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BSI Standards Publication

Electric-electronic interface between chassis-cab and bodywork of refuse collection vehicles (RCVs)

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National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Electric-electronic interface between chassis-cab and bodywork of refuse collection vehicles (RCVs)

Interface électrique-électronique entre le châssis-cabine et la superstructure des bennes de collecte des déchets

CAN-Schnittstelle zwischen Fahrgestellen und Aufbau von Abfallsammelfahrzeugen

This Technical Report was approved by CEN on 24 September 2013. It has been drawn up by the Technical Committee CEN/TC 183.

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Contents

Page

Foreword

This document (CEN/TR 16596:2013) has been prepared by Technical Committee CEN/TC 183 “Waste management”, the secretariat of which is held by DIN.

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Introduction

On September 29, 2009, CEN/TC 183/WG 2 mandated its PWG 5 to work on a proposal for the CAN communication between the chassis-cab and the bodywork of RCVs. Based on an earlier proposal (PWG 5 from 2002 to 2005), the experts of PWG 5 discussed the possibilities and concluded in the results shown in this document.

To comply with the requirements of the relevant safety Directives and Standards, it is unavoidable to use electronic controls on the RCV chassis-cab and on the bodywork of RCVs because the control devices have to communicate to get the RCV working in proper and safe conditions.

This document contains a proposal for an interface between the chassis-cab and the bodywork in terms of electrical wiring including plugs and positions for the plugs as well as an adequate CAN protocol.

1 Scope

This Technical Report proposes a standardized interface between the chassis-cab and the bodywork of refuse collection vehicles. The solution, initially for vehicles with hard wired interface and CAN interface, is developed into full CAN communication between the bodywork and the chassis-cab.

2 Normative references

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

EN 1501-1:2011, *Refuse collection vehicles — General requirements and safety requirements — Part 1: Rear loaded refuse collection vehicles*

EN 1501-5:2011, *Refuse collection vehicles — General requirements and safety requirements — Part 5: Lifting devices for refuse collection vehicles*

SAE J1939/71:2010-02, *Vehicle application layer*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1501-1:2011 and the following apply.

3.1
electric interface
provisions for power supply and control signals to ensure safe connections between the chassis-cab and the bodywork

3.2
electronic interface
provisions for communication between the chassis-cab and the bodywork by means of CanBus

3.3
Electronic Control Unit
ECU
embedded system that controls one or more electrical systems or subsystems in a RCV

4 Electric interface

4.1 Objective

This clause describes the electric interface between all chassis and the bodywork of refuse collection vehicles. Plugs, pin-outs and signals are defined.

The chassis-cab shall be provided with an electric-electronic interface ready to be connected inside the cab and outside the cab. From inside to outside of the cab, there is a defined wiring loom to connect the chassis information and which is also used for information reserved for the bodywork. By this means, the bodywork manufacturer does not need to rework the wiring and can therefore avoid wrong handling and damages on the chassis-cab side.

Annex A shows the architecture of the electric-electronic interface and examples of possible ways the bodybuilder can use it.

4.2 Description

As shown in Annex A, the electrical interface is composed of six plugs each shared into three lines. The plugs shall be marked according to the following format BBxy, where:

— x represents the line number, $1 \leq x \leq 2$;

— y represents the location of the plugs, $1 \leq x \leq 3$ (1: From the chassis, 2: Inside the cab, 3: Out of the cab).

EXAMPLE The plug BB23 represents the plug out of the cab on line 2.

4.3 Plugs

See Annex B.

The following plugs shall be used:

— BB11 MCP 2.8 Unsealed tab housing 21 ways, Coding C, Blue P/N 3-967630-1 Tyco Corp.
— BB21 MCP 2.8 Unsealed tab housing 18 ways, Coding A, Grey P/N 1-967629-1 Tyco Corp.
— BB12 MCP 2.8 Unsealed receptacle housing 21 ways, Coding C, Blue P/N 6-968975-1 Tyco Corp.
— BB22 MCP 2.8 Unsealed receptacle housing 18 ways, Coding A, Brown P/N 8-968974-1 Tyco Corp.
— BB13 MCP 2.8 Sealed tab housing with flange 21 ways, Coding A, Black P/N 1-2112162-1 Tyco Corp.
— BB23 MCP 1.5 Sealed tab housing 18 ways, Black P/N 1-1564412-1 Tyco Corp.

4.4 Pin-out and defined signals

See Annex C, D, E, F and G.

In case of full CAN-bus operation, line 1 is carrying all signals and energy pins and line 2 is not used.

In case of hard-wired interface operation, line 1 and line 2 are used with the defined pins.

4.5 Video cable

On RCVs, a camera with video-monitor inside the cab is mandatory and a video-cable shall be laid from outside to inside the cab. This cable is depending on the bodywork manufacturer video-system and cannot be standardized.

