SAE International

SURFACE VEHICLE STANDARD

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(R) Standard of Purity for Recycled R-134a (HFC-134a) and R-1234yf (HFO-1234yf) for Use in Mobile Air-conditioning Systems

RATIONALE

Refrigerant used in mobile air conditioning systems, under Federal Law, cannot be vented at service. The refrigerant can be recovered and generally be reused by using onsite recovery and recycling equipment that meet the appropriate SAE service equipment requirements. This SAE Standards identifies the level of purity of recovered and recycled refrigerant that can be considered acceptable for re-used in R-134a and R-1234yf mobile air conditioning systems.

1. SCOPE

This SAE Standard applies to:

- recycled R-134a refrigerant, used in servicing of motor vehicle air conditioning (A/C) systems that were designed for use with R-12 and have been retrofitted for use with R-134a;
- recycled R-134a refrigerant, used in servicing of motor vehicle air conditioning (A/C) systems that were designed for use with R-134a;
- recycled R-1234yf refrigerant, used in servicing of motor vehicle air conditioning (A/C) systems that were designed for use with R-1234yf.

Hermetically sealed, refrigerated cargo systems are not covered by this document.

1.1 Purpose

The purpose of this SAE Standard is to establish the minimum level of refrigerant purity required for the certification of on-site recovery, recycling and recharging machines per SAE J2843 and SAE J2788.

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http://www.sae.org/technical/standards/J2099_201204

2. REFERENCES

2.1 Applicable Documents

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 Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J639 Safety Standards for Motor Vehicle Refrigerant Vapor Compression Systems

SAE J1771 Criteria for Refrigerant Identification Equipment for Use with Mobile Air-Conditioning Systems

SAE J2788 HFC-134a (R-134a) Recovery/Recycle/Recharging Equipment for Mobile Air-Conditioning Systems

SAE J2843 R-1234yf [HFO-1234yf] Recovery/Recycling/Recharging Equipment for Flammable Refrigerants for Mobile Air-Conditioning Systems

SAE J2844 R-1234yf (HFO-1234yf) New Refrigerant Purity and Container Requirements for Use in Mobile Air-Conditioning Systems

SAE J2845 R-1234yf [HFO-1234yf] and R-744 Technician Training for Service and Containment of Refrigerants Used in Mobile A/C Systems

SAE J2912 Performance Requirements for R-134a and R-1234yf Refrigerant Diagnostic Identifiers for Use with Mobile Air Conditioning Systems

2.1.2 Other Publications

AHRI Standard 700C-2008: Appendix C to AHRI Standard 700 - Analytical Procedures for AHRI Standard 700-2006

3. PURITY SPECIFICATION

The refrigerant referred to in this standard, prior to its removal from a MAC system, shall have been identified with equipment certified to SAE J1771 for R-134a refrigerant or SAE J2912 for R-1234yf refrigerant as at least 98% pure, and SHALL HAVE been directly removed from, and intended to be returned to, a mobile A/C system that uses the specified refrigerant.

4. REQUIREMENTS FOR RECYCLE EQUIPMENT USED FOR ON-SITE A/C SERVICE OPERATIONS

4.1 The recycle equipment shall meet SAE J2788 for R-134a, SAE J2843 for R-1234yf, or both SAE J2788 and SAE J2843 for both refrigerants, which have additional requirements for moisture, acid, and filter requirements.

4.1.1 Contaminants in this recycled refrigerant shall be limited to refrigerant system lubricant (high boiling residue), non-condensable gases, and moisture, which, when measured in the refrigerant liquid phase, shall not exceed the following levels as measured by the accompanying procedures in section 5, or equivalent test procedures.

4.1.1.1 High Boiling Residues (Lubricant) - 500 ppm by weight, by gravimetric method

4.1.1.2 Non-condensable Gases (Air) - 1.5% by volume, at 23.9 ºC by gas chromatography

4.1.1.3 Moisture - 50 ppm by weight, by Karl Fischer method or equivalent analysis,

5. ANALYTICAL TEST PROCEDURES

5.1 Determination of Percent Lubricant

5.1.1 The amount of lubricant in the recycled refrigerant sample shall be determined via gravimetric analysis. The methodology shall account for the hygroscopicity of the lubricant.

5.1.2 Following venting of non-condensable gases in accordance with the manufacturer's operating instructions, the refrigerant container shall be shaken for 5 min prior to extracting samples for testing.

5.1.3 A weighed sample of 175 to 225 g of liquid refrigerant is allowed to evaporate at room temperature. The percent lubricant is calculated from weights of the original sample and the residue remaining after evaporation.

5.2 Determination of Non-condensable Gases

5.2.1 The amount of non-condensable gases shall be determined by gas chromatography. A sample of vaporized refrigerant liquid shall be separated and analyzed by gas chromatography. A Porapak Q column at 130 °C (266 °F) and a hot wire detector may be used for the analysis.

5.2.2 This test shall be conducted on liquid phase samples of recycled refrigerant taken from a full container within 30 min following the proper venting of non-condensable gases.

5.2.3 The liquid phase samples in 5.2.2 shall be vaporized completely prior to gas chromatographic analysis

5.3 Determination of Moisture

5.3.1 The recycled liquid phase sample of refrigerant shall be analyzed for moisture content via Karl Fischer coulometric titration, or an equivalent method. The Karl Fischer apparatus is an instrument for precise determination of small amounts of water dissolved in liquid and/or gas samples.

5.3.2 In conducting this test, a weighed sample of 30 to 130 grams is vaporized directly into the Karl Fischer anolyte. A coulometric titration is conducted and the results are reported as parts-per-million moisture (by weight).

6. PURITY OF REFRIGERANTS SUPPLIED FROM SOURCES OTHER THAN ON-SITE VEHICLE A/C RECYCLING

The purity of R-134a intended for servicing mobile A/C systems, supplied in containers from other sources, shall meet SAE J2776 refrigerant purity for new refrigerant. The purity of R-1234yf intended for servicing mobile A/C systems, supplied in containers from other sources, shall meet SAE J2844 refrigerant purity for new refrigerant.