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Road vehicles — Vehicle interface for electronic Periodic Technical Inspection (ePTI) —

Part 3:
Data definitions

Véhicules routiers — Interface de véhicule pour le contrôle technique périodique électronique (ePTI) —

Partie 3: Définition des données

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 31, *Data communication*.

A list of all parts in the ISO 20730 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Roadworthiness testing is a part of a wider regime designed to ensure that vehicles are kept in a safe and environmentally acceptable condition during their use. This regime covers periodic roadworthiness testing of vehicles and technical roadside inspections of vehicles used for commercial road transport activities and provides a vehicle registration procedure allowing for the suspension of a vehicle's authorization to be used in road traffic where the vehicle constitutes an immediate risk to road safety. Periodic testing is the main tool to ensure roadworthiness. Technical roadside inspections of commercial vehicles are merely complementary to periodic testing.

An ePTI system list, which is defined in this document, summarizes ePTI-relevant systems and specifies a defined name (system), a unique identifier (ePTI system identifier) and a description for each ePTI system. All the definitions in this document refer to this ePTI system list.

The ISO 20730 series is based on the Open Systems Interconnection (OSI) basic reference model specified in ISO/IEC 7498-1[1] and ISO/IEC 10731,[3] which structures communication systems into seven layers. When mapped on this model, the application protocol and data link framework requirements specified/ referenced in the ISO 20730 series are structured according to Figure 1.

Figure 1 illustrates a standard-based documentation concept, which consists of the following main clusters:

— vehicle diagnostic communication framework: covers all relevant basic vehicle diagnostic communication specifications of OSI layers 7, 6, and 5;

— vehicle diagnostic communication use case framework: covers the master specification, which specifies use cases und requirements of subject matter of OSI layer 7;

— presentation layer framework: covers all data relevant specifications of OSI layer 6;

— conformance test plan: covers the conformance test plan requirements of the use cases and communication requirements of OSI layers 7, 6, and 5;

— lower OSI layer framework: covers all vehicle diagnostic protocol standards of OSI layers 4, 3, 2, and 1, which are relevant and referenced by the use case specific standard.
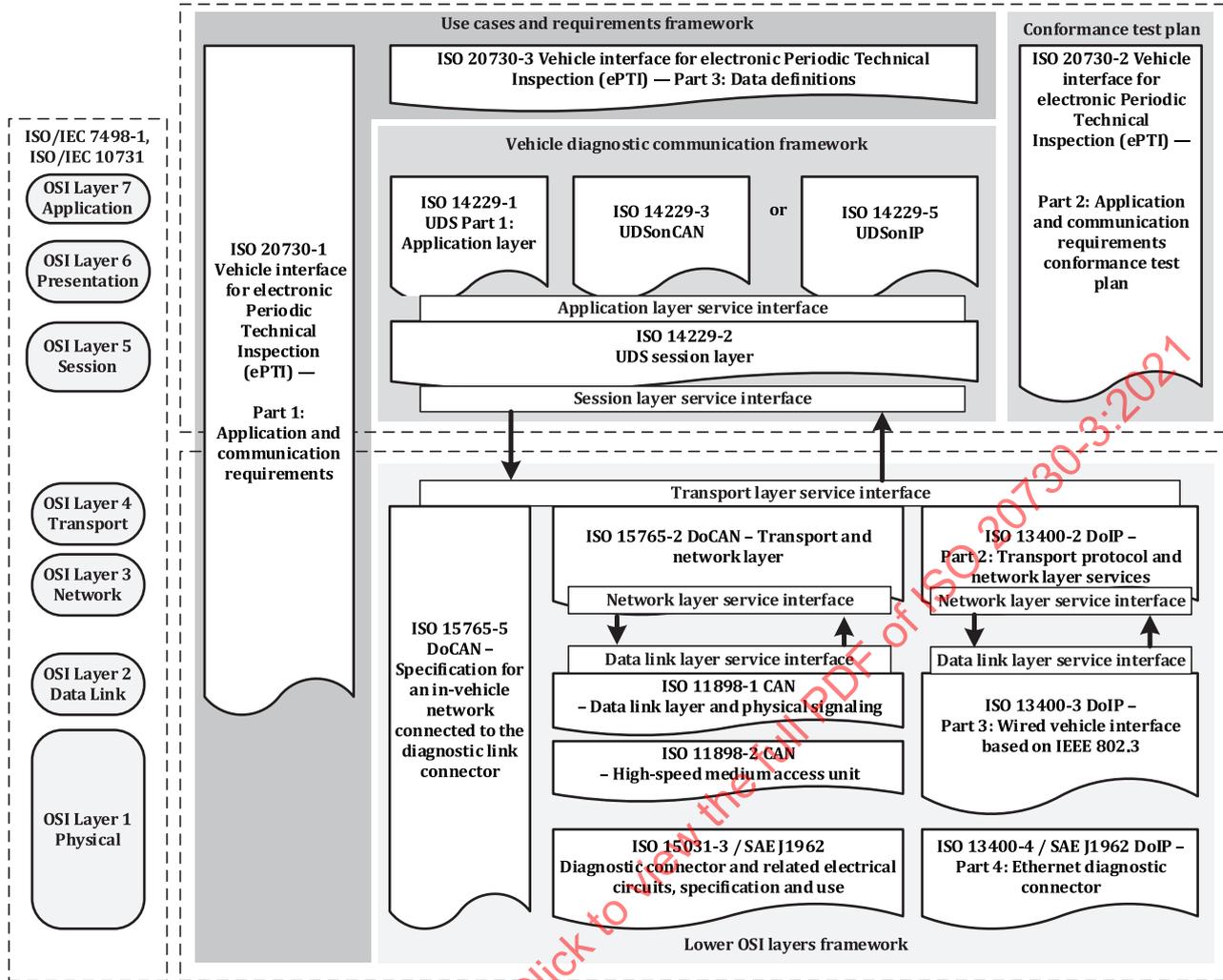
Figure 1 — ePTI document reference according to OSI model

Road vehicles — Vehicle interface for electronic Periodic Technical Inspection (ePTI) —

Part 3:
Data definitions

1 Scope

This document specifies ePTI-relevant system identifiers, data identifiers, routine identifiers, input/output control identifiers, data types, CompuMethods (computations), and units.

This document describes ePTI systems' data definitions and associated technical requirements. The technical requirements of data definitions of emissions-related systems are specified in other standards, e.g. the ISO 15031 series[4], the ISO 27145 series[5], and SAE J1979DA.

The ePTI system list defined in this document summarizes ePTI-relevant systems and specifies a defined name (system), a unique identifier (ePTI system identifier) and a description for each ePTI-relevant system.

This document does not specify any type of test method or pass/fail criteria of the ePTI-relevant system during a PTI.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3779, *Road vehicles — Vehicle identification number (VIN) — Content and structure*

ISO 14229-1, *Road vehicles — Unified diagnostic services (UDS) — Part 1: Application layer*

ISO 20730-1, *Road vehicles — Vehicle interface for electronic Periodic Technical Inspection (ePTI) — Part 1: Application and communication requirements*

SAE J1979DA, *Digital Annex of E/E Diagnostic Test Modes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14229-1, ISO 20730-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
error
indicates an erroneous status

3.2
currently not available
information cannot be reported at time of request

3.3
not installed
information cannot be reported because the source is physically not available

4 Symbols and abbreviated terms

4.1 Symbols

---   empty table cell or feature undefined

4.2 Abbreviated terms

Cvt   convention

DID   data identifier

IOID   input output identifier

IOCT   input output control

LSB   least significant byte

M   mandatory

MI   malfunction indicator

MSB   most significant byte

O   optional

RCTP   routineControlType

RCOR   routineControlOptionRecord

RID   routine identifier

SPN   suspect parameter number

TP   tyre pressure

U   user optional

5 Informative guidance for considering ePTI relevance

ePTI-relevant systems are all vehicle systems and components, that when not operating to their design criteria, affect the safety of the vehicle. These are vehicle systems that perform at least one of the following functions:

a) deceleration of the vehicle;

b) longitudinal, lateral and yaw stabilization of vehicle movements;

c) hold the vehicle stationary;

d) change of angle >3° on any steered wheel, while vehicle speed is ≥15 km/h;

e) adjustment of the intensity and/or direction of the road illumination;

f) change of the signal image of the vehicle lighting devices, while vehicle speed is ≥15 km/h;

g) protecting the survival space of road users;

h) adjustment of the behaviour of the suspension and shock absorbers;

i) monitoring and control of tyre air pressure;

j) adjustment of the aerodynamic devices;

k) high voltage electrical propulsion ≥60 V;

l) changes in visibility;

m) hazard warning and emergency related communication;

n) generation of external warning for, e.g. pedestrian attention in regard to electric vehicle;

o) adjustment of the vehicle height or tilt;

p) automatically controlled acceleration.

The criteria and definition should be updated as technology progresses.

EXAMPLE   The "automatic emergency brake" vehicle system can perform the "deceleration" function and is therefore an ePTI-relevant vehicle system.

6   ePTI-relevant system list, DIDs and RIDs

The ePTI-relevant system list shall be in accordance with Annex A. The status of Annex A is normative.

The DID definitions shall be in accordance with Annex B. The status of Annex B is normative.

The RID definitions shall be in accordance with Annex C. The status of Annex C is normative.

The templates for identifier definitions shall be in accordance with Annex D. The status of Annex D is normative.

Annex A
(normative)

ePTI-relevant system list

The ePTI-relevant systems are identified based on the functional criteria in Clause 5. Table A.1 specifies ePTI-relevantSystemIdentifier, ePTI-relevant system name, symbolic name and ePTI system description. The symbolic names provide the possibility , for example, to make a unique reference to diagnostic description information in case a diagnostic service is not yet implemented using the ePTI-relevantSystemIdentifier as specified in this document. Symbolic names use the character set ISO 8859-1[2] in the range of 30_{16} to 39_{16} (0, 1, ... 9), 41_{16} to $5A_{16}$ (A, B, ... Z), and $5F_{16}$ (_).

