SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
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SURFACE VEHICLE STANDARD

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Submitted for recognition as an American National Standard

Criteria for Refrigerant Identification Equipment for Use with Mobile Air-Conditioning Systems

Foreword—The purpose of this SAE Standard is to establish criteria for refrigerant identification equipment intended for use with or without recycling equipment when removing refrigerant from Mobile Air-Conditioning (A/C) Systems or from refrigerant containers prior to charging a mobile A/C system.

Establishing such specifications will provide a means to identify relatively pure refrigerant CFC-12 (R-12) or HFC-134a (R-134a) from mixtures of refrigerants (HFC, HCFC, CFC, hydrocarbons, etc.), in a mobile system prior to recovering/recycling (R/R) the refrigerant or prior to charging an A/C system from a refrigerant container.

1. Scope—This SAE Standard applies to refrigerant identification equipment to be used for identifying refrigerant CFC-12 (R-12) and HFC-134a (R-134a) refrigerant when servicing a mobile A/C system or for identifying refrigerant in a container to be used to charge a mobile A/C system. Identification or other refrigerants are the option of the equipment manufacturer.

2. References

2.1 Applicable Publications—The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J639—Safety and Containment of Refrigerant for Mechanical Vapor Compression Systems Used for Mobile Air-Conditioning Systems

2.1.2 UL PUBLICATION—Available from Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096. (1-800-704-4050)

UL 1604—Electrical Equipment for Use in Class I and II, Division 2 and Class III Hazardous (Classified) Locations

3. Equipment evaluated under this document shall have the following specification and general description.

3.1 The equipment shall be suitable for use in an automotive service garage environment and be capable of continuous operation in ambients from 10 to 49 °C.

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3.1.1 Equipment may be design certified as a Refrigerant Diagnostic Tool or as a Refrigerant Identifier when tested per 5.8.

3.1.2 REFRIGERANT DIAGNOSTIC TOOL—Equipment that will identify the refrigerant to 98, 96, 94, 92, or 90% purity and will also identify 5, 10, 15, or 20% of air in the refrigerant. The tool shall have an accuracy of ±1% for the refrigerant and ±1% for the air. Higher accuracy's are permitted at the manufacturer's request.

3.1.3 REFRIGERANT IDENTIFIER—Equipment that will identify the refrigerant to 90% purity or lower shall have an accuracy of ±3%.

3.2 This document is to certify the equipment for identification of CFC-12 (R-12) and HFC-134a (R-134a). However, the equipment may be certified to identify as many refrigerants or substances in accordance with the manufacturer's design.

3.2.1 The equipment shall have an accuracy as noted in 3.1.2 or 3.1.3. If the unit is designed to identify refrigerants other than CFC-12 (R-12) and/or HFC-134a (R-134a), the same accuracy shall apply.

3.2.2 Equipment that displays a visual percentage outside of the design certified percent purity level is informational and may not be accurate. See 4.6.

3.2.3 To prevent possible refrigerant contamination the equipment shall comply with Federal requirements that a unique separate hose assembly be used with a permanently attached service port fitting, for each type of refrigerant being identified.

3.3 The equipment shall be certified that it meets this specification by Underwriters Laboratories, Inc. (UL) or by an equivalent independent nationally recognized testing laboratory. The laboratory shall maintain documentation of testing to this specification for each model certified, including all calibration data and equipment calibration dates for a period of 5 years.

3.4 The equipment shall be marked as indicated in 3.4.1 or 3.4.2. The marking shall be in bold-type letters, a minimum of 3 mm in height, where "X" is replaced by the designation of the refrigerant for which the equipment was certified to identify, "Y" is replaced by the percent value (of refrigerants) in 2% increments, and "Z" (where applicable) is replaced by the percent value (of air) in 5% increments.

3.4.1 A refrigerant diagnostic tool shall have a label which states "Refrigerant Diagnostic Tool Design Certified by (Certifying Agent) to meet SAE J1771 to identify 'X' to 'Y' percent purity. Also this equipment will detect 'Z' percent or greater of air in 'X'."

As an example, for a diagnostic tool that meets this specification to identify R12 and R134a by ABC Company, to 90% purity and to detect 5% air, the label would read—"Refrigerant Diagnostic Tool Design Certified by ABC Company to Meet SAE J1771 to Identify CFC-12 (R-12) or HFC-134a (R-134a) to 98% purity. Also, this equipment will detect 5% or greater of air in CFC-12 (R-12) or HFC-134a (R-134a).

3.4.2 A refrigerant identifier shall have a label which states "Refrigerant Identifier Design Certified by (Certifying Agent) to Meet SAE J1771 to identify 'X' to 'Y' purity."

As an example, for an identifier that meets this specification to identify CFC-12 (R-12) and HFC-134a (R-134a) by ABC Company, to 90% purity, the label would read--"Refrigerant Identifier Design Certified by ABC Company to Meet SAE J1771 to identify CFC-12 (R-12) or HFC-134a (R-134a) to 90% purity."

3.4.3 If the equipment does not meet the requirements in 4.6 it shall also have a label located near the visual percentage display indication, "For Accuracy, see Manual."

