BS EN 14071:2015

BSI Standards Publication

LPG equipment and accessories — Pressure relief valves for LPG pressure vessels — Ancillary equipment

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National foreword

This British Standard is the UK implementation of EN 14071:2015. It supersedes BS EN 14071:2004 which is withdrawn.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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Foreword

This document (EN 14071:2015) has been prepared by Technical Committee CEN/TC 286 “Liquefied petroleum gas equipment and accessories”, 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of an identical text or by endorsement, at the latest by November 2015, and conflicting national standards shall be withdrawn at the latest by November 2015.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 14071:2004.

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.

The major changes in this revision include:

— the removal of requirements for protection caps;

— the introduction of additional testing;

— an update of the terminology.

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 is recommended that manufacturers develop an environmental management policy. For guidance, see the EN ISO 14000 series [1], [2] and [3].

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 [5].

1 Scope

This European Standard specifies the design, testing and inspection requirements for pressure relief valve isolating devices, valve manifolds, vent pipes and system assemblies which are, where necessary, used with pressure relief valves for use in static pressure vessels for Liquefied Petroleum Gas (LPG) service.

This European Standard addresses both prototype testing and production testing of isolating devices and PRV manifolds.

Pressure relief valves for LPG pressure vessels are specified in EN 14129:2014.

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

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

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 1503-3:2000, *Valves — Materials for bodies, bonnets and covers — Part 3: Cast irons 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 10204:2004, *Metallic products — Types of inspection documents*

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, *Copper and copper alloys — Forgings*

EN 13480-3:2012, *Metallic industrial piping — Part 3: Design and calculation*

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

EN 14129:2014, *LPG Equipment and accessories — Pressure relief valves for LPG pressure vessels*

ISO 6957, *Copper alloys — Ammonia test for stress corrosion resistance*

ASME B1.20.1:2013, *Pipe threads, general purpose (inch)*

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
pressure relief valve
(PRV)
self-closing valve which automatically, without the assistance of any energy other than that of the vapour concerned, discharges vapour at a predetermined pressure, and operates with a pop action

Note 1 to entry: This is known as a “safety valve” in ADR.

3.4
pressure relief valve system
PRV system
pressure relief valve(s) for use on the pressure vessel complete with isolating device or PRV manifold, and vent pipe where appropriate

3.5
pressure relief valve isolating device
device fitted between the storage tank and the external pressure relief valve, which permits the replacement of the pressure relief valve without de-pressuring the pressure vessel

3.6
coefficient of discharge
Kd
ratio of the actual measured flow capacity divided by the calculated theoretical capacity for the same fluid at the same operating conditions

3.7
pressure relief valve manifold
PRV manifold
device fitted to a storage vessel permitting two or more pressure relief valves to be fitted only one of which can be isolated at a time, which permits replacement of the isolated pressure relief valve without depressurizing the vessel

3.8
discharge capacity
capacity at the flow rating pressure of a pressure relief valve expressed in cubic metres per minute of free air at STP

3.9
vent pipe
open-ended pipe, fitted with a protection cap and attached to the pressure relief valve outlet, to direct discharged fluid away from the protected pressure vessel surface

3.10
design signal flow
limited flow of LPG intended to equalise pressures so that a replacement PRV can be properly fitted to an isolating device; indicate the effectiveness of the internal shut off in an isolating device before the PRV is completely removed; and produce an acoustic signal

3.11
Standard Temperature and Pressure
STP
15,6 °C (288,7 K), 1,013 bar absolute (0,1013 MPa absolute)

3.12
flow rating pressure
inlet pressure at which the discharge capacity is measured

3.13
lift
actual travel of the sealing disc away from the closed position

3.14
sealing element
non-metallic resilient component which effects a seal by contact with the valve seat

3.15
valve seat
normally raised area of the pressure relief valve body on to which the sealing element effects a seal

3.16
maximum allowable pressure
PS
maximum pressure for which the equipment is designed

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

3.17
nominal diameter (DN)
numerical designation of the size of a component, which is a convenient round number, approximately equal to the manufacturing dimensions in millimetres (mm)

3.18
external leak tightness
resistance to leakage through the fitting to or from the atmosphere

4 Operating conditions

4.1 Equipment designed in accordance with this European Standard shall be suitable for:

— minimum operating temperature of −20°C;

— maximum operating temperature of 65°C;

— maximum allowable pressure of 25 bar; and

— minimum pressure of 50 mbar absolute.

