Transmitted by the experts of TF AVRS

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Proposal to replace ECE/TRANS/WP.29/GRBP/2025/25

Submitted by the Task Force on Automated Vehicles Regulation Screening

The text reproduced below was prepared by the Task Force on Automated Vehicles Regulation Screening (TF AVRS) in order to make the requirements of UN Regulation No. 51 fit for approval of Automated Driving Systems. The modifications to the current text of the UN Regulation are marked in bold for new or strikethrough for deleted characters.

I. Proposal

Table of content, Annexes, amend to read:

"10 Special provisions for the testing of vehicles equipped with an ADS…… …."

Paragraph 1., footnote 1, amend to read:

"[1] As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.) (ECE/TRANS/WP.29/78/Rev.**8**)."

Paragraph 2.4.(a), amend to read:

"2.4. "*Mass of a vehicle in running order (m_{ro})*" means

(a) In the case of a motor vehicle:

The mass of the vehicle, with its fuel tank(s) filled to at least 90 per cent of its or their capacity/ies, ~~including the mass of the driver,~~ of the fuel and liquids, fitted with the standard equipment in accordance with the manufacturer's specifications and, when they are fitted, the mass of the bodywork, the cabin, the coupling and the spare wheel(s) as well as the tools **and the mass of the driver (75 kg) except in the case of vehicles of ~~C~~category X or ~~C~~category Y.**

…"

Insert a *new paragraph 2.11.3.,* to read:

"2.11.3. For bidirectional vehicles, the reference point shall be determined separately for each forward direction.

Insert *new paragraphs 2.29. to 2.34.3*., to read:

"2.29. *"Automated Driving System (ADS)"* means the vehicle hardware and software that are collectively capable of performing the entire Dynamic Driving Task (DDT) on a sustained basis. [1]

2.30. *"Dynamic Driving Task (DDT)"* means the real-time operational and tactical functions required to operate the vehicle. [1]

2.31. *"Bidirectional vehicle"* means a vehicle that can operate in two opposite forward directions. [1]

2.32. *"Forward direction" (of a vehicle)* means a direction that is intended to be used as main travelling direction of the vehicle. [1]

2.33. *"Accelerator"* means

(a) for manually driven vehicles:

the device used by the driver to control the engine speed and the vehicle speed;

(b) for vehicles equipped with an ADS:

the function in the ADS used to control the engine speed and the vehicle speed.

2.34. Categories of vehicles equipped with an ADS [1]

2.34.1. *"Category X vehicles"* are vehicles of categories M, N, L and T meeting all of the following conditions:

(a) They are equipped with an ADS

(b) They are not capable of being driven manually at speed exceeding 6 km/h; and

(c) They are designed to carry occupants

2.34.2. ***"Category Y vehicles"*** **are vehicles of categories N, L and T meeting all of the following conditions:**

(a) They are equipped with an ADS

(b) They are not capable of being driven manually at speed exceeding 6 km/h; and

(c) They are not designed to carry occupants at any time

~~**2.34.3.** ***"Dual control vehicle"*** **means a vehicle equipped with an ADS where the DDT can be performed by either the ADS or a driver including at speeds exceeding 6 km/h.~~

Annex 1, insert a new item 0.4.1., to read:

"0.4.1. Vehicle equipped with an ADS: yes/no

Annex 3,

Paragraph 2.2.2.2., amend to read:

"2.2.2.2. Target mass, m_{target}, is used to denote the mass that N_2 and N_3 vehicles should be tested at. The actual test mass of the vehicle can be less due to limitations on vehicle and axle loading.

For vehicles in category N_2, N_3 equipped with an ADS, $m_d = 0$ if there is no driver. In this case, if a person is inside the vehicle to perform the test, the mass of this person shall be considered part of the extra load m_{xload}."

Table 2, amend to read:

"Table 2: Specification of test mass for the various vehicle categories

Vehicle category	*Vehicle test mass*
M_1	The test mass m_t of the vehicle shall be between $0.9\ m_{ro} \leq m_t \leq 1.2\ m_{ro}$ **[For vehicle in category X and Y, $0.9\ m_{ro} \leq m_t - 75\ kg \leq 1.2\ m_{ro}$ ~~+ 75 kg~~ in case a person is inside the vehicle to perform the test]** **[~~For dual control vehicles~~, For vehicles equipped with an ADS, other than those of category X and Y, $0.9\ m_{ro} \leq m_t + 75\ kg \leq 1.2\ m_{ro}$ in case there are no occupants in the vehicle]**
N_1	The test mass m_t of the vehicle shall be between $0.9\ m_{ro} \leq m_t \leq 1.2\ m_{ro}$ **[For vehicle in category X and Y, $0.9\ m_{ro} \leq m_t - 75\ kg \leq 1.2\ m_{ro}$ ~~+ 75~~ kg in case a person is inside the vehicle to perform the test]** **[~~For dual control vehicles~~, For vehicles equipped with an ADS, other than those of category X and Y, $0.9\ m_{ro} \leq m_t + 75\ kg \leq 1.2\ m_{ro}$ in case there are no occupants in the vehicle]**
N_2, N_3	$m_{target} = 50\ [kg/kW] \times P_n\ [kW]$ Extra loading, m_{xload}, to reach the target mass, m_{target}, of the vehicle shall be placed above the rear axle(s). If the test mass m_t is equal to the target mass m_{target}, the test mass m_t shall be $0.95\ m_{target} \leq m_t \leq 1.05\ m_{target}$

Vehicle category	*Vehicle test mass*
	The sum of the extra loading and the rear axle load in an unladen condition, $m_{ra\ load\ unladen}$, is limited to 75 per cent of the technically permissible maximum laden mass allowed for the rear axle, $m_{ac\ ra\ max}$. If the test mass m_t is lower than the target mass m_{target}, the test mass m_t shall be achieved with a tolerance of ±5 per cent. If the centre of gravity of the extra loading cannot be aligned with the centre of the rear axle, the test mass, m_t, of the vehicle shall not exceed the sum of the front axle in an unladen condition, $m_{fa\ load\ unladen}$, and the rear axle load in an unladen condition, $m_{ra\ load\ unladen}$ plus the extra loading, $m_{xload,}$ and the mass of the driver m_d, **except in the case of vehicles of category X or category Y where $m_d = 0$.** The test mass for vehicles with more than two axles shall be the same as for a two-axle vehicle. If the vehicle mass of a vehicle with more than two axles in an unladen condition, $m_{unladen}$, is greater than the test mass for the two-axle vehicle, then this vehicle shall be tested without extra loading. If the vehicle mass of a vehicle with two axles, $m_{unladen}$, is greater than the target mass, then this vehicle shall be tested without extra loading.
M_2 ($M \leq 3{,}500$ kg)	The test mass m_t of the vehicle shall be between $0.9m_{ro} \leq m_t \leq 1.2m_{ro}$
Complete M_2 ($M > 3{,}500$ kg), M_3	If the tests are carried out with a complete vehicle having a bodywork, m_{target} = 50 [kg/kW] x P_n [kW] is calculated either in compliance with conditions above (see N_2, N_3 category) or the test mass m_t of the vehicle shall be $0.9\ m_{ro} \leq m_t \leq 1.1\ m_{ro}$.
Incomplete M_2 ($M > 3{,}500$ kg), M_3	If the tests are carried with an incomplete vehicle not having a bodywork, $m_{target} = 50$ [kg/kW] x P_n [kW] is calculated either in compliance with conditions above (see N_2, N_3 category), or the test mass m_t of the vehicle shall be $0.9\ m_{ro} \leq m_t \leq 1.1\ m_{ro}$. where $m_{ro} = m_{chassisM2M3} + m_{xloadM2M3}$

“

Paragraph 3.1.2.1.5., amend to read:

“3.1.2.1.5. Acceleration test

The manufacturer shall define the position of the reference point in front of line AA' of fully depressing the accelerator. The accelerator shall be fully depressed (as rapidly as is practicable) when the reference point of the vehicle reaches the defined point. The accelerator shall be kept in this depressed condition until the rear of the vehicle reaches line BB'. The accelerator shall then be released as rapidly as possible. The measurement reading shall not end before the rear of the

vehicle is 20 m behind the BB' line. The point of fully depressing the accelerator shall be reported in Addendum to the Communication form (Annex 1, Appendix 1). The Technical Service shall have the possibility of pretesting.

If the vehicle length was set according to the provisions of 3.1.2.1.2. the accelerator shall be kept in the depressed condition until the reference point reaches BB' + 5 m for front engine vehicles, and BB' + 2.5 m for mid-engine vehicles.

In the case of articulated vehicles consisting of two non-separable units regarded as a single vehicle, the semi-trailer shall be disregarded in determining when line BB' is crossed.

Specific provisions for the testing of vehicles equipped with an ADS are provided in Annex 10."

