



Comments to TFRWS-23-08 and tuned proposals introduced in TFRWS-24-02

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This presentation was produced to aid the discussions in the 24th meeting, however updated with regards to slide 11 on request of the meeting.

Non-self-adjusting

14.2.2.1: “Non-self-adjusting audible reverse warning device” or “Multiple audible reverse warning system” shall emit sound:

- Low 45 – 60 dBA @ 7 m
- Normal 60 – 75 dBA @ 7 m
- High 80 – 95 dBA @ 7 m

GREWUS: $\Delta \text{SPL} = 20 \times \log (L1 / L2) = + 16,9 \text{ dBA}$ (where $L1=7 \text{ m}$ & $L2=1 \text{ m}$):

Range and Average limit values @ 1m (max+min)/2 +16,9 dBA:

Mode	Range @ 1 m	Average @ 1 m	State-of-the-art @ 1 m	SAE @ 1,2 m
Low	62 - 77 dBA	69 dBA	72 dBA	77 ± 4 dBA
Normal	77 - 92 dBA	84 dBA	87 dBA	87 ± 4 dBA
High	97 - 112 dBA	104 dBA	102 dBA	107 ± 4 dBA

Reference sound for testing *self-adjusting*

6.4.7 A reference sound, simulating ambient noise, emitted by the loudspeaker has to play pink noise at three different SPLs:

- **Low level:** **45 dBA**
- **Normal Level:** **60 dBA**
- **High Level:** **[80] 75 dBA**

Per-Uno: To be aligned with non-self-adjusting.

Self-adjusting

6.4.8 Under the conditions set forth above, the sound-pressure level weighted in accordance with curve A shall comply to the following sound level values, including allowed variability of [± 4 dB], for “Self-adjusting audible reverse warning device”

- Low Verification level 1: 45 dB(A) @ 7 m plus [+ 22.5 dB(A) \pm 1] dB(A) → **67 \pm 4 dB(A) @ 1 m**
- Normal Verification Level 2: **[60] 55 dB(A) @ 7 m** plus [+ 22.5 dB(A) \pm 1] dB(A) → **82 \pm 4 dB(A) @ 1 m**
- Normal Level 2: ~~70 dB(A) plus [+ 22.5 dB(A) \pm 1] dB(A)~~
- High Verification Level 3: 80 dB(A) @ 7 m plus [+ 22.5 dB(A) \pm 1] dB(A) → **102 \pm 4 dB(A) @ 1 m**

GREWUS:

The term : +5 dB(A) is not correct, it has to be + 22 dB(A).

The reason: The ambient noise is around the vehicle homogenous. This means the same ambient noise at 1m behind the vehicle as well as 7 m behind. If the SPL is just 5 dBA @ 1 m distance higher than the ambient noise, the SPL would be e.g. at 45 dBA ambient noise just 50 dBA which means as written above 50 dBA -16.9 dBA = 33,1 dBA at 7 m this is not loud enough.

CLEPA suggests ± 4 dB(A) (TFRWS-23-07)

Per-Uno: Replace 55 dB(A) with 60 dB(A) and delete “Normal level 2” to align with Non-self-adjusting.

Stepwise self-adjusting

6.4.9. Under the conditions set forth above, the **recorded** sound-pressure levels, weighted in accordance with curve A, **divided into at least three separate sound level ranges**, shall and then fall inside the following sound level modes for “*Stepwise Self-adjusting audible reverse warning device*”:

Alternative 1:

- equal to [62] dB (A) and not more than [77] dB (A) for the signal of “Low Level”
- equal to [77] dB (A) and not more than [92] dB (A) for the signal of “Normal Level”
- equal to [97] dB (A) and not more than [112] dB (A) for the signal of “High Level”

Alternative 2:

- equal to [72 ± 4] dB(A) for the signal of “Low Level”
- equal to [87 ± 4] dB(A) for the signal of “Normal Level”
- equal to [102 ± 4] dB(A) for the signal of “High Level”

Other distributions of sound level ranges are accepted as long as they cover the total range of at least 62+4 dB(A) to 112-4 dB(A).

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GREWUS: For non self adjustable alarms and stepwise adjustable alarms the SPL values will be the same.

