

Council directive 92/23/EEC of 31 March 1992 relating to tyres for motor vehicles and their trailers and to their fitting (repealed)

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[^{F1}ANNEX V

TYRE/ROAD NOISE EMISSION

Textual Amendments

- F1** Inserted by [Directive 2001/43/EC of the European Parliament and of the Council of 27 June 2001 amending Council Directive 92/23/EEC relating to tyres for motor vehicles and their trailers and to their fitting.](#)

1. SCOPE

This annex applies to the EC type-approval of tyres, as components, in respect of tyre/road noise emissions.

2. DEFINITIONS

For the purposes of this Annex, the definitions of Annex II shall apply, except for the definition under section 2.1., which shall read as follows:

2.1. ‘Type of tyre’

means, in relation to type-approval pursuant to this Annex (tyre/road noise emission), a range of tyres consisting of a list of tyre size designations (see section 2.17 in Annex II), brand names, trade marks and trade descriptions which do not differ in such essential characteristics as:

- the manufacturer's name
- the tyre classification (see section 2.4. of this Annex)
- the tyre structure (see section 2.1.4. of Annex II)
- the category of use (see section 2.1.3. of Annex II)
- for class C1 tyres. Reinforced or Extra Load
- the tread pattern (see 2.3 of Information Document, Annex I, Appendix 3).

Note:

The effect of changes in minor details of tyre tread and construction on the tyre/road noise emission will be determined during checks on the conformity of production.

In addition, the following definitions shall also apply:

2.2. ‘Brand name or trade description’

means the identification for the tyre as provided by the tyre manufacturer. The brand name may be the same as the manufacturer and the trade description may coincide with the trade mark.

2.3. ‘Tyre/road noise emission’

means the noise arising from the contact between tyres in motion and the road surface.

2.4. For the purpose of this Annex, the following classification shall apply:

class C1 tyres	passenger car tyres (see section 2.32. of Annex II);
class C2 tyres	commercial vehicle tyres (see section 2.33. of Annex II) with load capacity index in single formation ≤ 121 and speed category

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	symbol \geq 'N' (see section 2.29.3. of Annex II);
class C3 tyres	commercial vehicle tyres (see section 2.33. of Annex II) with load capacity index in single formation \leq 121 and speed category symbol \leq 'M' (see section 2.29.3. of Annex II) or commercial vehicle tyres (see section 2.33. of Annex II) with load capacity index in single formation \geq 122.

3. MARKING REQUIREMENTS

3.1. In addition to other marking requirements given in section 4 of Annex I and section 3 of Annex II, the tyre must bear the following markings:

3.1.1. the manufacturer's name or trade mark; the brand name, the trade description or the trade mark.

4. TYRE/ROAD NOISE EMISSION REQUIREMENTS

4.1. General requirements

A set of four tyres bearing the same tyre size designation and tread pattern that is representative of the range of tyres, shall be submitted to a tyre/road noise emission level test to be carried out as specified in Appendix 1.

4.2. The noise levels determined in accordance with section 4.5 of Appendix 1 shall not exceed the following limits:

4.2.1. Class C1 tyres, with reference to the nominal section width (see Annex II, section 2.17.1.1.) of the tyre that has been tested:

		Limit values in dB(A)		
Tyre Class	Nominal section width (mm)	A	B ^d	C ^{de}
C1a	≤ 145	72 ^a	71 ^a	70
C1b	$> 145 \leq 165$	73 ^a	72 ^a	71
C1c	$> 165 \leq 185$	74 ^a	73 ^a	72
C1d	$> 185 \leq 215$	75 ^b	74 ^b	74

a Limit values in column A shall apply until 30 June 2007; Limit values in column B shall apply as from 1 July 2007.

b Limit values in column A shall apply until 30 June 2008; Limit values in column B shall apply as from 1 July 2008.

c Limit values in column A shall apply until 30 June 2009; Limit values in column B shall apply as from 1 July 2009.

d Indicative figures only. Definitive figures will depend on amendment of the Directive following the report required in Article 3(2) of Directive 2001/43/EC.

e Limit values for column C will result from the amendment of the Directive following the report required in Article 3(2) of Directive 2001/43/EC.

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C1e	> 215	76^c	75^c	75
a	Limit values in column A shall apply until 30 June 2007; Limit values in column B shall apply as from 1 July 2007.			
b	Limit values in column A shall apply until 30 June 2008; Limit values in column B shall apply as from 1 July 2008.			
c	Limit values in column A shall apply until 30 June 2009; Limit values in column B shall apply as from 1 July 2009.			
d	Indicative figures only. Definitive figures will depend on amendment of the Directive following the report required in Article 3(2) of Directive 2001/43/EC.			
e	Limit values for column C will result from the amendment of the Directive following the report required in Article 3(2) of Directive 2001/43/EC.			

