BS EN 14570:2014

BSI Standards Publication

LPG equipment and accessories — Equipping of overground and underground LPG vessels

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National foreword

This British Standard is the UK implementation of EN 14570:2014. It supersedes BS EN 14570:2005 which is withdrawn.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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LPG equipment and accessories - Equipping of overground and underground LPG vessels

Équipements et accessoires GPL - Équipement des réservoirs sous pression GPL aériens et enterrés

Flüssiggas-Geräte und Ausrüstungsteile - Ausrüstung von oberirdisch und unterirdisch aufgestellten Behältern für Flüssiggas (LPG)

This European Standard was approved by CEN on 4 February 2014.

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.

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Foreword

This document (EN 14570:2014) 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of an identical text or by endorsement, at the latest by October 2014, and conflicting national standards shall be withdrawn at the latest by October 2014.

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 14570:2005.

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 main modifications in comparison to EN 14570:2005 are:

- update of definitions taking into account the terminology document prepared by TC 286 WG11 (tanks replaced by pressure vessels ,etc..);
- amendment A1 September 2006 included in new standard : paragraph 5.5.1 modified by addition of “or” at the end of the a) and b) paragraphs.

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 if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

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.

It is recommended that companies using this European 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 personnel.

All pressures are gauge pressure.

1 Scope

This European Standard specifies requirements for the equipping of LPG pressure vessels, overground and underground, with a volume not greater than 13 m^3 manufactured in accordance with EN 12542 or equivalent and have been hydraulically tested.

The equipment covered by this European Standard is directly mounted onto the pressure vessel connections.

This European Standard excludes the equipping of depot storage pressure vessels and refrigerated storage vessels.

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 751-2:1996, *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 12542:2010, *LPG equipment and accessories - Static welded steel cylindrical tanks, serially produced for the storage of Liquefied Petroleum Gas (LPG) having a volume not greater than 13 m³ - Design and manufacture*

EN 13175:2003+A2:2007, *LPG equipment and accessories - Specification and testing for Liquefied Petroleum Gas (LPG) tank valves and fittings*

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

EN 14071:2004, *Pressure relief valves for LPG tanks - Ancillary equipment*

EN 14129:2004, *Pressure relief valves for LPG tanks*

EN ISO 10497:2010, *Testing of valves — Fire type-testing requirements (ISO 10497:2010)*

EN ISO 15995:2010, *Gas cylinders — Specifications and testing of LPG cylinder valves — Manually operated (ISO 15995:2006)*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1
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

3.1.2
pressure vessel
assembly of the pressure envelope (including the openings and their closures) and non-pressure-retaining parts attached directly to it

3.1.3
underground pressure vessel
pressure vessel below the surrounding ground level and completely covered

3.1.4
overground pressure vessel
pressure vessel above the surrounding ground level and not covered

3.1.5
fixed liquid level gauge
control device, such as a dip tube in combination with a vent valve to indicate when a predetermined liquid level has been reached or surpassed

3.1.6
depot storage vessel
pressure vessel at an installation where LPG is stored before being transferred into road/rail tankers and/or LPG cylinders for distribution

3.1.7
remotely operated
operated from a point at least 3 m from the vessel

3.1.8
drainage
process of removal of residual vessel content

3.1.9
liquid removal
withdrawal of LPG from the vessel for a purpose different from the normal use of the LPG (e.g. removal of LPG for decommissioning, maintenance or in case of an emergency)

3.1.10
vapour service
delivery of LPG in its vapour phase

Note 1 to entry: Vapour service is also referred to as vapour off-take.

3.1.11
liquid service
delivery of LPG in its liquid phase

Note 1 to entry: Liquid service is also referred to as liquid off-take.

