



UN Regulation No. 141 Annex 7 Appendix 1

Tyre Pressure Monitoring System Information Document for Reference Trailer

Document Issue No. : 2

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Glossary of Terms

Table 1 List of abbreviations

Term	Expansion/ meaning
Add.	Additional
CAN	Controller Area Network
EBS	Electronic Braking System
ECU	Electronic Control Unit
kPa	Kilopascals
mA	Milliamps
RF	Radio Frequency
Rx	Receiver / Received / Reception
s	Seconds
TPM	Tyre Pressure Monitor
TPMS	Tyre Pressure Monitoring System
Tx	Transmitter / Transmitted / Transmission
UDS	Unified Diagnostic Service
WU	Wheel Unit
Vdc	Volt (Direct Current)
°C	Degrees Celsius

UN Regulation No. 141

Annex 7 - Appendix 1

Tyre Pressure Monitoring System / ~~Tyre Pressure Refill System~~ / ~~Central Tyre Inflation System~~ Information document for reference trailer

1. General
 - 1.1. Name and address of manufacturer:

Sensata Technologies, Unit 11, Technology Park, Belfast Road, Antrim, Northern Ireland, BT41 1QS
 - 1.2. System name:

Sensata Heavy Trailer TPMS
 - 1.3. System variations:

The TPMS specified in this document supports all heavy trailer vehicles with up to and including five axles with two or four wheels on any/all axles.

Variants of the TPMS exist where up to and including four additional antennas/receivers will be an option for some axle configurations to enable advanced features or to provide extended RF range.

TPMS Variant 1: consists of wireless sensors mounted at each wheel and one primary ECU. TPMS Variant one supports vehicles up to and including three axles with two wheels per axle.

TPMS Variant 2: consists of wireless sensors mounted at each wheel, one primary ECU and up to and including four additional antenna/receivers. TPMS Variant two supports vehicles up to and including five axles with two or four wheels on any/all axles.
 - 1.4. System configurations (e.g. number of axles / number of tyres etc.):

Any Class O3 or O4 trailer with one to five axles and two or four wheels per axle.

Placard pressures from 150 to 1000 kPa.

Sensor measurement pressure up to 1390 kPa.
 - 1.5. Explanation of the basic function and/or philosophy of the system:

Wheel Unit tyre pressure sensors will broadcast tyre air cavity measurements via a radio link. The sensors will transmit on an adaptive schedule according to system conditions (from 16 s to 2 minutes). Any fitted TPMS receivers will collect and forward this data to the primary ECU. The primary ECU will process this data and compare with programmed vehicle parameters. The primary ECU will communicate relevant tyre measurements, under/over inflation, and malfunction warnings to the towed vehicle ISO 11992-2 gateway to be forwarded to the towing vehicle according to Annex 5 part B of R141.01. System warnings and malfunctions are not user resettable.

Warnings and malfunctions are only cleared when the respective issue has been corrected at source e.g inflating an underinflated tyre to vehicle placard pressure, or replacement/repair of malfunctioning sensor.

2. Applications:

2.1. List of trailer types and TPMS / ~~TPRS~~ / ~~CTIS~~¹ configurations for which approval is required.

Reference Trailer 1: Standard tri-axle trailer with single wheels.

Reference Trailer 2: Five axle trailer with twin wheels.

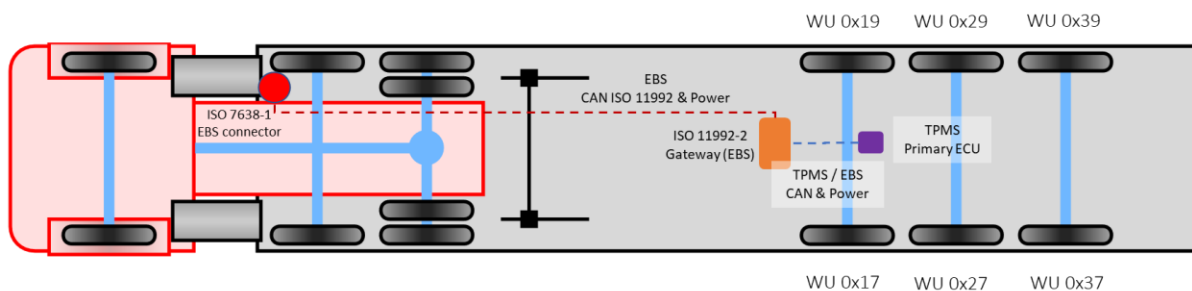
For approval of any trailer up to and including five axles, with up to and including four wheels per axle (maximum supported configuration).

