|  |  |
| --- | --- |
|  | E/ECE/324/Rev.1/Add.27/Amend.5−E/ECE/TRANS/505/Rev.1/Add.27/Amend.5 |
|  |  | TFRWS-09-04 Rev.1**TFRWS-16-05** |

 Comments by the Secretary

**TFRWS-16-05** was prepared by the Secretary based on the discussions and decisions made at the 14th and 15th meeting of the Task Force on Reverse Warning Sound issues (TFRWS); see TFRWS-15-03 Rev.1.

**Remark 1**:

Everything marked in blue needs to be adjusted due to the new Regulation

**Remark 2**:

Everything marked in grey was proposed during the 8th meeting but needs to be further discussed and approved at the 9th meeting

**Remark 3**:

Everything marked in **bold** was agreed on during the 14th and 15th meeting according to TFRWS-15-03 Rev.1 (see also TFRWS-15-3 Rev.2)

**Remark 4:**

Everything marked in yellow needs to be discussed

**Remark 5**:

Everything written in different colours has still to be overseen

**Remark 6**:

Remark: has been added by the Secretary

 Agreement

 Concerning the Adoption of Harmonized Technical United Nations Regulations for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these United Nations Regulations[[1]](#footnote-2)\*

(Revision 3, including the amendments which entered into force on 14 September 2017)

\_\_\_\_\_\_\_\_\_

 Addendum xx – UN Regulation No. 1xx

 Amendment 0

Date of entry into force as an annex to the 1958 Agreement: Day.Month.Year

 Uniform provisions concerning the approval of audible reverse warning devices and of motor vehicles with regard to their audible reverse warning signals

This document is meant purely as documentation tool. The authentic and legal binding text is: ECE/TRANS/WP.29/2017/3.

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**UNITED NATIONS**

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 UN Regulation No. 1xx, amend to read:

 "Uniform provisions concerning the approval of audible reverse warning devices and of motor vehicles with regard to their audible reverse warning signals

Contents

Regulation Page

 1. Scope 4

 I. Part I: Audible reverse warning device 4

 2. Definitions 4

 3. Application for approval 5

 4. Markings 5

 5. Approval 6

 6. Specifications 7

 7. Modification and extension of approval of the type of the audible reverse warning device . 12

 8. Conformity of production 12

 9. Penalties for non-conformity of production 13

 10. Production definitively discontinued 13

 II. Part II: Audible reverse warning signals for motor vehicles 13

 11. Definitions 13

 12. Application for approval 14

 13. Approval 14

 14. Specifications 15

 15. Modification and extension of approval of vehicle type 16

 16. Conformity of production 17

 17. Penalties for non-conformity of production 17

 18. Production definitively discontinued 17

 19. Names and addresses of Technical Services responsible for conducting approval tests
and Type Approval Authorities 18

Annexes

 1A Communication concerning the approval (or refusal or withdrawal of approval or production definitely discontinued) of a type of audible reverse warning device for motor vehicles pursuant to UN Regulation No. 1xx…… 19

 1B Communication concerning the approval (or refusal or withdrawal of approval or production definitely discontinued) of a vehicle type with regard to its audible reverse warning signals pursuant
to UN Regulation No. 1xx………… 24

 2 Arrangement of the approval marks 28

 3 Qualification criteria for anechoic environment 30

 4 Microphone positions for measurements of acoustic parameters of audible reverse warning

 device 32

 5 Microphone positions for measurements of audible reverse warning signals of motor vehicles 34

1. Scope

1.1. This Regulation applies to:

1.1.1. PART I: Approval of audible reverse warning devices which are intended for fitting to motor vehicles of categories M2  (M > 3500 kg), N2, N3 and M3;[[2]](#footnote-3)

1.1.2. PART II: Approval of motor vehicles listed in 1.1.1. with regard to fitting of devices as specified under Part I automatically activated when reverse gear is selected and the propulsion system is on.

I. Part I. Audible reverse warning device

2. Definitions

 For the purpose of this Regulation:

2.1. "*Audible reverse warning device*" means a device, emitting an acoustic signal to the outside of a vehicle which is intended to give audible reverse warning sound of the presence of a vehicle, with the primary purpose to fulfil the requirements of this Regulation;

2.1.1. “Non-self-adjusting audible reverse warning device” means a device which gives an audible reverse warning sound independent of ambient noise levels

2.1.2. “Self-adjusting audible reverse warning device” means a device which *automatically adjusts its sound level, throughout a defined range, in order to maintain a sound level differential between the sound output of the device and the ambient noise measured by the device*

2.1.3. “Stepwise self-adjusting audible reverse warning device” means a device which automatically adjusts to 1 of 3 fixed sound level modes (low, normal, high), depending on the ambient noise measured by the device

2.2. “*Low Level” means the emitted sound level of the “Audible reverse warning device” which is sufficient for safety of vulnerable road users during quiet times and/or quiet areas.*

2.3“*Normal Level” means the emitted sound level of the “Audible reverse warning device” which is sufficient for safety of vulnerable road users during normal traffic hours and areas not covered by 2.2. and 2.4.*

2.4*.* “*High Level” means the emitted sound level of the “Audible reverse warning device” which is sufficient for safety of vulnerable road users during times and/or areas**not covered by 2.2 and 2.3**(e.g. industrial or road construction sites)*

2.5. "*Type of audible reverse warning device*"means audible reverse warningdevices not differing essentially from each other with respect to such matters as:

2.5.1. Trade name or mark;

2.5.2. Principles of operation regarding sound pressure amplitude and frequency range;

2.5.2.1. Fixed arrangements;

2.5.2.2. Variable arrangements due background noise;

2.5.3 Type of electrical supply (direct or alternating current);

2.5.4. Rated voltage;

2.5.5. Shape or kind of sound outlet(s);

2.5.6. Rated sound frequency or frequencies;

2.6. “*Background noise*” or “*Ambient noise*” is any sound other than the sound of the reverse warning device, emitted by its acoustic signal. Its SPL is measured in dB(A) and the area considered around the vehicle is regarded as a homogeneous sound field with the same SPL

2.7. *“Tonal Sound”* means a sound which contains basically a single frequency, which is described as a **~~pure tone~~** sound commonly in the frequency range from 500 Hz to 4000 Hz

 2.8. *“Broadband Sound”* means a sound which contains a large number of single frequency components, continuously distributed over a required frequency range covering at least 500 Hz to 4000 Hz (see §2.7)

2.9 *“One-Third Octave Band Sound” means a sound which is defined as an acoustic signal with has its main energy and nearly constant power spectral density in 1 of 6 one-third octave frequency bands (Center frequency: 800, 1000, 1250, 1600, 2000, 2500 Hz* ***or 3150 Hz****).*

3. Application for approval

3.1. The application for approval of a type of audible reverse warning device shall be submitted by its manufacturer or by his duly accredited representative.

3.2. It shall be accompanied by a duly filled technical information document, either in paper format in triplicate or alternatively upon agreement with the Type Approval Authority in electronic format. A model of the technical information document is shown in Annex 1A.

3.3. In addition, the application for approval shall be accompanied by two samples of the type of audible reverse warningdevice.

3.4. The Type Approval Authority shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted.

4. Markings

4.1. Audible reverse warning devices excluding mounting accessories, shall bear:

4.1.1. The trade name or mark of the manufacturer and the model commercial name and/or number;

4.1.2. The approval mark according to paragraph 5.5.

4.2. The approval mark shall be shown on the audible reverse warning device according to paragraph 5.5. Each sample shall have a space of adequate dimensions for the approval mark; this space shall be indicated in the drawing.

4.3. All markings shall be clearly legible and indelible.

5. Approval

5.1. If the two samples submitted for approval conform to the provisions of paragraph 6. below, approval for this type of audible reverse warning device shall be granted.

5.2. An approval number shall be assigned to each type approved. Its first two digits (at present 00 for the UN Regulation in its original form) shall indicate the series of amendments incorporating the most recent major technical amendments made to the UN Regulation at the time of issue of the approval. The same Contracting Party may not assign this number to another type of audible reverse warning device.

5.3. The same approval number may be assigned to types of audible reverse warning device differing only with respect to rated voltage, rated sound frequency or frequencies.

