INTERNATIONAL STANDARD

ISO 11992-2

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Road vehicles — Electrical connections between towing and towed vehicles — Interchange of digital information —

Part 2:
Application layer for braking equipment

Véhicules routiers — Connexions électriques entre véhicules tracteurs et véhicules tractés — Échange de données numériques —

Partie 2: Couche application pour l'équipement de freinage

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Reference number
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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11992-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

ISO 11992 consists of the following parts, under the general title *Road vehicles — Electrical connections between towing and towed vehicles — Interchange of digital information*:

— *Part 1: Physical layer and data link layer*

— *Part 2: Application layer for braking equipment*

— *Part 3: Application layer for non-braking equipment*

Annex A of this part of ISO 11992 is for information only.

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Introduction

This part of ISO 11992 is subject to additions which will become necessary to keep pace with experience and technical advances. Care has been taken to ensure that these additions can be introduced in a compatible way, and care will have to be taken in the future that such additions remain compatible with previous versions. In particular, it may become necessary to standardize new parameters and parameter groups. ISO members may request that such new parameters and parameter groups be included in future editions of ISO 11992 by completing the "Parameter identification form" in annex A and submitting it to ISO/TC 22/SC 3.

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Road vehicles — Electrical connections between towing and towed vehicles — Interchange of digital information —

Part 2:
Application layer for braking equipment

1 Scope

This part of ISO 11992 specifies the data content for electronically controlled braking systems to ensure the interchange of digital information between road vehicles with a maximum authorised total mass greater than 3 500 kg, and their towed vehicles, including communication between towed vehicles.

The objective of the data structure is to optimise the use of the interface, while preserving a sufficient reserve capacity for future expansion.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 11992. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 11992 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3833:1977, *Road vehicles — Types — Terms and definitions.*

ISO 11898:1993, *Road vehicles — Interchange of digital information — Controller area network (CAN) for high speed communication.*

ISO 11992-1:1998, *Road vehicles — Electrical connections between towing and towed vehicles — Interchange of digital information — Part 1: Physical layer and data link layer.*

3 Definitions

For the purpose of this part of ISO 11992, the definitions given in ISO 11992-1 and the following apply.

3.1 commercial vehicle
motor vehicle which, on account of its design and appointments, is used mainly for conveying goods. It may also tow a trailer [ISO 3833:1977]

3.2 towed vehicle
non-power-driven road vehicle which, on account of its design and appointments, is used to transport persons or goods and is intended to be towed by a motor vehicle [ISO 3833:1977]

3.3 towing vehicle
power-driven or a non-power-driven vehicle which tows a succeeding vehicle, both being part of a road train

4 General specifications

The data link and the physical layer shall be in accordance with ISO 11992-1.

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To minimise bus loading on the towing/towed vehicle interface, appropriate messages are specified. These messages may be filtered by a device (node) on each vehicle which shall also provide address assignment and electrical isolation from the in-vehicle sub-network.

The architecture was chosen to allow any combination of new and old towing and towed vehicles. Multiple towed vehicles can be connected in any combination; the network shall be capable of addressing any towed vehicle, including dollies. The truck operator can disconnect and connect towed vehicles at any time and any order and the network shall adjust and respond accordingly.

5 Application layer

5.1 Message frame format

The application layer provides a string of information that is assimilated into a protocol data unit (PDU). The PDU provides a framework for organizing the information which will be sent by the CAN data frame.

The 29 bit identifier shall be in accordance with ISO 11898.

The PDU shall consist of seven fields in addition to the specific CAN fields (see figure 1).

The PDU fields are Priority (P), Reserved (R), Data Page (DP), PDU Format (PF), PDU Specific (PS), which can be a Destination Address (DA) or a Group Extension (GE), Source Address (SA) and data field.

	P	R	DP	PF	PS	SA	Data field
Bits	3	1	1	8	8	8	0 to 64

Figure 1 — 29-bit CAN identifier

5.1.1.1 Priority

The three priority bits are used to optimise message latency for transmission onto the bus only. They should be globally masked off by the receiver (ignored). The priority of any message may be set from highest, 0 (000_2), to lowest, 7 (111_2). The default for all control oriented messages is 3 (011_2). The default of all other informational messages is 6 (110_2).

5.1.2 Reserved bit (R)

The reserved bit is reserved for future expansion. This bit should be set to zero for transmitted messages.

5.1.3 Data page (DP)

The data page bit selects an auxiliary page of parameter group descriptions.

5.1.4 PDU format (PF)

The PDU format field is an eight-bit field that determines the PDU format and is one of the fields used to determine the parameter group number assigned to the data field. Parameter group numbers shall be used to identify or label a set of commands and data.