To prevent dismounting the cab only for this cable, a ductwork including a wire puller to fit the camera-cable shall be provided parallel to the wiring harness as shown in Annex A.

Outside the cab, the end of the ductwork shall be placed accessible close to the plugs BB11 and BB12. Inside the cab, the end of the ductwork shall be placed accessible near the middle of the dashboard.

The inner diameter of the ductwork shall be so that it is possible to lay the camera cable with M12 connector with a minimum of 20 mm.

The ductwork shall be fixed in the chassis-cab so that its radius allows the camera-cable to be easily pulled with the wire puller.

4.6 Plugs location

The plugs BBx1 and BBx2 inside the cab shall be located all together in the electrics compartment/base module and easily accessible.

The plugs BB13 and BB23 outside the cab shall be fixed all together on a plate behind the cab on the left hand side of the frame.

The chassis-cab shall be delivered with the external plugs protected to avoid oxidation of the contacts until they are used.

5 CAN Interface

5.1 Objective

To be compatible whatever the chassis-cab manufacturer, the electrical interface described in Clause 4 shall use the CAN communication with the most common used protocol on industrial vehicles: SAE J1939/71 revised February 2010.

5.2 SAE J1939/71 messaging for RCV

5.2.1 Description

See Annexes H and I.

All the requested information are those described in the SAE J1939/71 (revised February 2010) protocol. Therefore, for the information specific to the RCV some new messages have been created and the corresponding proprietary CAN identifiers have been defined.

Priority classification (PC) of the messages:

— PC1: Mandatory by EN 1501-1;

— PC2: Minimum necessary for correct operation of the bodywork;

— PC3: For complete integration between bodywork and chassis-cab.

5.2.2 Source address

Messages from bodywork to chassis-cab shall be sent with source address XX_h (XX_d).

5.3 Management of the information between bodywork and chassis-cab

5.3.1 Vehicle stopped

Priority classification: PC2.

Most of the hydraulic movements of the bodywork shall be possible only if the RCV is stopped. The RCV stopped condition is internally managed by the RCV's ECU depending on the primary CAN information, see Figure 1:

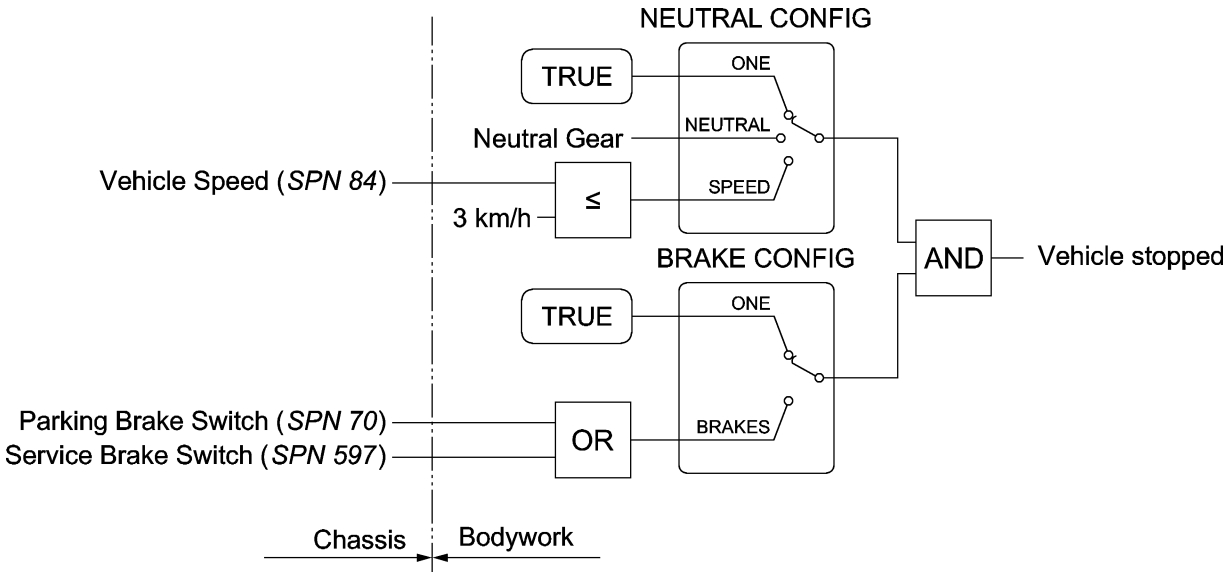


Figure 1 — Primary CAN information

The neutral gear information depends on the gearbox type. For a mechanical gearbox, it depends on the gear neutral switch and the position of the clutch pedal. For an automatic gearbox, the neutral gear information is considered active if it is selected and engaged; see Figure 2:

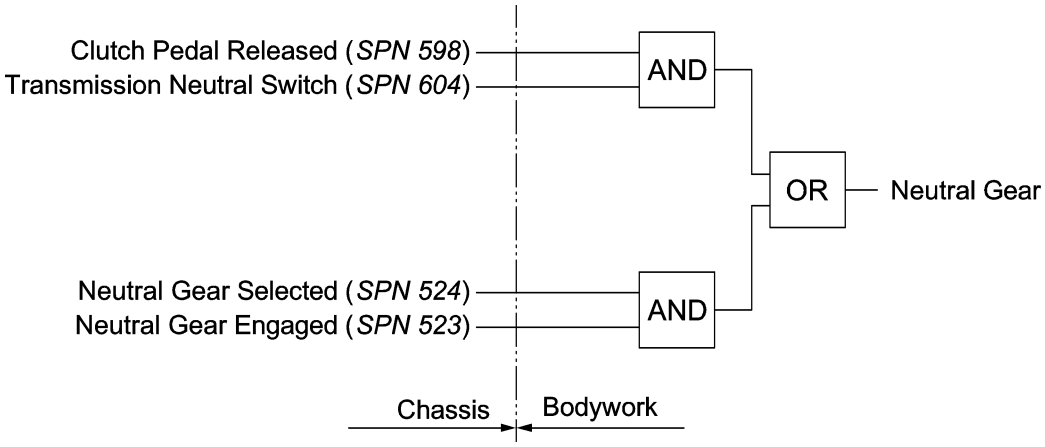


Figure 2 — Neutral gear information

Neutral gear information depends on gearbox type. Messages corresponding to manual gearbox are only available if this type of gearbox is used. Messages corresponding to automated/automatic gearbox are only available on automated/automatic gearbox types. There is no time-out triggering dependant on gearbox type in the RCV.

5.3.2 Vehicle reversing

Priority classification: PC1.

This information is necessary to comply with EN 1501-1 requirements for activation of the:

— external auditory warning (buzzer);

— brakes of the RCV if someone is standing on the footboard when the reverse gear is engaged.

See Figure 3.

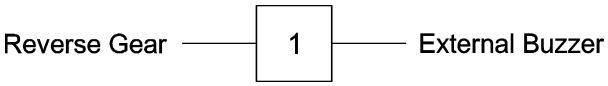


Figure 3 — Vehicle reversing

The reverse gear information depends on the gearbox type. For mechanical gearbox, it is directly sent depending on a switch state. For automatic gearbox, the reverse gear information is considered active when the reverse gear is selected and engaged; see Figure 4:

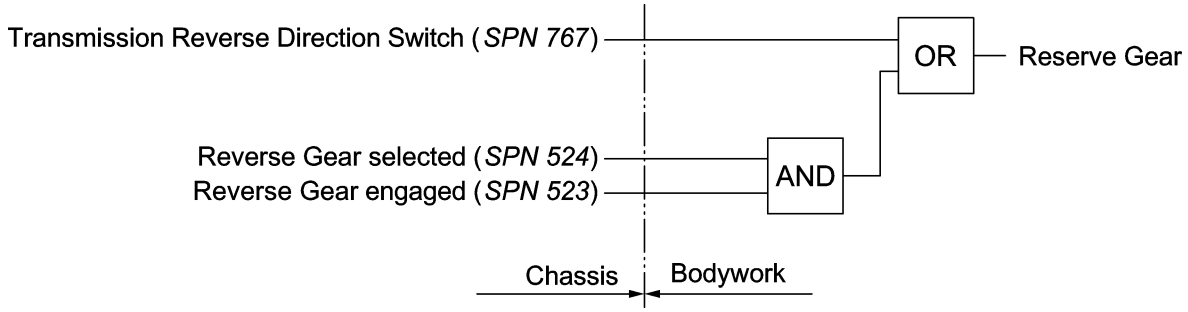


Figure 4 — Reverse gear information

Neutral gear information depends on gearbox type. Messages corresponding to manual gearbox are only available if this type of gearbox is used. Messages corresponding to automated/automatic gearbox are only available on automated/automatic gearbox types. There is no time-out triggering dependant on gearbox type in the RCV.

5.3.3 Vehicle speed

Priority classification: PC1.

This information is necessary to comply with EN 1501-1 requirements. If someone is standing on the footboard and the vehicle speed is greater than 40 km/h, a sound alarm shall be activated to the intention of the driver; see Figure 5.