5.4. Communication on approval or refusal or extension or withdrawal of approval or production definitely discontinued of a type of audible reverse warning device pursuant to this UN Regulation shall be communicated to the Parties to the Agreement applying this UN Regulation by means of a form conforming to the model in Annex 1A to the UN Regulation.

5.5. On every audible reverse warning device which conforms to a type approved under this Regulation, there shall be affixed conspicuously, in an easily accessible place indicated on the approval form, an international approval mark comprising:

5.5.1. A circle containing the letter "E" followed by the distinguishing number of the country granting approval[[3]](#footnote-4);

5.5.2. An approval number;

5.5.3. An additional symbol in the form of a figure in Roman numerals, showing the class to which the audible reverse warning device belongs.

5.6. Annex 2, Section I, to this Regulation gives an example of the arrangement of the approval mark.

5.7. The Type Approval Authority or its duly accredited technical service shall verify the arrangements of the marks for ensuring effective control of the conformity of production before type approval is granted.

6. Specifications

6.1. General specifications

6.1.1. The “*Audible reverse warning device*” shall emit an acoustic signal**~~, automatically activated, when reverse gear is selected and the propulsion system is on~~**.

The pattern of the acoustic signal shall include at least one silent part.

The pattern of the acoustic signal, including silent parts, shall be repeatable with 24 to 120 cycles per minute.

For audible reverse warning devices supplied with alternating current, this requirement shall apply only at constant generator speed, within the range specified in paragraph 6.3.4.2.

 The type approval tests shall be carried out on two samples of each type submitted by the manufacturer for approval; both the samples shall be subjected to all the tests and must conform to the technical specifications laid down.

6.1.2. The audible reverse warning device shall have acoustic characteristics and mechanical characteristics such that it passes, in the order indicated, the tests according to either paragraph 6.3. or 6.4. and 6.5.

[6.1.3. Alternative sounds

The manufacturer may define alternative sounds which can be selected by the driver; each of these sounds shall be in compliance and approved with the provisions in paragraphs 6.3. or 6.4. and 6.5.]

6.2. Measuring instruments

6.2.1. Acoustic measurements

6.2.1.1. When no general statement or conclusion can be made about conformance of the sound level meter model to the full specifications of IEC 61672-1:2013,[[4]](#footnote-5) the apparatus used for measuring the sound pressure level shall be a sound level meter or equivalent measurement system meeting the requirements of Class 1 instruments as described in IEC 61672-3:2013.3 Measurements shall be carried out using the "fast" response of the acoustic measurement instrument and the "A" weighting curve as described in IEC 61672-1:20133. When using a system that includes a periodic monitoring of the A-weighted sound pressure level, a reading should be made at a time interval not greater than 30 ms.

 When measurements of the sound pressures in the one-third mid-band frequencies 2,000, 2,500, 3,150 and 4,000 Hz are carried out for one-third octaves, the instrumentation shall meet all requirements of IEC 61260-1-2014, class 1. The sound pressure level in the mid-band frequency 2,500 Hz shall be determined by adding the quadratic means of the sound pressures in the one-third mid-band frequencies 2,000, 2,500, 3,150 and 4,000 Hz.

When measuring the rated sound frequency (or frequency range), the digital sound recording system shall have at least a 16 bit quantization. The average auto power spectrum shall be determined, using a Hanning window and at least 66.6 per cent overlap averages.

 The instruments shall be maintained and calibrated in accordance with the instructions of the instrument manufacturer.

6.2.1.2. Calibration of the entire Acoustic Measurement System for a Measurement Session

 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 60942:2003. 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.

6.2.1.3. Compliance with requirements

 Compliance of the sound calibrator with the requirements of IEC 60942:2003 and compliance of the instrumentation system with the requirements of IEC 61672-3:20133 shall be confirmed by the existence of a valid certificate of compliance.

6.2.2. Instrumentation for other measurements

 The voltage shall be measured with instrumentation having an accuracy of ±0.05 V or better.

 The resistance shall be measured with instrumentation having an accuracy of ±0.01 Ω or better.

 The distance shall be measured with instrumentation having an accuracy of ±5 mm or better.

 The time shall be measured with instrumentation having an accuracy of ±0.02 s or better.

 The meteorological instrumentation used to monitor the environmental conditions during the test shall include the following devices, which meet at least the following accuracy:

(a) Temperature measuring device, ±1° C;

(b) Wind speed-measuring device, ±1.0 m/s;

(c) Barometric pressure measuring device, ±5 hPa;

(d) A relative humidity measuring device, ±5 per cent.

**6.3. Measurement of the sound characteristics of the “*Non-self-adjusting audible reverse warning device*”**

6.3.1. The audible reverse warning device should, preferably, be tested in an anechoic chamber. Alternatively, it may be tested in a semi-anechoic chamber or in an open space.[[5]](#footnote-6) In these cases, precautions shall be taken to avoid reflections from the ground within the measuring area (for instance by erecting a set of absorbing screens). The wind speed shall be not more than 5 m/s. The ambient noise level shall be at least 10 dB lower than the sound pressure level to be measured.

 If the test facility shall be qualified as an anechoic environment it shall meet requirements of Annex 3.

6.3.2. The audible reverse warning device to be tested and the microphone shall be placed at the same height. This height shall be 1.20 ± 0.05 m.

 In alternative, the audible reverse warning device to be tested and the microphone may be placed in another traverse line which complies with Annex 3 specification for anechoic environment.

 The microphone shall be so placed that its diaphragm is at a distance
of **~~2.00~~** **1.00** ± 0.05 m from the plane of the sound outlet of the audible reverse warning device. The microphone must be positioned facing the front surface emitting sound of the audible reverse warning device in the direction in which the maximum sound level can be measured. (see figures in Annex 4).

6.3.3. The audible reverse warning device shall be mounted rigidly, by means of the equipment indicated by the manufacturer, on a support whose mass is at least ten times that of the audible reverse warning device under ~~test and not less than 30 kg~~. In addition, arrangements must be made ensuring that reflections on the sides of the support and its own vibrations have no appreciable effect on the measuring results.

6.3.4. The audible reverse warning device shall be supplied with current, as appropriate, at the following voltages:

6.3.4.1. In the case of audible reverse warning device supplied with direct current, at a voltage measured at the terminal of the electric power source of 13/12 of the rated voltage;

6.3.4.2. In the case of audible reverse warning device supplied with alternating current, the current shall be supplied by an electric generator of the type normally used with this type of audible reverse warning device. The acoustic characteristics of the audible reverse warning device shall be recorded for electric generator speeds corresponding to 50 per cent, 75 per cent and 100 per cent of the maximum speed indicated by the manufacturer of the generator for continuous operation. During this test, no other electrical load shall be imposed on the electric generator. The endurance test described in paragraph 6.5. shall be carried out at a speed indicated by the manufacturer of the equipment and selected from the above range.

6.3.5. If a rectified current source is used for the test of an audible reverse warning device supplied with direct current, the alternating component of the voltage measured at its terminals, when the audible reverse warning devices are in operation, shall not be more than 0.1 V, peak to peak.

6.3.6. For audible reverse warning device supplied with direct current, the resistance of the connecting leads, expressed in ohms, including terminals and contacts, shall be as close as possible to (0,10/12) x rated voltage in volt.

6.3.7. Under the conditions set forth above, the sound-pressure level weighted in accordance with curve A shall not exceed the following values for “*Non-self-adjusting audible reverse warning device*”

|  |  |  |
| --- | --- | --- |
|  | **Tonal Sound** | **Broadband Sound & One-Third Octave Band** |
|  | **Min. Level** | **Max. Level** | **Min. Level** | **Max. Level** |
|  | **dB(A)** | **dB(A)** | **dB(A)** | **dB(A)** |
| **Low Level** | [55] | [68] | [50] | [64] |
| **Normal Level** | [75] | [88] | [70] | [84] |
| **High Level** | [90] | [105] | [85] | [101] |

Table 1

**Remark:** See § 14.2.2.1. Proposal of Japan (**TFRWS-07-04**)

6.3.8. The specifications indicated above shall also be met by an audible reverse warning device subjected to the endurance test referred to in paragraph 6.5. below, with the supply voltage varying between 115 per cent and 95 per cent of its rated voltage for audible reverse warning device supplied with direct current or, for audible reverse warning device supplied with alternating current, between 50 per cent and 100 per cent of the maximum speed of the generator indicated by the manufacturer for continuous operation.