5.1.5 PDU specific (PS)

The PDU specific field is an eight-bit field that depends on the PDU format. Depending on the PDU format, it can be a destination address or a group extension. If the value of the PDU format (PF) field is below 240, then the PDU specific field is a destination address. If the value of the PF field is 240 to 255, then the PDU specific field contains a group extension (GE) value (see table 1).

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5.1.5.1 Destination address (DA)

The group extension field contains the specific address of the towing and towed vehicle to which the message is being sent. Any other device shall ignore this message. The global destination address (255) requires all devices to listen.

Table 1 — PDU specific field

	PDU format (PF) field	PDU specific (PS) field
PDU 1 field	0 to 239	Destination address
PDU 2 field	240 to 255	Group extension

5.1.5.2 Group extension (GE)

The group extension field, in conjunction with the four least significant bits of the PDU format field provide for 4 096 parameter groups per data page.

When the four most significant bits of the PDU format field are set, it indicates that the PS field is a group extension.

5.1.6 Source address (SA)

The source address field is eight-bits long. There shall only be one device on the network with a given source address. Therefore, the source address field assures that the CAN identifier will be unique, as required by CAN.

5.1.7 Data field

A single CAN data frame provides a maximum of eight data bytes. All eight bytes shall be used, even if fewer than eight bytes are required for expressing a given parameter group number. This provides a means to easily add parameters and while remaining compatible with previous revisions which only specified part of the data field.

5.1.8 Parameter group number (PGN)

The parameter group number is a 24-bit number which contains: Reserved bit, Data page bit, PDU Format field (eight bits), and PDU specific field (eight bits) (see table 2).

If the PF value is less than 240 (F0H; PDU 1 type message), then the lower byte of the PGN is set to zero.

Table 2 — Content of the parameter group number

Byte 1 (MSB)			Byte 2	Byte 3
Bits 8...3	Bit 2	Bit 1		
000000b	Reserved	Data Page	PDU format	PDU specific

5.1.9 PDU 1 format

The PDU format allows for applicable messages to be sent to either a specific or global destination. PDU 1 format messages are determined by the PDU format (PF) field. When the PDU format messages field value is 0 to 239, the message is a PDU 1 format.

5.1.10 PDU 2 format

The PDU 2 format may only be used to communicate global messages. PDU 2 format messages are those where the PDU format (PF) value is equal to 240 to 255.

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5.2 Address assignment

A road train consists of one commercial vehicle and one or more towed vehicle(s). Dolly axles within the road train are treated as towed vehicles as well (see figure 2).

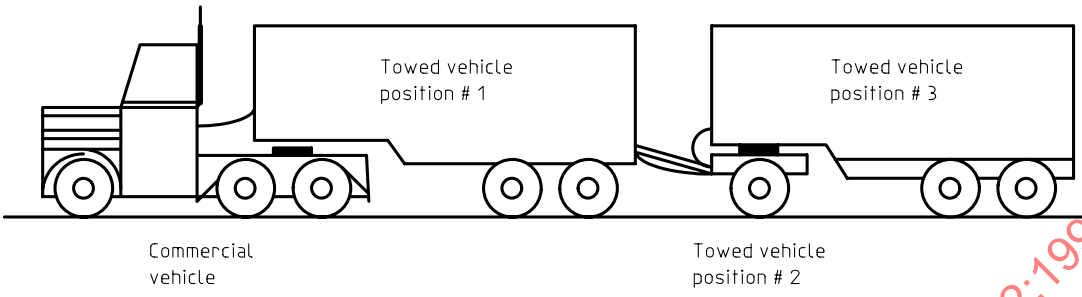

Figure 2 — Example of possible road train configuration

The address of the commercial vehicle is fixed.

The respective address of a towed vehicle corresponds to its position within the road train and has to be newly assigned each time

— communication starts,

— a towed vehicle has been connected.

For towing vehicle/towed vehicle communication, the addresses shown in table 3 shall be used as source addresses (SA) and destination addresses (DA). To avoid any transmission conflict during the dynamic address assignment phase (power-up), the PDU 2 type message shall have even PS (GE) in predecessor transmission direction and odd PS (GE) in successor transmission direction. If the same message has to be sent in both transmission directions, two PS (GE) are necessary.

The dynamic address assignment shall be handled by the respective towing vehicle/towed vehicle node and concerns the determination of the individual position within the road train. The global destination address shall be only used by the commercial vehicle to broadcast information to all towed vehicles simultaneously.

The dynamic address assignment is based on the transmission of the standard initialization message (see 5.5) by the respective predecessor within the road train.

Within a road train, the address assignment procedure shall be initiated by the commercial vehicle, using its standard address for the standard initialization message (see table 3). A powered-up towed vehicle node shall use the towed vehicle #1 address as the default address to transmit available information, until the standard initialization has been received and a valid address can be assigned.

