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**Acoustics — Measurement of the  
influence of road surfaces on traffic  
noise —**

**Part 3:  
Reference tyres**

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*Acoustique — Méthode de mesurage de l'influence des revêtements de  
chaussées sur le bruit émis par la circulation —  
Partie 3: Pneumatiques de référence*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html)

This document was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

A list of all parts in the ISO 11819 series can be found on the ISO website.

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## Introduction

The emission and propagation of road traffic noise greatly depends on road surface characteristics, notably on texture and porosity. Both these characteristics influence the generation of tyre/road noise and, in addition, the porosity can influence the propagation of sound, particularly when the propagation takes place close to the surface. Power unit noise, which is usually generated at a greater height above the road surface than tyre/road noise, may also be affected during propagation by the porosity characteristics of the road surface. These effects lead to differences in sound levels, associated with a given traffic flow and composition, from different road surfaces of up to 15 dB, which can have a substantial impact on the environmental quality alongside a road.

It is therefore important to be able to measure the influence of surface characteristics on tyre/road noise by a standardized method. Within the constraints of this method, ISO 11819-2 offers an objective rating of the road characteristics to satisfy a need expressed by road planners, road administrators, contractors, manufacturers of so-called “low-noise surfaces” and other parties concerned with the control of road traffic noise.

ISO 11819-2, which describes the so-called close-proximity (CPX) method, relies on special tyres to be used during the testing. However, it does not specify such tyres; instead, it is the purpose of this document to specify two reference tyres for use in the CPX method.

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# Acoustics — Measurement of the influence of road surfaces on traffic noise —

## Part 3: Reference tyres

### 1 Scope

This document specifies two tyres intended to serve as reference tyres when using the close-proximity (CPX) method specified in ISO 11819-2.

The CPX method is a method for evaluating different road surfaces with respect to their influence on traffic noise, under conditions when tyre/road noise dominates. This method ideally requires the use of standardized tyres, which have noise characteristics that are broadly representative of the effect of road surfaces on the noise emission of passenger car and heavy vehicle tyres. However, such tyres are not specified in ISO 11819-2. This document serves to specify these standardized tyres.

### 2 Normative references

The following documents are referred to in the text in such way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 868:2003, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)*

ISO 3911:2004, *Wheels and rims for pneumatic tyres — Vocabulary, designation and marking*

ISO 4000-1, *Passenger car tyres and rims — Part 1: Tyres (metric series)*

ISO 11819-2:2017, *Acoustics — Method for measuring the influence of road surfaces on traffic noise — Part 2: The close-proximity method*

ISO/TS 13471-1, *Acoustics – Temperature influence on tyre/road noise measurement – Part 1: Correction for temperature when testing with the CPX method*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ASTM F 2493:2014, *Standard Specification for P225/60R16 97S Radial Standard Reference Test Tire*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11819-2, ISO/TS 13471-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

**3.1  
reference tyre**

test tyre specified for the purpose of representing certain features in tyre/road sound emission, designed and constructed for use in the close-proximity (CPX) method with specified and reproducible standard characteristics

**3.2  
CPX level  
close-proximity level**

$L_{CPX}$

time-averaged A-weighted sound pressure level (SPL) of the tyre/road noise as determined by the close-proximity (CPX) method, either broadband or spectral bands, as required

Note 1 to entry: The CPX level is expressed in decibels. In order to provide more information, additional suffixes are used; see ISO 11819-2 where the close-proximity method is described.

**3.3  
rubber hardness**

$H_A$   
quantity expressed in Shore A units of the indentation resistance of tyre rubber based on the depth of penetration of a conical indenter, using a Type A durometer defined in ISO 868:2003

**3.4  
rubber hardness coefficient**

$\beta_t$

coefficient used for correcting the CPX level for rubber hardness (3.3) of the tread of tyre t

Note 1 to entry: The tyre rubber hardness coefficient is expressed in decibels per durometer Type A reading ("Shore A").

**4 General principles**

Different tyres rank road surface influence on noise differently. The two reference tyres in this document are denoted P1 and H1. Tyre P1 classifies the acoustic properties of road surfaces in a similar manner to the majority of passenger car tyres. Tyre H1 classifies acoustic properties in a similar manner to the majority of heavy vehicle tyres. Consequently, combining measurement results for these two tyres provides a good representation of how the noise emission of a mix of light and heavy vehicle traffic is influenced by road surfaces.