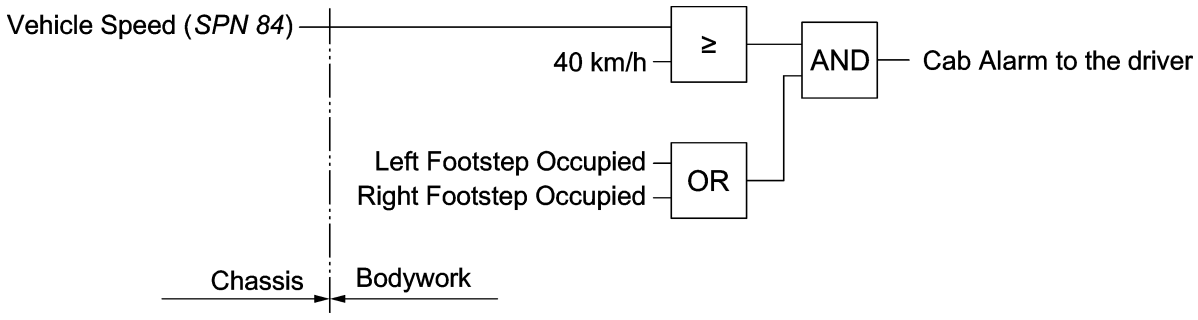


Figure 5 — Vehicle speed

5.3.4 Vehicle distance

Priority classification: PC2.

RCVs generally include a greasing system for the compaction system and lifting devices but also for the chassis-cab itself. In such a case, it is useful to manage the greasing of the chassis-cab depending on the travelled distance; see Figure 6.

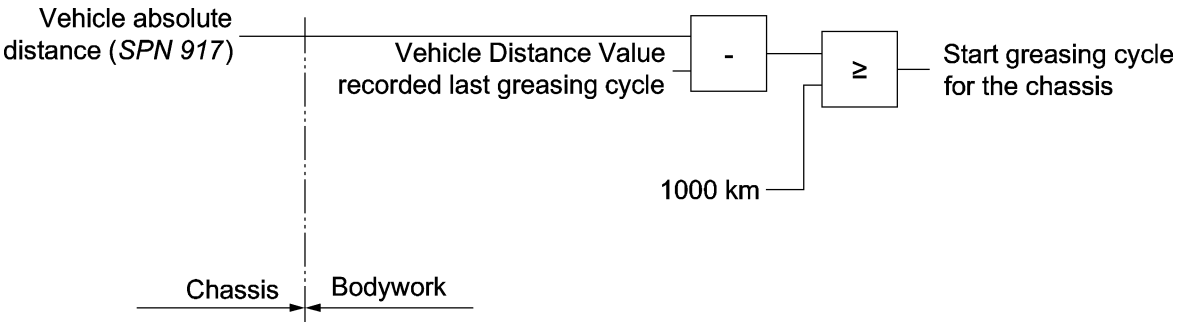


Figure 6 — Vehicle distance

5.3.5 Axles load distribution

Priority classification: PC2.

For RCVs with an important rear overhang, the rear axles can be overloaded at the beginning of the waste collection. To manage this problem, the weight of the axles shall be monitored and if one of them is closed to the upper limit, the ejection panel is moved forward so as to transfer the waste to the front of the body, see Figure 7. When the maximum permissible load is reached, the hydraulics of the RCV can be automatically stopped.

The chassis manufacturer shall specify the accuracy of the system.

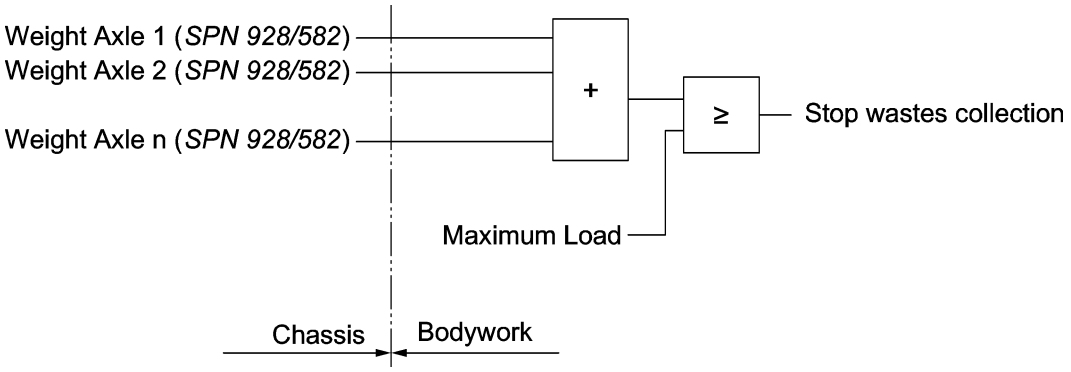


Figure 7 — Axles load distribution

5.3.6 Road speed limitation to 25 km/h / 30 km/h

Priority classification: PC1.

According to EN 1501-1:2011, 5.10.3.3:

> “If the footboard(s) is (are) occupied, the forward driving speed shall be limited to 30 km/h / 25 km/h”.
>
> “In order to avoid dangerous situations when driving over 40 km/h, the speed shall not be limited if no detection has occurred during the vehicle acceleration from 6 km/h to 30 km/h.” (managed by the RCV’s ECU).

