United Nations ECE/TRANS/WP.29/GRBP/2025/21

Economic and Social Council

Distr.: General
19 June 2025

Original: English

Economic Commission for Europe

Inland Transport Committee

World Forum for Harmonization of Vehicle Regulations

Working Party on Noise and Tyres

Eighty-second session
Geneva, 3–5 September 2025
Item 6 of the provisional agenda
Regulatory Fitness for Automated Driving Systems

Proposal for Supplement 3 to the 01 series of amendments to UN Regulation No. 141 (Tyre Pressure Monitoring Systems)

Submitted by the experts from the Task Force on Automated Vehicles Regulation Screening*

The text reproduced below was prepared by the experts from the Task Force on Automated Vehicles Regulation Screening (TF AVRS). The modifications are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2025 as outlined in proposed programme budget for 2025 (A/79/6 (Sect. 20), table 20.6), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

I. Proposal

Table of contents, add a new Annex 9:

"9 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)"

Add new paragraphs 2.16. - 2.23. to read:

"2.16. *"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.

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

2.18. *"Category X vehicles"* are vehicles of categories M, N, L and T meeting all of the following conditions[1]:

(a) They are equipped with an ADS

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

(c) They are designed to carry occupants

2.19. *"Category Y vehicles"* are vehicles of categories N, L and T meeting all of the following conditions[1]:

(a) They are equipped with an ADS

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

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

2.20 *"Dual control vehicles"* are vehicles equipped with an ADS where the DDT can be performed by either the ADS or a driver, including at speeds exceeding 6 km/h.

2.21. "Logical signal" means a signal used in a control system to indicate the state of a variable.

[2.22. *"Operational status (of the vehicle)"* means the status of the vehicle where the functions of the vehicle are powered and active for driving the vehicle.

2.23. *"Non-operational status (of the vehicle)"* means the status of the vehicle where many of the vehicle functions are deactivated, and power is turned off. It disables the vehicle to be driven.]"

Paragraph 5.1.1.1., amend to read:

"5.1.1.1. A Tyre Pressure Refill System (TPRS) or a Central Tyre Inflation System (CTIS) shall be deemed to be equivalent for Type Approval to a Tyre Pressure Monitoring System (TPMS) when it fulfils the requirements of paragraph 5.1.2., 5.1.3. and 5.4. to 5.6. and the test criteria of Annex 4 **(and the special provisions of Annex 9 for vehicles equipped with an ADS)** to this Regulation. In this case TPMS is not required to be installed."

Paragraph 5.1.1.2., amend to read:

"5.1.1.2. If more than one system as defined in paragraphs 2.8., 2.14. or 2.15. has been installed, the system(s) which communicate(s) warning messages ~~to the driver~~ shall be approved according to the requirements of this Regulation.

If more than one system is installed on the vehicle it has to be ensured that no contradictory information is **indicated** ~~displayed to the driver~~, e.g., by prioritization**.**"

Paragraph 5.1.4., amend to read:

"5.1.4. The vehicle shall fulfil the tests (puncture, diffusion and malfunction) as specified in Annex 3 **(and the special provisions of Annex 9 for vehicles equipped with an ADS)** to this Regulation."

Paragraph 5.2.1., amend to read:

"5.2.1. For vehicles of category M1 up to a maximum mass of 3,500 kg and N1, fitted with tyres of the tyre class C1, the TPMS shall ~~illuminate~~ **indicate** the warning signal described in paragraph 5.5. within no more than ~~ten~~ **10** minutes of cumulative driving time after **the inflation pressure** ~~in-service operating pressure~~ in one of the vehicle's tyres has been reduced by ~~twenty~~ **20** per cent **compared to the in-service operating pressure (P_{warm})** or has reached the minimum pressure of 150 kPa, whichever is higher."

Paragraph 5.2.2., amend to read:

"5.2.2. For vehicles of category M_1 up to a maximum mass of 3,500 kg and N_1, fitted with tyres of the tyre class C2, the TPMS shall ~~illuminate~~ **indicate** the warning signal described in paragraph 5.5. within ~~ten~~ **10** minutes of cumulative driving time after **the inflation pressure** ~~in-service operating pressure~~ in one of the vehicle's tyres has been reduced by ~~twenty~~ **20** per cent **compared to the in-service operating pressure (P_{warm})** or has reached the minimum pressure of 220 kPa, whichever is higher."

