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Pressure relief devices for gas cylinders

气瓶安全泄压装置

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1 Scope

This Standard specifies the type, structural type, setting principles, selection principles, basic requirements, calculation of minimum flow capacity for safety and certified capacity of pressure relief devices, principles for determining operating pressure or temperature, installation and maintenance, etc. of pressure relief devices for gas cylinders.

This Standard applies to gas cylinders of various structural types and containing various types of gases.

2 Normative references

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

GB/T 13005 Terminology of gas cylinders

GB/T 16163 Classification of gases filled in cylinder

3 Terms, definitions, and symbols

3.1 Terms and definitions

For the purpose of this document, the terms and definitions defined in GB/T 13005 and the following apply.

3.1.1

pressure relief device; PRD

General name for the pressure relief device installed on the cylinder, to enable the gas cylinder to discharge gas and release pressure quickly and automatically under unexpected high temperature conditions, to protect the cylinder shell from explosion.

3.1.2

minimum flow capacity for safety

4 Types and structural types of pressure relief devices

4.1 Fusible plug device

It is composed of a fusible plug and a plug boss. The plug boss is connected to the cylinder shell or valve body. When the temperature reaches a predetermined value, the fusible alloy melts and the gas is discharged.

4.2 Bursting disc device

It is composed of a bursting diaphragm, a clamping ring, and fasteners (for non-refillable welded cylinders, the diaphragm can be directly welded to the opening of the cylinder shell). When the gas pressure in the cylinder reaches a predetermined value, the diaphragm ruptures and the gas in the cylinder is discharged automatically.

4.3 Safety valve

A pressure control device that can be opened and closed repeatedly, composed of a valve boss, a valve disc, and a spring. When the gas pressure in the cylinder reaches a predetermined value, the valve disc pressed by the spring leaves the valve boss and the gas in the cylinder is discharged. After the pressure drops to a predetermined value, the valve disc closes again.

4.4 Bursting disc - fusible plug composite device

A safety pressure relief device composed of a bursting disc and a fusible plug connected in series. The fusible plug is set on the discharge side of the bursting disc. When the bursting disc pressure reaches the predetermined burst pressure and the ambient temperature also reaches the predetermined value, the composite device discharges gas and releases pressure.

4.5 Bursting disc - safety valve composite device

A pressure relief device composed of a bursting disc and a safety valve connected in series. When the gas pressure in the cylinder reaches a predetermined value, the bursting disc breaks first, and the discharged gas causes the safety valve to open, and the high-pressure gas is automatically discharged.

5 Principles for setting up pressure relief devices for gas cylinders

5.1 The following gas cylinders shall be equipped with pressure relief devices:

a) cylinders for on-board storage of fuel for automotive vehicle;

b) gas cylinders for fire extinguishers;

c) gas cylinders for respirators;

d) dissolve acetylene cylinders;

e) industrial combustible gas cylinders;

f) welded insulated gas cylinders containing cryogenic liquefied gases;

g) cluster gas cylinder groups containing liquefied gas;

h) large-capacity gas cylinders for long-tube trailers and tube-type containers.

5.2 Gas cylinders containing highly toxic gases (the second digit of the FTSC code in GB/T 16163 is "3") and self-igniting gases are prohibited from installing pressure relief devices. Liquid chlorine cylinders do not need to be equipped with pressure relief devices.

5.3 Non-industrial liquefied petroleum gas cylinders are not equipped with pressure relief devices.

5.4 Whether gas cylinders other than those specified in 5.1, 5.2, and 5.3 shall be equipped with pressure relief devices shall be agreed upon between the user and manufacturer of the gas cylinder.

6 Principles for selection of pressure relief devices

6.1 Gas cylinders containing toxic gases (the second digit of the FTSC code in GB/T 16163 is "2") shall not be equipped with a safety valve separately; gas cylinders containing low-pressure toxic gases may be equipped with a fusible plug device; gas cylinders containing high-pressure toxic gases should not be equipped with a fusible plug device separately, but a bursting disc - fusible plug composite device shall be used.

6.2 Gas cylinders containing flammable and combustible gases (the first digit of the FTSC code in GB/T 16163 is "2") should be equipped with a safety valve or a composite device with a safety valve.

6.3 Gas cylinders containing flammable gases that are prone to decomposition or polymerization (the first digit of the FTSC code in GB/T 16163 is "5") should be equipped with a fusible plug device.