Table A.1 — Definition of ePTI-relevant system identifiers and names

ePTISystem-Identifier	ePTI-relevant system name	Symbolic name	ePTI system description
0000_{16}	Reserved	RESRVD	Reserved by this document for future standardization.
0001_{16}	Generic ePTI information	SYS_GENERIC_INFO	This "virtual" (non-safety) system can be used to report standardized information as specified in this document, e.g. VIN or the mileage of the vehicle, which may not be supported by any of the other systems in this system list. This system is conditional. It is mandatory if standardized information, as specified in this document, is not provided by any of the other systems in this system list.
0002_{16}	Cornering light	SYS_CORN_LI	During cornering, an extra headlamp is activated. Operates up to 40 km/h, e.g. in accordance with ECE-R 48[21]; ECE-R 119[31].
0003_{16}	Adaptive cruise control	SYS_ADP_CRUISE_CTRL	The system maintains the vehicle's speed, depending on the preferred speed and distance to the vehicle in front.
0004_{16}	Adaptive deflectors	SYS_ADP_DEFLECTOR	Depending on the vehicle's speed, the air deflectors are adjusted in order to improve driving stability.
0005_{16}	Airbag	SYS_AIRBAG	In case of an accident, inflatable airbags reduce the risk of injury by their absorbing effect, e.g. in accordance with ECE-R 12[13]; ECE-R 14[15]; ECE-R 16[16].
0006_{16}	Active headrest	SYS_ACT_HEADREST	The system reduces the danger of a whiplash injury in the event of a rear end collision by changing the position of the headrest towards the head.
0007_{16}	Active hood	SYS_ACT_HOOD	By automatically lifting the bonnet, the system ensures a larger collapsible zone in the event of an accident involving a pedestrian.
0008_{16}	Automatic hold function	SYS_AUTO_HOLD_FCT	The system independently holds the vehicle after stopping using the service brake and/or parking brake and automatically releases them when starting.
NOTE The mentioned UN/ECE regulations are solely stated to clarify and/or help to understand each ePTI-relevant system.			

Table A.1 *(continued)*

ePTISys-tem-Identi-fier	ePTI-relevant system name	Symbolic name	ePTI system description
0009_{16}	Automatic head-lamp levelling	SYS_AUTO_HL_LEVEL	Depending on the load and (optional) pitch angle, the system regulates the headlamp's vertical aim, e.g. in accordance with ECE-R 121[32].
$000A_{16}$	Automatic emergency brake	SYS_AUTO_EM_BRAKE	The system independently starts braking in order to avoid a collision with an obstacle or to reduce the consequences of an inevitable impact.
$000B_{16}$	Anti-lock brake	SYS_ANTI_L_BRAKE	The system automatically prevents wheel-locking during braking by selective reduction of the wheel brake force, e.g. in accordance with ECE-R 13[14]; 71/320/EEC.
$000C_{16}$	Automatic light	SYS_AUTO_LI	Depending on the ambient brightness, the system automatically switches on and off the driving light.
$000D_{16}$	Electric drive	SYS_ELEC_DRIVE	Includes all propulsion systems which can propel the vehicle using electrical power, e.g. in accordance with ECE-R 100[29].
$000E_{16}$	Electro mechanic power steering	SYS_ELEC_MECH_PWR_STER	The supporting power for steering is generated by an electric motor.
$000F_{16}$	Electronic four-wheel steering	SYS_ELEC_4_W_STER	Two axles are steered, with a steering angle greater than 3° on all steered wheels, e.g. in accordance with ECE-R 79[22]; ECE-R 83[23]; 70/311/EEC[35].
0010_{16}	Electronic damping	SYS_ELEC_DAMP	Depending on the driving situation, the rebound and compression stage of the shock absorbers is adjusted by the system.
0011_{16}	Electronic brake system	SYS_ELEC_BRAKE	A brake pedal sensor and/or pressure sensor records the braking request and calculates the optimal brake force for each wheel, so that there is optimal activation of all wheel brakes.
0012_{16}	Electronic stability program	SYS_ ELEC_STAB_PRG	The system stabilizes the vehicle or the complete vehicle train in critical, dynamic driving situations, e.g. in accordance with Regulation (EC) No. 661/2009[9].
0013_{16}	High beam assist	SYS_HIGH_BEAM_AST	The system automatically activates and deactivates the high beam according to the driving situation and lighting conditions.
0014_{16}	Speed limiter	SYS_SPEED_LIM	While driving, the system prevents exceeding a defined maximum speed. Relevant, if mandatory, e.g. in accordance with ECE-R 89[25]; §57c German Road Traffic Act[39]; 92/24/EEC[38].
0015_{16}	Belt tensioner and belt force limiter	SYS_TENS_BELT_LIM	In the event of an accident, the seat belt is tensioned to place the passengers in a setpoint position and/or limits the belt force, electrically controlled and, thus, limits the forces acting on the persons e.g. in accordance with ECE-R 16[16]; ECE-R 94[27].
0016_{16}	Tail light switching	SYS_TAIL_LI	Depending on operating status and/or failure of the illuminants, lighting functions are taken over by other luminaires.
0017_{16}	Reserved	RESRVD	Reserved by this document for future standardization.
NOTE The mentioned UN/ECE regulations are solely stated to clarify and/or help to understand each ePTI-relevant system.			

Table A.1 *(continued)*

ePTISys-tem-Identifier	ePTI-relevant system name	Symbolic name	ePTI system description
0018_{16}	Bending light	SYS_BEND_LI	During cornering and depending on the steering angle and speed, the light beam is swivelled and/or an additional headlight is activated, e.g. in accordance with ECE-R 48[21]; ECE-R 98[28]; ECE-R 112[30]; ECE-R 123[33].
0019_{16}	Steering assist	SYS_STER_AST	Depending on the driving situation, the steering angle is automatically changed, without intervention by the driver. Relevant if the steering intervention occurs at a speed of more than 15 km/h, e.g. in accordance with ECE-R 79[22].
$001A_{16}$	Height levelling	SYS_HEIGHT_LEVEL	The system changes the clearance between vehicle chassis and the road.
$001B_{16}$	Emergency braking signal	SYS_EM_BRAKE_SIG	During strong deceleration, hazard warning lights and/or additional luminous surfaces are activated and/or the following traffic is warned by flashing brake lights, e.g. in accordance with ECE-R 48[21]; ECE-R 13[14].
$001C_{16}$	Pre-crash system	SYS_PRE_CRASH	In a critical driving situation, the vehicle is prepared for the crash so that the risk of injury to the passengers and/or other road users is reduced.
$001D_{16}$	Tyre pressure warning	SYS_TYRE_PRES_WAR	The system detects loss of tyre pressure through integrated sensors and/or by implausible values for wheel speed, e.g. in accordance with Regulation (EC) No. 661/2009[9].
$001E_{16}$	Traction control	SYS_TRACT_CTRL	The system prevents the drive wheels spinning during acceleration by applying brake force.
$001F_{16}$	Superimposed steering	SYS_SU_IMP_STER	Depending on the driving situation, the system varies the transmission ratio of the steering.
0020_{16}	Roll over protection (active)	SYS_ACT_R_O_PROTECT	In the event of an imminent rollover, support elements are extended to secure the survival space, e.g. in accordance with 74/60/EEC[37].
0021_{16}	Hydrogen installation	SYS_HYD_INST	The hydrogen is stored in the vehicle and is used to propel the vehicle, either by combustion in an internal combustion engine or by conversion in a fuel cell with an additional electric engine.
0022_{16}	Start-up aid	SYS_START_UP_AID	Aids start-up, e.g. by raising the lift axle or by momentarily applying brake pressure or by automatic release of the parking brake.
0023_{16}	Trailer stabilization	SYS_TRAILER_STAB	Through selective braking of the trailer by the service brakes, the complete vehicle train is stabilized.
0024_{16}	Endurance brake	SYS_END_BRAKE	Is an additional braking system that can maintain braking over a period of time without a significant reduction in performance, e.g. in accordance with ECE-R 13[14]; 71/320/EEC[36]; 92/24/EEC[38].
0025_{16}	Differential lock deactivation	SYS_DIF_LOCK_DACT	If this system is activated, the differential locks are unlocked depending on parameters (e.g. wheel slip, steering angle, speed).

NOTE   The mentioned UN/ECE regulations are solely stated to clarify and/or help to understand each ePTI-relevant system.

Table A.1 *(continued)*

ePTISys-tem-Identi-fier	ePTI-relevant system name	Symbolic name	ePTI system description
0026_{16}	Electronically controlled leading and trailing axle	SYS_ELEC_CTRL_LT_AX	The steered axles are additional axles with electronically controlled steering. The steering force is generated by a hydraulic pump or by the lateral force on the wheels.
0027_{16}	Electronic steering damper	SYS_ELEC_STER_DAMP	Steering damping is controlled electronically.
0028_{16}	Bus stop brake	SYS_BUS_STOP_BRAKE	The system ensures the application of brake pressure when stationary, independent of the brake pedal activation. Buses can only start moving when the doors are closed.
0029_{16}	Kneeling	SYS_KNEELING	The system allows a road vehicle to be lowered to make it easier for passengers to board and disembark.
$002A_{16}$	Steering brake	SYS_STER_BRAKE	During cornering, dosed braking is applied to one or more wheels.
$002B_{16}$	Tyre pressure control	SYS_TYRE_PRE_CTRL	According to the requirement of the driver, the system regulates the tyre pressure.
$002C_{16}$	Sliding joint stabilization	SYS_SLID_J_STAB	The articulated joint is stabilized by damping, dependent on vehicle speed, cylinder pressure of the articulated dampers, steering and articulation-angle.
$002D_{16}$	Reserved	RESRVD	Reserved by this document for future standardization.
$002E_{16}$	Four-wheel parking brake	SYS_4_W_PARK_BRAKE	The system applies the maximum brake pressure in the wheel cylinders at all four wheels.
$002F_{16}$	Front-wheel locking device	SYS_FRONT_W_LOCK	Front wheel suspension, which permits lateral inclination of the motorbike, can be locked and unlocked by an electric actuator. Above a certain speed, it is automatically unlocked.
0030_{16}	Adaptive headlights	SYS_ADAP_HEAD_LI	The illumination of the surrounding road area and/or the direct illumination of road users in the danger area in front of the vehicle is optimized by dynamic adaption of the light beams.
0031_{16}	Electrically-actuated parking brake	SYS_ELEC_PARK_BRAKE	The parking brake function is triggered or transmitted electronically or electromechanically.
0032_{16}	Lane change assist	SYS_LANE_CH_AST	At a lane change, the system warns the driver about vehicles in the next lane and steers the vehicle back.
0033_{16}	Lane keep assist	SYS_LANE_KEEP_AST	The system warns the driver when the vehicle is unintentionally leaving its lane and steers the vehicle back.
0034_{16}	Automatic eCall	SYS_AUTO_ECALL	The system is triggered automatically by in-vehicle sensors or manually, it transmits a minimum set of data (EN 15722) via mobile communication network and establishes an audio connection based on the (emergency) number between the vehicle passengers and the public safety answering point, see Regulation (EU) 2015/758[10].
NOTE The mentioned UN/ECE regulations are solely stated to clarify and/or help to understand each ePTI-relevant system.				