6.3.9. The time lapse between the moment when the audible reverse warning device is actuated and the moment when the sound reaches the minimum value prescribed in Table 1 above shall not exceed two cycles measured at an ambient temperature of **~~20 + 5~~ 5 ºC to 40** ºC.

6.3.10. To confirm the rated sound frequency (or frequency range) of audible reverse warning device the tests to measure this parameter using a spectrum analyzer with a frequency resolution of at least 1 Hz shall be conducted. The measured frequency (or frequency range) of the audible reverse warning device may differ from the rated sound frequency (or frequency range) no more than 10 per cent.

**6.4. Measurement of the sound characteristics of the “*Self-adjusting audible reverse warning device*” and of the “*Stepwise-self-adjusting reverse warning device*”**

6.4.1. The audible reverse warning device should, preferably, be tested in an anechoic chamber. Alternatively, it may be tested in a semi-anechoic chamber or in an open space.[[6]](#footnote-7) In these cases, precautions shall be taken to avoid reflections from the ground within the measuring area (for instance by erecting a set of absorbing screens). The wind speed shall be not more than 5 m/s. The ambient noise level shall be at least 10 dB lower than the sound pressure level to be measured.

If the test facility shall be qualified as an anechoic environment it shall meet requirements of Annex 3.

6.4.2. The audible reverse warning device to be tested, the loudspeaker and the microphone shall be placed at the same height. This height shall be 1.20 ± 0.05 m.

In alternative, the audible reverse warning device to be tested, the loudspeaker and the microphone may be placed in another traverse line which complies with Annex 3 specification for anechoic environment.

The microphone shall be so placed that its diaphragm is at a distance of **~~2.00~~** **1.00** ±0.05 m from the plane of the sound outlet of the audible reverse warning device. The microphone must be positioned facing the front surface emitting sound of the audible reverse warning device in the direction in which the maximum sound level can be measured. The loudspeaker for ambient noise is placed at a distance of **~~2.00~~** **1.00 ±0.05** m from the audible reverse warning device and from the microphone, facing between the microphone and the audible reverse warning device, see figure. xxxxxxxx



Figure xxxxx 🡺 New figures as proposed to be changed to 1.00 m, 1.00 m, 1.00 m

* **Remark:**
* **During development we test at 2dB(A) intervals but this is very time consuming and not recommended for the standard**
* **The reason for our set up not being an equilateral triangle is that this assumes the sound generating speaker produces sound evenly and that the sound level meter and the alarm are both measuring the same amount of noise.  We have found this is not always the case, the speakers tend to be more directional than the microphones**

6.4.3. The audible reverse warning device shall be mounted rigidly, by means of the equipment indicated by the manufacturer, on a support whose mass is at least ten times that of the audible reverse warning device under test **~~and not less than 30 kg~~**. In addition, arrangements must be made ensuring that reflections on the sides of the support and its own vibrations have no appreciable effect on the measuring results.

6.4.4. The audible reverse warning device shall be supplied with current, as appropriate, at the following voltages:

6.4.4.1. In the case of audible reverse warning device supplied with direct current, at a voltage measured at the terminal of the electric power source of 13/12 of the rated voltage;

6.4.4.2. In the case of audible reverse warning device supplied with alternating current, the current shall be supplied by an electric generator of the type normally used with this type of audible reverse warning device. The acoustic characteristics of the audible reverse warning device shall be recorded for electric generator speeds corresponding to 50 per cent, 75 per cent and 100 per cent of the maximum speed indicated by the manufacturer of the generator for continuous operation. During this test, no other electrical load shall be imposed on the electric generator. The endurance test described in paragraph 6.5. shall be carried out at a speed indicated by the manufacturer of the equipment and selected from the above range.

6.4.5. If a rectified current source is used for the test of an audible reverse warning device supplied with direct current, the alternating component of the voltage measured at its terminals, when the audible reverse warning devices are in operation, shall not be more than 0.1 V, peak to peak.

6.4.6. For audible reverse warning device supplied with direct current, the resistance of the connecting leads, expressed in ohms, including terminals and contacts, shall be as close as possible to (0,10/12) x rated voltage in volt.

 6.4.7. Ambient noise emitted by the loudspeaker has to play pink noise at 4 different SPLs:

* Low level: 45dBA
* Normal Level 1: 55 dBA
* Normal Level 2: 70 dBA
* High Level: 80 dBA

Pink noise is defined as random noise, where each octave carries an equal amount of noise energy throughout the frequency range of at least 200 Hz to 8000 Hz. 🡺 Definitions

For measurement procedure one has to test the sound levels where the reverse warning sound has to be in a certain sound mode, so for the levels 45dBA, 55dBA, 70dBA and 80dBA.

6.4.8. Under the conditions set forth above, the sound-pressure level weighted in accordance with curve A shall not exceed the following values for “S*elf-adjusting audible reverse warning device*”

(a) for “*Tonal sound*”

[+ 5 dB(A) ± 1] in addition to the ambient sound in the range of [63 to 100] dB(A)

* Low level: 45 dB(A) plus x dB(A)
* Normal Level 1: 55 dB(A) plus x dB(A)
* Normal Level 2: 70 dB(A) plus x dB(A)
* High Level: 80 dB(A) plus x dB(A)

(b) for “*Broadband sound*”

[+ 5 dB(A) ± 1] in addition to the ambient sound in the range of [60 to 95] dB(A)

* Low level: 45 dB(A) plus y dB(A)
* Normal Level 1: 55 dB(A) plus y dB(A)
* Normal Level 2: 70 dB(A) plus y dB(A)
* High Level: 80 dB(A) plus y dB(A)

(c) for “One-*Third Octave Band Sound*”

[+ 1 dB(A) ± 5] in addition to the ambient sound in the range of [55 to 93] dB(A).

* Low level: 45 dB(A) plus z dB(A)
* Normal Level 1: 55 dB(A) plus z dB(A)
* Normal Level 2: 70 dB(A) plus z dB(A)
* High Level: 80 dB(A) plus z dB(A)

6.4.9. Under the conditions set forth above, the sound-pressure level weighted in accordance with curve A shall not exceed the following values for “Stepwise S*elf-adjusting audible reverse warning device*”

(a) for “*Tonal sound*” (see Table 2.a below)

|  |  |
| --- | --- |
| Ambient noise SPL | *Tonal warning sound* |
| Min | Measured | Max |
| Low Level | 45 | 64 |  | 70 |
| Normal Level 1 | 55 | 67 |  | 73 |
| Normal Level 2 | 70 | 82 |  | 88 |
| High Level | 80 | 90 |  | 96 |

(b) for “*Broadband sound*” (see Table 2.b below)

|  |  |
| --- | --- |
| Ambient noise SPL | *Broadband sound* |
| Min | Measured | Max |
| Low Level | 45 |  |  |  |
| Normal Level 1 | 55 |  |  |  |
| Normal Level 2 | 70 |  |  |  |
| High Level | 80 |  |  |  |

(c) for “One-*Third Octave Band Sound*” (see Table 2.c below)

|  |  |
| --- | --- |
| Ambient noise SPL | One-*Third Octave Band Sound* |
| Min | Measured | Max |
| Low Level | 45 | 62 |  | 68 |
| Normal Level 1 | 55 | 65 |  | 71 |
| Normal Level 2 | 70 | 80 |  | 86 |
| High Level | 80 | 88 |  | 94 |

Additions to the SPLs:

* For special mounting positions the SPLs may be exceeded. Furthermore the test on the vehicle in [14.6] has to be passed
* For the case that the 1/3-octave band of the signal adapts dynamically to the ambient noise, the SPLs can be 3dB below.
* The required SPL has to be achieved after a maximum of two cycles of the warning sound

For stepwise-self-adjusting reverse warning devices one can define SPLs of the ambient noise when the reverse warning device has to switch to a certain level and when it can switch to a certain level, for example:

|  |  |  |
| --- | --- | --- |
| **Ambient noise** | **Stepwise-self-adjustable reverse warning device setting** | **Remark** |
| SPL < 45dBA | Low | The system has to switch in low sound mode |
| 45 ≤ SPL < 55 dBA | Low | The system can switch in low but it is allowed to stay in normal sound |
| 55 ≤ SPL ≤ 70 dBA | Normal | The system should stay in normal sound |
| 70 < SPL < 80 dBA | High | The system can switch in high sound but is allowed to stay in normal |
| >80dBA | High | The System has to switch in high modus |

Table 3

**Depending to the BGN different modes are possible.**

**The system switches from Normal to the Low mode in case the BGN <= BGNL= 45dB(A)  and switches back to Normal mode if the BGN reaches a SPL of BGNL+5dB(A) = 50dB(A).**

**The system switches from Normal to the High mode in case the BGN >= BGNH= 75dB(A)  and switches back to Normal mode if the BGN come back to a SPL of BGNH-5dB(A) = 70dB(A).**

6.4.10. The specifications indicated above shall also be met by an audible reverse warning device subjected to the endurance test referred to in paragraph 6.5. below, with the supply voltage varying between 115 per cent and 95 per cent of its rated voltage for audible reverse warning device supplied with direct current or, for audible reverse warning device supplied with alternating current, between 50 per cent and 100 per cent of the maximum speed of the generator indicated by the manufacturer for continuous operation.

