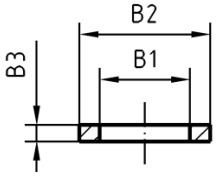
C2 = 12,8 – 13,2

C3 = 4 min.

C4 = 9 min.







Connector

A1 = 17,8 – 19,0

A2 = 14,0 – 15,0

A3 = 9,5 – 10,5

A4 = 11,9 – 12,0

A5 = 12,4 – 12,7

A6 = 0,6 – 1,0

A7 = 1,8 – 3,0

A8 = 2,6 – 3,0

A9 = 21,8 × 1,814 LH 55°

A10 = 25 S.W. min.

A11 = 16,5 max.

A12 = 14,3 – 15,0

A13 = 11,8 – 12,2

Seal

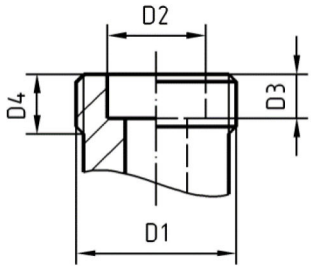
B1 = 11,5 – 12,5

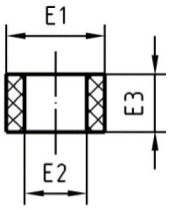
B2 = 17,5 – 18,5

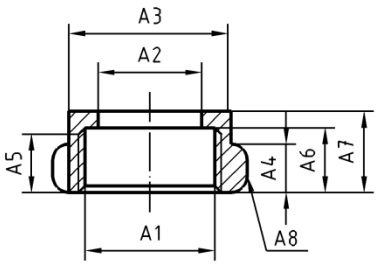
B3 = 1,9 – 2,2

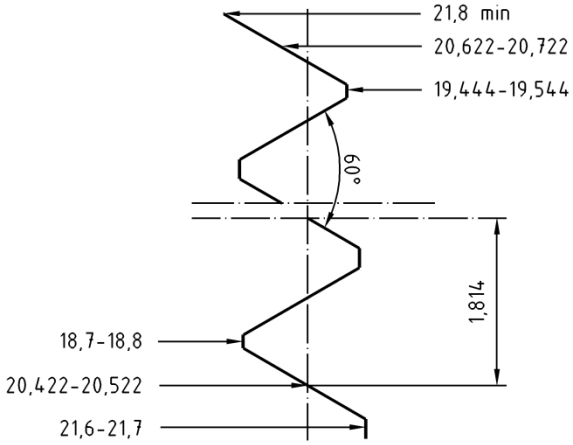
Figure H.7 — Type H.16 — External threaded 21,8 × 1,814 LH 55° flat seal connection

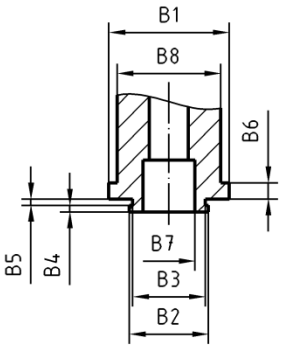
Dimensions in millimetres

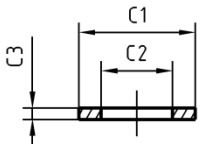








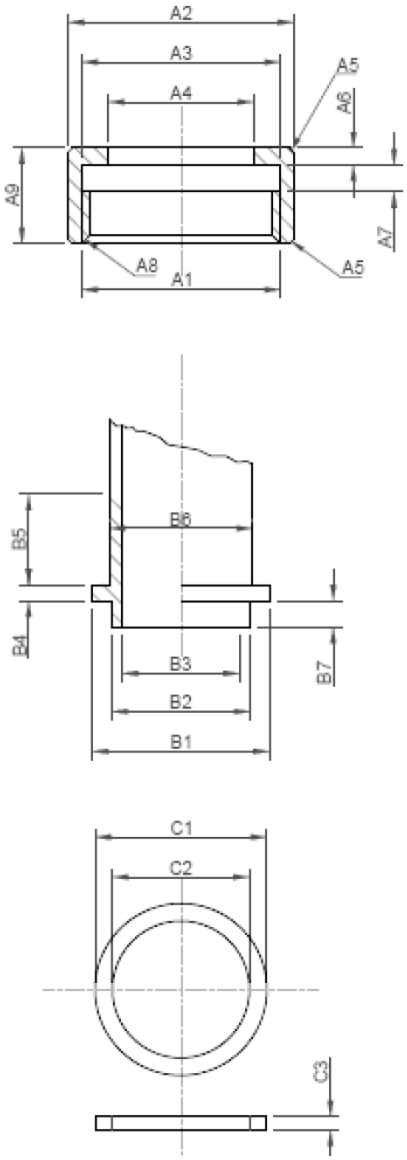


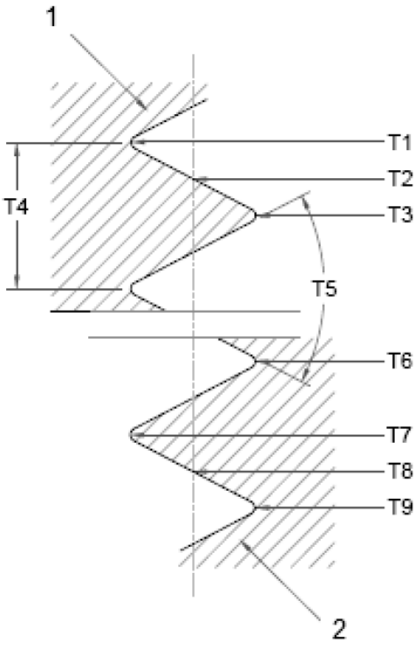


Connector
A1 = 21,8 × 1,814 L.H.
A2 = Ø16 max.
A3 = Ø24,6 min.
A4 = 7,5 min.
A5 = 7,5 – 8,1
A6 = 9,9 – 10,5
A7 = 12,5 min.
A8 = 5 Rips equi-spac
B1 = Ø18,5 – Ø18,7
B2 = Ø12,2 – Ø11,3
B3 = Ø11,1 – Ø11,3
B4 = 0,9 – 1,0
B5 = 2 – 2,2
B6 = 2,4 – 2,6
B7 = 9,0 max.
- 0,1
B8 = A2 - 0,3
Seal – Black
C1 = Ø17,7 - Ø18,0
C2 = Ø10,7 - Ø11,0
C3 = 1,7 – 2,0
NBR or equivalent
EN 549:
1994A2/H3

Figure H.8 — Type H.17 — External threaded 21,7 × 1,814 LH 60° flat seal connection