Paragraph 5.2.3., amend to read:

"5.2.3. For vehicles of category M_2, M_3, N_2 and N_3, fitted with tyres of the tyre class C2 or C3, the TPMS shall ~~illuminate~~ **indicate** the warning signal described in paragraph 5.5. within no more than ~~ten~~ **10** minutes of cumulative driving time after **the inflation pressure** ~~in-service operating pressure~~ in one of the vehicle's rolling tyres in contact with the ground has been reduced by ~~twenty~~ **20** per cent **compared to the in-service operating pressure (P_{warm})**."

Paragraph 5.2.4., amend to read:

"5.2.4. For vehicles of category O_3 and O_4, fitted with tyres of the tyre class C2 or C3, the TPMS shall ~~illuminate~~ **indicate** the warning signal described in paragraph 5.5. within no more than ten minutes of cumulative driving time after **the inflation pressure** ~~in-service operating pressure~~ in one of the vehicle's rolling tyres in contact with the ground has been reduced by ~~twenty~~ **20** per cent **compared to the in-service operating pressure (P_{warm})**."

Paragraph 5.2.5., amend to read:

"5.2.5. The low tyre pressure warning signal described in paragraph 5.5. shall be ~~illuminated~~ **indicated** whenever the towed vehicle TPMS provides low tyre pressure warning information via the communication interface described in paragraph 5.6."

Paragraph 5.3.1., amend to read:

"5.3.1. For vehicles of category M_1 up to a maximum mass of 3,500 kg and N_1, fitted with tyres of the tyre class C1, the TPMS shall ~~illuminate~~ **indicate** the warning signal described in paragraph 5.5. within no more than ~~sixty~~**60** minutes of cumulative driving time after **the inflation pressure** ~~in-service operating~~

~~pressure~~ in any of the vehicle's tyres has been reduced by ~~twenty~~**20** per cent **compared to the in-service operating pressure (P_{warm})** or has reached the minimum pressure of 150 kPa, whichever is higher."

Paragraph 5.3.2., amend to read:

"5.3.2. For vehicles of category M_1 up to a maximum mass of 3,500 kg and N_1, fitted with tyres of the tyre class C2, the TPMS shall ~~illuminate~~ **indicate** the warning signal described in paragraph 5.5. within no more than 60 minutes of cumulative driving time after **the inflation pressure** ~~in-service operating pressure~~ in any of the vehicle's tyres has been reduced by ~~twenty~~**20** per cent **compared to the in-service operating pressure (P_{warm})** or has reached the minimum pressure of 220 kPa, whichever is higher."

Paragraph 5.3.3., amend to read:

"5.3.3. For vehicles of category M_2, M_3, N_2 and N_3, fitted with tyres of the tyre class C2 or C3, the TPMS shall ~~illuminate~~ **indicate** the warning signal within no more than 60 minutes of cumulative driving time after **the inflation pressure** ~~in-service operating pressure~~ in one of the vehicle's rolling tyres in contact with the ground has been reduced by ~~twenty~~**20** per cent **compared to the in-service operating pressure (P_{warm})**."

Paragraph 5.3.4., amend to read:

"5.3.4. For vehicles of category O_3 and O_4, fitted with tyres of the tyre class C2 or C3, the TPMS shall transmit ~~an~~ **the** appropriate warning signal described in **paragraph** 5.5. within no~~t~~ more than 60 minutes of cumulative driving time after **the inflation pressure** ~~in-service operating pressure~~ in one of the vehicle's rolling tyres in contact with the ground has been reduced by ~~twenty~~**20** per cent **compared to the in-service operating pressure (P_{warm})**."

Paragraph 5.3.5., amend to read:

"5.3.5. The low tyre pressure warning signal described in paragraph 5.5. shall be ~~illuminated~~ **indicated** whenever the towed vehicle TPMS provides low tyre pressure warning information via the communication interface described in paragraph 5.6."

Paragraph 5.4.1., amend to read:

"5.4.1. The TPMS/ TPRS/ CTIS shall ~~illuminate~~ **indicate** the warning signal described in paragraph 5.5. no more than 10 minutes after the occurrence of a malfunction that affects the generation or transmission of control or response signals in the vehicle's TPMS/ TPRS/ CTIS."

