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LPG equipment and accessories - Construction and performance of LPG equipment for automotive filling stations - Part 1: Dispensers

Flüssiggas-Geräte und Ausrüstungsteile - Bau- und Arbeitsweise von Flüssiggas-Geräten für Autogas-Tankstellen - Teil 1: Zapfsäulen

Equipements pour GPL et leurs accessoires - Construction et caractéristiques des équipements GPL dans les stations-service - Partie 1: Distributeurs

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LPG equipment and accessories - Construction and performance of LPG equipment for automotive filling stations - Part 1: Dispensers

Equipements pour GPL et accessoires - Constructions et caracteristiques des équipements GPL devant être utilisé dans les stations service - Partie 1-Distributeurs

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This European Standard was approved by CEN on 9 January 2006.

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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 Central Secretariat has the same status as the official versions.

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Foreword

This European Standard (EN 14678-1:2006) 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of an identical text or by endorsement, at the latest by August 2006, and conflicting national standards shall be withdrawn at the latest by August 2006.

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 94/9/EC, see informative Annex ZA, which is an integral part of this document.

NOTE The Pressure Equipment Directive 97/23/EC (PED) applies to any assembly with a component defined as category II or higher in this Directive:

— Article 1, 3.6 of the PED excludes equipment classified as no higher than category I under article 9 if it is covered by Directive 94/9/EC (ATEX).

— The category I limit is defined in Annex II Table 6 of the PED. It applies to piping for liquids whose vapour pressure at the maximum allowable temperature is greater than 0,5 bar (50 kPa) above DN 100 or, in the case of maximum allowable pressures greater than 10 bar (1 kPa), is above the product of DN and PS of 1 000.

— Because the design pressure (PS) in this document is 25 bar (2 500 kPa) and the DN of the intended piping is less than 40, the product of DN and PS of 1 000 in Table 6 of the PED is not reached.

— The category I limit for vessels is defined in Annex II Table 1 of the PED. It also applies to vessels for liquids whose vapour pressure at the maximum allowable temperature is greater than 0,5 bar (50 kPa) above volumes (V) of 1 litre up to a pressure of 200 bar or, in the case of the product of V and PS of 50.

— Because the design pressure (PS) in this document is 25 bar (2 500 kPa) and if the V of the intended vessel is less than 2 litres, the product of V and PS of 50 in Table 1 of the PED is not reached.

This standard addresses the essential health and safety requirements of the ATEX Directive.

This standard does not include any requirement for metering performance.

The manufacturer may have to consider the requirements of Directives 73/23/EEC and 89/336/EEC where relevant.

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

1 Scope

This European Standard covers the requirements for the design, manufacture, testing and marking of LPG dispensers for automotive LPG filling stations with a design pressure of 25 bar (2 500 KPa), where the piping has a maximum DN 40 and any vessel fitted that has a volume less than 2 litres. This standard does not cover dispensers with integral pumps.

NOTE This standard may also be used for piping greater than DN 40 and/or vessels greater than 2 litres, but then the PED should be consulted.

This standard also covers the requirements for the LPG parts in multi-fuel dispensers.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. 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 837-1, *Pressure gauges, Part 1 Bourdon tube pressure gauges - Dimensions, metrology, requirements and testing.*

EN 1762, *Rubber hoses and hose assemblies for liquefied petroleum gas, LPG (liquid or gaseous phase), and natural gas up to 25 bar (2,5 MPa) - Specification*

EN 13463–1, *Non electrical equipment for potentially explosive atmospheres – Part 1: Basic method and requirements.*

EN 13617-1: 2004, *Petrol filling stations - Part 1: Safety requirements for construction and performance of metering pumps, dispensers and remote pumping units*

EN 13760, *Automotive LPG filling system for light and heavy duty vehicles – Nozzle, test requirements and dimensions.*

EN 60079-0: 2004, *Electrical apparatus for explosive gas atmospheres – Part 0: General requirements (IEC 60079-0:2004)*

EN 60079-7: 2003, *Electrical apparatus for explosive gas atmospheres - Part 7: Increased safety "e" (IEC 60079-7:2001)*

EN 60079-10: 2003 , *Electrical apparatus for explosive gas atmospheres Part 10 : Classification of hazardous areas (IEC 60079-10: 2002).*

EN 60079-14, *Electrical apparatus for explosive gas atmospheres Part 14: Electrical Installations in hazardous areas /other than mines) (IEC 60079-14: 2002).*

EN 60079-15: 2003, *Electrical apparatus for explosive gas atmospheres – Part 15: Type of protection "n" (IEC 60079-15:2001, modified)*

