
Cestna vozila in merilniki tlaka v pnevmatikah (TPG) - Medobratovalnost med sistemom podatkov o pnevmatikah (TIS) in TPG - Vmesniki in zahteve

Road vehicles and Tyre Pressure Gauges (TPG) - Interoperability between Tyre Information Systems (TIS) and TPG - Interfaces and Requirements

Reifendruck Management Systeme (TPMS) und Reifendruck Anzeigen - Interoperabilität zwischen TPMS im Fahrzeug und Füllsystemen (TPG) – Schnittstellen und Anforderungen

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Véhicules routiers et manomètres de pneumatiques (TPG) - Interopérabilité entre systèmes d'information de pneumatiques (TIS) et TPG - Interfaces et exigences

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ICS:

17.100	Merjenje sile, teže in tlaka	Measurement of force, weight and pressure
35.240.99	Uporabniške rešitve IT na drugih področjih	IT applications in other fields
43.040.80	Varnostne naprave in sistemi za zadrževanje	Safety installations and restraint systems

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Fahrzeug und Füllsystemen (TPG) - Schnittstellen und
Anforderungen

This European Standard was approved by CEN on 16 April 2015.

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Foreword

This document (EN 16661:2015) has been prepared by Technical Committee CEN/TC 301 “Road vehicles”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2015, and conflicting national standards shall be withdrawn at the latest by December 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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Introduction

The general objective of this document is the capability of standardized interactivity between tyre pressure gauges (TPG) with tyre information systems (TIS), which provide all relevant data for tyre (re-)filling process for example placard information and/or the tyre pressure monitored via Tyre Pressure Monitoring System (TPMS).

EU regulation No 661/2009 is requiring TPMS on all newly homologated car types by November 2012 and on new cars by November 2014.

Increasing potential of TIS/TPMS and TPG, this document is part of the future European standards covering the interoperability of TPG with TIS, through standardized interfaces and data exchange formats, allowing advanced information management and exchange. The architecture is open and scalable to support from the most complex (full interoperability) to the simplest (fully manual) applications. Furthermore, the architecture considers relevant ways of communication. The communication standard allows the secure interfacing for data exchanges between the TPG and TIS.

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1 Scope

This European Standard applies to the tyre pressure gauges (TPG) which operate using pressure equipment (devices used in fixed or mobile installations) to inflate the tyres of road using vehicles (M1 and M2 categories) and which may be capable of interacting with vehicles equipped with tyre pressure monitoring systems (TPMS) whereby the TPG may be steered by the TPMS/vehicle.

To set the correct tyre inflation, this European Standard defines requirements and processes for the interoperability of TPG with TPMS/vehicle, through standardized interfaces and data exchange formats allowing advanced information, management and control systems between TPG and TPMS/vehicle. The architecture is open and scalable to support the different levels of interoperability (from full interoperability to fully manual).

This European Standard does not define communication protocols (works specifically made under M/453 European mandate).

This European Standard may be applied to all TPG categories referenced in EN 12645.

The driver/operator is considered as being responsible for the validation of the parameters and tyre pressure.

This European Standard will be applicable upon development of Infrastructure solution (V2I-I2V communication solutions)

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

[SIST EN 16661:2015](#)
ETSI DTS 101 556-2, *Intelligent Transport System (ITS) — Infrastructure to Vehicle (I2V) communication — Communication system specification to support application requirements for Tyre Pressure Monitoring System (TPMS)*

ISO 639-1, *Codes for the representation of names of languages — Part 1: Alpha-2 code*

3 Conformance

In order to claim conformance with this European Standard, communication shall be established using accepted wireless communication standards (defined in ETSI DTS 101 556-2) and comply with the standards developed for the European mandate M/453 (Standardization mandate addressed to CEN, CENELEC and ETSI in the field of Information and Communication Technologies to support the interoperability of Co-operative systems for Intelligent Transport in the European Community).

It shall be able to demonstrate an open scalable architecture (from full interoperability to fully manual), depending on data availability defined herein.

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4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1
tyre pressure gauge
TPG
 tyre pressure measuring instrument comprising all the elements from the tyre valve connector up to and including the display device

Note 1 to entry: The elements may include connector, hose, control device, measurement components, display device, software, reservoir, etc.

4.2
Vehicle-to-Infrastructure interface
 V2I interface
 device mounted in the vehicle which exchanges data to the outside communication infrastructure

4.3
Infrastructure-to-Vehicle interface
 I2V interface
 device of the outside communication infrastructure which exchanges data with the vehicle

4.4
Vehicle-to-Infrastructure and Infrastructure-to-Vehicle communication
 V2I/I2V communication
 application of information and communication technologies that allows Vehicle-to-Infrastructure and Infrastructure-to-Vehicle communication

4.5
Tyre Information System
TIS
 in-vehicle functional system that contains tyre relevant in-vehicle data from TPMS and/or other sources (e.g. HMI, other systems, placard table, measured/available tyre data, etc.)