4.2 For some parts of Europe and certain applications, temperatures lower than - 20°C can be encountered. For these conditions, a temperature rating of - 40°C shall apply.

NOTE 1 In service, temperatures below this can be encountered during short periods, for example, during discharge.

NOTE 2 Vacuum conditions on the isolating device or PRV manifold, 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 normal operating conditions for which the device is intended to be used.

5.1.2 Material for components shall be selected for adequate strength in service. The material shall resist atmospheric corrosion, brass dezincification, stress corrosion, impact and material failure. Where stress corrosion could be present in a material, stress relieving heat treatment shall be carried out where necessary.

5.1.3 The components exposed to atmosphere shall be manufactured from corrosion resistant materials or suitably protected against corrosion.

NOTE 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 Equipment shall be made from steel, stainless steel, copper 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, cast iron shall comply with EN 1503-3:2000 and copper alloys shall comply with EN 1503-4:2002.

5.2.3 Components made from stainless steel shall contain not less than 16 % chromium, and not less than 7 % nickel. Springs shall be manufactured from stainless steel in accordance with EN 10270-3:2011, or from a material with an equivalent resistance to corrosion.

5.2.4 Hot stamped brass shall be non-porous and shall be suitable for machining or other processes. Leaded brass shall be CW614N or CW617N in accordance with EN 12420, EN 12164:2011 or 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. Components manufactured from hot stamped brass, drawn brass or machined from brass rod, shall be capable of withstanding, without cracking, the stress-cracking test.

5.2.5 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.

NOTE For guidance on the choice of metallic materials, see EN ISO 11114-1 [7].

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 device.

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 the atmosphere.

NOTE For guidance on the choice of non-metallic materials, see EN ISO 11114-2 [8].

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, EN 751-2 or EN 751-3.

5.5 Inspection Documents

The main metallic pressure-bearing parts shall be provided with material manufacturers' certificates conforming to EN 10204:2004, certificate type 3.1.

Springs and other metallic parts shall have certificates conforming to EN 10204:2004 certificate type 2.2.

Non-metallic parts shall be provided with certificates confirming their conformance with the specification.

6 Design

6.1 Introduction

6.1.1 This section identifies essential requirements for the design of ancillary equipment.

6.1.2 The design shall allow the equipment to operate with the flow characteristics as identified in 7.8.

6.1.3 Equipment components shall be designed with adequate strength and clearances to ensure correct operation in service.

6.1.4 The design should 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 the finished product.

6.2 Pressure relief valve isolating devices

6.2.1 General

Pressure relief valves intended for use with these isolating devices shall be in accordance with EN 14129:2014.

If interchangeability of pressure relief valves of diverse manufacturers is required, the requirements of 6.2.6 shall be fulfilled.

6.2.2 Actuation

Isolating devices shall only be actuated by the fitting or removal of the pressure relief valve. The isolating mechanism shall be closed by a spring.

The seal should preferably be metal to metal.

6.2.3 Indication of closure

Isolating devices shall have positive means to determine that closure has occurred when the PRV has been removed. This shall be achieved by:

— the use of two tell-tale holes in the pressure relief valve. When one complete hole is visible above the bonded seal, the isolating device shall close within one further revolution. (The valve should be closed within five revolutions when removing a fully engaged relief valve from an isolating device). When the isolating device is closed there shall be three full revolutions remaining before disengagement. The use of visible marking (e.g. machined groove) may be used on a thermal expansion valve which shall be visible when three full turns of engagement remain;

— a noticeable audible change in the release of gas which shall have taken place when removing the pressure relief valve indicating closure of the isolating device while a minimum of three threads remain engaged.

When the isolating device is closed the residual flow shall not exceed 600 l/h at 1 bar differential and STP.

The residual flow through a port of a PRV manifold, with a PRV removed, shall not exceed 2,5 l/h at 1 bar differential and STP.

6.2.4 Guiding arrangements

The design shall incorporate guiding arrangements of the isolating mechanism necessary to ensure reliable operation.

6.2.5 Isolating mechanism security

The isolating mechanism shall be fastened securely to prevent it becoming loose while in service.

6.2.6 Interchangeability

6.2.6.1 Interchangeability of PRVs, of diverse manufacturers, in isolating devices is permitted when the following requirements are met:

— isolating devices shall be designed and manufactured to ensure that their intended operation is not interfered with by the pressure relief valve;

— isolating devices shall be manufactured to the essential dimensions with Figure 1; and

— the flow capacity of the isolating device shall be tested in accordance with the requirement of 7.4 using the master pressure relief valve test piece defined in Annex A. The Kd shall be greater than 0,91 for the M36 isolating device and greater than 0,90 for the M45 isolating device.

