



Cylinder Pressure-Relief Devices

钢瓶减压装置

General

概述

Pressure-relief devices are installed on most cylinders to prevent the rupture of a normally pressurized cylinder when it is inadvertently exposed to fire or high temperatures. There are many types of pressure-relief devices; each has a designated use. Types of pressure-relief device designs include fusible plugs, rupture disks, rupture disks with fusible metal backing, and spring-loaded relief valves.

大多数钢瓶上安装有减压装置，以防止当无意中暴露于火或高压时正常加压的钢瓶破裂。减压装置有许多种类型；每种都有指定的用途。减压装置的设计类型包括易熔塞、破裂盘、带易熔金属衬里的破碎盘和弹簧减压阀。

This Safetygram identifies the pressure-relief devices used to provide cylinder protection for various compressed gases. The specific pressure-relief device designated for a compressed gas cylinder depends on many factors, including the type of gas, the Department of Transportation (DOT) rated service, test pressures of the cylinder, and the cylinder size.

本安全程序鉴别为各种压缩气体提供钢瓶保护的减压装置。指定用于一种压缩气体钢瓶的专门减压装置取决于许多因素，包括气体类型、交通部（DOT）额定的寿命、钢瓶的测试压力和钢瓶大小。

The Compressed Gas Association (CGA) lists the pressure-relief devices to be used on specific products in their Pamphlet S-1.1 "Pressure-Relief Device Standards Part 1: Cylinders for Compressed Gases." DOT regulations require compliance with this document for the selection and use of pressure-relief devices to be used on compressed gas cylinders.

在他们的手册S-1.1“减压装置标准第一部分：用于压缩气体的钢瓶”中列出了用于专门产品的减压装置。对于用于压缩气体钢瓶的减压装置的选择和使用，DOT的规范要求同这个文件相一致。

CAUTION: Pressure-relief devices do not permit the user to exercise any less care in following proper handling, use, and storage procedures for cylinders.

警告：减压装置不允许用户在遵守正确的钢瓶操作、使用和储存程序方面有任何的掉以轻心。

Types of Cylinder Pressure-Relief Devices

钢瓶减压装置的类型

The CGA has identified several types of pressure-relief devices: 压缩气体协会已经鉴定了减压装置的几种类型：

Type CG-1: The Rupture Disk Device

CG-1型：破裂盘装置



A rupture disk device is a nonreclosing pressure-relief device actuated by static pressure and designed to function by the bursting of a pressure-containing disk. The disk is the operating part of the device. It is a flat disk, typically made of metal, designed to a specification that will allow it to burst at a predetermined pressure to permit the release of gas. Rupture disks relieve overpressure in cylinders that may result from an external fire or from overfilling. The burst pressure of rupture disks may not exceed the minimum DOT-required test pressure of the cylinder, which is generally 5/3 of the cylinder service pressure. Some exceptions to this rule are:

破裂盘装置是一个非重闭减压装置，它由静压力启动，通过容压盘的破裂发挥作用。破裂盘是装置中的工作部件。它是一个平坦的盘子，多数用金属制成，设计得允许它在预定的压力下破裂，从而让气体释放。破裂盘释放钢瓶内可能源于外部着火或过量灌装的过多的压力。破裂盘的破裂压力不能超过DOT要求的钢瓶的最小测试压力，该压力一般是钢瓶工作压力的5/3。这个规定的一些例外是：

- The burst pressure must not exceed 4500 psig for DOT-3E or CTC-3E specification cylinders. 对于DOT-3E或CTC-3E规格钢瓶，破裂压力不能超过4500 psig。

- The burst pressure must not be less than 105% of the cylinder test pressure or greater than 80% of the minimum burst pressure for DOT-39 cylinders. 对于DOT-39钢瓶，破裂压力不能小于钢瓶测试压力的105%，或者大于最小破裂压力的80%。

The pressure rating of the disk is typically stamped onto the face of the device. 破裂盘的额定压力一般印在装置的正面。

Type CG-2: Fusible Plug Device Rated at 165°F

CG-2型：额定在165°F的易熔塞装置

The fusible plug device is a nonreclosing pressure relief device designed to function by the yielding or melting of a plug of fusible metal. The type CG-2 plugs use an alloy that yields at a temperature not exceeding 170°F, nor less than 157°F (165°F nominal). These devices are not suitable for service pressures exceeding 500 psig. Pressures above 500 psig may cause the fusible alloy to extrude and eventually release the product.

