BS EN 13175:2014

BSI Standards Publication

LPG Equipment and accessories — Specification and testing for Liquefied Petroleum Gas (LPG) pressure vessel valves and fittings

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National foreword

This British Standard is the UK implementation of EN 13175:2014. It supersedes BS EN 13175:2003 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PVE/19, LPG containers and their associated fittings.

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

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

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

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LPG Equipment and accessories - Specification and testing for Liquefied Petroleum Gas (LPG) pressure vessel valves and fittings

Équipements pour GPL et leurs accessoires - Spécifications et essais des équipements et accessoires des réservoirs pour gaz de pétrole liquéfié (GPL)

Flüssiggas-Geräte und Ausrüstungsteile - Spezifikation und Prüfung für Ventile und Fittinge an Druckbehältern für Flüssiggas (LPG)

This European Standard was approved by CEN on 14 September 2014.

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

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Foreword

This document (EN 13175:2014) has been prepared by Technical Committee CEN/TC 286 “LPG Equipment and accessories - Specification and testing for Liquefied Petroleum Gas (LPG) pressure vessel valves and fittings”, the secretariat of which is held by NSAI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2015 and conflicting national standards shall be withdrawn at the latest by May 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13175:2003+A2:2007.

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 EU Directive(s).

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

This European Standard has been submitted for reference into:

— the technical annexes of the ADR [4].

NOTE These regulations take precedence over any clause of this European Standard. It is emphasized that ADR is being revised regularly at intervals of two years which may lead to temporary non-compliances with the clauses of this European Standard.

The major changes to this revision include:

— reference to the RID and ADN has been removed;

— the addition of aluminium alloys and zinc alloys;

— additional requirements for brass materials;

— change in requirements for non-metallic components, lubricants, sealants and adhesives;

— the insertion of filler valve with overfill protection device, dry disconnect coupling requirements and the deletion of plug and cap requirements;

— the introduction of Annex C (informative), Inspection of 3 ¼ inch x 6 ACME coupling;

— the introduction of Annex D (normative), Dry disconnect couplings.

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

Introduction

This European Standard calls for the use of substances and procedures that may be injurious to health and/or the environment if adequate precautions are not taken. It refers only to technical suitability; it does not absolve the user from their legal obligations at any stage.

It has been assumed in the drafting of this European Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people.

All pressures are gauge pressures unless otherwise stated.

NOTE This European Standard requires measurement of material properties, dimensions and pressures. All such measurements are subject to a degree of uncertainty due to tolerances in measuring equipment, etc. It may be beneficial to refer to the leaflet “measurement uncertainty leaflet” SP INFO 2000 27 [8].

1 Scope

This European Standard specifies minimum requirements for the design, testing and production testing of valves, including appropriate fittings, which are connected to mobile or static LPG pressure vessels above 150 l water capacity. Pressure relief valves and their ancillary equipment, contents gauges and automotive LPG components are outside the scope of this European Standard.

This European Standard does not apply to refineries or other process plants.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 549:1994, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*

EN 751-1:1996, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water - Part 1: Anaerobic jointing compounds*

EN 751-2:1996, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water - Part 2: Non-hardening jointing compounds*

EN 751-3:1996, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water - Part 3: Unsintered PTFE tapes*

EN 837-1, *Pressure gauges - Part 1: Bourdon tube pressure gauges - Dimensions, metrology, requirements and testing*

EN 1092-1:2007+A1:2013, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 1: Steel flanges*

EN 1267:2012, *Industrial valves - Test of flow resistance using water as test fluid*

EN 1503-1:2000, *Valves - Materials for bodies, bonnets and covers - Part 1: Steels specified in European Standards*

EN 1503-2:2000, *Valves - Materials for bodies, bonnets and covers - Part 2: Steels other than those specified in European Standards*

EN 1503-4:2002, *Valves - Materials for bodies, bonnets and covers - Part 4: Copper alloys specified in European Standards*

EN 1563:2011, *Founding - Spheroidal graphite cast irons*

EN 1759-1:2004, *Flanges and their joint - Circular flanges for pipes, valves, fittings and accessories, Class designated - Part 1: Steel flanges, NPS 1/2 to 24*

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

EN 1983, *Industrial valves - Steel ball valves*

EN 10270-3:2011, *Steel wire for mechanical springs - Part 3: Stainless spring steel wire*

EN 12164:2011, *Copper and copper alloys - Rod for free machining purposes*

EN 12165:2011, *Copper and copper alloys - Wrought and unwrought forging stock*

EN 12420:2014, *Copper and copper alloys - Forgings*

EN 13547, *Industrial valves - Copper alloy ball valves*

EN 13709:2010, *Industrial valves - Steel globe and globe stop and check valves*

EN 13789:2010, *Industrial valves - Cast iron globe valves*

EN 13799:2012, *LPG equipment and accessories - Contents gauges for Liquefied Petroleum Gas (LPG) pressure vessels*

EN 13906-1:2013, *Cylindrical helical springs made from round wire and bar - Calculation and design - Part 1: Compression springs*

EN 15202:2012, *LPG equipment and accessories - Essential operational dimensions for LPG cylinder valve outlet and associated equipment connections*

EN 60079-0, *Explosive Atmospheres - Part 0: Equipment - General requirements (IEC 60079-0)*

EN ISO 196:1995, *Wrought copper and copper alloys - Detection of residual stress - Mercury(I) nitrate test (ISO 196:1978)*

ISO 7-1:1994, *Pipe threads where pressure-tight joints are made on the threads - Part 1: Dimensions, tolerances and designation*

ISO 301:2006, *Zinc alloy ingots intended for castings*

ISO 2859-1:1999, *Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 6957:1988, *Copper alloys - Ammonia test for stress corrosion resistance*

ANSI/ASME B1.20.1 - 1983, *Pipe threads, general purpose (inch) issued by American National Standards Institute in 1983*

ASME B1.5 - 1990, *ACME Screw Threads issued by American Society of Mechanical Engineers in 1990*

3 Terms and definitions

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

3.1
liquefied petroleum gas
LPG
low pressure liquefied gas composed of one or more light hydrocarbons which are assigned to UN 1011, UN 1075, UN 1965, UN 1969 or UN 1978 only and which consists mainly of propane, propene, butane, butane isomers, butene with traces of other hydrocarbon gases

3.2
pressure vessel
assembly of the pressure envelope (including the openings and their closures) and non-pressure-retaining parts attached directly to it

3.3
maximum allowable pressure
maximum pressure for which the equipment is designed

Note 1 to entry: All pressures are gauge pressures unless otherwise stated.

3.4
fitting
pressure containing component fitted to an LPG pressure system

3.6
internal leak tightness
resistance to leakage across the valve seal or other internal sealing components when the valve is closed

3.7
external leak tightness
resistance to leakage through the fitting to or from the atmosphere

3.8
residual flow
allowable flow through an excess flow or a non-return valve, when the valve is in the closed position

3.9
sealing element
non-metallic resilient component which effects a seal by contact with the valve seat

3.10
excess flow valve
valve designed to close automatically, with a small residual flow, when the fluid flow passing through it exceeds a predetermined value, and to re-open when the pressure differential across the valve has been restored below a certain value

3.11
non-return valve
valve designed to close automatically to restrict reverse flow

3.12
shut-off valve
valve to provide a leak tight seal which is operated either manually, remotely or is self-closing

3.13
service valve
valve for fluid off-take which is manually operated to provide a leak tight seal

3.14
filler valve
valve system for liquid fill service

3.15
plug
component which seals a female connection

3.16
cap
component which seals a male connection

3.17
overfill protection device
OPD
device designed to automatically reduce the filling rate to a minimal flow when the fill level reaches a predetermined amount

3.18
occasional liquid withdrawal valve
normally blanked valve, used for occasional liquid withdrawal which is designed to be opened by the engagement of a special connector valve

3.19
internal valve
valve which has its seal within the profile of the pressure vessel

3.20
self closing valve
normally closed valve that provides a leak tight seal, opens by the engagement of a special connector or by fluid passing through it and closes automatically upon removal of the connector or by stopping the fluid flow

3.21
vapour equalizing valve
valve which permits vapour to flow in either direction in order to equalize vapour pressure between pressure vessels during liquid transfer, and which incorporates an excess flow valve and a self-closing valve opened by a special connector valve

3.22
multipurpose valve
valve which incorporates two or more service functions and which meets the combined requirements of the individual functions

3.23
breakaway coupling
coupling which separates at a predetermined section when required and each separated section contains a self-closing shut-off valve, which seals automatically

Note 1 to entry: Also referred to as a safe break.

3.24
dry disconnect coupling
quick coupling which connects and disconnects with minimum LPG release and each separated section contains a self-closing shut-off valve, which seals automatically

3.25
Standard Temperature and Pressure
STP
15,6 °C (288,7 K), 1,013 bar absolute (0,101 3 MPa absolute)

4 Operating conditions

4.1 Valves and fittings designed in accordance with this European Standard shall be suitable for a minimum operating temperature of −20 °C.

NOTE In service, temperatures below this can be encountered during short periods, for example, during filling.

4.2 For some parts of Europe and certain applications, temperatures lower than −20 °C can be encountered; for these conditions the requirements of Annex B shall be applied.

4.3 Valves and fittings shall be designed for a maximum operating temperature of 65 °C.

4.4 Valves and fittings shall be designed for a maximum allowable pressure of 25 bar.

4.5 Valves and fittings shall be designed for a minimum pressure of 50 mbar absolute.

NOTE Vacuum conditions on the valve or fitting, arising from butane at low temperature or evacuation of the pressure vessel can expose the valve or fitting to a vacuum of 50 mbar absolute.

5 Materials

5.1 General

5.1.1 All materials in contact with LPG shall be physically and chemically compatible with LPG under all the normal operating conditions for which the valve or fitting is intended.

5.1.2 Materials for valve or fitting components shall be selected to give adequate strength in service. Consideration shall also be given to other modes of failure such as atmospheric corrosion, brass dezincification, stress corrosion, impact or material failure.

5.1.3 Alternative materials to those listed in 5.2 are not precluded, providing they comply with a standard or specification that ensures control of chemical and physical properties, and quality appropriate to the end use.

5.2 Metallic materials

5.2.1 Metallic materials for valves and fittings shall be steel, stainless steel, copper alloys, aluminium alloys, zinc alloys, or other suitable materials.

5.2.2 For pressure containing components, steel and stainless steels shall comply with EN 1503-1:2000 or EN 1503-2:2000 and copper alloys shall comply with EN 1503-4:2002.