6.2.6.2 Interchangeability of other designs of pressure relief valves and isolating devices not conforming to the dimensions given in Figure 1, may take place if it is shown that the flow capacity and other characteristics, tested in accordance with 7.4, of all possible combinations remain acceptable.

PRV connections, not conforming to the dimensions given in Figure 1, shall be designed to prevent connection with the isolating devices conforming to Figure 1.

6.3 PRV manifold

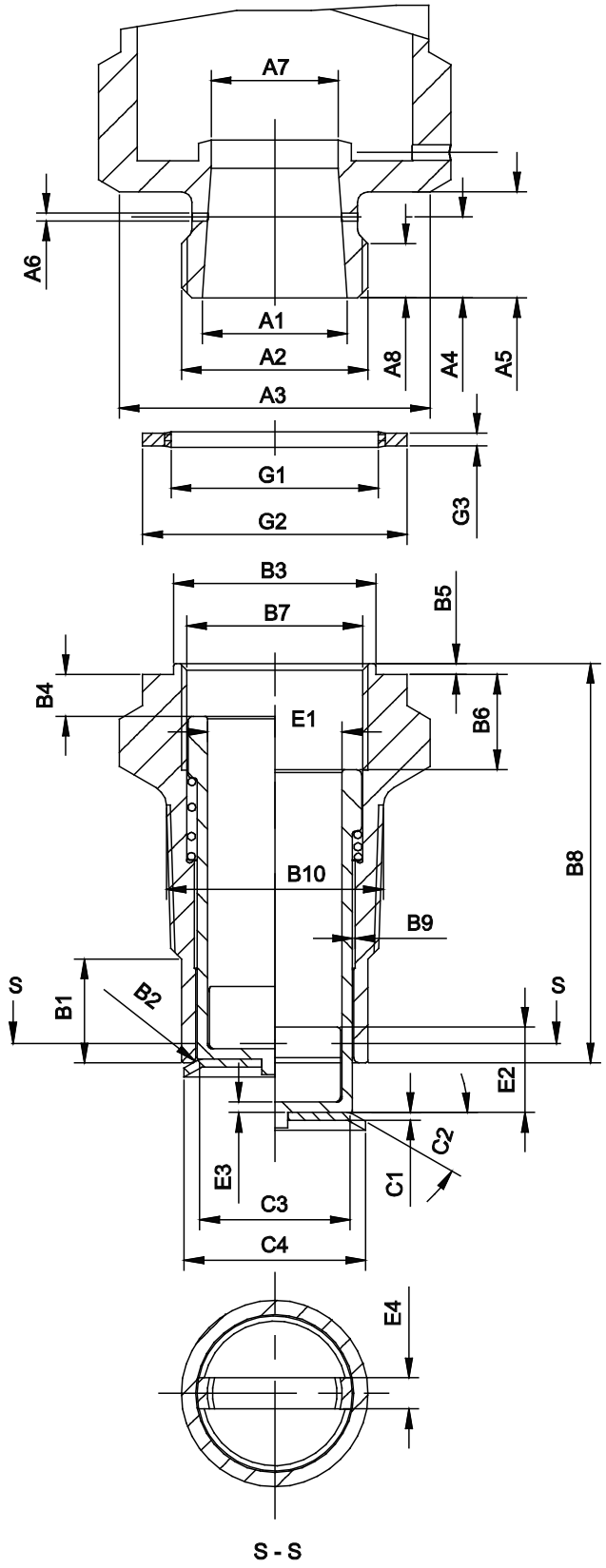
6.3.1 General

A PRV manifold is normally designed with two or four outlet ports and accommodates either two, three or four pressure relief valves.

The PRV manifold incorporates a pressure relief valve that is not included in the vessel discharge capacity. This allows the removal or replacement of one pressure relief valve without compromising the overall discharge capacity.

The PRV manifold shall be designed to enable the discharge capacity of the required pressure relief valves fitted, to be achieved with the absence of chatter, flutter, sticking and harmful vibration.

Where the product of PS x DN is 3,000 bar or greater the PRV manifold shall be designed for strength in accordance with EN 13480-3:2012, or other suitable standards.



NOTE The dimensional information is in Table 1.

