

CGA G-8.3—2013

**SAFE PRACTICES FOR
STORAGE AND HANDLING
OF NITROUS OXIDE**

FIRST EDITION



PREFACE

As part of a program of harmonization of industry standards, the European Industrial Gases Association (EIGA) and the Compressed Gas Association (CGA) formed a Joint Working Group (JWG) to produce G-8.3—2013, *Safe Practices for Storage and Handling of Nitrous Oxide*. This standard is intended as an international harmonized standard for the worldwide use and application of all members of the Asia Industrial Gases Association (AIGA), EIGA, Japan Industrial and Medical Gases Association (JIMGA) and CGA worldwide. The CGA edition is identical in technical content to the EIGA edition except for regional regulatory requirements (noted), and it has minor changes in formatting and spelling.

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1 Introduction

This publication has been prepared by member associations of the International Harmonization Council, under the lead of European Industrial Gases Association (EIGA) and is intended for the worldwide use and application by all members of the International Harmonization Council. The International Harmonization Council is composed of members from the Asia Industrial Gases Association (AIGA), Compressed Gases Association (CGA), EIGA, and the Japan Industrial and Medical Gases Association (JIMGA). Regional editions may use non SI units and refer to national, and or regional legislation.

Nitrous oxide (N₂O) has been produced and distributed by the industrial gases industry for many years. It is mainly used for medical purposes (anesthesia). It is also used in the food and electronic industries.

Severe accidents such as violent decomposition of nitrous oxide and the rupture of nitrous oxide tanks have occurred at production, storage, and distribution facilities. In addition nitrous oxide gas in elevated concentrations can cause health effects in operators, which shall be prevented.

A major cause of accidents and health effects has been insufficient attention to the specific properties of nitrous oxide when designing equipment and developing operating procedures. For that reason, this publication describes the properties and hazards of nitrous oxide. On this basis, the principles and relevant details of safe storage and distribution of nitrous oxide are considered.

Regulatory requirements for medical applications shall also be followed. For example the European Guide Good Manufacturing Practice in Europe, FDA and Health Canada good manufacturing practices in North America, as well as NFPA 99, *Health Care Facilities Code* in the United States and CSA Z305.1, *Nonflammable Medical Gas Piping Systems* in Canada, for medical gas piping systems [1, 2].

2 Scope

This publication is intended for the safe use in the industrial and medical gases industry for the design, engineering, construction, and operation of nitrous oxide, storage, and supply installations. This publication does not cover the manufacturing of nitrous oxide or quality control and analysis procedures. See CGA G-8.4, *Safe Practices for the Production of Nitrous Oxide Using Ammonium Nitrate* [3].

3 Definitions

For purposes of this publication, the following definitions apply.

3.1 Authorized person

Trained and qualified person approved or assigned to perform specific types of duties or to be at a specific location.

3.2 Bundle (of cylinders)

Assembly of cylinders that are fastened together, which are interconnected by a manifold and transported as a unit.

3.3 Cryogenic receptacle

Transportable thermally insulated pressure receptacle for refrigerated liquid gas of a capacity of not more than 1000 L.

3.4 Cylinder

Transportable pressure receptacle of a water capacity not exceeding 150 L.

3.5 Decomposition

Separation of a chemical compound into smaller elements. Nitrous oxide separates into components in an exothermic reaction that can be accelerated by changes in pressure, temperature, or energy inputs, presence of catalyzer or impurities.

3.6 Filling degree

Percentage of the volume of liquefied gas to the volume of water at 59 °F (15 °C) that would fill completely a pressure receptacle or tank.