Dimensions in millimetres





Device

A1 = 37,0 × 2,309

A2 = 42 - 42,5 AF 8 Sides

A3 = Ø37 - Ø37,4

A4 = Ø27,4 - Ø27,7

A5 = 0,8 × 45° Max

A6 = 3,2 - 3,7

A7 = 4,6 - 5,4

A8 = 45° Chamfer to depth of thread

A9 = 17,6 - 18,4

B1 = Ø30 - Ø30,3

B2 = Ø25,9 - Ø26,1

B3 = Ø21,6 - Ø22,4

B4 = 2 - 4

B5 = 17 Min

B6 = Ø26,6 - Ø27,2

B7 = 4,6 - 5,4

SEAL

C1 = Ø31,9 - Ø32,7

C2 = Ø25,4 - Ø26,2

C3 = 2,2 - 2,6

Thread

1: NUT THREAD

2: CONNECTION THREAD

T1 = Ø37 Min

T2 = Ø35,53 - Ø35,785

T3 = Ø34,05 - Ø34,735

T4 = 2.309

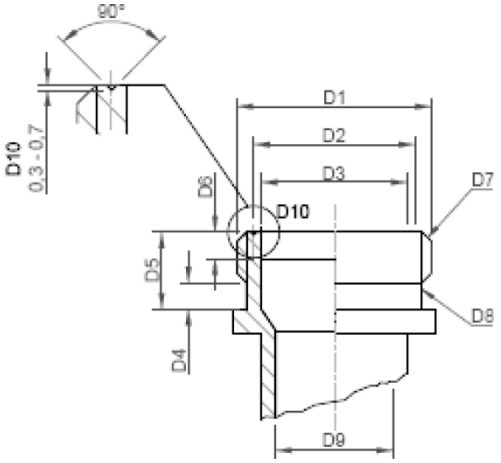
T5 = 55°

T6 = 0,317

T7 = Ø36,565 - Ø36,905

T8 = Ø35,17 - Ø35,425

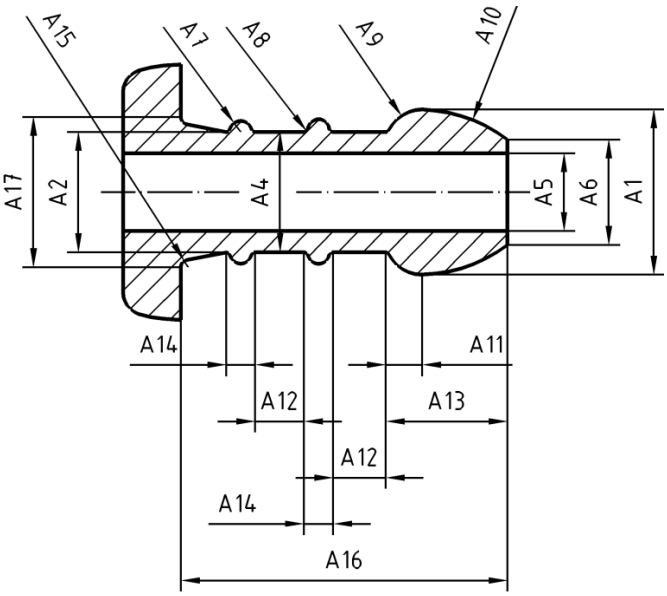
T9 = Ø33,535 - Ø35,950



Connector
D1 = 37,0 × 2,309
D2 = Ø29,9 - Ø30,5
D3 = Ø26,8 - Ø27,2
D4 = 4,6 - 5,4
D5 = 14,1 - 14,9
D6 = 5 Min
D7 = 45° Chamfer to thread depth.
D8 = 33.1 - 33.5
D9 = Ø22.0mm Min
D10 = 0,3 - 0,7

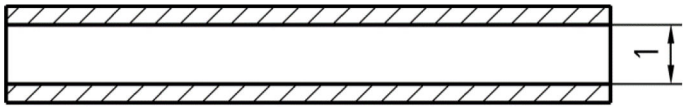
Figure H.9 — Type H.21 — External threaded connection 37 × 2,309 55° flat seal connection

Dimensions in millimetres



Device
A1 = Ø10,0 - Ø10,3
A2 = Ø8,0 - Ø8,2
A4 = Ø8,0 - Ø8,2
A5 = Ø5,0 - Ø5,6
A6 = Ø6,8 - Ø7,2
A7 = R0,75
A8 = R0,25
A9 = R2,3 – 2,7
A10 = R9,7 – 10,3
A11 = 1,7 – 2,1
A12 = 4,3 – 4,7
A13 = 6,75 – 7,25
A14 = 1,4 – 1,6
A15 = R0,5
A16 = 23 - 24
A17 = Ø10 min.

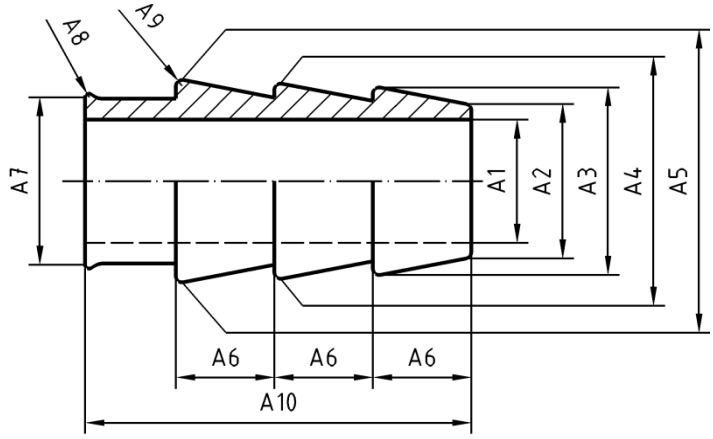
Hose



Key
1 Ø 8 nominal

Figure H.10 — Type H.50 — Hose nozzle D10 × L23,5 connection

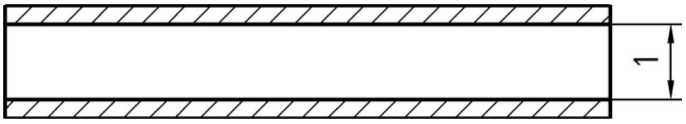
Dimensions in millimetres



Device

A1 = Ø8,5 max.
A2 = Ø10,0 - Ø10,5
A3 = Ø12,2 - Ø12,7
A4 = Ø12,7 - Ø13,2
A5 = Ø13,2 - Ø13,7
A6 = 6,4 – 6,6
A7 = Ø11 - Ø11,5
A8 = R1,0 - 1,5
A9 = R0,3 – 0,5
A10 = 23 min.

Hose

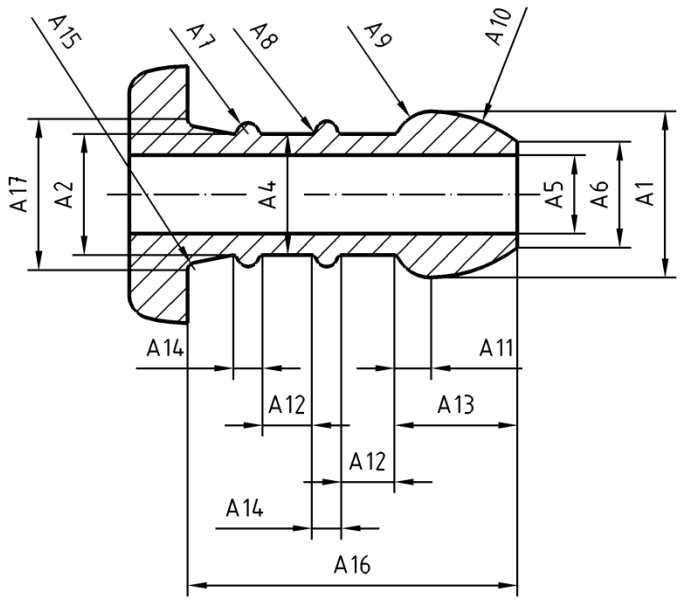


Key

1 Ø 10 nominal

Figure H.11 — Type H.51 — Hose nozzle D13,5 × L23 connection

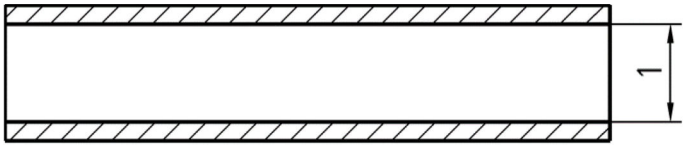
Dimensions in millimetres



Device

A1 = Ø14,0 - Ø14,2
A2 = Ø12,0 - Ø12,2
A4 = Ø12,0 - Ø12,2
A5 = Ø9,0 - Ø9,8
A6 = Ø10,8 - Ø11,2
A7 = R0,75
A8 = R0,25
A9 = R4,8 – 5,2
A10 = R21,7 – 22,3
A11 = 2,8 – 3,2
A12 = 8,8 – 9,2
A13 = 10,75 – 11,25
A14 = 1,4 – 1,6
A15 = R0,5
A16 = 47,5 – 48,5
A17 = Ø14 min.