6.4.11. The time lapse between the moment when the audible reverse warning device is actuated and the moment when the sound reaches the minimum value prescribed in 6.4.7. above shall not exceed one cycle measured at an ambient temperature of **~~20 + 5~~** **5 ºC to 40** ºC.

6.4.12. To confirm the rated sound frequency (or frequency range) of audible reverse warning device the tests to measure this parameter using a spectrum analyzer with a frequency resolution of at least 1 Hz shall be conducted.

The measured basic frequency (or frequency range) of the audible reverse warning device has to be within the range of 1k to 3.5k Hz. The frequency should be measured for 10 cycles and must not differ more than 10 per cent between each cycle. To measure the frequency (or frequency range) the loudspeaker for ambient noise simulation has to be switched off.

6.5. Endurance test

6.5.1. The audible reverse warning device shall be supplied with current at the rated voltage and with the connecting lead resistances specified in paragraphs 6.3.4. to 6.3.6. above, and operated respectively for a period of 24 hours.

6.5.2. If the test is made in an anechoic chamber, the chamber shall be large enough to ensure normal dispersal of the heat released by the audible reverse warning device during the test.

6.5.3. The ambient temperature in the testing room shall be between +**~~15~~** **5** and +**~~30~~** **40** ºC inclusively.

6.5.4. If, after the audible reverse warning device has been operated for **12 hours** **~~half the number of times prescribed~~**, the sound-level characteristics are no longer the same as before the test, the audible reverse warning device may be adjusted. After being operated **24 hours** **~~the prescribed number of times~~**, and after further adjustment if necessary, the audible reverse warning device must pass the test described in paragraph 6.3. above.

7. Modification and extension of approval of the type of the audible reverse warning device

7.1. Every modification of the type of the audible reverse warning device shall be notified to the Type Approval Authority which granted approval to that type of the audible reverse warning device. This Type Approval Authority may then:

7.1.1. Either take the view that the modifications made are not likely to have any appreciable adverse effect;

7.1.2. Or call for a new report from the Technical Service responsible for the tests.

7.2. Communication on confirmation of the approval, with particulars of the modifications, or of refusal of approval shall be communicated to the Parties to the Agreement applying this Regulation, in accordance with the procedure indicated in paragraph 5.4. above.

7.3. The Type Approval Authority issuing the extension of approval shall assign a series number to each communication form drawn up for such an extension.

8. Conformity of production

 The conformity of production procedures shall comply with those set out in the 1958 Agreement, Schedule 1 (E/ECE/TRANS/505/Rev.3) with the following requirements:

8.1. Audible reverse warning device approved under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set forth in paragraph 6. above.

8.2. The authority which has granted type approval may at any time verify the conformity control methods applied in each production facility. The normal frequency of these verifications shall be once every two years.

9. Penalties for non-conformity of production

9.1. The approval granted to a type of audible reverse warning device pursuant to this Regulation may be withdrawn if the conditions set forth in paragraph 8.1. are not complied with or if the audible reverse warning device fails to pass the checks referred to in paragraph 8.2. above.

9.2. Should a Party to the Agreement applying this Regulation withdraw an approval which it has previously granted, it shall forthwith notify the other Contracting Parties applying this Regulation by means of a copy of the approval form bearing at the end in large letters the statement, signed and dated: "APPROVAL WITHDRAWN".

10. Production definitively discontinued

 If the holder of an approval granted pursuant to this Regulation discontinues the production of the type of audible reverse warning deviceapproved, he shall inform the authority which granted the approval. Upon receipt of the communication, this authority shall inform the other Parties to the Agreement applying this Regulation by means of a copy of the approval form bearing at the end in large letters the statement, signed and dated: "PRODUCTION DISCONTINUED".

 II. Part II. Audible reverse warning signals of motor vehicles

11. Definitions

 For the purpose of this Regulation,

11.1. "*Approval of the motor vehicle*" shall be understood to mean approval of a vehicle type with regard to its audible **reverse** warning signal;

11.2. "*Vehicle type*"shall be understood to mean vehicles not essentially different from another with respect to such matters affecting their acoustic behaviour as:

11.2.1. The number and type(s) of audible reverse warning devices fitted on the vehicle;

11.2.2. The position of the audible reverse warning device(s) on the vehicle (e.g. position relative to the end of the vehicle, etc.);

11.2.3. The shape and materials of the bodywork at the rear of the vehicle which might affect the level of the sound emitted by the audible reverse warning device(s) and have a masking effect.

11.2.4. A vehicle type in respect of this Regulation can also include vehicles from different vehicle classes (e.g. vehicles of category N2 and N3 within the same vehicle approval) if the vehicles are not essentially different in respect of their rearward acoustic behaviour.

**Remark: to be taken into consideration**

**Copied from UN Regulation No. 138.01**

2.3. "Vehicle type" means a category of motor vehicles which does not differ essentially in such respects as:

2.3.1. The shape and the materials of the bodywork of the vehicle which affect the sound level emitted;

~~2.3.2. The principle of the drivetrain (from the batteries to the wheels). Notwithstanding the provisions of paragraph 2.3.2. vehicles which differ with respect to overall gear ratios, battery type or the fitment of a range extender may be considered vehicles of the same type;~~

2.3.3. If applicable, the number and type(s) of sound emitting devices (hardware) of AVAS fitted on the vehicle.

2.3.4. If applicable, the position of the AVAS on the vehicle.

**Remark: to be taken into consideration**

**Copied from UN Regulation No.28 Amendment 5**

11.2.2. The mountings used to fit the audible warning device(s) and/or audible warning system(s) and/or multiple audible warning system(s) to the vehicle;

11.2.3. The position of the audible warning device(s) and/or audible warning system(s) and/or multiple audible warning system(s) on the vehicle;

11.2.4. The rigidity of the parts of the structure on which the audible warning device(s) and/or audible warning system(s) and/or multiple audible warning system(s) is (are) mounted;

11.2.5. The shape and materials of the bodywork at the front of the vehicle which might affect the level of the sound emitted by the audible warning device(s) and/or audible warning system(s) and/or multiple audible warning system(s) and have a masking effect.

11.3 "*Technically permissible maximum laden mass (M)*" means the maximum mass allocated to a vehicle on the basis of its construction features and its design performances; the technically permissible laden mass of a trailer or of a semi-trailer includes the static mass transferred to the towing vehicle when coupled;

11.4 “*Background noise*” or “*Ambient noise*” is any sound other than the sound of the reverse warning device. Its SPL is measured in dB(A) and the area considered around the vehicle is regarded as a homogeneous sound field with the same SPL.

11.5. “*Low Level*” as defined in 2.2.

11.6. “*Normal Level*” as defined in 2.3.

11.7. “*High Level*” as defined in 2.4.

11.8. "*Pause function*" means a mechanism to halt temporarily the operation of a reverse warning device.