Paragraph 5.4.2., amend to read:

"5.4.2. The malfunction indication warning signal described in paragraph 5.5. shall be ~~illuminated~~ **indicated** whenever the towed vehicle TPMS/ TPRS/ CTIS provides a malfunction indication via the communication interface described in paragraph 5.6."

Paragraph 5.4.3., amend to read:

"5.4.3. The malfunction indication warning signal described in paragraph 5.5. shall be ~~illuminated~~ **indicated** whenever no valid TPMS/ TPRS / CTIS information is available from a connected towed vehicle, that is required to have TPMS/ TPRS/ CTIS, via any communication interface described in paragraph 5.6."

Paragraph 5.5.1., amend to read:

"5.5.1. **In the case of a vehicle designed to be driven manually only,** the warning indication shall be by means of an optical warning signal conforming to UN Regulation No. 121."

In the case of a vehicle of category X or category Y, the warning indication shall be by means of a logical signal.

In the case of a dual control vehicle, the warning indication shall be by means of both an optical and a logical signal."

Paragraph 5.5.2., amend to read:

"5.5.2. In the case of a vehicle of category N_2 or N_3 towing at least one vehicle of category O_3 or O_4, the ~~optical~~ warning signal referred to in 5.5.1. must indicate whether any warning relates to the individual towing or to the towed vehicle(s)."

Paragraph 5.5.3., amend to read:

"5.5.3. The **optical** warning signal **referred to in paragraph 5.5.1** shall be activated when the ignition (start) switch is in the "on" (run) position (bulb check). This requirement does not apply to tell-tales shown in a common space."

Paragraph 5.5.4., amend to read:

"5.5.4. The **optical** warning signal **referred to in paragraph 5.5.1** must be visible even by daylight; the satisfactory condition of the signal must be easily verifiable by the driver from the driver's seat."

Paragraph 5.5.6., amend to read:

"5.5.6. **The optical warning signal described in paragraph 5.5.1 may be used** to indicate both under-inflation and a malfunction of the TPMS. In that case, the following shall apply: **when** ~~with~~ the ignition (start) **is switched** in the "on" (run) position the warning signal shall flash to indicate a malfunction. After a short period of time the warning signal shall remain continuously illuminated as long as the malfunction exists~~,~~ and the ignition (start) switch is in the "on" (run) position. The flashing and illumination sequence shall be repeated each time the ignition (start) **is switched** in the "on" (run) position until the malfunction has been corrected."

Paragraph 5.5.7., amend to read:

"5.5.7. The tell-tale of the **optical** warning described in paragraph 5.5.1. may be used in a flashing mode in order to provide information about the reset status of the tyre pressure monitoring system in accordance with the owner's manual of the vehicle."

Paragraph 6.1.3., amend to read:

"6.1.3. Additional information about the significance of the low tyre pressure warning ~~tell-tale illuminating~~ and a description of the corrective action to be undertaken if this happens, including the reset procedure if the actual system includes such a feature.

For vehicles equipped with an ADS, the expected corrective action shall be considered in the design of the ADS, and the manufacturer shall describe in the owner's manual how this is handled."

Annex 1,

Add a new item 2.1. to read:

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

Item 10, amend to read:

10. **Mode(s) tested, additional preparation(s) and result** of the tests:

Add new items 10.1. and 10.2. to read:

"10.1. Mode(s) tested: manual operation /ADS operation/both

10.2. Additional preparation of the test and vehicle for tests with ADS operation (if any)"

Item 10.1. and 10.2., renumber as 10.3. and 10.4., respectively.

Annex 3,

Paragraph 1.1., amend to read:

"1.1. General

In the case that both TPRS and TPMS are fitted to a vehicle, when TPMS is tested according to the tests outlined in this Annex, then TPRS shall be deactivated before commencing tests of TPMS. TPRS shall remain deactivated during tests of TPMS and can be reactivated after TPMS tests have been completed.

In the case that both CTIS and TPMS are fitted to a vehicle, when TPMS is tested according to the tests outlined in this Annex, then CTIS shall be deactivated before commencing tests of TPMS. CTIS shall remain deactivated during tests of TPMS and can be reactivated after TPMS tests have been completed. **Refer to Annex 9 for the special provisions for the testing of vehicles equipped with an ADS."**

Paragraph 1.5.1., amend to read:

"1.5.1. Test Weight.