Table A.1 *(continued)*

ePTISys-tem-Identi-fier	ePTI-relevant system name	Symbolic name	ePTI system description
0035_{16}	Active roll stabi-lization	SYS_ACT_ROLL_STAB	Via appropriate actuators the system produces a roll moment which encounters the vehicle roll movement depending on the current driving situation.
0036_{16}	Camera monitor	SYS_CAM_MONITOR	The system which generates at least a part of the indirect field of vision by a camera monitor combination (e.g. in accordance with ECE-R 46[20]).
0037_{16}	Acoustic vehicle alerting	SYS_ACO_VE_ALERTING	At low speed, the system generates an external, specific sound in order to warn, e.g. pedestrians.
0038_{16}	Basic exterior lights	SYS_ EXTER_LI	The system switches on/switches off the basic lighting devices (e.g. indicators).
0039_{16}	Automated lane keeping system (ALKS)	SYS_AUTO_LANE_KEEP	A system which is activated by the driver and which keeps the vehicle within its lane by controlling the lateral and longitudinal movements of the vehicle for extended periods without the need for further driver input.
$003A_{16}$	Turning assis-tant	SYS_TURN_ASSIST	A system to inform the driver of a possible collision with a traffic participant (e.g. bicycle) near side (e.g. in accordance with ECE-R 151[34]).
$003B_{16}$	Tachograph	SYS_TACHOGRAPH	A system to record the driving time, breaks, rest periods as well as periods of other work undertaken by a driver, for example, required by Regulation (EU) No 165/2014[8].
$003C_{16}$ to $EFFF_{16}$	Reserved	RESRVD	Reserved by this document for future standardization.
$F000_{16}$ to $FFFE_{16}$	Reserved for vehicle manufac-turer use	RESRVD_VM	Reserved for vehicle manufacturer use.
$FFFF_{16}$	Reserved	RESRVD	Reserved by this document, not available for ePTI system identifier assignment.
NOTE The mentioned UN/ECE regulations are solely stated to clarify and/or help to understand each ePTI-relevant system.			

Annex B
(normative)

DID definitions

B.1 Definition of DIDs and names

Table B.1 specifies the DID #, DID name, symbolic name, and definition. The symbolic names provide the possibility, e.g. to make a unique reference to diagnostic description information in case a diagnostic service is not yet implemented using the DIDs and computation methods specified in this document. Symbolic names use the character set ISO 8859-1[2] in the range of 30_{16} to 39_{16} (0, 1, ... 9), 41_{16} to $5A_{16}$ (A, B, ... Z), and $5F_{16}$ (_).

REQ	7.1 Definition of DIDs and names
DID implementation in ePTI-relevant ECU(s) shall be in accordance with Table B.1.	

The accuracy of the sensor values identified by the DID might have a different resolution as specified in this document.

Table B.1 — Definition of DIDs and names

DID #	DID name	Symbolic name	Definition	Cvt[a]
$FA19_{16}$	ISO edition number	DID_ISO_ED_NUM	Description, definition and requirements are specified in B.3.	M
$FA20_{16}$	Supported ePTI data identifiers	DID_SUPP_DID	DIDs are specified in this table.	M
$FA21_{16}$	Supported ePTI systems	DID_SUPP_SYS	Description, definition and requirements for the ePTISystem identifiers are specified in B.4 and Annex A.	M
$FA22_{16}$	Supported ePTI routine identifiers	DID_SUPP_RID	Routine identifiers are specified in Annex C.	M
$FA23_{16}$	Supported ePTI input/output control identifiers	DID_SUPP_IOCT_DID	Input/output identifiers are specified in Annex D.	M
$FA24_{16}$	ePTI system status	DID_SYS_STATUS	Description, definition and requirements are specified in B.10.	M
$FA25_{16}$	Seat belt buckle	DID_SEAT_BELT_BUC	Description, definition and requirements are specified in B.11.	O
$FA26_{16}$	Hydraulic brake pressure	DID_HYD_BRK	Description, definition and requirements are specified in B.12.	O
$FA27_{16}$	Air brake pressure	DID_AIR_BRK	Description, definition and requirements are specified in B.13.	O
$FA28_{16}$	Tyre pressure	DID_TYRE_PRESS	Description, definition and requirements are specified in B.14.	O
$FA29_{16}$	Wheel speed	DID_WHEEL_SPD	Description, definition and requirements are specified in B.15.	O
$FA2A_{16}$	Dynamic driving values	DID_DYN_DRIVING	Description, definition and requirements of are specified in B.16.	O
[a] See ISO 20730-1, BP7 for the condition of implementation.				

Table B.1 *(continued)*

DID #	DID name	Symbolic name	Definition	Cvt[a]
FA2B$_{16}$	Steering wheel angle	DID_STEER_WHEEL_ ANGLE	Description, definition and requirements are specified in B.17.	O
FA2C$_{16}$ to FACF$_{16}$	Reserved	RESRVD	Reserved by this document.	M
[a] See ISO 20730-1, BP7 for the condition of implementation.				

B.2   DIDs defined in other standards

Table B.2 defines DIDs and names, which are specified in other standards.

REQ	7.2 DIDs defined in other standards
Table B.2 specifies DIDs defined in other standards for ePTI-relevant systems, which shall be supported if implemented.	

Table B.2 — DIDs defined in other standards

DID #	DID name	Symbolic name	Definition	Cvt[a]
F18F$_{16}$	Regulation 'X' software identification number	DID_RxSWIN	Description, definition and requirements are specified in B.9.	O
F190$_{16}$	Vehicle identification number	DID_VIN	Description, definition and requirements are specified in B.5.	M
F4A6$_{16}$	Vehicle odometer	DID_ODO	Description, definition and requirements are specified in B.6.	M
F40D$_{16}$	Vehicle speed sensor	DID_VSS	Description, definition and requirements are specified in B.7.	O
F442$_{16}$	Control module voltage	DID_CMV	Description, definition and requirements are specified in B.8.	O
[a] See ISO 20730-1, BP7 for the condition of implementation.				

B.3   ISO edition number

B.3.1   Description

This parameter provides the vehicle's supported version number of ISO 20730-1 and this document (ISO 20730-3).

B.3.2   ISO edition number attributes

REQ	7.3 ISO edition number – Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.3.	

Table B.3 — ISO edition number attributes

Attribute	Value
Byte position	4: ISO edition number of ISO 20730-1
	5: ISO edition number of ISO 20730-3
Data length	8 bit
Data type	unsigned numeric

Table B.3 *(continued)*

Attribute	Value
Data range	00_{16}: reserved
	01_{16} to FA_{16}: valid range of ISO edition number
	FB_{16}: reserved
	FC_{16}: error or currently not available
	FD_{16}: not installed
	FE_{16} to FF_{16}: reserved
Type	stored value

B.3.3 ISO edition number example

Table B.4 specifies the ISO edition number example.

Table B.4 — ISO edition number example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA19_{16}$	DID = ISO edition number
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA19_{16}$	DID = ISO edition number
	dataRecord = [
01_{16}	ISO edition number of ISO 20730-1: 1
02_{16}	ISO edition number of ISO 20730-3: 2

B.4 ePTI system identifier

B.4.1 Description

This parameter provides a unique identifier for an ePTI-relevant system. The ePTI system identifier values are standardized by this document.

B.4.2 ePTI system identifier attributes

REQ	7.4 ePTI system identifier - Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.5.	

Table B.5 — ePTI system identifier attributes

Attribute	Value
Byte position	4 (MSB of first ePTI system identifier)
Data length	16 bit per system
Data type	enumeration
Data range	0000_{16} to $FFFF_{16}$, see Annex A
Type	predefined values

B.5 Vehicle identification number

B.5.1 Description

This parameter provides the vehicle identification number.

B.5.2 Vehicle identification number attributes

REQ	7.5 Vehicle identification number - Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with ISO 14229-1 and ISO 3779.	

B.6 Vehicle odometer

B.6.1 Description

This parameter provides the odometer reading of a vehicle.

B.6.2 Vehicle odometer attributes

REQ	7.6 Vehicle odometer - Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with SAE J1979DA.	

B.7 Vehicle speed sensor

B.7.1 Description

This parameter provides the vehicle speed.

B.7.2 Vehicle speed sensor attributes

REQ	7.7 Vehicle speed sensor - Parameter attributes
If the ePTI-relevant ECU supports this DID the implementation shall be in accordance with SAE J1979DA.	

B.8 Control module voltage

B.8.1 Description

This parameter provides the control module voltage.

B.8.2 Control Module Voltage attributes

REQ	7.8 Control module voltage - Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with SAE J1979DA.	

B.9 Regulation 'X' software identification number

B.9.1 Description

This parameter provides the regulation 'X' software identification number(s) (RxSWIN).

B.9.2 RxSWIN attributes

REQ	7.9 Regulation 'X' software identification number - Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with ISO 14229-1.	

B.10 ePTI system status

B.10.1 Description

This parameter provides the status of an ePTI-relevant system.

B.10.2 ePTI system status attributes

REQ	7.10 ePTI system status - Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.6.	

Table B.6 — ePTI system status attributes

Attribute	Value
Byte position	6 (ePTI system status of first system)
Data length	8 bit per system
Data type	enumeration
Data range	00_{16} to 01_{16}: valid range of ePTI system status
	00_{16}: no system error detected, system self-test completed
	01_{16}: system error detected, system self-test completed
	02_{16} to FB_{16}: reserved
	FC_{16}: error or currently not available[a]
	FD_{16}: not installed[b]
	FE_{16} to FF_{16}: reserved
Type	measured value

[a] This status is also reported when the system self-test is not completed.

[b] This status is defined for consistency purposes only with all other status definitions in this document.

B.11 Seat belt buckle

B.11.1 Description

This parameter provides the status of each seat belt buckle.

