

GUIDELINE

Passenger car and light commercial vehicle tyres

Method for stabilizing evaporative emissions of a new tyre

June 2022 edition



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Foreword

ETRMA is the European Tyre and Rubber Manufacturers Association. It is the voice of the tyre and rubber goods producers to the EU Institutions. Its activities focus on supporting the tyre and rubber innovative industry and cooperating with the legislators to create an enabling environment that will help the industry achieve the following goals: promoting the principles of better regulation, ensuring that policymaking is science-based and, once in implementation, effectively enforced.

ETRMA aims to contribute in a meaningful manner to legislative developments and anticipates the impact of future initiatives on the industry through recognized scientific research. ETRMA furthermore develops non-binding guidelines to support the industry in becoming an even more innovative, competitive, responsible and sustainable sector across Europe and beyond.

Through the ETRMA experts working groups, ETRMA periodically reviews such guidance documents, such as the present document, with a view to update them as needed or appropriate, for instance on account of relevant regulatory evolutions at European and/or at UN level or on account of scientific developments.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. Details of any patent rights incidentally identified during the development of the documents will be referred therein. ETRMA is not responsible for identifying any or all such patent rights. Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

The present ETRMA guidelines do not relate to market conduct, since they merely deal with a test method and not with the actual performance of the tyres. They are completely voluntary and do not constitute a compulsory requirement or directive for members and/or non-members. The fact that these ETRMA guidelines advance a certain method for stabilizing evaporative emissions of a new tyre does not imply that other methods would not be suitable or less suitable.

They are moreover fully in adherence to the World Trade Organization (WTO) principles with respect to Technical Barriers to Trade (TBT).

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1 Introduction

Any vehicle tyre is usually emitting an unstable and higher level of evaporative emissions soon after the manufacturing process. These emissions are decaying during the normal tyre storage and use during the first months following the manufacturing, until reaching a stable level.

Whole vehicle evaporative emissions standards and regulatory methodologies are historically aiming at reducing vehicle evaporative emissions of the fuel system over the entire life span of the vehicle, including during the refuelling operations. In other words, existing regulations only have these emissions in scope.

Evaporative emissions may nonetheless also be emitted by non-fuel components of the vehicle, such as tyres and/or plastics or other rubber parts. Tyre emissions have been always accounted for only a negligible part with respect to a threshold set for a SHED (Sealed Housing for Evaporative Determination) of a whole vehicle. However, with the continuous tightening over time of fuel system evaporative emission thresholds, those emissions not pertinent to the fuel system and outside the regulatory scope, have the potential to influence the measurements if the stabilization procedures are not evolving over time as well.

In general, SHED testing procedures for a whole vehicle are already considering a pre-conditioning phase and a background stabilization phase. Despite the increasing need for more accurate SHED measurements on the fuel system emissions performances on account of the tightening of the thresholds, the current practice of a pre-conditioning phase and a background stabilization phase is not always taking into account the tyre stabilization decay curve and the proper conditions to prevent the tyre emissions from influencing the vehicle SHED measurements objectives.

The method for stabilizing the evaporative emissions of a new tyres for passenger cars and light commercial vehicles described in this document aims to identify the tyre preparation prior to a SHED or other evaporative emission test when mounted on a vehicle, to reduce the variability of the vehicle fuel system evaporative emissions performance measurement. It is based on the work described in the bibliography [1] – [5]. In general, tyres cannot be considered stabilized before 3000 km run-in.

2 Scope

This document specifies a method that is deemed appropriate for stabilizing the emissions of new tyres for passenger cars and light commercial vehicles, as a preparatory phase before measuring evaporative emissions by using the SHED (Sealed Housing for Evaporative Determination) or equivalent, either as a single tyre, a set of tyres, or when mounted on a vehicle undergoing evaporative emissions measurements.

The method may be used for all passenger car tyres including T-type temporary-spares tyres (i.e. tyres conforming to ISO 4001-1 or UN regulation no. 30) and light commercial vehicle tyres (i.e. tyres conforming to ISO 4209-1 or UN regulation no. 54 and marked with "C", "CP" or "LT").

3 Normative references

The following documents are referred to in the text. The latest edition of the referenced document applies.

- ISO 4000-1, *Passenger car tyres and rims (metric series) — Part 1: Tyres.*
- ISO 4209-1, *Truck and bus tyres and rims (metric series) — Part 1: Tyres.*
- ISO 4223-1, *Definitions of some terms used in the tyre industry — Part 1: Pneumatic tyres.*
- UN regulation no. 30 - *Uniform Provisions Concerning The Approval Of Pneumatic Tyres For Motor Vehicles And Their Trailers.*
- UN regulation no. 54 - *Uniform Provisions Concerning The Approval Of Pneumatic Tyres For Commercial Vehicles And Their Trailers.*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4223-1 “Definitions of some terms used in the tyre industry -- Part 1: Pneumatic tyres”, in ISO 4000-1 “Passenger car tyres and rims (metric series) — Part 1: Tyres”, in ISO 4209-1 “Truck and bus tyres and rims (metric series) — Part 1: Tyres”, as well as the following apply.

