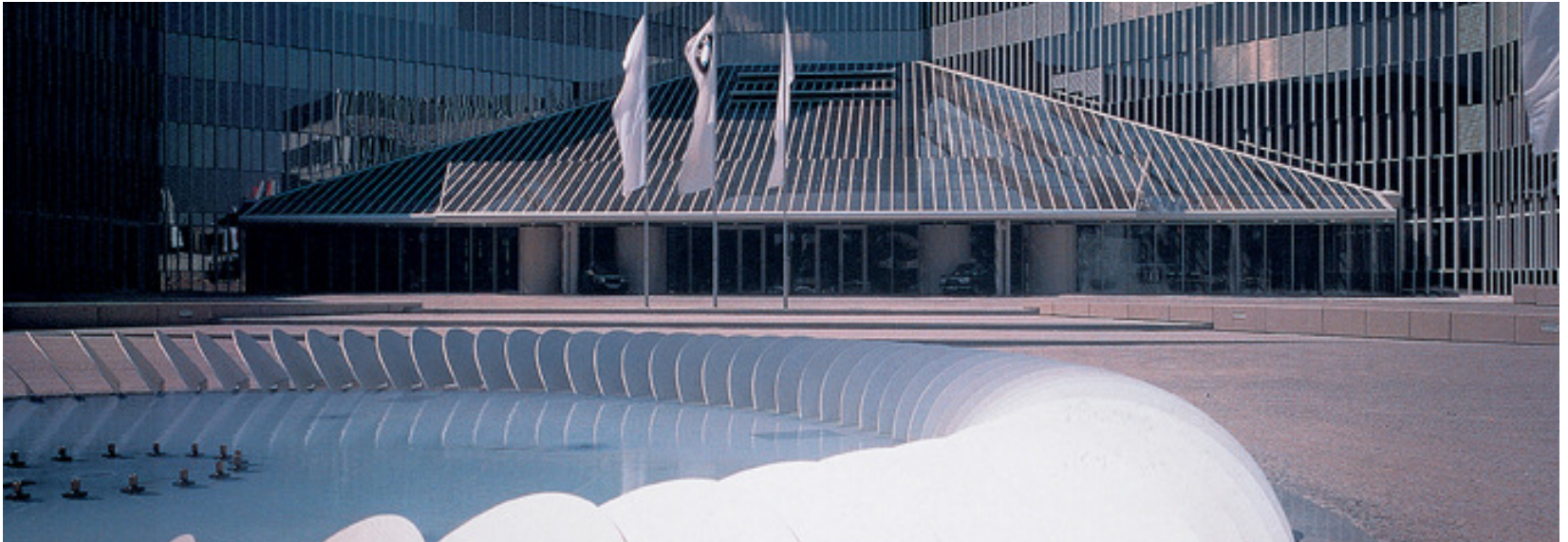


Adhoc AK R744 Safety

SAE safety guidelines R744-AC



BMW Group



SAE Standards for R744

Overview

1. SAE J639

Safety Standards for Motor Vehicle Refrigerant Vapor Compression Systems

2. SAE J2210

CO₂ (R-744) Refrigerant Removal and R-744/R-134a Charging Equipment for Mobile Refrigerant Systems

3. SAE J2196

SERVICE HOSES FOR CFC-12 (R-12), HFC-134a (R-134a) and CO-2 (R-744) Mobile Refrigerant Systems

4. SAE J2197

CO--2 (R-744) SERVICE HOSE AND EQUIPMENT FITTINGS FOR MOBILE REFRIGERANT SYSTEMS SERVICE EQUIPMENT

5. SAE J2683

Refrigerant Purity and Container Requirements For Carbon Dioxide (CO₂ R-744) Used In Mobile Air-Conditioning Systems

New SAE Standard

Scope

This SAE Standard provides safety requirements for R744 refrigerant vapour compression systems at the entire lifecycle of the vehicle. This SAE Standard Practice is restricted to R744 refrigerant vapour compression systems that provide air-conditioning for the passenger compartments of passenger and commercial vehicles.

This standard guides the design of a safe vehicle R744 AC system during production and assembly, operation and service and as well as the final scrapping.

All severe hazards affecting persons inside the vehicle and in the close surrounding of the vehicle are considered. This includes indirect impacts by retroactive effects on other safety related systems. Possible failure scenarios and the consequences for the safety targets are described.

Methods to prove the compliance of the safety measures and devices with the safety requirements are defined. This standard focuses on requirements and does not demand nor suggest concrete solutions.

