

Nextteq Industry Special Report

Interchangeability Part 1



Interchangeability Is In Conflict With All U.S. And International Standards For The Proper And Safe Use Of Detector Tube And Pump Systems.

The Purpose Of Some Standards Is To Ensure That Things Are Not Used Together That Are Not Interchangeable.

Lately, there has been confusion in the industry concerning the validity of interchanging detector tubes and pumps of different manufacturers. If the components of detector tube and pump systems do not fit together or if the industry standard specifies that the parts and components of different manufacturers are not interchangeable, some companies claim this constitutes a problem. However, in some cases the primary purpose of a standard, such as ANSI/ISEA 102-1990 (R1998), is to ensure that things are not used together that are not interchangeable. For example, in medicine, preventing different gases from mixing or being confused with each other in the operating room is critical for the patient's safety. Obviously, problems can arise if the same screw thread is used for gas cylinders containing different gases. In the past, this has occurred resulting in nitrogen or carbon dioxide being supplied to patients instead of oxygen, with disastrous results.

In many cases a standard is supposed to simplify things by encouraging that components from different manufacturers fit together and be interchangeable. However, this requirement is true only up to a certain limit. Standardization is not a benefit if it is achieved at the expense of safety. Interchanging parts and components of different manufacturers' detector tube and pump systems may reduce system accuracy or cause system failures. To ensure accurate measurements, and thereby

“A manufacturer’s gas detector tube and sampling pump should be regarded as a single unit”

National Institute of Occupational Safety and Health

ensure worker safety, parts and components of different manufacturers' detector tube and pump systems should not be interchanged. This opinion is reflected in U.S. and international standards for safe detector tube and pump system use.

Interchangeability is contrary to industry standards of care and safety. No U.S. performance standard for safety equipment systems allows interchangeability of parts and components of different manufacturers' systems. No U.S. or international standard-setting organization, certifying body, or professional association endorses the interchangeability of parts and components of detector tube and pump systems.

The recommendations and requirements of U.S. and international organizations that prescribe the proper use of detector tube and pump systems prohibit or recommend against the practice of interchanging parts and components of different systems. All prohibit, recommend against, or discourage the practice of interchangeability.

These Organizations Include:

- **National Institute for Occupational Safety and Health NIOSH**
- **Occupational Safety and Health Administration OSHA**
- **American Industrial Hygiene Association AIHA**
- **American National Standards Institute ANSI**
- **Industrial Safety Equipment Association ISEA**
- **International Unions of Pure and Applied Chemistry IUPAC**
- **Deutsches Institute fur Normung DIN EN1231**
- **British Standards BSEN 1231 (1997)**
- **Japan Industrial Standards JIS 1992**
- **Safety Equipment Institute SEI**

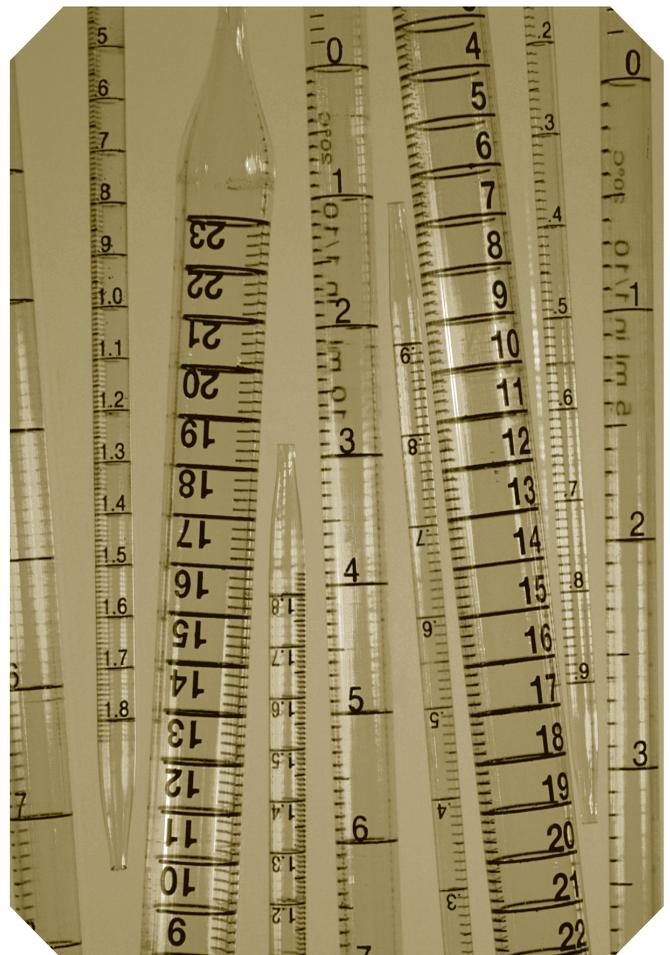
The Specific Prohibitions Of Many Of These Organizations Are As Follows:

OSHA: The Occupational Safety and Health Administration makes the following statement in the OSHA Technical Manual:

“Detector tubes of a given brand are to be used only with a pump of the same brand. The tubes are calibrated specifically for the same brand of pump and may give erroneous results if used with a pump of another brand.”

NIOSH: The National Institute of Occupational Safety and Health published a study titled: A Study of the Interchangeability of Gas Detector Tubes and Pumps (NIOSH TR-71). NIOSH stated:

“It can be seen [from the study] that the interchange of various manufacturers' gas detector tubes with various manufacturers' sampling pumps can introduce systematic analysis errors. Each manufacturer's CO gas detector tube is calibrated for a fixed sampling volume and airflow rate dictated by its sampling pump. To connect its CO gas detector tube to another manufacturer's sampling pump will more often than not yield purely qualitative results. These systematic errors added to current errors already inherent in each sampling pump and detector tube would increase the total error to the point that the quantitative nature of the sampling pump and gas detector tubes would be reduced to a qualitative level, and this modification is not in the best interests of the user.





“Interchanging tubes of various manufacturers could lead to erroneous results”

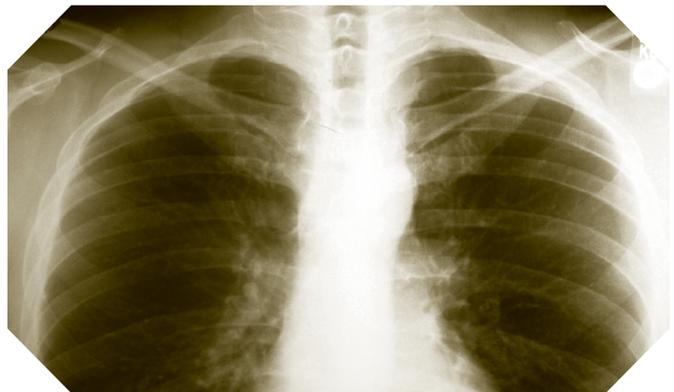
American Industrial Hygiene Association

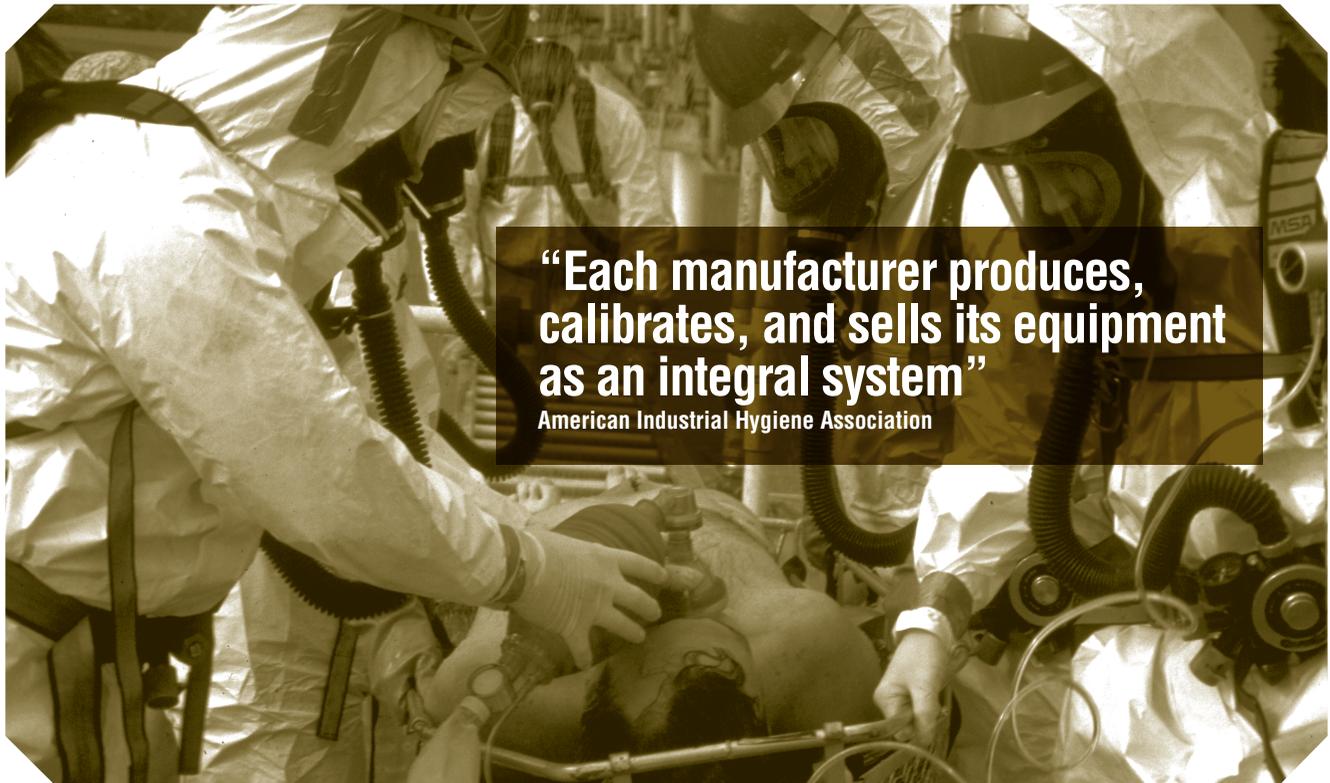
Although this study involved only carbon monoxide as a contaminant, it indicates that a manufacturer’s gas detector tube and sampling pump should be regarded as a single unit and accordingly, should not be interchanged with other manufacturers’ sampling pumps and gas detector tubes.”