B.11.2 Seat positions and configurations

Figure B.1 shows the supported seat configurations (top view) and the respective seat positions. Each physical seat position and configuration is mapped to a logical seat position and configuration which is reported by the seat belt buckle positive response message parameters. Each logical seat position is specified by a coordinate system with row index and column index. Position "11" is the left seat in the first row to driving direction, also if a single seat is in the first row regardless of the seat position and steering wheel position. The column index of the seat belt buckle continuously increases for the next fitted seat. The row index of the seat belt buckle equals the seat row. For a double decker bus the seats of the 2nd level continue from the last row index of lower level.
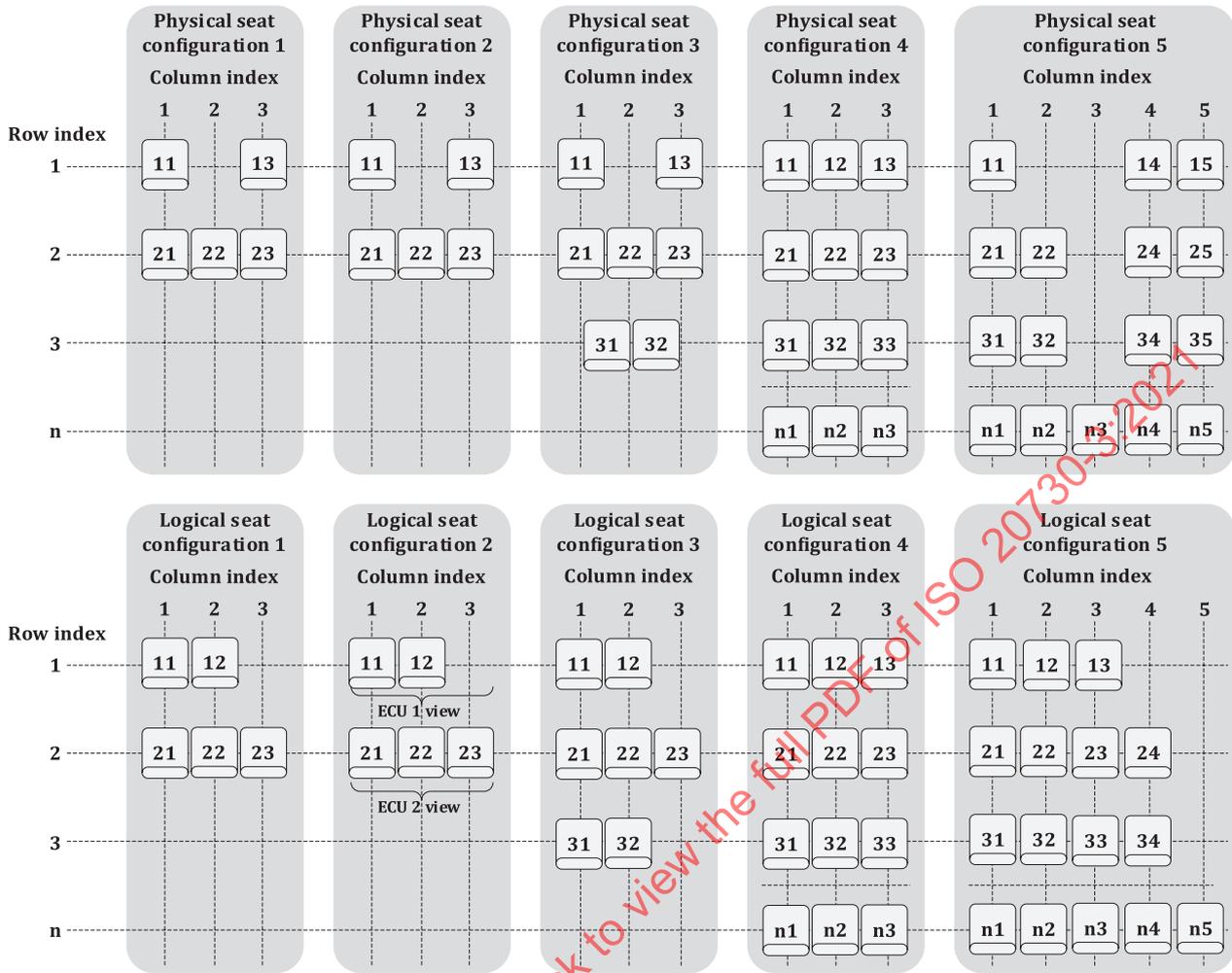
Figure B.1 — Seat positions and configurations

B.11.3 Seat belt buckle attributes

REQ	7.11 Seats per row – Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.7.	

Table B.7 — Seats per row attributes

Attribute	Value
Byte position	4
Data length	8 bit
Data type	unsigned numeric
Data range	00_{16} = reserved
	01_{16} to FA_{16} = valid range of maximum number of seats per row
	FB_{16}: reserved
	FC_{16}: error or currently not available
	FD_{16}: not installed
	FE_{16} to FF_{16}: reserved

Table B.7 *(continued)*

Attribute	Value
Data conversion	see Formula (B.1)
Type	stored value

$$N_{\text{SeatsPerRow}} = S_{\text{Row\_Raw}} \tag{B.1}$$

where

$S_{\text{Row\_Raw}}$ is the raw value of seats per row;

$N_{\text{SeatsPerRow}}$ is the number of seats per row.

REQ	7.12 Seat belt buckle – Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.8.	

If a seat is not assembled in the vehicle, the parameter value for seat belt buckle of this seat position may be set to FD_{16} (not installed).

Table B.8 — Seat belt buckle attributes

Attribute	Value
Byte position	5 (value of the most left seat belt buckle in first row)
Data length	8 bit per seat
Data type	enumeration

Data range	00_{16} to 01_{16}: valid range of seat belt buckle
	    00_{16} = not buckled
	    01_{16} = buckled
	02_{16} to FB_{16}: reserved
	FC_{16}: error or currently not available
	FD_{16}: not installed
	FE_{16} to FF_{16}: reserved

Type	measured value

REQ	7.13 Seat belt buckle – Total length of data record
The total length of the data record in the positive response message shall not exceed 100 data bytes.	

B.11.4 Seat belt buckle – 5-seater single ECU example

Figure B.2 shows an example of the seat belt buckle from a 5-seater single ECU.

Figure B.2 — Seat belt buckle – 5-seater single ECU example

Table B.9 specifies the seat belt buckle from an example of a 5-seater single ECU, based on Figure B.2.

Table B.9 — Seat belt buckle – 5-seater single ECU example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA25_{16}$	DID = Seat belt buckle
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA25_{16}$	DID = Seat belt buckle
03_{16}	Seats per row: 3
	dataRecord = [
01_{16}	Seat belt buckle position 11 = buckled
00_{16}	Seat belt buckle position 12 = not buckled
FD_{16}	Seat belt buckle position 13 = not installed
01_{16}	Seat belt buckle position 21 = buckled
00_{16}	Seat belt buckle position 22 = not buckled
00_{16}	Seat belt buckle position 23 = not buckled]

B.11.5 Seat belt buckle – 5-seater dual ECU example

Figure B.3 shows an example of the seat belt buckle from a 5-seater dual ECU.

Key

a   Primary row index 1 and 2 and column index 1, 2, and 3 are covered by ECU #1.

b   Secondary row index 1 and 2 and column index 1, 2, and 3 are covered by ECU #2.

    buckled

    not buckled

    not installed

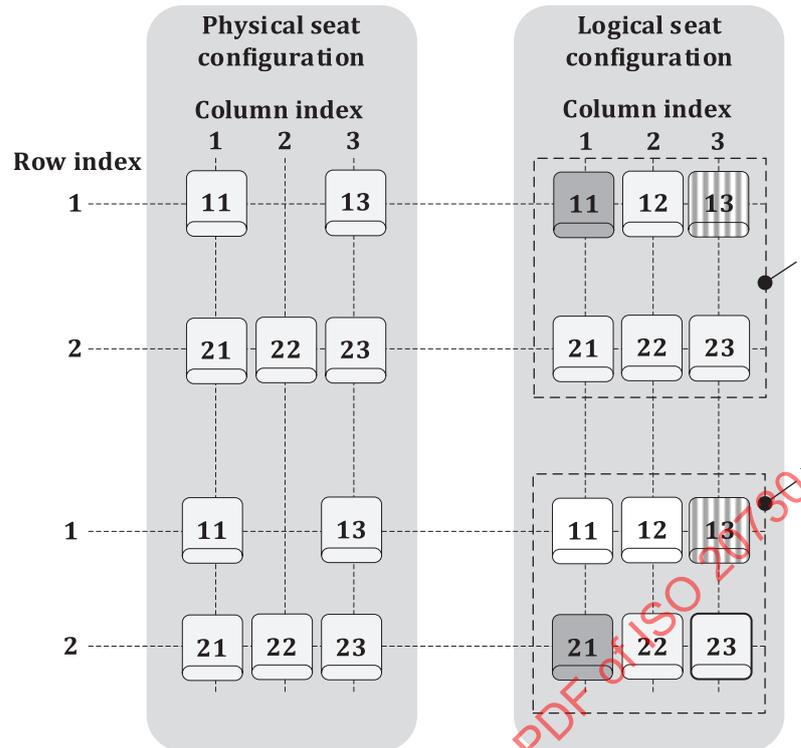**Figure B.3 — Seat belt buckle – 5-seater dual ECU example**

Table B.10 specifies the seat belt buckle from an example of a 5-seater response from ECU 1, based on Figure B.3.

Table B.10 — Seat belt buckle – 5-seater response from ECU 1 example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA25_{16}$	DID = Seat belt buckle
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA25_{16}$	DID = Seat belt buckle
03_{16}	Seats per row: 3
	dataRecord = [
01_{16}	Seat belt buckle position 11 = buckled
00_{16}	Seat belt buckle position 12 = not buckled
FD_{16}	Seat belt buckle position 13 = not installed
00_{16}	Seat belt buckle position 21 = not buckled
00_{16}	Seat belt buckle position 22 = not buckled
00_{16}	Seat belt buckle position 23 = not buckled]

Table B.11 specifies the seat belt buckle from an example of a 5-seater response from ECU 2, based on Figure B.3.

Table B.11 — Seat belt buckle – 5-seater response from ECU 2 example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA25_{16}$	DID = Seat belt buckle
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA25_{16}$	DID = Seat belt buckle
03_{16}	Seats per row: 3
	dataRecord = [
00_{16}	Seat belt buckle position 11 = not buckled
00_{16}	Seat belt buckle position 12 = not buckled
FD_{16}	Seat belt buckle position 13 = not installed
01_{16}	Seat belt buckle position 21 = buckled
00_{16}	Seat belt buckle position 22 = not buckled
00_{16}	Seat belt buckle position 23 = not buckled]

B.11.6 Seat belt buckle – 7-seater single ECU example

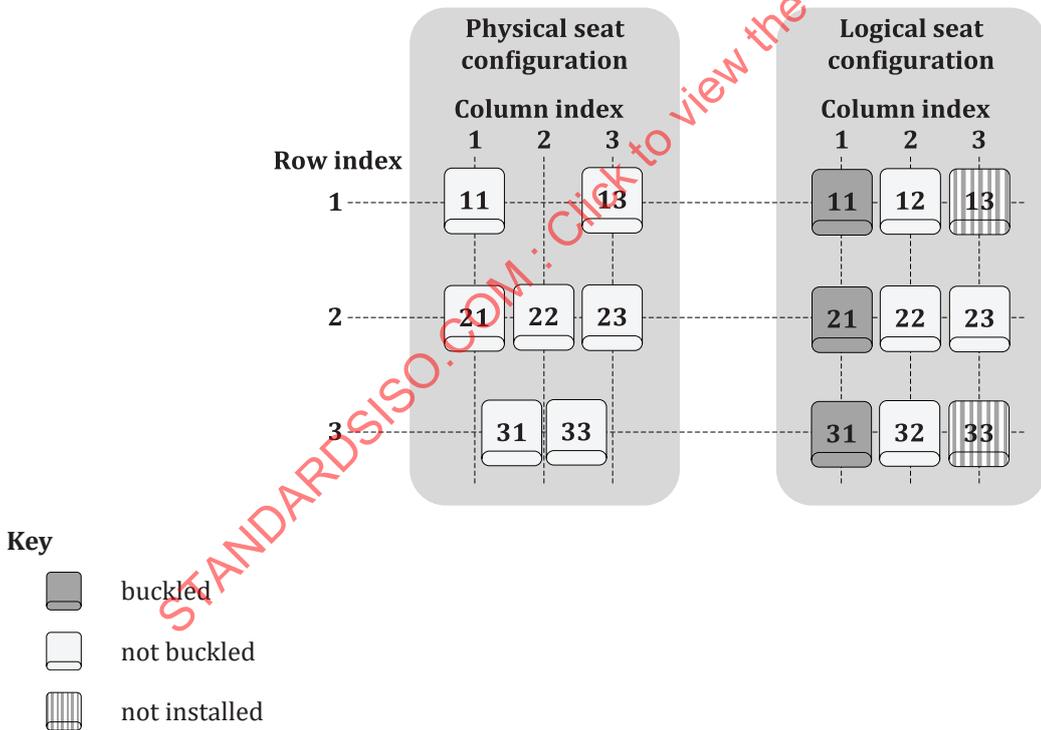Figure B.4 shows an example of the seat belt buckle from a 7-seater single ECU.