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Table 3 — Commercial vehicle/towed vehicle addresses

Name	Address	Predecessor	Successor
Commercial vehicle (position #0)	32d = 20h	N/A	Towed vehicle position #1
Towed vehicle position #1	200d = C8h	Commercial vehicle (position #0)	Towed vehicle position #2
Towed vehicle position #2	192d = C0h	Towed vehicle position #1	Towed vehicle position #3
Towed vehicle position #3	184d = B8h	Towed vehicle position #2	Towed vehicle position #4
Towed vehicle position #4	176d = B0h	Towed vehicle position #3	Towed vehicle position #5
Towed vehicle position #5	168d = A8h	Towed vehicle position #4	undefined
Global destination address	255d = FFh	undefined	undefined

This allows the towed vehicle node to communicate and to identify its presence to its predecessor immediately after power-up. This means that several towed vehicles can use the same address, until the address assignment procedure has been completed.

An assigned address shall be valid as long as the standard initialization message is received from the predecessor with the corresponding source address and specified message timing.

To provide address assignment for itself and for possible successors, a node shall be capable of permanently sending the standard initialization message with its own source address (see figure 3)

Permanent sending of the initialization message is necessary to allow immediate towed vehicle address assignment at any time a towed vehicle might be connected.

In addition, a towed vehicle node shall be capable of

— identifying its predecessor by the source address of the standard initialization message;

— assigning its own address based on the predecessors address;

— identifying potential receiver(s) by the destination address and by the message type.

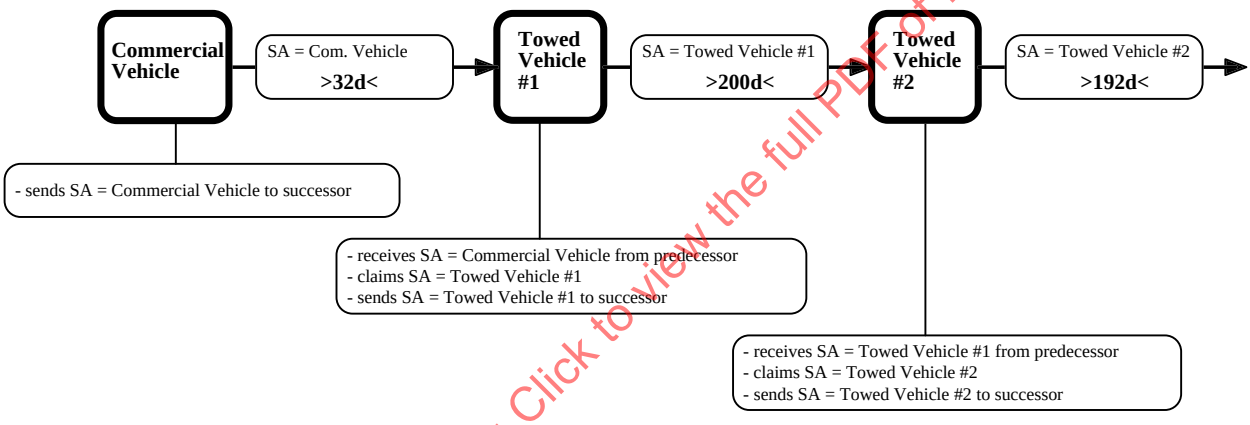

Figure 3 — Address assignment

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5.3 Message routing

To allow communication between towing and towed vehicles, a node shall be capable of

— receiving messages from its predecessor and successor within the road train;

— identifying receiver(s) by the destination address (PDU 1 type messages) or the PDU format (PDU 2 type messages);

— routing all messages from its predecessor(s) to its successor(s) within the road train by sending them with the unchanged source and destination address to its successor[1)] within a maximum delay time of t_d = 13 ms;

— routing all messages from its successor(s) to its predecessor(s) within the road train by sending them with the unchanged source and destination address to its predecessor[1)] within a maximum delay time of t_d = 13 ms.

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1) If no provisions are provided for a successor, this function is not required.

A towed vehicle node shall not route messages to its successor or predecessor within the road train, if the source address of a message received from its

— predecessor corresponds to a road train position higher or equal to its own;

— successor corresponds to a road train position lower or equal to its own.

Figures 4 to 9 illustrate the PDU type message sent in different directions.

