

Proposal for a correction to UN Regulation No. 51.03



Scope

- Annex 8 (Indoor testing) in Regulation 51.03 contains an inconsistency, as it refers to free-rolling tyre noise measurements being performed according to two different methods.
- This document explores the issue and proposes a correction to resolve the inconsistency.

R51.03 up to supplement 4 (introducing indoor testing Annex 8)



Annex 3

Methods and instruments for measuring the sound made by motor vehicles

3. Methods of testing

...
Indoor tests shall be performed according to paragraph 3.1. using the specifications of ISO 362-3:2016, variant A. For indoor application, the manufacturer shall provide to the technical service, documentation according to Annex 8, paragraph 1. Variant A is a combination of indoor testing (power train sound) and outdoor testing (tyre/road sound).

...

Annex 8 Indoor testing

Indoor testing is only for Annex 3 and Annex 7 measurements.

2. Vehicle tested indoor using Variant A

2.3. Tyre/road sound

The measurements of the tyre/road sound shall be performed on a test track as described paragraph 2.1.1. of Annex 3 of this Regulation. The evaluation of tyre/road sound consists of two procedures, namely:

- (a) Evaluation of free rolling sound;
- (b) Evaluation of tyre/road sound including torque influence which can be derived from a) by a simplified method.

All conditions for evaluation of tyre/road sound shall be done according to paragraph 3. of this Annex.

3. Procedure for measurement, evaluation, and calculation of tyre/road sound when using variant A. All conditions for evaluation of tyre/road sound, free rolling sound, and torque influence are described in ISO 362-3:2016, Annex B.

ISO362-3:2016

Variant A: Measurement of power train noise on the dynamometer analogously to ISO 362-1 and energetical addition of the tyre/road noise (measured separately on an outdoor test track) (see 10.2).

All conditions for evaluation of tyre/road noise, free rolling noise, and torque influence are described in Annex B.

ISO 362-3:2016 (Annex B)

Procedure for measurement, evaluation, and calculation of tyre/ road noise when using variant A (Annex B)

B.2.1 Tyre test vehicle

B.2.2 Power train conditions

B.2.3 Tyre conditions

B.2.4 Temperature correction

B.3.1 Vehicle operating conditions for the free rolling noise component

R51.03 up to supplement 7 (introducing tyre temperature correction)

Annex 3

Methods and instruments for measuring the sound made by motor vehicles

3. Methods of testing

...
Indoor tests shall be performed according to paragraph 3.1. using the specifications of ISO 362-3:2016, variant A. For indoor application, the manufacturer shall provide to the technical service, documentation according to Annex 8, paragraph 1. Variant A is a combination of indoor testing (power train sound) and outdoor testing (tyre/road sound).

...

Annex 8 Indoor testing

Indoor testing is only for Annex 3 and Annex 7 measurements.

2. Vehicle tested indoor using Variant A

2.3. Tyre/road sound

The measurements of the tyre/road sound shall be performed on a test track as described paragraph 2.1.1. of Annex 3 of this Regulation. The evaluation of tyre/road sound consists of two procedures, namely:

- Evaluation of free rolling sound; as described in Appendix 3 of Annex 3;
- Evaluation of tyre/road sound including torque influence which can be derived from a) by a simplified method.

All conditions for evaluation of tyre/road sound shall be done according to paragraph 3. of this Annex.

3. Procedure for measurement, evaluation, and calculation of tyre/road sound when using variant A. All conditions for evaluation of tyre/road sound, free rolling sound, and torque influence are described in ISO 362-3:2016, Annex B.

ISO362-3:2016

Variant A: Measurement of power train noise on the dynamometer analogously to ISO 362-1 and energetical addition of the tyre/road noise (measured separately on an outdoor test track) (see 10.2).

...
All conditions for evaluation of tyre/road noise, free rolling noise, and torque influence are described in Annex B.

ISO 362-3:2016 (Annex B)

Procedure for measurement, evaluation, and calculation of tyre/ road noise when using variant A (Annex B)

B.2.1 Tyre test vehicle

B.2.2 Power train conditions

B.2.3 Tyre conditions

B.2.4 Temperature correction

B.3.1 Vehicle operating conditions for the free rolling noise component

Annex 3 – Appendix 3

Coast-by test method for measuring tyre-rolling sound emission

Comment: According to 2.3 a) the free rolling sound shall be evaluated according to Appendix 3 of Annex 3. However, 2.3 also states that the evaluation of tyre/road noise shall be done according to paragraph 3, which in turn points to ISO 362-3:2016 Annex B. The problem is that ISO 362-3 and Annex 3 of Appendix 3 provides different procedures to determine tyre/road noise!



Background: Supplement 7

Submitted by the [Informal Working Group on Measurement Uncertainties](#)
[ECE/TRANS/WP.29/GRBP/2022/8](#)

With the purpose to reduce test variability

Introducing:

[Annex 3 – Appendix 2 “Correction for the tyre rolling sound component of pass-by sound measurements”](#)

[Annex 3 – Appendix 3 “Coast-by test method for measuring tyre-rolling sound emission](#)

Introducing the following text in Annex 3:

[3.4.2. Tyre rolling sound reference measurements according to Annex 3 Appendix 3 which are carried out independent of the type approval of a vehicle \(see Case 2 of Annex 3 Appendix 2\) are not mandatory but can be performed at the option and responsibility of the vehicle manufacturer.](#)

and introducing the following text in Annex 8:

2.3. Tyre/road sound

The measurements of the tyre/road sound shall be performed on a test track as described paragraph 2.1.1. of Annex 3 of this Regulation. The evaluation of tyre/road sound consists of two procedures, namely:

(a) Evaluation of free rolling sound as described in [Appendix 3 of Annex 3;](#)



Main differences between R51.03 and ISO362-3:2016

	R51 Annex 3, app 3	ISO362-3:2016
Purpose	To calculate the tyre rolling sound level at a reference temperature and speed, to correct test result in Annex 3.	To calculate tyre sound (rolling + torque) level as a function of vehicle position , which is added to indoor vehicle sound measurements
Speed at AA'	40-60 km/h Evenly distributed	40-90 km/h 25-65 km/h (N3/M3) Incr. of 10 km/h
No of measurements.	≥ 6 for the whole range	≥ 4 per speed
Measurement read-out of sound level:	Maximum sound level	Continuously between AA' and BB'
Measurement read-out of speed	Front end of vehicle at line PP'	Continuously between AA' and BB'
Type of test	Coast down (or constant speed for EVs)	Coast down
Tyres	Four tyres shall be fitted on the test vehicle	As fitted on the test vehicle
Torque model	No	Yes



Summary

- Supplement 7 introduced an inconsistency in R51.03 Annex 8. As currently written, it requires free-rolling tyre noise testing to be conducted in accordance with both ISO 362-3:2016 **and** Annex 3, Appendix 3
- The test methods in ISO362-3:2016, and Annex 3, Appendix 3 are different and serve different purposes
- Annex 3, Appendix 3 does not include a test method capable of generating a tyre sound model that can be integrated into indoor powertrain measurements.



Proposal for a supplement

Annex 8

2.3. Tyre/road sound

The measurements of the tyre/road sound shall be performed on a test track as described paragraph 2.1.1. of Annex 3 of this Regulation. The evaluation of tyre/road sound consists of two procedures, namely:

- (a) Evaluation of free rolling sound; ~~as described in Appendix 3 of Annex 3;~~
- (b) Evaluation of tyre/road sound including torque influence which can be derived from a) by a simplified method.

All conditions for evaluation of tyre/road sound shall be done according to paragraph 3. of this Annex.