Figure B.4 — Seat belt buckle – 7-seater single ECU example

Table B.12 specifies the seat belt buckle from an example of a 7-seater single ECU, based on Figure B.4.

Table B.12 — Seat belt buckle – 7-seater single ECU example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA25_{16}$	DID = Seat belt buckle
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA25_{16}$	DID = Seat belt buckle
03_{16}	Seats per row: 3
	dataRecord = [
01_{16}	Seat belt buckle position 11 = buckled
00_{16}	Seat belt buckle position 12 = not buckled
FD_{16}	Seat belt buckle position 13 = not installed
01_{16}	Seat belt buckle position 21 = buckled
00_{16}	Seat belt buckle position 22 = not buckled
00_{16}	Seat belt buckle position 23 = not buckled
01_{16}	Seat belt buckle position 31 = buckled
00_{16}	Seat belt buckle position 32 = not buckled
FD_{16}	Seat belt buckle position 33 = not installed]

B.12 Hydraulic brake pressure

B.12.1 Description

This parameter provides the gage pressure in circuit 1 and circuit 2 (if implemented) of the hydraulic brake pressure system.

B.12.2 Hydraulic brake pressure – Parameter attributes

REQ	7.14 Hydraulic brake pressure- Parameter attributes
	If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.13.
	If a hydraulic brake pressure circuit is absent, the relevant byte position shall be set to FD_{16}: not installed.

A vehicle with SAE J1939 network implements SAE J1939DA -SPN 2580 for the hydraulic brake pressure circuit 1 and SAE J1939DA -SPN 2581 for the hydraulic brake pressure circuit 2 and converts the parameter values according to Table B.13 requirements.

Table B.13 — Hydraulic brake pressure attributes

Attribute	Value
Byte position	4: actual hydraulic brake pressure of circuit 1
	5: actual hydraulic brake pressure of circuit 2
Data length	8 bit
Data type	unsigned numeric
Data range	00_{16} to FA_{16}: valid range of actual hydraulic brake pressure of circuit 1 and/or circuit 2 (kPa, without decimals)
	FB_{16}: reserved
	FC_{16}: error or currently not available
	FD_{16}: not installed
	FE_{16} to FF_{16}: reserved

Table B.13 *(continued)*

Attribute	Value
Data conversion	see Formula (B.2)
Type	measured value

$$P_{HB} = P_{HB\_Raw} \times 100 \tag{B.2}$$

where

P_{HB_Raw} is the raw value of the hydraulic brake pressure of circuit 1 or circuit 2;

P_{HB} is the hydraulic brake pressure circuit 1 or circuit 2.

B.12.3 Hydraulic brake pressure example

Table B.14 specifies the hydraulic brake pressure example.

Table B.14 — Hydraulic brake pressure example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA26_{16}$	DID = Hydraulic brake pressure
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA26_{16}$	DID = Hydraulic brake pressure
	dataRecord = [
10_{16}	Hydraulic brake pressure circuit 1: 1 600 kPa
FD_{16}	Hydraulic brake pressure circuit 2: circuit 2 not installed

B.13 Air brake pressure

B.13.1 Description

This parameter provides the pneumatic pressure in the primary/secondary air (service) brake pressure circuit or reservoir, supplying the front/rear axle.

B.13.2 Air brake pressure – Parameter attributes

REQ	7.15 Air brake pressure – Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.15.	
If an air brake pressure circuit is absent, the relevant byte position shall be set to FD_{16}: not installed.	

A vehicle with SAE J1939 network implements SAE J1939DA SPN 1087 for the air brake pressure circuit 1 and SAE J1939DA SPN 1088 for the air brake pressure circuit 2 and converts the parameter values according to Table B.15 requirements.

Table B.15 — Air brake pressure attributes

Attribute	Value
Byte position	4: actual air brake pressure of circuit 1
	5: actual air brake pressure of circuit 2
Data length	8 bit
Data type	unsigned numeric

Table B.15 *(continued)*

Attribute	Value
Data range	00_{16} to FA_{16}: valid range of actual air brake pressure of circuit 1 and/or circuit 2 (kPa, without decimals) FB_{16}: reserved FC_{16}: error or currently not available FD_{16}: not installed FE_{16} to FF_{16}: reserved
Data conversion	see Formula (B.3)
Type	measured value

$$P_{AB} = 8 \times P_{AB\_Raw} \qquad\qquad (B.3)$$

where

P_{AB_Raw} is the raw value of the air brake pressure circuit 1 or circuit 2;

P_{AB} is the air brake pressure circuit 1 or circuit 2.

B.13.3 Air brake pressure example

Table B.16 specifies the air brake pressure example.

Table B.16 — Air brake pressure example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA27_{16}$	DID = Air brake pressure
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA27_{16}$	DID = Air brake pressure
	dataRecord = [
10_{16}	Air brake pressure circuit 1: 128 kPa
11_{16}	Air brake pressure circuit 2: 136 kPa

B.14 Tyre pressure

B.14.1 Description

This parameter provides the tyre pressure of each wheel of all vehicle axles.

B.14.2 Tyre positions and configurations

Figure B.5 shows six supported physical tyre position configurations (top view) and their respective tyre position. Each physical tyre position and configuration is mapped to a logical tyre position and a configuration which is reported by the tyre pressure positive response message parameters. Each logical tyre position is specified by a coordinate system with axle index and tyre index. Position "11" is the left tyre of the front axle to driving direction, also if a single tyre is on the front axle regardless of the tyre position and steering wheel position. The tyre index of the tyre pressure continuously increases for the next fitted tyre. The axle index of the tyre pressure equals the tyre position on the axles.
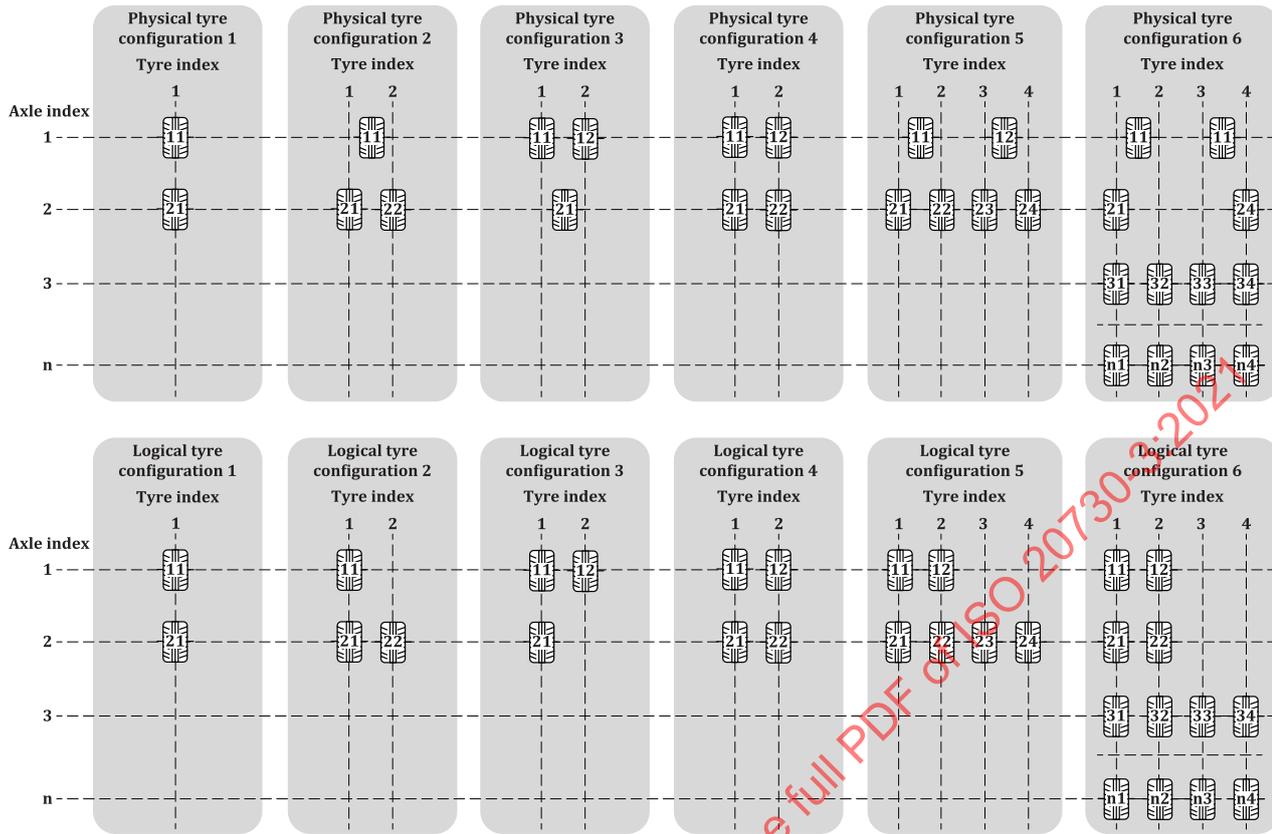
Figure B.5 — Tyre positions and configurations

B.14.3 Tyre pressure attributes

REQ	7.16 Maximum number of wheels per axle – Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.17.	

Table B.17 — Maximum number of wheels per axle attributes

Attribute	Value
Byte position	4
Data length	8 bit
Data type	unsigned numeric
Data range	00_{16} = reserved
	01_{16} to FA_{16} = valid range of wheels per axle
	FB_{16}: reserved
	FC_{16}: error or currently not available
	FD_{16}: not installed
	FE_{16} to FF_{16}: reserved
Data conversion	see Formula (B.4)
Type	stored value

$$N_{\text{WheelsPerAxle}} = W_{\text{Axle\_Raw}} \tag{B.4}$$

where

$W_{\text{Axle\_Raw}}$ is the raw value of wheels per axle;

$N_{\text{WheelsPerAxle}}$ is the number of wheels per axle.

REQ	7.17 Tyre pressure – Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.18.	