4.2.1.1. For reinforced (or Extra Load) tyres (see Annex II, section 3.1.8.), the limit values in section 4.2.1. shall be increased by 1 dB(A)

4.2.1.2. For tyres classified in category of use 'Special', (see Annex II, section 2.1.3.), the limit values in section 4.2.1. shall be increased by 2 dB(A).

4.2.2. Class C2 tyres with reference to the category of use (see Annex II, section 2.1.3.) of the range of tyres:

Category of use	Limit value expressed in dB(A)
Normal	75
Snow	77
Special	78

4.2.3. Class C3 tyres, with reference to the category of use (see Annex II, section 2.1.3.) of the range of tyres:

Category of use	Limit value expressed in dB(A)
Normal	76
Snow	78
Special	79

Appendix 1

TEST METHOD FOR TYRE-ROAD SOUND LEVELS COAST-BY METHOD

0. Introduction

The presented method contains specifications on measuring instruments, measurement conditions and the measurement method, in order to obtain the noise level of a set of tyres mounted on a test vehicle rolling at high speed on a specified road surface. The maximum sound pressure level is to be recorded, when the test vehicle is coasting, by remote-field microphones; the final result of a reference speed is obtained from a linear regression analysis. Such test results cannot be related to tyre noise measured during acceleration under power or deceleration during braking.

1. Measuring instruments

1.1. Acoustic measurements

The sound level meter or the equivalent measuring system, including the windscreen recommended by the manufacturer, shall at least meet the requirements of Type 1 instruments in accordance with IEC 60651, second edition.

The measurements shall be made using the frequency weighting A, and the time weighting F.

When using a system that includes a periodic monitoring of the A-weighted sound level, a reading should be made at a time interval not greater than 30 ms.

1.1.1. Calibration

At the beginning and at the end of every measurement session, the entire measurement system shall be checked by means of a sound calibrator that fulfils the requirements for sound calibrators of at least precision Class 1 according to IEC 942:1988. Without any further adjustment the difference between the readings of two consecutive checks shall be less than or equal to IEC 942:1988. Without any further adjustment the difference between the readings of two consecutive checks shall be less than or equal to 0,5 dB. If this value is exceeded, the results of the measurements obtained after the previous satisfactory check shall be discarded.

1.1.2. Compliance with requirements

The compliance of the sound calibration device with the requirements of IEC 60942:1988 shall be verified once a year and the compliance of the instrumentation system with the requirements of IEC 60651:1979/A1:1993, second edition, shall be verified at least every two years by a laboratory which is authorised to perform calibrations traceable to the appropriate standards.

1.1.3. Positioning of the microphone

The microphone (or microphones) must be located at a distance of $7,5 \text{ m} \pm 0,05 \text{ m}$ from track reference line CC¹ (*figure 1*) and $1,2 \text{ m} \pm 0,02 \text{ m}$ above the ground. Its axis of maximum sensitivity must be horizontal and perpendicular to the path of the vehicle (line CC¹).

1.2. Speed measurements

The vehicle speed shall be measured with instruments with an accuracy of $\pm 1 \text{ km/h}$ or better when the front end of the vehicle has reached line PP' (*figure 1*).

1.3. Temperature measurements

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Measurements of air as well as test surface temperature are mandatory. The temperature measuring devices shall be accurate within ± 1 °C.

1.3.1. Air temperature

The temperature sensor is to be positioned in an unobstructed location close to the microphone in such a way that it is exposed to the airflow and protected from direct solar radiation. The latter may be achieved by any shading screen or similar device. The sensor should be positioned at a height of $1,2 \text{ m} \pm 0,1 \text{ m}$ above the test surface level in order to minimise the influence of the test surface thermal radiation at low airflows.

1.3.2. Test surface temperature

The temperature sensor is to be positioned in a location where the temperature measured is representative of the temperature in the wheel tracks, without interfering with the sound measurement.

If an instrument with a contact temperature sensor is used, heat-conductive paste shall be applied between the surface and the sensor to ensure adequate thermal contact.

If a radiation thermometer (pyrometer) is used, the height should be chosen to ensure that a measuring spot with a diameter of $\geq 0,1 \text{ m}$ is covered.

1.4. Wind measurement

The device must be capable of measuring the wind speed with a tolerance of $\pm 1 \text{ m/s}$. The wind shall be measured at microphone height. The wind direction with reference to the driving direction shall be recorded.