System reported tyre measurements, under/over inflation, and malfunction warnings are not impacted by lift or steer axles.

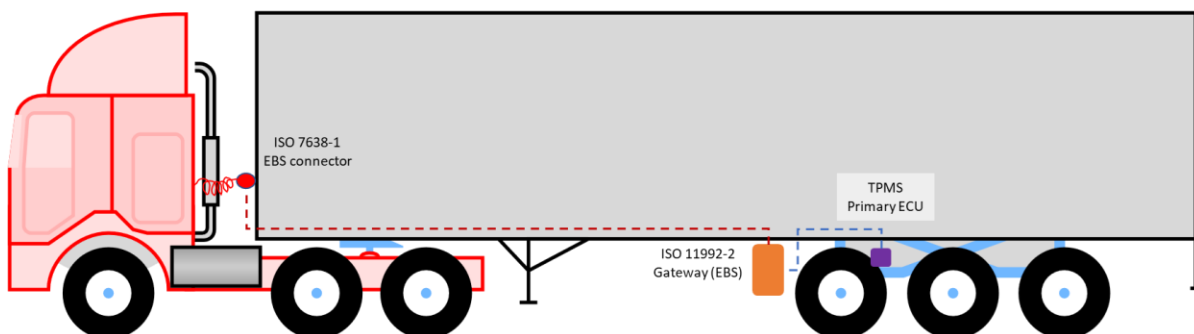
The system monitors a tyre pressure range from 0 kPa to 1390 kPa.

The system monitors a tyre temperature range from -40 °C to 120 °C.

2.2. Schematic diagrams of the system configurations installed on the trailers defined in item 2.1:

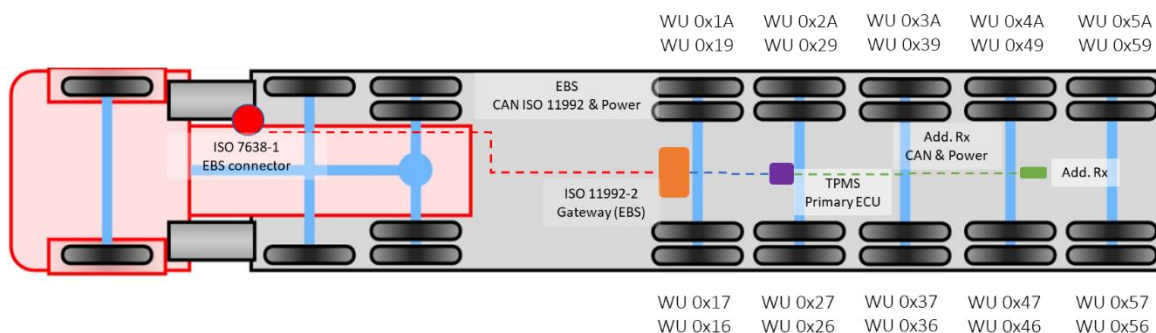


All wheel/tyre assemblies fitted to the towed vehicle are fitted with a TPMS Wheel Unit Sensor (WU)
One TPM sensor per wheel/tyre air cavity

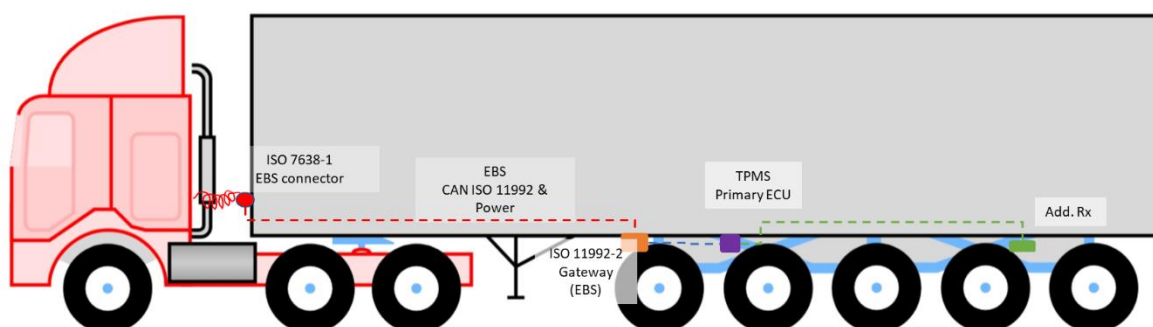


Reference Trailer 1: Standard tri-axle with single wheels (Fig. 1)