Table B.18 — Tyre pressure attributes

Attribute	Value
Byte position	5 (tyre pressure value of left outer wheel of axle 1: data byte #1)
Data length	16 bit per wheel
Data type	unsigned numeric
Data range	0000_{16} to $FFFA_{16}$: valid range of actual tyre pressure sensor reading (kPa, no decimal) $FFFB_{16}$: reserved $FFFC_{16}$: error or currently not available $FFFD_{16}$: not installed $FFFE_{16}$ to $FFFF_{16}$: reserved Axles are identified from the front of the towing vehicle. A maximum of 4 wheels per axle is assumed. — Data byte #1 (MSB) in byte array: 1st axle left outer wheel — Data byte #2 (LSB) in byte array: 1st axle left outer wheel — Data byte #3 (MSB) in byte array: 1st axle left inner wheel — Data byte #4 (LSB) in byte array: 1st axle left inner wheel — Data byte #5 (MSB) in byte array: 1st axle right inner wheel — Data byte #6 (LSB) in byte array: 1st axle right inner wheel — Data byte #7 (MSB) in byte array: 1st axle right outer wheel — Data byte #8 (LSB) in byte array: 1st axle right outer wheel — … — Data byte #153 (MSB) in byte array: 20th axle left outer wheel — Data byte #154 (LSB) in byte array: 20th axle left outer wheel — Data byte #155 (MSB) in byte array: 20th axle left inner wheel — Data byte #156 (LSB) in byte array: 20th axle left inner wheel — Data byte #157 (MSB) in byte array: 20th axle right inner wheel — Data byte #158 (LSB) in byte array: 20th axle right inner wheel — Data byte #159 (MSB) in byte array: 20th axle right outer wheel — Data byte #160 (LSB) in byte array: 20th axle right outer wheel
Data conversion	see Formula (B.5)
Type	measured value

$$P_{\text{Tyre}} = 0,1 \times \left(P_{\text{Tyre\_MSB\_Raw}} \times 256 + P_{\text{Tyre\_LSB\_Raw}} \right) \qquad (B.5)$$

where

$P_{\text{Tyre\_MSB\_Raw/Tyre\_LSB\_Raw}}$ is the raw value of the tyre pressure;

P_{Tyre} is the tyre pressure, in kPa.

REQ	7.18 Tyre pressure attributes – Total length of data record
The total length of the data record in the positive response message to report tyre pressure per wheel shall not exceed 160 data bytes if four wheels per axle of 20 axles are reported.	

If a tyre pressure sensor is not assembled at a certain wheel in the vehicle, the parameter value for tyre pressure of this wheel position may be set to FD_{16} (not installed).

B.14.4 Tyre pressure – Motorbike example

Figure B.6 shows an example of the tyre pressure of a motorbike.
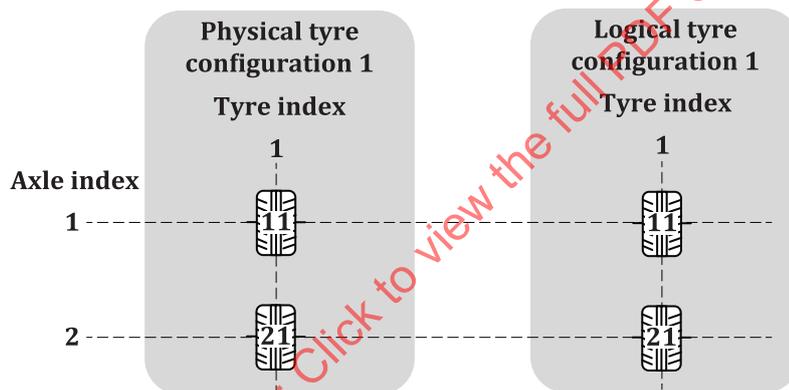

Figure B.6 — Tyre pressure – Motorbike example

Table B.19 specifies the tyre pressure from an example of a motorbike, based on Figure B.6.

Table B.19 — Tyre pressure - Motorbike example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA28_{16}$	DID = Tyre pressure
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA28_{16}$	DID = Tyre pressure
01_{16}	Wheels per axle: 1
	dataRecord = [
$09C4_{16}$	Tyre pressure of wheel in position 11 (MSB, LSB): 250 kPa
$09F6_{16}$	Tyre pressure of wheel in position 21 (MSB, LSB): 255 kPa]

B.14.5 Tyre pressure – Trike example

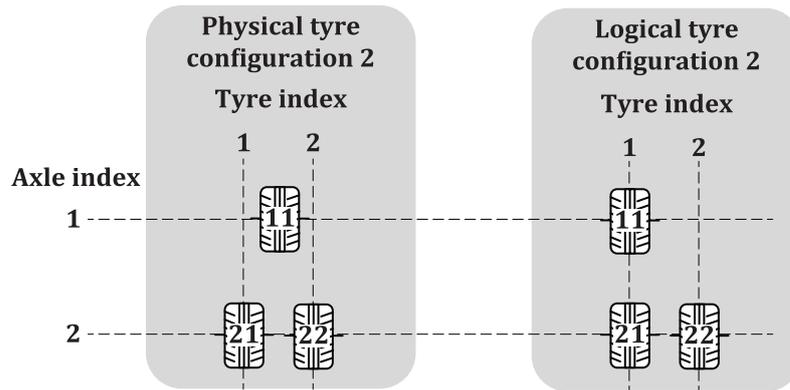Figure B.7 shows an example of the tyre pressure of a trike.

Figure B.7 — Tyre pressure – Trike example

Table B.20 specifies the tyre pressure from an example of a trike, based on Figure B.7.

Table B.20 — Tyre pressure - Trike example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA28_{16}$	DID = Tyre pressure
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA28_{16}$	DID = Tyre pressure
02_{16}	Wheels per axle: 2
	dataRecord = [
$09C4_{16}$	Tyre pressure of wheel in position 11 (MSB, LSB): 250 kPa
$FFFD_{16}$	Tyre pressure of wheel in position 12 (MSB, LSB): not installed
$09F6_{16}$	Tyre pressure of wheel in position 21 (MSB, LSB): 255 kPa
$0A32_{16}$	Tyre pressure of wheel in position 22 (MSB, LSB)]: 261 kPa

B.14.6 Tyre pressure – Trike reverse example

Figure B.8 shows an example from the tyre pressure of a trike reverse.
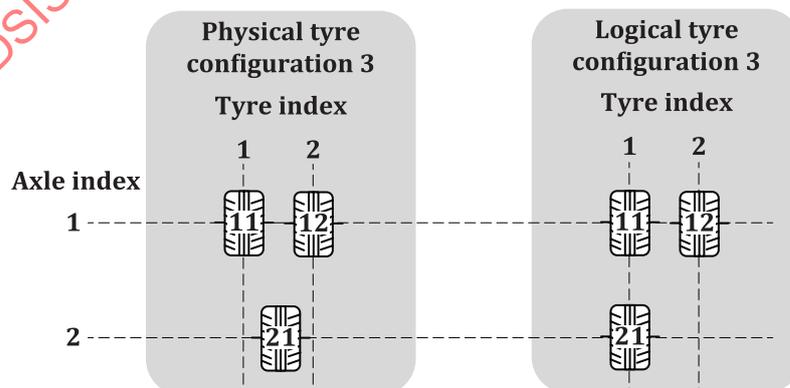

Figure B.8 — Tyre pressure – Trike reverse example

Table B.21 specifies the tyre pressure from an example of a trike reverse, based on Figure B.8.

Table B.21 — Tyre pressure - Trike reverse example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA28_{16}$	DID = Tyre pressure
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA28_{16}$	DID = Tyre pressure
02_{16}	Wheels per axle: 2
	dataRecord = [
$08FC_{16}$	Tyre pressure of wheel in position 11 (MSB, LSB): 230 kPa
$092E_{16}$	Tyre pressure of wheel in position 12 (MSB, LSB): 235 kPa
$09C4_{16}$	Tyre pressure of wheel in position 21 (MSB, LSB): 250 kPa
$FFFD_{16}$	Tyre pressure of wheel in position 22 (MSB, LSB): not installed]

B.14.7 Tyre pressure – Vehicle with 4 tyres example

Figure B.9 shows an example of the tyre pressure from a vehicle with 4 tyres.
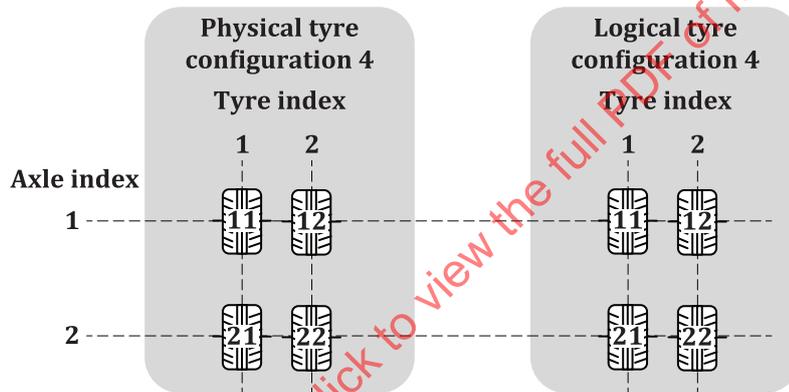
Figure B.9 — Tyre pressure – Vehicle with 4 tyres example

Table B.22 specifies the tyre pressure from an example of a vehicle with 4 tyres, based on Figure B.9.

Table B.22 — Tyre pressure - Vehicle with 4 tyres example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA28_{16}$	DID = Tyre pressure
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA28_{16}$	DID = Tyre pressure
02_{16}	Wheels per axle: 2
	dataRecord = [
1194_{16}	Tyre pressure of wheel in position 11 (MSB, LSB): 450 kPa
1194_{16}	Tyre pressure of wheel in position 12 (MSB, LSB): 450 kPa
$12C0_{16}$	Tyre pressure of wheel in position 21 (MSB, LSB): 480 kPa
$12F2_{16}$	Tyre pressure of wheel in position 22 (MSB, LSB):485 kPa]

B.14.8 Tyre pressure – Vehicle with dual tyres on rear axle example

Figure B.10 shows an example of the tyre pressure from a vehicle with dual tyres on rear axle.
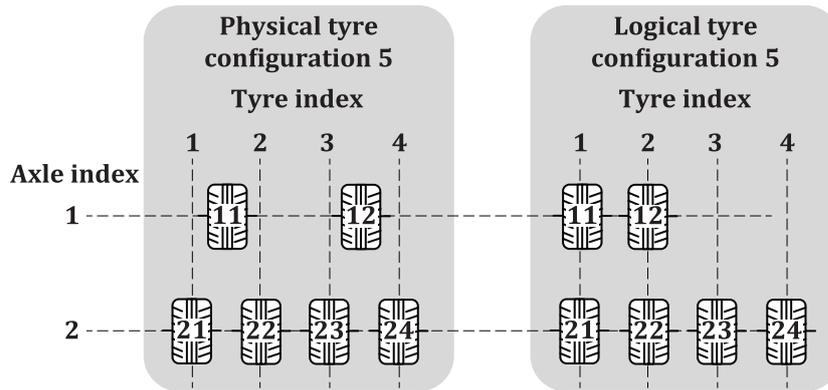
Figure B.10 — Tyre pressure – Vehicle with dual tyres on rear axle example

Table B.23 specifies the tyre pressure from an example of a vehicle with dual tyres on rear axle, based on Figure B.10.