5.2.3 Materials for steel flanges shall be in accordance with EN 1092-1:2007+A1:2013.

5.2.4 Stainless steel for components shall contain not less than 16 % chromium and shall contain not less than 7 % nickel.

5.2.5 Springs shall be manufactured from stainless steel in accordance with EN 10270-3:2011.

5.2.6 Hot stamped brass shall be non-porous and suitable for machining or other processing. Leaded brass shall be CW614N or CW617N in accordance with EN 12420:2014, EN 12164:2011 and EN 12165:2011. 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. Components produced from stamping brass shall not exhibit cold shuts also known as folds, or surface defects.

5.2.7 Components manufactured from hot stamped brass or bodies made of drawn brass or machined from brass rod shall be capable of withstanding, without cracking, the stress cracking test (see 8.11).

5.2.8 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.

5.2.9 ZnAl4 and ZnAl4Cu1 shall be in accordance with ISO 301:2006 or EN 1774:1997.

5.2.10 Castings shall be free from inclusions and surface defects which could adversely affect the strength, leak tightness or performance of the valve or fitting.

5.2.11 For guidance on the choice of metallic materials, see EN ISO 11114-1:2012.

5.3 Non-metallic components

All non-metallic materials in contact with LPG shall not distort, harden or adhere to the body or seat face to such an extent as to impair the function of the valve.

All rubber materials shall also comply with the requirements of EN 549:1994. The ozone test in EN 549:1994 shall only be carried out where gaskets/seals are exposed to atmosphere.

NOTE For guidance on the choice of non-metallic materials, see EN ISO 11114-2:2013.

5.4 Lubricants, sealants and adhesives

Where used on threads and seals; lubricants, sealants, and adhesives shall be compatible with LPG and shall not interfere with the operation of the valve or fitting.

Sealants shall comply with EN 751-1:1996, EN 751-2:1996 or EN 751-3:1996.

6 Design – general requirements

6.1 General

6.1.1 Valves and fittings shall be capable of withstanding all service conditions, including fatigue, to which they will be subjected during normal conditions of use (or carriage where appropriate) as detailed in Table 3.

6.1.2 Moving parts shall have sufficient clearance to ensure freedom of movement under all normal conditions of service. Where necessary, means of guidance shall be provided to ensure correct seating or sealing.

6.1.3 All components vital to the function of a valve or fitting shall be secured to prevent disassembly during normal operation. Internal valves shall be either automatically operated or remotely operated to prevent inadvertent operation.

6.1.4 Valves and fittings shall be designed to ensure external leak tightness, internal leak tightness and their function shall not be affected as a result of vibration during transportation.

6.1.5 For mobile applications, the valves and fittings shall be capable of withstanding a deceleration of 100 times gravity in the X, Y and Z axis and shall remain leak tight.

6.1.6 In transport applications, valves and fittings directly connect to the shell (including the internal stop-valve and its seating) shall be protected against the danger of being wrenched off by external stresses. This may be achieved by the provision of weak sections or shear grooves in the valve or fitting that allows the sealing mechanism to remain within the shell after failure. These valves and fittings shall fulfil the test requirements of 8.10.

6.1.7 The design shall take account of the use of dissimilar materials.

EXAMPLE Electrochemical corrosion or material expansion.

6.1.8 Electrical equipment, when used with a valve or fitting shall meet the requirements of EN 60079-0 where appropriate.

6.1.9 Valves shall have their flow resistance determined using water as a test fluid.

6.1.10 Possible stress corrosion shall be eliminated by either design or heat treatment.

6.1.11 The design shall take account of the following:

— minimizing the use of raw materials;

— minimizing the environmental impact of in-service maintenance and end of life disposal; and

— efficient packaging of finished product.

6.2 Seats and seals

6.2.1 Valves and fittings shall be designed to allow installation without damaging non-metallic seats or seals.

6.2.2 Sealing may be achieved by either elastomeric or other non-metallic material.

When a metal to metal closure is used, the residual flow test requirements of 8.6 shall be met.

6.2.3 The sealing element ensuring internal leak tightness shall be attached or otherwise assembled such that it will not become dislodged under service conditions. The means to secure the sealing element shall not rely solely on adhesive.

6.3 Springs

Springs shall be designed in accordance with EN 13906-1:2013.

6.4 Threads

6.4.1 Taper threaded pressure vessel connections shall comply with ANSI/ASME B1.20.1 - 1983. Thread sizes shall not exceed DN 80.

6.4.2 Where taper threads are used, the design shall ensure that over-torquing shall not impede the correct operation of the valve or fitting, see 8.3.

6.4.3 Taper threaded sections of a body designed for a pressure vessel connection shall be constructed with wrenching flats.

6.4.4 All threads other than taper threaded pressure vessel connections shall be in accordance with a European Standard or an International Standard, or shall be ACME threads in accordance with Annex A or ANSI/ASME B1.20.1 - 1983. Where the design includes 3¼ inch x 6 ACME threads, periodic inspections of the couplings are required. Annex C provides recommendations for these periodic inspections.

6.4.5 To avoid mismatching with ANSI/ASME B1.20.1 – 1983 threads, ISO 7-1:1994 threads shall not be used.

6.5 Flanges

Flanges shall comply with EN 1092-1:2007+A1:2013 or EN 1759-1:2004.

7 Design - specific requirements

7.1 Excess flow valve

7.1.1 Excess flow valves shall be designed so that when closed the flow past the seat to allow for reduction of differential pressure across the valve, shall not exceed that of an opening of 1,8 mm^2 cross sectional area.

7.1.2 Excess flow valves shall operate at a flow-rate of not more than 10 % above, nor less than 20 % below the rated closing flow capacity specified and it shall close automatically at a pressure differential across the valve of not more than 1,4 bar.

7.1.3 The connection to the pressure vessel shall not affect the function of the valve or its rated flow.

7.2 Non-return valve

The connection to the pressure vessel shall not affect the operation of the non-return valve.

7.3 Shut-off valves

7.3.1 General

Shut-off valves shall be of the ball valve or globe valve type or shall be a service valve. Ball valves shall be in accordance with EN 1983 or EN 13547. Globe valves shall be in accordance with EN 13709:2010 or EN 13789:2010. Service valves shall meet the requirements of 7.3.3.

The position and/or direction of closure of shut-off devices shall be clearly apparent. This can be achieved either by marking, indicators or remote signal.

7.3.2 Excess flow protection

Valves with a minimum cross section of LPG passage through the valve greater than 7 mm^2 (equivalent to a diameter of 3 mm) for liquid phase withdrawal, shall be protected by an excess flow valve.

Valves with a minimum cross section of LPG passage through the valve greater than the equivalent cross sectional area of 50 mm^2 (equivalent to a diameter of 8 mm) for vapour phase withdrawal, shall be protected by an excess flow valve.

7.3.3 Service valve

7.3.3.1 Valve operating mechanism

7.3.3.1.1 The valve operating mechanism shall be manually operated.

7.3.3.1.2 The valve operating mechanism shall be designed in such a way that it remains captive, and it achieves direct contact with the valve body in the absence of the sealing element. The valve shall be designed in such a way that the valve operating mechanism cannot be removed during normal use and without showing evidence of tampering.

7.3.3.1.3 Under normal use the valve shall operate without difficulty even after prolonged use and shall satisfy the requirements of 8.7 with the closing torque not exceeding 3 Nm.

7.3.3.1.4 The sealing element, to ensure internal leak tightness, shall be attached or otherwise assembled such that it will not become dislocated under service conditions. The means to secure the sealing element shall not rely solely on cement or adhesive.

7.3.3.1.5 All valves shall close when turned clockwise and open when turned anti-clockwise. It is recommended that the valve operating mechanism is visibly marked with a portion of circle terminating in two arrows. One arrow marked “–“ and the other arrow marked “+”, to indicate the result of the rotation as detailed in Figure 1.

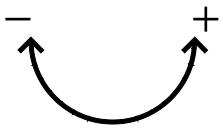


Figure 1 — Hand-wheel marking

7.3.3.2 Valve body

Where the valve body is made of more than one component, precautions shall be taken to ensure that there can be no unintentional disassembly. Disassembly shall require specialized equipment.

7.3.3.3 Sealing mechanism

The mechanism shall ensure internal leak tightness.

7.3.3.4 Operating torque

After the endurance test in accordance with 8.7 which is representative of the service valve life, the operating torque shall not exceed 3 Nm.

7.4 Filler valve

7.4.1 The filler valve shall be either:

a) manually operated; or

b) a remotely operated shut-off valve in combination with a non-return valve; or

c) a double non-return valve, at least one of which meets the requirements of 8.5, the other non-return valve may meet the requirements of either 8.5 or 8.6; or

d) a system that provides an equivalent level of safety.

7.4.2 Where supplied as an assembled unit, the filler valve shall meet the following criteria:

a) the non-return valve components shall meet the requirements of 7.2; and

b) where liquid can be trapped, means shall be provided to relieve excess pressure; and

c) where the body is made of two or more components, it shall not be possible to disassemble the components with a torque of less than 80 Nm.

7.4.3 The device shall have a minimum filling rate greater or equal to 8 m^3/h (water) under a differential pressure of 4 bar.

7.4.4 The fill connection shall be provided with a leak tight cap or blind flange. When the fill connection is provided with a soft-seated non-return valve in combination with a shut-off valve, a leak tight cap shall not be required. Consideration shall be given to providing dust protection.

NOTE Plugs and caps can be provided with a locking mechanism to prevent unauthorized interference.

7.4.5 Typical filler valve inlet connections are listed in Annex A.

When a dry disconnect coupling is used as a filler valve, the essential dimensions for a DN 50 and DN 80 connections are shown in Annex D.

7.4.6 Where the connecting seal is retained in the body of the filler valve, the seal retaining groove shall be provided with a vent hole in order to prevent the ejection of the seal on disconnection.

7.4.7 The valve may be provided with an extension for use with buried pressure vessels.

7.4.8 The valve shall include one or two weak sections.

— For valves without an extension a weak section e.g. break-off grooves or shear points, shall be included so as to leave the main closure intact in the event of the valve being fractured. The bending force to fracture shall be between 400 Nm and 500 Nm.

— For valves with an extension there shall be two weak sections, one below the fill connection and the other in the middle of the extension. They shall be such that the fracture by bending occurs at the upper weak section with a bending force applied to the fill connection of between 400 Nm and 500 Nm. The weak section in the lower part shall break when a bending force of between 550 Nm and 750 Nm is applied.

