BS EN 16631:2015

BSI Standards Publication

LPG equipment and accessories — Pressure relief valves for LPG pressure vessels — Reconditioning requirements

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 16631:2015.

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.

ISBN 978 0 580 81190 6

ICS 23.060.40

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

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2015.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 16631

May 2015

ICS 23.060.40

English Version

LPG equipment and accessories - Pressure relief valves for LPG pressure vessels - Reconditioning requirements

Équipements pour GPL et leurs accessoires - Soupapes de sécurité pour réservoirs de GPL sous pression - Exigences de reconditionnement

Flüssiggas-Geräte und Ausrüstungsteile - Sicherheitsventile für Druckbehälter für Flüssiggas (LPG) - Anforderungen an die Instandsetzung

This European Standard was approved by CEN on 5 March 2015.

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

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

CEN members are the national standards bodies of 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 United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 16631:2015 E

Contents

Page

Foreword

This document (EN 16631:2015) 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.

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

Protection of the environment is a key political issue in Europe and elsewhere. Protection of the environment is taken in a very broad sense. What is meant is the total life cycle aspects of, e.g. a product on the environment, including expenditure of energy and during all phases from mining of raw materials, fabrication, packaging, distribution, use, scrapping, recycling of materials, etc.

Provisions have to be restricted to a general guidance. Limit values are specified in national laws. It is recommended that companies using this standard develop an environmental management policy. For guidance see ISO 14000 series.

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. Where judgements are called for, it has been assumed that they are made by competent persons who have been trained specifically for the tasks.

1 Scope

This European Standard specifies the requirements for the reconditioning, retesting and certification of Pressure Relief Valves (PRVs) for LPG pressure vessels covered under the scope of EN 14129.

This European Standard applies to retesting and reconditioning of PRVs that are carried out in a workshop and does not apply to site adjustment of installed PRVs.

Annex A is an informative annex detailing a sampling approach for PRV requalification which should only be used in case of on-site requalification of series produced pressure vessels fitted with series produced PRVs.

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

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

ISO 2230, *Rubber products — Guidelines for storage*

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 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.

3.3
competent person
person which by combination of appropriate qualification, training, experience, and resources, is able to make objective judgments on the subject

3.4
setting
operation of adjusting and testing the start to discharge pressure to the nominal set pressure

3.5
reconditioning
operation that includes complete dismantling of the valve, evaluation and replacement of components and reassembly

3.6
pop action
rapid opening of the pressure relief valve sealing element so that the pressure relief valve is fully open, resulting from an increase of inlet pressure creating a sudden increase in force and compression of the spring

3.7
sealing element
non-metallic moveable resilient component which affects a seal by contact with the pressure relief valve seat

4 General

PRVs shall have a storage life of two years after assembly.

All PRVs shall be subjected to inspection in accordance with Clause 6 prior to reconditioning, setting or changing the set pressure.

PRVs where the set pressure (reset) is to be changed, shall meet the requirements of Clause 9.

PRVs that have been stored for more than two years, but are less than five years old, shall have the sealing element changed and shall meet the requirements of Clauses 6 and 8.

PRVs that have been stored for more than five years shall be reconditioned in accordance with Clauses 6, 7 and 8.

PRVs that are to be reconditioned shall be subjected to reconditioning in accordance with Clauses 6, 7 and 8.

5 Materials

5.1 General

Components for reconditioning shall meet the Original Equipment Manufacturer (OEM) specification.

5.2 Lubricants, sealants and adhesives

Lubricants, sealants and adhesives shall be compatible with LPG and not interfere with the operation of the PRV, when used on operating threads and seals. Sealants shall comply with the requirements of EN 751-1, EN 751-2 or EN 751-3.

5.3 Shelf life

5.3.1 Shelf life of components

Metallic components, other than springs (see 5.3.2), have an unlimited shelf life.

Rubber components shall have a storage life of 7 years with the ability to extend this to 10 years when the requirements of ISO 2230 are met.

Lubricants, sealants and adhesives shall have a shelf life in accordance with the manufacturer's instructions.

5.3.2 Storage life of assembled PRVs

After manufacture PRVs may be stored for up to two years when stored in line with the manufacturer's recommendations. Manufacturers shall ensure that the functional characteristics of the PRV such as opening pressure, reseating pressure, flow capacity, etc. remain in line with the design standard and the specification during this period.

PRVs that exceed this storage period of two years shall have the sealing element replaced and shall be assembled, set and tested in accordance with Clause 8 to ensure correct operation.