Table B.23 — Tyre pressure - Vehicle with dual tyres on rear axle example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA28_{16}$	DID = Tyre pressure
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA28_{16}$	DID = Tyre pressure
04_{16}	Wheels per axle: 4
	dataRecord = [
1194_{16}	Tyre pressure of wheel in position 11 (MSB, LSB): 450 kPa
1194_{16}	Tyre pressure of wheel in position 12 (MSB, LSB): 450 kPa
$FFFD_{16}$	Tyre pressure of wheel in position 13 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 14 (MSB, LSB): not installed
1450_{16}	Tyre pressure of wheel in position 21 (MSB, LSB): 520 kPa
$14B4_{16}$	Tyre pressure of wheel in position 22 (MSB, LSB): 530 kPa
1482_{16}	Tyre pressure of wheel in position 23 (MSB, LSB): 525 kPa
$14E6_{16}$	Tyre pressure of wheel in position 24 (MSB, LSB): 535 kPa]

B.14.9 Tyre pressure – Vehicle with >6 tyres configuration 1 example

Figure B.11 shows an example of the tyre pressure from a vehicle with >6 tyres configuration 1.

Figure B.11 — Tyre pressure – Vehicle with >6 tyres configuration 1 example

Table B.24 specifies the tyre pressure from an example of a vehicle with >6 tyres configuration 1, based on Figure B.11.

Table B.24 — Tyre pressure - Vehicle with >6 tyres configuration 1 example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA28_{16}$	DID = Tyre pressure
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA28_{16}$	DID = Tyre pressure
06_{16}	Wheels per axle: 6
	dataRecord = [
1194_{16}	Tyre pressure of wheel in position 11 (MSB, LSB): 450 kPa
$FFFD_{16}$	Tyre pressure of wheel in position 12 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 13 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 14 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 15 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 16 (MSB, LSB): not installed
1450_{16}	Tyre pressure of wheel in position 21 (MSB, LSB): 520 kPa
1450_{16}	Tyre pressure of wheel in position 22 (MSB, LSB): 520 kPa
$FFFD_{16}$	Tyre pressure of wheel in position 23 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 24 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 25 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 26 (MSB, LSB): not installed
$14B4_{16}$	Tyre pressure of wheel in position 31 (MSB, LSB): 530 kPa
$14B4_{16}$	Tyre pressure of wheel in position 32 (MSB, LSB): 530 kPa
$14B4_{16}$	Tyre pressure of wheel in position 33 (MSB, LSB): 530 kPa
$14B4_{16}$	Tyre pressure of wheel in position 34 (MSB, LSB): 530 kPa
$14B4_{16}$	Tyre pressure of wheel in position 35 (MSB, LSB): 530 kPa
$14B4_{16}$	Tyre pressure of wheel in position 36 (MSB, LSB): 530 kPa]

B.14.10 Tyre pressure – Vehicle with >6 tyres configuration 2 example

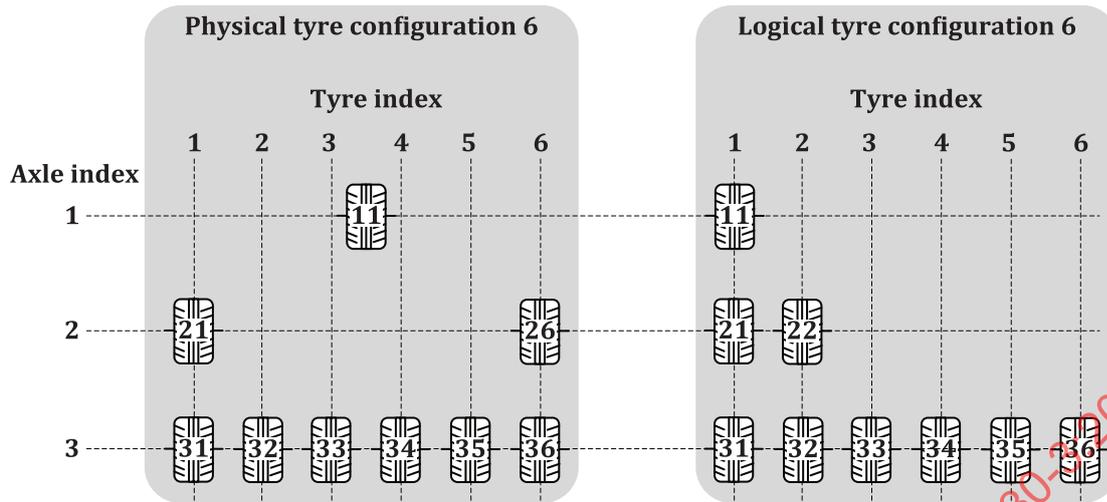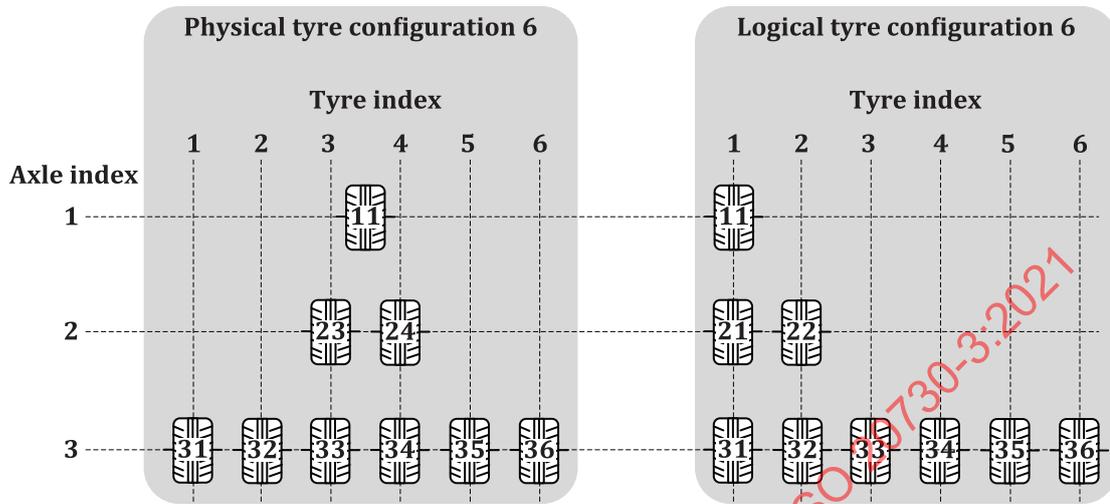Figure B.12 shows an example of the tyre pressure from a vehicle with >6 tyres configuration 2.

Figure B.12 — Tyre pressure – Vehicle with >6 tyres configuration 2 example

Table B.25 specifies the tyre pressure from an example of a vehicle with >6 tyres configuration 2, based on Figure B.12.

Table B.25 — Tyre pressure - Vehicle with >6 tyres configuration 2 example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA28_{16}$	DID = Tyre pressure
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA28_{16}$	DID = Tyre pressure
06_{16}	Wheels per axle: 6
	dataRecord = [
1194_{16}	Tyre pressure of wheel in position 11 (MSB, LSB): 450 kPa
$FFFD_{16}$	Tyre pressure of wheel in position 12 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 13 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 14 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 15 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 16 (MSB, LSB): not installed
1450_{16}	Tyre pressure of wheel in position 21 (MSB, LSB): 520 kPa
1450_{16}	Tyre pressure of wheel in position 22 (MSB, LSB): 520 kPa
$FFFD_{16}$	Tyre pressure of wheel in position 23 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 24 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 25 (MSB, LSB): not installed
$FFFD_{16}$	Tyre pressure of wheel in position 26 (MSB, LSB): not installed
$14B4_{16}$	Tyre pressure of wheel in position 31 (MSB, LSB): 530 kPa
$14B4_{16}$	Tyre pressure of wheel in position 32 (MSB, LSB): 530 kPa
$14B4_{16}$	Tyre pressure of wheel in position 33 (MSB, LSB): 530 kPa
$14B4_{16}$	Tyre pressure of wheel in position 34 (MSB, LSB): 530 kPa

Table B.25 *(continued)*

Data	A_PDU definition
$14B4_{16}$	Tyre pressure of wheel in position 35 (MSB, LSB): 530 kPa
$14B4_{16}$	Tyre pressure of wheel in position 36 (MSB, LSB): 530 kPa]

B.15 Wheel speed

B.15.1 Description

This parameter provides the wheel speed for each wheel of all vehicle axles.

B.15.2 Wheel speed sensor positions and configurations

Each axle of the vehicle has up to two wheel speed sensors (left and right side). Therefore, the wheel speed positive response message reports a list of values, containing a value tuple on each axle, beginning with front left position to driving direction.

B.15.3 Wheel speed attributes

REQ	7.19 Wheel speed sensors per axle – Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.26.	

Table B.26 — Wheel speed sensors per axle attributes

Attribute	Value
Byte position	4
Data length	8 bit
Data type	unsigned numeric
Data range	00_{16} = reserved
	01_{16} to FA_{16} = valid range of wheel speed sensors per axle
	FB_{16}: reserved
	FC_{16}: error or currently not available
	FD_{16}: not installed
	FE_{16} to FF_{16}: reserved
Type	measured value

REQ	7.20 Wheel speed – Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.27.	

If a wheel speed sensor is not assembled at a certain wheel in the vehicle, the parameter value for wheel speed of this wheel position may be set to $FFFD_{16}$ (not installed).

Table B.27 — Wheel speed attributes

Attribute	Value
Byte position	5 (MSB of left wheel speed sensor of axle 1)
Data length	16 bit per wheel speed sensor
Data type	unsigned numeric

Table B.27 *(continued)*

Attribute	Value
Data range	0000_{16} to $FFFA_{16}$: valid range of current wheel speed (km/h, one decimal)
	$FFFB_{16}$: reserved
	$FFFC_{16}$: error or currently not available
	$FFFD_{16}$: not installed
	$FFFE_{16}$ to $FFFF_{16}$: reserved
Data conversion	see Formula (B.6)
Type	measured value

$$V_{\text{Wheel}} = 0,1 \times \left(V_{\text{Wheel\_MSB\_Raw}} \times 256 + V_{\text{Wheel\_LSB\_Raw}} \right) \tag{B.6}$$

where

$V_{\text{Wheel\_MSB\_Raw/Wheel\_LSB\_Raw}}$ is the raw value of the wheel speed;

V_{Wheel} is the wheel speed.

B.15.4 Wheel speed – Trike example

Table B.28 specifies the wheel speed from an example of a trike, based on Figure B.7.

