



COMPRESSED GAS ASSOCIATION, INC.

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TECHNICAL BULLETIN

4221 WALNEY ROAD, 5TH FLOOR
CHANTILLY, VA 20151
703-788-2700
cga@cganet.com

CORRECT ASSEMBLIES AND INSTALLATION OF RUPTURE DISK AND FUSIBLE PLUG TYPE PRESSURE RELIEF DEVICES

DANGER: *Installation of the wrong type rupture disk or fusible plug, or using multiple disks can cause severe property damage, personal injury, and loss of life.*

This technical bulletin illustrates and describes the correct assemblies and installation of rupture disk, fusible plug and combination-type pressure relief devices for compressed gas cylinders. It does not provide application requirements or assignments for the various types of devices. For application requirements and assignments for various types of devices, refer to CGA S-1.1, *Pressure Relief Devices Standards—Part 1—Cylinders for Compressed Gases* and CGA S-7, *Method for Selecting Pressure Relief Devices for Compressed Gas Mixtures in Cylinders* [1, 2].

Rupture disk-type devices

Figures 1-6 illustrate typical rupture disk-type pressure relief devices, which function on pressure and are described below.

NOTE—Use only original manufacturer's parts or assemblies in the repair or replacement of rupture disk devices.

Figures 1 and 2 illustrate typical cap-type rupture disk devices in which the rupture disk holder is in the form of an internally threaded cap that threads onto the cylinder or valve and is attached to the cylinder. The exploded view illustrates the proper sequence of rupture disk and gasket seal in relation to the rupture disk holder.

Figure 3 represents a factory assembled cap type in which the gasket seal is staked in place to keep the components correctly assembled until attached to a cylinder or cylinder valve.

Figures 4, 5, and 6 illustrate typical plug-type rupture disk devices in which the rupture disk holder is in the form of an externally threaded plug that could be threaded directly into the cylinder but normally is threaded into the valve. The orifice edge in these figures may be sharp or radius.

NOTE—The gasket seal, when required, is always located between the rupture disk and the valve body regardless whether the device is a cap or plug design.

Figure 5 illustrates a factory assembled plug-type device in which the gasket seal is swaged over the rupture disk holder, thus capturing the disk in place to keep the components correctly assembled until attached to a cylinder or cylinder valve.

Figure 6 illustrates a design in which the cup-shaped rupture disk is attached to the rupture disk holder by friction. In some cases a gasket seal may be required by the manufacturer.

Combination-type devices

Figure 7 illustrates a combination-type pressure relief device that contains a rupture disk with a fusible metal backing and generally requires both excessive temperature and pressure to function. It is similar to Figures 1, 2, and 3 except for factory added fuse metal. A combination device in an externally threaded disk holder (similar to Figures 4, 5, and 6) is also required for certain gas applications. (Not specifically illustrated.)

For pressure relief devices that contain a rupture disk it is very important to note the following:

1. The shape of the orifice edge:
 - Figure 1 illustrates a radius edge orifice designed for rupture of the disk in tension (also seen in Figure 3); and
 - Figure 2 illustrates a sharp edge orifice designed for rupture of the disk in shear.
2. Components of devices designed to rupture in shear are very similar in appearance to those designed to rupture in tension, but are not interchangeable because they have completely different modes of actuation.
3. If components are inadvertently interchanged (for example, a disk designed to rupture in shear is installed in a holder designed to accommodate a disk designed to rupture in tension) a serious incident could result that could lead to loss of life due to the significant increase in rupture pressure of the disk. Conversely, if a disk designed to rupture in tension is installed in a holder designed to accommodate a disk designed to rupture in shear, premature rupture could occur with complete loss of contents due to the significant reduction in rupture pressure of the disk.
4. Pressure relief devices designed to rupture in shear or designed to rupture in tension cannot be readily distinguished in the field.
5. Combination devices are virtually the same as the nonbacked variety except for the factory added fuse metal and the markings on the devices. Therefore, the same cautions apply regarding the potential for inadvertent interchange of the rupture components.
6. Combination-type devices require sufficient heat to function properly, and they do not offer protection against overpressurization by improper charging practices.
7. The user is cautioned:
 - Never use more than one disk;
 - Install device using original manufacturer's parts;
 - Install device using factory recommended torque;
 - Device should only be replaced as a factory assembled unit when available;
 - Do not attempt to add or use a fusible metal backing with a rupture disk device unless it is specifically designed and approved for the intended application; and
 - Components of combination-type devices shall not be repaired.

Fuse plug-type relief devices

Figures 8-12 illustrate typical fuse plug-type pressure relief devices. The manufacturer adds the fuse metal to the center of the cavity. In each design, the shape of the cavity not only serves to anchor the fuse metal to the fuse plug body, but also serves to resist extrusion of the fuse metal when exposed to cylinder pressure. These designs primarily function at marked temperatures of 165 °F, 212 °F, and 217 °F.

For fuse plug-type pressure relief devices it is important to note the following:

1. Fuse plug-type pressure relief devices are generally limited to cylinder or product pressure up to 500 psig except the type in illustration Figure 12, which may be used up to 6000 psig and are marked with the maximum service pressure with which they are to be used.
2. Sufficient heat is required for these devices to function properly and therefore, they do not offer protection against overpressurization by improper charging practices.
3. The user is cautioned:
 - Install fuse plug devices to industry or factory recommended torque;