

## HFO-1234yf proven safe: Overview of third party studies

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### **SAE International: Cooperative Research Project (2007 – 2009)**

The Society of Automotive Engineers (SAE) established a Cooperative Research Project ([CRP1234](#)) evaluating the safety of HFO-1234yf between 2007 and 2009. The research project involved 15 global vehicle manufacturers – including all German manufacturers, large suppliers and 18 international, independent research institutes. Using fault tree analysis (FTA) the results of the CRP1234 assessment showed that the risk associated with the use of HFO-1234yf in automotive vehicles is well below those commonly considered acceptable by the general public and regulatory agencies. Moreover, it showed that the use of HFO-1234yf in vehicles is safe and offers “greatest potential to meet environmental and consumer needs”. The risk assessment was submitted to the U.S. Environmental Protection Agency (US EPA) as part of the Significant New Alternatives Policy (SNAP) approval process, and the US EPA subsequently approved HFO-1234yf for use in US vehicles. Daimler doubted the validity of this study and subsequently conducted their own safety tests.

### **SAE International: Additional risk assessment of alternative refrigerant HFO-1234yf (24 July 2013)**

In July 2013, SAE conducted a subsequent risk assessment of the refrigerant HFO-1234yf ([CRP1234-4](#)), based on extensive data provided by OEMs, including Daimler. This report described Daimler’s internal safety testing as “unrealistic” as the “the reconstructed tests show that inclusion of the Daimler setup resulted in refrigerant ignition with a particular vehicle that was not observed when a realistic nozzle configuration was used on that same vehicle”. The tests would create “extreme conditions that favored ignition while ignoring many mitigating factors that would be present in an actual real-world collision”. The SAE stated that the overall risk originating from a vehicle using HFO-1234yf is six orders of magnitude smaller than the general risk of vehicle fires involving all other possible causes. Thus, it is also significantly “below risks that are commonly viewed as acceptable by the general public”.

### **Krafftahrt-Bundesamt (Federal Transport Authority): Risk assessment of the Federal Transport Authority concerning the use of refrigerant HFO-1234yf in vehicle air conditioning systems (MAC) (8 August 2013)**

The Federal Motor Transport Authority (KBA) has published the results of its risk assessment on the use of the refrigerant in mobile air-conditioning systems of motor vehicles in August 2013. The assessment was carried out under the responsibility and on behalf of the KBA in cooperation with the Federal Highway Research Institute (*Bundesanstalt für Straßenwesen*; BASt), the Federal Institute for Materials Research and Testing (*Bundesanstalt für Materialforschung und -prüfung*; BAM) and the Federal Environmental Agency (*Umweltbundesamt*; UBA) in accordance with the jointly developed test parameters by TÜV Rheinland. According to the KBA, the results did “not provide sufficient supporting evidence of a serious risk within the meaning of the Product Safety Act (ProdSG)” ([KBA Press release No. 25/2013](#)). The authority therefore sees no reason to take “immediate measures” concerning the use of the refrigerant.

### **Joint Research Centre: JRC technical and scientific support to the research on safety aspects of the use of refrigerant HFO-1234yf on MAC systems (3 March 2014)**

The Joint Research Centre (JRC) of the European Commission conducted a comprehensive evaluation of the numerous tests already carried out on HFO-1234yf, to conclude a final risk assessment. The JRC’s evaluation was preceded by a careful three-month review of the available data. The [final JRC report](#) assesses the KBA’s report that had stated that there is no adequate, supportive evidence for an increased risk, which should have led to an intervention by the authorities. The Commission noted in a statement that “there is no evidence of a serious risk in the use of this refrigerant in MAC systems under normal and foreseeable conditions of use” ([European Commission Memo 14/168](#)). The Joint Research Centre concludes that HFO-1234yf is a safe refrigerant, through which car manufactures are enabled to meet the requirements of the EU MAC Directive. It underpins the results of the previous studies and finds no evidence for safety concerns.