Table B.28 — Wheel speed - Trike example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA29_{16}$	DID = Wheel speed
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA29_{16}$	DID = Wheel speed
02_{16}	Wheel speed sensor per axle: 2
	dataRecord = [
0079_{16}	Left wheel speed axle 1 (MSB, LSB): 12,1 km/h
$FFFD_{16}$	Right wheel speed axle 1 (MSB, LSB): not installed
0079_{16}	Left wheel speed axle 2 (MSB, LSB): 12,1 km/h
0078_{16}	Right wheel speed axle 2 (MSB, LSB): 12,0 km/h

B.16 Dynamic driving values

B.16.1 Description of yaw rate

This parameter provides the yaw rate of the vehicle.

B.16.2 Yaw rate attributes

REQ	7.21 Dynamic driving values – Yaw rate – Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.29.	

Table B.29 — Yaw rate attributes

Attribute	Value
Byte position	4 (MSB of yaw rate)
Data length	16 bit
Data type	unsigned numeric
Data range	0000_{16} to $FFFA_{16}$: valid range of yaw rate value (°/s, one decimal) $FFFB_{16}$: reserved $FFFC_{16}$: error or currently not available $FFFD_{16}$: not installed $FFFE_{16}$ to $FFFF_{16}$: reserved
Data conversion	yaw rate value, see Formula (B.7)
Type	measured value

$$D_{\text{YawRate}} = 0,1 \times \left(D_{\text{YawRate\_MSB\_Raw}} \times 256 + D_{\text{YawRate\_LSB\_Raw}} - 32\,768 \right) \tag{B.7}$$

where

$D_{\text{YawRate\_MSB\_Raw/YawRate\_LSB\_Raw}}$ is the raw value of the yaw rate of dynamic driving values;

D_{YawRate} is the yaw rate of the dynamic driving values.

B.16.3 Description of lateral acceleration

This parameter provides the lateral acceleration of the vehicle.

B.16.4 Lateral acceleration attributes

REQ	7.22 Dynamic driving values – Lateral acceleration – Parameter attributes
	If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.30.

Table B.30 — Lateral acceleration attributes

Attribute	Value
Byte position	6 (MSB of lateral acceleration)
Data length	16 bit
Data type	unsigned numeric
Data range	0000_{16} to $FFFA_{16}$: valid range of lateral acceleration value (m/s^2, one decimal) $FFFB_{16}$: reserved $FFFC_{16}$: error or currently not available $FFFD_{16}$: not installed $FFFE_{16}$ to $FFFF_{16}$: reserved
Data conversion	lateral acceleration value, see Formula (B.8)
Type	measured value

$$D_{\text{LatAccel}} = 0,1 \times \left(D_{\text{LatAccel\_MSB\_Raw}} \times 256 + D_{\text{LatAccel\_LSB\_Raw}} - 32\,768 \right) \tag{B.8}$$

where

$D_{\text{LatAccel\_MSB\_Raw/LatAccel\_LSB\_Raw}}$ is the raw value of the lateral acceleration of dynamic driving values;

D_{LatAccel} is the lateral acceleration of dynamic driving values.

B.16.5 Description of longitudinal acceleration

This parameter provides the longitudinal acceleration of the vehicle.

B.16.6 Longitudinal acceleration attributes

REQ	7.23 Dynamic driving values – Longitudinal acceleration – Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.31.	

Table B.31 — Longitudinal acceleration attributes

Attribute	Value
Byte position	8 (MSB of longitudinal acceleration)
Data length	16 bit
Data type	unsigned numeric
Data range	0000_{16} to $FFFA_{16}$: valid range of longitudinal acceleration value (m/s^2, one decimal)
	$FFFB_{16}$: reserved
	$FFFC_{16}$: error or currently not available
	$FFFD_{16}$: not installed
	$FFFE_{16}$ to $FFFF_{16}$: reserved
Data conversion	longitudinal acceleration value, see Formula (B.9)
Type	measured value

$$D_{\text{LongAccel}} = 0.1 \times \left(D_{\text{LongAccel\_MSB\_Raw}} \times 256 + D_{\text{LongAccel\_LSB\_Raw}} - 32\,768 \right) \tag{B.9}$$

where

$D_{\text{LongAccel\_MSB\_Raw/LongAccel\_LSB\_Raw}}$ is the raw value of the longitudinal acceleration of dynamic driving values;

$D_{\text{LongAccel}}$ is the longitudinal acceleration of dynamic driving values.

B.16.7 Dynamic driving values example

Table B.32 specifies the dynamic driving values example.

Table B.32 — Dynamic driving values example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA2A_{16}$	DID = Dynamic driving values
62_{16}	**ReadDataByIdentifier positive response message SID**
$FA2A_{16}$	DID = Dynamic driving values
	dataRecord = [
$800B_{16}$	Dynamic driving values yaw rate (MSB, LSB): 1,1°/s

Table B.32 *(continued)*

Data	A_PDU definition
8000_{16}	Dynamic driving values lateral acceleration (MSB, LSB): 0,0 m/s^2
$7FF4_{16}$	Dynamic driving values longitudinal acceleration (MSB, LSB): –1,2 m/s^2

B.17 Steering wheel angle

B.17.1 Description

This parameter provides the steering wheel angle.

B.17.2 Steering wheel angle attributes

REQ	7.24 Steering wheel angle – Parameter attributes
If the ePTI-relevant ECU supports this DID, the implementation shall be in accordance with Table B.33.		

A vehicle with SAE J1939 network implements SAE J1939DA -SPN 1807 for the steering wheel angle and converts the parameter values according to Table B.33 requirements.

Table B.33 — Steering wheel angle attributes

Attribute	Value
Byte position	4 (MSB of steering wheel angle)
Data length	16 bit
Data type	unsigned numeric
Data range	0000_{16} to $FFFA_{16}$: valid range of steering wheel angle (°, one decimal)
	$FFFB_{16}$: reserved
	$FFFC_{16}$: error or currently not available
	$FFFD_{16}$: not installed
	$FFFE_{16}$ to $FFFF_{16}$: reserved
Data conversion	steering wheel angle value, see Formula (B.10)
Type	measured value

$$S_{StWhAngle} = 0,1 \times \left(S_{StWhAngle\_MSB\_Raw} \times 256 + S_{StWhAngle\_LSB\_Raw} - 32768 \right) \qquad (B.10)$$

where

$S_{StWhAngle\_MSB\_Raw/StWhAngle\_LSB\_Raw}$ is the raw value of the steering wheel angle;

$S_{StWhAngle}$ is the steering wheel angle.

B.17.3 Steering wheel angle example

Table B.34 specifies the steering wheel angle example.

Table B.34 — Steering wheel angle example

Data	A_PDU definition
22_{16}	**ReadDataByIdentifier request message SID**
$FA2B_{16}$	DID = Steering wheel angle
62_{16}	**ReadDataByIdentifier positive response message SID**

Table B.34 *(continued)*

Data	A_PDU definition
FA2B$_{16}$	DID = Steering wheel angle
	dataRecord = [
8096$_{16}$	Steering wheel angle (MSB, LSB): 15,0 °

Annex C
(normative)

Routine definitions

C.1 Definition of routine identifiers and names

Table C.1 specifies a RID #, supported routineControlType, RID name, symbolic name, and a definition. The symbolic names provide the possibility, for example, to make a unique reference to diagnostic description information in case a diagnostic service is not yet implemented using the RIDs specified in this document. Symbolic names use the character set ISO 8859-1[2] in the range of 30_{16} to 39_{16} (0, 1, … 9), 41_{16} to $5A_{16}$ (A, B, … Z), and $5F_{16}$ (_).

REQ	7.25 Definition of routine identifiers and names
If the ePTI-relevant ECU implements the RID, the RID shall be in accordance with Table C.1.	

Table C.1 — Definition of routine identifiers and names

RID #	Supported RCTP	RID name	Symbolic name	Definition	Cvt[a]
$E200_{16}$ to $E201_{16}$	---	Reserved	RESRVD	Reserved	M
$E202_{16}$	01_{16}	Malfunction indicator activation	RID_MIL_ACT	Description, definition and requirements are specified in C.4.	M
$E203_{16}$	01_{16}	eCall echo mode activation	RID_ECALL_ECHO_ACT	Description, definition and requirements are specified in C.5.	O
$E204_{16}$	01_{16}	eCall speaker activation	RID_ECALL_SPK_ACT	Description, definition and requirements are specified in C.6.	O
$E205_{16}$	01_{16}	Control headlamp levelling	RID_CTRL_HL_LEV	Description, definition and requirements are specified in C.7.	O
$E206_{16}$	01_{16}	Control bending light	RID_CTRL_BEND_LI	Description, definition and requirements are specified in C.8.	O
$E207_{16}$	01_{16}, 02_{16}	Exterior light device activation	RID_EXT_LI_ACT	Description, definition and requirements are specified in C.3.	M
$E208_{16}$ to $E2FF_{16}$	---	Reserved	RESRVD	Reserved	M
[a] See ISO 20730-1, BP7 for the condition of implementation.					

C.2 Definition of routine names

Table C.2 defines ePTI-relevant vehicle manufacturer-specific routines.

Table C.2 — Definition of routine names

RID name	Symbolic name	Definition	Cvt
Control adaptive light function	RID_CTRL_ADAP_LI_FCT	Activation of the three lighting functions of the low beam: 1. city light (Class V according to ECE-R 48:2011, 6.22.7.4.2[21]) 2. highway light (Class E according to ECE-R 48:2011, 6.22.7.4.3[21]) 3. bad-weather light (Class W according to ECE-R 48:2011, 6.22.7.4.4[21])	C1[a]
Control masked high beam	RID_CTRL_MASK_HB	Activation of the adaptive driving-beam according to ECE R123:2006, 6.3[33] (e.g. dynamic cut-in cut-out sequence)	C1[a]
Control steering actuator (rear axle)	RID_CTRL_STER_ACTU_RA	Change the rear axle steering actuator from the current position to the first (left or right) end position, then to the second end position and then back to the starting position.	C1[a]
Control reversible belt tensioner	RID_CTRL_REV_BT	Tightening and release of each reversible belt tensioner.	C1[a]
Control parking brake	RID_CTRL_PARK_BRAKE	Apply and release parking brake.	C1[a]
[a] Mandatory access, if implemented in the vehicle and used for repair and maintenance or PTI purposes.			

C.3   RoutineControl – Exterior light device activation

C.3.1   Description

The exterior light device activation routine controls the state from OFF to ON and ON to OFF. The mechatronic adjustment of lighting equipment is not part of the exterior light device activation. It is left to the discretion of the vehicle manufacturer to switch lamps into state OFF automatically after a specified time.

C.3.2   Pre-conditions

Minimum pre-conditions are:

— ignition status: ON,

— vehicle speed sensor: 0 km/h.

C.3.3   routineInfo

This parameter provides information after the routine has been executed, to support a generic external test equipment handling. If not supported, the parameter is not included in the positive response message.

C.3.4   routineControlOptionRecord

This parameter provides control option information at the time the routine is started.

REQ	7.27 routineControlOptionRecord - Parameter attributes
The parameter shall be implemented as specified in Table C.3.	