¹ Strike out what does not apply



All wheel/tyre assemblies fitted to the towed vehicle are fitted with a TPMS Wheel Unit Sensor (WU)
One TPM sensor per wheel/tyre air cavity



Reference Trailer 2: Five axle vehicle with all twin wheel axles – maximum supported configuration (Fig. 2)

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)

The installer shall follow fitting instructions as provided by Sensata Technologies – including ECU/Receiver positioning and mounting, wiring harness construction and routing, and wheel unit installation.

The system requires one TPM sensor per tyre air cavity and a sufficient number of receivers as defined below.

Special consideration: The entirety of all single wheel & tyre assemblies to be monitored must be within a 4.4 m linear distance of an installed ECU/Receiver.

The entirety of all twin wheel & tyre assemblies must be within a 2.4m linear distance of an installed ECU/Receiver

See Fig. 4 and Fig. 5.

The ISO 11992-2 GW module shall provide to the towed vehicle TPMS ECU at least the ISO 11992-2 PGN 768 (EBS21) including the vehicle speed signal.

The ISO 11992-2 GW module shall send malfunction warnings in compliance with R141 Annex 5 e.g. loss of communication with TPMS.

2.4. Additional information (if applicable) to the application of the TPMS
~~/TPRS / CTIS:~~

Initial programming of the system settings is performed by means of UDS diagnostics. The initial programming sets parameters specific to the fitted vehicle, including the number of axles, number of wheels, and tyre placard pressures.

3. Component description :

3.1. Sensor(s)

- Function

Measures and transmits tyre air cavity data, and sensor diagnostic data via a radio link.

- Identification (e.g. part number(s))

Laser etched model number on sensor body: ATFPG4

3.2. Receiver(s) / Antenna (s)

- General description and function

Primary ECU: Receive and process data transmitted by wheel unit sensors and wheel unit data forwarded from up to and including 4 additional antennas/receivers. Compare this data to programmed vehicle parameters and communicate results via ISO 11992-2 gateway to the towing vehicle so that the driver may be notified of insufficient tyre inflation pressures or system component malfunction.

Additional receivers/antennas: Receive data transmitted by wheel unit sensors and forward this to the primary ECU for processing.

- Identification (e.g. part number(s))

Laser etched Model Number on component body

Primary ECU: MAXRX18KL

Additional Receivers/Antennas: FHTERX

Primary ECU Software: 1.0.X

- Additional features (e.g. automatic configuration, variable parameters, diagnostics)

Option to automatically detect the presence and position of previously unknown wheel unit sensors using Sensata Learn and Locate algorithm.

- Failure Modes

Failure to receive data from one or more wheel unit sensors.

Failure to communicate with ISO 11992-2 gateway.

Failure / Malfunction warnings are cleared when the fault is corrected.

3.3. Electrical equipment:

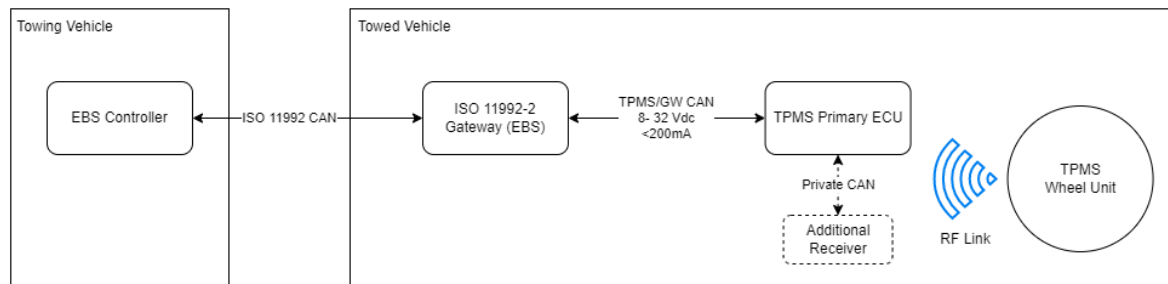
- Circuit diagram(s)
- Powering methods

The system will be powered from the ISO 11992-2 gateway.

