

**Economic and Social Council**Distr.: General  
2 July 2021

Original: English

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**Economic Commission for Europe**

Inland Transport Committee

**World Forum for Harmonization of Vehicle Regulations****Working Party on Noise and Tyres****Seventy-fourth session**

Geneva, 15–17 September 2021

Item 7 (f) of the provisional agenda

**Tyres: UN Regulation No. 141 (Tyre pressure monitoring system)****Proposal for Supplement 2 to 01 series of amendments to UN Regulation No. 141****Submitted by the Task Force Tyre Pressure Monitoring System and Tyre Installation\***

The text below has been prepared by the experts of the Task Force on Tyre Pressure Monitoring System and Tyre Installation (TF TPMSTI) in order to introduce in UN Regulation No. 141 an alternative procedure for type approval of trailers (vehicles of categories O<sub>3</sub> and O<sub>4</sub>) regarding their Tyre Pressure Monitoring System (TPMS), Tyre Pressure Refilling System (TPRS) and Central Tyre Inflation System (CTIS). The modifications to the existing text of the UN Regulation are marked in bold for new or strikethrough for deleted characters.

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\* In accordance with the programme of work of the Inland Transport Committee for 2021 as outlined in proposed programme budget for 2021 (A/75/6 (Sect.20), para 20.51), 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

*Insert a new Annex 7 and a new Annex 8 to read:*

### "Annex 7

#### **Performance testing of Tyre Pressure Monitoring System / Tyre Pressure Refilling System / Central Tyre Inflation System**

1. **General**
  - 1.1. This Annex defines the procedure to determine the performance of a Tyre Pressure Monitoring System (TPMS), Tyre Pressure Refilling System (TPRS) or Central Tyre Inflation System (CTIS) intend to be fitted to vehicles of category O<sub>3</sub> and O<sub>4</sub>.
  - 1.2. Tests carried out on trailers of category O<sub>4</sub> will be deemed to cover the requirements for trailers of O<sub>3</sub> category.
2. **Information document**
  - 2.1. The manufacturer of the TPMS / TPRS / CTIS shall supply to the Technical Service an information document of the system(s) requiring performance verification. This document shall contain at least the information defined in Appendix 1 and if applicable Appendix 2 to this Annex.
  - 2.2. If applicable the manufacturer(s) of an ISO11992-2 Towed Vehicle ECU (Gateway ECU) shall supply to the manufacturer of the TPMS / TPRS / CTIS an information document of the system(s) requiring performance verification to be submitted to the Technical Service by the manufacturer of the TPMS / TPRS / CTIS. This document shall contain at least the information defined in Appendix 2 to this Annex.
3. **Definition of test vehicles**
  - 3.1. Based on the information supplied in the information document, in particular the trailer applications defined in paragraph 2. of Appendix 1, the Technical Service shall carry out tests on representative trailer(s) having up to max. number of axles defined in the information document and equipped with the respective to TPMS / TPRS / CTIS configuration. Additionally, when selecting trailer(s) for evaluation consideration shall also be given to the parameters defined in the following paragraphs.
    - 3.1.1. Number of axles.
    - 3.1.2. Number and type of rim and tyre sizes per axle
    - 3.1.3. Number and position of Lift Axles
    - 3.1.4. Distance between wheels and receiver/antenna
    - 3.1.5. Supported range of reference/nominal pressure
  - 3.2. For the purpose of the approval, semi-trailers, full trailers, dolly trailers and center axle trailers shall be deemed to be of the same vehicle type.
4. **Test schedule for reference trailer**
  - 4.1. The following tests shall be conducted by the Technical Service on the vehicle(s) defined in paragraph 3. of this Annex for each TPMS / TPRS / CTIS configuration taking into consideration the application list defined in paragraph 1.4. of Appendix 1 and if applicable Appendix 2 to this



**Annex.**

- 4.1.1. In case of TPMS: Puncture Test: Conduct a test according to Annex 3 to this Regulation**
- 4.1.2. In case of TPMS: Diffusion Test: Conduct a test according to Annex 3 to this Regulation**
- 4.1.3. In case of TPRS / CTIS: Refilling Test: Conduct a test according to Annex 4 to this Regulation**
- 4.1.4. In case of TPMS: Malfunction Test: Conduct a test according to Annex 3 to this Regulation**
- 4.1.5. In case of TPRS / CTIS: Malfunction Test: Conduct a test according to Annex 4 to this Regulation**
- 4.1.6. Data communication: In case of usage of ISO11992 Gateway: Communication Test: Conduct a test according Annex 6 to this Regulation.**