3.1.12
connection
boss, flange, pad provided at an opening for the purpose of attaching equipment piping or pipe fittings

3.1.13
fail-safe shut-off valve
valve that automatically returns to its safe position in case of actuating power failure or fire engulfment

3.1.14
shut-off valve
valve to provide a leak-tight seal which is operated either manually, remotely or is self-closing

3.1.15
hydrostatic relief valve
self-closing valve which automatically, without the assistance of any energy other than that of the fluid concerned, discharges fluid at a predetermined pressure

3.1.16
filler valve
valve system for liquid fill service

3.1.17
overfill protection device
OPD
device designed to automatically reduce the filling rate to a minimal flow when the fill level reaches a predetermined amount

Note 1 to entry: In automotive applications, the predetermined amount is 80 % of the water capacity.

3.1.18
mounded vessel
pressure vessel above or partially underground of which the part above the ground is completely covered

3.1.19
semi-mounded vessel
pressure vessel above or partially underground of which the part above the ground is partially covered

3.1.20
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.

3.1.21
non-return valve
valve designed to close automatically to restrict reverse flow

3.1.22
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

3.1.23
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

3.1.24
plug
component which seals a female connection

3.1.25
cap
component which seals a male connection

3.2 Abbreviations

PRV	Pressure Relief Valve
PS	Maximum allowable pressure
PED	Pressure Equipment Directive (Directive 97/23/EC) [1]
PTFE	Polytetrafluoroethylene

4 Pressure vessel equipment

4.1 General

Pressure vessel connections, that are not in use or piped up during normal operation, shall be plugged or capped or blanked off (blind flange). A valve may be fitted between the connection and the plug or blind flange.

Except for PRVs and level gauges, all operating valves shall be protected from unauthorised operations. This can be achieved by enclosure within a lockable valve cover, secure compound or other suitable means.

In the case of underground/mounded pressure vessels, when valves are below the ground/backfill level, the valves shall be enclosed in a suitable access chamber.

4.2 Selection of pressure vessel equipment

The selection of pressure vessel equipment is related to the size of the pressure vessel and/or the complexity of the operation, and shall match the level of safety required.

Pressure vessel equipment shall be rated for the maximum allowable pressure (PS) of the pressure vessel.

Pressure vessel equipment shall be selected to meet the design conditions of the pressure vessel and shall be in accordance with EN 13175 (or EN ISO 15995 for manual shut-off valves up to DN 25), EN 13799, EN 14071 and EN 14129, as appropriate.

Normal service connections, where the passageway diameter into the pressure vessel is greater than 1,5 mm and up to 3 mm for liquid and 8 mm for vapour, shall be equipped with a shut-off valve.

Normal service connections, where the passageway diameter into the pressure vessel is greater than 3 mm for liquid and 8 mm for vapour, shall be equipped with at least one of the following:

a) a remotely operated fail-safe shut-off valve;

b) an excess flow valve plus manual shut-off valve;

c) a non-return valve plus manual shut-off valve.

Where two valves are fitted, they shall be located as close as practicable to each other.

These requirements shall not apply to:

1) pressure relief valves (PRV's);

2) filler connections which include a double non-return valve;

3) occasional liquid withdrawal valves which shall include an excess flow valve unless this is provided by the special connector used to open the valve;

4) level gauges.

Where fitted, valve actuators shall be sized to operate the valve at the maximum allowable pressure (PS) likely to be seen in service.

Remotely operated failsafe shut-off valves shall be fire safe in accordance with EN ISO 10497 and shall close in a controlled manner so as to avoid excessive pressure surge in the piping system, unless provision is made to protect the pipe-work in such a situation.

4.3 Screwed joints

Screwed joints shall only be used for joint sizes of DN 50 or less. However, larger screwed joints are permissible for proprietary items such as relief valves. Where the thread provides the seal, tapered threads shall be used.

4.4 Seals and gaskets

Seals and gaskets shall be selected taking account of the maximum allowable pressure (PS) of the pressure vessel.

Gaskets shall be selected to match the size and design of the flanges and be used in strict accordance with the manufacturers' specifications and recommendations.

PTFE tape shall comply with Class G of EN 751-3.

Thread sealing compounds shall be non-hardening types complying with Class C of EN 751-2.

5 Operational functions

5.1 General

Pressure vessels shall be equipped to provide the operational functions detailed as “Mandatory” in Table 1.

Pressure vessels may be equipped to provide the operational functions detailed as “Optional” in Table 1.