Paragraph 3.1.2.1.6., amend to read:

"3.1.2.1.6. Constant speed test

The constant speed test shall be carried out with the same gear(s) specified for the acceleration test and a constant speed of 50 km/h with a tolerance of ±1 km/h between AA' and BB', or if applicable at the speed determined for the acceleration test according 3.1.2.1.4.1. (d) or 3.1.2.1.4.2. with a tolerance of ±1 km/h between AA' and BB'. During the constant speed test the **accelerator** ~~acceleration control~~ shall be positioned to maintain a constant speed between AA' and BB' as specified. If the gear is locked for the acceleration test, the same gear shall be locked for the constant speed test.

Specific provisions for the testing of vehicles equipped with an ADS are provided in Annex 10."

Paragraph 3.1.2.2.2., amend to read:

"3.1.2.2.2. Acceleration test

When the reference point of the vehicle reaches the line AA' the **accelerator** ~~acceleration control~~ shall be fully depressed (without operating the automatic downshift to a lower range than normally used in urban driving) and held fully engaged until the reference point reaches BB' + 5 m. The accelerator unit can then be released on request of the manufacturer.

In the case of articulated vehicles consisting of two non-separable units regarded as a single vehicle, the semi-trailer shall be disregarded in determining when line BB' is crossed.

Specific provisions for the testing of vehicles equipped with an ADS are provided in Annex 10."

Paragraph 3.2.5.3.2.2., amend to read:

"3.2.5.3.2.2. Test procedure

The engine speed shall be gradually increased from idle to the target engine speed, not exceeding the tolerance band of ±3 per cent of the target engine speed, and held constant. Then the throttle control shall be rapidly released and the engine speed shall be returned to idle. The sound pressure level shall be measured during a period of operation consisting of a maintaining constant engine speed of 1 second and throughout the entire deceleration period. The maximum sound level meter reading during this period of operation, mathematically rounded to the first decimal place, is taken as the test value.

Specific provisions for the testing of vehicles equipped with an ADS are provided in Annex 10."

Annex 3, Appendix 3, paragraph 3.1., amend to read:

"3.1. General conditions

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

When the front end of the test vehicle has reached the line AA' the vehicle shall be brought to coast-down by full release of the **accelerator** ~~acceleration pedal.~~ If applicable, the influence of the power train noise shall be minimized, e.g. the driver shall have put the gear selector to neutral position and switched off the engine. If abnormal noise (e.g. ventilator, self-ignition) is emitted by the test vehicle during the measurement, the test shall be disregarded.

As an alternative test method, the **accelerator** ~~acceleration pedal~~ may be positioned such to maintain a constant speed between line AA' with an accuracy of +/- 1 km/h. The procedure is recommended especially for electric vehicles when a release of the acceleration pedal would result is a forced deceleration (recuperation) with higher negative torque on the tyre.

Specific provisions for the testing of vehicles equipped with an ADS are provided in Annex 10."

Annex 6, paragraph 2., amend to read:

"2. Testing procedure

The test site and measuring instruments shall be those as described in Annex 3 **and Annex 10 for vehicles equipped with an ADS."**

Insert a new Annex 10, to read*:*

"Annex 10

Specific provisions for the testing of vehicles equipped with an ADS

1. General

This Annex adapts Annexes 3 and 7 to vehicles equipped with an ADS. It does not add nor remove any requirement.

2. Specifications

2.1. Preparations

When performing the tests of this Regulation, the conditions prescribed in chapter 6 "Specifications" shall be fulfilled. Additional preparation of the test track, the vehicle or other equipment may be needed for vehicles equipped with an ADS. This additional preparation shall be approved by the Type Approval Authority and its designated Technical Service and described in the test report.

2.2. For ~~Dual Control Vehicles~~ vehicles equipped with an ADS, other than those of category X or Y, it is sufficient to test either in manual operation or ADS operation, when the two following conditions are fulfilled:

- **the manufacturer declares that the vehicle is designed in such a way that there should be no difference between the manual and the automated modes with regards to this Regulation and**
- **the Type Approval Authority and its designated Technical Service agree to this single mode testing.**

2.2.1. If tested in manual operation, the sound shall be measured according to Annex 3 and, if applicable, Annex 7

2.2.2. If tested in ADS operation, the sound shall be measured according to Annex 3 and, if applicable, Annex 7, and this Annex.

3. Adaptation of the accelerator commands

Several paragraphs in Annexes 3 and 7 prescribe actions on the accelerator. For vehicles equipped with an ADS and tested in ADS operation, these should be interpreted as commands from the ADS to achieve specific vehicle behaviours. Table 1 below translates the actions on the accelerator into the required actions from the ADS.

