CGA
Compressed Gas Association
The Standard For Safety Since 1913

6TH EDITION

CGA G-8.1 — 2024

STANDARD FOR NITROUS OXIDE SYSTEMS AT CUSTOMER SITES

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NOTE—Technical changes from the previous edition are underlined.

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1 Introduction

At atmospheric pressure and temperature, nitrous oxide is a colorless, practically odorless, tasteless, and non-toxic gas about 50% heavier than air. It is quite soluble in water, vegetable oils, and other liquids. Its main use is as an anesthetic. It is also used as a propellant in pressure package containers, in analytical instruments, as a leak detector, and in other specialized applications.

Nitrous oxide is available in the compressed, liquefied form either in high pressure containers or low pressure insulated containers conforming to the specifications of the U.S. Department of Transportation (DOT), Transport Canada (TC) or in relatively low pressure bulk containers maintained at reduced temperatures. Below the critical point of 97.7 °F (36.5 °C) liquid nitrous oxide is in equilibrium with its vapor at a pressure dependent upon the temperature. For specific data see the *Handbook of Compressed Gases* [1].[1] Under normal conditions of storage and use, nitrous oxide is stable in both gas and liquid phases and is noncorrosive. It does not form an acid in water.

As with oxygen, ignition of combustible materials can occur more readily in a nitrous oxide-enriched atmosphere than in air with combustion proceeding at a faster rate. Nitrous oxide also decomposes exothermally under conditions of high temperature and pressure. If sufficient heat is added, the decomposition can be self-sustaining and with the resulting high temperature and pressure, the nitrous oxide can explode. Refer to CGA G-8.3, *Safe Practices for the Storage and Handling of Nitrous Oxide* [2]. Therefore, this standard provides primarily for protection of the nitrous oxide system from fire from sources apart from the system itself. It is important to locate nitrous oxide systems in well-ventilated locations since nitrous oxide-enriched atmospheres can collect temporarily in confined areas in the event of the functioning of a pressure relief device (PRD) or leakage from the system.

The properties of nitrous oxide are shown in Tables 1 and 2.

2 Scope

This standard covers the general principles recommended for the installation of nitrous oxide systems on medical or industrial customer premises.

Such systems consist of a central supply, which can be either cylinders connected to a common manifold or bulk liquid containers and the associated equipment and piping required for connecting the central supply to the line supplying the nitrous oxide to the point of use.

The authority having jurisdiction (AHJ) may authorize the continued use of an existing nitrous oxide system, which is not in strict compliance with the provisions of this standard, where such continued use will not constitute a hazard to life or adjacent property.

This standard does not apply to nitrous oxide manufacturing plants and normally does not apply to distributor bulk stations. However, where distributor bulk stations interface closely with business or facilities unrelated to the handling of nitrous oxide or where the general public can be exposed to such bulk facilities, the applicable safety provisions of this standard shall be followed.

Additional requirements for nitrous oxide systems are contained in NFPA 99, *Health Care Facilities Code,* NFPA 55, *Compressed Gases and Cryogenic Fluids Code,* and CSA Z305.1, *Nonflammable Medical Gas Piping Systems* [3, 4, 5].

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