EN 60204-1: 1998, *Safety of machinery; electrical equipment of machines - Part 1: General Requirements (IEC 60204-1: 1997).*

EN 60529: 1993, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989).*

EN 60947-3, *Low voltage switchgear and controlgear.- Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units (IEC 60947-3:1999)*

HD 21.13 S1, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 13: Oil resistant PVC sheathed cables with two or more conductors*

HD 22.4 S4, *Cables of rated voltages up to and including 450/750 V and having crosslinked insulation - Part 4: Cords and flexible cables*

3 Terms and definitions

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

3.1
LPG (liquefied petroleum gas)
mixture of predominantly butane or propane with traces of other hydrocarbon gases classified in accordance with UN number 1965, hydrocarbon gases mixture, liquefied, NOS or UN number 1075, petroleum gases, liquefied

NOTE 1 In some countries, UN numbers 1011 and 1978 may also be designated LPG.

NOTE 2 For automotive LPG specification see EN 589.

3.2
design pressure
pressure for which the equipment is designed

NOTE Gauge pressure unless otherwise stated.

3.3
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

3.4
hydrostatic relief valve
device that prevents the build up of hydrostatic pressure above a pre-set value

3.5
shear valve (impact check valve)
normally open valve activated by impact which closes both sides of the break point to prevent flow and remains closed after activation

3.6
dead man's push button
manually operated non latching device which immediately stops the flow when released

3.7
hazardous area
area in which an explosive gas atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation of equipment and use of apparatus

3.8
dispenser
delivery and measuring unit for LPG in the liquid phase

3.9
break-away coupling (safe break)
coupling which separates at a predetermined section when required and each separated section contains a self-closing shut-off valve, which seals automatically

3.10
nozzle boot
partially enclosed housing where the filling nozzle is located when not in use

3.11
LPG system
piping, pipe fittings and components through which LPG flows, including seals and gaskets

3.12
break point
weakened section in a pipe or fitting intended to break when excessive force is applied

3.13
sight glass
device to allow checking that all, or part, of the measuring system is completely filled with liquid

3.14
screen
perforated cladding fabrication which may be provided to enhance the visual appearance of a pump or dispenser or to provide another related function

3.15
STP
Standard Temperature and Pressure [15,6 °C (288,7 K), 1,013 bar absolute (0,1013 MPa absolute)]

4 Requirements

4.1 Electrical equipment

4.1.1 General

The electrical equipment is deemed to fulfil minimum electrical requirements for the continuity of the protective bonding circuit, its insulation and the voltage if it fulfils the requirements of 5.6.

The provisions of EN 60079-14, EN 60079-0, EN 60204-1 and EN 60950-1, as appropriate, shall apply.

4.1.2 Cabling insulation resistance

The power supply shall have a means of disconnection within the dispenser to allow a 500V d.c. insulation test to be applied from the non-hazardous area to all power cables connecting the dispenser to the power supply (PELV, Protective Extra-Low Voltage, cables are not included).

Access to any manual means of disconnection shall be provided, removable cladding or covers are permitted.

Any manual means of disconnection shall be readily accessible by designated and trained personnel.

The means of disconnection shall ensure that:

a) all external power cables up to the means of disconnection can be tested between any phase and earth and between phases;

and

b) all dispenser power cables and equipment within the hazardous area can be tested between the power circuit and the earth.

4.1.3 Cables used in hazardous area

Electrical cables used in hazardous areas shall comply with either:

— EN 60079-14 and HD 21.13 S1 or

— EN 60079-14 and HD 22.4 S4, or

— the requirements of 5.4,

to confirm that unarmoured elastomeric and/or plastic insulated cables, with a semi-rigid or tough sheath, are suitable for use in pumps, dispensers and remote pumping units.

4.1.4 Dead man push button

The dead man push button shall be in accordance with the requirements of EN 60947 – 3 (see 4.4.8).

4.1.5 Insulation and isolation

In order to avoid danger from sources of electrical energy capable of causing shock, and also, in hazardous areas, from non-intrinsically safe energy sources capable of causing incentive sparks, all such sources of energy and conductive components which are intended to remain live during maintenance, testing or inspection, shall be insulated or shielded according to clause 6 of EN 60204-1 so as to prevent accidental contact.

In order to prevent electrostatic discharges between the nozzle and the filler connection that could cause ignition, materials and components shall be selected to ensure that the resistance between nozzle and earth is less than 10^6 ohms when measured with a low voltage ohm-meter.