***11.9 Symbols and Abbreviations***

|  |  |  |  |
| --- | --- | --- | --- |
| *Lcorr* | dB(A) | Annex 3 para.2.3.2. | Background noise correction |
| *Ltest,j* | dB(A) | Annex 3 para.2.3.2. | A-weighted sound pressure level result of jth test run |
| *Ltestcorr,j* | dB(A) | Annex 3 para.2.3.2. | A-weighted sound pressure level result of jth test run corrected for background noise |
| *Lbgn* | dB(A) | Annex 3 para.2.3.1. | Background A-weighted sound pressure level. |
| *∆Lbgn, p-p*  | dB(A) | Annex 3 para.2.3.2. | Range of maximum to minimum value of the representative background noise A-weighted sound pressure level over a defined time period. |
| *∆L* | dB(A) | Annex 3 para.2.3.2. | A-weighted sound pressure level of jth test result minus the A-weighted background noise level (∆*L* = *Ltest,j* - *Lbgn*) |

**Table x**

**Remark: Maybe already needed for 6.4**

12. Application for approval

12.1. The application for approval of a vehicle type with regard to its audible reverse warning signals shall be submitted by the vehicle manufacturer or by his duly accredited representative;

12.2. It shall be accompanied by a duly filled technical information document, either in paper format in triplicate or alternatively upon agreement with the Type Approval Authority in electronic format. A model of the technical information document is shown in Annex 1B.

12.3. A vehicle representative of the vehicle type to be approved shall be submitted to the technical service responsible for the approval tests.

13. Approval

13.1. If the vehicle type submitted for approval pursuant to this Regulation meets the requirements of paragraph 14. below, approval for this vehicle type shall be granted.

13.2. An approval number shall be assigned to each type approved. Its first two digits (at present 00 for the UN Regulation in its original form) shall indicate the series of amendments incorporating the most recent major technical amendments made to the UN Regulation at the time of issue of the approval. The same Contracting Party may not assign this number to another vehicle type.

13.3. Communication on approval or extension or withdrawal of approval or production definitely discontinued of a vehicle type pursuant to this Regulation shall be communicated to the Parties to the Agreement applying this Regulation by means of a form conforming to the model in Annex 1B to the UN Regulation.

13.4. On every vehicle which conforms to a vehicle type approved under this Regulation there shall be affixed conspicuously, in an easily accessible place indicated on the approval form, an international approval mark comprising:

13.4.1. A circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval[[7]](#footnote-8);

13.4.2. The number of this Regulation, followed by the letter "R", a dash and the approval number placed to the right of the circle prescribed in paragraph 13.4.1.

13.5. If the vehicle conforms to a vehicle type approved, under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 13.4.2. need not be repeated; in such a case the UN Regulation and approval numbers and the additional symbols of all the UN Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 13.4.

13.6. The approval mark must be clearly legible and indelible.

13.7. The approval mark shall be placed near the plate bearing the characteristics of the vehicle and may also be affixed to this plate.

13.8. Annex 2, Section II, to this Regulation gives an example of the arrangement of the approval mark.

13.9. The Type Approval Authority shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted.

14. Specifications

14.1. General specifications

14.1.1. The audible reverse warning device shall be so designed, constructed and assembled as to enable the vehicle, when reverse gear is selected and the propulsion system is on, despite the vibration to which it may be subjected, to comply with the provisions of this Regulation.

14.1.2. The audible reverse warning device(s) and its (their) mounting elements to the vehicle shall be so designed, constructed and assembled as to be able to reasonably resist the corrosive phenomena to which it is exposed with regards to the conditions of use of the vehicle, including regional climate differences.

**14.1.3. The manufacturer may define alternative sounds which can be selected by the driver; each of these sounds shall be in compliance and approved with the provisions in paragraphs 6.3. or 6.4. and 6.5.**

14.2. Specifications regarding sound levels

14.2.1. Each sound made by the audible reverse warning device(s) fitted to the vehicle type submitted for approval shall be measured by the methods described in paragraph 14.**~~3~~** **5**.;

14.2.2. Measured under the conditions specified in paragraph~~s~~ 14.**~~3~~ 5**. the sound-pressure level of the signal tested **~~of the~~** **shall fulfil limit value described in paragraph 14.2.2.1 or 14.2.2.2:**

14.2.2.1. “*Non-self-adjusting audible reverse warning device*” shall be:

|  |  |  |
| --- | --- | --- |
|  | **Tonal Sound** | **Broadband & One-Third Octave Band Sound**  |
|  | **Min. Level** | **Max. Level** | **Min. Level** | **Max. Level** |
|  | **dB(A)** | **dB(A)** | **dB(A)** | **dB(A)** |
| **Low Level** | [50] | [58] | [46] | [54] |
| **Normal Level** | [68] | [78] | [64] | [74] |
| **High Level** | [85] | [95] | [81] | [91] |

Table 4

[Proposed regulatory value by Japan (**TFRWS-07-04)**

|  |  |  |
| --- | --- | --- |
|  | Min. level | Max. level |
|  | dBA | dBA |
| Low level | 38 | 58 |
| Normal level | 58 | 78 |

As to the regulatory value for the device alone in 6.3.7.1, if the regulatory value is needed, a proposal will be made once the value for the device onboard has been finalized.]

14.2.2.2. “*Self-adjusting audible reverse warning device*” shall be at least (**TFRWS-08-03**):

(a) for “*Tonal sound*”

[+ 5 dB(A) ± 1] in addition to the ambient noise in the range of [45 to 90] dB(A)

* Low level: 45 dB(A) plus x dB(A)
* Normal Level 1: 55 dB(A) plus x dB(A)
* Normal Level 2: 70 dB(A) plus x dB(A)
* High Level: 80 dB(A) plus x dB(A)

(b) for “*Broadband sound*”

[+ 5 dB(A) ± 1] in addition to the ambient noise in the range of [40 to 90] dB(A)

* Low level: 45 dB(A) plus y dB(A)
* Normal Level 1: 55 dB(A) plus y dB(A)
* Normal Level 2: 70 dB(A) plus y dB(A)
* High Level: 80 dB(A) plus y dB(A)

(c) for “*One-Third Octave Band Sound*”

[+ 1 dB(A) ± 5] in addition to the ambient noise in the range of [40 to 90] dB(A).

* Low level: 45 dB(A) plus z dB(A)
* Normal Level 1: 55 dB(A) plus z dB(A)
* Normal Level 2: 70 dB(A) plus z dB(A)
* High Level: 80 dB(A) plus z dB(A)

14.2.2.3. “Stepwise self-adjusting audible reverse warning device” shall be at least (**TFRWS-8-03**):

* Measure SPL of reverse warning device
* Requirement: SPL of [Table 2.a, 2.b, 2.c of 6.4.9.] minus 11dB for a distance of 7 m

14.2.3. The values measured in accordance with the provisions of paragraph 14.4 shall be entered in the test report and a communication corresponding to the model shown in Annex 1B.

14.3. Pause function

The manufacturer may install a pause function to disable temporarily the acoustic reverse warning device when a vehicle of category M2 (M>3500 kg), N2, M3, N3, or O is equipped with a non-audible safety system, [such as a rearward facing camera system[[8]](#footnote-9)] [or a detection system[[9]](#footnote-10)], allowing the driver to check the hazard area behind the vehicle, including when towing vehicles, and it is ensured that such safety system(s) functions while reversing. Any other disabling function which does not satisfy the specifications below is prohibited.

14.3.1. When the towing vehicle(s) of category O is(are) not equipped with a non-audible safety system, [such as a rearward facing camera system**7**] [or a detection system**8**] and the driver is not able to see the rearward area behind the last vehicle of category O, the activation of the pause function shall be disabled (the acoustic reverse warning device shall still be active).

**Remark: See comments by EC (TFRWS-08-07)**

14.3.2. The pause function shall be located so that it is operable by the driver in a normal seating position.

14.3.3. In the case when the pause function is activated, the suspension of reverse warning sound has to be indicated clearly to the driver.

14.3.4. The reverse warning device shall be reactivated to “Normal Level” when the vehicle is re-started following each vehicle turn-off.

14.3.5. Owner’s manual information

If a pause function is installed, the manufacturer shall provide the owner with information (e.g. in the owner’s manual) as to the increased risks thus created:

The pause function of the reverse warning sound device shall not be used unless for an obvious lack of necessity to emit sound for alert in the surrounding area and that it is certain that there are no pedestrians within a short distance.

14.4. The “*Non-self-adjusting audible reverse warning device*” shall automatically return to “*Normal Level*” when the vehicle is started following each vehicle turn-off.