Figure 1 — Essential dimensions for the isolating device and relief valve connection

Table 1 — Key for Figure 1

Dimensions in millimetres unless otherwise stated			
		M 36	**M 45**
Pressure relief valve	A1	28 max	37 max
	A2	M36 × 2	M45 × 2
	A3	51 min	60 min
	A4	11,8 to 12,2	
	A5	20,5 to 20,8	
	A6 [a]	Ø 1,4 to 1,6	
	A7	24,5 min	29,5 min
	A8	9,3 to 9,8	
Gasket	G1	Ø 39,9 to 40,1	Ø 48,9 to 49,1
	G2	Ø 50,65 to 51,1	Ø 59,65 to 60,1
	G3	2,4 to 2,6	
Isolating device	E1	Ø 26 to 26,15	Ø 34 to 34,15
	E2	14 to 14,5	
	E3	2 to 2,2	
	E4	5,85 to 6,15	
	B1	20 to 20,5	25 to 25,5
	B2	Radius 0,8 to 1,0	
	B3	39 max	48 max
	B4	7,8 to 8,5	
	B5	2 to 2,2	
	B6	18,5 min	
	B7	M36 × 2	M45 × 2
	B8	~ 77	~ 81
	B9	1 min	0,5 min
	B10	1 ¼ inch NPT	2 inch NPT
	C1	1,5	
	C2	30°	
	C3	Ø 28,9 to 29,1	Ø 36,9 to 37,1
	C4	Ø 34,9 to 35,1	Ø 43,4 to 43,6
[a] 2 holes spaced 180° apart.			

6.3.2 Indication of port closure

There shall be a method to determine that positive closure of the port has occurred, prior to the removal of the relevant pressure relief valve.

6.3.3 Port closure

A PRV manifold shall be provided with a system to allow the closure of each port, to enable PRV removal when the PRV manifold is under pressure.

6.4 Vent pipe

6.4.1 Design

The inside diameter of the vent pipe shall not be less than the inside diameter of the pressure relief valve outlet.

Vent pipes shall be designed in such a way that the required flow of fluid discharges freely away from the pressure vessel and the function of the PRV is not impaired.

6.4.2 Materials

Materials for vent pipes shall take into account fire resistance.

6.4.3 Effect from external conditions

Vent pipes shall exhibit sacrificial failure to protect the PRV system from the effects of the external forces.

If vent pipes are not self-supporting, they shall be provided with a method of support that does not cause any unacceptable load on the pressure vessel or PRV.

6.5 Connections

6.5.1 Isolating devices shall be connected to the LPG pressure vessel by means of a taper thread.

6.5.2 PRV manifolds shall be connected to the pressure vessel by means of a taper thread or by a flange connection in accordance with EN 1092-1.

6.5.3 Isolating devices shall be connected to the PRV by means of a parallel thread, used in conjunction with a suitable gasket.

6.5.4 PRVs, intended to be fitted to PRV manifolds, shall be connected by means of a parallel thread used in conjunction with a suitable gasket, a taper thread or a flange.

6.6 Threads

6.6.1 All threads shall be right hand.

6.6.2 Taper threads shall be in accordance with ASME B1.20.1:2013.

To avoid mismatching with ASME B1.20.1:2013 threads, EN 10226-1 [6] should not be used.

6.6.3 Thread sizes shall not exceed DN 80.

6.6.4 Where taper threads are used, the design shall ensure that over-torquing shall not impede the correct operation of the device.

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

6.7 Minimum requirements for springs

Helical compression springs shall be in accordance with EN 13906-1.

7 Testing of the design

7.1 General

The purpose of these tests is to ensure that, before commencement of production of a new design, each pressure relief valve isolating device or PRV manifold shall meet the requirements of this standard.

Sample isolating devices and PRV manifolds shall initially be subject to visual inspection and dimensional checks.

The following documents shall be available:

— description of the device and the method of operation;

— information on the use of the isolating device or PRV manifold; and

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

7.2 Test requirements

7.2.1 The device shall comply with the documentation submitted.

7.2.2 The isolating devices and PRV manifolds shall withstand a hydraulic proof test without visible permanent deformation, rupture or leak, see 7.3.

7.2.3 The isolating device shall be subject to a flow test, see 7.4.

The Kd for the isolating device shall meet the requirements of 6.2.6.1.

If the Kd does not meet these requirements, the design shall be rejected.

7.2.4 The isolating device shall be subject to an audible signal test, see 7.5.2.

The isolating device and PRV manifold shall be subject to a residual flow test, see 7.5.3.

7.2.5 The isolating device disc assembly shall be subject to strength test, see 7.6.

The disc shall not detach from the assembly or the design shall be rejected.