易熔塞装置是一个非重闭减压装置，通过易熔金属制成的塞子的变形或熔化发挥作用。CG-2型塞子使用一种合金，该合金在不超过170°F和不少于157°F (标称值165°F) 的温度时变形。这些装置不适用于超过500 psig的工作压力。500 psig以上的压力会使易熔合金变形和最终释放出产品。

Failures from excess pressure are time- and pressure-dependent. These devices cannot be relied upon to protect from over pressurization at temperatures below their melting point.

过大压力导致的失效同时间和压力有关。在温度低于它们的熔点时，不能依赖它们来防止过压。

They are designed to protect the cylinder from over pressurization caused by exposure to excessive heat only. In the event a cylinder is exposed to fire or other sources of excess heat, the fusible plug is designed to melt and release the cylinder contents. This prevents product within the cylinder from creating excessively high pressures, caused by high external temperatures, and rupturing the cylinder. The plugs may use one of several designs to hold the fusible alloy in place. (See Fig. 2.)



The temperature rating of the fusible metal is stamped into the face of the device. 它们只能防止仅仅由于接触过多的热量导致的钢瓶过压。在钢瓶暴露于火或其它的过热源的情况下，易熔塞熔化，钢瓶释放出内容物。这就防止了钢瓶内的产品由于外界的高温产生过高的压力和钢瓶破裂。塞子可以采用几种设计中的一种，把易熔合金置于适当的位置。易熔金属的额定温度印在装置的正面。

Type CG-3: Fusible Plug Device Rated at 212°F

CG-3型：额定在212°F的易熔塞装置

This device is similar to the CG-2 pressure-relief device except that it uses a fusible metal with a higher melting temperature. The CG-3 device uses a fusible alloy with a melting point not exceeding 220°F, nor less than 208°F (212°F nominal). This device is most commonly found on acetylene cylinders.

除了采用一种熔点更高的易熔合金之外，这个装置同CG-2型减压装置相似。CG-3型减压装置使用熔点不超过220°F和不小于208°F (标称值212°F)的易熔合金。它一般用于乙炔钢瓶。

Type CG-4: Combination Rupture Disk/Fusible Alloy Rated at 165°F

CG-4型：额定在165°F的破裂盘 / 易熔合金组合减压装置

The CG-4 consists of a rupture disk backed by a fusible plug on the atmospheric side of the disk. The burst pressure of the disk must not exceed the minimum DOT required test pressure of the cylinder (except as noted under Type CG-1); the fusible metal must yield between 157-170°F (165°F nominal).

CG-4由破裂盘和在其靠空气一端的易熔塞组成。破裂压力不能超过DOT要求的钢瓶的最小测试压力（除了在CG-1型那一节注明的）；易熔金属在157到170°F (标称165°F)之间变形。

The combination pressure-relief device provides protection against cylinder rupture caused by fire or high temperatures. If a fire occurs, the fusible metal yields or melts and cylinder overpressure caused by the heated gas is relieved by the bursting of the rupture disk. Both the pressure and temperature requirements of the device must be satisfied before the device can function.

组合减压装置防止了火或高温造成的钢瓶破裂。如果起火，易熔金属变形或熔化；通过破裂盘的破裂释放由被加热的气体造成的过压。在减压装置能发挥作用之前，必须满足装置的压力和温度要求。

This device will not protect a cylinder from over pressurization if the fusible alloy is not heated to its yield temperature. The fusible alloy will prevent the disk from rupture if it remains in place. The fusible metal prevents premature rupture disk failure from momentary over pressurization and also protects the disk from external corrosion which could cause premature failure of the rupture disk.