Table 1 —Operational functions

Function	Clause	Pressure vessel vapour service	Pressure vessel liquid service
Pressure relief [a]	5.2	M [a]	M [a]
Drainage	5.3	O	O
Liquid removal	5.4	M [b]	O
Maximum fill indication/control	5.5	M	M
Filling system	5.6	M	M
Vapour off-take	5.7	M	O
Vapour return	5.8	O	O
Liquid off-take	5.9	O	M
Liquid return	5.10	O	O
Temperature indication	5.11	O	O
Pressure indication	5.12	O	O
Liquid Level indication	5.13	M	M
Potential bonding point [c]	5.14	O	O
Earthing [c]	5.15	O	O

a Unless exempted, see 5.2.1.2

b Where liquid off-take is provided this becomes Optional.

c Unless required by national regulations.

NOTE 1 M = Mandatory, O = Optional.

NOTE 2 Depending upon operational or safety requirements, remote operation or reading may be provided as desired, except for PRVs.

NOTE 3 Underground or mounded and semi-mounded pressure vessels are not earthed if they are fitted with a cathodic protection system.

5.2 Pressure relief

5.2.1 General

5.2.1.1 The pressure vessel shall be protected by a PRV(s) or a hydrostatic relief valve in accordance with Annex B.

5.2.1.2 Underground/mounded vessels may be exempted from the requirements of a PRV or a hydrostatic relief valve, if the pressure vessel is protected from over pressure during operation by alternative means. This shall be clearly indicated in the manufacturers' operating/installation instructions.

An example of appropriate alternative means is given in Annex A.

5.2.1.3 PRVs or hydrostatic relief valves shall be connected to the vapour phase of the pressure vessel.

5.2.1.4 If the PRV or hydrostatic relief valve is located inside the valve cover, the cover shall be provided with a sufficient sized hole so as to allow free discharge.

NOTE For underground pressure vessels, such a hole is not required if the cover is not water tight and will allow free discharge.

5.2.1.5 PRVs or hydrostatic relief valves shall be fitted with rain/dust protective devices that will not obstruct the free discharge.

5.2.2 Isolating devices and manifolds

5.2.2.1 Shut-off valves shall not be fitted between a PRV or hydrostatic relief valves and the pressure vessel. However, a suitable isolating device may be used to facilitate the exchange of the PRV or hydrostatic relief valve, provided this device is retained in the fully open position by the presence of the relief valve and closes before the relief valve is completely removed (see EN 14071).

5.2.2.2 Any manifold for PRVs shall be in accordance with EN 14071.

5.2.3 Vent pipes

If vent pipes are fitted, they shall:

— be in accordance with EN 14071;

— be positioned so that they discharge to a safe location;

— be designed and installed so that in the event of ignition of discharged LPG, flame impingement on any pressure vessel equipment, piping or other LPG equipment is avoided;

— be protected against internal/external corrosion;

— have a water drain point, unless provided by the PRV;

— be designed so as not to induce vibrations that might affect the PRV operation, either because of wind effect or when the PRV discharges;

— be made from a material which is not affected by the heat resulting from ignition of the gas release.

5.3 Drainage

If a drainage connection is provided it shall be fitted with:

a) a shut-off valve which shall be blanked, capped or plugged if not connected to a drainage system; or

b) an occasional liquid withdrawal valve or equivalent; or

c) a blank, cap or plug.

If there are no provisions for draining, alternative means to permit cleaning inspection and maintenance in a safe manner shall be provided.

NOTE This can be achieved by inverting the vessel.

5.4 Liquid removal system

The liquid removal system shall be in accordance with 4.2 with either:

a) an eduction tube fitted with an occasional liquid withdrawal valve complying with EN 13175, the diameter of which shall not exceed DN 40 (shall not be used as a liquid off-take), or

b) an excess flow valve and a shut off valve.

When the vessel is not permanently connected to pipework, then the shut off valve shall be plugged, blanked or capped.

NOTE If the occasional liquid withdrawal valve complying with EN 13175 is equipped with an excess flow valve and a shut off valve, it may be used for liquid service.