PRVs that have been in storage for more than five years shall be reconditioned.

Springs and seals on PRVs that have been in storage for more than five years shall not be reused.

6 Inspection

PRVs shall be subjected to inspection for the following criteria to establish the suitability of the PRV or its components for reuse.

Components which do not meet the following criteria and cannot be safely rectified shall be scrapped:

— stems that have drill holes in the potentially stressed area above the nut;

— bent or damaged stems;

— bent, deformed, corroded, badly marked, scored or cracked bodies;

— contaminants, foreign matter and corrosion;

— cross-threaded, damaged or stripped PRV threads;

— indications of having been subjected to excessive heat or having been in a fire;

— foreign matter in visible internal passageways; or

— evidence of abuse or tampering.

PRVs that are to be reconditioned shall also be checked for:

— damaged sealing surfaces and/or any non-metallic sealing elements; and

— non-standard parts.

7 Reconditioning

Each PRV shall be dismantled into its component parts. Each component shall be inspected to ensure its suitability for reuse including meeting the manufacturer's original specification.

Threads shall be cleaned and checked for stripped threads, damage, distortion, cuts, cracks or corrosion. Threads shall be assessed by a competent person to determine if they can be rectified and reused.

Taper threads where the full form thread gauge screws on by more than 1 turn over maximum shall be scrapped. Threads shall be checked using thread gauges.

During reconditioning springs shall not be reused once removed from a PRV.

During reconditioning non-metallic materials shall not be reused in a PRV.

Spare parts used in the reconditioning of PRVs shall be to the original manufacturer's specification.

For mobile applications, PRVs shall be constructed with the stem guide permanently attached to the PRV body. This design shall be able to withstand a deceleration of 100 times gravity and shall remain leak tight and operate correctly afterwards.

The reconditioned PRV shall be tested in accordance with Clause 8.

8 Pressure setting

8.1 General

Setting and testing shall be carried out in accordance with the requirements of this standard by the PRV reconditioner, prior to any painting which may be required.

The tests required below for all PRVs shall be conducted using air or nitrogen. The responsibility for the design and safety of the pneumatic test rig rests with the reconditioner.

The accuracy class for pressure measuring equipment used during the tests shall not be more than 0,6, see EN 837-1:1996, with the test pressure within the middle third of the instrument range.

All Bourdon tube pressure gauges shall be calibrated in accordance with EN 837-1.

PRVs undergoing pneumatic pressure testing shall not be subjected to any form of shock load.

The hazards involved in pneumatic pressure testing shall be considered and appropriate precautions taken.

All pipes, connections and blanking devices of the test installation shall be capable of withstanding at least twice the nominal set pressure of the PRV on test.

8.2 Setting and testing of PRVs

8.2.1 Only springs to the original PRV manufacturer’s specification shall be used.

8.2.2 Each PRV shall be individually set such that when air or nitrogen supply is connected to the PRV inlet at a pressure equal to the nominal set pressure marked on the PRV, the first of a stream of bubbles appears through a water seal not more than 50 mm in depth applied on the outlet of the PRV.

8.2.3 All pressure relief PRVs shall be set to start to discharge at the nominal set pressure.

8.2.4 If at any time after manufacture and prior to use it is required to check the set pressure, then the first application of pressure shall allow the tolerance defined in 8.2.5 between the first start to discharge pressure and the set pressure marked on the PRV to overcome 'adhesion' of the sealing disc to PRV seat which can occur during storage prior to use.

8.2.5 The tolerance on start to discharge/nominal set pressure for PRVs fitted to static pressure vessels, road tankers/railcars is ± 5 %.

8.2.6 After verification of the set pressure, the inlet pressure shall be increased until a steady stream of bubbles is obtained without causing the PRV to pop fully open. The inlet pressure shall then be gradually decreased until the flow of bubbles ceases. The pressure at which this occurs is the reseal pressure which shall not be less than 90 % of the nominal set pressure.

8.2.7 A PRV shall achieve the required leak tightness in accordance with EN 14129:2014, 7.8. This shall not be confused with the first of a stream of bubbles at the start to discharge pressure.

9 Changing the set pressure

Where there is a requirement to change the set pressure of a PRV the following requirements shall be met:

— verify with the manufacturer that the spring can be used for the new pressure setting or the spring shall be changed. Only springs complying with the original PRV manufacturer's specification shall be used;

— identify the new discharge capacity in accordance with EN 14129:2014, 7.7.