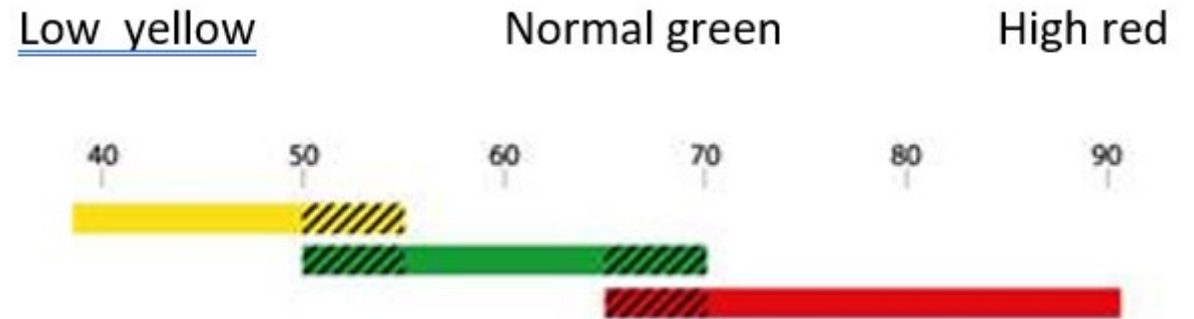
Stepwise self-adjusting

GREWUS: *The following graphic explains the meaning:*

Between 50dBA and 55dBA as well as 65dBA and 70dBA two modes are possible.

Explanation of this behaviour:

- The vehicle is in a quiet area, only few times the noise exceeds 50dBA than the Alarm remains in Low.*
- Over a wide range from 50-70dBA it will stay in normal mode.*



Self-adjusting

14.2.2.2. “Self-adjusting audible reverse warning device” shall be at least:

[+ 5 dB(A) \pm 1] in addition to the reference sound – **measured at the test microphone**
– in the range of [40 to 95] dB(A)

GREWUS: *This value is not meaningful; it belongs to a distance of 7m behind the vehicle because it is in the second part. The alarm can not be as low as $40-16,9= 23,1$ dBA.*

Per-Uno: *This value shall be understood as measured at the test microphone at 7 m and not as the output of the alarm. The corresponding alarm shall be 22 dB above the reference sound, measured at 1 m from the alarm.*

Stepwise self-adjusting

14.2.2.3. “Stepwise self-adjusting audible reverse warning device” :

The sound pressure level, measured in accordance with 14.5, shall comply with the requirements **below, with a tolerance of $[\pm 4]$** :

- ~~Low level~~ **Verification level 1:** [45] dB(A) plus ~~x dB(A)~~ **[5] dB**
- ~~Normal~~ **Verification Level 2:** [~~60~~55] dB(A) plus ~~x dB(A)~~ **[5] dB**
- Normal Level 2: [70] dB(A) plus ~~x dB(A)~~ **[5] dB**
- ~~High~~ **Verification Level 3:** [80] dB(A) plus ~~x dB(A)~~ **[5] dB**

The vehicle verification test shall at least cover one of the prescribed levels under condition that the device has been proven to comply with the requirements described in Part I in this document.

GREWUS: *Not needed because the stepwise should exactly as high as the non-self adjusting. The stepwise adjustable just automatically switches into the three modes.*

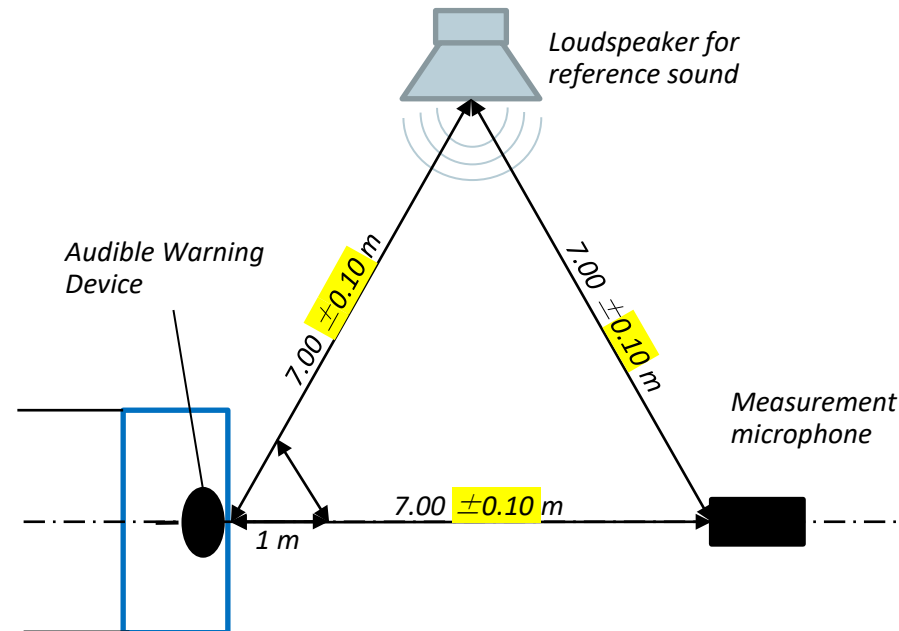
Per-Uno: *The reverse warning device mounted on the vehicle may only be verified at one background noise level, provided that the function already has been verified in accordance with the Part I test.*