An additional control [...] shall be provided so that in case of a faulty function of the device(s) or by road traffic emergency, the speed limitation and reversing safety device(s) can be overridden." (managed by the RCV's ECU). See Figure 8.

NOTE The speed limitation depends on the orientation of the mounted footboards (see EN 1501–1).

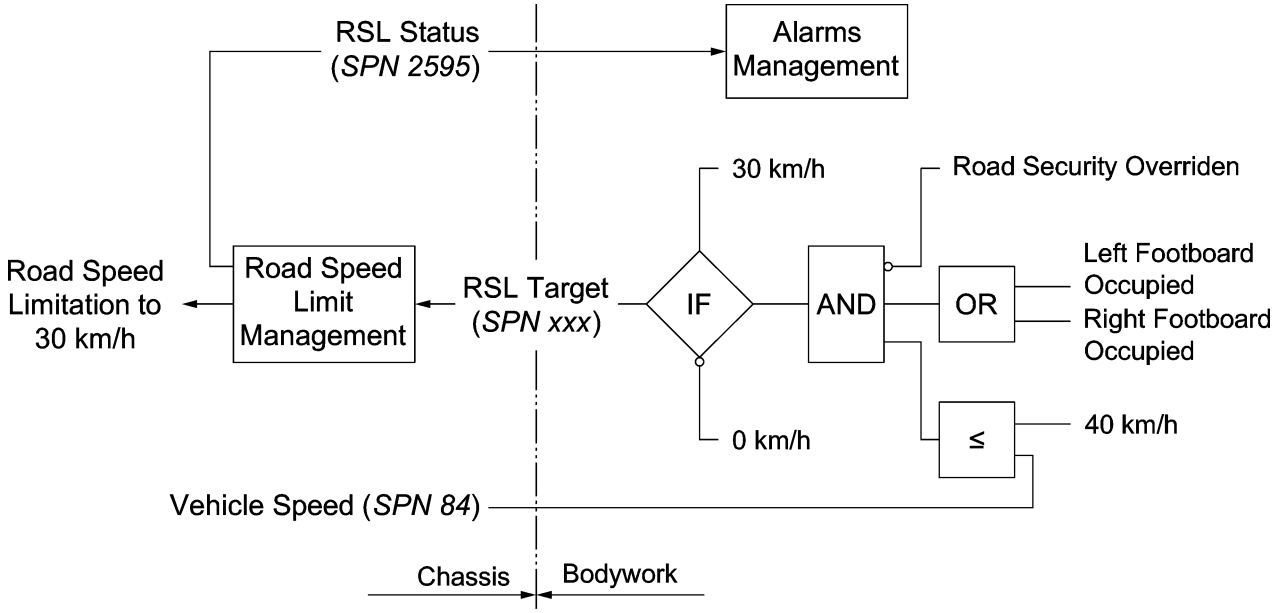


Figure 8 — Road speed limitation to 30 km/h

5.3.7 Road speed limitation to 6 km/h

Priority classification: PC1.

According to EN 1501-5:2011, 5.4:

"If the waste container lifting device is in a position where some parts of it protrude beyond the dimensions of the RCV, the RCV shall not be able to be driven faster than 6 km/h (positioning movement)."

See Figure 9.