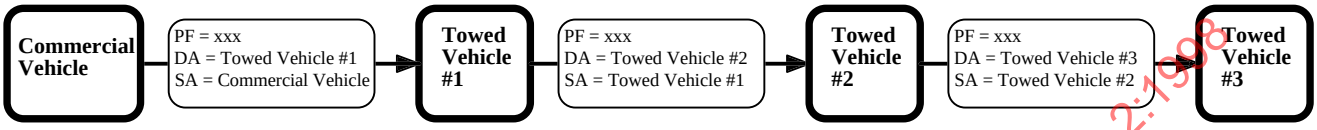

Figure 4 — Example of PDU 1 type messages from towing vehicle to succeeding towed vehicle

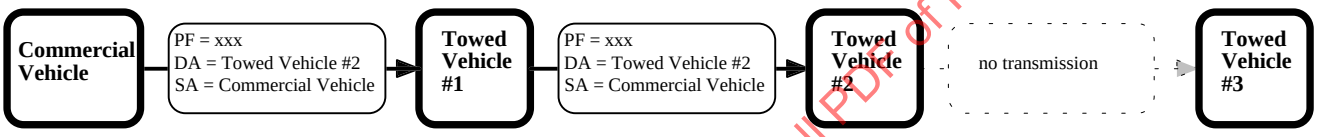

Figure 5 — Example of PDU 1 type message from towing vehicle to towed vehicle #2

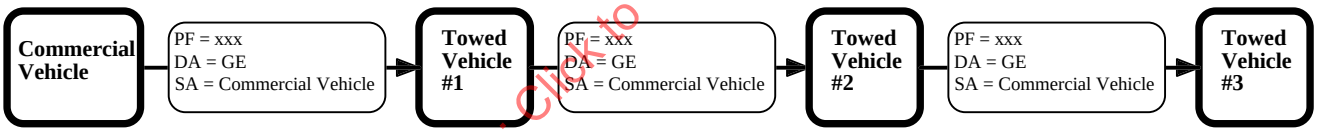

Figure 6 — Example of PDU 2 type message from commercial vehicle to all towed vehicles

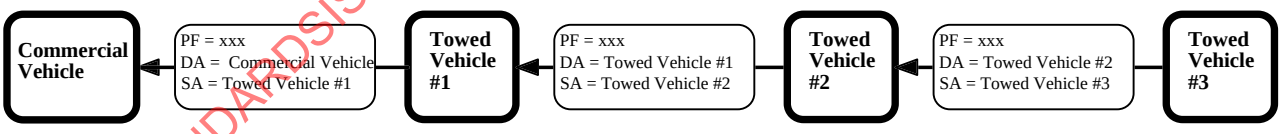

Figure 7 — Example of PDU 1 type messages from towed vehicle to preceding towing vehicle

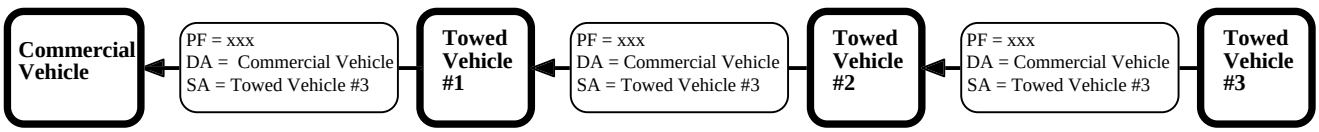

Figure 8 — Example of PDU 1 type message from towed #3 to commercial vehicle

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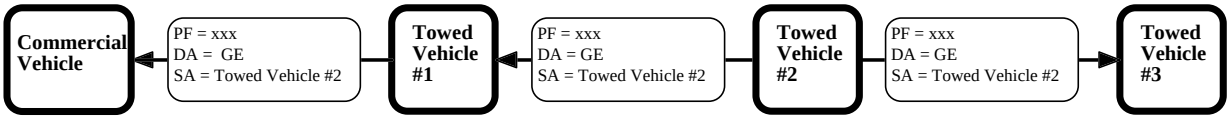

Figure 9 — Example of PDU 2 type message from towed vehicle #2

5.4 Parameters

5.4.1 Parameter ranges

Table 4 specifies the ranges used to determine the validity of transmitted signal.

Table 5 specifies the ranges used to denote the state of a discrete parameter and table 6 defines the ranges used to denote the state of a control mode command.

The values in the range "error indicator" provide a means for a module to immediately indicate that valid parameter data is not currently available due to some type of error in the sensor, sub-system, or module. Additional information about the failure may be available using diagnostic requests.

The values in the range "not available" provide a means for a module to transmit a message which contains a parameter that is not available or not supported in that module. This value does not replace the "error indication".

The values in the range "not requested" provide a means for a device to transmit a command message and identify those parameters where no response is expected from the receiving device.

After power on, a node should internally set the "availability bits" of received parameters as not available and operate with default values until valid data is received. When transmitting, undefined bytes should be sent as 255Dec (FFHex) and undefined bits should be sent as "1".

If a component failure prevents the transmission of valid data for a parameter, the error indicator, as described in tables 4 and 5, shall be used in place of that parameter data. However, if the measured or calculated data has yielded a value that is valid yet exceeds the defined parameter range, the error indicator shall not be used. The data should be transmitted using the appropriate minimum or maximum parameter value.

A word (16 bit) parameter shall be sent, least significant byte first, most significant byte second.