5.5 Maximum fill indication/control

5.5.1 General

Pressure vessels shall be provided with a maximum fill indication/control consisting of:

a) a fixed liquid level gauge; or

b) a fixed liquid level gauge and an overfill protection device; or

c) an overfill protection device.

NOTE National regulations may apply to these options.

The critical dimensions or operating point of the device(s) shall be based on the permitted maximum fill and the dimensions of the pressure vessel. The maximum fill shall be determined in accordance with Annex A in EN 12542:2010.

Overfill protection devices shall be in accordance with EN 13175.

5.5.2 Fixed liquid level gauge

The vent valve shall be installed so that it can be conveniently reached and is visible from the fill point and the direction of venting shall be away from the operator.

5.5.3 Overfill protection device

The overfill protection device shall monitor the level to automatically activate a device to terminate the filling operation.

5.6 Filling system

The pressure vessel filling system shall have a filling connection, which shall discharge directly, or via internal piping, into the vapour space of the pressure vessel.

The filler valve shall be located or designed to avoid interference with other functions (e.g. vapour off-take, liquid level indication).

5.7 Vapour off-take

The vapour off-take system shall have a connection, which shall connect preferably directly on the top of the vessel above the liquid level at maximum fill or, alternatively, via internal piping, into the vapour space of the pressure vessel.

The valve shall have an outlet connection compatible with a directly mounted regulator or connecting piping, and satisfy the requirements of 4.2.

WARNING — Liquid LPG may accumulate in any vapour piping at vessel pressure.

5.8 Vapour return

The vapour return system shall have a connection, which shall connect directly or via internal piping, into the vapour space of the pressure vessel and shall satisfy the requirements of 4.2.

WARNING — Liquid LPG may accumulate in any vapour piping at vessel pressure.

5.9 Liquid off-take

The liquid off-take system shall have a connection, which shall connect directly or via internal piping, into an appropriate point in the liquid space of the pressure vessel and shall satisfy the requirements of 4.2.

Where the liquid is withdrawn from the bottom of the pressure vessel, it is recommended that an internal short up-stand is provided either as part of the pressure vessel or part of the fitting to avoid any internal debris being entrained with the liquid.

5.10 Liquid return

The liquid return connection shall terminate at the pressure vessel connection or internally via piping preferably to the vapour space of the pressure vessel and shall satisfy the requirements of 4.2.

It shall be located or designed to avoid interference with other functions (e.g. vapour or liquid off-take, liquid level indication).

5.11 Temperature indication

Temperature gauges shall be installed in blind pockets, located in the liquid phase. The pocket shall be constructed in accordance with the pressure vessel design standard.

5.12 Pressure indication

Pressure gauges shall be connected to the vapour space of the pressure vessel and shall be easily read and shall comply with EN 13175.

Pressure gauge connections shall be protected either by a tapping reduced internally to a bleed hole not larger than 1,5 mm diameter or by a suitable excess flow valve and shut-off valve.

5.13 Liquid level indication

The level gauge shall be:

— designed or selected to suit the dimensions of the pressure vessel;

— located so that the movement of any working part is not obstructed by any part of the pressure vessel or its equipment;

— not permanently affected by impingement of liquid during filling or liquid return;

— in accordance with EN 13799.

Any gauging device that relies on differential pressure shall be installed so that the effect of condensation in the balance line and pressure fluctuations in the pressure vessel do not interfere with satisfactory operation.

The nature of the reading (e.g. % of fill) shall be clearly marked on the gauge, or close to it.

5.14 Road tanker potential bonding

Where bonding connections are provided, they shall be free from any insulating material (e.g. paint…) and be electrically continuous with the pressure vessel.

5.15 Earthing

Where earthing connections are provided, they shall be free from any insulating material (e.g. paint…) and be electrically continuous with the pressure vessel.

6 Equipping

6.1 General

6.1.1 Equipping of LPG pressure vessels shall only be performed by competent personnel under the supervision of the supplier of the pressure vessel and/or the owner of the pressure vessel.