14.5. Measurement on stationary vehicle of the sound characteristics of the “*Non-self-adjusting audible reverse warning device*”

14.5.1. The vehicle shall comply with the following specifications:

14.5.1.1. The audible reverse warning device(s) fitted on the vehicle shall be of a type approved under this Regulation (Part I);

14.5.1.2. The test voltage shall be as specified in paragraph 6.3.4. of this Regulation;

 In case of audible reverse warning device(s) supplied with direct current, the test voltage shall be supplied by either:

(a) The vehicle battery only; or

(b) The vehicle battery with the vehicle engine warmed-up and at idle; or

(c) With an external power source supply connected to the audible reverse warning device(s) .

14.5.2. The sound pressure level and other measurements shall be made according to the conditions specified in paragraph 6.2. of this Regulation.

14.5.3. The A-weighted sound pressure level emitted by the audible reverse warning device(s) fitted on the vehicle shall be measured at a distance of 7.00 ± 0.10 m to the rear of the vehicle **at CC-line** (see figures in Annex 5), which is being placed on an open site[[10]](#footnote-11), on flat concrete or asphalt surface.

14.5.4. The microphone of the measuring instrument shall be placed approximately (± 0.10 m) in the mean longitudinal plane of the vehicle;

14.5.5. Background noise

14.5.5.1. Measurement criteria for A-weighted sound pressure level

The “*background noise*” or “*ambient noise*” shall be measured for a duration of at least 10 seconds. A 10 second sample taken from these measurements shall be used to calculate the reported background noise, ensuring the 10 seconds sample selected is representative of the background noise in the absence of any transient disturbance. The measurements shall be made with the same microphones and microphone locations used during the test.

When testing in an indoor facility, the noise emitted by other test facility equipment, without the vehicle installed or present, inclusive of the noise caused by air handling of the facility, shall be reported as the background noise.

The recorded maximum A-weighted sound pressure level from both microphones during the 10 second sample shall be reported as the background noise, Lbgn, for both left and right microphones.

For each 10 second sample at each microphone, the maximum to minimum range of the background noise, ∆Lbgn, p-p, shall be reported.

*The one-third octave frequency spectrum, corresponding to the reported maximum level of background noise in the microphone with the highest background level, shall be reported.*

As an aid for measurement and reporting of background noises see flowchart in Figure 1 of Appendix 6.

14.5.5.2 Vehicle A-weighted sound pressure level measurement correction criteria

Depending on the level and the range of maximum to minimum value of the representative background noise A-weighted sound pressure level over a defined time period, the measured jth test result within a test condition, Ltest,j, shall be corrected according to the table below to obtain the background noise corrected level Ltestcorr,j. Except where noted, Ltestcorr,j = Ltest,j - Lcorr.

Background noise corrections to measurements are only valid when the range of the maximum to minimum background noise A-weighted sound pressure levels are 2 dB(A) or less.

In all cases where the range of the maximum to minimum background noise is greater than 2 dB(A), the maximum level of the background noise shall be 10 dB(A) or greater below the level of the measurement. When the maximum to minimum range of background noise is greater than 2 dB(A) and the level of the background noise is less than 10 dB(A) below the measurement, no valid measurement is possible.

|  |
| --- |
| Correction for background noise |
| Range of maximum to minimum value of the representative background noise A-weighted sound pressure level over a defined time period **∆**Lbgn, p-p in dB(A) | Sound pressure level of j-th test result minus background noise level∆L = Ltest,j - Lbgnin dB(A) | Correction in dB(A)Lcorr |
| - | **∆**L > 10  | no correction needed |
| < 2  | 8 ≤ **∆**L <10  | 0,5 |
| 6 ≤ **∆**L <8 | 1,0 |
| 4.5 ≤ **∆**L <6 | 1,5 |
| 3 ≤ **∆**L <4.5  | 2,5 |
| **∆**L < 3 | no valid measurementcan be reported |

If a sound peak obviously out of character with the general sound pressure level is observed, that measurement shall be discarded.

As an aid for measurement correction criteria see flowchart in Figure 2 of Appendix 6.

**Remark: To be aligned with UN Regulation No. 138 or/and No. 51.03**

14.5.6. The maximum sound-pressure level shall be sought within the range of 0.5 and 1.5 m above the ground, and the height, at which the maximum sound-pressure level was found has to be fixed for the purpose of taking the measurements prescribed below.

 The sound pressure level shall be measured at that fixed height for a duration of at least 3 seconds. The final result shall be the maximum A-weighted sound pressure level of the reading period, rounded mathematically to the nearest integer.

14.6. Measurement on stationary vehicle of sound characteristics of the “*Self-adjusting audible reverse warning device*” or of the “Stepwise Self-adjusting audible reverse warning device”

14.6.1 to 14.6.y. Measurement procedure needs to be added

**(TFRWS-08-03):**

* 1/3 octave sound: microphone at 1m height, variation of height is not needed (like for tonal sounds)
* Type Approval for device has to be available (to assure self-adjusting function)
* ~~The device has to be mounted at the position in conformity with the specification of the device type approval~~
* ~~If the device is intended for a special mounting position, the manufacturer of the vehicle has to ensure that the required SPLs are reached.~~
* Measure present background noise or ambient noise at microphone position at 7 m
* open space see §6.3.1. and §6.4.1

15. Modification and extension of approval of the vehicle type

15.1. Every modification of the vehicle type shall be notified to the Type Approval Authority which granted approval to the vehicle type. This Type Approval Authority may then:

15.1.1. Either take the view that the modifications made are not likely to have any appreciable adverse effect and that in any case the vehicle still meets the requirements; or

15.1.2. Call for a new report from the Technical Service responsible for the tests.

15.2. Communication on confirmation of approval with particulars of the modifications, or of refusal of approval shall be communicated to the Parties to the Agreement applying this Regulation, in accordance with the procedure indicated in paragraph 13.3. above.

15.3. The Type Approval Authority issuing the extension of approval shall assign a series number to each communication form drawn up for such an extension.

16. Conformity of production

 The conformity of production procedures shall comply with those set out in the 1958 Agreement, Schedule 1 (ECE/TRANS/505/Rev.3) with the following requirements:

16.1. A vehicle approved under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set forth in paragraph 14. above.

16.2. The Type Approval Authority which has granted type approval may at any time verify the conformity control methods applied in each production facility. The normal frequency of these verifications shall be once every two years.

17. Penalties for non-conformity of production

17.1. The approval granted to a vehicle type pursuant to this Regulation may be withdrawn if the conditions set forth in paragraph 16.1. above are not complied with, or if the vehicle fails to pass the checks referred to in paragraph 16.2. above.

17.2. Should a Party to the Agreement applying this Regulation withdraw an approval which it has previously granted, it shall forthwith notify the other Contracting Parties applying this Regulation by means of a copy of the approval from bearing at the end in large letters the statement, signed and dated: "APPROVAL WITHDRAWN".

18. Production definitively discontinued

18.1. If the holder of the approval completely ceases to manufacture a vehicle type approved in accordance with this Regulation, he shall so inform the authority which granted the approval. Upon receiving the relevant communication that authority shall inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in Annex 1B to this Regulation.

19. Names and addresses of Technical Services responsible for conducting approval tests and of Type Approval Authorities

 The Contracting Parties to the 1958 Agreement applying this Regulation shall communicate to the United Nations Secretariat the names and addresses of the Technical Services responsible for conducting approval tests and of the Type Approval Authorities which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval, issued in other countries, are to be sent.