Table 4 — Transmitted signal ranges

Parameter	Unit	Value range	
		1 byte	2 bytes
Signal range	Dec	0 to 250	0 to 64255
	Hex	00 to FA	0000 to FAFF
Reserved range for future indicator bits	Dec	251 to 253	64256 to 65023
	Hex	FB to FD	FB00 to FDFF
Error indicator	Dec	254	65024 to 65279
	Hex	FE	FExx
Not available or not requested	Dec	255	65280 to 65535
	Hex	FF	FFxx

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Table 5 — Transmitted values for discrete parameters

Range name	Transmitted value
Disabled (off, passive, insufficient)	00
Enabled (on, active, sufficient)	01
Error indicator	10
Not available or not installed	11

Table 6 — Transmitted values for control requests

Range name	Transmitted value
Request to disable function (turn off, etc.)	00
Request to enable function (turn on, etc.)	01
Reserved	10
Don't care/take no action (leave function as it is)	11

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5.4.2 Parameter specifications

5.4.2.1 General

A description of each parameter is given in 5.4.2.2 to 5.4.2.32. The description includes data length, data type, resolution and range for reference.

The type of data shall also be identified for each parameter. Data may be either status or measured. Status specifies the present state of a multi-state parameter or function as a result of action taken by the transmitting node. Note that specific confirmation of this action is not necessarily assured. For instance, the status can indicate that a solenoid has been activated, even if no measurement has been taken to ensure the solenoid accomplished its function. An example of measured-type data is "vehicle service brake active/passive".

Measured data conveys the current value of a parameter as measured or observed by the transmitting node to determine the condition of the defined parameter. An example of status-type data is "service brake demand value".

Negative signed torque parameter indicates deceleration, positive signed torque indicates acceleration in accordance to the driveline of the vehicle.

5.4.2.2 Park brake demand value

The requested brake pressure value of the parking brake as a percentage of maximum.

Data length: 1 byte

Resolution: 0,4 %/bit gain, 0 % offset

Data range: 0 % to 100 %

Type: Status

5.4.2.3 Retarder demand value

The demanded value of the retarder on the towed vehicle(s) as a percentage of the absolute peak torque of retarder.

Data length: 1 byte
Resolution: 1 %/bit gain, –125 % offset
Data range: –125 % to 125 %
Operating range: –125 % to 0 %
Type: Status

NOTE — Retarder demand torque is defined in indicated torque as a percentage of peak retarder torque.

In the definition of power train speed/torque the retarder torque reaction is a deceleration defined by a negative signed parameter.

EXAMPLE

Retarder demand value = 75 % × absolute Peak Torque of retarder

Calculation:

1st step Data Content (DC) of RDV:

$$DC = \frac{RDV - Offset}{Resolution} = \frac{-75\% - (-125\%)}{1\%/bit} = 50$$

2nd step Measured (Actual) Retarder Torque (ART)

$$DC = \frac{ART - Offset}{Resolution} = 50$$

$$ART = DC \times Resolution + Offset$$

$$ART = 50 \times 1\% + (-125\%)$$

$$ART = -75\ \%$$

5.4.2.4 Service brake demand value

The requested brake pressure value of the service brake demanded by the driver.

Data length: 2 bytes
Resolution: 5/256 kPa/bit gain, 0 kPa offset
Data range: 0 kPa to 1255 kPa
Type: Status

NOTES

1 This value may be modified by the coupling force control function, which has been specified by ECE Regulation R.13.

2 1 bar = 10^5 Pa.

5.4.2.5 Wheel-based (from braking system) vehicle speed

Actual speed of the vehicle (positive value for forward and backward speed) calculated as the average of the wheel speeds of one axle influenced by slip and filtered by a frequency range of 5 Hz to 20 Hz.

Data length: 2 bytes
Resolution: 1/256 kmph/bit gain, 0 kmph offset
Data range: 0 kmph to 250 kmph
Type: Measured

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5.4.2.6 Reference retarder torque

This parameter is the 100 % reference value for all defined indicated retarder torque parameters. It is only defined once and does not change if a different retarder torque map becomes valid.

Data length: 2 bytes,
Resolution: 1 Nm/bit gain, 0 Nm offset,
Data range: 0 Nm to 64255 Nm.
Type: Measured

5.4.2.7 Actual percentage of retarder peak torque

Actual torque of the retarder as negative percentage of maximum.

Data length: 1 byte
Resolution: 1 %/bit gain, –125 % offset
Data range: –125 % to +125 %
Operating range: –125 % to 0 %
Type: Measured

5.4.2.8 Axle load sum

Sum of the static vertical loads of the vehicles axles.

Data length: 2 bytes
Resolution: 2 kg/bit gain, 0 kg offset
Data range: 0 kg to 128 510 kg
Type: Measured

5.4.2.9 Pneumatic supply pressure

Actual supply pressure of the reservoir of the braking system.