The vehicle may be tested at any condition of load, the distribution of the mass among the axles being that stated by the vehicle manufacturer without exceeding any of the maximum permissible mass for each axle.

However, in the case where there is no possibility to set or reset the system, the vehicle shall be unladen, but for systems which will automatically raise the lift axle when no load is detected the vehicle shall be laden enough to avoid lifting of those axles. For vehicles of category M_1 up to a maximum mass of 3,500 kg, M_2, M_3, N_1, N_2, and N_3 there may be, in addition to the driver, a second person ~~on the front seat (if fitted)~~ who is responsible for noting the results of the tests. The load condition shall not be modified during the test."

Paragraph 1.5.2., amend to read:

"1.5.2. Vehicle speed

The TPMS shall be calibrated and tested for vehicles of category M_1 up to a maximum mass of 3,500 kg and N_1:

(a) In a speed range from ~~forty~~ **40** km/h **to**~~and~~ 120 km/h (or the vehicle's maximum design speed if it is less than 120 km/h) for the puncture test to verify the requirements of paragraph 5.2. to this Regulation; and

(b) In a speed range from ~~forty~~ **40** km/h **to**~~and~~ 100 km/h (or the vehicle's maximum design speed if it is less than 100 km/h) for the diffusion test to verify the requirements of paragraph 5.3 to this Regulation and for the malfunction test to verify the requirements of paragraph 5.4. to this Regulation.

The TPMS shall be calibrated and tested for vehicles of categories M_2, M_3, N_2, N_3, O_3 and O_4:

(c) In a speed range from 30 km/h **to** ~~and~~ 90 km/h (or the vehicle's maximum design speed if it is less than 90 km/h) for the puncture test to verify the requirements of paragraph 5.2. to this Regulation; and

(d) In a speed range from 30 km/h **to** ~~and~~ 90 km/h (or the vehicle's maximum design speed if it is less than 90 km/h) for the diffusion test to verify the requirements of paragraph 5.3 to this Regulation and for the malfunction test to verify the requirements of paragraph 5.4. to this Regulation.

The whole speed range shall be covered during the test.

For vehicles equipped with cruise control, the cruise control shall not be engaged during testing."

Paragraph 2.2., amend to read:

"2.2. With the vehicle stationary and the ignition locking system in the "Lock" or "Off" position, activate the ignition locking system to the "On" or "Run" position. The **Electronic Control Unit (**ECU**)** controlling the ~~tell-tale~~ **optical warning signal referred to in paragraph 5.5.1** shall perform a check of lamp function for the low tyre pressure tell-tale as specified in paragraph 5.5.~~2~~**3** of this Regulation. This last requirement does not apply to tell-tales shown in a common space."

Paragraph 2.6.1.1., amend to read:

"2.6.1.1. Drive the vehicle along any portion of the test course (not necessarily continuously). The sum of the total cumulative drive time shall be the lesser of 10 minutes or the time at which ~~the low tyre pressure tell-tale illuminates.~~ **the low tyre pressure warning signal is indicated.**

If the low tyre pressure warning signal is not indicated within 10 minutes of driving, discontinue the test."

Paragraph 2.6.2.1., amend to read:

"2.6.2.1. Drive the vehicle along any portion of the test course. After no less than twenty (20) minutes and no more than forty (40) minutes bring the vehicle to a complete standstill with the engine switched off and ~~if the vehicle is equipped with an ignition key, it should be removed or~~ **the vehicle in non-operational status** for no less than one (1) minute and no more than three (3) minutes. Resume the test. The sum of the total cumulative drive time shall be the lesser of sixty (60) minutes of cumulative driving under the conditions set out in paragraph 1.5.2. ~~above~~ **of this annex** or the time at which ~~the low tyre pressure tell-tale illuminates.~~ **the low tyre pressure warning signal is indicated.**

If the low tyre pressure warning signal is not indicated within 60 minutes of driving, discontinue the test."

Paragraph 2.6.3., delete.

