STANDARD

ANSI/ASHRAE Standard 97-2007 (RA 2017)
(Reaffirmation of ANSI/ASHRAE Standard 97-2007)

Sealed Glass Tube Method to Test the Chemical Stability of Materials for Use within Refrigerant Systems

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NOTE

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE website at www.ashrae.org/technology.

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FOREWORD

ASHRAE Standard 97 describes a uniform means for testing the various materials used within hermetic and nonhermetic refrigerant systems. It is primarily intended as an accelerated screening tool and can provide valuable information on the chemical stability of system materials.

This is a reaffirmation of Standard 97-2007. This standard was prepared under the auspices of ASHRAE. It may be used, in whole or in part, by an association or government agency with due credit to ASHRAE. Adherence is strictly on a voluntary basis and merely in the interests of obtaining uniform guidelines throughout the industry. This version of the reaffirmation has no changes.

1. PURPOSE

The purpose of this standard is to establish a test procedure utilizing sealed glass tubes for the evaluation of materials for use in refrigerant systems.

2. SCOPE

2.1 This standard describes the preparation of sealed glass tubes and the procedure for charging them with refrigerant, lubricant, other materials to be tested, or combinations of these.

2.2 A procedure for aging the tubes, usually at elevated temperatures, is described. The tubes are evaluated by quantitative or qualitative analysis, or both, of the tube contents to yield information for determining the compatibility or chemical stability of materials in refrigerant systems.

2.3 The technique described may be used for evaluating many different types of materials. Therefore, the standard does not describe in detail the preparation of the materials to be tested prior to placing them in the glass tubes, the conditions of exposure, nor the methods of analysis.

2.4 Detailed safety precautions are included in Section 8, "Safety Requirements."

3. APPARATUS

3.1 A *sealed glass tube* generally consists of a borosilicate glass tube 9 mm (0.35 in.) OD × 7 mm (0.27 in.) ID × approximately 180 mm (7.1 in.) long with one end formed into a round bottom. The above are the finished dimensions. The tube is charged with the refrigerant and materials to be tested and then sealed in a rounded tip at the other end.

3.2 The *tube charging apparatus* is illustrated in Figure 1. This apparatus consists of a manifold (metal or glass), vacuum pump, pressure gauge, high vacuum gauge, refrigerant cylinder, valves, and filling ports. The function of this apparatus is to evacuate the tube, add refrigerant, and seal it along with the test materials. It is calibrated so that the refrigerant may be added very accurately by following the change in pressure on the vacuum gauge as refrigerant is added to the tube.

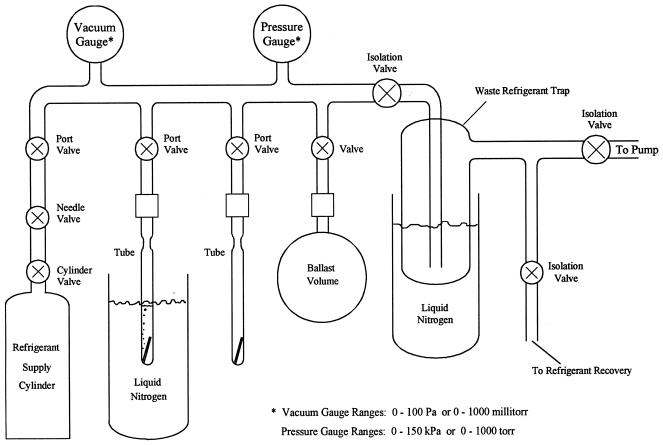


Figure 1 Manifold for filling glass tubes.

3.3 An *aluminum block* is used for aging the sealed glass tubes at elevated temperatures. The aluminum block has cylindrical holes in it to support the sealed glass tubes being tested. The purpose of the aluminum block is to protect the tubes from each other in the event of breakage. A further function is to maintain temperature uniformity. A typical aluminum block is illustrated in Figure 2. The holes in the block should be drilled completely through, and the block should have a separate removable bottom to simplify cleaning. A vent may be included to release pressure should a tube burst. The overall dimensions shall be sized to accommodate the desired number of sealed glass tubes while maintaining adequate wall thickness. A small wad of glass wool should be placed in the bottom of the drilled hole to cushion and support the tubes during aging.

3.4 *Individual pipe chambers* may be more convenient for testing a small number of samples, instead of the aluminum block described above. These individual chambers may be constructed of metal pipe and closed at both ends with threaded caps.

3.5 The electrically heated *aging oven* shall have mechanical convection capable of maintaining a uniform temperature with ±1.0°C (1.8°F) throughout the test chamber. The oven chamber shall be large enough to accommodate the aluminum block and allow for adequate air circulation and venting. The oven shall be equipped with an indicating controller with a control sensitivity of ±0.5°C (0.9°F).

3.6 The *tube opening apparatus* is illustrated in Figure 3. This apparatus is suitable for safely and conveniently opening a sealed tube for subsequent analysis of the contents. An alternative apparatus is illustrated in Figure 4.

3.7 *Flexible tubing* (PVC or rubber) is often used in preparation of sealed glass tubes. It is important to clean the tubing prior to use. It must be free of excess plasticizer, lubricants, powders, and other contaminants.