Regardless of the type of fracture, the lower check shall remain operational. There shall be no deformation of the connecting threads between the different parts, nor between the lower body and the pressure vessel.

7.5 Filler valve with OPD

7.5.1 General

The filler valve with OPD shall meet the requirements of 7.4.

7.5.2 Performance

7.5.2.1 The device shall have a minimum filling rate greater or equal to 8 m^3/h (water) under a differential pressure of 4 bar.

7.5.2.2 The device shall operate at a predetermined percentage volume level. The tolerance on filling shall be 0 % to −5 %. The stop shall be gradual so as not to create a shock in the pipe-work upstream.

7.5.2.3 The maximum flow-rate after the closure of the stop fill shall be less or equal to 50 l/h (water) with a differential pressure of 1 bar.

7.5.3 Float

The float shall meet the requirements 8.8 and 8.12 of EN 13799:2012.

Valves that are fitted with an OPD shall clearly identify that an OPD is present by marking, colour coding or other means.

7.6 Occasional liquid withdrawal valve

7.6.1 An occasional liquid withdrawal valve shall incorporate an excess flow valve unless this is provided by the special connector used to open the valve.

7.6.2 It shall be provided with a plug or cap to provide a leak tight seal (see 8.3).

7.6.3 The plug or cap shall contain a vent to indicate leak tightness before the plug or cap is fully disengaged.

7.6.4 The special connector shall be designed or located to ensure a sufficient engagement before activating the self-closing element.

7.6.5 The joint between the special connector and the occasional liquid withdrawal valve shall be designed to be leak tight.

7.7 Internal valve

7.7.1 The internal valve shall incorporate one of the following systems:

a) a self-closing valve and an excess flow valve, when open;

b) an automatic shut-off valve, actuated by LPG pump differential pressure that will provide a leak tight seal when the pump is not in operation;

c) a self-closing valve opened by hydraulic, pneumatic or mechanical means.

Consideration should be given to incorporating a thermally sensitive device to ensure the valve closes in the event of fire.

7.7.2 Internal valves shall be designed so as to prevent any unintended opening through impact or an inadvertent act. This may be achieved either by the valve being operated automatically or by being actuated with a system that provides this facility.

7.7.3 A weak section, e.g. break-off grooves or shear points, shall be provided to leave the main closure intact if it should be subjected to external damage.

7.7.4 Where shear studs are provided to secure flanged valves, the stud weak section shall fail sacrificially without causing damage that can interfere with the satisfactory operation of the valve.

7.7.5 The position and/or direction of closure of shut-off devices shall be clearly apparent. This can be achieved either by marking, indicators or remote signal.

7.8 Vapour equalizing valve

A weak section, e.g. break-off grooves or shear points, shall be included such as to leave the main closure intact if it should be subjected to external damage. The bending force to fracture shall be between 150 Nm to 250 Nm up to 1,25 inch ACME thread size and shall be between 400 Nm and 500 Nm for 1,75 inch ACME and above.

7.9 Multipurpose valve

The design shall be such as to ensure that one function does not adversely affect other functions.

7.10 Break-away coupling

The breaking strength of the coupling shall be clearly defined by the manufacturer. Both ends of the coupling shall effect a leak tight seal when the coupling breaks away.

7.11 Dry disconnect coupling

7.11.1 The coupling shall be quick acting and shall contain a connection system which allows the engagement of the coupling without a threaded connection and without the use of tools. Each separated section shall contain a self-closing shut-off valve which seals automatically.

7.11.2 On engagement of the two components of the coupling, the internal leak tightness of the male and female components shall remain tight until the external leak tightness is secured. The coupling of the two components shall fully engage and provide external leak tightness prior to the opening of the self-closing shut-off valves in either component.

7.11.3 On disengagement of the two components of the coupling, the external leak tightness shall be maintained until the self-sealing components of both parts are closed. The uncoupling of the two components shall not take place and shall continue to remain leak tight until after the closure of the self-closing shut-off valves in both components.

7.11.4 The pressure vessel connector of a dry disconnect coupling shall be used in series combination with a manual shut-off valve.

7.11.5 The loading connector of a dry disconnect coupling shall be provided with either of the following designs:

a) The loading connector shall be designed to ensure that the coupling cannot be disconnected from the pressure vessel connector unless the loading connector is in the closed position; or

b) The loading connector shall be provided with a means to confirm that the self-sealing component of the loading connector is closed (e.g. bleed screw), prior to disengagement of the two components of the coupling.

7.11.6 Where liquid can be trapped, means shall be provided to relieve excess pressure.

7.11.7 On connection the coupling shall remain fully leak tight. On disconnection, the maximum allowable LPG release shall be in accordance with Table 1.

7.11.8 The dry disconnect coupling shall conform to the dimensions in Annex D.

7.11.9 The flow-rate through the coupling at a pressure difference of 0,5 bar, shall be at least in accordance with Table 2 (see also 8.13).

Table 1 — Maximum allowable LPG release upon disconnection of dry disconnect couplings

Coupling nominal size	**Maximum allowable LPG release upon disconnection** ml
DN 25	0,2
DN 50	0,3
DN 65	0,5
DN 80	0,7
DN 100	1,6

Table 2 — Minimum LPG flow-rate of dry disconnect couplings

Coupling nominal size	**Minimum LPG flow-rate with a differential pressure 0,5 bar** l/min
DN 25	200
DN 50	600
DN 80	2 500

7.12 Pressure gauge

7.12.1 The pressure gauge shall conform to the appropriate requirements of this European Standard and to EN 837-1 and shall be resistant to the effects of the weather.

7.12.2 Where fluid shock or vibration is likely to be encountered, the design shall be of a type compatible with these conditions.

7.12.3 The accuracy shall be in accordance with the requirements of EN 837-1, with a minimum Class 2,5.

7.12.4 Pressure gauges on pressure vessels for butane service shall be capable of withstanding a vacuum of at least 50 mbar absolute.

8 Testing of the design

8.1 General

8.1.1 Samples representative of the design, size and type of valve or fitting shall meet the requirements of the tests described in Table 3. A minimum of three samples shall be submitted for each test unless otherwise stated.

8.1.2 Unless otherwise specified, tests shall be carried out at 20 °C ± 5 °C and ambient pressure.

8.1.3 Pneumatic leakage and hydrostatic pressure strength tests shall be maintained for at least 2 min, unless otherwise specified in this European Standard.

8.1.4 Sample valves or fittings shall initially be subject to visual inspection and dimensional checks.

8.1.5 The following documents shall be available to the person carrying out the tests:

— description of the valve or fitting and the method of operation;

— information on the use of the valve or fitting;

— drawings consisting of the general layout, parts lists and component drawings; and

— test procedures.

8.2 Testing of non-metallic components

8.2.1 Samples of parts constructed of rubber materials, shall be subjected to physical and chemical tests in accordance with EN 549:1994.

8.2.2 Samples of parts constructed of non-metallic materials, other than rubber, shall be subjected to:

a) the resistance to gas test in accordance with 7.6 of EN 549:1994; and

b) after the resistance to gas test above, a visual examination, to ensure the components have not cracked, deformed or become brittle to such an extent as to impair the function of the valve.

Table 3 — Design testing

Test	Clause	Valve or Fitting (subclause)										
		Excess flow valve	Non-return valve	Shut-off valve	Filler valve	Filler valve with OPD	Occasional liquid withdrawal valve	Internal valve	Vapour equalizing valve	Multi-purpose valve	Break-away coupling	Dry disconnect coupling
		(7.1)	(7.2)	(7.3)	(7.4)	(7.5)	(7.6)	(7.7)	(7.8)	(7.9)	(7.10)	(7.11)
Over torquing deformation	**8.3**	O	O	O	X	X	X	O	X	O	X	X
External leak tightness	**8.3**	O	O	X	X	X	X	X	X	X	X	X
Internal leak tightness	**8.5**	N/A	O	X	X	X	X	X	X	X	X[a]	X[a]
Residual Flow	**8.6**	X	X	N/A	N/A	N/A	O	O	X	O	N/A	O
Pressure strength	**8.7**	X	X	X	X	X	X	X	X	X	X	X
Excess flow	**8.8**	X	N/A	N/A	N/A	N/A	O	O	X	O	N/A	N/A
Endurance	**8.9**	O	N/A	X	X	X	X	X	X	X	N/A	X
Weak section strength	**8.10**	O	O	O[c]	X	X	O	X	X	O	X	O
Stress cracking	**8.11**	O	O	O	O	O	O	O	O	O	O	O
Vacuum	**8.12**	O	O	X	X	X	X	O	X	X	O	X
Flow resistance	**8.13**	X	X	X	X	X	X	X	X	X	X	X
Filler valve flow	**8.14**	N/A	N/A	N/A	X[b]	X[b]	N/A	N/A	N/A	N/A	N/A	N/A
OPD	**8.15**	N/A	N/A	N/A	N/A	X[b]	N/A	N/A	N/A	N/A	N/A	N/A

Table key: X — Mandatory O — If appropriate N/A — Not applicable

NOTE 1 Test equipment connections are subject to dimensional control to ensure compatibility with the test sample.

NOTE 2 Other testing procedures may be used provided that they ensure an equivalent level of accuracy.

[a] Each part shall be tested separately.

[b] Test only applicable to 1 ¾ inch x 6 ACME filler valve.

[c] For shut-off valves for transportable tanks ADR requires either protection against the danger of being wrenched off by external stresses or a design resisting these stresses, which is demonstrated by this test.

8.3 Over torquing deformation test

8.3.1 New samples shall be subject to an over torquing deformation test to ensure the correct operation and tightness in that condition.

8.3.2 The body shall be fitted on a test fixture representative of its intended use.

8.3.3 All stem thread types shall withstand a torque of 1,5 times the manufacturer's recommended fitting torque, or the torque as shown in Table 4, whichever is greater. Taper threaded joints shall be assembled without sealant.

8.3.4 The sample shall then be checked for freedom of movement and correct operation of the internal components prior to being removed from the test fixture. It shall then be tested for external leak tightness in accordance with 8.4 and internal leak tightness in accordance with 8.5.

8.4 External leak tightness test

8.4.1 The inlet shall be connected to a supply of either air or nitrogen.

8.4.2 The outlet shall be fitted with a pressure gauge.

8.4.3 The valve or fitting shall be in the open condition in order to subject the body to the test pressure.

8.4.4 The test pressures and the test temperatures as given in Table 5 shall be applied. The pressure shall be kept constant during the test.