4.1
evaporative emissions
hydrocarbon vapours lost from the fuel system of a motor vehicle during parking and immediately before refuelling of a sealed fuel tank, also referred as VOC.
Evaporative emissions do not include hydrocarbon vapours emitted through the tailpipe as part of exhaust gases.
Hydrocarbon vapours can be also emitted at the beginning by newly manufactured tyres and, not being within the above definition, can influence the measurement of such evaporative emissions if the tyres are not stabilized.

4.2
test tyre
the tyre undergoing the stabilization procedure

4.3
set of tyres
set of four (4) test tyres plus spare tyre if applicable

4.4
test chamber
ventilated and temperature-controlled chamber used to stabilize a test tyre or a set of tyres

The test chamber can be either a walk-in chamber or of a size sufficient for containing the set of tyres.

5 Procedure methodology

5.1 Evaporative emissions stabilization method for a passenger car tyres

The tyre stabilization is obtained by heating tyres, which may be mounted on a rim and inflated to a pressure adequate to keep the tyre fitted to the rim flanges, for a fixed period in controlled ambient conditions.

Before testing, tyres should be cleaned and tyre label should be removed.

The “relative” evaporative emission level of the stabilized tyres mounted on the vehicle shall be evaluated through a SHED (Sealed Housing for Evaporative Determination) or equivalent test: this procedure is outside the scope of this document.

5.2 Procedure Equipment

The procedure refers to one set of tyres. The stabilization procedure shall be performed inside a test chamber with the following features:

- the ventilation system shall ensure sufficient air circulation to avoid VOC saturation in the chamber;
- the temperature control shall be capable of maintaining the temperature at $70^{\circ}\text{C} \pm 3^{\circ}\text{C}$.

5.3 Tyres

The procedure is intended for newly manufactured tyres that were produced not less than 2 weeks, as determined by the week of manufacture marked on the sidewall, recorded at the start of the procedure. It is permissible to stabilize tyres according to this procedure after they have been subjected to run-in.

As a result of the stabilization procedure, the tyres are stiffened. Therefore, in particular for low-aspect ratio tyres and run flat and Extended Mobility Tyres (EMT), it should be considered carefully whether the stabilization procedure has an adverse effect on the mountability of such tyres and whether the tyres should be mounted on a rim before the stabilization procedure.

5.4 Procedure

5.4.1 Execution

Set the temperature to 70°C .

Once the target temperature has been reached, position the tyres vertically and not touching each other inside the test chamber.

Conduct the stabilization for 5 weeks without interruption.

Remove the tyres from the chamber and wait until the tyres have reached the ambient temperature prior to proceeding to any SHED test.

5.4.2 Boundary conditions

Although this procedure is non-destructive and does not affect the overall tyre characteristics and performances, at temperatures exceeding 50°C, certain forms of deterioration might be accelerated sufficiently to affect the ultimate service life. Therefore, it is strongly recommended not to use tyres stabilized according to this procedure for any other purpose than for vehicle SHED or equivalent measurements. In any case, any other use of tyres stabilized according to this procedure shall be agreed with the tyre manufacturer.

When storing the tyres, the ETRTO Recommendations [6] should be observed. In particular, moist conditions should be avoided, and care shall be taken to ensure that no condensation occurs. Whenever possible, tyres should be stored inside a cool, dry and aerated area.

Bibliography

[1] HHA-102 RMA report (2001), Final Report - Evaporative Emissions Sampling of Whole Tires Test Project, Harold M. Haskew, Harold Haskew & Associates, Inc. - Submitted to the Rubber Manufacturers Association, 1400 K Street, NW, Washington, D.C. 20005 - June, 2001.

[2] UN Global Technical Regulation No. 19 (2020) (EVAPorative emission test procedure for the Worldwide harmonized Light vehicle Test Procedure (WLTP EVAP)) – Amendments 1 to 3 (9 October 2020).

[3] JRC REPORT (2012) - Review of the European Test Procedure for Evaporative Emissions: Main Issues and Proposed Solutions, Giorgio Martini, Urbano Manfredi, Marta Rocha, Alessandro Marotta - Luxembourg: Publications Office of the European Union, 2012.

[4] Martini, Giorgio & Paffumi, Elena & De Gennaro, Michele & Mellios, Giorgos. (2014). European type-approval test procedure for evaporative emissions from passenger cars against real-world mobility data from two Italian provinces. *The Science of the total environment*. 487C. 506-520. 10.1016/j.scitotenv.2014.04.053.

[5] European Commission (2020), Commission Regulation (EU) 2017/1151 of 1 June 2017 supplementing Regulation (EC) No 715/2007 of the European Parliament and of the Council on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information, amending Directive 2007/46/EC of the European Parliament and of the Council, Commission Regulation (EC) No 692/2008 and Commission Regulation (EU) No 1230/2012 and repealing Commission Regulation (EC) No 692/2008. Consolidated text of 25.01.2020.

[6] ETRTO The European Tyre and Rim Technical Organisation (2021), RECOMMENDATIONS, Edition: 13 July 2021, Brussels – Belgium

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