

**CGA V-7—2009**

**STANDARD METHOD OF  
DETERMINING CYLINDER  
VALVE OUTLET  
CONNECTIONS FOR  
INDUSTRIAL GAS  
MIXTURES**

**FIFTH EDITION**



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NOTE—Technical changes from the previous edition are underlined.

NOTE—Appendix A (Normative) is a requirement.

NOTE—Appendix B (Informative) is for information only.

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## 1 Introduction

The Compressed Gas Association's (CGA) original standard on cylinder valve outlet connections was adopted by the American Standards Association and the Canadian Standards Association in 1949 as *the American National, Canadian, and Compressed Gas Association Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections*. This document is revised periodically and published as CGA V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections* [1]. CGA V-1 provides valve outlet connections for numerous pure gases but only includes a few mixtures that have a history of being commercially or medically important and for which standards were in demand [1].

In recent years, there has been a tremendous increase in the number of industrial, specialty, and semiconductor gas mixtures entering the commercial market, and the need to have some separation in the applicability of valve outlets to the thousands of gas mixtures became apparent. CGA undertook the development of a procedure for providing some safe separation of valve outlets for gas mixtures having similar properties.

It was recognized that it was physically impossible to establish a sufficient number of different valve outlets to provide a major separation for these thousands of gas mixtures. After much consideration, CGA concluded that a practical and reasonable separation could be achieved by selecting a limited number of existing connections and assigning these to mixtures having similar properties. This was intended to minimize the misconnection of gas mixtures whereby a serious hazard could occur.

With the publication of the fifth edition of CGA V-1 in 1977, many new gases and a number of new valve outlet connections were included [1]. These additions were organized according to a system of classifying gases and grouping them according to similarity of properties. This was necessary to cover the many new gases introduced since the fourth edition of CGA V-1 and to provide new outlet connections in a logical and orderly manner [1]. The method for determining a cylinder valve outlet connection for various industrial gas mixtures is based on a four-digit FTSC numerical code assigned to each gas based on its fire potential, toxicity, state of the gas, and corrosiveness.

The seventh edition of CGA V-1 provided an entirely new set of outlet connections for ultra high integrity service (UHIS) used by the semiconductor industry.

References in this publication to valve outlet connection numbers are those contained in the twelfth edition of CGA V-1 [1].

Medical gases and medical gas mixtures are given special treatment because of their applications which involve the care and critical handling of medical patients. For this reason, outlet connections for mixtures of medical gases are considered on a mixture-by-mixture basis and are not covered in this standard. They are covered in CGA V-7.1, *Standard Method of Determining Cylinder Valve Outlet Connections for Medical Gases* [2].

## 2 Scope and purpose

### 2.1 Scope

This standard applies to the selection of a suitable cylinder valve outlet connection for industrial, specialty, and semiconductor gas mixtures for pressures up to 3000 psig (20 680 kPa) at 120 °F (48.9 °C).<sup>1</sup> It applies to cylinders filled for individual use as well as cylinders filled individually for the purpose of assembling into a cylinder bundle, and for all cylinder bundle manifold outlet connections.

This standard does not apply to cylinders contained within an assembled cylinder bundle filled as one individual unit by use of the cylinder bundle manifold outlet connections. It also does not apply to medical gas mixtures (see CGA V-7.1) [2].

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<sup>1</sup> kPa shall indicate gauge pressure unless otherwise noted as (kPa, abs) for absolute pressure or (kPa, differential) for differential pressure. All kPa values are rounded off per CGA P-11, *Metric Practice Guide for the Compressed Gas Industry* [3].

For the assignment of UHIS connections for mixtures, see Appendix A. Appendix A is reproduced with permission from ISO 10692-1:2001, *Gas cylinders—Gas cylinder valve connections for use in the micro-electronics industry—Part 1: Outlet connections* [4].

For the purpose of this standard, a mixture is understood to be the purposeful combination of two or more components. An odorant shall be considered a component when added to either a pure gas or a mixture. Blanketing of a pure gas or mixture is not considered the generation of a new mixture.

## 2.2 Purpose

The purpose of this standard is to establish a method for selecting the proper cylinder valve outlet connection for mixtures of two or more industrial gases. This standard does not attempt to identify which gas mixtures can be manufactured safely and successfully since this is the responsibility of the mixture manufacturer. Further, it does not describe any means or technique for making mixtures.

## 3 Definitions

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

### 3.1 Corrosive

Value of 1, 2, or 3 for the C value of FTSC.

### 3.2 Highly oxidizing

Value of 4 for the F value of FTSC, which is an equivalent oxygen concentration greater than 23.5%.

### 3.3 Oxidizing

Value of 1 for the F value of FTSC, which is an equivalent oxygen concentration greater than or equal to 5% but less than or equal to 23.5%.

### 3.4 Toxic

Value of 3 for the T value of FTSC, which is equivalent to an LC<sub>50</sub> less than or equal to 200 ppm.

NOTE—Materials with a T value of 2 (LC<sub>50</sub> less than or equal to 5000 ppm and greater than 200 ppm) also may be classified as toxic.

## 4 Description of the method

### 4.1 General

The standard method described herein shall be used in conjunction with the latest edition of CGA V-1 [1]. Drawings for all of the connection numbers referred to in this standard can be found in CGA V-1 [1].

### 4.2 FTSC code classification

Each gas is classified with an FTSC numerical code based on the four properties described in Table 1 from which the initials FTSC derive, namely fire potential, toxicity, state of the gas, and corrosiveness.

A numerical scale (0 to 9) is used to assign a level within each of the four property categories as shown in Table 1 and these numbers produce the four-digit FTSC code for each gas shown in Table 2.

The FTSC code thus established identifies the gas by its properties and allows similar gases to be grouped under the same FTSC code.

When the final mixture is flammable or oxidizing and contains components that are toxic or corrosive, additional evaluation and segregation shall be made according to Table 3.

Table 4 lists mixture component rating numbers (MCRNs) assigned to various FTSC codes and the high and low pressure connections assigned to these MCRNs.