8.4.5 The test pressure shall be applied for at least 1 min. The valve or fitting shall either be submerged in water to detect leakage or an equivalent leak detection system shall be used.

8.4.6 The valve or fitting shall then be depressurized.

8.4.7 The total leakage rate for each test shall not exceed 15 cm^3/h of air measured at STP.

Table 4 — Torques for deformation test

Valve stem major diameter large end mm	**Torque** Nm
10	30
14	50
17	90
21	160
27	200
33	240
42	290
48	310
60	330
73	350
89	360
114	380

Table 5 — Pressures and temperatures for leakage tests

Test Number	Test pressure bar	Test temperature °C
1	0,1	−20 ± 5
2	5,0	−20 ± 5
3	0,1	20 ± 5
4	25,0	20 ± 5
5	0,1	65 ± 5
6	25,0	65 ± 5

8.5 Internal leak tightness test

8.5.1 The inlet shall be connected to a supply of either air or nitrogen.

8.5.2 The valve shall be fitted with a pressure gauge.

8.5.3 The outlet and, if applicable, pressure relief valve and accessories shall be blanked.

8.5.4 The test pressure, see Table 5, shall be applied when the valve is in the open mode. The pressure shall be kept constant during the test.

8.5.5 The test pressure shall be applied for at least 1 min. The valve or fitting shall either be submerged in water to detect leakage or an equivalent leak detection system shall be used.

8.5.6 The valve or fitting shall be closed under pressure, and if a torque needs to be applied, it shall not exceed the maximum closing torque as specified by the manufacturer.

8.5.7 The outlet shall be depressurized and at least 1 min shall pass before checking internal tightness. The valve or fitting shall either be submerged in water to detect leakage or an equivalent leak detection system shall be used. The test duration shall be at least 1 min.

8.5.8 The valve or fitting shall be depressurized.

8.5.9 The test pressures and the test temperatures as given in Table 5 shall be applied. The pressure shall be kept constant during the test.

8.5.10 The total leakage rate for each test shall not exceed 15 cm^3/h of air measured at STP.

8.6 Residual flow test

8.6.1 The valve or coupling inlet (outlet for a non-return valve) shall be connected to a supply of either air or nitrogen.

8.6.2 The valve or coupling under test or the test rig shall be fitted with a pressure gauge to measure the test pressure.

8.6.3 If required, the valve or coupling may be closed under pressure.

8.6.4 A pressure greater than 1 bar shall be applied when the valve or coupling is closed.

8.6.5 The valve or coupling shall either be submerged in water to detect leakage, or an equivalent leak detection system shall be used. The test duration shall be at least 1 min.

8.6.6 The valve or coupling shall be depressurized to 1 bar.

8.6.7 The residual flow shall not exceed 570 cm^3/s with air at 1 bar. If nitrogen is used, the flow rate recorded shall be corrected for air.

8.7 Pressure strength test

8.7.1 The pressure-containing envelope of the valve or fitting shall be capable of withstanding a hydraulic pressure test without rupture or permanent distortion.

8.7.2 Water shall be used as the test fluid.

8.7.3 The test pressure shall be at least 1,43 × the maximum allowable pressure.

8.7.4 Valves and fittings for pressure receptacles for transport applications, shall be designed and constructed so that the burst pressure is at least 1,5 times the test pressure of the pressure receptacle.

NOTE ADR specifies numbered test pressures for various types LPG, propane, propene, butane, butane isomers and butene for the testing of for pressure receptacles, tanks and its equipment.

8.7.5 The test pressure shall be maintained for a minimum of 10 min at a constant value.

8.8 Excess flow test

8.8.1 General

8.8.1.1 Three samples of each size and type of valve which includes an excess flow function shall be subjected to these tests. A valve intended for use only with liquid shall be tested with water, otherwise the tests shall be made both with air and with water. Separate tests shall be run with each sample installed in vertical, horizontal and inverted positions. A valve intended for installation in one position only, may be tested only in that position.

NOTE Other suitable test gases can be used, e.g. nitrogen.

8.8.1.2 The valve shall meet the requirements of 7.1.2, during the tests described in 8.8.2 and 8.8.3.

8.8.2 Excess flow test with air

8.8.2.1 The tests shall be made without piping or other restrictions connected to the outlet of the test sample.

8.8.2.2 The test shall be conducted by using an appropriately designed and calibrated flow meter connected to an air supply of adequate capacity and pressure. The upstream pressure of the air supply shall remain within ±2 % of the set value during the test, until closure is achieved.

8.8.2.3 The valve shall be connected to the outlet of the flow meter. A recording pressure gauge shall be installed on the upstream side to indicate the closing pressure.

8.8.2.4 The test shall be conducted by slowly increasing the flow of air until the excess flow valve closes. At the instant of closing, the flow-rate shall be determined and the closing pressure recorded.

8.8.2.5 The test shall be conducted for the set values of upstream air pressure of 2 bar and 7 bar.

Air flow shall be recorded in cubic metres per minute, for each pressure setting.

LPG vapour flow-rate shall be derived from the following formula:

$$Q_{\mathrm{LPGv}} = Q_{\mathrm{AIR}} \sqrt{\frac{\rho_{\mathrm{AIR}}}{\rho_{\mathrm{LPGv}}}}$$

where

Q_{LPGv} is the volume flow-rate of LPG vapour;

Q_{AIR} is the volume flow-rate of air;

ρ_{AIR} is the density of air;

ρ_{LPGv} is the density of LPG vapour.

8.8.3 Excess flow test with water

8.8.3.1 The test with water shall be conducted using an appropriately designed and calibrated liquid flow meter installed in a piping system having sufficient pressure to provide the required flow.

8.8.3.2 Prior to the test air shall be eliminated from the system. The test shall be conducted by slowly increasing the flow until the excess flow valve closes. Just before the instant of closing, the rate of flow shall be recorded. This closing flow-rate shall be expressed in cubic metres per minute (m^3/min) of liquid LPG. The LPG flow-rate shall be derived from the following formula:

$$Q_{\mathrm{LPG}} = Q_{\mathrm{WATER}} \sqrt{\frac{\rho_{\mathrm{WATER}}}{\rho_{\mathrm{LPG}}}}$$

where

Q_{LPG} is the volume flow-rate of liquid LPG;

Q_{WATER} is the volume flow-rate of water;

ρ_{LPG} is the density of liquid LPG;

ρ_{WATER} is the density of water.

8.8.4 Excess flow strength test

8.8.4.1 Each valve shall be subject to a strength test by the application of a differential pressure of 25 bar to close the valve.

8.8.4.2 After the test, the valve shall be visually inspected, and shall not show signs of damage that will interfere with normal operation.

8.9 Endurance test

8.9.1 Where required by Table 3, a valve or fitting shall be subjected to an endurance test of 6 000 cycles. A liquid withdrawal valve shall be subjected to an endurance test of 500 cycles.

8.9.2 The samples used for this test shall have previously been subjected to the following test(s) as required by Table 3:

— external leak tightness test, see 8.4,

— internal leak tightness test, see 8.5,

— residual flow test, see 8.6,

— excess flow test, see 8.8.

8.9.3 The cyclical test shall be carried out in circumstances representative of its subsequent intended use and operated through its full range of movement.

8.9.4 The test shall be conducted at a rate not greater than 10 cycles per minute.

8.9.5 The test shall be performed at an air pressure of 12 bar.

8.9.6 The samples used for this test shall now be subjected to and pass the following test(s) as required by Table 3:

— external leak tightness test, see 8.4;

— internal leak tightness test, see 8.5;

— residual flow test, see 8.6;

— excess flow test, see 8.8.

8.9.7 A visual examination shall then be carried out and there shall be no signs of deformation, damage or undue wear likely to cause failure.

8.9.8 For multipurpose valves, each service function shall be subjected to this test.

8.10 Weak section strength test

8.10.1 The valve or fitting shall be fitted on a test fixture representative of its intended use. A bending force sufficient to break the valve at the weak section shall be applied.

8.10.2 After breaking at the weak section, the internal mechanism of the valve or fitting shall remain intact and operative. The valve shall then subjected to and pass the internal leak tightness test, see 8.5, or the residual flow test, see 8.6.

8.11 Stress cracking test

8.11.1 General

8.11.1.1 A stress cracking test shall be carried out on brass components in accordance with 8.11.2 or 8.11.3.

Alternative methods for testing of stress cracking may be employed on condition that the results are comparable.

8.11.1.2 Each test sample shall be subjected to the physical stresses normally imposed on or within a part as the result of assembly with other components. Such stresses shall be applied to the sample prior to, and be effective during, the test.

8.11.1.3 After being tested, a brass part shall show no evidence of cracking or lamination when examined using 25 × magnification.

8.11.2 Mercury(I)nitrate immersion test

The test sample shall be subjected to and shall meet the requirements of the mercury(I)nitrate test as defined in EN ISO 196:1995 to detect residual stress.

8.11.3 Moist ammonia air stress cracking test

The test sample shall be degreased and then tested in accordance with ISO 6957:1988 for a duration of 168 h.

8.12 Vacuum test

The valve or fitting including accessories, for example a plug or cap, shall remain leak tight when a pressure of 50 mbar absolute is applied to the valve from the pressure vessel connection or applied in a direction which would allow the sealing mechanism to be lifted off the valve seat.

8.13 Flow resistance test

Tests shall be carried out to establish the specified pressure loss, flow coefficient or flow resistance coefficient in accordance with EN 1267:2012.

The relevant service functions of a multipurpose valve shall be tested separately.

8.14 Filler valve flow test

8.14.1 The test shall be carried out with water and shall be conducted using an appropriately designed and calibrated liquid flow meter installed in a system having sufficient pressure to provide the required flow.

8.14.2 Prior to the test, air shall be eliminated from the system.

8.14.3 The test shall be conducted by slowly increasing the flow until the minimum water flow rate of 8 m^3/h is achieved at a differential pressure of 4 bar. If this flow rate has been achieved at this pressure differential, then the valve is deemed to have passed the test.

8.15 OPD test

8.15.1 General

The maximum residual flow rate after the closure of the valve shall be equal to or less than 50 l/h (water) with a differential pressure of 1 bar when the filler valve with an OPD is in its operating orientation and with the float held in the closed position by the water level.