## Annex 7 - Appendix 1

### **Tyre Pressure Monitoring System / Tyre Pressure Refilling System/ Central Tyre Inflation System Information document for reference trailer**

- 1. General**
  - 1.1. Name and address of manufacturer**
  - 1.2. System name**
  - 1.3. System variations**
  - 1.4. System configurations (e.g. number of axles / number of tyres etc.)**
  - 1.5. Explanation of the basic function and/or philosophy of the system.**
- 2. Applications**
  - 2.1. List of trailer types and TPMS / TPRS / CTIS<sup>1</sup> configurations for which approval is required.**
  - 2.2. Schematic diagrams of the system configurations installed on the trailers defined in item 2.1. above with consideration given to the following parameters:**
    - **Number of axles;**
    - **Wheel locations;**
    - **Position of lift axles;**
    - **Position of receiver/antenna locations;**
    - **Position of sensors.**
  - 2.3. Installation / Integration limitations (e.g. distance between receiver/antenna and wheel or rim, input messages and signals required by TPMS so that the vehicle shall meet the performance requirements contained in paragraphs 5.1.2. to 5.6. of this Regulation and fulfil the tests (puncture, diffusion and malfunction) as specified in Annex 3 to this Regulation e.g. vehicle-speed)**
  - 2.4. Additional information (if applicable) to the application of the TPMS / TPRS / CTIS**
- 3. Component description**
  - 3.1. Sensor(s)**
    - **Function**
    - **Identification (e.g. part number(s))**
  - 3.2. Receiver(s) / Antenna (s)**
    - **General description and function**
    - **Identification (e.g. part number(s))**
    - **Additional features (e.g. automatic configuration, variable parameters, diagnostics)**
    - **Failure modes**
  - 3.3. Electrical equipment**

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<sup>1</sup> Strike out what does not apply

- **Circuit diagram(s)**
  - **Powering methods**
- 3.4. If applicable the Electro-magnetic compatibility according to UN Regulation No. 10 as last amended by**
- (a) **the 03 series of amendments for vehicles without a coupling system for charging the Rechargeable Electric Energy Storage System (traction batteries);**
  - (b) **the 06 series of amendments for vehicles with a coupling system for- charging the Rechargeable Electric Energy Storage System (traction batteries).**
- 3.5. Additional information (if applicable) to the component description of the TPMS / TPRS / CTIS**

## Annex 7 - Appendix 2

### ISO11992-2 Gateway ECU Information document for reference trailer

1. General
  - 1.1. Name and address of manufacturer of the Gateway
  - 1.2. System name
  - 1.3. System variations
  - 1.4. System configurations (e.g. number of axles/ number of tyres etc.)
  - 1.5. Explanation of the basic function and/or philosophy of the system.
2. Applications
  - 2.1. List of trailer types and configurations for which approval is required.
  - 2.2. Schematic diagrams of the system configurations installed on the trailers defined in item 2.1. above with consideration given to the following parameters:
    - Enabling of TPMS gateway functionality.
  - 2.3. Installation limitations
  - 2.4. Additional information (if applicable) to the application of the TPMS / TPRS / CTIS.
3. Component description
  - 3.1. Gateway for ISO11992 according Annex 5
    - General description and function;
    - Identification (e.g. part number(s));
    - Limitations (e.g. compatibility with other CAN-bus attendees), output of messages and signals required by TPMS so that the vehicle shall meet the performance requirements contained in paragraphs 5.1.2. to 5.6. of this Regulation and fulfil the tests (puncture, diffusion and malfunction) as specified in Annex 3 to this Regulation e.g. vehicle-speed);
    - The verification of this element might be provided by a separate test report.
  - 3.2. Electrical equipment
    - Circuit diagram(s);
    - Powering methods.
  - 3.3. If applicable the Electro-magnetic compatibility according to UN Regulation No. 10 as last amended by
    - (a) the 03 series of amendments for vehicles without a coupling system for charging the Rechargeable Electric Energy Storage System (traction batteries);
    - (b) the 06 series of amendments for vehicles with a coupling system for- charging the Rechargeable Electric Energy Storage System (traction batteries).
  - 3.4. Additional information (if applicable) to the component description of the TPMS / TPRS / CTIS.