Power sources such as batteries, and capacitors which do not decay to a stored energy level of less than 0,2 mJ within 10s, shall be considered as potential ignition sources and therefore shall be insulated or isolated.

The means of isolation shall:

a) apply to all phase conductors;

b) be operable prior to access to the internals of any electrical enclosure in a hazardous area, and be suitable for the hazardous area in which it is mounted; and

c) for sources of energy not exceeding 24 V, be in accordance with either EN 60947-3 or include a gap between contacts in accordance with EN 60730-2-10 or be capable of satisfying a 500 V dielectric test across the contacts; or

d) for sources of energy exceeding 24 V, be in accordance with EN 60947-3.

NOTE Neutral /negative conductors should be considered as phase conductors.

4.1.6 Chemical cells in non-hazardous areas

There is a possibility of explosive atmosphere generation from chemical cells used to supply electrical power to the display head or other equipment attached to the dispenser; thus producing its own hazardous area.

Therefore chemical cells shall be in a ventilated area. If the chemical cells are located in an enclosure with no internal hazardous area, low and high level ventilation shall be provided consistent with a degree of protection of IP33 according to EN 60529 or more open.

Any chemical cell or battery of chemical cells forming a sub-assembly shall be fitted into a vented enclosure with high and low ventilation having a degree of protection not better than IP33 according to EN 60529.

The means of construction of the cells and their enclosure shall be according to clause 4 of EN 60079-7 for emission of gas and method of connection of cells. Conformity shall be demonstrated by the supplier's declaration.

These provisions apply to all cells and batteries of cells except for primary cells operated in discharge mode only.

4.2 Design

4.2.1 Design pressure

The design pressure, for the LPG pressure containing parts, shall be at least 25 bar (2 500 kPa).

4.2.2 Design temperature

The maximum design temperature shall be + 40 °C.

The minimum design temperature shall be - 20 °C.

However, where a design temperature outside the above range is required, the manufacturer shall demonstrate the suitability of the design at this temperature and the temperature shall be marked in accordance with 8.

4.2.3 Materials

Materials in contact with LPG shall be compatible with automotive LPG.

Materials exposed to corrosive conditions shall be corrosion resistant or protected against corrosion.

NOTE Material complying with the requirements of EN 13175 may be used.

The component manufacturer shall maintain records of and provide if requested:

— chemical analysis certificates,

— mechanical property data,

— results of metallurgical and mechanical tests and analysis,

for the materials used in construction of the parts subjected to pressure.

All elastomer materials in contact with LPG shall be compatible with LPG and shall not distort, harden or adhere to other components to such an extent as to impair the function of those components. For guidance on selection of non-metallic materials see EN ISO 11114-2. Rubber materials shall conform to the requirements of EN 549.

The component manufacturer shall maintain a system for the identification and tracing of materials used in the fabrication of parts under pressure.

4.2.4 Pressure gauges

Where fitted, pressure gauges shall be in accordance with EN 837-1.

4.2.5 Trapped liquid

Where LPG in liquid phase can be trapped, means shall be provided to prevent the pressure exceeding the design pressure of the LPG system.

4.2.6 Joints

All joints other than welded joints shall be accessible for inspection.

Pipe connections within the dispenser shall be such that unacceptable mechanical stresses shall not occur, e.g. by use of flexible steel joints.

The number of joints shall be kept to a minimum.

4.2.7 Seals and gaskets

Seals and gaskets shall be compatible with automotive LPG.

4.2.8 Sight glass

Where a sight glass is fitted, it shall be of sufficient strength and tested according to the requirements of 5.2.

4.2.9 LPG system

Piping and pipe fittings through which liquid or vapour LPG flows shall be constructed from materials:

— compatible with automotive LPG,

— which do not directly contribute to the development of fire and,

— which shall not be degraded by the external environment in which the materials are used.

For guidance on selection of materials, see ISO 11114-1 and/or ISO 11114-2.

The piping and pipe fittings of the LPG system shall be designed and assembled in accordance with a suitable standard such as EN 13480 parts 1 to 5.

4.3 Explosion protection measures

4.3.1 General

For specifying explosion protection measures, see Annex C.

Equipment, components and protective systems used within hazardous areas, shall be suitable for at least Explosion Group IIA with temperature class T3 as defined in EN 60079-0 and EN 13463-1.

4.3.2 Avoidance or reduction of ignition sources

4.3.2.1 General

All electrical and non-electrical equipment and components, intended for use in potentially explosive atmospheres, shall be designed and constructed according to good engineering practice and in conformity