Hose

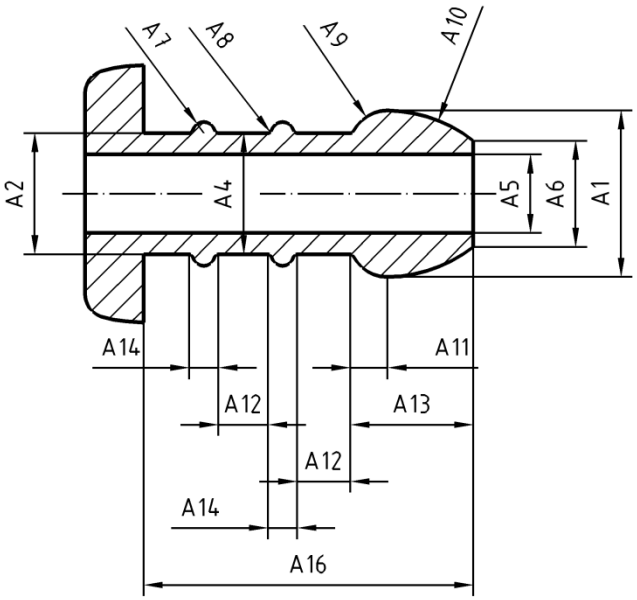


Key

1 Ø 13 nominal

Figure H.12 — Type H.52 — Hose nozzle D14 × L48 connection

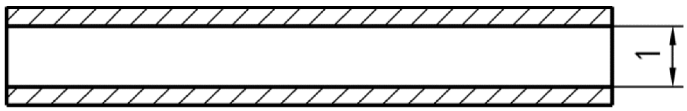
Dimensions in millimetres



Device

A1 = Ø9,8 - Ø10
A2 = Ø8 - Ø8,2
A4 = Ø8 - Ø8,2
A5 = Ø5 - Ø5,8
A6 = Ø6,8 - Ø7,2
A7 = R0,75
A8 = R0,25
A9 = 2,4 – 2,6
A10 = 9,8 – 10,2
A11 = 1,7 – 2,1
A12 = 4 - 5
A13 = 6,5 – 7,5
A14 = 1,5
A16 = 28,5 – 29,5

Hose

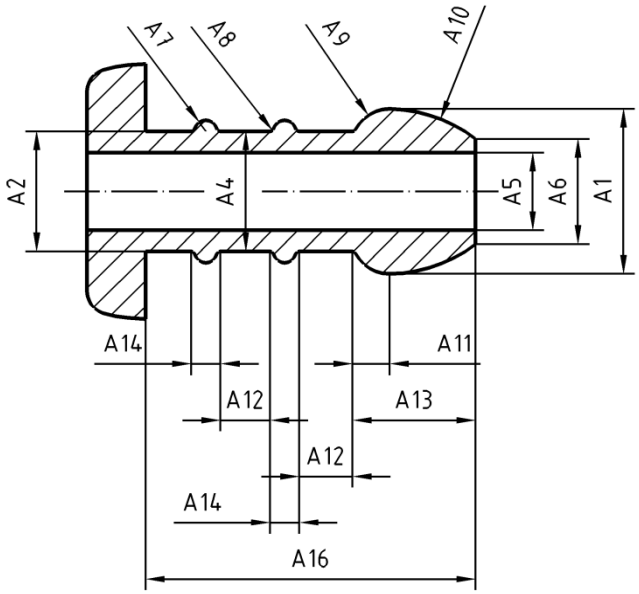


Key

1 Ø 8 nominal

Figure H.13 — Type H.53 — Hose nozzle D10 × L29 connection

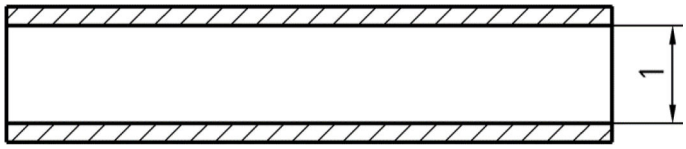
Dimensions in millimetres



Device

A1 = Ø14 - Ø14,2
A2 = Ø12 - Ø12,2
A4 = 12 - 12,2
A5 = 9 - 9,8
A6 = 10,8 - 11,2
A7 = R0,75
A8 = R0,25
A9 = 4,9 – 5,1
A10 = 21,8 – 22,2
A11 = 2,8 – 3,2
A12 = 6,5 – 7,5
A13 = 10,5 – 11,5
A14 = 1,5
A16 = 43,5 – 44,5

Hose



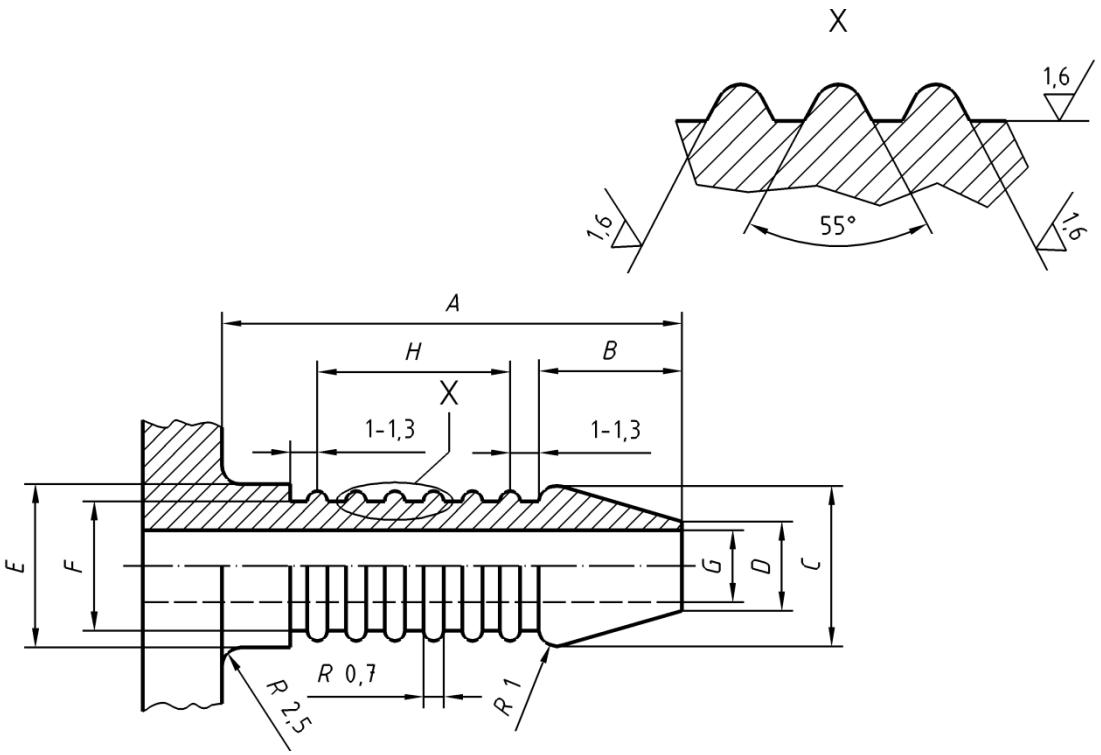
Key

1 Ø 13 nominal

Figure H.14 — Type H.54 — Hose nozzle D14 × L44 connection

Dimensions in millimetres

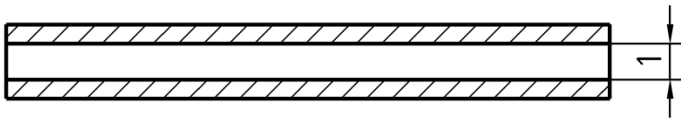
Device



1 profile
H 5 ribs

Nominal diameter of the hose	A ± 0,25	B ± 0,25	ØC $^{+0,13}_{-0}$	ØD $^{+0,13}_{-0}$	ØE $^{+0,13}_{-0}$	ØF ± 0,13	ØG ± 0,13
4,8	20,3	6,35	6,73	4,06	6,35	5,58	3

Hose



Key

1 Ø 4,8 nominal

Figure H.15 — Type H.55 — Hose nozzle D6,73 × L20,3 connection

Annex I
(informative)

Test method for resistance to corrosion

I.1 Principle

Accelerated corrosion by salt mist of defined composition, under precise temperature and pressure conditions.

The degree of corrosion is assessed visually.

I.2 Reagents

I.2.1 Saline solution

The concentration shall be (5 ± 0,5) %

The sodium chloride shall not contain, in the dry state, more than 0,2 % of total impurities and more than 0,1 % of sodium iodide. It shall be free from nickel and copper.

The distilled water shall not contain more than 0,02 % of impurities.

The procedure is as follows:

— dissolve five parts in mass of sodium chloride into 95 parts of distilled water;

— check the concentration by measuring the density of the solution at (35 ± 1) °C. Carry out this check every day. The density of the solution at 5 % shall be between 1 030 kg/m^3 and 1 040 kg/m^3;

— adjust the pH of the solution to the value of $\left(7{,}0^{+0{,}2}_{-0{,}5}\right)$;

— before spraying, if necessary, remove the impurities in suspension by filtration or decantation.

I.2.2 Compressed air

Air shall be pure, maintained at 85 % to 90 % relative humidity at a temperature of (35 ± 1) °C and sent to the sprayers at a pressure of (1,0 ± 0,2) bar.

In order to purify it, pass it through a water purifier.

In order to maintain the concentration of the saline solution constant, humidify the air at a temperature greater than 35 °C by making it bubble, in finely divided bubbles, through a saturator containing water heated to a suitably adjusted temperature. The height of the water column is less important than the fineness of bubbles, the saturation of very fine bubbles being almost instantaneous. The humidifier water shall be replaced every week so as to remove impurities.