Note 1 to entry: It provides these data to the vehicle ITS station for interoperability.

4.6
interoperability
 standardized information exchange between the tyre pressure measuring instrument and TIS

4.7
level of interoperability
 process automation level to complete data exchange between TIS and tyre pressure measuring system

4.8
placard table
 table that contains the recommended inflation pressures made/calculated by vehicle manufacturer and/or tyre manufacturer for the intended service conditions

4.9
load configuration
 vehicle load (partly/fully load) including the mass of the vehicle itself and supported loads

4.10**Tyre Pressure Monitoring System (TPMS)**

any system fitted on a vehicle, able to evaluate the pressure of the tyres or the variation of the pressure over time and to transmit corresponding information to the user while the vehicle is running

Note 1 to entry: A TPMS is functionally composed of:

- sensing devices;
- information channel hardware;
- Central Processing Unit (CPU); and
- Human Machine Interface (HMI).

4.11**recommended cold tyre inflation pressure (p_{rec})**

pressure recommended by the vehicle and/or the tyre manufacturer for each tyre position and for the intended service conditions of the vehicle

Note 1 to entry: p_{rec} is the same or higher than the minimum cold tyre inflation pressure.

Note 2 to entry: This data is usually defined on vehicle placard or on the owner's manual or stored into an available database (e.g. in an ECU in a vehicle, etc.)

4.12**proposed tyre pressure**

$p_{proposed}$

inflation pressure proposed by the TPG

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4.13**applied tyre pressure**

$p_{applied}$

tyre pressure value indicated by TPG after the filling process is completed

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4.14**cold tyre inflation pressure**

p_{cold}

tyre pressure measured in absence of any pressure build-up due to tyre usage

4.15**warm tyre inflation pressure**

p_{warm}

tyre pressure measured under the influence of pressure build-up due to tyre usage

4.16**intended vehicle service conditions**

load, speed and camber of a vehicle corresponding to the intended usage

4.17**Wheel Fitted Component (WFC)**

optional device that measures physical parameters and conveys information to (downlink) a central unit fitted in the vehicle body

Note 1 to entry: A WFC may also be equipped with an uplink channel which could carry the pressure on demand inputs or elsewhere.

EN 16661:2015 (E)**4.18****under-inflation**

tyre inflation pressure lower than recommended for the vehicle in service

4.19**diagnostic function**

system process to verify the functionality of all involved components in terms of interoperability

4.20**TPG Intelligent Transport System (ITS) Station**

TPG enabling the exchange of data: directly with a Vehicle ITS Station or indirectly with a Vehicle via a Central ITS Station

4.21**TPG Human Machine Interface (HMI)**

Human Machine Interface as part of the TPG for data exchange and validation, and display required to perform the filling process

4.22**operator**

human person in charge of inflating/verifying process can be driver or professional worker

4.23**vehicle ITS Station**

establishes wireless communication between the vehicle to TPG ITS station and/or RSU ITS station

5 Symbols and abbreviations (standards.iteh.ai)

DOT	US Department of Transportation
ECU	Electronic Control Unit
ENM	Enumerated
FL	Front Left
FR	Front Right
FS	Full Scale
HMI	Human Machine Interface
ITS	Intelligent Transport System
RF	Radio Frequency
RL	Rear Left
RR	Rear Right
RSU	Road Side Unit
TIN	Tyre Identification Number (often called DOT)
TIS	Tyre Information System
TPG	Tyre Pressure Gauge (see also new definition under 4.1)
TPMS	Tyre Pressure Monitoring System
V2I/I2V	Vehicle to Infrastructure/Infrastructure to Vehicle
WFC	Wheel Fitted Component

6 Requirements

6.1 Levels of interoperability

Depending on the level of equipped components and the availability of data, the following modes are possible:

- 1) Fully automatic mode: parameters from Table 1, Table 2 and Table 3 which are necessary for the correct determination of the p_{proposed} are provided by TIS or TPG, and are confirmed by the operator.
- 2) Semi-automatic mode: part of the parameters from Table 1, Table 2 and Table 3 which are necessary for the correct determination of the p_{proposed} are provided by TIS or TPG, and are confirmed by the operator.
- 3) Manual mode: operator identifies and applies the intended pressures (fully manual).

Independent which mode is utilized, a final confirmation by the operator of the p_{proposed} related to the intended vehicle service condition is required prior to any filling process.

6.2 Required parameters provided by TIS, depending on level of interoperability

6.2.1 General

The requirements listed in the following clauses are associated to 1) and 2) defined in 6.1. All communication requirements for interoperability are covered in ETSI DTS 101 556-2.

Independent on level of interoperability as defined in 1) and 2) of 6.1, the following data shall be provided:

- basic parameter (see Table 1);
- placard table information (see Table 2).

The TPG provides a menu based on the data required to perform the filling process. The operator uses the TPG according to the intended vehicle service condition.

Details on the format and content of all parameters defined in the following clauses are described in Annex A and Annex B.