2. Conditions of measurement

2.1. Test site

The test site must consist of a central section surrounded by a substantially flat test area. The measuring section must be level; the test surface must be dry and clean for all measurements. The test surface shall not be artificially cooled during or prior to the testing.

The test track must be such that the conditions of a free sound field between the sound source and the microphone are attained to within 1 dB(A). These conditions shall be deemed to be met if there are no large sound reflecting objects such as fences, rocks, bridges or buildings within 50 m of the centre of the measuring section. The surface of the test track and the dimensions of the test site shall be in accordance with Appendix 2 of this Annex.

A central part of at least 10 m radius shall be free of powdery snow, tall grass, loose soil, cinders or the like. There must be no obstacle which could affect the sound field within the vicinity of the microphone and no persons shall stand between the microphone and the sound source. The operator carrying out the measurements and any observers attending the measurements must position themselves so as not to affect the readings of the measuring instruments.

2.2. Meteorological conditions

Measurements shall not be made under poor atmospheric conditions. It must be ensured that the results are not affected by gusts of wind. Testing shall not be performed if the wind speed at the microphone height exceeds 5 m/s.

Measurements shall not be made if the air temperature is below 5 °C or above 40 °C or the test surface temperature is below 5 °C or above 50 °C.

2.3. Ambient noise

The background sound level (including any wind noise) shall be at least 10 dB(A) less than the measured tyre-road sound emission. A suitable windscreen may be fitted to the microphone provided that account is taken of its effect on the sensitivity and directional characteristics of the microphone.

Any measurement affected by a sound peak which appears to be unrelated to the characteristics of the general sound level of tyres shall be ignored.

2.4. Test vehicle requirements

2.4.1. General

The test vehicle shall be a motor vehicle and be fitted with four single tyres on just two axles.

2.4.2. Vehicle load

The vehicle must be loaded such as to comply with the test tyre loads as specified in section 2.5.2. below.

2.4.3. Wheelbase

The wheelbase between the two axles fitted with the test tyres shall for Class C1 be less than 3,50 m and for Class C2 and Class C3 tyres be less than 5 m.

2.4.4. Measures to minimise vehicle influence on sound level measurements

To ensure that tyre noise is not significantly affected by the test vehicle design the following requirements and recommendations are given.

Requirements:

- (a) Spray suppression flaps or other extra device to suppress spray shall not be fitted.
- (b) Addition or retention of elements in the immediate vicinity of the rims and tyres, which may screen the emitted sound, is not permitted.
- (c) Wheel alignment (toe in, camber and castor) shall be in full accordance with the vehicle manufacturer's recommendations.
- (d) Additional sound absorbing material may not be mounted in the wheel housings or under the underbody.
- (e) Suspension shall be in such a condition that it does not result in an abnormal reduction in ground clearance when the vehicle is loaded in accordance with the testing requirement. If available, body level regulation systems shall be adjusted to give a ground clearance during testing which is normal for unladen condition.

Recommendations to avoid parasitic sound:

- (a) Removal or modification of components on the vehicle that any contribute to the background sound of the vehicle is recommended. Any removals or modifications shall be recorded in the test report.
- (b) During testing it should be ascertained that brakes are not poorly released, causing brake noise.

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- (c) It should be ascertained that electric cooling fans are not operating.
- (d) Windows and sliding roof of the vehicle shall be closed during testing.

2.5. Tyres

2.5.1. General

Four identical tyres of the same type and range must be fitted to the test vehicle. In the case of tyres with a load capacity index in excess of 121 and without any dual fitting indication, two of these tyres of the same type and range must be fitted to the rear axle of the test vehicle; the front axle must be fitted with tyres of a size suitable for the axle load and planed down to the minimum depth in order to minimise the influence of tyre/road contact noise while maintaining a sufficient level of safety. Winter tyres that in certain Member States may be equipped with studs intended to enhance friction shall be tested without this equipment. Tyres with special fitting requirements shall be tested in accordance with these requirements (e.g. rotation direction). The tyres must have full tread depth before being run-in.

Tyres are to be tested on rims permitted by the tyre manufacturer.

2.5.2. Tyre loads

The test load Q_t for each tyre on the test vehicle shall be 50 % to 90 % of the reference load Q_r , but the average test load $Q_{t,avr}$ of all tyres shall be 75 % \pm 5 % of the reference load Q_r .

For all tyres the reference load Q_r corresponds to the maximum mass associated with the load capacity index of the tyre. In the case where the load capacity index is constituted by two numbers divided by slash (/), reference shall be made to the first number.