如果易熔合金没有被加热到它的变形温度，这个装置无法对钢瓶过压加以保护。如果易熔合金保持在适当的位置，它将防止破裂盘破裂。易熔金属防止了由于瞬间过压造成的破裂盘的过早失效。它还防止了导致破裂盘的过早失效的外部侵蚀。

The face of these devices is marked with the burst pressure rating of the disk and the yield temperature of the fusible alloy.

这些装置的正面标记着盘的破裂额定压力和易熔合金的变形温度。

Type CG-5 Combination Rupture Disk /Fusible Alloy Rated at 212°F

CG-5型：额定在212°F的破裂盘 / 易熔合金组合减压装置

This device is the same as the CG-4 pressure-relief device except that it uses a fusible metal with a higher melting temperature. The CG-5 device uses a fusible alloy with a melting point not exceeding 220°F, nor less than 208°F (212°F nominal).

除了采用一种熔点更高的易熔合金之外，这个装置同CG-4型减压装置一样。CG-5型减压装置使用熔点不超过220°F和不小于208°F (标称值212°F)的易熔合金。

Type CG-7: Pressure-Relief Valve

CG-7型：减压阀

Pressure-relief valves are spring-loaded valves that are normally closed. When the cylinder pressure exceeds the pressure setting of the spring in the relief valve, the valve opens and begins discharging the cylinder contents. Once the cylinder pressure decreases to the relief valve's pressure setting, the valve will normally reseal—without leakage—after venting sufficient gas to control the internal cylinder pressure. The pressure setting of the pressure-relief valve must not be less than 75%, nor more than 100% of the minimum test pressure of the cylinder. The reseating pressure must not be less than the pressure in a normally charged cylinder at 130°F.

减压阀是内装弹簧的阀门，一般是封闭的。当钢瓶压力超过减压阀内弹簧的压力设定值时，阀门开启，开始释放钢瓶内容物。一旦钢瓶压力下降到减压阀的压力设定值，在排放了足够的气体来控制钢瓶内部压力之后，正常情况下阀门会重新关闭——没有泄漏。减压阀的压力设定值不能小于钢瓶的最小测试压力的75%，也不能大于它的100%。重新关闭时的压力不能小于130°F时钢瓶内的正常压力。

An exception is the relief valve on DOT-39 cylinders. With these, the set pressure must not exceed 80% of the minimum burst pressure of the cylinder and must not be less than 105% of the cylinder test pressure.

DOT-39钢瓶上的减压阀是一个例外。对于这些钢瓶，压力设定值不能超过最小破裂压力的80%，也不能小于钢瓶测试压力的105%。

Cylinder Pressure-Relief Devices for Several Gases

用于几种气体的钢瓶减压装置

Cylinder pressure-relief devices for several common industrial gases are described below. For information about relief devices on other gas cylinders, consult your supplier.

下面描述用于几种普通工业气体的钢瓶减压装置。要得到关于其它气体钢瓶上的减压装置的资料，请咨询你的供应商。

Air, Argon, Helium, Nitrogen, Oxygen

空气、氩、氦、氮、氧

These gases are nonflammable and stored in cylinders as high-pressure gases. The pressure-relief device used on these gas cylinders is normally Type CG-1.

这些气体是不可燃的，作为高压气体储存在钢瓶里。用于这些气体钢瓶的减压装置一般是CG-1



型。

Carbon Dioxide, Nitrous Oxide

二氧化碳、一氧化二氮

These products are nonflammable and are stored in cylinders as liquefied compressed gases. Cylinders are normally protected by Type CG-1 pressure-relief devices. Small medical cylinders with post-type valves maybe protected by Type CG-1 rupture disks or by Type CG-4 combination rupture disk/fusible plug relief devices.

这些产品是不可燃的，作为液化压缩气体储存在钢瓶里。一般用CG-1型减压装置保护钢瓶。采用CG-1型破裂盘或CG-4型组合破裂盘/易熔塞减压装置保护使用柱型阀门的小的医用钢瓶。

Hydrogen

氢气

Hydrogen is flammable and stored in cylinders as a high-pressure gas. Cylinders under 65" long must be equipped with rupture disk/fusible alloy Type CG-4 or Type CG-5 devices. Cylinders greater than 65" in length and 9 5/8" in diameter must be equipped with Type CG-4, Type CG-5, or Type CG-1 rupture-disk devices. Cylinders over 65" in length and 22" in diameter must use Type CG-1 rupture disk devices.