Paragraph 2.7., amend to read:

"2.7. Low **tyre** pressure **indication"**

Paragraph 2.7.1., amend to read:

"2.7.1. For vehicles of category M_1 up to a maximum mass of 3,500 kg and N_1

If **a low tyre pressure warning signal is indicated, as referred to in paragraph 5.5.1. of this regulation** during the procedure in paragraph 2.6. **of this Annex**, deactivate the ignition locking system to the "Off" or "Lock" position **or put the vehicle in a non-operational status**. After a ~~five~~ **5** minutes period, reactivate the vehicle's ignition locking system to the "On" ("Run", **operational**) position. **The low tyre pressure warning signal shall be indicated immediately and remain in that state** as long as the ignition locking system is in the "On" ("Run"**, operational**) position."

Paragraph 2.7.2., amend to read:

"2.7.2. For vehicles of category M_2, M_3, N_2, N_3, O_3 and O_4

If **a low tyre pressure warning signal is indicated, as referred to in paragraph 5.5.1 of this regulation** during the procedure in paragraph 2.6. **of this Annex**, deactivate the ignition locking system to the "Off" or "Lock" position **or put the vehicle in a non-operational status**. After a ~~five~~ **5** minutes period, reactivate the vehicle's ignition locking system to the "On" ("Run"**, operational**) position. **The low tyre pressure warning signal shall be**

indicated within ten (10) minutes and remain in that state as long as the ignition locking system is in the "On" ("Run"**, operational**) position."

Paragraph 2.8., amend to read:

"2.8. Inflate all ~~of~~ the vehicle's tyres to the vehicle manufacturer's recommended cold inflation pressure. Reset the system in accordance with the instructions of the vehicle manufacturer. Determine whether **the low pressure warning signal is no longer indicated.** If necessary, drive the vehicle until **the low pressure signal is no longer indicated**. **If the low tyre pressure warning signal remains indicated after 20 minutes for M1 and N1 vehicles and 120 minutes for other vehicles**, discontinue the test."

Paragraph 3.3., amend to read:

"3.3. The sum of the total cumulative drive time under paragraph 3.2. of Annex 3 shall be the lesser of ~~ten~~ **10** minutes or the time at which the TPMS malfunction **signal is indicated."**

Paragraph 3.4., amend to read:

"3.4. If the TPMS malfunction **signal is not indicated** in accordance with paragraph 5.4. to this Regulation, as required, discontinue the test."

Paragraph 3.5., amend to read:

"3.5. For vehicles of category M_1 up to a maximum mass of 3,500 kg and N_1

If the TPMS **indicates a malfunction signal** during the procedure in paragraphs 3.1. to 3.3**. of this Annex** ~~above~~, deactivate the ignition locking system to the "Off" or "Lock" position **or put the vehicle in a non-operational status**. After five minutes, reactivate the vehicle's ignition locking system to the "On" ("Run"**, operational**) position. The TPMS malfunction **signal** shall again signal a malfunction and remain **in this state** as long as the ignition locking system is in the "On" ("Run"**, operational**) position."

Paragraph 3.6., amend to read:

"3.6. For vehicles of category M_2, M_3, N_2, N_3, O_3 and O_4

If the TPMS ~~malfunction indicator is illuminated or illuminates~~ **indicates a malfunction signal** during the procedure in paragraphs 3.1. to 3.3. **of this Annex** ~~above~~, deactivate the ignition locking system to the "Off" or "Lock" position **or put the vehicle in a non-operational status**. After ~~five~~ **5** minutes, reactivate the vehicle's ignition locking system to the "On" ("Run"**, operational**) position. The TPMS malfunction ~~indicator~~ **signal** shall again signal a malfunction within ten minutes and remain ~~illuminated~~ **in this state** as long as the ignition locking system is in the "On" ("Run"**, operational**) position."

Paragraph 3.7., amend to read:

"3.7. Restore the TPMS to normal operation. If necessary, drive the vehicle until the warning signal ~~has extinguished~~ **is no longer indicated**. **If the** ~~warning lamp has not extinguished~~ **malfunction signal remains indicated after 20 minutes for M1 and N1 vehicles and 120 minutes for other vehicles**, discontinue the test."

Annex 4,

Paragraph 1.3.1., amend to read:

"1.3.1. Test weight

The vehicle may be tested at any condition of load, the distribution of the mass among the axles being that stated by the vehicle manufacturer without exceeding any of the maximum permissible mass for each axle.