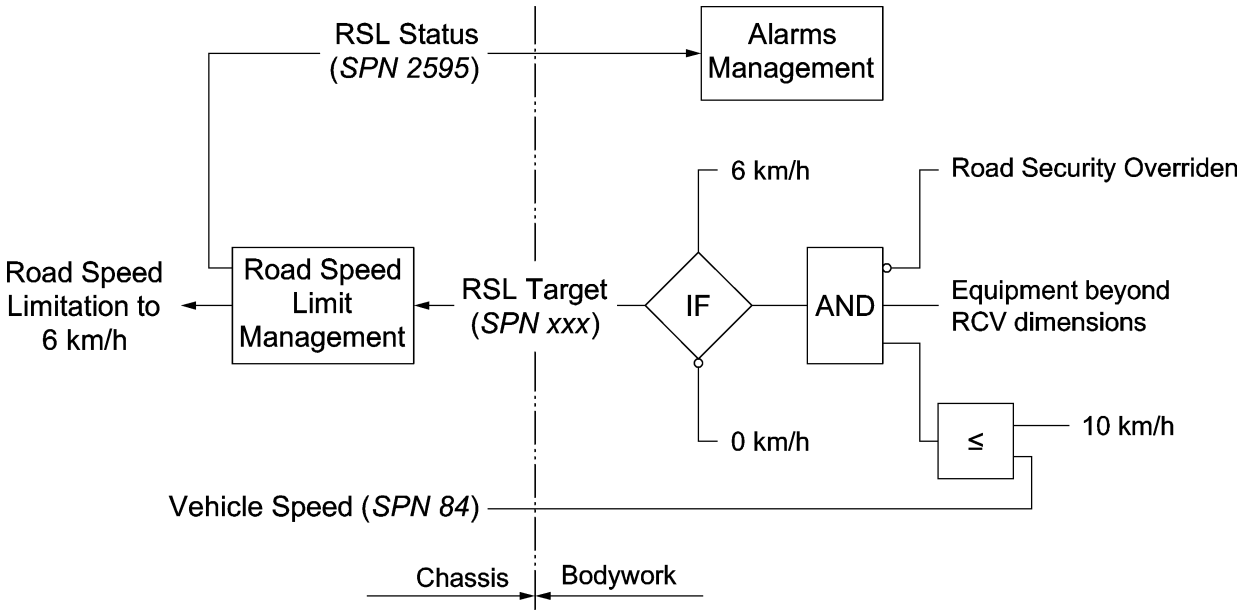


Figure 9 — Road speed limitation to 6 km/h

5.3.8 Brakes system activation

Priority classification: PC1.

According to EN 1501-1:2011, 5.10.3.3:

> "If the footboard(s), is (are) occupied... reversing of the rear loaded RCV shall not be possible."
>
> "The prevention of reversing has to be achieved by activation of the brake system [...]. The fully loaded RCV shall remain stationary on a 10 % slope […] When, after a prevention of the reversing of the ... RCV, the safety device is no longer detecting a person on a footboard, any further reversing shall be possible only by an intentional re-actuation of the gearbox by the driver, whatever the type of gearbox: manual, automatic, semi-automatic." (managed by the RCV's ECU).
>
> An additional control shall be provided so that in case of a faulty function of the device(s) or by road traffic emergency, the speed limitation and reversing safety device(s) can be overridden." (managed by the RCV's ECU).