User interchange of pumps and tubes or components supplied by different manufacturers may provide erroneous and invalid measurements of toxic environments. Accordingly, such interchange is not recommended.”

ANSI/ISEA: The American National Standards Institute and Industrial Safety Equipment Association have supplied a standard for detector tube performance called, Recommendation and Precaution Concerning Gas Detector Tube Unit Use. The following statement appears in an appendix to ANSI/ISEA 102-1990:

“Since the indicating behavior of a detector tube depends not only on the stroke volume, but also on the suction characteristic of the pump, it must be ensured that each detector tube is used only with the prescribed pump. Pump and tube and components are designed, manufactured, and calibrated together to form a gas detector tube unit.





“Each manufacturer produces, calibrates, and sells its equipment as an integral system”

American Industrial Hygiene Association

Interchangeability Is Not Safe And Should Not Be Practiced.

AIHA: Peper and Dawson in the American Industrial Hygiene Association publication, Direct-Reading Colorimetric Indicator Tubes Manual, make the following statement:

“Interchanging tubes of various manufacturers could lead to erroneous results because the sampling rates of the various pumps and the reaction rates of the chemical reagents in the indicating layers are not necessarily the same. Each manufacturer produces, calibrates, and sells its equipment as an integral system. A study conducted by NIOSH to test interchangeability of tubes and pumps concludes that interchanging tubes and pumps of different manufacturers should not be practiced. Their findings show great variability and significant errors in the results. The two main sources are differences in suction pressure per unit time and flow rate through the reagent material per unit time. The American National Standards Institute

(ANSI) recommends that tubes or pumps of various manufacturers not be changed and that only tubes recommended by the pump manufacturer be used.”

IUPAC: The International Unions of Pure and Applied Chemistry makes the following statement in its article, Performance Standard for Detector Tube Units Used to Monitor Gases and Vapors in Working Areas:

“The aspirating pump assigned for use with the detector tube must have the same flow characteristics as those of the pump used by the manufacturer in calibrating the tubes. Because pumps made by different manufacturers may not operate at the same rate even when they draw the same volume they cannot be interchanged.”

Interchangeability is not safe, does nothing to protect workers and is contrary to industry standards. Interchangeability is known to add design errors, manufacturing errors, human errors and reduce system accuracy. Not a single respected U.S. or international organization recommends interchangeability.

SOURCES

“Detector Tubes and Pumps,” OSHA Technical Manual (Appendix 1:1-1, OSHA CD-OMOSHA A97-1, February, 1997). A Study of the Interchangeability of Gas Detector Tubes and Pumps (NIOSH TR-71). Peper, Janet B. and Barbara J. Dawson, Direct Reading Colorimetric Indicator Tube Manual (second edition). (AIHA Gas and Vapor Detection Systems Committee, 1993.) “Performance Standard for Detector Tube Units Used to Monitor Gases and Vapors in Working Areas,” Pure & Applied Chemistry 54, no. 9: 1765.



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