6.4 Welded insulated gas cylinders containing cryogenic liquefied gases shall be equipped with two pressure relief devices. The bursting disc is used to prevent the cylinder shell (liner) from bursting due to the pressure increase caused by high temperature in a fire environment; and the safety valve is used to prevent the pressure

increase explosion caused by the complete failure of the thermal insulation performance of the gas cylinder.

7 Basic requirements for pressure relief devices

7.1 Requirements for design and structure of pressure relief devices

7.1.1 The structure of devices shall be suitable for the use environment and conditions.

7.1.2 The setting of devices shall not hinder the normal use and transportation of gas cylinders.

7.1.3 The gas discharging reaction force during the operation of devices will not cause adverse effects.

7.1.4 For gas cylinders containing flammable gases, the structure and installation of devices shall be such that the exhausted gas is discharged directly to the atmospheric space without being blocked or impacted on other equipment.

7.1.5 The devices shall have good sealing performance under normal use conditions.

7.2 Requirements for materials of pressure relief devices

7.2.1 For materials from which parts are made, the chemical composition and physical properties shall be uniform.

7.2.2 For components or parts that may come into contact with the medium in the cylinder, the materials and media shall have good compatibility and corrosion resistance.

7.2.3 Bursting discs shall be made of pure metal sheets (nickel, copper) or alloy sheets (such as nickel-chromium stainless steel, brass, bronze, etc.) with uniform texture.

7.2.4 The fusible alloy used for fusible plugs shall be eutectic alloys. The initial melting temperature, final melting temperature, and gravity flow temperature of the alloy shall be completely consistent.

7.3 Requirements for installation locations of pressure relief devices

7.3.1 The pressure relief device of seamless gas cylinders shall be installed on the cylinder valve.

7.3.2 The pressure relief device of welded gas cylinders can be installed on the cylinder valve, or can be installed separately on the valve boss or head of the gas cylinder.

7.3.3 The pressure relief device of non-refillable welded steel cylinders can be installed on the cylinder valve, and the bursting disc is also allowed to be directly welded to the opening of the gas cylinder head.

special requirements, it shall be agreed upon between the manufacturer and user of the gas cylinder.

9.1.3 For bursting disc devices used in non-refillable gas cylinders, the calibrated burst pressure shall not exceed 130 % of the test pressure of the gas cylinder, nor shall it be lower than 117 %.

9.2 The requirements for safety valves shall meet the following requirements:

9.2.1 The set pressure (opening pressure) of safety valves shall not be less than 75 % of the hydraulic test pressure of the gas cylinder, nor shall it be greater than 100 % of the hydraulic test pressure; if there are other provisions in the gas cylinder product standards, those provisions shall prevail.

9.2.2 The rated discharge pressure of safety valves shall not exceed the hydraulic test pressure of the gas cylinder, and the return pressure shall not be less than the temperature rise pressure of the gas cylinder at the maximum operating temperature.

9.3 For fusible plugs or fusible alloy used in bursting disc - fusible plug composite devices, the operating temperature is specified by the gas cylinder product standards.

10 Installation and maintenance of pressure relief devices

10.1 There must be no stop valve installed between the gas cylinder pressure relief device and the gas cylinder, nor on the outlet side of the device, nor any other parts that may hinder the normal operation of the device.

10.2 When using gas cylinders, the pressure relief device shall be kept in good condition. It shall prevent the device from being corroded or blocked by sand, paint, or dirt, causing it to malfunction.

10.3 Before filling a gas cylinder, the operator shall carefully check whether the pressure relief device is corroded, damaged, blocked, or have other external defects; check whether the fusible plug is loose, dislodged, or leaking. Gas cylinders that are found to have serious defects in the pressure relief device and cannot operate normally shall not be filled with gas.

10.4 Safety valves on gas cylinders shall be cleaned, inspected, and calibrated regularly. Bursting disc devices (or bursting discs) shall be replaced regularly. The service life of bursting discs is determined by the manufacturer, but it shall not exceed the periodic inspection cycle of the gas cylinder.

10.5 Non-professionals are not allowed to modify or change the pressure relief device on gas cylinders at will, including adjusting the spring of the safety valve, replacing or changing the bursting disc on the bursting disc device (the entire assembled bursting disc device shall be replaced as a set).

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