Annex 1A

 Communication

|  |  |
| --- | --- |
| (maximum format: A4 (210 x 297 mm))**[[11]](#footnote-12)****1**Concerning:[[12]](#footnote-13) Approval granted Approval extended Approval refused Approval withdrawn Production definitively discontinued | issued by: Name of administration:........................................................................................................................ |

of a type of 2

audible reverse warning device

for motor vehicles pursuant to UN Regulation No. 1xx

Approval No.: .002439[[13]](#footnote-14) Extension No.: 00

Section I

0.1. Make (trade name (mark) of manufacturer):

0.2. Type or commercial description:

0.3. Means of identification of type if marked:[[14]](#footnote-15)

0.3.1. Location of that marking:

0.4. Company name and address of manufacturer:

0.5. Name and address of the manufacturer's representative (if any):

0.6. Names and address(es) of assembly plant(s):

Section II

1. Additional information (where applicable): See Addendum

2. Technical service responsible for carrying out the tests:

3. Date of test report:

4. Number of test report:

5. Remarks (if any): See Addendum

6. Place:

7. Date:

8. Signature:

9. Reasons for Extensions:

 Attachments:

 Information package

 Test report(s)

 Addendum to the communication form No. 002439,[[15]](#footnote-16) Extension No.: 00

1. Additional information

1.1. Brief description of a principle of operation

1.2. Rated voltage(s), V2

1.3. Rated sound frequency (or frequencies), Hz2

2. Test results for each of two samples:

2.1. For tonal sound A-weighted sound pressure level, dB(A)1

 For broadband sound from 400 Hz to 10 kHz A-weighted sound pressure, dB(A) 1

 For One-Third Octave Band Sound in between 800 Hz and 2500 Hz 1/3 A-weighted sound pressure level in dB(A) 1

2.4. Endurance test: passed / not passed2

3. Remarks

Annex 1A – Appendix 1

Technical Information Document for type approval of audible reverse warning device
for motor vehicles

0.General

0.1. Make (trade name (mark) of manufacturer):

0.2. Type or commercial description:

0.3. Means of identification of type if marked:

0.3.1. Location of that marking:

0.4. **Principles of operation: Fixed arrangements / Variable arrangements due background noise**[[16]](#footnote-17):

0.5. Company name and address of manufacturer:

0.6. Name and address of the manufacturer's representative (if any):

0.7. Names and address(es) of assembly plant(s):

1. General construction characteristics;

1.1. Brief description of a principle of operation

1.2. Rated voltage(s), V;1

1.2.1. Type of electrical supply (direct or alternating current);

1.3. Rated sound frequency (or frequencies), Hz;1

1.4. Outer shape of case;

1.5. Shape or kind of sound outlet(s);

1.6. Photographs and/or drawings;

1.7. Drawings showing the place provided for the approval number in relation to the circle of the approval mark; the location and the appearance of trade name or mark of the manufacturer and type or commercial description (if any);

1.8. A list of the components used in production, duly identified, with an indication of the materials used;

1.9. Drawings in cross section and of all the components used in production.

 Signed:

 Position in company:

 Date:

Annex 1B

 Communication

|  |  |
| --- | --- |
| (maximum format: A4 (210 x 297 mm))**[[17]](#footnote-18)****1**concerning:[[18]](#footnote-19) Approval granted Approval extended Approval refused Approval withdrawn Production definitively discontinued | issued by: Name of administration:........................................................................................................................ |

of a vehicle type with regard to its audible signals pursuant to UN Regulation No. 28

Approval No.: .002439[[19]](#footnote-20) Extension No.: 00

Section I

0.1. Make (trade name of manufacturer of vehicle):

0.2. Type:

0.3. Means of identification of type if marked on the vehicle:[[20]](#footnote-21)

0.3.1. Location of that marking:

0.4. Category of vehicle:[[21]](#footnote-22)

0.5. Company name and address of manufacturer:

0.6. Names and address(es) of assembly plant(s):

0.7. Name and address of the manufacturer's representative (if any):

Section II

1. Additional information (where applicable): See Addendum

2. Technical service responsible for carrying out the tests:

3. Date of test report:

4. Number of test report:

5. Remarks (if any): See Addendum

6. Place:

7. Date:

8. Signature:

9. Reasons for Extensions:

Attachments:

 Information package

 Test report(s)

Addendum to the communication form No. 002439,3 Extension No.: 00

1. Additional information

1.1. Make (trade name (mark) of manufacturer) of audible reverse warning device(s):

1.2. Type or commercial description of audible reverse warning device(s):

1.3. Means of identification of type if marked on the audible reverse warning device(s):[[22]](#footnote-23)

1.4. The approval number and issuing authority of audible reverse warning device(s):

2. Test results

2.1. Power supply used: Vehicle battery only / Battery with vehicle engine at idle / External power supply2

2.2. “*Non-self-adjusting audible reverse warning device*”

*For “Tonal sound” A-weighted sound pressure level[[23]](#footnote-24)*

 *For “Broadband sound” A-weighted sound pressure7*

 *For “One-Third Octave Band Sound” A-weighted sound pressure level7*

*“Low Level”*:A-weighted sound pressure level: .......... dB(A)

*“Normal Level”:A-weighted sound pressure level: .......... dB(A)*

*“High Level”:A-weighted sound pressure level: .......... dB(A)*

2.3. “*Self- adjusting audible reverse warning device”*

*for “Tonal sound” 7*

*for “Broadband sound”7*

*for “One-Third Octave Band Sound”7*

*A-weighted sound pressure level: .......... dB(A) above ambient sound between .......... dB(A) and .......... dB(A)*

3. Remarks

Annex 1B – Appendix 1

Technical Information Document for type approval of a vehicle with regard to its audible reverse warning signals

0.General

0.1. Make (trade name of manufacturer of vehicle):

0.2. Type:

0.3. Means of identification of type if marked on the vehicle[[24]](#footnote-25):

0.3.1. Location of that marking:

0.4. Category of vehicle:[[25]](#footnote-26)

0.5. Company name and address of manufacturer:

0.6. Name and address of the manufacturer's representative (if any):

0.7. Name(s) and Address(es) of assembly plant(s):

0.8. Make (trade name (mark) of manufacturer) of audible reverse warning device(s):

0.9. Type or commercial description of audible reverse warning device(s):

0.10. Means of identification of type if marked on the audible reverse warning device(s):[[26]](#footnote-27)

0.11. The approval number and issuing authority of audible reverse warning device(s):

0.12. Rated voltage(s), V:[[27]](#footnote-28)

0.13. Type of electrical supply (direct or alternating current):

1. General construction characteristics of the mountings of the audible reverse warning device(s) on the vehicle

1.1. Photographs or drawings of a representative vehicle:

1.2. Drawings of the mountings and mounting position(s) of the audible reverse warning device(s):

1.3. Description of the component materials in front of the audible reverse warning device(s):

1.4. A list of the components used in production on which the audible reverse warning device(s) are fitted, duly identified, with indication of the materials used;

1.5. Detailed drawings of all the components on which the device(s) are fitted, used in production;

 Signed:

 Position in company:

 Date:

Annex 2

 Arrangement of the approval mark

 I. Arrangement of the approval mark of the audible reverse warning device

(see paragraph 5.5. of this Regulation)

|  |
| --- |
| надписи 3-3-1 |



The above approval mark affixed to an audible reverse warning device shows that this audible reverse warning device has been approved in the Netherlands (E 4) under approval number 002439. The first two digits of the approval number indicate that the approval was granted in accordance with the requirements of UN Regulation No. 1xx in its original form.

*Note****s***:

1. The approval number must be placed close to the circle and must be in a position either above or below the letter "E" or to left or right of that letter. The digits of the approval number must be on the same side of the letter "E" and face in the same direction. The use of Roman numerals as approval numbers should be avoided so as to prevent any confusion with other symbols.

2. Approval marks of already existing types of audible reverse warning devices (system) or vehicle types may be continued to be used.

II. Arrangement of the approval mark of vehicle with regard to its audible reverse warning signals

(see paragraph 13.4. of this Regulation)

**Model A**

|  |
| --- |
| надписи 3-1**1xxR** |

The above approval mark affixed to a vehicle indicates that, pursuant to UN Regulation No. 1xx, this vehicle type has been approved in the Netherlands (E 4), with regard to its audible warning signals. The first two digits of the approval number indicate that UN Regulation No. 1xx was in its original form.

**Model B**

|  |
| --- |
| **надписи 3-3**1xx |

The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E 4) pursuant to UN Regulations Nos. 1xx and 33.[[28]](#footnote-29) The approval numbers indicate that, at the dates when the respective approvals were granted, UN Regulation No. 1xx and UN Regulation No. 33 were in their original form.