7.2.6 The isolating device shall withstand an over-torquing test to ensure the freedom of movement of all operating parts and shall pass a pneumatic external leak tightness at 25 bar, see 7.7.

7.2.7 The isolating device and PRV manifold shall be subject to an operation test, see 7.8.

The lowest value of the discharge capacity of the tests shall be deemed to be the nominal discharge capacity. The discharge capacity shall be quoted in cubic metres per minute of free air measured at STP, rounded down to one decimal place.

7.2.8 The range of results of all the tests shall be within ± 5 % of the average value.

7.2.9 A stress cracking test shall be carried out on brass components in accordance with 7.9.

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

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.

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

7.3 Hydraulic proof test

7.3.1 This test shall be carried out on one sample prior to other tests.

7.3.2 The outlet of the body of the isolating device/PRV manifold shall be blanked off using a fitting reproducing the relief valve connection. The internal mechanism shall be in the fully open position.

7.3.3 Pressure shall be applied through a fitting reproducing the pressure vessel boss.

7.3.4 The test medium shall be water or other suitable fluid.

7.3.5 The pressure shall be raised continuously and gradually.

7.3.6 The test pressure shall be 1,43 times the maximum allowable pressure.

7.3.7 The test duration shall be two minutes minimum.

7.4 Relief valve isolator test

The relief valve Master Test Piece shall be manufactured in accordance with Annex A.

The relief valve isolating device under test shall be manufactured in accordance with Figure 1. It shall be assembled with the PRV Master Test Piece and flow tested at 6 bar using air in order to determine its Kd.

7.5 Testing of audible signal of isolating devices and residual flow of isolating devices and PRV manifolds

7.5.1 All tests shall be carried out using air.

7.5.2 Isolating devices shall be subjected to an inlet pressure of 25 bar. A noticeable audible change in the release of air shall take place when removing the PRV, indicating closure of the isolating device, while a minimum of 3 threads remain engaged.

7.5.3 Isolating devices and PRV manifolds in the closed position (or each closed position), shall be tested at a pressure of 1 bar and the signal flow rate measured. They shall meet the requirements of 6.2.3 or the design shall be rejected.

7.6 Resistance of the isolating mechanism

The isolating mechanism shall be subjected to a tensile force of 1 000 N in the direction opposite to the flow to ensure that no component becomes deformed or detached.

7.7 Over-torque deformation test

An isolating device with taper threads shall be subject to an over-torquing deformation test, to ensure the correct operation and tightness in that condition, as follows:

— the isolating device shall be fitted on a test fixture representative of its expected use;

— the taper threaded joints shall be assembled with lubricant;

— the isolating device valve shall be tightened to 5 Nm. It shall then be tightened a further three revolutions;

— after the torque has been applied, the isolating device shall be checked for freedom of movement of all operating parts;

— the isolating device shall meet the requirements of 6.6 or the design shall be rejected.

7.8 Operation test

7.8.1 General

The isolating device/PRV manifold design fitted with its PRV(s), in accordance with EN 14129:2014, shall be subjected to a system test.

7.8.2 System test

7.8.2.1 Pressure relief valve systems test (isolating device)

Three of each type of isolating device shall be used with the three PRVs.

The discharge capacity of each system shall be determined at the flow rating pressure.

7.8.2.2 Pressure relief valve systems tests (PRV manifold)

Three PRV manifolds, fitted with the appropriate number of PRVs, shall be tested and measurement of the lift at the flow rating pressure shall be carried out.

After the lift of the PRV has been measured and the pressure has been removed, the adjusting screws and springs shall be removed and the sealing element retainers supported in the measured lift position.

The system shall then be flow tested at 4 bar and the arithmetic mean of all the test values shall be used for determining the mean discharge capacity of the system. The mean discharge capacity shall be quoted in cubic metres per minute of free air measured at STP rounded down to one decimal place.

The discharge capacity of the system shall then be calculated at the flow rating pressure in accordance with the design standard of the pressure vessel to which it is to be fitted.

7.9 Stress cracking test

7.9.1 General

The stress cracking test shall be either a mercury(I)nitrate immersion test or a moist ammonia test.

7.9.2 Mercury(I)nitrate immersion test

The sample shall be degreased and shall withstand total immersion for 30 min without cracking, in an aqueous mercurous nitrate solution containing 10 g of mercurous nitrate and 10 ml of nitric acid (specific gravity 1,42) per litre of solution.

