CGA S-1.1—2019

PRESSURE RELIEF DEVICE STANDARDS—PART 1—CYLINDERS FOR COMPRESSED GASES

FIFTEENTH EDITION

CGA
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The Standard For Safety Since 1913

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Work Item 16-003
Cylinder Valve Committee

NOTE—Technical changes from the previous edition are underlined.

NOTE—Appendices A and B (Normative) are requirements.

FOREWORD

On April 16, 1981, the United States Department of Transportation promulgated new regulations to 49 CFR 173.34(d), which eliminated the need for pressure relief device approval by the Bureau of Explosives of the Association of American Railroads. It now becomes the responsibility of the individual manufacturer or shipper to conduct his own flow and/or fire tests on new pressure relief device combinations to show compliance with CGA S-1.1, CGA C-12, and CGA C-14 as applicable, and to retain test records of the compliance.

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1 Introduction and scope

This standard represents the minimum requirements for pressure relief devices (PRDs) considered to be appropriate and adequate for use on cylinders with a water capacity less than or equal to 1000 lb (454 kg) of water. Refer also to Title 49 of the U.S. *Code of Federal Regulations* (49 CFR), CSA B340, *Selection and use of cylinders, spheres, tubes, and other containers for the transportation of dangerous goods, Class 2*, or CSA B342, *Selection and use of UN pressure receptacles and multiple-element gas containers for the transport of dangerous goods, Class 2* [1, 2, 3].[1] This standard also applies to DOT-3AX, DOT-3AAX, and DOT-3T cylinders with a water capacity greater than 1000 lb (454 kg) of water as well as United Nations (UN) pressure receptacles with a water capacity up to 3000 kg of water, and which comply with the design specifications and charging (filling) and maintenance regulations of the U.S. Department of Transportation (DOT) or the corresponding specifications and regulations of Transport Canada (TC) [1, 4].

This standard does not cover PRD requirements for CTC/DOT-4L and TC-4LM insulated cylinders containing cryogenic liquids, see CGA S-1.2, *Pressure Relief Device Standards—Part 2—Portable Containers for Compressed Gases* [5]. This standard does not cover PRD requirements for multi-unit tank car tanks (DOT106A/TC106A and DOT110A-W/TC110A), see 49 CFR 179.300-15 and CGSB 43.147, *Construction, Modification, Qualification, Maintenance, and Selection and Use of Means of Containment for the Handling, Offering for Transport, or Transporting of Dangerous Goods by Rail*, as appropriate [1, 6].

This standard includes tables that provide information pertaining to PRDs. Table 1 contains information on the different types of PRDs. Table 2 provides a list of gases and their PRD assignments. Table 3 contains temperature correction factors. Table 4 includes values for basic orifice factors flange taps for flow in ft^3/minute.

When cylinders that conform to the specification requirements of DOT or TC but are used in services beyond the jurisdiction of any of these authorities, it is recommended that the state, provincial/territorial, local, or other authorities having jurisdiction (AHJ) over these cylinders be guided by this standard in determining PRD requirements provided that the cylinders are charged and maintained in accordance with DOT or TC regulations.

It is further recognized that there can be cylinders that are used in services beyond the jurisdiction of DOT or TC that do not conform to the specification requirements of either authority. The AHJ over such cylinders should be guided by this standard in determining PRD requirements provided that such cylinders are considered by the authority as having a construction at least equal to the equivalent DOT or TC specification requirements and they are charged and maintained in accordance with DOT or TC requirements.

A number of states, provinces/territories, cities, and other local regulatory authorities have pressure vessel laws and regulations that include requirements for PRDs. This standard is prepared specifically for compressed gas cylinders, and the PRDs may not be acceptable unless special permission is obtained from the AHJ. For cylinders that come within the jurisdiction of state, provincial/territorial, and local regulatory authorities, the user should check for compliance with all such regulations.

For newly constructed cylinders that come within the jurisdiction of DOT or TC, PRDs shall comply with requirements of this standard. The intent of this standard is to minimize the number and optimize the types of approved PRDs specified for each specific gas. This standard does not prohibit the continued use of previously approved and installed devices unless stated otherwise in Table 2, 49 CFR, CSA B340, and/or CSA B342 [1, 2, 3]. However, if a PRD is replaced, the new device shall meet the requirements of this standard.

It is the filler's responsibility to ensure that the PRD is correct.

For PRD standards for bulk transport containers and stationary storage containers, see CGA S-1.2 and CGA S-1.3, *Pressure Relief Device Standards—Part 3—Stationary Storage Containers for Compressed Gases* [5, 7].

2 Definitions

For the purpose of this publication, the following definitions apply.

[1] References are shown by bracketed numbers and are listed in order of appearance in the reference section.

2.1 Publication terminology

2.1.1 Shall
Indicates that the procedure is mandatory. It is used wherever the criterion for conformance to specific recommendations allows no deviation.

2.1.2 Should
Indicates that a procedure is recommended.

2.1.3 May
Indicates that the procedure is optional.

2.1.4 Will
Is used only to indicate the future, not a degree of requirement.

2.1.5 Can
Indicates a possibility or ability.

2.2 Technical definitions

2.2.1 Approach channel
Passage or passages through which fluid must pass from the cylinder to reach the operating parts of the PRD.

2.2.2 CG-10 activation time
Time for a CG-10 device to achieve its full rated flow capacity using a standardized activation test (see 6.8.1.5).

2.2.3 CG-10 design life
Time the CG-10 device is designed to provide operation, within its design specification, while in normal service and use.

2.2.4 CG-10 service life
Specific term to be applied to those devices (CG-10) that have been shown by special analysis or testing to demonstrate a fixed service life within its service (see 6.8.1.8 and 6.8.1.9).

2.2.5 Combination rupture disk/fusible plug device
Rupture disk in combination with a low temperature melting material intended to prevent bursting of the disk at its predetermined burst pressure unless the temperature is high enough to first cause yielding or melting of the fusible material.

2.2.6 Compressed gas
Gas which when packaged under pressure for transportation is entirely gaseous at temperatures at −50 °C (−58 °F).

NOTE—Also referred to as nonliquefied compressed gas.

2.2.7 Compressed gas in solution
Nonliquefied compressed gas that is dissolved in a solvent (such as acetylene dissolved in acetone).

NOTE—Also referred to as dissolved gas.

2.2.8 Cryogenic liquid
Liquid with a normal boiling point below –90 °C (–130 °F) at 1 atm pressure absolute.

2.2.9 Cylinders
Pressure vessels as described in 49 CFR 171.8 and applicable TC regulations (including DOT, TC, and UN pressure receptacles) [1, 4].

NOTE—For the purposes of this publication, cylinder (when used) includes UN pressure receptacles or group of UN pressure receptacles that are an element of a MEGC that can be isolated.