Where possible, reference tyres are selected to offer long-term consistency in manufacture and availability. This document also supplies requirements and advice with regard to the performance of the tyres over time, in order to provide time-independent CPX measurement results.

NOTE The reference tyres specified here can also meet a more general need for reference tyres. Tyre P1 in this document is already used as a reference for wet and snow grip testing according to UN ECE Regulation R117.<sup>[1]</sup> Examples of other possible alternative uses are as follows:

- as a stable reference against which the noise emission of other tyres can be compared;
- as a stable reference to check long-term performance of ISO 10844 test surfaces;
- as suitable tyres for vehicle noise testing, when it is desirable to have well-defined tyre equipment;
- as reference tyres for performing certain rolling resistance or fuel consumption tests of road surfaces.<sup>[3]</sup>



## 5 Reference tyres

### 5.1 Tyre descriptions

The following two tyres are defined as reference tyres in this document.

- **Tyre P1:** A steel-belted radial tyre for relatively large passenger cars or vans, specified in ASTM F2493: 2014, having the dimensional code P225/60R16 and referred to as a standard reference test tyre (SRTT). Both the text “Standard Reference Test Tyre” and the dimensional code P225/60R16 shall be displayed on the sidewall [see [Figure 1 a](#)].
- **Tyre H1:** A steel-belted reinforced radial tyre for light trucks and vans, manufactured by Cooper Tire & Rubber Co. in the United Kingdom under the product name “Supervan AV4”,<sup>1)</sup> having the dimensional code 195R14C. Both the text “Avon Supervan AV4” and the dimensional code 195R14C shall be displayed on the sidewall [see [Figure 1 b](#)]. The Supervan AV4 has a reinforced carcass construction to enable the carriage of heavy loads, and has a very robust rubber compound on the sidewall.



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a) Tyre P1

b) Tyre H1

NOTE Both subfigures show the sidewall where the complete DOT mark appears, including the production date WWYY. [Annex D](#) gives details about how to get access to the tyres.

**Figure 1 — Sidewall markings**

For both tyres, the week and year of production is marked by four digits (WWYY) on at least one of the sidewalls (where WW is week number and YY is the year). See the specifications in [Clause 6](#).

NOTE At the time of publication, there is no known standard reference test tyre that classifies acoustic properties of road surfaces in a similar manner to the majority of heavy vehicle tyres. It is, therefore, necessary to use a market tyre for H1, even though this is unlikely to have the same high quality properties as P1 and it may have a limited availability.

Information on the storage and preservation of tyres is given in [Annex B](#).

The availability of the reference tyres is given in [Annex C](#).

### 5.2 Tyre specifications

The basic dimension designation shall be P225/60R16 for tyre P1, and 195R14C for tyre H1, in accordance with ISO 4000-1. [Table 1](#) presents the various specifications of the tyres.

1) Supervan AV4 is the trade name of a product supplied by Cooper Tire & Rubber Co., United Kingdom. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named.

**Table 1 — Specifications of the reference tyres**

Tyre	Basic dimension code	Nominal cross-section width	Nominal undeflected diameter	Cross-sectional tread radius	Load index (LI)	Speed index
P1	P225/60R16	231 mm	680 mm	308 mm	97	S
H1	195R14C	198 mm	666 mm	302 mm	106/104	N

### 5.3 Tread pattern

The tread patterns are as follows.

- **Tyre P1:** This tread has a geometrical pattern as illustrated in [Figure 2 a\)](#) and defined in ASTM F2493: 2014; see [5.1](#).
- **Tyre H1:** This tread has a geometrical pattern as illustrated in [Figure 2 b\)](#) and defined in specifications for “Supervan AV4” by Cooper Tire & Rubber Co.; see [5.1](#).