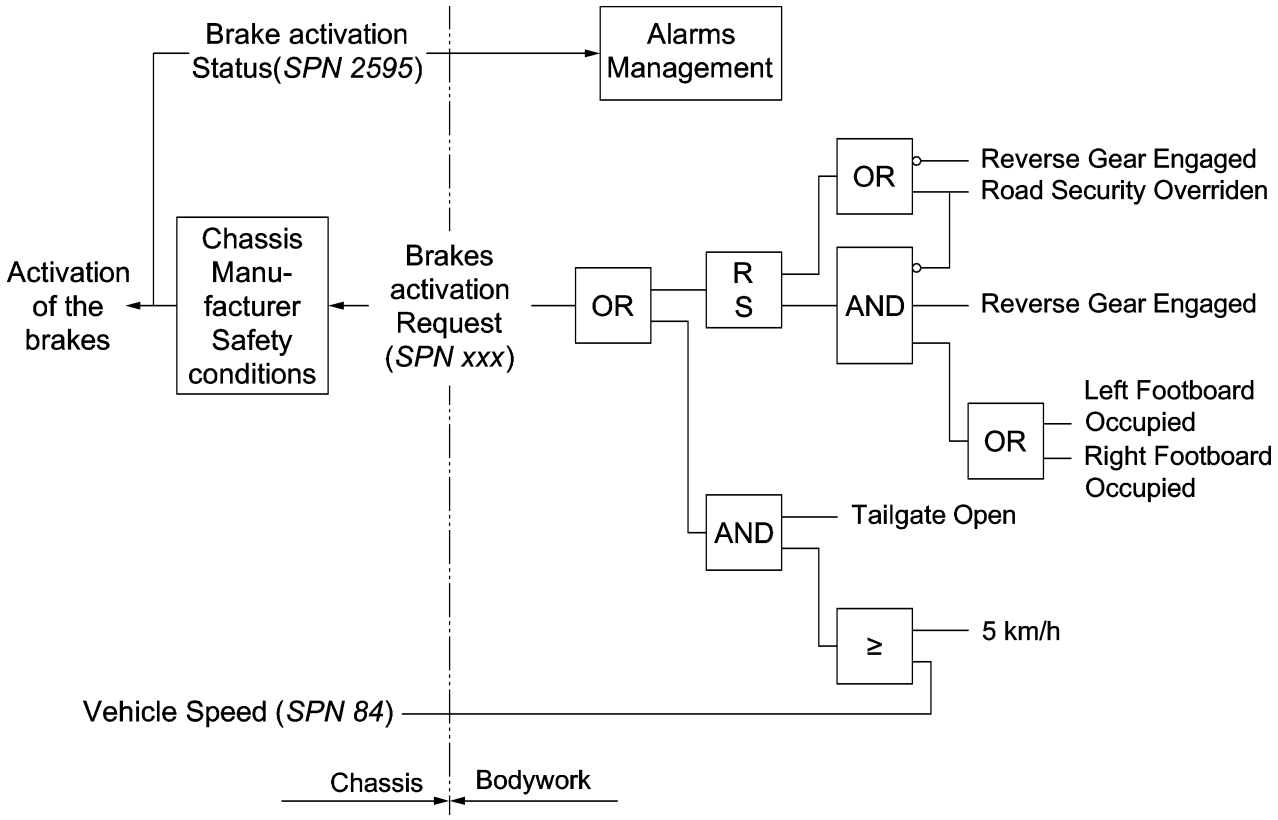


Figure 10 — Brakes system activation

Optionally, the brakes of the chassis-cab can be activated when the tailgate is open to discharge the waste. For example: many drivers leave the location where they just discharged the waste with the tailgate open and crash the tailgate against the top of the entrance gate.

For safety reasons, the brakes activation shall not be possible if the vehicle speed is greater than 6 km/h

The brakes activation status give the information that the chassis-cab has taken in account the brake activation request sent by the bodywork.

See Figure 10.

5.3.9 Power take off (PTO) (All)

Priority classification: PC2.

Usually, RCVs use chassis-cab provided with engine mounted PTO without clutch. If a PTO clutch exists, the preferred management shall be as stated in Figure 11:

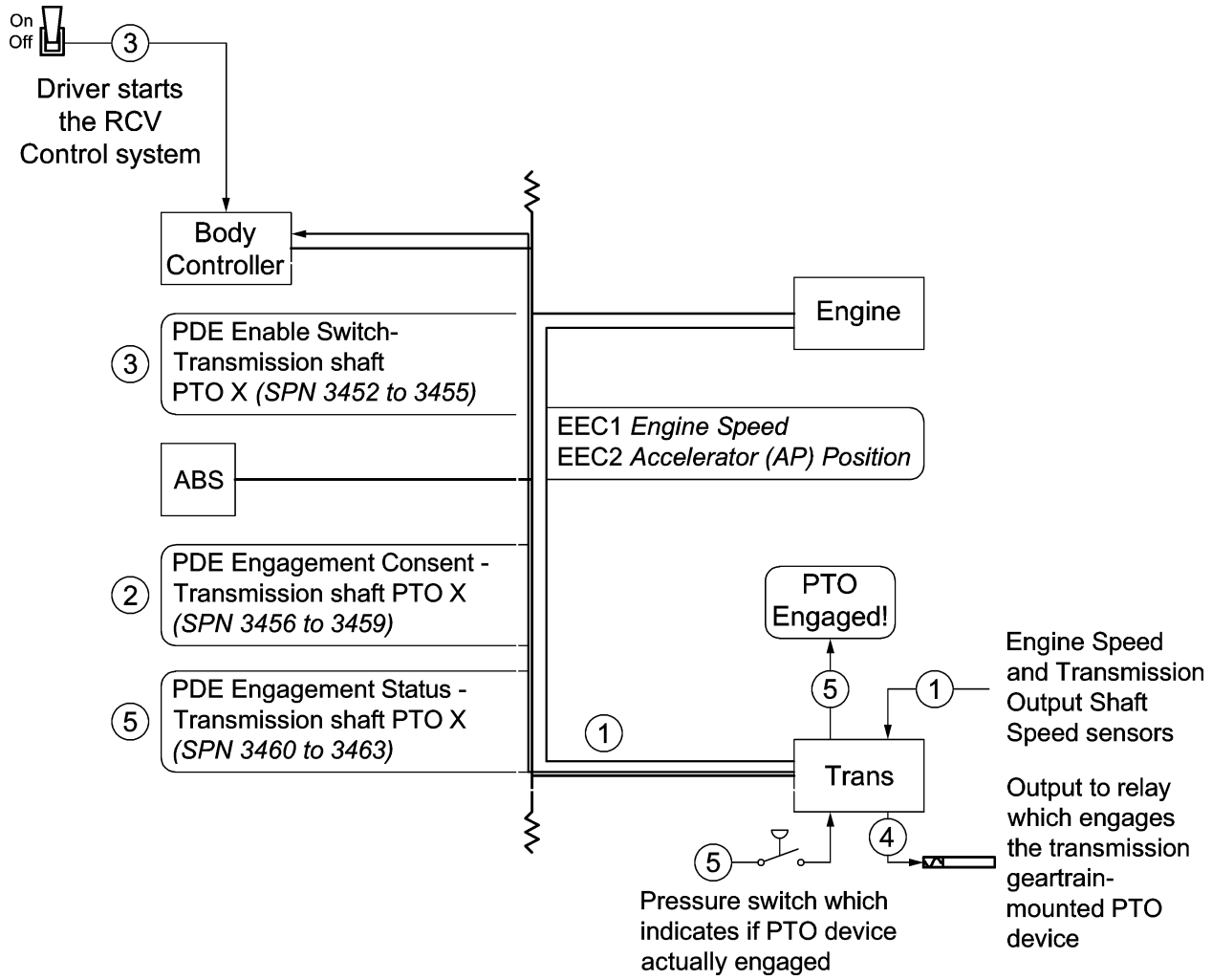


Figure 11 — Power take off (PTO) (All)

1) The PTO controller continually monitors the conditions it requires before its PTO drive can be engaged. This may include internal sensors as well as data collected from the network, such as throttle position.