7.9.3 Moist ammonia air stress cracking test

The sample shall be degreased and then tested in accordance with ISO 6957 for the duration of 168 h.

8 Production testing of isolating devices and PRV manifolds

8.1 All pressure tests shall be carried out using air or water.

8.2 Isolating devices and PRV manifolds shall be checked for correct operation of the moving parts.

8.3 Isolating devices and PRV manifolds shall be tested for external leakage at a pressure of 25 bar. The total leakage rate shall not exceed 15 cm^3/h of air measured at STP.

8.4 When the device or manifold has a product of maximum allowable pressure (PS) and volume (V) greater than 25 bar litres, it shall be proof tested at 1,43 times the maximum allowable pressure (35,75 bar).

NOTE This is in accordance with the requirements for PED. For PED category 1 equipment, this testing can be carried out on a statistical basis such as ISO 2859-1:1999 [9].

9 Marking and labelling

9.1 PRV isolating device

Each isolating device shall be clearly and permanently marked with the following information:

a) manufacturer's name or trademark;

b) type number;

c) date (code) indicating month and year of manufacture;

d) maximum allowable pressure; and

e) the capital letter "I" in a circle to denote interchangeability, when the isolating device complies with the requirement of 6.2.6.

NOTE EU Directive 97/23/EC [4] also has marking requirements.

9.2 Pressure relief valve PRV manifolds

The following minimum information shall be marked on the body of all PRV manifolds. This may be integral with the body or on a plate securely fixed on the body.

a) manufacturer's name or trademark;

b) type number;

c) date (code) indicating month and year of manufacture; and

d) maximum allowable pressure.

NOTE EU Directive 97/23/EC [4] also has marking requirements.

10 User instructions

10.1 PRV isolating devices

User instructions, in the language where the product is placed on the market, shall be provided and shall contain at least the following information:

a) manufacturer's name and address;

b) type number and data on performance;

c) torque requirements for tightening PRVs into isolating devices to:

   i) prevent over-tightening of the system; and

   ii) ensure the required movement of the isolating device in the pressure vessel.

d) information regarding the design of the opening in the pressure vessel in which the isolating device is to be fitted to ensure that flow is not restricted;

e) torque requirements for sealing taper threads;

f) procedure for the removal of the isolating device from the pressure vessel;

g) detailed operating instructions of the system, with particular regard to positive indication that the device has closed prior to the removal of the PRV; and

h) the number of this standard.

10.2 PRV manifolds

User instructions, in the language where the product is placed on the market, shall be provided and shall contain at least the following information:

a) manufacturer's name and address;

b) type number and data on performance;

c) information regarding the design of the opening in the pressure vessel in which the PRV manifold is to be fitted to ensure that flow is not restricted;

d) torque requirements for tightening;

e) detailed operating instructions of the system, with particular regard to positive indication that the device has closed prior to the removal of the PRV;

f) method of sealing PRV manifold connection to pressure vessel;

g) method of sealing connection threads of PRV;

h) the procedure for the removal of the PRV manifold from the pressure vessel;

