



# VOLATILE ORGANIC COMPOUNDS (VOCs)

## Purpose

This document serves as a guideline for brands, manufacturers, and suppliers of raw materials and chemicals to align on a common approach and definition for testing Volatile Organic Compounds (VOCs) in materials used in the production of apparel, footwear, accessories, and related products.

It includes a harmonized implementation and verification approach based on supply chain communication, documentation, and laboratory analytical testing.

We encourage value chain actors to use this document to demonstrate conformity with the current AFIRM RSL.



## Background

**VOCs cover a huge range of chemical substances from many different substance groups or families because they are defined by a physical property rather than a specific functional group. Consequently, there are many sources of VOCs largely associated with manufacturing, which are best addressed using a Manufacturing Restricted Substances List (MRSL).**

However, due to their nature, VOCs create risks in articles that need to be understood and managed. For the purposes of this guide, in-scope products include finished products ready to ship through to end of life. For the sake of simplicity, a restricted VOC is any substance that can be released into the atmosphere at ambient temperatures and that can cause issues all along the supply chain, including:

- In the working environment at factories
- In shipping containers
- In distribution centers and warehouses
- In retail outlets and stores
- For consumers
- At the end of life

Due to the ease with which VOCs are released, testing can be challenging (see AFIRM Sampling Guidance). Several substances which can be defined as VOCs are regulated or otherwise restricted, and these appear throughout the AFIRM Restricted Substances List (RSL) in different sections according to their chemical type / functional grouping. They may have specific test methods and limits which can complicate testing.

## Testing Approach

The AFIRM VOC Task Force, in consultation with AFIRM's LabTAC, introduced a semi-quantitative approach of GC / MS headspace, 45 minutes at 120°C, as the appropriate screening method in the 2025 AFIRM RSL. Using a single reference standard, this method can characterise:

- The 16 existing VOCs, excluding Benzene, from earlier versions of the AFIRM RSL.
- An additional 21 relevant VOCs with significant hazard profiles (Cat 1 or 2 CMR typically) added to Version 10 of the AFIRM RSL (February 2025).
- All 37 substances at concentrations > 100 ppm per substance (excluding Benzene, which has a 5 ppm limit derived from existing regulation).

A *total* VOC limit of 500 ppm, above which brands may wish to conduct further investigation, is also included.

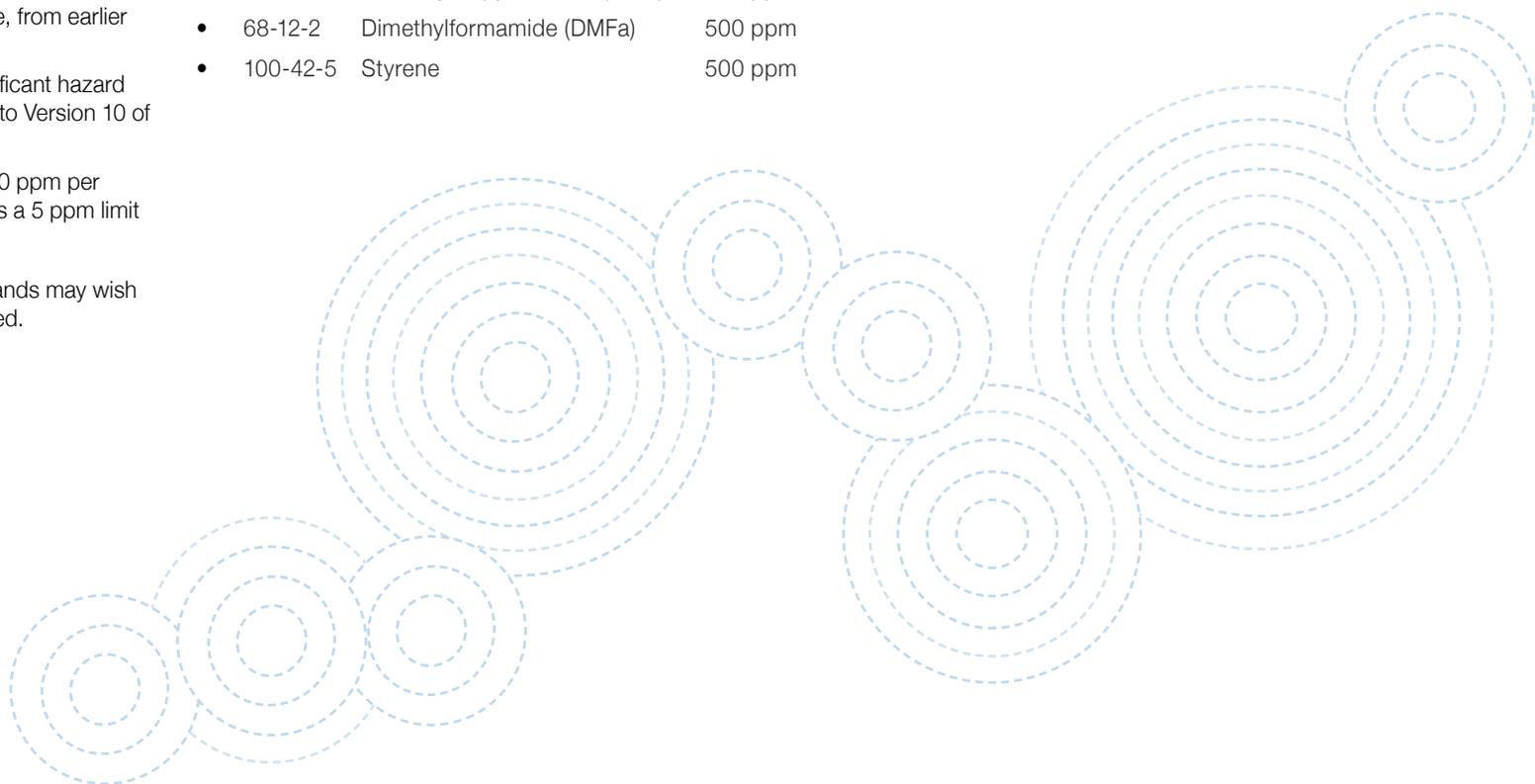
Using the headspace screening method, 10 substances listed in other sections of the RSL may also be detected. The screening results can indicate whether further investigation using dedicated methods included in the RSL might be necessary. Since this is a semi-quantitative method, results from targeted analysis using dedicated methods may yield different results. Legal thresholds should only be verified using the appropriate method from the AFIRM RSL.

The following five substances have limit values > 100 ppm, so screening gives a good indication if they are present at levels potentially exceeding AFIRM RSL limits:

- 75-12-7 Formamide 1000 ppm
- 127-19-5 Dimethylacetamide (DMAC) 1000 ppm
- 872-50-4 N-Methyl-2-pyrrolidone (NMP) 1000 ppm
- 68-12-2 Dimethylformamide (DMFa) 500 ppm
- 100-42-5 Styrene 500 ppm

For the other five, the AFIRM RSL limit values are < 100 ppm, so further testing using dedicated methods may be necessary to determine whether they are present at levels exceeding AFIRM RSL limits (that is, if they are not detected > 100 ppm via headspace screening assessment).

- 98-86-2 Acetophenone 50 ppm
- 617-94-7 2 phenyl 2 propanol 50 ppm
- 91-20-3 Naphthalene 10 ppm
- 95-50-1 1,2 dichlorobenzene 10 ppm
- 106-46-7 1, 4 dichlorobenzene 1 ppm





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