



SURFACE VEHICLE STANDARD

J2773™

MAY2020

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Superseding J2773 FEB2017

Standard for Refrigerant Risk Analysis for Mobile Air Conditioning Systems

RATIONALE

This standard is being updated to include provisions for R-152a (HFC-152a).

FOREWORD

The potential impact of unintended refrigerant discharges resulting in high refrigerant concentrations shall be investigated and considered.

All reasonable hazards affecting persons inside the vehicle and in the close proximity of the vehicle, as well as the effects of long-term exposure shall be considered. Possible failure scenarios and safety targets shall also be considered.

1. SCOPE

This SAE Standard describes methods to understand the risks associated with vehicle mobile air conditioning (MAC) systems in all aspects of a vehicle's lifecycle including design, production, assembly, operation, and end of life. Information for input to the risk assessment is provided in the appendices of this document. This information should not be considered to be complete, but only a reference of some of the data needed for a complete analysis of the risk associated with the use of refrigerants in MAC systems.

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 +1 724-776-4970 (outside USA), www.sae.org.

SAE J639 Safety Standards for Motor Vehicle Refrigerant Vapor Compression Systems

SAE J1739 Potential Failure Mode and Effects Analysis in Design (Design FMEA), Potential Failure Mode and Effects Analysis in Manufacturing and Assembly Processes (Process FMEA)

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https://www.sae.org/standards/content/J2773_202005

- SAE J2683 Refrigerant Purity and Container Requirements for Carbon Dioxide (CO₂ R-744) Used in Mobile Air-Conditioning Systems
- SAE J2772 Measurement of Passenger Compartment Refrigerant Concentrations Under System Refrigerant Leakage Conditions
- SAE J2844 R-1234yf (HFO-1234yf) New Refrigerant Purity and Container Requirements for Use in Mobile Air-Conditioning Systems

2.1.2 ISO Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

- ISO 13043 Road Vehicles - Refrigerant Systems Used in Mobile Air Conditioning Systems (MAC) - Safety Requirements

2.2 Legal Requirements

The United States Environmental Protection Agency's SNAP regulation defines accepted refrigerants for the use in MAC Systems. The listed substances may require use conditions (accepted with use conditions). The full SNAP list with refrigerants and potential use conditions can be found in the U.S. federal register at U.S. EPA 40 CFR Part 82 Subpart G Appendix B. All motor vehicles' automotive refrigerants may be subject to, and must comply with, all legal regulations as required by local, national, or international authorities.

3. DEFINITIONS

FAULT TREE ANALYSIS (FTA): FTA is a methodology that graphically presents the sequences and combinations of failures that lead to a particular outcome. It utilizes a "top-down" approach, starting with the undesired effect as the top event of a tree of logic. Each situation that could cause that effect is added to the tree as a series of logic expressions. This technique analyzes the potential combinations or sequences of events by which an undesired event may occur. FTA can consider such causal effects as human error, equipment failure, and operating and maintenance procedures, though it cannot cover those causes of system failure that cannot be envisioned by risk analysts (Blackwell et al., 2006). FTAs consist of various event "boxes," which reflect the probability or frequency of key events leading up to a system failure. The event boxes are linked by connectors ("gates") which describe how the contributing events may combine to produce the failure.

GENERAL SAFETY PROCESS REQUIREMENTS: Proper design practices for the application of a refrigerant to MAC systems are required. The following or other equivalent methods shall be used to assess the risks associated with the use of a new refrigerant proposed for use in mobile air conditioning systems.

RISK: Combination of probability of a harm occurring during an event and the severity of it.

SAFETY: Safety is the absence of non-acceptable risks. Non-acceptable risks are those that are higher than those already accepted by the general public today (e.g., risks involved with riding in an airplane are considered acceptable by general public today).

4. SAFETY ASSESSMENT

This standard provides the guidelines for an assessment of safety with the refrigerants referenced in this standard for mobile air-conditioning systems.

The management of functional safety shall include the following from the concept phase through the lifetime of the vehicle.

1. Concept phase
2. Product development phase
3. Production and assembly