2.5.3. Tyre inflation pressure

Each tyre fitted on the test vehicle shall have a test pressure P_t not higher than the reference pressure P_r and within the interval:

$$P_r(Q_t/Q_r)^{1,25} \leq P_t \leq 1,1 P_r(Q_t/Q_r)^{1,25}$$

where P_r is the pressure corresponding to the pressure index marked on the sidewall.

For Class C1 the reference pressure is $P_r = 250$ kPa for 'standard' tyres and 290 kPa for 'reinforced' tyres, the minimum test pressure shall be $P_t = 150$ kPa.

2.5.4. Preparations prior to testing

The tyres should be 'run-in' prior to testing to remove compound nodules or other tyre pattern characteristics resulting from the moulding process. This will normally require the equivalent of about 100 km of normal use on the road.

The tyres fitted to the test vehicle shall rotate in the same direction as when they were run-in.

Prior to testing tyres shall be warmed up by running under test conditions.

3. Method of testing

3.1. General conditions

For all measurements the vehicle must be driven in a straight line over the measuring section (AA' to BB') in such a way that the median longitudinal plane of the vehicle is as close as possible to the line CC'.

When the front end of the test vehicle has reached the line AA', the vehicle's driver must have put the gear selector on neutral position and switched off the engine. If abnormal noise (e.g. ventilator, self-ignition) is emitted by the test vehicle during the measurement, the test must be repeated.

3.2. Nature and number of measurements

The maximum sound level expressed in A-weighted decibels (dB(A)) shall be measured to the first decimal place as the vehicle is coasting between lines AA' and BB' (*figure 1* — front end of the vehicle on line AA', rear end of the vehicle on line BB'). This value will constitute the result of the measurement.

At least four measurements shall be made on each side of the test vehicle at test speeds lower than the reference speed specified in paragraph 4.1. and at least four measurements at test speeds higher than the reference speed. The speeds shall be approximately equally spaced over the speed range specified in paragraph 3.3.

3.3. Test speeds

The test vehicle speeds shall be within the range:

- (i) from 70 km/h to 90 km/h for Class C1 and Class C2 tyres;
- (ii) from 60 km/h to 80 km/h for Class C3 tyres.

4. Interpretation of results

The measurement shall be invalid if an abnormal discrepancy between the maximum value and the other values is recorded.

4.1. Determination of test result

Reference speed V_{ref} used to determine the final result will be:

- (i) 80 km/h for Class C1 and Class C2 tyres;
- (ii) 70 km/h for Class C3 tyres.

4.2. Regression analysis of noise measurements

The (not temperature corrected) tyre-road noise level L_R in dB(A) is determined by a regression analysis according to:

where:

$$\bar{L}$$

is the mean value of the noise levels L_i , measured in dB(A):

n is the measurement number ($n \geq 16$),

$$\bar{v}$$

is the mean value of logarithms of speeds v_i :

With

a is the slope of the regression line in dB(A):

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4.3. Temperature correction

For Class C2 tyres, the final result shall be normalised to a test surface reference temperature θ_{ref} by applying a temperature correction, according to the following:

$$L_R(\theta_{\text{ref}}) = L_R(\theta) + K(\theta_{\text{ref}} - \theta)$$

where θ is the measured test surface temperature,

$$\theta_{\text{ref}} = 20^\circ\text{C},$$

For Class C1 tyres, the coefficient K is $-0,03 \text{ dB(A)/}^\circ\text{C}$ when $\theta > \theta_{\text{ref}}$ and K is $-0,06 \text{ dB(A)/}^\circ\text{C}$ when $\theta < \theta_{\text{ref}}$.