8.15.2 Level test

The filler valve fitted with an OPD shall be mounted in its operating orientation in a test vessel. The liquid level shall be slowly raised at a differential pressure of 4 bar ± 0,4 bar (the flow rate shall be greater than 7,2 m^3/h water). The closing level of the liquid at the predetermined fill level shall be +0 % and −5 % of the diameter or height of the vessel.

8.15.3 Vibration Test

The filler valve fitted with an OPD in the open position shall be fitted to a vibration machine and submitted for 4 h to vibrations with 1 mm amplitude and 50 Hz frequency, applied in the axis of the valve.

After the test, the valve shall be visually inspected and shall pass a flow test as per 8.14 and a further level test as per 8.15.2. The valve shall not show signs of damage that will interfere with normal operation.

8.16 Test report

The testing procedure, conditions and results of each test shall be recorded. A report shall be produced for each design of valve or fitting indicating compliance with the requirements of this European Standard.

This test report may be used as a basis for type approvals for valves and fittings which may be issued separately from type approvals for pressure receptacles and tanks, as foreseen by ADR.

9 Production testing

All valves and fittings shall be subjected to production testing in accordance with Annex E.

10 Marking

10.1 Each valve or fitting shall be permanently marked with the following information:

a) type number or reference;

b) date mark indicating the year and month of manufacture;

c) the maximum allowable pressure;

d) an indication of the direction for opening and/or closing the valve, where necessary, e.g. for hand wheel valves “+ / -”, see Figure 1;

e) manufacturer's mark;

f) direction of flow, where necessary;

g) “-40 °C” for valves or fittings fulfilling the requirements of Annex B;

NOTE 1 Where marking is regulated by PED [6], this takes precedence over any clause in this European Standard. The PED [6] includes additional marking requirements, e.g. CE-marking.

NOTE 2 Where marking is regulated by TPED [7], this takes precedence over any clause in this European Standard. The TPED [7] includes additional marking requirements, e.g. “π”-marking.

NOTE 3 “Manufacturer's mark” plus any additional information may be coded in order that the information can be accommodated on the body.

10.2 Valves/fittings shall, where possible, have the markings visible when installed.

10.3 For filler valves fitted with OPD, the following shall also be marked on the lower body:

a) Orientation of the float; and

b) Diameter of the pressure vessel/level of cut-off for which the valve is designed.

NOTE The diameter can be included in the part number.

11 Documentation

11.1 The following information shall accompany valves and fittings being delivered to the user:

a) general operating instructions including its suitability for use with LPG;

b) performance characteristics;

c) specific installation instructions;

d) method and torque requirements for sealing taper threads;

e) valve identification;

f) manufacturers' details and name;

g) maintenance and reconditioning requirements;

h) information recorded in 10.1, c) to g).

11.2 The information for filler valves with OPD shall be provided to identify the diameter of the pressure vessel and level of cut-off for which the valve is designed.

12 Packaging

Any packaging and protection used during storage/transport of the finished products should be selected to have the minimum environmental impact, i.e. use of recyclable or bio-degradable materials, minimum use of energy.

Recycling instructions and/or recycling symbols for each packaging material should be printed on the packaging.

Annex A
(normative)

ACME connections

ACME threads shall be in accordance with Table A.1 and shall be Class 2G, Male (M), Right Hand (RH) in accordance with ASME B1.5.

Table A.1 — ACME connections

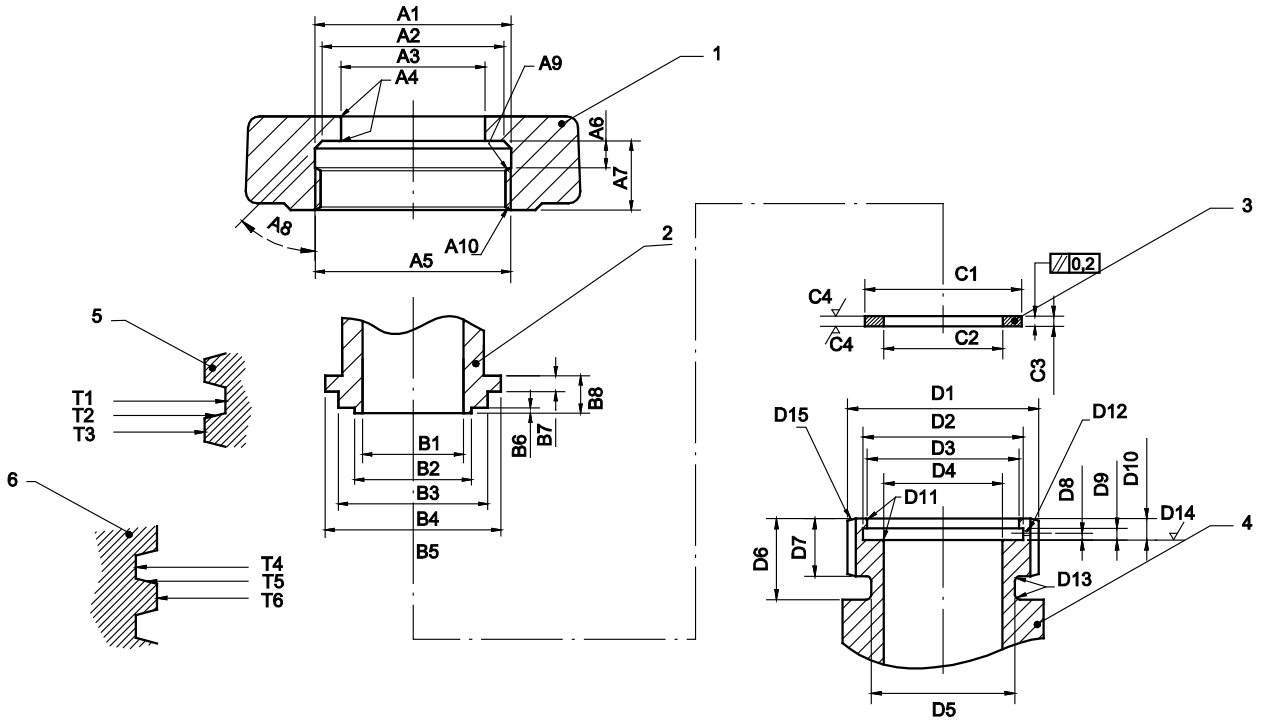
Connection	Reference
1 ¼ inch x 5 ACME	EN 15202:2012, Type G 29
1 ¾ inch x 6 ACME	EN 15202:2012, Type G 31
2 ¼ inch x 6 ACME	See Figure A.1
3 ¼ inch x 6 ACME	See Figure A.2

Figure A.1 and Figure A.2 specify basic dimensions of ACME connections to enable them to be safely connected together.

Where a 3 ¼ inch x 6 ACME thread is used, careful inspections of the coupling shall be carried out periodically. Annex C gives recommendations relative to these periodic inspections.

These inspections are critical in the case of the 3 ¼ inch ACME due to the small thread size on the relatively large diameter coupling, but may not be required to the same extent for the smaller diameter couplings.

Dimensions in millimetres



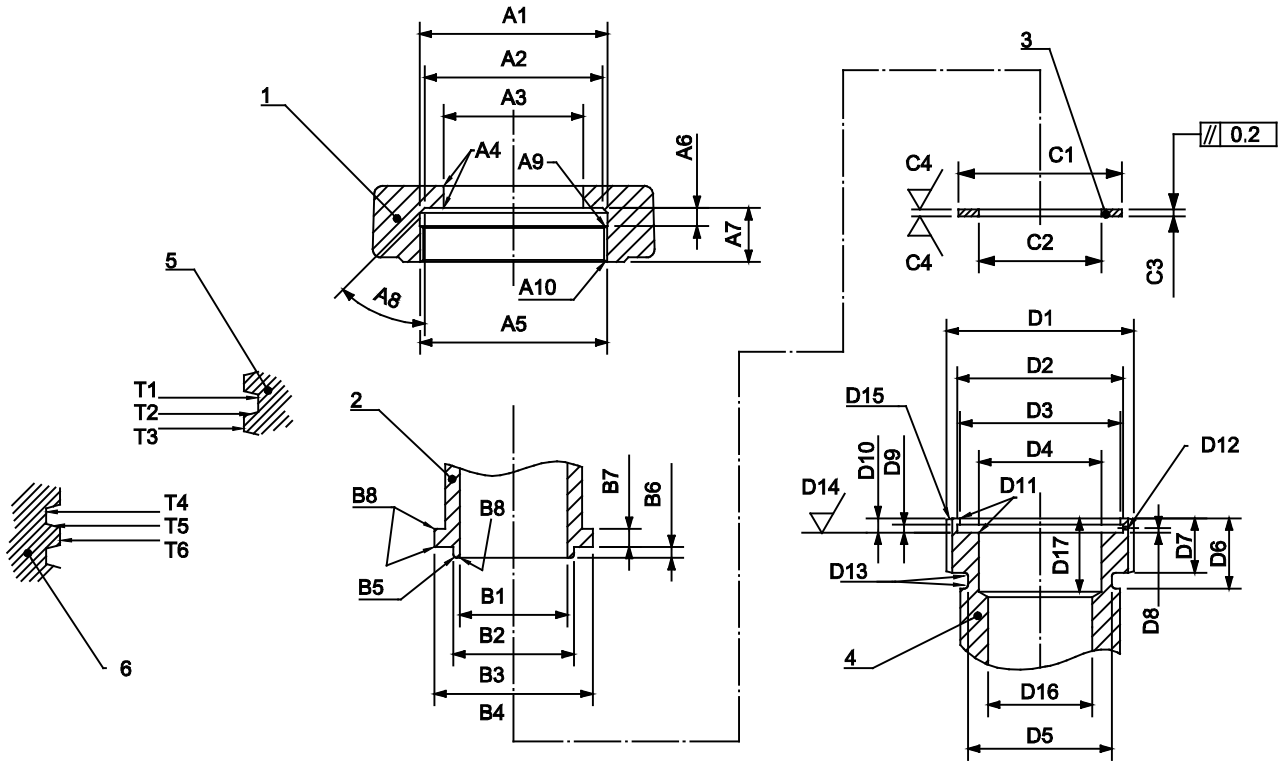
Key

		Nut		Connector		Valve	
1	nut	A1	ϕ 58,42 $^{0}_{-0,25}$	B1	ϕ 30 ± 0,13	D1	2 ¼ inch x 6 ACME – 2G
2	connector	A2	ϕ 54,1	B2	ϕ 34,9 ± 0,13	D2	ϕ 47,75 ± 0,13
3	seal	A3	ϕ 43 $^{0}_{-0,25}$	B3	ϕ 44,45 ± 0,13	D3	ϕ 45,23 ± 0,13
4	valve	A4	0,4 × 45° Chamfer	B4	ϕ 52,4 ± 0,13	D4	ϕ 35,43 ± 0,13
5	internal thread	A5	2 ¼ inch x 6 ACME – 2G	B5	ϕ 53 stock	D5	ϕ 42,86
6	external thread	A6	8,0	B6	1,5	D6	24,0
Thread		A7	20,6	B7	4,75	D7	17,0
2 ¼ inch x 6 ACME – 2G		A8	45°	B8	11,13	D8	2,0
T1	Major ϕ 58,16 – 57,66	A9	30° Chamfer to depth of thread	**Seal**		D9	3,5 ± 0,1
T2	Pitch ϕ 55,57 – 55,03			C1	ϕ 46,8	D10	6,35 ± 0,13
T3	Minor ϕ 53,13 – 52,92	A10	30° Chamfer to ϕ 58,75	C2	ϕ 35,5	D11	0,4 × 45° Chamfer
T4	Major ϕ 57,15 – 56,94			C3	3,0	D12	Drill ϕ 1,3 [A]
T5	Pitch ϕ 54,73 – 54,19			C4	√ Ra 3,2	D13	R 1,5
T6	Minor ϕ 52,41 – 51,60					D14	√ Ra 1,6
						D15	15° [B]