I.2.3 Salt mist

The salt mist is defined by the characteristics of the solution collected in the collectors during the test.

The intensity of the mist shall be such that for each horizontal collection surface of 80 cm^2, (2 ± 1) ml of solution is collected per hour, for a minimum duration of sixteen hours operation.

The solution collected shall have the density and the pH specified in I.2.1.

I.3 Apparatus

I.3.1 Spraying chamber

The dimensions and mode of construction of the spraying chamber are left to the manufacturers' and users' initiative, provided that the following requirements are met:

a) The walls of the chamber, the framework and supports placed inside shall resist the corrosion of salt mist. Among the materials having a high resistance are: glass, rubber, types of stainless steel resistant to salt mist, certain plastics, cement.

b) The design of the chamber shall be such that the mist can form a deposit directly by gravity onto devices. To this end, suitable positioning of the sprayers and orifices for the exhaust of condensed liquid shall be designed.

c) The design of the walls of the chamber, the framework and supports shall be such that the liquid which trickles on their surface cannot pour out onto the devices. The condensed solution is discharged at the base of the chamber without being reused.

d) In order to facilitate homogeneous equipment, a type of recommended chamber is shown with its main dimensions in Figure I.1.

I.3.2 Sprayers

Use one or several compressed air sprayers. Figure I.2 describes a sprayer of this type as an example.

Previous tests shall enable the establishment, once and for all, of the angle of the deflector in relation to the jet axis and its distance from the sprayer so as to obtain the most homogeneous possible distribution of the mist, controlled by quantities of solutions collected in the various collectors.

I.3.3 Heating device

The heating device shall maintain a temperature of (35 ± 2) °C inside the spraying chamber.

Various means may be used.

It is desirable that air enters the spraying chamber at a temperature greater than 35 °C. The degree of overheating depends on:

— the maintenance of the temperature inside the chamber at 35 °C,

— the thermal capacity of the walls and the ambient temperature,

— the volume of forced air,

— the air pressure which determines the temperature necessary for obtaining the required humidity. This temperature is between 43 °C and 47 °C for a pressure between 0,8 bar and 1,2 bar.

It is desirable, in general, that the ambient temperature around the spraying chamber be as even as possible. To this end, the chamber can be placed into a room at constant temperature or surrounded with a casing containing water at a suitable temperature. Chambers which are completely insulated may be heated with hot air. However this method can require the use of an auxiliary heating source with automatic control enabling a quick rise of temperature after the opening of the chamber.

It is practically impossible to comply with the temperature characteristics, when using heating elements dipped into the saline solution tank.

The device for measuring the temperature inside the chamber shall allow, either a continuous check, or at the rate of two checks per day.

I.3.4 Salt solution supply device

The salt solution is contained in containers made of materials that cannot influence the pH in the solution. To this end, rubber or plastic coated steel containers or glass containers or a type of stainless steel resistant to salt mist may be used.

I.3.5 Compressed air supply device

The compressed air supply device includes:

— an air compressor at a pressure of (1,0 ± 0,2) bar;

— a pressure adjuster;

— gauges;

— an air coalescing filter;

— a water saturator.

I.3.6 Mist collectors.

Use glass or plastic funnels with a 10 cm diameter as collectors, fixed onto pierced plugs placed on measuring cylinders. A 10 cm diameter funnel has a surface opening of approximately 80 cm^2.

Place at least two collectors in the exposure area so as to collect the mist falling directly into the funnels, without the liquid which trickles from the test pieces exposed or from any other part of the chamber.

Collectors are placed in such a way that one of them is as near as possible to a sprayer and another as far as possible from all the sprayers.

I.4 Test method

I.4.1 Method of exposure of devices

The devices as delivered with their connections unprotected and inlet and outlet orifices blocked shall be placed in the chamber in such a way that they are not in the direct path of the mist sprayed. Deflectors can be fitted so as to avoid direct spraying of the solution on devices.

The supports of the devices shall be made of non-metallic inert materials: glass, plastics. If it is necessary to hang them, hanging materials shall, on no account, be metallic but of synthetic fibres.

Devices shall be positioned in such a way that they do not come in contact with each other and test surfaces are exposed to the free circulation of the mist. Devices may be placed on different levels in the spraying chamber provided that the solution cannot trickle from the devices placed on a given level onto the lower level.

I.4.2 Duration of tests

Spraying shall be continuous throughout the test duration specified in 5.8.

I.4.3 Checks

Check the temperature continuously or at least twice a day with a 7 h interval.

Check the pressure.

Measure the quantity of saline solution collected in the collectors.

Check the concentration and pH of the solution collected.

I.4.4 Cleaning of devices

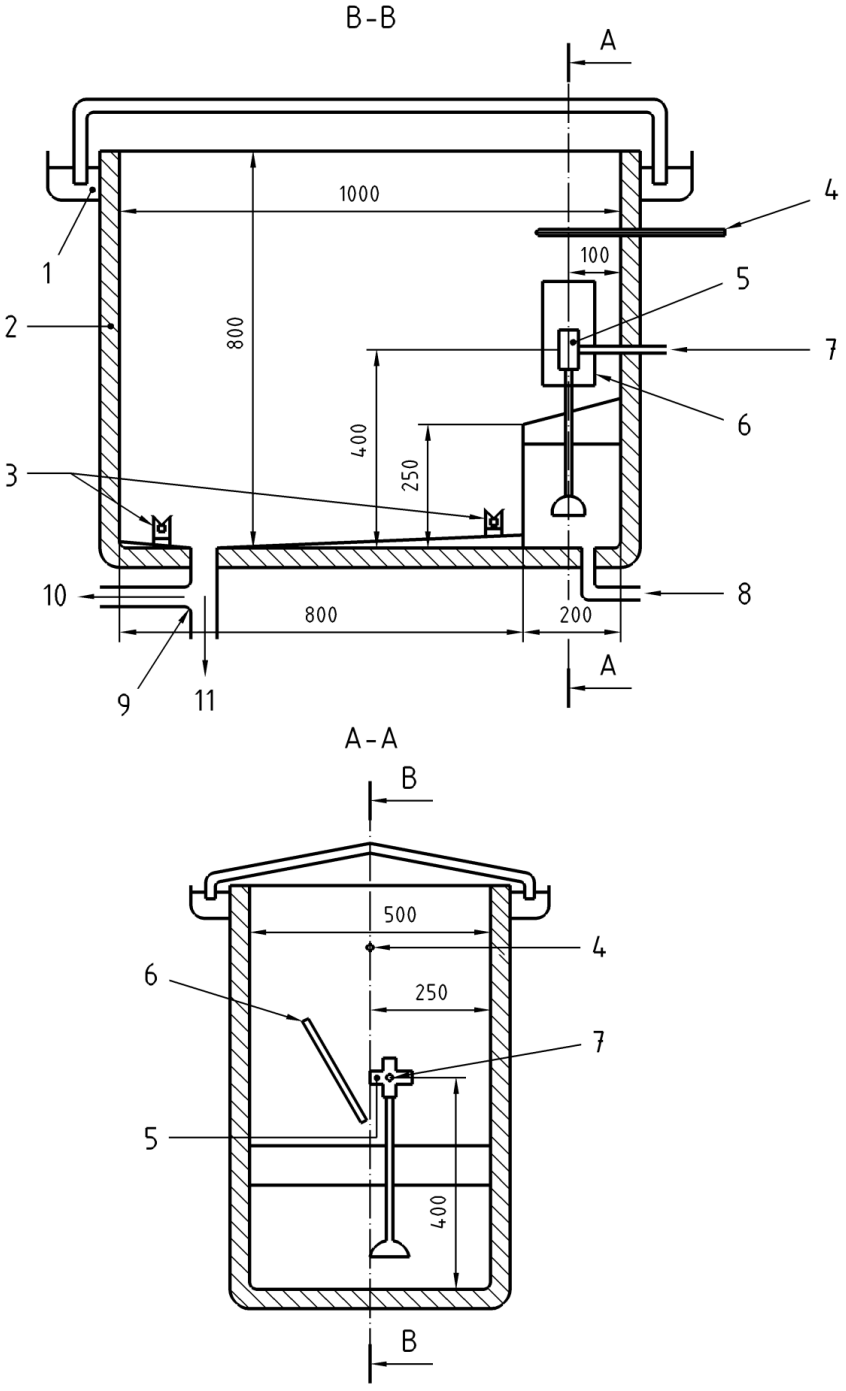
At the end of the test, the devices are lightly washed under running water at a temperature not exceeding 37 °C, so as to remove salt deposits, then they are immediately dried.

