

TECHNICAL BULLETIN

RECOMMENDATIONS FOR CG-7 PRESSURE RELIEF VALVES USED IN PROPYLENE SERVICE

Introduction

Pressure relief devices (PRDs) have been used successfully for more than 75 years by the compressed gas industry to relieve excess pressure from compressed gas and liquefied gas cylinders. Propylene cylinders are equipped with a CG-7 pressure relief valve (PRV), a type of PRD designed to limit the pressure in the cylinder. It may be attached directly to the cylinder or be an integral part of the cylinder valve. CG-7 PRVs operate in a prescribed pressure range determined by the service pressure of the cylinder. Propylene is typically packaged in a cylinder with a minimum service pressure of 260 psi (18 bar).

NOTE—Requirements to determine a cylinder's marked service pressure in the United States are found in Title 49 of the U.S. Code of Federal Regulation (49 CFR), Part 173.301(a)(8), and in Canada in CSA B340, *Selection and Use of Cylinders, Spheres, Tubes, and Other Containers for the Transportation of Dangerous Goods, Class 2*, Section 5.3.1.1 [1, 2].

At the request of the U.S. Chemical Safety and Hazard Investigation Board, the Compressed Gas Association, Inc. (CGA) has reviewed the use of CG-7 PRVs on cylinders in propylene service.

Scope

The intent of this technical bulletin is to raise awareness within the compressed gas industry of the potential for the discharge of propylene from a CG-7 PRV if the 260 psi (18 bar) service pressure propylene cylinder and contents are exposed to elevated temperatures. This technical bulletin addresses CG-7 PRVs attached directly to the cylinder or as an integral part of the cylinder valve when used in propylene service and includes recommendations and requirements for the PRV start-to-discharge pressure for a 260 psi (18 bar) service pressure cylinder, seat materials, inspection and maintenance, activation indicators, and markings.

This technical bulletin does not address PRV requirements for DOT-39 and TC-39M cylinders. It is beyond the scope of this technical bulletin to present detailed information on the storage, handling, and maintenance of the overall propylene cylinder package.

Background

The CG-7 PRV is a spring-loaded valve where the closing force exerted by the spring in the valve exceeds the force exerted by the cylinder's internal pressure. It is designed to open when the cylinder pressure exceeds the CG-7 PRV's start-to-discharge pressure. The PRV opens and discharges product with the intent to limit excessive pressure in the cylinder. As the cylinder's internal pressure decreases sufficiently, the spring forces the PRV closed. Subsequent start-to-discharge and resealing/reseating pressure values may differ from the initial start-to-discharge and resealing/reseating pressure values set by the manufacturer.

When propylene was packaged in 260 psi (18 bar) service pressure cylinders, the CG-7 PRV start-to-discharge pressure range was 390 psi to 520 psi (27 bar to 36 bar) in accordance with the thirteenth edition of [CGA S-1.1, Pressure Relief Device Standards—Part 1—Cylinders for Compressed Gases](#) [3]. Historically, these PRVs or cylinder valves having an integral CG-7 PRV could have been marked using one (or more) of the following designations:

- 405 psi;
- 260 Service Pressure; or
- PROPYLENE.

The CG-7 PRV has a limited service lifetime and the device shall be replaced or requalified in accordance with [CGA S-1.1](#), section 9.1.1 [4].

Start-to-discharge pressure

For CG-7 PRVs used on 260 psi (18 bar) service pressure propylene cylinders, the permitted range for the start-to-discharge pressure shall be a range of 435 psi to 520 psi (30 bar to 36 bar). The internal pressure of these cylinders normally does not exceed the previous minimum start-to-discharge pressure of 390 psi (27 bar) when filled, stored, and handled. However, the change of the lower value from 390 psi to 435 psi (27 bar to 30 bar) provides an increase in the pressure differential relationship between the vapor pressure of propylene and the lower end of the start-to-discharge pressure range. The increased pressure differential then became similar to the pressure differential between the vapor pressure of propane (packaged in a 240 psi (16 bar) service pressure cylinder) and the lower end of the start-to-discharge pressure range for the CG-7 PRV for propane service. The flow capacity of the CG-7 PRV remains unchanged. See [CGA S-1.1](#) [4].

Seat materials

Seat materials used in the construction of the CG-7 PRV shall be compatible with propylene. Materials that are not compatible with propylene can result in a malfunction or failure of the CG-7 PRV to open when needed or to leak prematurely at pressures below the start-to-discharge pressure. Seat materials for propylene service shall be tested and approved in accordance with UL 132, *Standard for Safety Relief Valves for Anhydrous Ammonia and LP-Gas* [5].

Inspection and maintenance

The CG-7 PRV shall be inspected and checked for leaks prior to each cylinder fill. If the device exhibits evidence of tampering or has any defects such as visible dirt, bugs, corrosion, paint, or other foreign material, which could interfere with its function, the PRV shall be replaced.

If it is suspected that the PRV has been activated due to the cylinder's exposure to a fire, excessive heat, or other circumstances, the PRV should be replaced with a new or requalified valve in accordance with [CGA S-1.1](#) [4].

Activation indicators

Generally, CG-7 PRVs are not equipped with devices designed to indicate that the PRV has activated. PRVs on valves or directly installed in cylinders could contain protective coverings supplied as dust caps that may have been used to indicate that PRV activation has occurred. Not all protective coverings indicate a release in every instance and could interfere with leak detection or proper functioning of the CG-7 PRV.

In light of the recommendation to increase the minimum start-to-discharge pressure from 390 psi to 435 psi (27 bar to 30 bar), CGA does not recommend that an activation indicator be provided on CG-7 PRVs used on 260 psi (18 bar) service pressure cylinders in propylene service. However, CGA does not prohibit activation indicators for CG-7 PRVs. If activation indicators are used, they shall be designed to permit the PRV to function as prescribed in [CGA S-1.1](#) and allow the detection of leakage [1].

Markings

CG-7 PRVs manufactured after January 1, 2008, comply with recommendations and requirements of this technical bulletin and are marked with the number indicating the lower limit of the start-to-discharge pressure range followed by TB27. For example, a CG-7 PRV with a start-to-discharge pressure range of 435 psi to 520 psi (30 bar to 36 bar) is marked "435 TB27".

References

Unless otherwise specified, the latest edition shall apply.

[1] U.S. *Code of Federal Regulations*, Title 49 (Transportation) Parts 100-180, Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20401. www.gpo.gov