## Annex 7 – Appendix 3

### Tyre Pressure Monitoring / Tyre Pressure Refilling System / Central Tyre Inflation System Test Report for reference trailer

1. Identification
  - 1.1. Name and address of manufacturer of the Tyre Pressure Monitoring System (TPMS) / Tyre Pressure Refilling System (TPRS) / Central Tire Inflation System (CTIS)<sup>2</sup>
  - 1.2. System name / model
  - 1.3. Monitoring function for TPMS
  - 1.4. Control Monitoring function for TPRS / CTIS
2. System(s) and installations approved:
  - 2.1. TPMS / TPRS / CTIS configurations (where appropriate): definition of parameters which have impact on the TPMS / TPRS / CTIS performance. All allowed sub-configurations shall be supported if marked accordingly, e.g. if only a subset of axles is implemented.

	<i>Number of axles</i>					
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
Single Tyre						
Twin Tyre						
Nominal Pressure Range (kPa)						

- Type or specification of other factors, e.g. rim types and sizes,
  - Number and position of Lift Axles,
  - Position and configuration of receiver and /or antennas incl. the allowed installation area.
- 2.2. Other limitations defined by the Manufacturer (Range of application (trailer type(s) and number of axles, input messages and signals required by TPMS) so that the vehicle shall meet the performance requirements contained in paragraphs 5.1.2. to 5.6. of this Regulation and fulfil the tests (puncture, diffusion and malfunction) as specified in Annex 3 to this Regulation e.g. vehicle-speed)
  - 2.3. Additional features (if applicable)
  3. Test results
    - 3.1. Tyre Class, Marking and wheel size(s) of standard unit equipment
    - 3.2. Brief description of the Tyre Pressure Monitoring System (TPMS) / Tyre Pressure Refill System (TPRS) / Central Tyre Inflation System (CTIS) including implemented measures to avoid inadvertent reset control operation according to paragraph 5.1.6. to this Regulation, if applicable
    - 3.3. Result of the tests
    - 3.4. According to Annex 3 (TPMS) to this Regulation, if applicable:

<sup>2</sup> Strike out what does not apply

<i>Test</i>	<i>Measured Time to warning (mm:ss)</i>
<b>Puncture Test</b>	
<b>Diffusion Test</b>	
<b>Malfunction Test</b>	

3.5. **According to Annex 4 (TPRS / CTIS) to this Regulation, if applicable<sup>2</sup>:**

<i>Test</i>	<i>Measured Time to warning (mm:ss)</i>
<b>Refilling Test</b>	
<b>Malfunction Test</b>	

4. **Limits of installation**

5. **Date of test:**

6. **This test has been carried out and the results reported in accordance with Annex 3 / Annex 4 to UN Regulation No. 141 as last amended by the 01 series of amendments.**

7. **Technical Service conducting the test**

**Signed: ..... Date: .....**



## Annex 7 – Appendix 4

### ISO11992-2 Gateway ECU Test Report for reference trailer

1. Identification
  - 1.1. Manufacturer of the ISO11992-2 Gateway ECU (name and address)
  - 1.2. System name / model
2. System(s) and installations approved:
  - 2.1. Range of application (trailer type(s) and number of axles)
  - 2.2. System identification of TEBS system to provide ISO11992 Gateway function
3. Test results
  - 3.1. Brief description of ISO11992-2 Gateway ECU
  - 3.2. Result of the tests
  - 3.3. According to Annex 6 (Gateway Function) to this Regulation:

<i>Test</i>	<i>Measured Time to warning (mm:ss)</i>
Low Tyre Pressure Test	
Malfunction Test	