Data length: 1 byte
Resolution: 5 kPa/bit gain, 0 kPa offset
Data range: 0 kPa to 1 250 kPa (12,5 bar)
Type: Measured

5.4.2.10 Tyre identification

Identification number of the tyre with

— insufficient pressure, or

— brake linings, or

— specific brake temperature.

The identification number specifies the wheel position on each axle (bit 1 to 4) and the number of axles starting from the front vehicle (bit 5 to 8) (see figure 10).

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The identification number is in conjunction with the status information in the message.

Data length: 1 byte

Resolution: 1/bit gain, 0 offset

Data range: 1 - 15 wheel position (low bits)

1 - 15 axle position (high bits)

Type: Measured

The tyre identification is labelled sequentially from the vehicle symmetric line, starting from '9' incrementing on the right side, and from '7' decrementing on the left side. '8' is used for one wheel on the symmetric line.

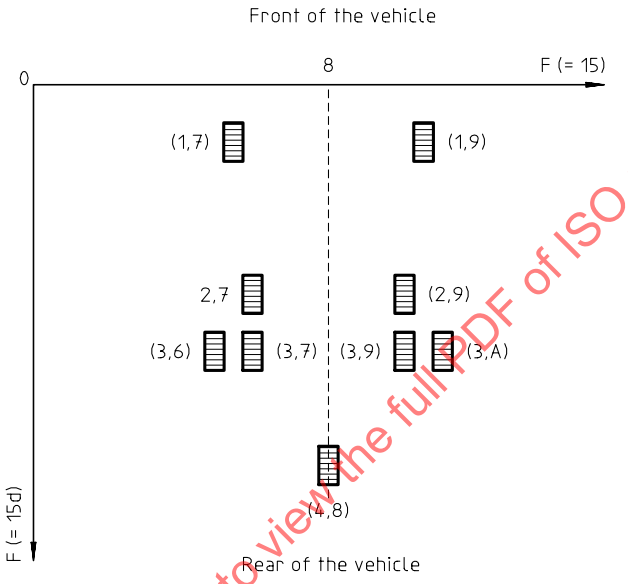

Figure 10 — Wheel and axle position

5.4.2.11 Brake lining

Actual relative value of brake lining of a specific brake.

Data length: 1 byte

Resolution: 0,4 %/bit gain, 0 % offset

Data range: 0 % to 100 %

Type: Measured

5.4.2.12 Brake temperature

Actual brake temperature.

Data length: 1 byte

Resolution: 10 °C/bit gain, 0 % offset

Data range: 0 °C to 2 500 °C

Type: Measured

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5.4.2.13 Tyre pressure

Actual tyre pressure without corrections.

Data length: 1 byte
Resolution: 10 kPa/bit gain, 0 kPa offset
Data range 0 kPa to 2 500 kPa
Type: Measured

5.4.2.14 Vehicle retarder control active/passive

This signal indicates the active/passive state in all cases when the installed retarder is applied by the drivers demand or by other systems (brakes).

NOTE — "Applied" means that the retarder starts to increase its torque and decelerates the vehicle.

00 — Retarder 'passive'
01 — Retarder 'active'
Type: Measured

5.4.2.15 Vehicle service brake active/passive

Signal indicating the service brake of the towed vehicle is active/passive, by supervising the brake pressure.

00 — Vehicle service brake passive
01 — Vehicle service brake active
Type: Measured

5.4.2.16 Automatic towed vehicle braking active/passive

Signal indicating the automatic towed vehicle braking is active/passive. This function will occur when the pneumatic supply is insufficient or not connected.

00 — Vehicle automatic braking passive
01 — Vehicle automatic braking active
Type: Measured

5.4.2.17 Vehicle ABS active/passive

Signal indicating the ABS is active/passive. The signal is set active when the ABS starts to modulate the wheel brake pressure, and is reset to passive when all wheels are in stable condition for a certain time period. The signal can also be set to active when driven wheels are in high slip (e.g. caused by retarder).

NOTE — Active does not mean "installed" or "enabled", but indicates an actual ABS situation. In case of at least one wheel speed error, the error indicator shall have priority (see table 5).

00 — Vehicle ABS passive, but installed
01 — Vehicle ABS active
Type: Measured

5.4.2.18 Vehicle electrical supply sufficient/insufficient

Signal indicating the actual supply voltage is sufficient/insufficient for proper brake function (including over voltage).

00 — Vehicle electrical supply insufficient
01 — Vehicle electrical supply sufficient
Type: Status

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5.4.2.19 Vehicle pneumatic supply sufficient/insufficient

Signal indicating the actual supply pressure of the reservoir of the braking system is insufficient or sufficient.

00 — Vehicle pneumatic supply insufficient

01 — Vehicle pneumatic supply sufficient.