[A] Shall enter through minor diameter of thread.
[B] Chamfer to thread depth each end. Sharp edges of thread to be removed by milling.

Figure A.1 — 2 ¼ inch x 6 ACME

Dimensions in millimetres



Key

		Nut		Connector		Valve	
1	nut	A1	ϕ 83,82 $^{0}_{-0,25}$	B1	ϕ 47,6 ± 0,13	D1	3 ¼ inch x 6 ACME – 2G
2	connector	A2	ϕ 79,5	B2	ϕ 53,16 ± 0,13	D2	ϕ 73,15 ± 0,13
3	seal	A3	ϕ 61,5 $^{0}_{-0,25}$	B3	ϕ 69,85 ± 0,13	D3	ϕ 70,6 ± 0,13
4	valve	A4	0,4 × 45° Chamfer	B4	ϕ 82 stock	D4	ϕ 54,0
5	internal thread	A5	3 ¼ inch x 6 ACME – 2G	B5	R1,5	D5	ϕ 63,5 ± 0,13
6	external thread	A6	8,0	B6	4,75	D6	31,0
Thread		A7	23,8	B7	8,0	D7	24,0
3 ¼ inch x 6 ACME – 2G		A8	45°	B8	0,4 × 45° Chamfer	D8	2,0
T1	Major ϕ 83,56 - 83,06	A9	30° Chamfer to depth of thread			D9	3,5 ± 0,1
T2	Pitch ϕ 81.03 - 80,43			**Seal**		D10	6,35 ± 0,13
T3	Minor ϕ 78,53 - 78,23	A10	30° Chamfer to ϕ 58,75	C1	ϕ 72,25	D11	0,4 × 45° Chamfer
T4	Major ϕ 82,55 – 82,34			C2	ϕ 54	D12	Drill ϕ 1,3 [A]
T5	Pitch ϕ 80,08 – 79,48			C3	3,0	D13	R 1,5

T6	Minor ϕ 77,81 – 76,91			C4	√ Ra 3,2	D14	√ Ra 1,6
						D15	15° [B]
						D16	ϕ 46,0
						D17	38
[A] Shall enter through minor diameter of thread. [B] Chamfer to thread depth each end. Sharp edges of thread to be removed by milling.							

Figure A.2 — 3 ¼ inch x 6 ACME

Annex B
(normative)

Special low temperature requirements for valves

Valves which are used under extreme low temperature conditions (temperatures below −20 °C) shall meet the following requirements:

a) the valve shall be subjected to a temperature of ($-40\ ^{+0}_{-5}$) °C for 24 h; and

b) the temperature shall be then raised to −30 °C and the valve or fitting shall then pass the external leak tightness test as per 8.4 and the internal leak tightness test as per 8.5.

Annex C
(informative)

Inspection of 3 ¼ inch ACME Couplings

C.1 Introduction

This annex specifies the requirements for inspection of 3 ¼ inch ACME threaded couplings and end fittings.

These inspections are critical in the case of the 3 ¼ inch ACME due to the small thread size on the relatively large diameter coupling, but may not be required for the smaller diameter couplings.

This procedure applies to all 3 ¼ inch ACME connectors wherever they are fitted, e.g. on road tankers, bulk storage installations and all liquid transfer equipment.

The checks are to be carried out on both male and female couplings.

This procedure is to identify potentially worn ACME couplings and connectors for replacement.

To detect damage, thread wear beyond acceptable limits and the need for replacement seals, regular inspection of male and female couplings including both threads should be carried out. ACME threads are parallel but wear can vary along their length with most of the wear likely to be on the first thread.

This should be a visual inspection of the coupling for wear and damage together with a thread dimensional check. It is not sufficient to use only a “No-Go” gauge to check the threads as this may not identify worn or distorted threads.

Pressure testing is not a suitable method of inspection.

The nature and frequency of the inspection should be appropriate to the design, materials of construction and duty of the couplings involved but should not be less than once a year for plant, hose and tanker couplings.

A lesser frequency may be considered where couplings are fitted to bulk storage pressure vessels at consumer premises which are filled less than five times a year. For example, a visual inspection at the time of filling then a gauge and/or measurement inspection at intervals not exceeding 10 years.

C.2 Definitions

C.2.1
male coupling
coupling with a male thread

C.2.2
female coupling
coupling which includes a female threaded loose nut on a centre spigot

C.3 Visual examination

C.3.1 Visual examination should be carried out with particular emphasis on:

— narrowing or distortion of the thread form;

— cracks, dents, bulges cracked or broken threads (any of which may weaken the fitting);

— worn threads with a “stepped” appearance (see below);

— other uneven wear of the threads;

— debris in the threads;

— excessive corrosion or pitting; particularly of steel threads;

— damage or distortion of the internal cone on a female vapour coupling;

— damage to or absence of the pin on male vapour balance coupling;

— damage to the “lugs” of female couplings nuts (if the “lugs” of female coupling have been damaged this may prevent the use of the correct wrench and may indicate a “stretched” thread);

— damage to the rubber seal of male couplings; and

— damage to the sealing face of the female couplings.

C.3.2 Where a fault is identified, it shall be immediately rectified. If rectification is not possible, the coupling is deemed to fail the visual examination and it shall be prevented from being used further. Failed couplings shall be removed from service, disabled so as to prevent further accidental usage and shall be scrapped.

C.4 Dimensional check

C.4.1 Visual inspection of ACME threads may not always show potentially dangerous conditions. The majority of thread wear occurs:

— above the thread pitch diameter of a male thread;

— on the major diameter of the male thread;

— below the thread pitch diameter of a female thread;

— on the minor diameter of the female thread.

C.4.2 The coupling shall be replaced when there is a maximum of 0,5 mm wear on the flank angle, after the 1st incomplete thread.

C.4.3 Male couplings shall be subjected to a dimensional check to ensure that the diameter has not been reduced below an acceptable level. Female couplings shall be subjected to a dimensional check to ensure that the diameter has not been increased above an acceptable level. In addition the coupling shall be subjected to a “No-Go” gauge test which may identify wear on the flank of the thread.

C.4.4 The coupling shall be replaced when the major diameter of a male thread and the minor diameter of a female thread exceed the dimensions given in Table C.1. These dimensions are based on a wear allowance of 25 % of the thread engagement.

Table C.1 — Acceptable thread sizes

Thread Size	Acceptable minimum major diameter (male thread)	Acceptable maximum minor diameter (female thread)
3 ¼ inch ACME x 6 TPI	82,02 mm	78,85 mm

C.4.5 Threads shall be measured to confirm they conform and are acceptable to the dimensions given in Table C.1. Four measurements are taken equally spaced along the thread length, at axial interval angles of 45°.

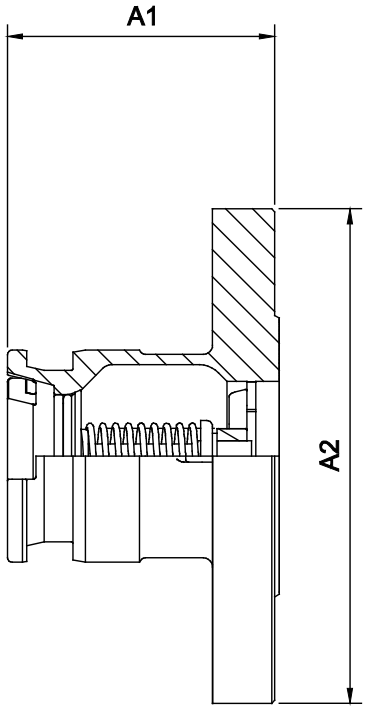
C.4.6 If the “No-Go” thread gauge can be threaded more than one turn onto (or into) an ACME coupling, this indicates unacceptable thread wear of the coupling. A “No-Go” gauge may not identify a worn thread, if the thread is damaged, oval or distorted thus giving a false result.

Annex D
(normative)

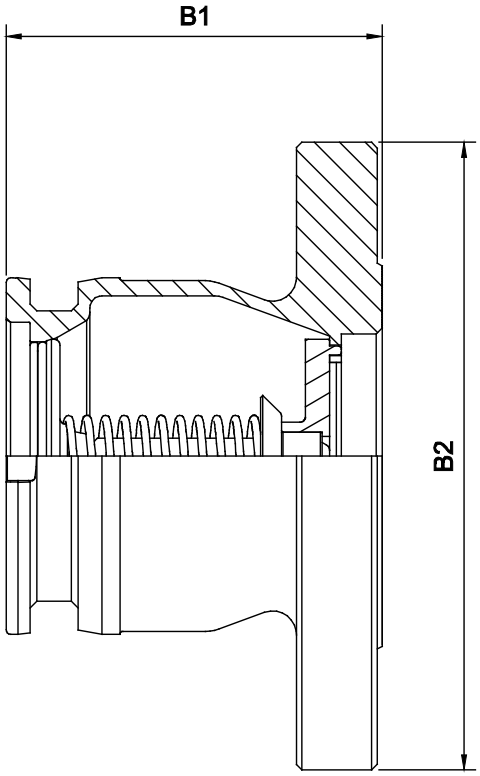
Dry disconnect couplings

D.1 The general arrangement of dry disconnect couplings shall be as shown in Figure D.1, Figure D.2, Figure D.3 and Figure D.4.