However, in the case where there is no possibility to set or reset the system, the vehicle shall be unladen. For vehicles of category M_1 up to a maximum mass of 3,500 kg, M_2, M_3, N_1, N_2, and N_3 there may be, in addition to the driver, a second person ~~on the front seat (if fitted)~~ to help performing the test. **Vehicles of category X or category Y have no driver and may be tested with no occupants on board.**

The load condition shall not be modified during the test."

Paragraph 2.3., amend to read:

"2.3. With the vehicle stationary and the ignition locking system in the "Lock" or "Off" position, activate the ignition locking system to the "On" or "Run" position. The TPRS / CTIS shall perform a check of lamp function for the low tyre pressure tell-tale as specified in paragraph 5.5.**3**~~2~~. of this Regulation. This last requirement does not apply to tell-tales shown in a common space."

Paragraph 2.5., amend to read:

"2.5. Check the systems refill functionality

Check the systems refill functionality for incident-related pressure loss and for detection of a tyre pressure level significantly below the recommended pressure for optimum performance including fuel consumption and safety.

Inflate the vehicle's tyres to the vehicle manufacturer's recommended cold inflation pressure (P_{rec}).

Deflate the tyre pressure of one tyre by **50 kPa or** 20% ~~but not more than 50 kPa~~ below the manufacturer's recommended cold inflation pressure (Prec)**, whichever is reached first**. During the deflation the tyre shall not be connected to the pneumatic circuit."

Paragraph 2.5.1., amend to read:

"2.5.1. Check refilling according to Figure 1

Check that within 2 minutes, when the system is operational, the TPRS/ CTIS starts refilling and at least after 2 minutes the low tyre pressure ~~tell-tale~~ **warning signal indicates a low tyre pressure,** as described in paragraph 5.5. of the Regulation~~, is "On"~~**.**

Refill process shall be completed within 8 min**utes** after the refill process has started and the low tyre pressure ~~tell-tale~~ **warning signal**, as described in paragraph 5.5. of the Regulation**, shall not indicate the low tyre pressure warning anymore** ~~is "Off"~~ as soon as the refilling process is completed.

After the refilling process has been completed, check that the tyre pressure is in a range of +/- 5% of manufacturers recommended cold inflation pressure P_{rec}."

Paragraph 2.5.2., amend to read:

"2.5.2. Check refilling according to Figure 2 (Annex 4)

Check that within 2 minutes when the system is operational the TPRS/ CTIS starts refilling and at least after 2 minutes the low tyre pressure ~~tell-tale~~ **warning signal**, as described in paragraph 5.5. of the regulation, ~~is "On"~~ **indicates a low tyre pressure warning.**

Refill process shall not be completed within 8 min**utes** after the refill process has started and the low tyre pressure ~~tell-tale~~ **warning signal**, as described in paragraph 5.5. of the regulation, ~~is "ON"~~ **shall still indicate a low tyre pressure warning** after at least 2 minutes of refilling time.

The deflation rate during the test must be higher than the refilling rate."

Paragraph 2.6.2., amend to read:

"2.6.2. Restore the TPRS/ CTIS to normal operation. If the warning ~~lamp has not extinguished~~ **signal remains indicated**, discontinue the test."

Annex 5 A,

Paragraph 2.2., amend to read:

"2.2. When the towed vehicle transmits the following messages, the towing vehicle shall provide a low tyre pressure warning **signal** ~~to the driver~~:

Function / Parameter	*ISO 11992-2:2014 reference*	***TPMS/TPRS/CTIS*** *~~Driver~~ warning required*
...		

,,

Paragraph 2.3., amend to read:

"2.3. When the towed vehicle transmits the following messages, the towing vehicle shall provide a TPMS/ TPRS/ CTIS malfunction indication ~~to the driver~~:

Function / Parameter	*ISO 11992-2:2014 reference*	***TPMS/TPRS/CTIS*** *~~Driver~~ warning required*
...		

,,

Paragraph 2.3.1., amend to read:

"2.3.1. The towed vehicle shall transmit a Tyre Pressure Status value of "error indicator" within 10 minutes of cumulative driving (in accordance with paragraph 5.4.1. of this Regulation) for any scenario where a valid Tyre Pressure Status (i.e. tyre pressure sufficient or insufficient) cannot be transmitted.

