14. Specifications

14.1. General specifications

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

14.1.2. The audible reverse warning device shall be so designed, constructed and assembled as to enable the vehicle, despite the vibration to which it may be subjected, to comply with the provisions of this Regulation.

14.1.3. 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.

14.1.4. In case a device has more than one mode, the reverse warning device shall be automatically activated to its default mode.

For non-self adjusting audible reverse warning device and for step-wise self-adjusting audible reverse warning device the default mode is the “Normal mode”.

**14.1.5. 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** | |  | |
|  | **Min.  Level** | **Max.  Level** |  |  |
|  | **dB(A)** | **dB(A)** |  |  |
| **Low Level** | [40] | [55] |  |  |
| **Normal Level** | [60] | [75] |  |  |
| **High Level** | [85] | [95] |  |  |

Table 4



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[[1]](#footnote-1)] [or a detection system[[2]](#footnote-2)], 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 pause switch shall be deactivated 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.

14.5. 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[[3]](#footnote-3), 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 measurement

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 the measurement microphone during the 10 second sample shall be reported as the background noise, Lbgn.

For each 10 second sample, 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, 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.

|  |  |  |
| --- | --- | --- |
| 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 - Lbgn  in 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 measurement can 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.

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.

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.

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

14.6.1. The vehicle shall comply with the following specifications:

14.6.1.1. The audible reverse warning device(s) fitted on the vehicle shall comply to the corresponding parts ~~be of a type approved~~ under Part 1 of this Regulation (see …..);

14.6.1.2. 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) .

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

14.6.3. 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[[4]](#footnote-4), on flat concrete or asphalt surface.

14.6.4. The microphone of the measuring instrument shall be placed approximately (± 0.10 m) in the mean longitudinal plane of the vehicle (along CC-line);

14.6.5. Background noise recording

14.6.5.1. 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 the measurement microphone during the 10 second sample shall be reported as the background noise, Lbgn.

For each 10 second sample, 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, shall be reported.*

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

14.6.5.2 Vehicle A-weighted sound pressure level measurement correction criteria in case of measuring the performance of “***step-wise*** *self-adjusting* *audible reverse warning device*”

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.

|  |  |  |
| --- | --- | --- |
| 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 - Lbgn  in 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 measurement can 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.

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.

14.6.5.4 Background noise in case of measuring the performance of “self-adjusting-alarm”

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

~~14.6.6.~~

14.6.6 Specific specification concerning “*Self-adjusting sound level alarms”*

This paragraph specify how the “*Self-adjusting sound level alarm*” shall be checked when mounted in vehicle with respect to its emitted sound level. The basic function of self-adjusting sound level alarm and its ability to adjust the output to the instant reference noise shall be verified in accordance with part 1 of this document.

The A-weighted sound pressure level shall be determined at test measurement positions in paragraph [14.6.3].

The arrangement for the purpose of producing **reference sound** can be either

* the running engine of the vehicle with the alarm mounted, but switched off,
* or a secondary sound source, similar to the set-up with loudspeaker in paragraph 6.4 in part 1 of this document; however the in case of a loudspeaker emitting the reference sound, this loudspeaker shall be placed at a equidistance of 7.0 +/-0.10 m from the [**rear of the vehicle**] as well as the measurement microphone.
* or the reference level of the test can also be achieved by the (site) background level, recorded in accordance with paragraph 14.6.5.4.

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, similar to paragraph 14.5.6.

The sound pressure level shall be measured at that fixed height for a duration of at least [**10**] seconds.

Capture the maximum sound pressure level with the reversing alarm off ~~and the engine at maximum governor engine speed (high idle)~~.

Capture the maximum sound pressure level with the reversing alarm on ~~and the engine at maximum governor engine speed (high idle)~~.

The recorded values from “Alarm On” shall be a minimum of [**5+1**] dB greater than the measured values from “Alarm Off”.

The final result shall be the maximum A-weighted sound pressure levels of the reading period, rounded mathematically to the nearest integer.

To be reported: measurement levels for “alarm on” and “alarm off”.

14.6.7 Specific specification concerning “*Step-wise self-adjusting sound level alarms”*

This paragraph specify how the “*Step-wise self-adjusting sound level alarm*” shall be checked when mounted in vehicle with respect to its emitted sound level. The basic function of self-adjusting sound level alarm and its ability to adjust the output to the instant reference noise shall be verified in accordance with part 1 of this document.

The A-weighted sound pressure level shall be determined at test measurement positions in paragraph [14.6.3].

The arrangement for the purpose of producing **reference sound** can be either

* the running engine of the vehicle with the alarm mounted, but switched off,
* or a secondary sound source, similar to the set-up with loudspeaker in paragraph 6.4 in part 1 of this document; however the in case of a loudspeaker emitting the reference sound, this loudspeaker shall be placed at a equidistance of 7.0 +/-0.10 m from the [**rear of the vehicle**] as well as the measurement microphone.
* or the reference level of the test can also be achieved by the (site) background level, recorded in accordance with paragraph 14.6.5.4.

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, similar to paragraph 14.5.6.

The sound pressure level shall be measured at that fixed height for a duration of at least [**10**] seconds.

Capture the maximum sound pressure level with the reversing alarm off ~~and the engine at maximum governor engine speed (high idle)~~.

Capture the maximum sound pressure level with the reversing alarm on ~~and the engine at maximum governor engine speed (high idle)~~.

The recorded values from “Alarm On” shall be a minimum of [**5+1**] dB greater than and a maximum of [**15**] dB greater than the measured values from “Alarm Off”.

The final result shall be the maximum A-weighted sound pressure levels of the reading period, rounded mathematically to the nearest integer.

To be reported: measurement levels for “alarm on” and “alarm off”.

1. [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-1)
2. 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-2)
3. See paragraph 6.3.l., footnote 4. [↑](#footnote-ref-3)
4. See paragraph 6.3.l., footnote 4. [↑](#footnote-ref-4)