4. Limits of installation
  - 4.1. Other recommendations/limitations (Output of messages and signals required by TPMS so that the vehicle shall meet the performance requirements contained in paragraphs 5.1.2. to 5.6. of this Regulation and fulfil the tests (puncture, diffusion and malfunction) as specified in Annex 3 to this Regulation e.g. vehicle-speed)
  - 4.2. Other recommendations/limitations (Output of messages and signals required by TPRS / CTIS so that the vehicle shall meet the performance requirements contained in paragraphs 5.1.2. to 5.6. of this Regulation and fulfil the tests (puncture, diffusion and malfunction) as specified in Annex 4 to this Regulation e.g. vehicle-speed)
5. Date of test:
6. This test has been carried out and the results reported in accordance with Annex 6 to UN Regulation No. 141 as last amended by the 01 series of amendments.
7. Technical Service conducting the test  
Signed: ..... Date: .....

## Annex 8

### Alternative procedure for type approval of subject trailer(s)

1. **General**
- 1.1. **This Annex defines an alternative procedure for type approval of trailers, regarding their Tyre Pressure Monitoring System (TPMS) / Tyre Pressure Refilling System (TPRS) / Central Tyre Inflation System (CTIS) utilizing information from test reports issued in accordance with Annex 7, Appendix 3 and / or Appendix 4 to this Regulation.**
- 1.2. **On completion of the verification procedures described in Annex 3, the Type Approval Authority shall issue a UN type approval certificate conforming to the model specified in Annex 1 to this Regulation.**
2. **Application for type approval**
- 2.1. **The application for UN type approval of a trailer type with regard to TPMS, TPRS or CTIS shall be submitted by the trailer manufacturer. The trailer manufacturer shall supply to the Type Approval at least the following:**
- 2.2. **Test reports according Annex 7, Appendix 3 and / or Appendix 4 to this Regulation from the TPMS / TPRS / CTIS and/or Gateway supplier which confirms the function of the systems of a reference trailer, covering the application of subject trailer to be approved.**
- 2.2.1. **The information documents of a trailer type hereafter referred to as the "reference trailer"<sup>3</sup> according to Annex 7 to this Regulation on which the TPMS / TPRS / CTIS is to be based. This trailer will have been subject to the actual tests defined in Annex 3 and / or Annex 4 and / or Annex 6 to this Regulation for the appropriate trailer. A trailer that has been approved to the alternative procedure defined in this Annex shall not be used as a reference trailer.**
- 2.2.2. **A trailer, representative of the trailer type to be approved hereafter referred to as the "subject trailer".**
3. **Verification**
- 3.1. **The requirements of Annex 3 and / or Annex 4 and/or Annex 6 are considered to be met if the subject trailer configuration is equivalent with the following conditions:**
- 3.1.1. **The subject trailer configuration complies with one of the marked configurations in the test report in terms of number of axles, number of tyres and position of lift axles**
- 3.1.2. **The allowed pressure range of the nominal pressure is within the range of the reference trailer.**
- 3.1.3. **Installation/Integration and setup of TPMS / TPRS / CTIS and the ISO11992-2 Gateway ECU (if applicable) on the subject trailer is in accordance with the installation/integration and setup limitations specified for the reference trailer.**
- 3.1.4. **Add information documents about subject trailer according to Appendix 1 and Appendix 2 of this Annex.**
4. **General**

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<sup>3</sup> The reference trailer may be from a different manufacturer

- 4.1. Testing of a trailer in accordance with Annex 3 and / or Annex 4 to this Regulation may be waived by the Type Approval Authority at the time of type approval of the trailer provided that the Tyre Pressure Monitoring System (TPMS) complies with the requirements of Annex 3 / Tyre Pressure Refilling System (TPRS) / Central Tyre Inflation System (CTIS) complies with the requirements of Annex 4 and, if applicable, Gateway complies with the requirements of Annex 6 to this Regulation.**
- 5. Installation limitation checks (according to Annex 7, Appendix 1 and Appendix 2, paragraph 2.3. to this Regulation if applicable)**

## Annex 8 - Appendix 1

### **Tyre Pressure Monitoring System / Tyre Pressure Refilling System / Central Tyre Inflation System Information document for subject trailer(s)**