System power requirements: +8 Vdc to +32 Vdc (<200 mA).

See Fig. 1,2 above and Fig. 3 below:

Simplified System Schematic (Fig. 3)



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).

UN Regulation No. 10 Type approval numbers below:

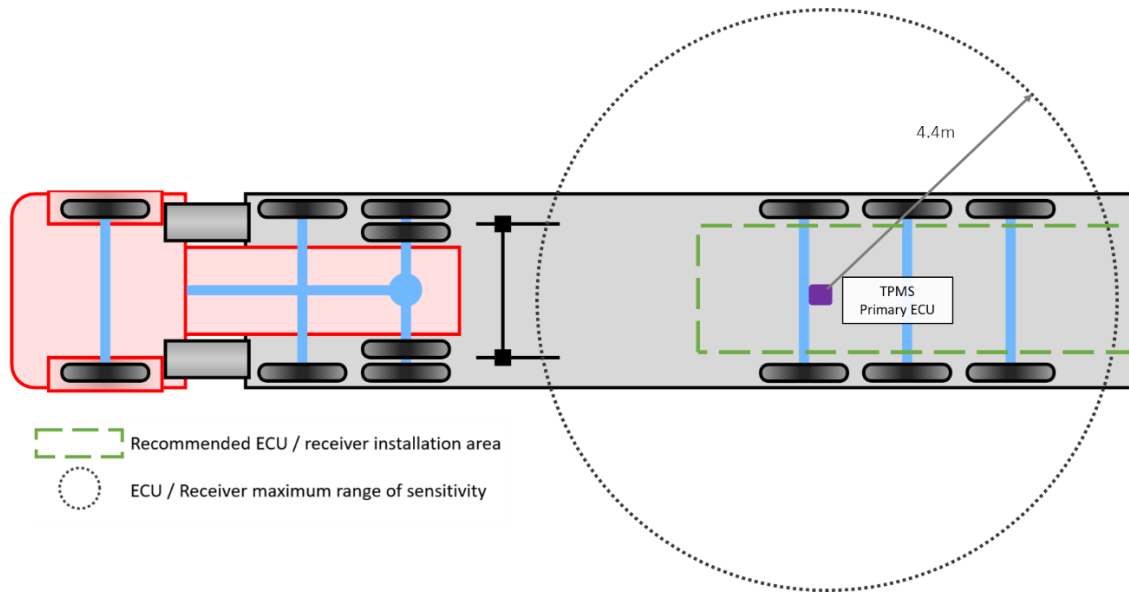
Primary ECU: E24*10R06/00*3521*00	App. A
Additional receiver: E24*10R06/00*3125*00	App. B
TPM Sensor: E24*10R06/00*3558*00	App. C

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

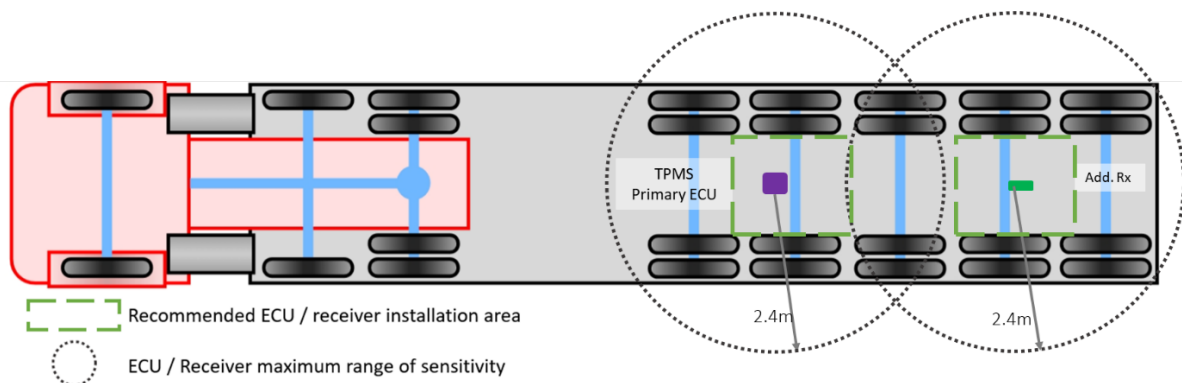
Diagrams to show recommended receiver installation positions and approximate limits of effective communication. (Fig. 4,5).