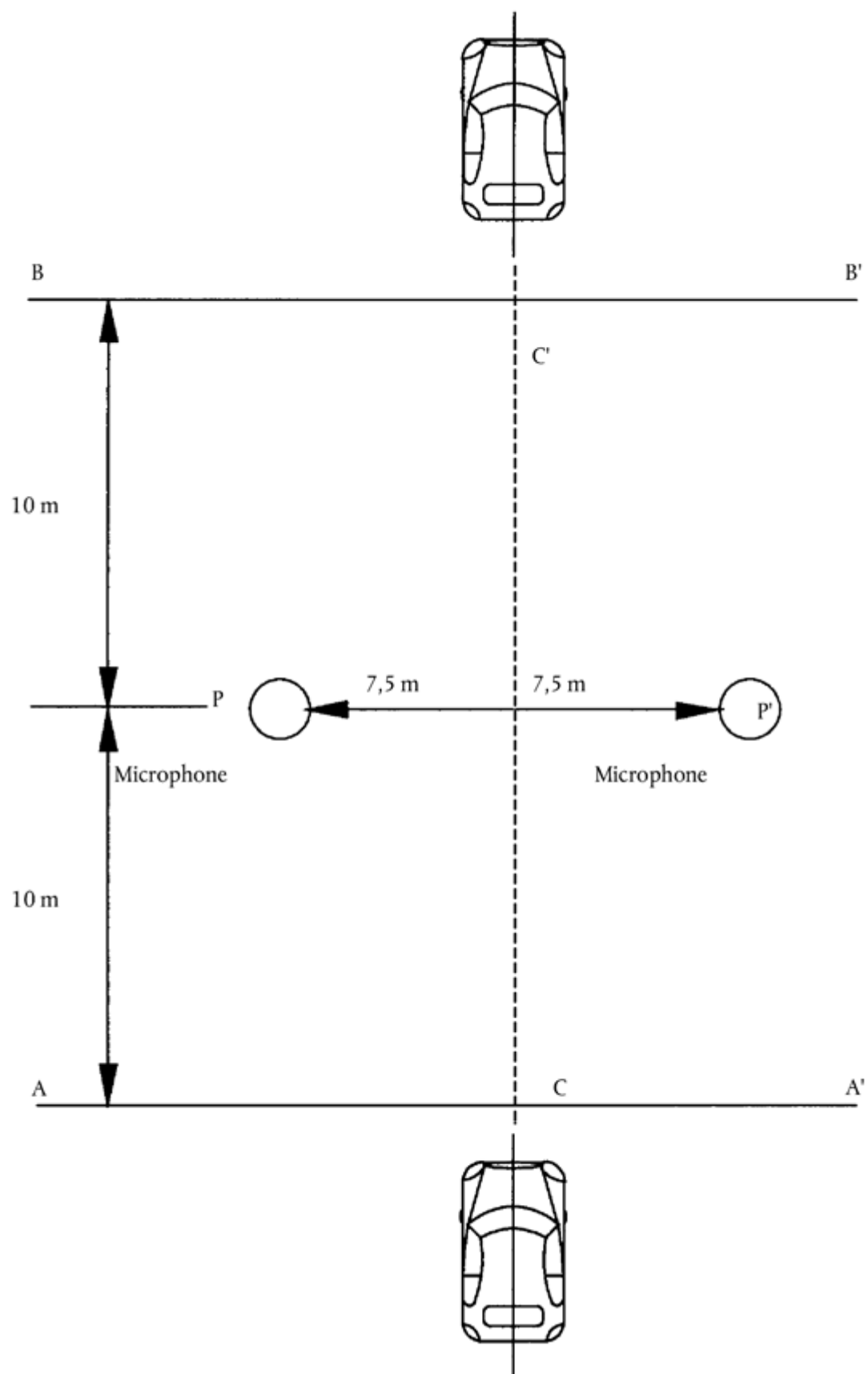
For Class C2 tyres, the coefficient K is $-0,02 \text{ dB(A)/}^\circ\text{C}$

If the measured test surface temperature does not change by more than 5°C within all measurements necessary for the determination of the sound level of one set of tyres, the temperature correction may be made only on the final reported tyre-road sound level as indicated above, utilizing the arithmetic mean value of the measured temperatures. Otherwise each measured sound level L_i shall be corrected, utilizing the temperature at the time of the sound recording.

There will be no temperature correction for Class C3 tyres.

- 4.4. In order to take account of any measuring instrument inaccuracies, the results according to section 4.3. shall be reduced by 1 dB(A) .
- 4.5. The final result, the temperature corrected tyre-road noise level $L_R(\theta_{\text{ref}})$ in dB(A) , shall be rounded down to the nearest lower whole value.

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Appendix 2

TEST REPORT

The test report shall include the following information:

- (a) meteorological conditions inclusive of air and test surface temperature for each test run,
- (b) date and method of check on compliance of the test surface with ISO 10844:1994,
- (c) test rim width,
- (d) tyre data: manufacturer, brand name, trade name, size, load index, reference pressure,
- (e) test vehicle description and wheelbase,
- (f) type test load Q_t in N and in per cent of the reference load Q_r for each test tyre, average test load $Q_{t,avr}$ in N and in per cent of the reference load Q_r ,
- (g) cold inflation pressure in kPa for each test tyre,
- (h) test speeds when the vehicle passed line PP',
- (i) maximum A-weighted sound levels for each test run and each microphone,
- (j) the test result L_R : A-weighted sound level in decibel at reference speed, corrected for temperature (if applicable), rounded down to the nearest lower whole value.
- (k) regression line slope.]