For tyre H1 it has appeared that at least a few samples of this tyre have been manufactured with a misaligned tread pattern, as illustrated in [Figure 3](#). The grooves running in the lateral direction shall not be totally blocked by the misalignment (although a thin “skin” at the joint between the two halves of the tread is normal). Therefore, the type of misaligned pattern in [Figure 3 b\)](#) is not acceptable, whereas the one illustrated in [Figure 3 a\)](#) is acceptable.



a) Tyre P1

b) Tyre H1

**Figure 2 — Tread patterns**

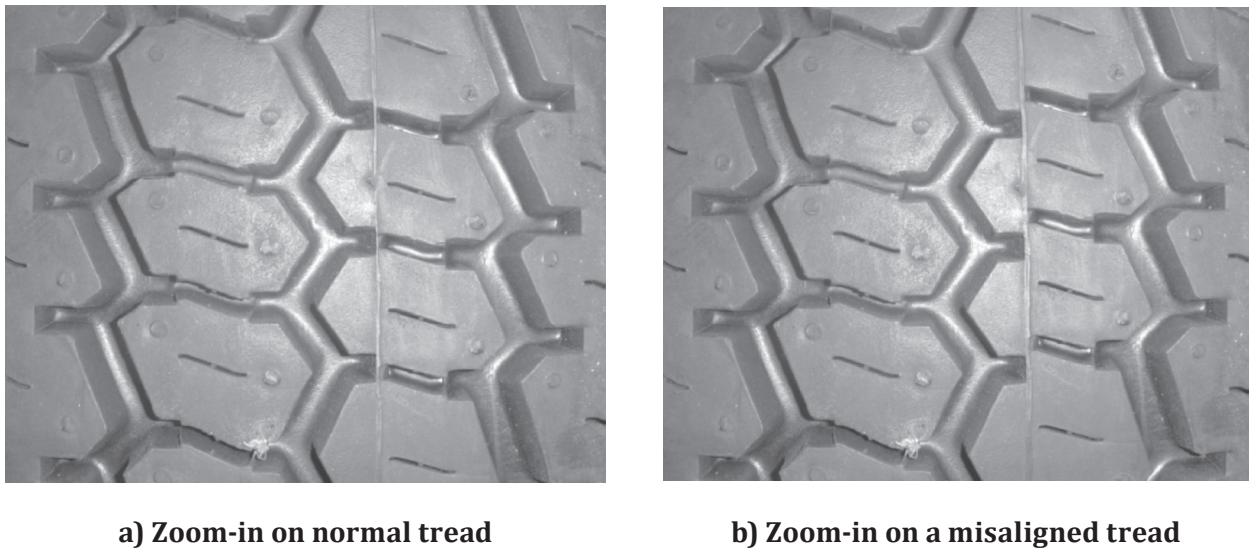


Figure 3 — Tread of tyre H1

#### 5.4 Tread pattern condition

Initial tread pattern depth as measured in the circumferential grooves shall be

- $(8,0 \pm 0,5)$  mm for tyre P1, and
- $(10,0 \pm 0,5)$  mm for tyre H1.

The tyre treads shall be as originally moulded without any tread grinding; except for that caused by normal run-in (see [Clause 7](#)), and without any repairs that change the surface of the tyre.

Tread pattern wear shall be a maximum of 1,0 mm in comparison to the initial tread depth. The tread depth change can be measured with the procedure specified in Reference [4].

The test tyres shall be examined regularly for damage to the tread and for the presence of foreign objects in the tread. Chippings or other dirt in the tread shall be removed before testing takes place and where appropriate during testing. If there is clearly noticeable wear or deformation on any part of the tyre its use shall be discontinued.

#### 5.5 Rubber hardness

The rubber hardness shall be measured after the tyre has been run-in and at least every three months during the period when they are used for measurements. Measurements shall be performed at  $20 \text{ °C} \pm 5 \text{ °C}$  with a Type A durometer, using the procedure described in [Annex A](#). The whole tyre shall have settled at an equilibrium temperature before the measurements start. The rubber hardness values  $H_A$  (expressed in “Shore A”) shall be within the range

- 62 to 73 for tyre P1, and
- 60 to 73 for tyre H1.

NOTE 1 The measured value for rubber hardness is a reading which is unitless. Nevertheless, a commonly used designation is “Shore A”.

NOTE 2 The rubber hardness of tyre P1 in new condition is specified in ASTM F2493 as  $(64 \pm 2)$  Shore A at a temperature of  $23 \text{ °C}$ .