Annex 3

 Qualification criteria for anechoic environment

The anechoic environment shall meet the requirements of ISO 26101:2012 with the following qualification criteria and measurement requirements appropriate to this test method. For qualifying the acoustic space, the following evaluation shall be conducted:

* Sound source location shall be placed in position of the audible warning device, audible warning system, multiple audible warning system to be tested;
* Sound source shall provide a broadband input for measurement;
* Evaluation shall be conducted in one-third octave bands;
* Microphone locations for evaluation shall be on a line from the source location to position of the microphone used for measurement. This is commonly referred to as the microphone traverse; only one microphone traverse line from the microphone to sound source shall be used;
* A minimum of 10 points shall be used for evaluation on the microphone traverse line. The measurement shall start at 0.5 ± 0.05 m from the sound source, and spacing shall be 0.15 m (e.g. Figure 1);
* The one-third octave bands used to establish anechoic qualification shall be defined to cover the spectral range of interest from 250 Hz to 10 kHz;
* The deviations of the measured sound pressure levels from those estimated using the inverse square law, shall not exceed the values given in the following table.

|  |  |
| --- | --- |
| *One-third octave-band frequency (Hz)* | *Allowable deviations (dB)* |
| ≤ 630800 to 5000≥ 6300 | ±1.5±1.0±1.5 |

Figure 1

*The distance from surrounding object shall be 0.5 or more.*

*The distance from surrounding object shall be 0.5 or more.*

*Sound*

*source*

*2.00±0.05*

*Microphone*

*Traverse line*

*0.50±0.05*

*1.20±0.05*

*Except from*

*measurement range*

*Mesh or ground*

(All dimensions are in m)

Annex 4

 Microphone positions for measurements of acoustics parameters of audible reverse warning device

All dimensions are in m

**Audible Reverse Warning Device**

Annex 5

 Microphone positions for measurements of audible reverse warning signals of motor vehicles

0.10 m ± 0.05 m

0.10 m ± 0.05 m

hmin: minimum height for measurements

hmax: maximum height for measurements

PLmax: point of maximum sound pressure level

PLmax

hmin = 0.5m ± 0,05m

hmax = 1.5m ± 0.05m

7.0 m ± 0.10 m

microphone

 **Change vehicle layout/drawing from PC to Heavy Commercial vehicle**

 

**Annex 6**

 **Flowcharts**

# Figure 1

**Determination of the range of background noise**

Measure background noise for 10 seconds using both left and right microphones. (2.3.1.)

Any transient disturbance? (2.3.1.)

YES

NO

Re-measure background noise (2.3.1.)

Report maximum A-weighted SPL from both Left and Right microphones. L\_bgn=MAX(Max\_SPL\_left), (Max\_SPL\_right)) (2.3.1.)

Report maximum to minimum range of the background noise at each microphone. ΔL\_bgn, p-p (2.3.1.)

Report 1/3-Octave frequency spectrum at time corresponding to L\_bgn (2.3.1.)

# Figure 2

**Vehicle A-Weighted sound pressure level measurement correction criteria**

Is ΔL\_bgn, p-p less or equal to 2 dB? (2.3.1.)

NO

YES

Is ΔL according to Table 3 greater or equal to 10 dB? (2.3.2.)

NO

YES

Carry out SPL correction according to Table 3 for each individual measurement j . (2.3.2.)

STOP. No valid measurement

Report *L\_testcorr, j* for each individual test run j. (2.3.2.)

Conduct measurement according to 3.3.

1. \* Former titles of the Agreement:

 Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, done at Geneva on 20 March 1958 (original version);

 Agreement concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these Prescriptions, done at Geneva on 5 October 1995 (Revision 2). [↑](#footnote-ref-2)
2. As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.), document ECE/TRANS/WP.29/78/Rev.6, para. 2 - [www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html](http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html) [↑](#footnote-ref-3)
3. The distinguishing numbers of the Contracting Parties to the 1958 Agreement are reproduced in Annex 3 to the Consolidated Resolution on the Construction of Vehicles (R.E.3), document ECE/TRANS/WP.29/78/Rev. 6, Annex 3 - [www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html](http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html) [↑](#footnote-ref-4)
4. For the purpose of this Regulation, the previous versions of the standards IEC 61672-1:2004 and IEC 61672-3:2006 may be applied. [↑](#footnote-ref-5)
5. The site may take the form, for instance, of an open space of 50 m radius, the central part of which must be practically horizontal over a radius of at least 20 m, the surface being of concrete, asphalt or a similar material, which must not be covered with powdery snow, tall weeds, or loose soil or cinders, as mentioned in ISO 10844:2014. The measurements shall be made on a clear day. No-one other than the observer reading the instrument shall remain near the audible reverse warning device or the microphone, since the presence of spectators may affect the readings of the instrument to a considerable extent, if they are near the audible reverse warning device or the microphone. Any peak which appears to be unrelated to the general sound level shall be disregarded in the reading. [↑](#footnote-ref-6)
6. The site may take the form, for instance, of an open space of 50 m radius, the central part of which must be practically horizontal over a radius of at least 20 m, the surface being of concrete, asphalt or a similar material, which must not be covered with powdery snow, tall weeds, or loose soil or cinders, as mentioned in ISO 10844:2014. The measurements shall be made on a clear day. No-one other than the observer reading the instrument shall remain near the audible reverse warning device or the microphone, since the presence of spectators may affect the readings of the instrument to a considerable extent, if they are near the audible reverse warning device or the microphone. Any peak which appears to be unrelated to the general sound level shall be disregarded in the reading. [↑](#footnote-ref-7)
7. The distinguishing numbers of the Contracting Parties to the 1958 Agreement are reproduced in Annex 3 to the Consolidated Resolution on the Construction of Vehicles (R.E.3), document ECE/TRANS/WP.29/78/Rev. 6, Annex 3 - [www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html](http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html). [↑](#footnote-ref-8)
8. [This type of safety system shall be activated automatically whenever reverse gear is engaged. Further, the camera/monitor system shall comply with UN Regulation No. 46.04. [↑](#footnote-ref-9)
9. This type of safety system shall be activated automatically whenever reverse gear is engaged. Further, the detection system, shall comply with new UN Regulation for “Devices for Reversing Motion”, taking into account the UNECE work on that issue.] [↑](#footnote-ref-10)
10. See paragraph 6.3.l., footnote 4. [↑](#footnote-ref-11)
11. Distinguishing number of the country which has granted/extended/refused/withdrawn approval (see approval provisions in the Regulation). The proportions and dimensions in accordance with Annex 3. [↑](#footnote-ref-12)
12. Delete (strike out) what does not apply. [↑](#footnote-ref-13)
13. Example of Approval No and Extension No. The first two digits of the approval number indicate that UN Regulation No. 1xx was in its original form. [↑](#footnote-ref-14)
14. If the means of identification of type contains characters not relevant to describe the type warning devices covered by the type-approval certificate such characters shall be represented in the documentation by the symbol: '?' (e.g. ABC??123??). [↑](#footnote-ref-15)
15. Example of Approval No and Extension No. The first two digits of the approval number indicate that UN Regulation No. 1xx was in its original form. [↑](#footnote-ref-16)
16. Delete (strike out) what does not apply. [↑](#footnote-ref-17)
17. Distinguishing number of the country which has granted/extended/refused/withdrawn approval (see approval provisions in the Regulation). The proportions and dimensions in accordance with Annex 2. [↑](#footnote-ref-18)
18. Delete (strike out) what does not apply. [↑](#footnote-ref-19)
19. Example of Approval No and Extension No. The first two digits of the approval number indicate that Regulation No. 1xx was in its original form. [↑](#footnote-ref-20)
20. If the means of identification of type contains characters not relevant to describe the vehicle types covered by the type-approval certificate such characters shall be represented in the documentation by the symbol: '?' (e.g. ABC??123??). [↑](#footnote-ref-21)
21. As defined in R.E.3. [↑](#footnote-ref-22)
22. If the means of identification of type contains characters not relevant to describe the type of audible reverse warning device(s) covered by the type-approval certificate, such characters shall be represented in the documentation by the symbol: '?' (e.g. ABC??123??). [↑](#footnote-ref-23)
23. Delete (strike out) what does not apply [↑](#footnote-ref-24)
24. If the means of identification of type contains characters not relevant to describe the vehicle types covered by the type-approval certificate such characters shall be represented in the documentation by the symbol: '?' (e.g. ABC??123??). [↑](#footnote-ref-25)
25. As defined in R.E.3. [↑](#footnote-ref-26)
26. If the means of identification of type contains characters not relevant to describe the type of the audible reverse warning devices covered by the type-approval certificate such characters shall be represented in the documentation by the symbol: '?' (e.g. ABC??123??). [↑](#footnote-ref-27)
27. Delete (strike out) what does not apply. [↑](#footnote-ref-28)
28. The latter number is given as an example only. [↑](#footnote-ref-29)