D.2 The dimensions of dry disconnect couplings shall be as shown in Figure D.5 and Figure D.6. The dimensions of the gaskets shall take into account the characteristics of the gasket material in order to ensure the leak tightness, the inter-changeability and the good functioning of the dry disconnect coupling.



Coupling for vapour line DN 50

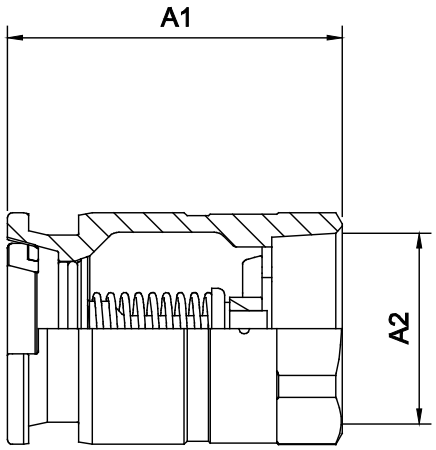


Coupling for liquid line DN 80

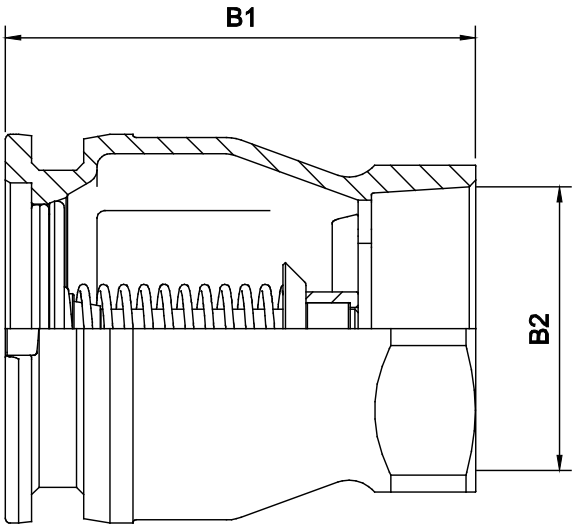
Key

A1	92 mm	B1	126 mm
A2	Flange 2 inch ANSI Class 300	B2	Flange 3 inch ANSI Class 300

Figure D.1 — Pressure vessel unit with flange



Coupling for vapour line DN 50

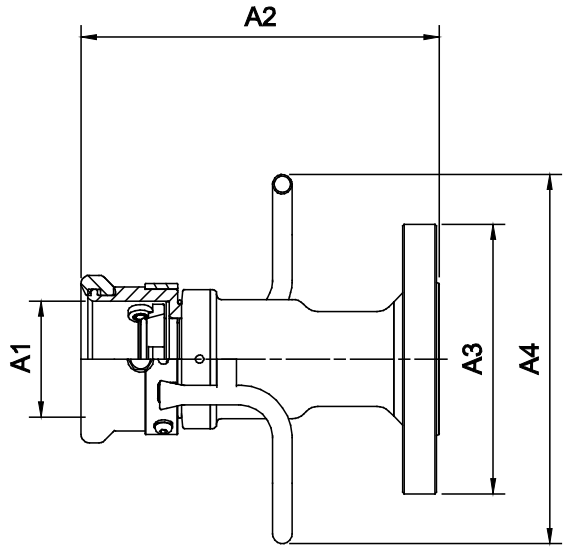


Coupling for liquid line DN 80

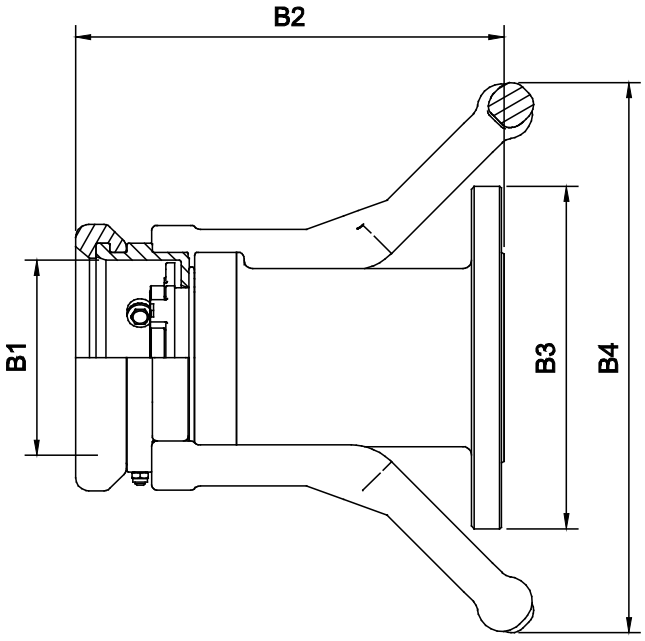
Key

A1	103 mm	B1	144 mm
A2	2 inch NPT internal thread	B2	3 inch NPT internal thread

Figure D.2 — Pressure vessel unit with thread



Coupling for vapour line DN 50

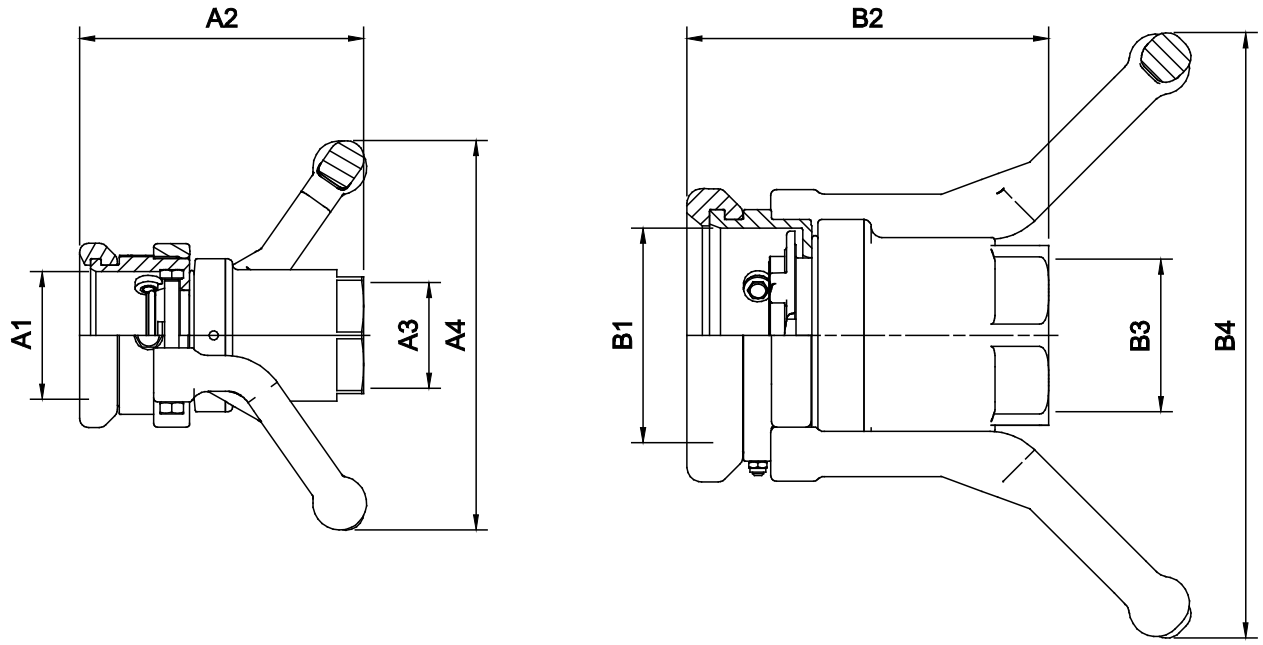


Coupling for liquid line DN 80

Key

A1	71 mm	B1	119 mm
A2	220 mm	B2	262 mm
A3	Flange 2 inch ANSI Class 300	B3	Flange 3 inch ANSI Class 300
A4	maximum 226 mm	B4	maximum 340 mm

Figure D.3 — Hose unit with flange



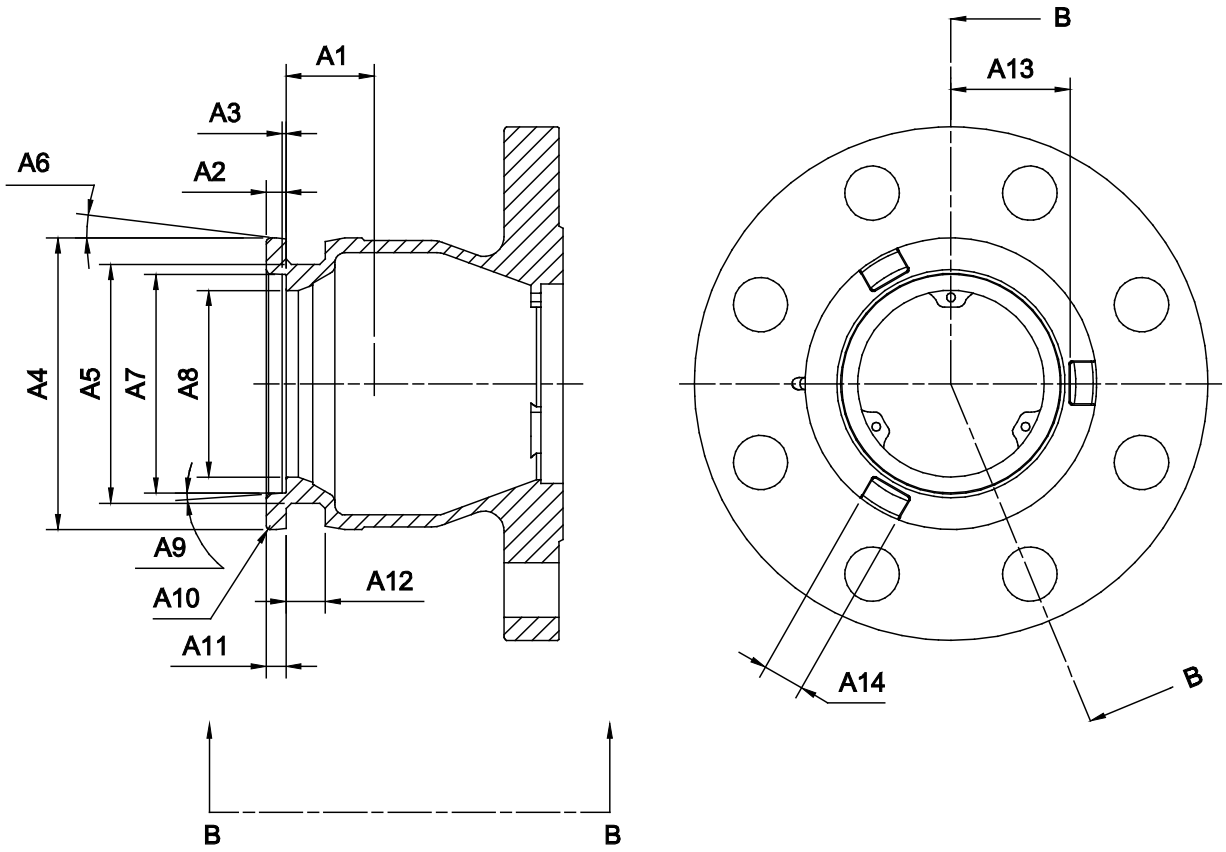
Coupling for vapour line DN 50

Coupling for liquid line DN 80

Key

A1	71 mm	B1	119 mm
A2	156 mm	B2	202 mm
A3	2 inch NPT internal thread	B3	3 inch NPT internal thread
A4	maximum 226 mm	B4	maximum 340 mm