Note that before towed vehicles needed to comply with this Regulation, some of them transmitted Tyre Pressure Status "not available" for some of these scenarios, including when the towed vehicle had no function to perform tyre pressure monitoring. Towed vehicles that are required to comply with this Regulation going forward shall instead transmit "error indicator" for these scenarios.

Note that the towing vehicle would not be required to ~~display~~ **indicate** a towed vehicle TPMS/ TPRS/ CTIS malfunction **signal** ~~indication~~ in the case that valid towed vehicle TPMS information is available on an alternative communication interface."

Paragraph 2.4., amend to read:

"2.4. When a permanent failure is detected in the communication line, the towing vehicle shall ~~illuminate~~ **indicate** the towed vehicle TPMS/ TPRS/ CTIS malfunction ~~indication~~ signal.

Note that the towing vehicle would not be required to **indicate** ~~display~~ a towed vehicle TPMS/ TPRS/ CTIS malfunction **signal** ~~indication~~ in the case that valid towed vehicle TPMS/ TPRS/ CTIS information is available on an alternative communication interface."

Paragraph 2.5., amend to read:

"2.5. When a valid Tyre Pressure Status is temporarily not available (i.e. unavailable for less than 10 minutes of cumulative drive time), the towed vehicle shall transmit the following messages:

Function / Parameter	*ISO 11992-2:2014 reference*	***TPMS/TPRS/CTIS*** *~~Driver~~ warning required*
...		

"

Annex 6,

Paragraph 2.2.1.1.1., amend to read:

2.2.1.1.1. Simulate a towed vehicle low tyre pressure warning and check that the low tyre pressure warning signal specified in paragraph 5.5 of this regulation is ~~displayed~~ i**ndicated**.

The parameters defined in EBS 23 bytes 1 and 2 of ISO 11992-2:2014 shall be transmitted as follows:

…"

Paragraph 2.2.1.1.2., amend to read:

"2.2.1.1.2. Simulate a towed vehicle low tyre pressure warning (without known tyre/wheel ID) and check that the low tyre pressure warning signal specified in paragraphs 5.5 of this Regulation is **indicated** ~~displayed~~.

The parameters defined in EBS 23 bytes 1 and 2 of ISO 11992-2:2014 shall be transmitted as follows:

…"

Paragraph 2.2.1.2.1., amend to read:

"2.2.1.2.1. Simulate a towed vehicle TPMS/ TPRS/ CTIS malfunction, signalled by the towed vehicle TPMS/ TPRS/ CTIS, and check that the towed vehicle TPMS/ TPRS/ CTIS malfunction indication warning signal specified in paragraph 5.5.6. of this Regulation is **indicated** ~~displayed~~.

The parameters defined in EBS 23 bytes 1 and 2 of ISO 11992-2:2014 shall be transmitted as follows:

…"

Paragraph 2.2.1.2.2., amend to read:

"2.2.1.2.2. Simulate a towed vehicle TPMS/ TPRS/ CTIS malfunction (without known tyre/wheel ID) and check that the towed vehicle TPMS malfunction indication warning signal specified in paragraph 5.5.6. of this Regulation is **indicated** ~~displayed~~.

The parameters defined in EBS 23 bytes 1 and 2 of ISO 11992-2:2014 shall be transmitted as follows:

…"

Paragraph 2.2.1.2.3., amend to read:

"2.2.1.2.3. Simulate a permanent failure in the communication line and check that the towed vehicle TPMS/ TPRS/ CTIS malfunction ~~indication~~ warning signal specified in paragraph 5.5.6. of this Regulation is **indicated** ~~displayed~~."

Paragraph 2.2.1.2.4., amend to read:

"2.2.1.2.4. Note that the towed vehicle TPMS/ TPRS/ CTIS malfunction **warning signal** ~~indication~~ would not be **indicated** ~~displayed~~ in the case that valid TPMS/ TPRS/ CTIS information is available on an alternative interface."

Insert a new Annex 9 to read*:*

"Annex 9

Special provisions for the testing of vehicles equipped with an ADS

1. General

This Annex explains how to adapt UN-R141 – Tyre Pressure Monitoring Systems - 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 the Annexes 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. Dual control vehicles shall fulfil the requirements both in manual operation (illuminated tell-tale) and in ADS operation (logical signal) according to the applicable parts of this regulation.