Table 1: Translation of actions on the accelerator into required actions from the ADS.

Chapter	**Action for vehicles tested in manual operation**	**Equivalent action for vehicles tested in ADS operation**
Annex 3, paragraph 3.1.2.1. Annex 3, paragraph 3.1.2.2. Annex 7, paragraph 2.3.	Fully depressing the accelerator	Command from the ADS to apply the maximum acceleration
Annex 3, paragraph 3.1.2.1.5.	Keeping the accelerator in the depressed position	Command from the ADS to continue the maximum acceleration
Annex 3, Appendix, paragraph 3. and paragraph 3.1.	Releasing the accelerator	Command from the ADS to achieve coast down condition (no torque requested from the engine)
Annex 3, Appendix 3, paragraph 3.1.	Positioning the accelerator as such to maintain a constant speed	Command from the ADS to achieve a constant speed
Annex 3, paragraph 3.2.5.3.2.2.	Rapidly release the throttle control	Command from the ADS to the ICE to release the throttle to go to idling. (Only applies to Category X and Y vehicles with an ICE.)

“

II. Justification

1. The objective of TF AVRS is to amend the UN Regulations in the purview of GRBP, where necessary, to make it possible for Automated Driving Systems (ADS) to meet the requirements of these Regulations. TF AVRS will not add new requirements to the UN Regulations in their current scope.

2. The TF AVRS also suggests modifications to adapt the regulations to bidirectional vehicles (which are not necessarily equipped with an ADS).

3. The approach is to keep the text for the manually driven vehicles intact, and add provisions for vehicles equipped with an ADS where needed in the main body of the text. To add further guidance on how to test these vehicles, Annex 10 is introduced.

4. The definition of “mass in running order” (2.4.) is in line with the definition in R.E.3, revision 8 except that “mass of the crew member” remains exempted in this Regulation, just as it was exempted before the inclusion of Category X and Y vehicles.

5. The bidirectional vehicles can have two different reference points (2.11.3.).

6. The definition of “bidirectional vehicles” (2.31.) is added to describe/define a vehicle that can operate in two forward directions. Hence, it is assumed that the vehicle will meet all applicable requirements in both directions.

7. The definition of “Forward direction (of a vehicle)” (2.32.) is introduced as a consequence of introducing the definition of bidirectional vehicles.

8. The definition of “Accelerator” (2.33.) describes what an accelerator means for manually driven vehicles and vehicles equipped with an ADS. This is introduced to make the main body of the text, wherever “accelerator” is mentioned, usable for vehicles equipped with an ADS. Table 1 in Annex 10 provides further clarification what actions are expected from vehicles with an ADS when actions on the accelerator are concerned. In addition, an alignment throughout the Regulation to only use one term for “accelerator” has been made. For instance “accelerator pedal” and “accelerator control” are changed to “accelerator”.

~~9. The definition of the Dual Control Vehicle (2.34.3.) is added to describe/define a vehicle that can be driven both by a driver or by an ADS including at speeds exceeding 6 km/h. This type of ADS vehicle is defined to distinguish this group of vehicles from vehicles of category X and category Y. Dual Control Vehicles need in principle to perform the test in both modes. Still Annex 910 introduces an exception to this general principle to ensure that the burden of testing remains proportionate to the safety and environmental issues at stake.~~

10. A logical consequence when testing vehicle in Category N_2 and N_3 which are equipped with an ADS and tested without a driver, is that the mass of a driver must equal zero.

11. ~~[~~For vehicles in Category X and Y, the mass of a driver is not included in mass in running order m_{ro}. In the situation where a person is needed to be inside the vehicle to perform the test (handle the measurement equipment), there is a risk of exceeding the allowed test mass (1.2 m_{ro}), with the unnecessary consequence that a new vehicle variant is created, which causes additional administrative work for the manufacturer. To avoid this, the test mass of a driver (75 kg) should be deducted from the test mass (table 2 of Annex 3). Consequently, for vehicles ~~in Category Dual Control~~ equipped with an ADS, other than those of Category X and Y, where the mass of the driver is included in the mass of running order, the mass of a driver (75 kg) should be added to the test weight in case the test is perform without any occupants in the vehicle.~~]~~

12. To notify the user of this Regulation that testing of ADS vehicles needs special consideration, several paragraphs in Annex 3 are amended with the text “Specific provisions for the testing of vehicles equipped with an ADS are provided in Annex 10”