The ECU and receiver components should be mounted such that the connectors are not pointing skyward. Detailed fitting guidance will be provided to installers from Sensata.

Recommended ECU/receiver position for reference trailer 1 (single ECU/Receiver) (Fig. 4)



Recommended ECU/Receiver position for reference trailer 2 (Twin ECU/Receiver) (Fig. 5)



Appendix

- A. Primary ECU Regulation No. 10 Approval certificate
- B. Additional Receiver ECU Regulation No. 10 Approval certificate
- C. Tyre Pressure Monitoring Sensor Regulation No. 10 Approval certificate



ECE TYPE-APPROVAL CERTIFICATE

E24

Communication Concerning: ☐ Approval granted
☐ Approval extended
☐ Approval refused
☐ Approval withdrawn
☐ Production definitively discontinued

Of a type of electrical/electronic sub-assembly with regard to Regulation No.10.

Approval No: *E24*10R06/00*3521*00*

Reason for extension: -N/A

1. Make (trade name of manufacturer): *Schrader Electronics Ltd*

2. Type and general commercial description: *Tire Pressure Monitoring Receiver*
MAXRX18KL

Variant(s): *N/A*

3. Means of identification of type, if marked on the vehicle/
component/separate technical unit: **Model name on part**

3.1 Location of that marking: *Outer sensor casing*

4. Category of vehicle: *N/A*

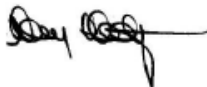
5. Name and address of manufacturer: *Schrader Electronics Ltd,
Unit 11, Antrim Technology Park,
Antrim, Co Antrim,
N.Ireland, BT41 1QS*

6. In the case of components and separate technical units, location and method of affixing of the approval mark: *Indelible label to outer casing*

7. Address(es) of assembly plant(s): *Schrader Electronics Ltd,
Unit 11, Antrim Technology Park,
Antrim, Co Antrim,
N.Ireland, BT41 10S*



Approval No: E24*10R06/00*3521*00

- | | |
|--|---|
| 8. Additional information (where applicable): | <i>See appendix below</i> |
| 9. Technical service responsible for carrying out the tests: | Compliance Engineering Ireland Ltd
CLONROSS, DUNSHAUGHLIN, CO
MEATH, IRELAND |
| 10. Date of test report: | 18.05.2021 |
| 11. Number of test report: | 21E9197-3 |
| 12. Remarks (if any): | <i>See Appendix below</i> |
| 13. Place: | Dublin |
| 14. Date: | 19th May, 2021 |
| 15. Signature: |  |



16. The index to the information package lodged with the approval authority, which may be obtained on Request, is attached.

CT-11-03 Rev 5

NSAI, 1 Swift Square, Northwood, Santry, Dublin 9, Ireland. Telephone: (+353+1) 807 3800, Facsimile: 01-807 3844

49.83.05.01.16
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NSAI

Approval No: E24*10R06/00*3521*00

Appendix

To type-approval communication concerning the type approval of an electrical/electronic sub-assembly under Regulation No.10.

1. Additional information
 - 1.1. Electrical system rated voltage: *DC 12V / 24V, negative ground*
 - 1.2. This ESA can be used on any vehicle type with the following restrictions: *See manufacturer's specifications.*
 - 1.2.1 Installation conditions, if any: *See manufacturer's specifications.*
 - 1.3. This ESA can only be used on the following vehicle types: *N/A*
 - 1.3.1 Installation conditions, if any: *N/A*
 - 1.4. The specific test method(s) used and the frequency ranges covered to determine immunity were:
*Bulk Current Injection Method:
Frequency: (2 – 80 MHz)
Absorber Chamber Test:
Frequency: (80 – 2000 MHz)*
 - 1.5. Laboratory accredited to ISO 17025 and recognized by the Approval Authority responsible for carrying out the tests: *Compliance Engineering Ireland Ltd*
2. Remarks: *N/A*

Appendix to type-approval communication concerning the type approval of a vehicle under Regulation No.10.