Type: Status

5.4.2.20 Spring brake installed

Signal indicating the vehicle has one or more axle(s) fitted with spring brakes.

00 — Vehicle without spring brakes

01 — Vehicle with spring brakes

Type: Status

5.4.2.21 Electrical load proportional function

Signal indicating the vehicle is equipped with an electrical load proportional function.

00 — Vehicle without electrical load proportional function

01 — Vehicle with electrical load proportional function

Type: Status

5.4.2.22 ABS off-road request

Request to activate the ABS off-road function. The switch signal is independent of an actual ABS control situation.

00 — ABS off road switch off

01 — ABS off road switch on

Type: Status

5.4.2.23 ASR brake control active/passive

Signal which indicates that ASR brake control is active/passive. Active means that ASR actually controls wheel brake pressure at one or more wheels of the driven axle(s).

NOTE — Active does not mean "installed" or "enabled", but indicates an actual ASR situation.

00 — ASR brake control passive, but installed

01 — ASR brake control active

Type: Measured

5.4.2.24 ASR engine control active/passive

Signal which indicates that ASR engine control is active/passive. Active means that ASR actually tries to control the engine. This status is independent of other control commands to the engine (e.g. from the transmission) which may have higher priority.

NOTE — Active does not mean "installed" or "enabled", but indicates an actual ASR situation.

00 — ASR engine control passive

01 — ASR engine control active

Type: Measured

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5.4.2.25 Pneumatic control line

Status signal which indicates that the towing vehicle has a pneumatic control line for the towed vehicle service braking system.

00 — Towing vehicle without pneumatic control line

01 — Towing vehicle with pneumatic control line

Type: Status

NOTE — This parameter is required by ECE regulation R.13.

5.4.2.26 Two electrical circuits brake demand value

Status signal which indicates that the service brake demand value sent by the towing vehicle can be generated by one or two independent electrical braking circuit(s).

00 — One electrical circuit brake available

01 — Two electrical circuit brake available

Type: Status

NOTE — This parameter is required by ECE R13.

5.4.2.27 Tyre pressure sufficient/insufficient

Status signal which indicates that the tyre pressure is out of the specific pressure range.

00 — Tyre pressure insufficient

01 — Tyre pressure sufficient

Type: Status

5.4.2.28 Brake lining sufficient/insufficient

Status signal which indicates that the brake lining is sufficient/insufficient.

00 — Brake linings insufficient

01 — Brake linings sufficient

Type: Status

5.4.2.29 Brake temperature status

Status signal which indicates that the brake temperature is higher than a specific level.

00 — Brake temperature out of range

01 — Brake temperature normal

Type: Status

5.4.2.30 Brake light switch

Status signal which indicates that the brake pedal is being pressed.

00 — Brake light switch off

01 — Brake light switch on

Type: Status

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5.4.2.31 Vehicle type

Status information to identify a dolly axle within the road train.

00 — Towing or towed vehicle

01 — Dolly axle

Type: Status

5.4.2.32 Red warning signal request

Request from the towed vehicle to the commercial vehicle to activate the red warning signal on the commercial vehicle, which indicates certain specified failures within the braking equipment of the towed vehicles.

NOTE — This parameter is required by ECE regulation R.13.

00 — No towed vehicle failure to be indicated by the red warning signal

01 — Towed vehicle failure to be indicated by the red warning signal

Type: Status

5.5 Messages

5.5.1 General

This subclause specifies the data content for use on the electrical connection between towing and towed vehicles.

All undefined bits are to be transmitted with a value of "1". All undefined bits should be received as "don't care" (either masked out or ignored). This permits them to be defined and used in the future without causing incompatibilities.

The data content block is described by a short form of the function, e.g. EBS for electronic braking system, and two numbers. The first stands for the transmission direction:

— towing to towed vehicle: 1

— towed to towing vehicle: 2

The second is the block (messages) number.

For the dynamic address assignment, one of the PDU1-type messages to be sent from the towing vehicle to the towed vehicle with the lowest transmission repetition time is specified as the standard initialization message. This message, as well as one of the PDU1-type messages to be sent from a towed vehicle to its predecessor with the lowest transmission repetition time shall be sent permanently.

For PDU 1 and PDU 2 type messages, see tables 7 and 8.

The messages EBS11 and EBS21 are to be transmitted only between two directly coupled vehicles for optimal brake control between these two units. Since EBS21 also contains information that is relevant to the commercial vehicle (warning information to the driver) this information is also mapped into the message EBS22.