I.4.5 Results

The external surface is visually inspected.

After the performance tests, the device is dismantled and the internal parts visually examined.

Dimensions in millimetres

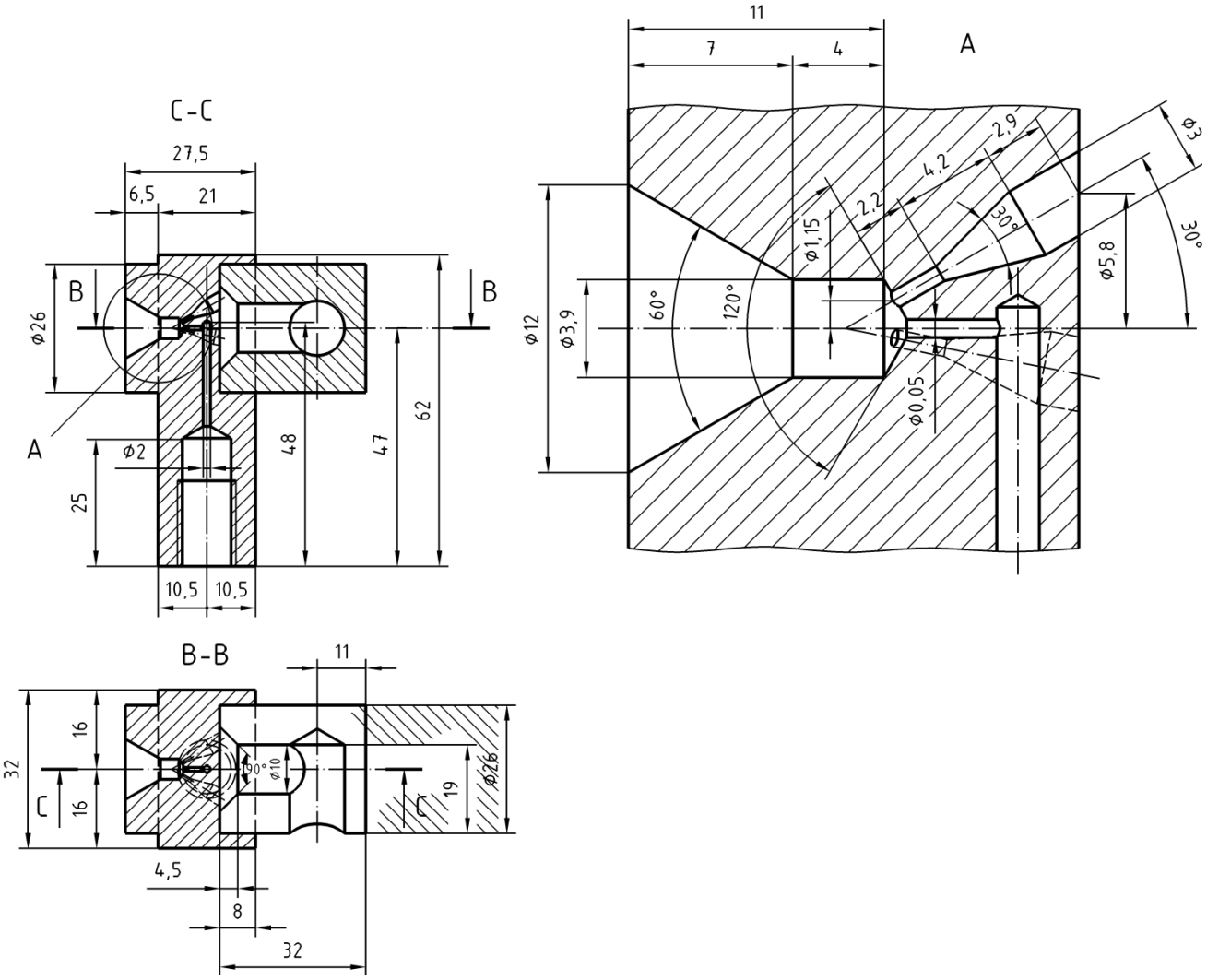


Key

1	closure by water seal	6	deflector at a distance from the sprayer with variable slope
2	insulated heating panel	7	compressed air supply
3	2 collectors (horizontal read of 80 cm^2	8	salt solution supply
4	thermometer	9	drain
5	sprayer orifice	10	air
		11	water

Figure I.1 — Diagram of a spraying chamber

Dimensions in millimetres



The sprayer is generally made of durable and clear plastic.

Figure I.2 — Salt mist sprayer

Annex J
(informative)

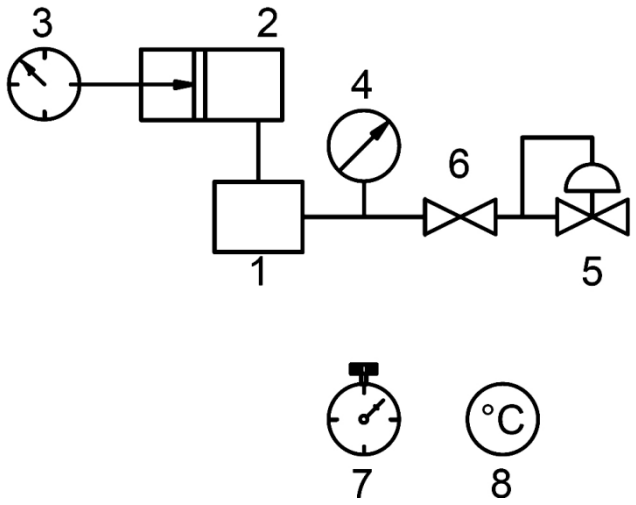
Method for measuring leaks

J.1 Scope

Method for measuring leaks expressed in cubic centimetres per hour of dry air at 15 °C, 1 013,25 mbar, with an accuracy of ± 5 %.

J.2 Diagram of the test bench

The test bench is shown in Figure J.1.



Key

1 control volume V_x (volume of the device + additional volume of bench, tubes, unions, etc..)
2 chamber with variable volume
3 comparator (category 1, 1/100 mm)
4 gauge (preferably electronic), category 0,1
5 pressure regulator
6 shut-off valve
7 1/10 s timer
8 thermometer

Figure J.1 — Diagram of the test bench used for measuring leaks

J.3 Coefficient *K*

J.3.1 Method

Fix a device to be tested onto the bench; for this test, the device shall be sound.

Using the pressure regulator (5), set the test pressure (p_{test}). Close the shut-off valve (6).

Change the control volume V_x by small quantities dV using the piston (2) and record the corresponding changes in pressure dp using the gauge (4). Take six measurements.

The change dV shall be sufficiently small compared to V_x (Vx/dV > 100). See the verification in J.5.

J.3.2 Calculations

Work out K from the linear regression d$V = K \cdot$ dp.

K is expressed in cubic centimetres per millibar (cm³/mbar).

The value is acceptable if the coefficient is greater than or equal to 0,99.

J.4 Measurement of the leak

J.4.1 Method

Fix a device to be tested onto the bench.

The test pressure being always equal to p_{test}, close the shut-off valve at time t_0 and record the pressure p_1 at the time t_1.

J.4.2 Calculations

Use the formula

$$F = 3600 \times \frac{K}{t_1 - t_0} \times \frac{1013{,}25 + p_{test}}{1013{,}25} \times \frac{288{,}15}{273{,}15 + \theta_{test}} \times (p_{test} - p_1)$$

where

F is the value of the leak, expressed in cubic centimetres per hour (cm³/h);

K is the coefficient obtained according to J.3, in cubic centimetres per millibar (cm³/mbar);

t_0 represents the start of test, expressed in seconds (s);

t_1 represents the end of test, expressed in seconds (s);

p_{test} relative test pressure, expressed in millibar (mbar);

p_1 relative test pressure after a period t_1, expressed in millibar (mbar);

θ_{test} is the ambient temperature, in degrees Celsius (°C)

J.5 Checks

Check the control volume V_x using the following formula:

$V_x = K$ x ($p_{test} + p_a$)

where

p_a is the atmospheric pressure in millibars (mbar)

Check that $\frac{V_x}{dV} > 100$.