2.2.1. Dual Control Vehicles should therefore be tested in both manual operation and ADS operation.

2.2.2. By exception to paragraph 2.2.1. of this Annex, a dual control vehicle can be tested in manual operation only when the three following conditions are fulfilled:

the Dual Control Vehicle is operated by the ADS only in a limited number of very specific cases (example: valet parking [with low speed and short duration and assessed as low risk by the manufacturer]);

the manufacturer declares that the logical signal is indicated to the ADS even in those limited very specific cases;

the Type Approval Authority and its designated Technical Service agree to this manual operation testing."

II. Justification

1. In general, all amendments are made to facilitate the approval of a vehicle equipped with an ADS according to UN Regulation No. 141.

2. In addition to that, TF-AVRS proposes several amendments to clarify the original intention of the Regulation.

3. The definition of the Dual Control Vehicle 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 9 introduces an exception to this general principle to ensure that the burden of testing remains proportionate to the safety and environmental issues at stake.

4. The definitions of “logical signal”, “category X vehicles”, “category Y vehicles, ADS and DDT are also added.

5. It was considered useful to add definitions for “vehicle in operational status” and “vehicle in non-operational status” that appear several times. This status is added in the test method description to explain that the ADS should be turned OFF an ON in analogy to switching the ignition key ON and OFF.

6. A number of requirements in the regulation refer to the illumination of the tell-tale on the dashboard. “Indicate” is the word that replaces illuminate (aligned with the United States Federal Motor Vehicle Safety Standard FMVSS 138).

7. It was noticed that several paragraphs were ambiguous in the description of the 20 % (or others) reduction of inflation pressure, compared to the in-service operation pressure. This text is clarified in this amendment (see paragraphs 5.2. and 5.3.).

8. Several amendments refer to a new Annex 9 that gives additional guidance and requirements on how a vehicle equipped with an ADS shall be tested.

9. Paragraph 5.5.1. describes the different signals that are used in the communication of the TPMS status. These are the tell-tale (according to UN Regulation No. 121) and the logical signal for ADS. This paragraph also requires that both signals are available when a vehicle is designed to be driven by a driver or an ADS. These types of vehicles are referred to as dual control vehicles.

10. Paragraph 5.5.3. describes the requirements for a bulb check. This requirement only relates to the tell-tale and therefore “optical” (warning signal) is added to the requirement.

11. Paragraph 5.5.4. and 5.5.7. are also requirements that are only applicable to the tell-tale and dashboard.

12. In Annex 1 ADS is included in the type definition. Information on the way the test is performed is also added.

13. Annex 3 “Test requirements for TPMS” contains several amendments in line with the earlier justifications. The test weight accommodates the possibility to test without a person in the vehicle in case of vehicles equipped with an ADS, which is described in the Annex 9. A reference to Annex 9 is added to the introduction of Annex 3.

14. Annex 3, paragraph 1.5.2.: editorial change.

15. Annex 3, paragraph 2.2.: The requirement is a bulb check for the tell-tale only and it should refer to paragraph 5.5.3. This is corrected.

16. Annex 3, paragraphs 2.6. was meant to be read successively and to be finalized in 2.6.3 with “discontinue the test” in case of failing the requirement. This is additionally clarified in the text.

17. Annex 3, paragraphs 2.7., and 2.8., contain several rewordings in line with justification paragraph 3 above.

18. Annex 3, paragraphs 3.xx contain several rewordings related to the *indication* of the malfunction signal and the state of this signal in line with the Justification 3.

19. Annex 3, paragraph 3.7. contains a clarification on the time to be driven until the test will be discontinued. This time relates to the reset time.

20. Annex 4, paragraph 1.3.1. allows the possibility to test without a driver.

21. Annex 4, paragraph 2.3.: the reference to paragraph 5.5.2. was wrong. It is corrected to 5.5.3.

22. Annex 4, paragraphs 2.5.1., 2.5.2. and 2.6.2.: several rewordings are made related to the *indication* of the low-pressure signal and the state of this signal in line with justification paragraph 3.

23. Annex 5, several proposals to replace *"driver"* by a more generic wording to incorporate the driver and ADS. Further proposals are in line with justification paragraph 3.