6.1.2 The equipment shall be checked to ensure that it is in accordance with the specifications set out in 4.2, that it has the required markings (e.g. CE mark, manufacturer's identification, etc…) and, where appropriate, it is within any specified test date or shelf life.

6.1.3 Prior to equipping, all connections shall be checked for compatibility between the mating parts, for cleanliness and for suitable sealing/jointing materials.

6.1.4 During equipping, care shall be taken to ensure that all equipment is fitted to the correct connection of the pressure vessel.

6.2 Screwed joints

6.2.1 Taper threaded joints shall be made using PTFE tape and/or a thread sealing compound. Care shall be taken in the positioning and application of all thread sealing material to ensure that it does not obstruct operation of the equipment.

6.2.2 The joint shall be tightened to achieve leak tightness and correct orientation of the equipment. Correct orientation shall be achieved by further tightening or remaking the joint completely. Partial unscrewing shall not be permitted.

6.2.3 Parallel threaded joints shall be made using a seal specified by the equipment supplier.

6.2.4 The maximum torque applied during assembly shall not exceed values defined by the equipment supplier or the relevant thread documents if no advice from the manufacturer is provided.

6.3 Flanged joints

6.3.1 Following correct orientation of the equipment, the joint shall be tightened to achieve leak tightness. Where o-rings are used, care shall be taken to ensure that the ring remains properly located in its groove during assembly and tightening.

6.3.2 The maximum torque applied during assembly shall not exceed values defined by the equipment supplier or the relevant bolt documents if no advice from the manufacturer is provided.

7 Checking and testing

7.1 General

A final inspection shall be performed on the equipped pressure vessel to confirm that each item of equipment is in accordance with the specification, including checks of the markings and/or documentation, as appropriate, and that it has been correctly fitted to the designated connection.

A functional check shall be carried out on the filler valve, PRV-isolating device, occasional liquid withdrawal valve, to ensure free movement where fitted.

7.2 Leak tightness

The pressure vessel shall be pressurized using air, an inert gas or other suitable gas, to a minimum of 0,2 bar. All joints and equipment shall be checked for leaks using a leak detection fluid.

Where a plug, a cap or blank has been fitted to a normal service connection controlled by a valve, it shall be removed before the leak tightness tests are carried out.

The causes of any leak detected shall be rectified avoiding overtorquing. The test shall be repeated until it is established the equipped pressure vessel is leak tight.

WARNING — Some leak detection fluids may contain ammonia and should be washed off any fittings after use.

When equipment directly in contact with LPG has to be replaced, the leak tightness test shall be repeated.

7.3 Excess flow valve

While the pressure vessel is still pressurized, the correct operation of each excess flow valve fitted shall be checked by opening the appropriate shut-off valve of the normal service connection, in accordance with manufacturers' instructions.

If an excess flow valve does not meet this requirement, it shall be replaced.

The test shall be repeated to establish that the new valve is operating correctly.

7.4 Completion and purging

Upon the completion of the tests, where LPG is not used as the test medium, the pressure vessel shall be depressurised gradually to approximately atmospheric pressure.

All plugs, caps and blanks that were removed shall be refitted.

The air/inert gas inside the pressure vessel shall be removed and replaced by LPG in accordance with safe purging procedures. If required by the user/owner, all joints shall be re-checked for leakage.

8 Storage, handling and transportation

When pressure vessels are transported with valves and/or fittings fitted, adequate precautions shall be taken to protect them against impact damage during transport and handling. All valve outlets shall be protected from the ingress of debris or moisture, during transport and storage, by the fitting of protective covers, caps or plugs, as appropriate.

9 Documentation

The supplier responsible for placing the equipped pressure vessel on the market shall make available a written procedure covering all aspects of the selection and assembling of the equipment and for testing of the equipped pressure vessel.