Annex K
(normative)

Special requirements for low pressure fixed regulators fitted with two or three outlets for outdoor use

K.1 Scope

This annex applies to regulators intended to be directly connected to a cylinder valve in order to supply appliances at pressures given in EN 437:2003+A1:2009, for outdoor use only.

K.2 Constructional characteristics

The regulator shall be designed and built so that its total guaranteed flow rate does not exceed 1,5 kg/h.

The regulator shall have two or three identical outlets, each outlet being capable of being closed separately. Each closing device shall incorporate a knob whose closing direction shall be clearly identified by an unambiguous and indelible marking (arrow or drawing). This marking shall also indicate the fully open position without any possible mistake.

Connections shall be identical and one of the types described in this standard.

K.3 Performance characteristics

The sum of the rates of all the outlets shall be equal to the guaranteed flow rate.

The performance requirements shall be met by each outlet under the test conditions defined in K.4.2

Shut off devices shall be sound after 5 000 operations.

K.4 Test methods

K.4.1 Test on the shut off devices

K.4.1.1 Soundness test

Shut off devices shall be sound at the pressures of 20 mbar, 150 mbar and 1 bar, the duration of the test being 10 min in the open position and in the closed position.

K.4.1.2 Endurance test

The endurance test shall be carried out on two samples which are subject to a series of 5 000 opening/closure operations using the following method:

— the regulator is placed in the test conditions described in 7.2.6.1;

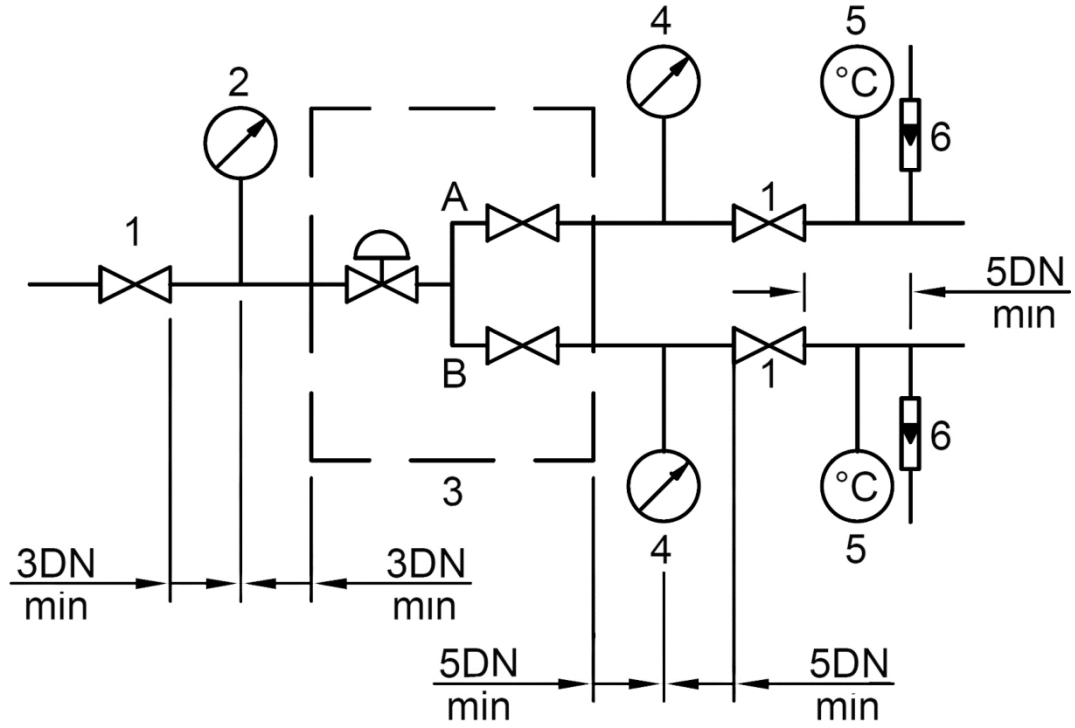
— the valve shall resist 5 000 opening/closing cycles including rotation from the closed position up to the fully opened position applying a torque of 0,3 N·m in the open and closed positions. The frequency shall be (6 ± 2) cycles/min.

At the end of these 5 000 cycles, the valve shall be closed with a torque of 0,5 N·m and soundness shall be verified under the conditions of K.4.1.1, first with the valve closed then with the valve open and the outlet sealed.

K.4.2 Performance test

K.4.2.1 Test conditions

The regulator shall be placed on a test bench in accordance with Figure K.1.



Key

1 adjuster/closing device
2 pressure measuring device (gauge) for *p*
3 test sample (*A* and *B*: outlet marks)
4 pressure measuring device (gauge) for outlet pressures
5 temperature measuring device
6 flow rate measuring device

Figure K.1 — Test apparatus for regulators with two outlets (A and B)

K.4.2.2 Regulator with two outlets (marked A and B)

Test No.1:

With the outlet A closed, the shut off device is opened fully at the outlet B.

At a rate of 50 % of the guaranteed flow rate, the regulator shall meet the same requirements for regulation and closing pressure as a regulator fitted with a single outlet.

Test No.2:

Using a restrictor, outlet A shall be adjusted, in the fully open position, to a rate of 50 % of the guaranteed flow rate. The assessment of the behaviour at the outlet B shall be made as in test No.1.

Test No.3:

With the outlet B closed, the shut off device is opened fully at the outlet A.

At a rate of 50 % of the guaranteed flow rate, the regulator shall meet the same requirements for regulation and closing pressure as a regulator fitted with a single outlet.

Test No.4:

Using a restrictor, outlet B shall be adjusted, in the fully open position, to a rate of 50 % of the guaranteed flow rate. The assessment of the behaviour at the outlet A shall be made as in test No.3.

K.4.2.3 Regulator with three outlets

The test shall be carried out in a similar way as K.4.2.2 at a rate of 33 % of the guaranteed flow rate for each outlet.

K.5 Marking

In addition to the requirements of 8.2, the regulators fitted with two or three outlets shall bear the symbol of Figure K.2:

NOTE IEC 60417-5109 was developed to identify electrical equipment. The meaning of this symbol is here extended to include gas regulators which are suitable for outside use only.

Figure K.2 — Symbol for outdoor use only — IEC 60417-5109: Not to be used in residential areas

The marking of the guaranteed flow rate shall have the form of the number of outlets multiplied by the rate of each outlet, expressed in kg/h (for example, “2 × 0,5 kg/h”).

K.6 Instructions

In addition to the requirements of 8.4, the instructions of use shall state that only outdoor use is allowed.

The instructions shall state the guaranteed flow rate in the form of the number of outlets multiplied by the rate of each outlet, expressed in kg/h (for example, “2 × 0,5 kg/h”).

Annex L
(normative)

Special requirements for regulators fitted with an inlet valve

L.1 Scope

This annex applies to regulators intended to be directly connected to a cylinder valve in order to supply appliances at pressures given in EN 437:2003+A1:2009.

L.2 Definition

An inlet valve is an opening and closing device allowing for the full opening or the complete shut off of the gas flow. It shall be mounted upstream of the regulating sub assembly and shall be integral in the regulator.

L.3 Constructional characteristics

The valve shall incorporate a knob whose closing direction shall be clearly identified by an unambiguous and indelible marking (arrow or drawing).

This marking shall also indicate without doubt the fully open position.

L.4 Performance characteristics: mechanical strength

It shall not be possible to dismantle the valve inadvertently.

The compliance with this requirement shall be verified using the test described in L.5.

L.5 Test methods

The regulator fitted with the valve shall meet all the tests described in the body of this standard. In addition, the following tests shall be carried out:

A torque of 1 N·m shall be applied to the knob of the valve, in the opening direction and then in the closure direction.

At the end of these tests, correct operation of the valve shall be checked.

Annex M
(normative)

Devices for gas cylinders to supply appliances installed in seawater boats

M.1 Scope

The purpose of this annex is to describe the specifications and test methods applicable to devices which can be used to supply appliances installed in seawater boats.

M.2 General

Devices shall comply with all the requirements of Annex D, with the exceptions, modifications and additions given in the following subclauses.

The automatic change over device function can also be carried out by an assembly of regulators, forming an "automatic change over device system" as defined in 3.1.9.

M.3 Maximum guaranteed flow rate

The guaranteed flow rate shall not exceed 4 kg/h.