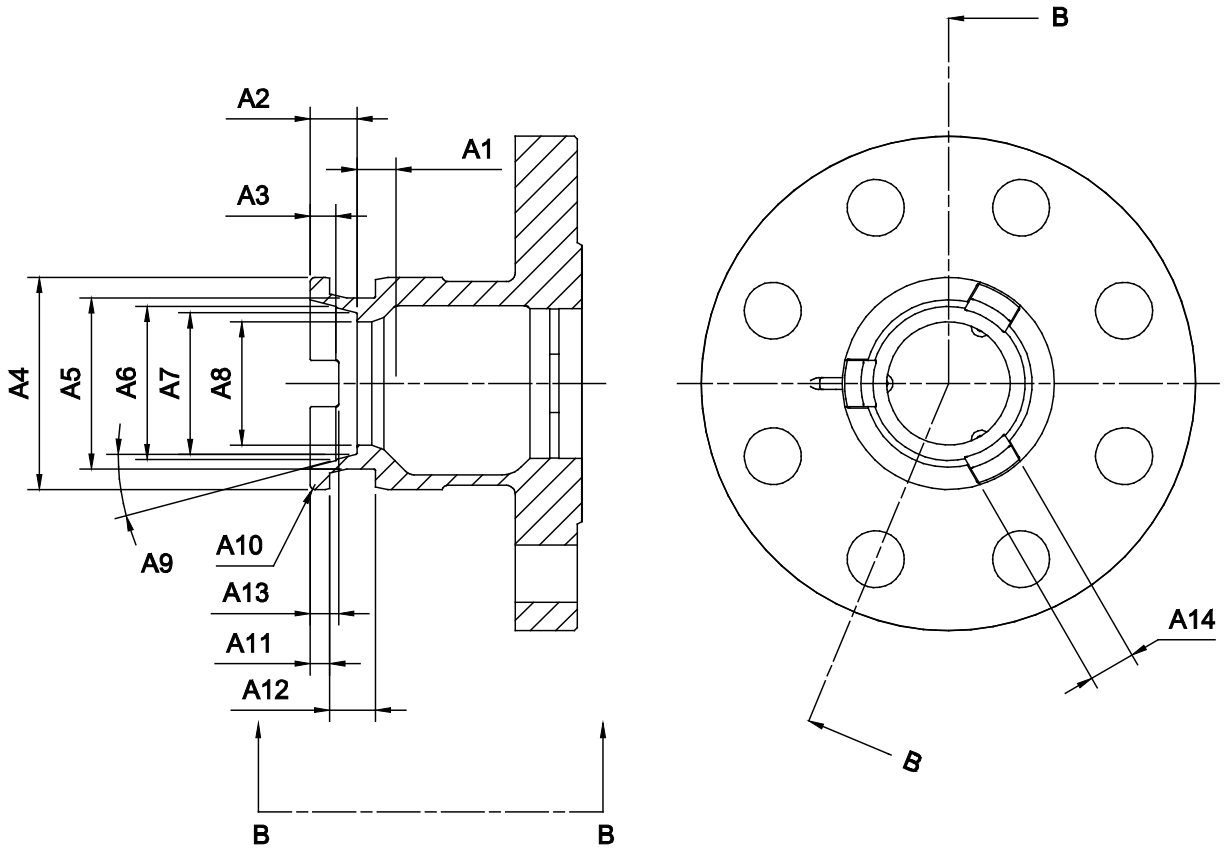
Figure D.4 — Hose unit with thread



Key

A1	Minimum piston movement 36 mm
A2	7,865 mm ± 0,015 mm
A3	0,8 mm ± 0,8 mm
A4	Ø 118,95 mm ± 0,05 mm
A5	Ø 97,5 mm ± 0,25 mm
A6	6° ± 1°
A7	Ø 89,2 mm ± 0,3 mm
A8	Ø 76,25 ± 0,05 mm
A9	2° ± 2°
A10	R 2,0 mm ± 0,5 mm
A11	7,95 mm ± 0,03 mm
A12	16,25 mm ± 0,25 mm
A13	48,375 mm ± 0,375 mm
A14	16,75 mm ± 0,25 mm

Figure D.5 — Coupling DN 80 for product line



Key

A1	Minimum piston movement 13 mm
A2	15,6 mm ± 0,1 mm
A3	8,5 mm ± 0,1 mm
A4	Ø 70,75 mm ± 0,05 mm
A5	Ø 57,1 mm ± 0,1 mm
A6	Ø 51,4 mm ± 0,2 mm
A7	Ø 47,2 mm ± 0,1 mm
A8	Ø 41,2 ± 0,2 mm
A9	15°
A10	R 1,5 mm ± 0,25 mm
A11	6,475 mm ± 0,025 mm
A12	15,325 mm ± 0,025 mm
A13	9,6 mm ± 0,1 mm
A14	15,5 mm ± 0,2 mm

Figure D.6 — Coupling DN 50 for vapour line

Annex E
(normative)

Production testing and inspection

E.1 Testing and inspection procedures shall be implemented to ensure that the quality and performance of the manufactured valves comply with the quality and performance of the design.

E.2 Pressure equipment shall undergo a final inspection to assess visually and by examination of the accompanying documents, compliance with the requirements of the Directive 97/23/EC [6]. Tests carried out during manufacture may be taken into account. As far as is necessary, on safety grounds, the final inspection shall be carried out internally and externally on every part of the equipment, where appropriate in the course of manufacture (e.g. where examination during the final inspection is no longer possible).

E.3 Leak tightness testing and a visual examination shall be carried out on each valve or fitting produced and shall be in accordance with Table E.1.

These tests shall be carried out at a temperature of between 5 °C and 40 °C.

E.4 Batch samples shall be taken at a minimum the following tests and inspections shall be carried out:

— correct operation;

— dimensional verification;

— pressure strength test at the test pressure specified in 8.7.3;

— material suitability; and

— marking.

E.5 Valves not meeting the requirements of E.2 or E.3 shall be rejected.

The rejection criteria of ISO 2859-1:1999 for batches of valves not meeting the requirements of E.4 shall be followed.

Table E.1 — Production testing of valves and fittings

	Clause	8.4 External leak tightness test	Internal leak tightness test
Excess flow valve	7.1	O	N/A
Non-return valve	7.2	O	O
Shut-off valve	7.3	X	X
Filler valve	7.4	X	X
Filler valve with OPD	7.5	X	X
Occasional liquid withdrawal valve	7.6	X	X
Internal valve	7.7	X	X
Vapour equalizing valve	7.8	X	X
Multipurpose valve	7.9	X	X
Break-away coupling	7.10	X	X[a]
Dry disconnect coupling	7.11	X	X

Table key:
X — Mandatory
O — External leak tightness test only applicable to pressure containing parts
N/A — Not applicable

NOTE 1 Test equipment connections are subject to dimensional control to ensure compatibility with the test sample.

NOTE 2 Other testing procedures may be used, as long as they provide an equivalent level of accuracy.

[a] Each part shall be tested separately.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 97/23/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the 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.

Table ZA.1 — Correspondence between this European Standard and Directive 97/23/EC

Clause(s)/sub-clause(s) of this EN	Essential requirements (ERs) of directive 97/23/EC Annex I	Content
8.2 8.3 8.4 8.6 8.9 8.10 8.11	2.1	Safe throughout intended life
Clause 4 Clause 6 excluding 6.1.5, 6.1.6, 6.1.8 and 6.1.11 Clause 7 8.9	2.2.1	Design for adequate strength
Clause 8	2.2.4	Experimental design method
Clause 6 excluding 6.1.5, 6.1.6, 6.1.8 and 6.1.11 Clause 7	2.3	Safe handling and operation
5.1.1, 5.2.4, 5.2.5, 6.1.7 (physically and chemically compatible) 5.1.2, (brass dezincification) 8.11	2.6	Corrosion and other chemical attack
Clause 9 Annex E	3.2.1	Final inspection
Clause 10	3.3	Marking and labelling
Clause 11	3.4	Operating instructions
5.2.7 6.1.10	4.1 b)	Materials – chemical resistance of pressurized parts

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this European Standard.

Bibliography

[1] EN ISO 11114-1:2012, *Gas cylinders - Compatibility of cylinder and valve materials with gas contents - Part 1: Metallic materials (ISO 11114-1:2012)*

[2] EN ISO 11114-2:2013, *Gas cylinders - Compatibility of cylinder and valve materials with gas contents - Part 2: Non-metallic materials (ISO 11114-2:2013)*

[3] Regulations concerning the International Carriage of Dangerous Goods by Rail (RID), appearing as Appendix C to the Convention concerning International Carriage by Rail (COTIF), Vilnius, 3 June 1999, as amended

[4] European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), Geneva, 30 September 1957, as amended

[5] Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres

[6] Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment

[7] Directive 2010/35/EU of the European Parliament and of the Council on transportable pressure equipment, Brussels, 16 June 2010, as amended

[8] Measurement uncertainty leaflet (SP INFO 2000 27 uncertainty), Magnus Holmgren et al published by Swedish National Testing and Research Institute

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