1. Additional information
2. Special devices for the purpose of Annex 4 to this Regulation: *N/A*
3. Electrical system rated voltage: *N/A*
4. Type of bodywork: *N/A*
5. List of electronic systems installed in the tested vehicle(s) not limited to the items in the information document: *N/A*
- 5.1 Vehicle equipped with 24 GHz short-range radar equipment (yes/no): *N/A*
6. Laboratory accredited to ISO 17025 and recognized by the Approval Authority responsible for carrying out the tests: *N/A*
7. Remarks: *N/A*

CT-11-03 Rev 5

NSAI, 1 Swift Square, Northwood, Santry, Dublin 9, Ireland. Telephone: (+353+1) 807 3800, Facsimile: 01-807 3844

49.83.05.01.16
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ECE TYPE-APPROVAL CERTIFICATE



Communication Concerning: Approval granted
 ~~Approval extended~~
 ~~Approval refused~~
 ~~Approval withdrawn~~
 ~~Production definitively discontinued~~

Of a type of electrical/electronic sub-assembly with regard to Regulation No.10.

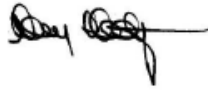
Approval No: E24*10R06/00*3125*00

Reason for extension:	-N/A
1. Make (trade name of manufacturer):	<i>Schrader Electronics Ltd</i>
2. Type and general commercial description:	<i>Tire Pressure Monitoring Receiver FHITERX Tire Pressure Monitoring Receiver</i>
3. Means of identification of type, if marked on the component:	<i>Model name on part</i>
3.1 Location of that marking:	<i>Outer sensor casing</i>
4. Category of vehicle:	<i>N/A</i>
5. Name and address of manufacturer:	<i>Schrader Electronics Ltd Unit 11, Antrim Technology Park, Antrim, Co Antrim, BT41 1QS Northern Ireland</i>
6. In the case of components and separate technical units, location and method of affixing of the ECE approval mark:	<i>Indelible label to outer casing</i>
7. Address(es) of assembly plant(s):	<i>Schrader Electronics Ltd Unit 11, Antrim Technology Park, Antrim, Co Antrim, BT41 1QS Northern Ireland</i>



NSAI

Approval No: E24*10R06/00*3125*00

- | | |
|--|--|
| 8. Additional information (where applicable): | <i>See appendix</i> |
| 9. Technical service responsible for carrying out the tests: | <i>Compliance Engineering Ireland Ltd
Clonross, Dunshaughlin, Co. Meath,
Ireland</i> |
| 10. Date of test report: | <i>11.06.2020</i> |
| 11. Number of test report: | <i>20E8682-2</i> |
| 12. Remarks (if any): | <i>See Appendix</i> |
| 13. Place: | <i>Dublin</i> |
| 14. Date: | <i>12th June, 2020</i> |
| 15. Signature: |  |



16. The index to the information package lodged with the approval authority, which may be obtained on request is attached.



NSAI

Approval No: E24*10R06/00*3125*00

Appendix

To type-approval communication concerning the type approval of an electrical/electronic sub-assembly under Regulation No.10.

1. Additional information
 - 1.1. Electrical system rated voltage: *12/24V DC, negative ground*
 - 1.2. This ESA can be used on any vehicle type with the following restrictions: *See manufacturer's specifications.*
 - 1.2.1 Installation conditions, if any: *See manufacturer's specifications.*
 - 1.3. This ESA can only be used on the following vehicle types: *N/A*
 - 1.3.1 Installation conditions, if any: *N/A*
 - 1.4. The specific test method(s) used and the frequency ranges covered to determine immunity were:
*Bulk Cable Injection Method:
Frequency: (2 - 80MHz)
Anechoic Chamber Method:
Frequency: (80 - 2000MHz)*
 - 1.5. Laboratory accredited to ISO 17025 and recognized by the Approval Authority responsible for carrying out the tests: *Compliance Engineering Ireland Ltd*
2. Remarks: *N/A*

Appendix to type-approval communication concerning the type approval of a vehicle under Regulation No.10.

1. Additional information
2. Special devices for the purpose of Annex 4 to this Regulation: *N/A*
3. Electrical system rated voltage: *N/A*
4. Type of bodywork: *N/A*
5. List of electronic systems installed in the tested vehicle(s) not limited to the items in the information document: *N/A*
- 5.1 Vehicle equipped with 24 GHz short-range radar equipment (yes/no): *N/A*
6. Laboratory accredited to ISO 17025 and recognized by the Approval Authority responsible for carrying out the tests: *N/A*
7. Remarks: *N/A*

CT-11-03 Rev 4

NSAI, 1 Swift Square, Northwood, Santry, Dublin 9, Ireland. Telephone: (+353+1) 807 3800, Facsimile: 01-807 3844

49.83.05.01.12
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NSAI

ECE TYPE-APPROVAL CERTIFICATE



Communication Concerning: ~~Approval granted~~
~~Approval extended~~
~~Approval refused~~
~~Approval withdrawn~~
~~Production definitively discontinued~~

Of a type of electrical/electronic sub-assembly with regard to Regulation No.10.