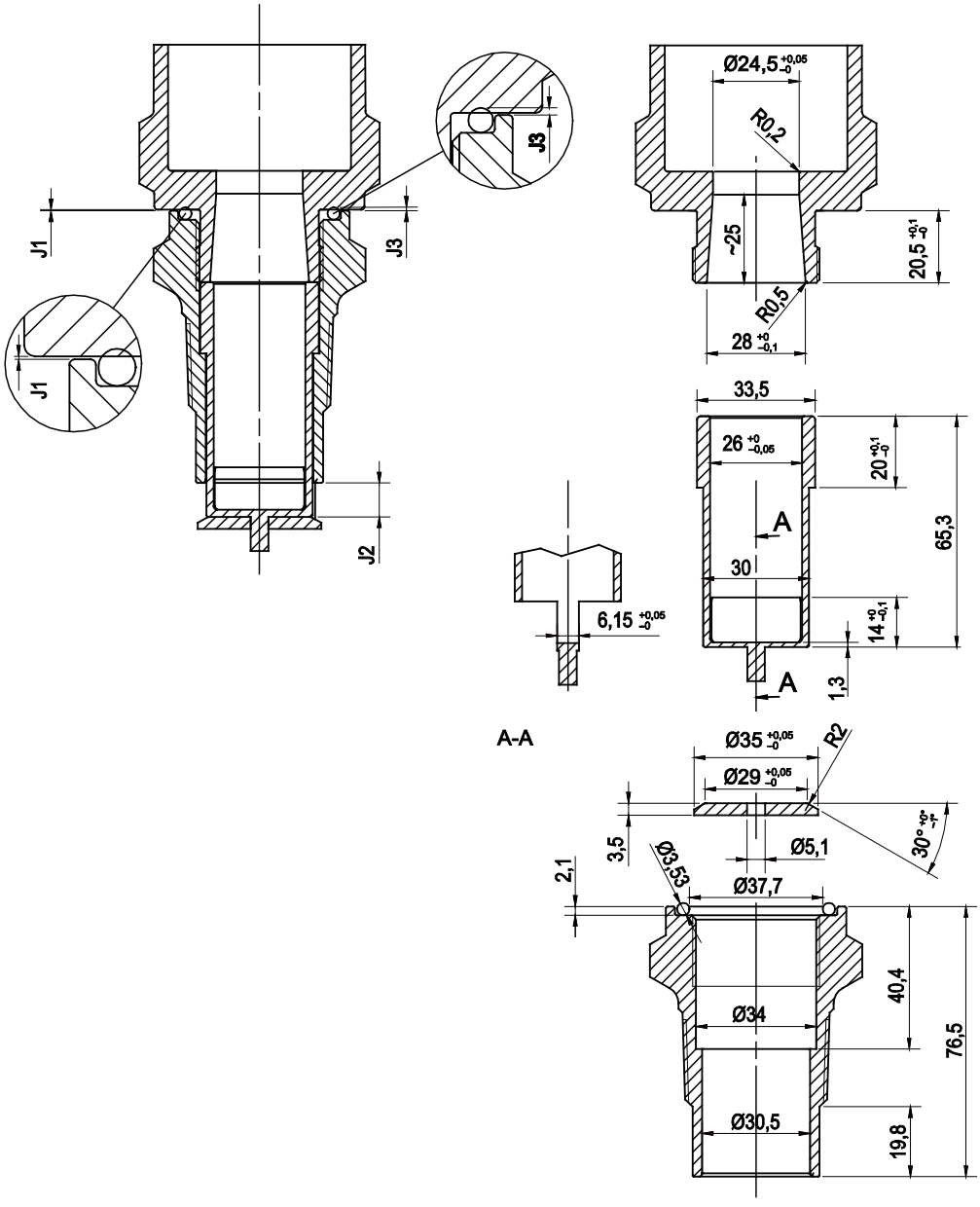
i) details of the PRV manifold connection to the pressure vessel; and

j) the number of this standard.

Annex A
(normative)

Dimensions of master test pieces for PRV and isolating devices

Dimensions in millimetres



Key

J1 = 0,1 min. (metal-metal clearance)

