

**CGA P-2—2019**

**GUIDELINE FOR  
CHARACTERISTICS AND SAFE  
HANDLING OF MEDICAL GASES**

**ELEVENTH EDITION**

**PLEASE NOTE:**

The information contained in this document was obtained from sources believed to be reliable and is based on technical information and experience currently available from members of the Compressed Gas Association, Inc. and others. However, the Association or its members, jointly or severally, make no guarantee of the results and assume no liability or responsibility in connection with the information or suggestions herein contained. Moreover, it should not be assumed that every acceptable commodity grade, test or safety procedure or method, precaution, equipment or device is contained within, or that abnormal or unusual circumstances may not warrant or suggest further requirements or additional procedure.

This document is subject to periodic review, and users are cautioned to obtain the latest edition. The Association invites comments and suggestions for consideration. In connection with such review, any such comments or suggestions will be fully reviewed by the Association after giving the party, upon request, a reasonable opportunity to be heard. Proposed changes may be submitted via the Internet at our web site, [www.cganet.com](http://www.cganet.com).

This document should not be confused with federal, state, provincial, or municipal specifications or regulations; insurance requirements; or national safety codes. While the Association recommends reference to or use of this document by government agencies and others, this document is purely voluntary and not binding unless adopted by reference in regulations.

A listing of all publications, audiovisual programs, safety and technical bulletins, and safety posters is available via the Internet at our website at [www.cganet.com](http://www.cganet.com). For more information contact CGA at Phone: 703-788-2700, ext. 799. E-mail: [customerservice@cganet.com](mailto:customerservice@cganet.com).

Work Item 17-035  
Medical Gases Committee

---

NOTE—Technical changes from the previous edition are underlined.

NOTE—Appendices A, B, C, D, E, F, and G (Informative) are for information only.

ELEVENTH EDITION: 2019  
TENTH EDITION: 2013  
NINTH EDITION: 2006  
EIGHTH EDITION: 1996

© 2019 The Compressed Gas Association, Inc. All rights reserved.

All materials contained in this work are protected by United States and international copyright laws. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical including photocopying, recording, or any information storage and retrieval system without permission in writing from The Compressed Gas Association, Inc. All requests for permission to reproduce material from this work should be directed to The Compressed Gas Association, Inc., 14501 George Carter Way, Suite 103, Chantilly VA 20151. You may not alter or remove any trademark, copyright or other notice from this work.

<b>Contents</b>	<b>Page</b>
1 Introduction.....	1
2 Scope .....	1
3 Definitions.....	1
4 General characteristics.....	2
4.1 Single component medical gases.....	2
4.2 Multi-component medical gases.....	3
4.3 Regulations and other standards.....	3
5 Containers.....	4
5.1 Bulk storage systems .....	4
5.2 High pressure cylinders and valves.....	4
5.3 Large cryogenic containers and valves.....	7
5.4 Small cryogenic containers and portables.....	7
5.5 Labeling.....	8
6 Safe practices and handling.....	9
6.1 General practices .....	9
6.2 Moving.....	11
6.3 Storing.....	11
6.4 Product withdrawal.....	14
6.5 Transfilling.....	15
7 Equipment.....	17
7.1 Supply systems.....	17
7.2 Pressure regulators.....	17
8 References.....	18
 <b>Tables</b>	
Table 1—Color marking of compressed gas containers for medical use .....	6
Table 2—Cryogenic outlet connections .....	7
Table 3—DOT requirements for compressed gas container labels.....	8
Table 4—TC requirements for compressed gas container labels.....	8
 <b>Appendices</b>	
Appendix A—Medical air (Informative).....	20
Appendix B—Medical carbon dioxide (Informative) .....	21
Appendix C—Medical helium (Informative).....	22
Appendix D—Medical nitrogen (Informative) .....	23
Appendix E—Medical nitrous oxide (Informative) .....	24
Appendix F—Medical oxygen (Informative) .....	25
Appendix G—Dimensions and gaseous capacities of standard medical gas containers (Informative) .....	26
 <b>Appendices tables</b>	
Table A-1—Properties of medical air .....	20
Table B-1—Properties of medical carbon dioxide.....	21
Table B-2—Approximate gauge pressure in a cylinder of carbon dioxide when both liquid and vapor are present .....	21
Table C-1—Properties of medical helium .....	22
Table D-1—Properties of medical nitrogen .....	23
Table E-1—Properties of medical nitrous oxide.....	24

Table E-2—Approximate gauge pressure in a cylinder of nitrous oxide when both liquid and vapor are present .....	24
Table F-1—Properties of medical oxygen .....	25
Table G-1—Gaseous volume of nonliquefied gases in various cylinder styles at select pressures .....	26
Table G-2—Contents of liquefied gases in uninsulated cylinders by weight and equivalent gas volume .....	27
Table G-3—Liquid contents by weight and equivalent gaseous volume <sup>1)</sup> .....	27
Table G-4—Liquid contents by weight and equivalent gaseous volume for liquid oxygen base units .....	28
Table G-5—Liquid contents by weight and equivalent gaseous volume for liquid oxygen respiratory portables .....	28
Table G-6—Medical liquid nitrogen dewars contents by volume and weight .....	29