New SAE Standard

Focus

System Lifecycle

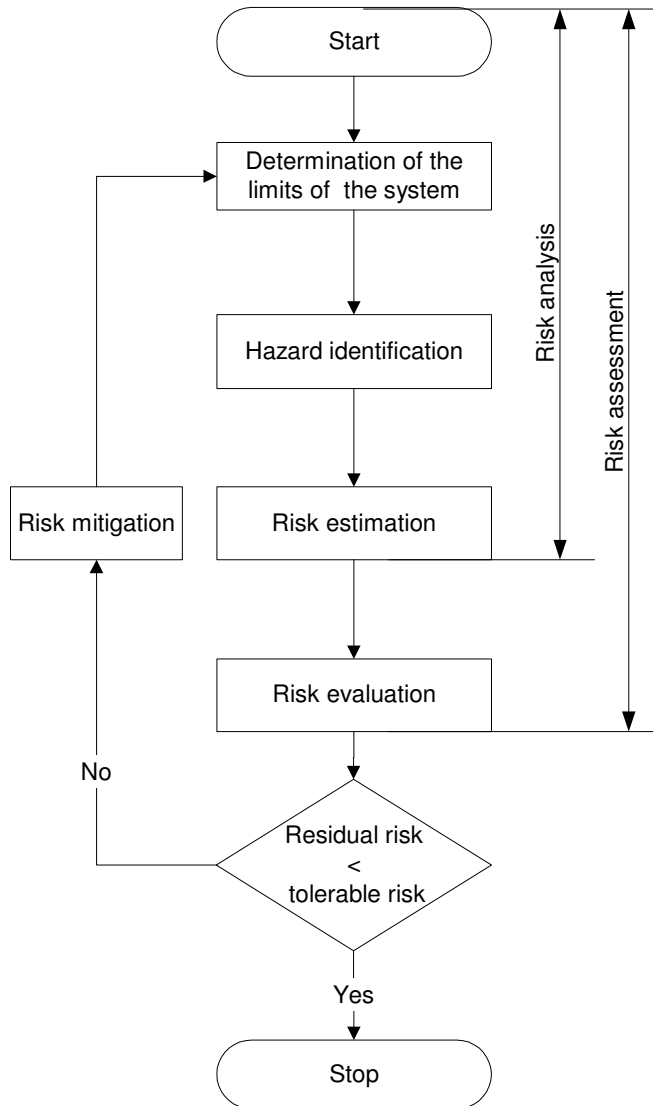
- **Production and assembly**
- **Operation**
- **Service**
- **Scrapping**

but limited to the R744 system

- **Excluded: equipment and processes for evacuation and vacuum check or charging at the production line / workshop**

New SAE Standard

Hazard Analysis and Risk Assessment



Definitions:

Harm: physical injury and/or damage to health or property

Hazardous event: Event that can cause harm

Hazardous situation: Circumstance in which a person is exposed to a hazard

Safety: Absence of unacceptable risks

Safety measure: Means that eliminates a hazard or reduces a risk

Residual risk: Risk remaining after safety measures have been taken

Risk: Combination of harm occurrence probability and the severity of the harm

Tolerable risk: Risk that is acceptable in the individual context, based on the actual social moral concept.

New SAE Standard

Tolerable Risk

According SAE ARP4761 (aircrafts), Table 1:

<i>Probability [1/h] SAE ARP 4767</i>	<i><10E-3</i>	<i><10E-5</i>	<i><10E-7</i>	<i><1E-9</i>
<i>Severity Classification</i>	<i>Minor</i>	<i>Major</i>	<i>Hazardous</i>	<i>Catastrophic</i>
<i>Denotation</i>	Light and moderate injuries	Serious injuries, under certain circumstances perilous, in all likelihood: survival	Life-threatening injuries (Survival uncertain) or lethal injuries	Not possible in automotive application
<i>MAIS* [-]</i>	1 – 2	3 – 4	5 - 6	./.

(* Maximum Abbreviated Injury Scale, American Association for Automotive Medicine (1995)
 Abbreviated Injury Scale - Revision 90. Am Ass F Autom Med , Morton Grove, Illinois, USA)

New SAE Standard

Tolerable Risk

Adopted to a single system in automotive application

<i>Severity Classification</i>	<i>Minor</i>	<i>Major</i>	<i>Hazardous</i>	<i>Catastrophic</i>
Probability (R744 system) [1/h]	10E-6 to 10E-7	10E-7 to 10E-8	10E-8 to 10E-9	Not possible in automotive application

New SAE standard

Timeline

1st draft

today

Kick-Off intern. SAE working group

July 2005

„Publish“ Standard

Dezember 2005

Discussion on SAE congress (USA/Japan)

from Feb. 2006