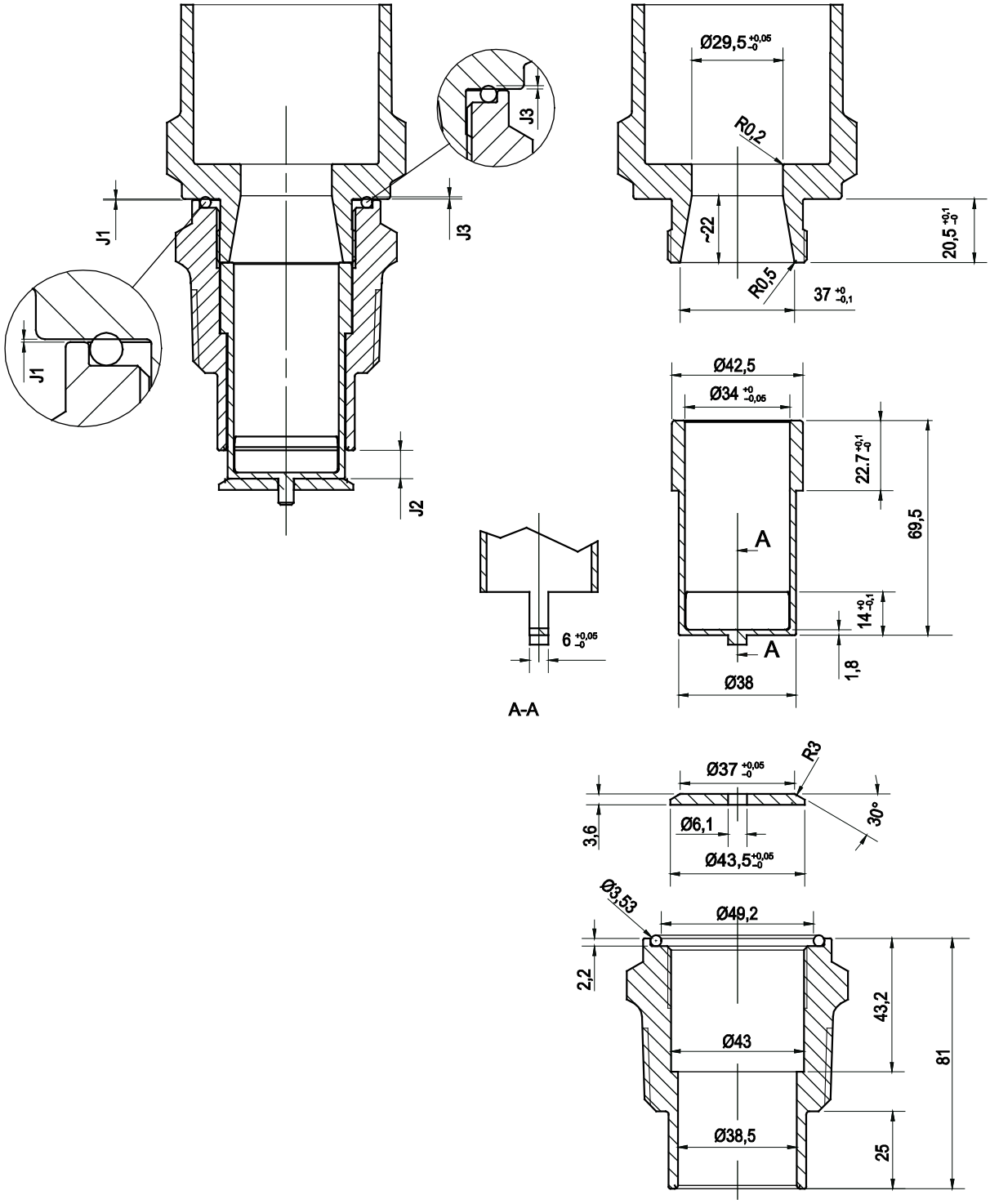
J2 = 9,35 to 9,4 (lift)

J3 = 0,3 min. (o ring compression)

NOTE General tolerance = ± 0,1

Figure A.1 — Dimensions for isolating devices (M 36)

Dimensions in millimetres



Key

J1 = 0,1 min. (metal-metal clearance)

J2 = 9,35 to 9,4 (lift)

J3 = 0,3 min. (O ring compression)

NOTE General tolerance = ± 0,1

Figure A.2 — Dimensions for isolating devices (M 45)

Annex ZA
(informative)

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

This European Standard has been prepared under a mandate Relationship between this European Standard and the Essential Requirements of EU Directive 97/23/EC for pressure equipment 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 (1 of 2)

Clause(s)/sub-clause(s) of this EN	Essential requirements (ERs) of Directive 97/23/EC Annex I	Qualifying remarks/Notes
Clause 6	2.1	Design
6.4.3 7.3 7.6 7.7	2.2.1	Design for adequate strength
6.3.1, last paragraph	2.2.3	
7.2	2.2.4	Experimental design method
6.2 6.3 6.4.1 7.4 7.5	2.3	Safe handling and operation
5.1 5.2 5.3	2.6	Corrosion and other chemical attack
6.4.2	2.12	External fire
Clause 9	3.3	Marking and labelling
Clause 10	3.4	Operating instructions

Table ZA.2 — Correspondence between this European Standard and Directive 97/23/EC (2 of 2)

Clause(s)/sub-clause(s) of this EN	Essential requirements (ERs) of Directive 97/23/EC Annex I	Qualifying remarks/Notes
5.1 5.2 5.3	4.1 (a) 4.1 (b) 4.1 (c) 4.1 (d) 4.1 (e)	Materials for pressurized parts
5.5	4.3	Materials certification

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

Bibliography

[1] EN ISO 14021, *Environmental labels and declarations — Self-declared environmental claims (Type II environmental labelling) (ISO 14021)*

[2] EN ISO 14024, *Environmental labels and declarations — Type I environmental labelling — Principles and procedures (ISO 14024)*

[3] EN ISO 14025, *Environmental labels and declarations —Type III environmental declarations — Principles and procedures (ISO 14025)*

[4] 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

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

[6] EN 10226-1, *Pipe threads where pressure tight joints are made on the threads — Part 1: Taper external threads and parallel internal threads — Dimensions, tolerances and designation*

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

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[9] 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*

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