Documentation shall be prepared and available relating to the pressure vessels, valves and accessories, as follows:

— documentation specified in the pressure vessels manufacturing documents, including any certificates of conformity or hydraulic test;

— technical specifications and any certificates of conformity specified in the valve and accessories manufacturing documents;

— certificates confirming satisfactory completion of the leak tightness tests required by 7.2;

— operating instructions, (e.g. LPG to be stored, maximum permitted filling level, climatic areas for which the equipped pressure vessel has been designed/equipped, list of valves and fittings fitted and their safe operation);

— transport, handling, storage and installation recommendations/instructions;

— recommendations regarding maintenance/safety checks required to be done by the user/owner.

Annex A
(informative)

Examples of alternative means of over pressure protection for underground/mounded pressure vessels

Pressure relief protection is optional when the following provisions are made:

— earth cover thickness not less than: 0,5 m;

— 2 independent liquid level overfill protection systems including automatic shutdown of the filling operation at maximum fill level;

— 2 independent overpressure control systems (pressure switches shutting down the liquid and vapour inlet/return lines);

— protection of the pressure vessel shell against fire inside the valve access chamber, e.g. by means of a fire protection coating or provisions of emergency flooding.

Annex B
(normative)

Settings and discharge rates for PRVs and hydrostatic relief valves

B.1 Setting

The pressure at which the PRVs and hydrostatic relief valves start to discharge shall be not less than the pressure developed by the LPG at the reference temperature (see Annex A of EN 12542:2010) and not higher than the maximum allowable pressure (PS) of the pressure vessel.

For operating conditions other than external fire engulfment, the discharge rate through the PRVs and hydrostatic relief valves shall be such that the pressure vessel pressure does not permanently exceed PS and the short duration surge pressure does not exceed 110 % of PS.

B.2 Discharge rates

B.2.1 General

Operating conditions used to determine the discharge rate of PRVs and hydrostatic relief valves are determined by national regulations.

B.2.2 Above ground pressure vessels

For damage-limitation in the case of external fire, the PRV, as installed on the pressure vessel, shall be capable of discharging LPG vapour at a rate equivalent to an air flow not less than Q.

The discharge rate, Q (in cubic metres per minute, at 15 °C and 1,013 bar abs.) shall be calculated as follows:

$$Q_{\text{Propane}} = (0{,}25p + 6{,}3)A^{0{,}82}$$

$$Q_{\text{Butane}} = (0{,}27p + 7{,}0)A^{0{,}82}$$

where

A is the pressure vessel surface area (m^2);

Q is the required pressure vessel discharge rate of air (m^3/minute);

P is the marked set pressure of pressure relief valve (bar gauge).

As an alternative, and only for pressure vessels filled with propane, when the marked set pressure of the pressure relief valve is less than or equal to 17,4 bars (bar gauge), the discharge rate, Q (in cubic metres per minute, at 15 °C and 1,013 bar abs.) may also be calculated as follows:

$$Q = 10{,}655A^{0{,}82}$$

B.2.3 Underground/fully mounded pressure vessels

Underground and fully mounded LPG pressure vessels, do not require discharge capacity for external fire. Pressure vessels up to 13 m^3 capacity may be fitted with hydrostatic relief valves instead of PRVs provided

that the flow of liquid through the valve is sufficient to ensure that the pressure vessel is not subject to a momentary pressure greater than 110 % of PS.

B.2.4 Semi-mounded pressure vessels

Semi-mounded pressure vessels shall be treated similarly to fully mounded. However, the relief valve discharge rates for semi-mounded vessels should be increased, according to the area exposed, using the formula for above ground vessels.

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 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	Qualifying remarks/Notes
4, 5	Safe handling and operation	2.3
5.3, 5.4	Draining and venting	2.5
4, 5.4, 5.5, 5.6, 5.7, 5.9, 5.13	Filling and discharge	2.9
5.1, 5.2, 5.5, 5.6, 5.13 Annex B	Protection against exceeding the allowable limits of pressure equipment	2.10
5.2, Annex B except B.2.1	Safety accessories	2.11, 7.3
5.2, Annex B except B.2.1	External fire	2.12
7	Final inspection	3.2.1
5.2, 7	Inspection of safety devices	3.2.3
9	Operating instructions.	3.4

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

Bibliography

[1] 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 (PED)

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

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

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

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