- 1. General**
- 1.1. Name and address of manufacturer**
- 1.2. System name**
- 1.3. System configuration of the TPMS / TPRS / CTIS<sup>4</sup> (e.g.: which components are included)**
- 2. Application**
- 2.1. System configuration of the subject trailer:**
  - **Number of axles**
  - **Wheel locations**
  - **Position of Lift axles**
  - **Position of Receiver/antenna locations**
  - **Position of sensors**
  - **Nominal pressure range.**
- 2.2. Schematic diagrams of the system configuration installed on the trailer defined in item 2.1.**
- 2.3. Installation/ Integration limitations (e.g. input messages and signals required by TPMS so that the vehicle shall meet the performance requirements contained in paragraphs 5.1.2. to 5.6. of this Regulation and fulfil the tests (puncture, diffusion and malfunction) as specified in Annex 3 to this Regulation e.g. vehicle-speed)**
- 2.4. Additional information (if applicable) to the application of the TPMS / TPRS / CTIS**
- 3. Component description**
- 3.1. Sensor(s)**
  - **Identification (e.g. part number(s)).**
- 3.2. Receiver(s) / Antenna (s)**
  - **Identification (e.g. part number(s)).**
- 3.3. Electrical equipment**
  - **Circuit diagram(s)**
  - **Powering methods.**
- 3.4. If applicable the electromagnetic compatibility according to UN Regulation No. 10 as last amended by**
  - (a) the 03 series of amendments for vehicles without a coupling system for charging the Rechargeable Electric Energy Storage System (traction batteries);**

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<sup>4</sup> Strike out what does not apply

(b) the 06 series of amendments for vehicles with a coupling system for charging the Rechargeable Electric Energy Storage System (traction batteries).

3.5. Additional information (if applicable) to the component description of the TPMS / TPRS / CTIS.

## Annex 8 - Appendix 2

### ISO11992-2 Gateway ECU information document for subject trailer(s)

1. General
  - 1.1. Name and address of manufacturer
  - 1.2. System name
  - 1.3. System configuration in respect to TPMS / TPRS / CTIS<sup>5</sup>
2. Applications
  - 2.1. System configurations applied; e.g. other ECUs connected to the same CAN bus as the TPMS / TPRS / CTIS ECU
  - 2.2. Schematic diagrams of the system configurations installed on the subject trailers
  - 2.3. Limitations (e.g. compatibility with other CAN-bus attendees, output of messages and signals required by TPMS so that the vehicle shall meet the performance requirements contained in paragraphs 5.1.2. to 5.6. of this Regulation and fulfil the tests (puncture, diffusion and malfunction) as specified in Annex 3 to this Regulation e.g. vehicle-speed)
  - 2.4. Additional information (if applicable) to the application of the TPMS / TPRS / CTIS
3. Component description
  - 3.1. Gateway for ISO11992 according to Annex 5
    - Identification (e.g. part number(s))
    - Description of other connected components (e.g. on CAN-bus)
  - 3.2. Electrical equipment
    - Circuit diagram(s)
    - Powering methods
  - 3.3. If applicable the Electro-magnetic compatibility according to UN Regulation No. 10 as last amended by
    - (a) the 03 series of amendments for vehicles without a coupling system for charging the Rechargeable Electric Energy Storage System (traction batteries);
    - (b) the 06 series of amendments for vehicles with a coupling system for- charging the Rechargeable Electric Energy Storage System (traction batteries).
  - 3.4. Additional information (if applicable) to the component description of the TPMS / TPRS / CTIS. ”

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<sup>5</sup> Strike out what does not apply

## II. Justification

1. To lower the burden for manufacturers of vehicles of categories O<sub>3</sub> and O<sub>4</sub> an alternative procedure for type approval of trailers, regarding their TPMS, TPRS and CTIS is introduced in the 01 series of amendments to UN Regulation No. 141. The proposed alternative procedure for type approval is based on the spirit of UN Regulation No. 13.
  2. Annex 8 defines the alternative procedure for type approval of trailers (subject trailers), regarding their TPMS, TPRS and CTIS utilizing information from test reports issued in accordance with Annex 7 for a reference trailer, tested fully according to UN Regulation No. 141. The competent Technical Service has the right to request an alternative procedure for a subject trailer.
  3. All text in this proposal is produced by TF TPMSTI by amending the text of ECE/TRANS/WP.29/2021/10/Rev.1.
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