4. Operating Instructions

4.1 The equipment manufacturer shall provide operating instructions, including warm-up time (if needed), calibration, parts replacement list, and use instructions. The instructions shall include any other necessary maintenance procedures, source information for replacement parts and repair, and safety precautions.

4.2 For equipment certified as a refrigerant identifier, the operating instruction manual shall clearly indicate that the percent of refrigerant purity that is indicated, includes the percent amount of air that may be in refrigerant being tested but does not identify the air as a containment. The following statement, or equivalent, shall be provided in the manual.

NOTE—The percent refrigerant purity indicated by this equipment includes the amount of air that may be in the refrigerant being tested. However, the percent amount of air is not identified. For example, the identifier may indicate 98% refrigerant purity, but the refrigerant may contain 10% air.

4.3 For equipment certified as a diagnostic tool, the operating instruction manual shall clearly indicate the meaning of the percentage of refrigerant purity and percentage amounts of air that the tool displays. The following statement or equivalent shall be provided in the manual:

NOTE—This diagnostic tool will display the percent of refrigerant purity and the percent of air in the refrigerant being tested. Since the percent of air is included as part of the percent refrigerant purity, the total of the two percentages displays may exceed 100%. For example, the tool may display: 98% refrigerant purity and 10% air. This means there is 10% air in the refrigerant being tested.

4.4 If the equipment requires special calibration gases, source information, and test facilities, this information must be included with the operating instructions. Instructions must clearly indicate calibration frequency intervals to ensure the analyzer maintains its accuracy and sensitivity.

4.5 The instructions shall indicate if the equipment is for use with vapor only or for vapor and liquid. Tests per 5.8 shall be conducted using the correct refrigerant phase as declared by the manufacturer.

4.6 If the accuracy of informational displayed percentages of CFC-12 (R-12) and/or HFC-134a (R-134a) are outside of the designed certified purity value required by 3.1.2 and 3.1.3, the following statement shall be published in the manual. "If the refrigerant being tested is identified as contaminated, any visual percentages displayed of CFC-12 (R-12) or HFC-134a (R-134a) outside the design certified value is informational and may not be accurate" or equivalent. Certification for other refrigerant identification in Section 1 shall also comply with this requirement.

5. Equipment Requirements

5.1 The equipment shall be capable of identifying the specified refrigerants, CFC-12 (R-12) and/or HFC-134a (R-134a), to the specified purity level when evaluated to the test criteria in 5.8 and 5.9. The indication may be a visual display or other accurate display means.

5.2 The equipment shall not use more than 14 g per test cycle of the material being identified to perform its functions.

5.3 Equipment that is intended to be connected to automotive refrigerant recycling machines may have means to prevent flow of refrigerant to the recovery/recycling machine, as soon as refrigerant which does not meet the purity specification.

5.4 Equipment shall meet a gas ignition test as follows. The identifier is to be installed in a test chamber at a 49 °C ambient. The identifier is to be operated in the normal standby condition and the most easily ignitable mixture of propane and air is to be introduced into the identifier. The identifier is then to be operated in the signal condition and the input voltage then increased to 110% of rated voltage.

There shall be no ignition of the gas-air mixture during 10 min of exposure.

5.5 Equipment designed to be operated in hazardous use locations of automotive service garages shall meet requirements for Class I, Division 2 locations identified in Standard UL 1604. (Electrical Equipment for use in Class I and II, Division 2, and Class III hazardous locations.)

5.6 The equipment shall be provided with connection fittings to the refrigerant storage container and to the mobile A/C system as identified by SAE J639.

5.7 Test Equipment and Program

5.7.1 The test apparatus shall consist of 13.6 kg test cylinders filled with 5 kg (or other appropriate amount) of the test mixtures detailed in 5.8.

5.7.1.1 The manufacturer shall declare the purity level prior to testing. Testing will be conducted at that purity level and at three test points of a purity level above (except for 98% declared) and below the declared level.

CAUTION—Certain Mixtures of Refrigerants and Hydrocarbons and Certain Mixtures of HFC-134a (R-134a) and Air May be Combustible. Care Must be Taken when Conducting This Test.

5.8 Test Mixtures

5.8.1 For equipment intended to identify CFC-12 (R-12), the test mixtures shall consist of the following:

Prior to identifying each specific test mixture, the equipment shall be tested using pure CFC-12 (R-12) and the test sequence shall be performed twice to assure proper operation of the equipment.

a. Base Material—CFC-12 (R-12), with mineral oil—4000 ppm by weight and air—300 ppm by weight and with 5, 10, 15, or 20% air (by weight at 21 °C.)
b. Other Materials:

1. For a Refrigerant Diagnostic Tool—Added to base material, one at a time at either 2, 4, 6, 8, or 10% by weight.
2. For a Refrigerant Identifier—Added to base material, one at a time at 10% by weight. This percent shall be higher if a lower percent purity level is declared by the manufacturer.

1. HFC-134a (R-134a)
2. R22
3. R124
4. R142b
5. Hydrocarbons[1]

1. The hydrocarbon shall be 1/3 each, by weight, of propane, N-butane, and iso-butane. Each hydrocarbon shall be 99% pure.