氢是易燃的，作为高压气体储存在钢瓶里。长度小于65英尺的钢瓶必须配备破裂盘/易熔塞CG-4型或CG-5型减压装置。长度大于65英尺、直径大于9 5/8英尺的钢瓶必须配备CG-4型、CG-5型或CG-1型破裂盘装置。长度大于65英尺、直径大于22英尺的钢瓶必须使用CG-1型破裂盘装置。

Propane

丙烷

Propane are flammable. They are stored in cylinders as liquefied compressed gases. Cylinders containing these products are usually protected by Type CG-7 spring-loaded, pressure-relief valves. A Type CG-3 212°F fusible metal plug may be used, but only when in combination with the Type CG-7 pressure-relief valve.

丙烷气体是易燃的。它们作为液化压缩气体储存在钢瓶里。通常用CG-7型弹簧减压阀来保护装有这些产品的钢瓶。CG-3 212°F型易熔塞也可以用，但只能和CG-7型减压阀组合使用。

Acetylene

乙炔

Acetylene is a flammable gas stored in cylinders as a dissolved gas. The cylinders are filled with a porous material saturated with a solvent, usually acetone. The acetylene dissolves into the solvent as it is placed into the cylinder. These cylinders are protected by Type CG-3 fusible metal plugs with a nominal yield temperature of 212°F. The devices are usually an integral part of the cylinder rather than being installed in the cylinder valve. Some small acetylene cylinders, Type B or MC size cylinders, are equipped with fusible plugs in the valve body.

乙炔是易燃的，作为溶解气体储存在钢瓶里。钢瓶内填充着充满了浸透了溶剂，通常是丙酮的多孔渗水材料。当置于钢瓶中时，乙炔是溶解在溶剂里的。用标称变形温度212°F的CG-3型易熔金属塞保护这些钢瓶。通常减压装置是钢瓶整体的一部分，而不是安装在钢瓶阀门上。一些小的



乙炔钢瓶，B型或MC型钢瓶，在阀体里配备着易熔塞

Medical Gas Cylinders with Post-Type Valves

带有柱型阀门的医用气体钢瓶

Post-type valves on small medical cylinders are generally equipped with Type CG-4 rupture disks with 165°F fusible metal backing. Carbon dioxide and nitrous oxide cylinders may be equipped with the CG-4 or the CG-1 devices.

在小的医用钢瓶上的柱型阀门一般配备带有165°F 易熔金属衬里的CG-4型破裂盘。二氧化碳和一氧化二氮钢瓶可以配备CG-4或CG-1型减压装置。

Safety Considerations

对安全的考虑

Cylinder pressure-relief devices must be maintained in proper operating condition to function correctly.

必须把钢瓶减压装置维持在正常工作状态，以便正确发挥作用。

- **NEVER** tamper with pressure-relief devices in valves or cylinders. **禁止**堵塞阀门或钢瓶的减压装置。

- Only qualified gas supplier personnel should service pressure-relief devices. 只有经过认定的气体供应商的员工才能维修减压装置。

- Care should be taken when handling and storing cylinders to prevent damage to the pressure-relief devices.

操作和储存钢瓶时必须十分小心，防止损伤减压装置。

- Do not obstruct any pressure-relief device. Dirt, paint, corrosion, or other materials prevent pressure-relief devices from functioning properly.

禁止阻塞任何减压装置。污垢、油漆、腐蚀物或其它材料阻止减压装置完全发挥作用。

- If any obstruction, deformation, or extrusion of fusible metal is observed in a pressure-relief device, notify the supplier. The cylinder should be removed from service immediately and appropriate action arranged through the supplier.

如果在减压装置上观察到易熔金属的任何阻塞、变形或突起，通知供应商。立刻把钢瓶从设施上移走，通过供应商安排合适的行动。

- Any problem with pressure-relief devices should be immediately reported to your supplier. 应该立刻把减压装置的任何问题报告给你的供应商。