M.4 Regulating devices fitted with a pressure relief valve

For regulating devices equipped with a pressure relief valve safety device, the vent shall be provided with a pipe connection in order to convey the released gas outside.

M.5 Vent

The vent shall be on the edge of the diaphragm, in a suitable location and of a suitable size to drain any water which may collect on the diaphragm.

M.6 Connections

If the guaranteed flow rate of the device is less or equal to 1,5 kg/h, connections given in Annex D shall be used.

For devices of which the guaranteed flow rate is greater than 1,5 kg/h and up to 4 kg/h, connections in accordance with Annexes G and H and suitable for the rate shall be used.

M.7 Material

Materials in contact with the atmosphere shall be suitably corrosion resistant. In particular, this includes internal components above the diaphragm.

Springs shall be stainless steel.

Mild steel and plated mild steel components shall not be used.

Copper alloys shall be seawater resistant to avoid dezincification.

M.8 Corrosion

M.8.1 General

Subclauses 5.8 and 7.2.8 of this standard are replaced by the following subclauses.

M.8.2 Corrosion requirement

After testing in accordance with M.8.3:

— the degree of corrosion shall be not greater than that given as Ri 1 in Table 1 of EN ISO 4628-3:2016;

— performance characteristics shall remain in accordance with the requirements given in Clause 6 of this standard;

M.8.3 Corrosion test method

The sample used for this test shall be a complete regulating device with its connections.

The test is carried out in accordance with EN ISO 9227:2017, with a duration of 500 h. Other test methods leading to equivalent results, for example the method described in informative Annex I, are allowed.

The test chamber being in a steady-state, the device is placed in one of the positions of use recommended by the installation instructions.

For a regulating device this test shall be carried out, with the device cycling using air applied to the outlet connection at a pressure of 0 mbar for (20 ± 2) seconds and p_0 for (20 ± 2) seconds, the inlet connection being blocked.

For a non-regulating device this test shall be carried out with its inlet and outlet blocked.

M.9 Marking

In addition to the information specified in Clause 8, Annex A and possibly Annex D of this European Standard, the marking and packaging of seawater boat device shall include the marking “Marine”.

M.10 Instructions for use and maintenance

Replace the sentence required in the sixth dash of 8.4 with the following:

“In normal conditions of use, in order to ensure a correct operating of the installation, it is recommended that this device is changed within 6 years of the date of manufacture“.

Furthermore, the instructions shall state that if the device is not directly connected to the gas cylinder, its brackets and fasteners shall be resistant to corrosion.

When a marine regulating device complies with Annex D (guaranteed flow rate less or equal to 1,5 kg/h), the warning “Only for use in caravans, motor caravans and freshwater boats” stated in D.8, shall be replaced by the warning: “Only for use in boats, caravans, or motor caravans”.

For marine devices with a guaranteed flow rate greater than 1,5 kg/h and up to 4 kg/h the warning “Only for use in caravans, motor caravans and freshwater boats” stated in D.8, shall be replaced by the warning: “Only for use in seawater boats”.

Annex N
(normative)

Alternative possible seal

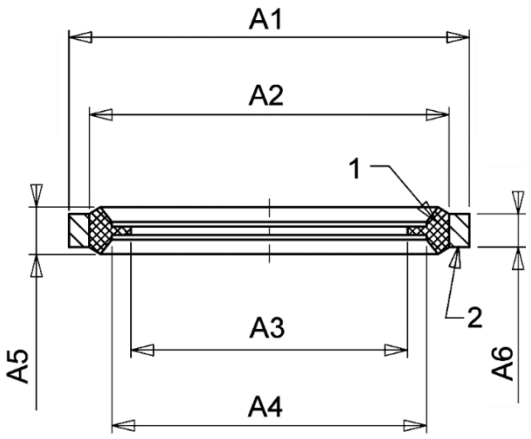
N.1 Scope

The scope of this annex is to give alternative design of the flat seals defined in the nut-EN ISO 228-1:2003 connections: G.13, G.17, G.28, G.34, G.36, H.1, H.18, H.20.

This alternative design combines a rubber part and a metallic insert.

It can provide a better behaviour in respect of large climatic condition variations and a better stability independently from the assembling torques.

N.2 Dimensions



	Type 1	Type 2	Type 3
A1	Ø17,7 - Ø17,8	Ø23,8 – Ø23,9	Ø21,9 – Ø22,0
A2	Ø15,8 - Ø16,2	Ø21,8 – Ø22,2	Ø19,8 – Ø20,2
A3	Ø12,1 - Ø12,3	Ø16,4 – Ø16,6	Ø16,4 – Ø16,6
A4	Ø13,8 - Ø14,2	Ø19,8 – Ø20,2	Ø17,8 – Ø18,2
A5	1,8 - 2,3	2,3 – 2,8	2,3 – 2,8
A6	1,4 – 1,5	1,9 – 2,0	1,9 – 2,0

Key

1 rubber material

2 metallic material

Figure N.1 — Metallic insert seal

N.3 Materials

Rubber material shall comply with EN 549: 1994category A2/H3 and shall be black colour.

Metallic material shall be made of brass or of stainless steel.

N.4 Markings

In order to identify the right flat seal to be used in a connection, the following rules shall be applied:

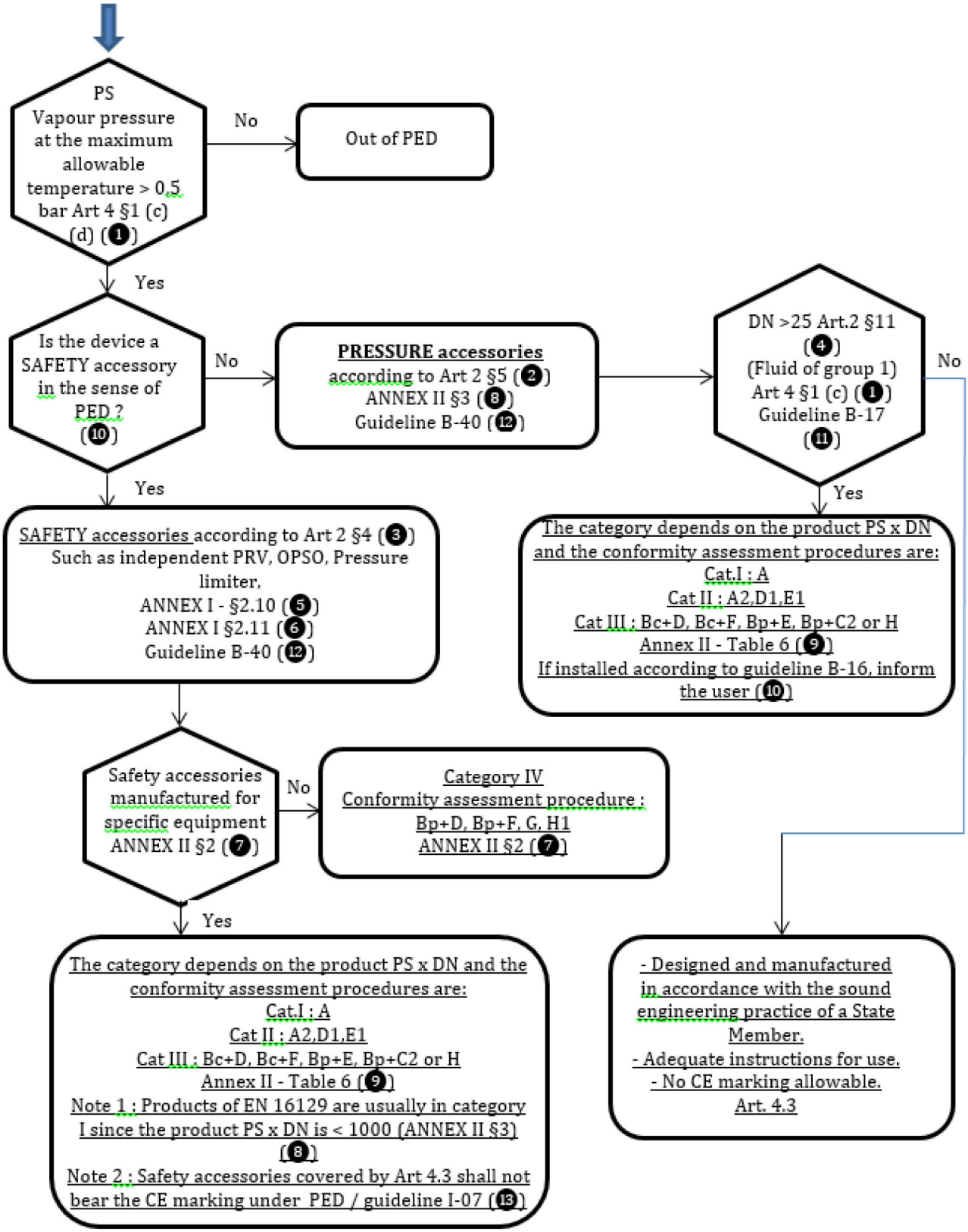
Table N.1 – Marking rules

	Type 1	**Type 2**	**Type 3**
Connection description	Nut M20 x 1,5	Nut G3/4 line	Nut G3/4 Tank
Connection to be used, referring to Annexes G and H	G.13, G.36, H1, H.20	G.28, G.34, H.18	G.17
Colour of the metallic part	Original brass or stainless steel	Original brass or stainless steel	Black coating
Additional marking on the metallic insert	Red spot	None	None

Annex O
(informative)

Flow chart describing situation of regulators regarding to PED

For PED conformity assessment classification PS × DN should be used.