Approval No: E24*10R06/00*3558*00

Reason for extension:	-N/A
1. Make (trade name of manufacturer):	<i>Schrader Electronics Ltd</i>
2. Type and general commercial description:	<i>ATFPG4 Tire Pressure Monitoring Sensor</i>
Variant(s):	<i>N/A</i>
3. Means of identification of type, if marked on the vehicle/ component/separate technical unit:	<i>Model name on part</i>
3.1 Location of that marking:	<i>Outer sensor casing</i>
4. Category of vehicle:	<i>N/A</i>
5. Name and address of manufacturer:	<i>Schrader Electronics Ltd, Unit 11, Antrim Technology Park, Antrim, Co Antrim, N.Ireland, BT41 1QS</i>
6. In the case of components and separate technical units, location and method of affixing of the approval mark:	<i>Indelible label to outer casing laser etching or embossed.</i>
7. Address(es) of assembly plant(s):	<i>Schrader Electronics Ltd, Unit 11, Antrim Technology Park, Antrim, Co Antrim, N.Ireland, BT41 1QS</i>



Approval No: E24*10R06/00*3558*00

- | | |
|--|---|
| 8. Additional information (where applicable): | <i>See appendix below</i> |
| 9. Technical service responsible for carrying out the tests: | Compliance Engineering Ireland Ltd
CLONROSS, DUNSHAUGHLIN, CO
MEATH, IRELAND |
| 10. Date of test report: | 10.05.2021 |
| 11. Number of test report: | 21E9356-1 |
| 12. Remarks (if any): | <i>See Appendix below</i> |
| 13. Place: | Dublin |
| 14. Date: | 28th May, 2021 |
| 15. Signature: |  |



16. The index to the information package lodged with the approval authority, which may be obtained on Request, is attached.

CT-11-03 Rev 5

NSAI, 1 Swift Square, Northwood, Santry, Dublin 9, Ireland. Telephone: (+353+1) 807 3800, Facsimile: 01-807 3844

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Approval No: E24*10R06/00*3558*00

Appendix

To type-approval communication concerning the type approval of an electrical/electronic sub-assembly under Regulation No.10.

1. Additional information
 - 1.1. Electrical system rated voltage: *DC 3V*
 - 1.2. This ESA can be used on any vehicle type with the following restrictions: *See manufacturer's specifications.*
 - 1.2.1 Installation conditions, if any: *See manufacturer's specifications.*
 - 1.3. This ESA can only be used on the following vehicle types: *N/A*
 - 1.3.1 Installation conditions, if any: *N/A*
 - 1.4. The specific test method(s) used and the frequency ranges covered to determine immunity were: *Absorber Chamber Test:
Frequency: (20 – 2000 MHz)*
 - 1.5. Laboratory accredited to ISO 17025 and recognized by the Approval Authority responsible for carrying out the tests: *Compliance Engineering Ireland Ltd*
2. Remarks: *N/A*

Appendix to type-approval communication concerning the type approval of a vehicle under Regulation No.10.

1. Additional information
2. Special devices for the purpose of Annex 4 to this Regulation: *N/A*
3. Electrical system rated voltage: *N/A*
4. Type of bodywork: *N/A*
5. List of electronic systems installed in the tested vehicle(s) not limited to the items in the information document: *N/A*
 - 5.1 Vehicle equipped with 24 GHz short-range radar equipment (yes/no): *N/A*
6. Laboratory accredited to ISO 17025 and recognized by the Approval Authority responsible for carrying out the tests: *N/A*
7. Remarks: *N/A*

CT-11-03 Rev 5

NSAI, 1 Swift Square, Northwood, Santry, Dublin 9, Ireland. Telephone: (+353+1) 807 3800, Facsimile: 01-807 3844

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Document Issue History

Document Issue Number	Date of Issue	Author	Notes
1	11 th August 2023	Mark Carruthers	First Issue
2	17 th October 2023	Mark Carruthers	Added full R.10 documents, corrected error in appendix table