Table 7 — PDU 1 type messages

Repetition rate	Data specification	P	R	DP	PF	PS	PGN	Remarks
< 100 ms	Electronic brake # 1/1 - EBS 11	3	0	0	2	DA	000200h	
< 100 ms	Electronic brake # 2/1 - EBS 21	3	0	0	3	DA	000300h	

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Table 8 — PDU 2 type messages

Repetition rate	Data specification	P	R	DP	PF	PS (GE)	PGN	Remarks
≥ 100 ms	Electronic brake # ½ - EBS 12	6	0	0	254	201	00FEC9h	
≥ 100 ms	Electronic brake # 2/2 - EBS 22	6	0	0	254	196	00FEC4h	
≥ 100 ms	Electronic brake # 2/3 - EBS 23	6	0	0	254	198	00FEC6h	

5.5.2 Message specifications, transmission direction from towing to towed vehicle

5.5.2.1 Towing vehicle message # 1/1, EBS 11

This message is defined as standard initialization message for address assignment of the receiving vehicle.

Sending of this message is required.

Transmission repetition time: 10 ms ± 1 ms
Data length: 8 bytes
Data page: 0
Parameter format: 2
PDU specific: address of the successor
Default priority: 3

Byte: 1 Towing vehicle system status 1 Bit: 1-2 ABS active/passive
3-4 Vehicle retarder control active/passive
5-6 ASR brake control active/passive
7-8 ASR engine control active/passive

2 Towing vehicle system status 2 Bit: 1-2 Brake light switch
3-4 Vehicle type
5-8 Not defined

3-4 Service brake demand value
5 Park brake demand value
6 Retarder demand value
7-8 Not defined

5.5.1.2 Towing vehicle message # 1/2, EBS 12

Sending of this message is required.

Transmission repetition time: 100 ms ± 10 ms
Data length: 8 bytes
Data page: 0
Parameter format: 254
PDU specific: 201

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Default priority: 6

Byte: 1 Towing vehicle system status 3 Bit: 1-2 Vehicle retarder control active/passive
3-8 Not defined
2 Towing vehicle system status 4 Bit: 1-8 Not defined
3 Towing vehicle recognition 1 Bit: 1-2 Two electrical circuits brake demand value
3-4 ABS off road switch on/off
5-6 Pneumatic control line
7-8 Not defined
4 Towing vehicle recognition 2 Not defined
5-8 Not defined

5.5.3 Message specifications, transmission direction from towed to towing vehicle

5.5.3.1 Towed vehicle message # 2/1, EBS 21

Sending this message is required.

Transmission repetition time: 10 ms ± 1 ms
Data length: 8 bytes
Data page: 0
Parameter format: 3
PDU specific: Address of the predecessor
Default priority: 3
Byte: 1 Towed vehicle system status 1 Bit: 1-2 Vehicle ABS active/passive
3-4 Vehicle retarder control active/passive
5-6 Vehicle service brake active/passive
7-8 Automatic towed vehicle brake active/passive
2 Towed vehicle system status 2 Bit: 1-8 Not defined
3-4 Wheel-based vehicle speed
5 Actual percentage of the retarder torque
6-8 Not defined

5.5.3.2 Towed vehicle message # 2/2, EBS 22

Sending this message is required.

Transmission repetition time: 100 ms ± 10 ms
Data length: 8 bytes
Data page: 0
Parameter format: 254
PDU specific: 196
Default priority: 6
Byte: 1 Towed vehicle system status 1 [1)] Bit: 1-2 Vehicle ABS active/passive
3-4 Vehicle retarder control active/passive

1) Warning information to the commercial vehicle.

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			5-6	Vehicle service brake active/passive
			7-8	Automatic towed vehicle brake
2	Towed vehicle status 3	Bit:	1-2	Vehicle electrical supply sufficient/insufficient
			3-4	Red warning signal request
			5-8	Not defined
3	Towed vehicle recognition 1	Bit:	1-2	Spring brake installed
			3-4	Electric load proportional function
			5-6	Vehicle type
			7-8	Not defined
4	Towed vehicle recognition 2	Bit:	1-8	Not defined
5-6	Axle load sum			
7-8	Reference retarder torque			

5.5.3.3 Towed vehicle message # 2/3, EBS 23

Sending this message is required.

Transmission repetition time:		100 ms ± 10 ms		
Data length:		8 bytes		
Data page:		0		
Parameter format:		254		
PDU specific:		198		
Default priority:		6		
Byte: 1	Towed vehicle system status	Bit:	1-2	Tyre pressure sufficient/insufficient
			3-4	Brake lining sufficient/insufficient
			5-6	Brake temperature status
			7-8	Vehicle pneumatic supply sufficient/insufficient
2	Tyre identification (pressure)			
3	Tyre identification (lining)			
4	Tyre identification (temperature)			
5	Tyre pressure			
6	Brake lining			
7	Brake temperature			
8	Pneumatic supply pressure			

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6 Conformance tests

6.1 General

The conformance tests specify methods to check the message transmission of the towing and towed vehicles to ensure compatibility.

The data content of the parameters is not part of the conformance tests.