Key

1. Article 4 §1 (c) (d) Technical requirements
2. Scope and definitions Article 2 §5
3. Scope and definitions Article 2 §4

❹ Article 2 §11 Scope and definitions
❺ ANNEX I §2.10 Essential Safety Requirements
❻ ANNEX I §2.11 Essential Safety Requirements
❼ ANNEX II §2 Conformity assessment table
❽ ANNEX II §3 Conformity assessment table
❾ ANNEX II Table 6 Conformity assessment table
❿ Guidelines B-16 related to the Pressure Equipment Directive2016/68/EU
⓫ Guidelines B-17related to the Pressure Equipment Directive 2016/68/EU
⓬ Guidelines B-40 related to the Pressure Equipment Directive 2016/68/EU
⓭ Guidelines I-07 related to the Pressure Equipment Directive 2016/68/EU

Figure O.1 — Situation of regulators regarding to PED

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Regulation (EU) 2016/426/EC aimed to be covered (for regulating devices only)

This European Standard has been prepared under a Commission's standardization request to provide one voluntary means of conforming to essential requirements of Regulation (EU) 2016/426 relating to appliances burning gaseous fuels

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

NOTE Change-over devices and adaptors are not within the scope of the Gas appaliance regulation 2016/426/EC.

Table ZA.1 — Correspondence between this European Standard and Annex 1 of Regulation 2016/426/EC

Essential requirement of Regulation (EU) 2016/426	Clause(s)/subclause(s) of this EN	Remarks/Notes
1		
1.1	5, 6	
1.2		
1.3		
1.4		
1.5	Not relevant for fittings	
1.6.1	Not relevant for fittings	
1.6.2	Not relevant for fittings	
1.6.3	Not relevant for fittings	
1.7	8.4, A.1.6, A.2.6, A.3.5, A.4.5, A.5.5, A.6.5, A.7.6, B.1.6, B.2.6, K.6	
2	5.2, 5.4, 5.7, 5.8, C.2.1, C.3, E.2, E.3, M.7, N.3	
3		
3.1		
3.1.1	5.1, 5.2.1, 5.2.2, 5.2.4, 5.2.5, 5.2.6, 5.3, 5.4, 5.6, 5.7, 5.8, A.1.2, A.2.2, A.3.2, A.5.2, A.6.2, A.7.2,	
3.1.2	5.2.7, 8.4 h)	

Essential requirement of Regulation (EU) 2016/426	Clause(s)/subclause(s) of this EN	Remarks/Notes
3.1.3	5.2.1	
3.1.4	5.3.3, 5.5,	
3.1.5		Not applicable
3.1.6		Not applicable
3.1.7		Not applicable
3.1.8		
3.1.9	5.2.7, 5.4.2, 5.6, 5.7	
3.1.10	A.1.2, A.2.2, A.3.2, A.4.2, A.5.2, A.6.2, A.7.2, B.1.2, B.2.2, D.4, M.2, M.4,	
3.1.11	5.1 (3rd paragraph), A.2.2.1	
3.1.12	5.1 (10th paragraph)	
3.1.13	5.3.4.4, A.2.6, A.3.5, A.4.5	
3.2		
3.2.1	5.5	
3.2.2		Not applicable
3.2.3		Not applicable
3.2.4		Not applicable
3.3		Not applicable
3.4		
3.4.1		Not applicable
3.4.2		Not applicable
3.4.3		Not applicable
3.4.4		Not applicable
3.5		
3.6		
3.6.1		Not applicable
3.6.2		Not applicable
3.6.3		Not applicable
3.7		Not applicable

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

Annex ZB
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2014/68 aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/071 to provide one voluntary means of conforming to essential requirements of EU Directive 2014/68/UE (PED).

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZB.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZB.1 — Correspondence between this European Standard and Annex 1 of Directive 2014/68/EC

Essential Requirements of Directive 2014/68	**Clause(s)/subclause(s) of this EN**	**Remarks/Notes**
1.1	5.1	
1.2		Not addressed in this standard
1.3	5.3.4.4, 8.2.1 h) 2), k), j), m)	
2.1		General EE addressed through other following EE
2.2.1	5.1, 5.4, 5.8	
2.2.2		See 2.2.3 and 2.2.4
2.2.3		Not addressed in this standard
2.2.4	5.6, 5.8	
2.3		Not applicable for devices covered by this standard, due to the size and relatively low pressures.
2.4		Not applicable for devices covered by this standard, due to the size and relatively low pressures.
2.5		Not applicable for devices covered by this standard, due to the size and relatively low pressures.
2.6	5.8, M.8	
2.7		Not applicable. LPG regulators are not exposed to erosion nor abrasion.

Essential Requirements of Directive 2014/68	**Clause(s)/subclause(s) of this EN**	**Remarks/Notes**
2.8		Not applicable. Devices covered by this standard are not assemblies according to PED definition.
2.9	5.3.4.3	Only to comply with EE 2.9 c). EE 2.9 a) and b) are not applicable
2.10	Annex A: A.1, A.2, A.5, A.6	
2.11	Annex A: A.1, A.2, A.5, A.6	
2.12		Not applicable due to the size of the devices covered by this standard.
3.1		Manufacturing process. Not covered by this product standard.
3.2		Final assessment. Not covered by this product standard which is a type test standard.
3.3	8.2.1A.1.5, A.2.5, A.5.4, A.6.4, C.4, D.7, M.9	
3.4	8.4, A.1.6, A.2.6, A.5.5, A.6.5, C.5, D.8, M.10	
4.1	5.2, 5.7, E.2, E.3.1, M.7	
4.2		Not covered certification process
4.3		Not covered certification process
5		Devices covered by this standard are not concerned
6		Devices covered by this standard are not concerned
7		Not applicable

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

Bibliography

<std>[1] EN 751-1, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water - Part 1: Anaerobic jointing compounds*</std>

<std>[2] EN 751-2, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water - Part 2: Non-hardening jointing compounds*</std>

<std>[3] EN 751-3, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water - Part 3: Unsintered PTFE tapes*</std>

<std>[4] EN 13878, *Leisure accommodation vehicles - Terms and definitions*</std>

<std>[5] ANSI B1.20.1, *Pipe Threads, General Purpose*</std>

<std>[6] ANSI/CGA V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections*</std>

<std>[7] EN ISO 3166-1, *Codes for the representation of names of countries and their subdivisions - Part 1: Country codes (ISO 3166-1:2013)*</std>

<std>[8] EN 521:2006, *Specifications for dedicated liquefied petroleum gas appliances - Portable vapour pressure liquefied petroleum gas appliances*</std>

<std>[9] EN 560:2005, *Gas welding equipment - Hose connections for equipment for welding, cutting and allied processes*</std>

<std>[10] EN ISO 75-1:2013, *Plastics - Determination of temperature of deflection under load - Part 1: General test method (ISO 75-1:2013)*</std>

<std>[11] EN ISO 75-2:2013, *Plastics - Determination of temperature of deflection under load - Part 2: Plastics and ebonite (ISO 75-2:2013)*</std>

<std>[12] EN ISO 75-3:2013, *Plastics — Determination of temperature of deflection under load - Part 3: High-strength thermosetting laminates and long-fibre-reinforced plastics*</std>

<std>[13] EN ISO 228-1:2003, *Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation (ISO 228-1:2000)*</std>