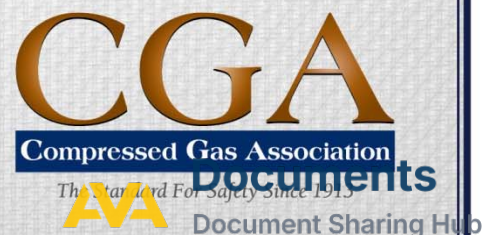


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CGA V-5—2019

**STANDARD FOR
DIAMETER INDEX SAFETY SYSTEM
(NONINTERCHANGEABLE LOW
PRESSURE CONNECTIONS FOR
MEDICAL GAS APPLICATIONS)**

SEVENTH EDITION



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Work Item 18-012
Medical Equipment Committee

NOTE—Technical changes from the previous edition are underlined.

NOTE—Appendices A, B, C, D, E, F, G and H (Normative) are a requirement.

SEVENTH EDITION: 2019
REAFFIRMED: 2013
SIXTH EDITION: 2008
FIFTH EDITION: 2005

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1 Introduction

The administration of medical gases to patients is subject to a variety of hazards that can result from human error due to preoccupation, a mental lapse, or carelessness. This publication was developed to reduce the possibility of inadvertent substitution of the wrong medical gases by personnel when using equipment for administering anesthesia, resuscitation, and therapy.

CGA V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections*, establishes assigned standard connections for threaded outlets on cylinder valves, which results in the removal from service of all cylinder valves having nonconforming threaded outlets [1].¹ **CGA V-1** also describes the details of the Pin Index Safety System for flush-type medical gas cylinder valves. This system reduces the possibility of inadvertent substitution of the wrong gases on equipment with yoke-type connections. The Pin Index Safety System has been adopted by national and international standards organizations including the Canadian Standards Association (CSA) and the International Organization for Standardization (ISO).

2 Scope

The Diameter Index Safety System defines noninterchangeable removable connections for use with medical gases at pressures of 200 psi (1380 kPa) or less.² Removable, threaded connections are readily and commonly engaged or disengaged in routine use and service and are often found on regulators, resuscitation equipment, anesthesia equipment, therapy equipment, and other similar equipment.

The Diameter Index Safety System supplements but does *not* replace:

- any of the means for medical gas identification currently in use;
- the Pin Index Safety System;
- the existing threaded outlet standards for cylinder valves; or
- automatic quick coupler valves that also provide noninterchangeable connections for medical gases and suction equipment.

CGA does not designate where the Diameter Index Safety System should be applied.

3 Definitions

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

3.1 Publication terminology

3.1.1 Shall

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

3.1.2 Should

Indicates that a procedure is recommended.

3.1.3 May

Indicates that the procedure is optional.

3.1.4 Will

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

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

² 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**, *Guideline for Metric Practice in the Compressed Gas Industry* [2].

3.1.5 Can

Indicates a possibility or ability.

4 CGA V-5 revisions**4.1 Second edition (1978)**

The second edition of **CGA V-5** included the original twelve connections described the 1959 edition and added a co-standard 1000-A series. Eight new connections (1500 series) designed and shown in SI dimensions were also added.

4.2 Third edition (1989)**4.2.1 1500 series replaced by 2000 series**

The third edition abandoned the 1500 series connections in favor of a new smaller 2000 series, which offered eight new connections that are designed and shown in customary U.S. dimensions (inches).

4.2.2 Revised nitrous oxide-oxygen mixture connection

Connection No. CGA 1570, which was described in the 1978 edition and assigned to nitrous oxide-oxygen mixtures (nitrous oxide 47.5% to 52.5%), was replaced by Connection No. CGA 2020.

4.2.3 New assignments

Connection No. CGA 2040 was assigned to oxygen-enriched air mixtures.

Connection No. CGA 2220 was assigned to gas evacuation (waste gas).

4.2.4 Metrication

Metric equivalents to the English dimensions were added. Except as otherwise specified, the metric conversions in this publication are soft conversions.

4.3 Fourth edition (2000)

All thread classifications (9/16-18UNF, 3/4-16UNF, and 7/8-14UNF) were changed from class 2 to class 1.

Connection No. CGA 1240, Dimension C was changed from .255 max to .290 max to allow maximum flow. Nut minor diameter was changed from the range .502 to .515 to the range .505 to .515.

Connection No. CGA 2220, Dimension D was changed from .317 max to .388 max.

Connection No. CGA 1220, Dimension D was changed from .255 max to .300 max.

Drawing No. 1000 and Drawing No. 1000-A, Dimension E was changed from .151 max to .161 max.

Drawing No. 1000 and Drawing No. 1000-A, Dimension D was changed from .161 max to .200 max.

Metric conversion for Dimension P were corrected from 17.84 ± 0.12 to 19.84 ± 0.12 on Drawing No. 1000 and Drawing No. 1000-A.

Connection No. CGA 2060 was assigned to Xenon (see Table 1 and Appendix G.)

4.4 Fifth edition (2005)

Connection No. CGA 2080 was assigned to Instrument air (IAir). See Table 1 and Appendix G.

4.5 Sixth edition (2008)

Color coding in conformance with NFPA 99 was added. See 4.2.3.

Connection No. CGA 2220, gas symbols EVAC and EVAC-VAC will be replaced with the gas symbol for waste anesthetic gas disposal (WAGD). The effective date for exclusive use of WAGD is 5 years from the publication date of the sixth edition of V-5 (October 20, 2013).

4.6 Seventh edition (2019)

Connection No. CGA 2220, gas symbols EVAC and EVAC-VAC were replaced with the gas symbol for waste anesthetic gas disposal (WAGD) as the implementation date has passed.

5 Description of the Diameter Index Safety System

5.1 General features

The Diameter Index Safety System presents a design concept for low pressure medical gas connections. Each connection of the Diameter Index Safety System consists of a body, nipple, and nut. For all medical gases and suction connections except oxygen (Connection Nos. CGA 1220, 1240, and 2220), noninterchangeable indexing is achieved by a series of increasing and decreasing diameters in the component parts of the connections (two concentric and specific bores in the body, and two concentric and mating diameters on the nipple). To achieve noninterchangeability between different connections, the two diameters on each part vary in opposite directions: as one diameter increases the other decreases. In this way, only the properly mated parts fit together to allow thread engagement.

The long-established 9/16-in, 18-thread connection for oxygen has been retained. See Connection No. CGA 1240 in Appendix E.

The direction of flow through connections of the system is optional unless otherwise specified for a particular connection assignment.

5.2 Optional features

5.2.1 Check valves

The addition of a check valve in the body portion of connections is permissible provided:

- a corresponding nut and nipple that meet the connection specifications opens the valve;
CAUTION: *When a check valve activator (e.g., plunger, poppet, etc.) is used in the body through-hole, caution shall be exercised to ensure that the opening mechanism is properly actuated by this nut and nipple.*
- no gas flows unless the threads are engaged at least 3/4 turn; and
- the strength, noninterchangeability, and nose-to-conical seat sealing are maintained, e.g., metal-to-metal contact at contact diameter.

NOTE—For some applications flow capacity can be critical, and the valve design should minimize flow restriction through the connection.

5.2.2 Secondary seals

A secondary elastomer seal is permissible on the large indexing diameter and/or on the nose radius of the nipple provided:

- The strength, noninterchangeability, and nose-to-conical seat sealing are maintained (e.g., metal-to-metal contact at contact diameter);
- Material used for the secondary elastomer seal is compatible for the intended gas service;