The pressure setting shall be confirmed in accordance with Clause 8.

10 Marking

All reconditioned PRVs shall be marked with the following information:

— PRV type;

— set pressure;

— discharge capacity;

— retest date;

— serial number or unique Identification code; and

If the set pressure of a PRV is to be changed, the body shall be re-marked to indicate the change and the discharge capacity and the original markings shall be removed. Where the PRV is intended to be used in combination with an isolating device, the system capacity shall be marked on the PRV.

A mark to identify the name of the reconditioning person or company shall be clearly and permanently marked on the PRV body. All external adjustments shall be sealed following satisfactory testing.

11 Documentation/Certification

The reconditioner shall, on request, supply to the purchaser:

— test certificates; and

— discharge capacity.

If requested by the customer, each batch of PRVs shall be certificated to indicate conformity with this standard.

12 Operating instructions

Where being placed on the market for a new user or where requested by the existing customer, operating instructions shall be provided and shall contain at least the following information:

a) reconditioner's name and adress;

b) manufacturer's name and address;

c) type number and data on performance;

d) details for fitting, removal and replacement of the PRV;

e) method and torque requirements for sealing connecting threads;

f) information on maintenance;

g) number of this standard;

h) details of the isolating device to be used where the PRV is used with an isolating device;

i) if applicable, details on the importance of keeping “tell tale” holes and drain holes free of obstruction; and

j) a warning, written in the language of the intended country of use, as a minimum, using the following words: “**Warning**: PRVs, which have operated up to their “pop” pressure, shall be removed from service for reconditioning or destruction. No spring shall be reused once removed from a PRV that has been in service”.

Annex A
(informative)

Assessment of PRVs by sampling

A.1 General testing of PRVs on a sampling basis

This sampling approach shall only be used in case of on-site requalification of series produced pressure vessels fitted with series produced PRVs.

These pressure vessels are themselves requalified by testing a representative sample, see EN 12817:2010, Annex E.

Batches of PRVs can be checked on a sampling basis after 10 years in service and, if they have passed these tests, after 20 years in service. They shall be systematically replaced when they reach 30 years of service life.

The inspection of each PRV at the time of the periodic inspection of the tank shall consist of:

a) a check that the PRV is part of a production batch whose performance is ensured by the results of tests conducted at the time of requalification on a representative sample;

b) an external inspection of the PRV to ensure there is no corrosion or damage;

c) a check on the condition of the spring for corrosion or damage (for an external PRV);

d) a check of the PRV drain hole to ensure it is clear;

e) a check of the stack pipe for damage or corrosion;

f) a check that rain cap is present and in good condition.

Defects d), e) and f) shall be fixed or the PRV shall be replaced with a new or reconditioned PRV. In case of a) (non-compliant batch), b) or c), the PRV shall be replaced with a new or reconditioned PRV.

The aim of the assessment is to ascertain, at the time of requalification, the start to discharge pressure of a homogenous batch of series produced PRVs by testing a representative sample.

NOTE A homogenous batch is defined as PRVs manufactured in the same year by the same manufacturer are part of the same batch.

A.2 Sample size

The sample size shall be assessed using ISO 2859-1 with a general inspection level II in combination with a single sampling plan for normal inspection.

The sample size for different batch sizes is given in ISO 2859-1:1999, Table 1.

A.3 Sample selection

PRVs making up the sample should be selected at random. PRVs removed from pressure vessels returned by customers, should be considered chosen at random. PRVs can be removed from pressure vessels at the customers' site in order to complete the sample.

A.4 Inspection period

PRVs manufactured in year n should be checked in year n+9 and, in case of positive result, in year n+19. The sampling approach should not be used for older PRVs.

A.5 Pass criteria

A PRV from the sample shall be considered as compliant if the start to discharge pressure ± 10 % of the nominal set pressure on the first measurement.

A batch of PRVs shall be considered as compliant if the number of non-compliant PRVs of the sample is equal or below the acceptance number (see ISO 2859-1:1999, Table 2A). The Acceptance Quality Level as defined in ISO 2859-1 should be set to 4. In case of non-compliance, all the PRVs of the batch shall be replaced by new or reconditioned PRVs at time of the next periodic inspection of the pressure vessels they are fitted onto.

Bibliography

[1] EN 12817:2010, *LPG Equipment and accessories — Inspection and requalification of LPG tanks up to and including 13 m³*

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

[3] EN ISO 14001, *Environmental management systems — Requirements with guidance for use (ISO 14001)*

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™