Part II: Measurement set-up & measured levels

The “background” sound level shall be same at the self-adjusting RWS device and at the measurement microphone

the alarm shall produce a sound that exceed the background level measured at the microphone by more than 5 ± 4 dBA at 7 m.

Because the alarm is 7 m from the microphone the alarm shall produce a level of $17+5 \pm 4$ dBA higher than the background/reference sound level at 1 m – at the measurement position according to Part I.



Part I: Measured alarm level:

- Low level: 67 ± 4 dBA
- Normal Level: 82 ± 4 dBA
- High Level: 97 ± 4 dBA

Measured (reference) ambient level:

- Low level: 45 dBA
- Normal Level: 60 dBA
- High Level: 75 dBA

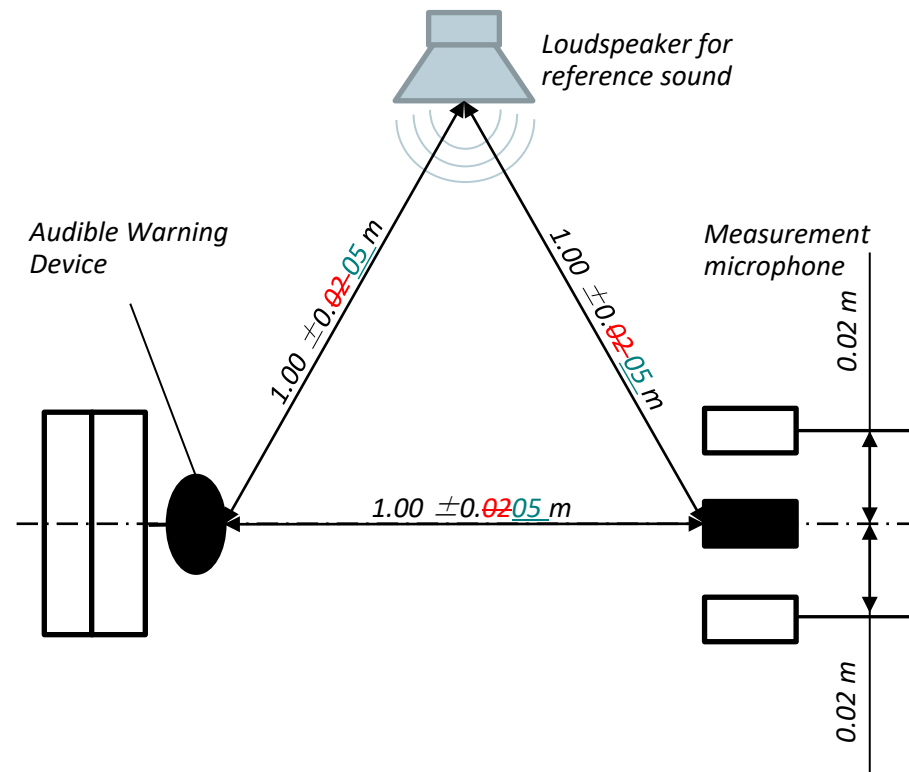
Part II: Measured alarm level:

- Low level: 50 ± 4 dBA
- Normal Level: 65 ± 4 dBA
- High Level: 80 ± 4 dBA

Part I: Measurement set-up & measured levels

The loudspeaker for reference sound shall produce the same “background” sound level at the self-adjusting device and at the measurement microphone, simulating the background noise in a realistic situation.

The measurement shall *first* monitor the right reference sound level and *secondly* secure that the alarm produce a sound that exceed the background level by more than $17+5 \pm 4$ dBA.



1: Measured (reference) ambient level:

- Low level: 45 dBA
- Normal Level: 60 dBA
- High Level: 75 dBA

2: Measured alarm level:

- Low level: 67 ± 4 dBA
- Normal Level: 82 ± 4 dBA
- High Level: 97 ± 4 dBA