2) Regardless of whether the driver has requested PTO engagement, the ‘engagement consent’ status is continually broadcast by the transmission.

3) When the driver starts the RCV’s ECU to collect waste, this controller reflects this status in its message broadcast; the transmission controller receives this input.

4) If conditions are acceptable, the transmission controller power the circuit to engage the PTO mounted on the transmission.

5) The PTO controller monitors the progress of the physical PTO engagement, and reflects this in its broadcast so that the RCV’s ECU may use the information.

5.3.10Speed up

5.3.10.1 Fixed speed up

Priority classification: PC2.

When a hydraulic movement is requested by the RCV, the engine speed shall be increased to get sufficient oil flow. The target rpm value depends on the hydraulic pump and the gear ratio between engine and PTO. Usual targets are between 850 rpm and 1 150 rpm.

The speed up is requested only if the RCV is stopped (see conditions in 5.3.1). As soon as the *Vehicle Stopped* conditions are not fulfilled (or no hydraulic movement is requested), the RCV's ECU no more requests the engine speed governor.

IMPORTANT — To get a fast response of the engine so that the requested oil flow is immediately available, the minimum possible engine speed acceleration shall be 300 rpm/s.

The speed control during hydraulic movement shall have higher priority than the accelerator pedal and the cruise control functions.

See Figure 12.

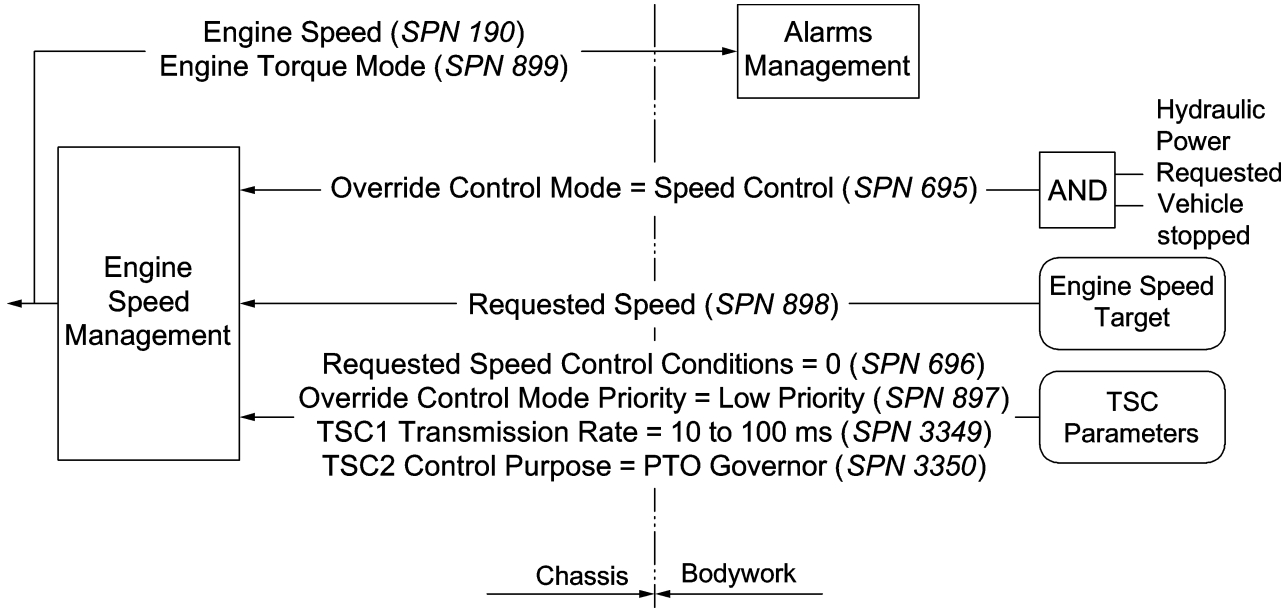


Figure 12 — Fixed speed up

5.3.10.2 Variable speed up

Priority classification: PC2.

With fixed engine speed target, the delivered oil flow is always at its maximum. Sometimes, the requested movement in progress does not need this maximum and the exceeding flow is lost as calories through a relief valve.

To optimise the fuel consumption and also the engine noise, the engine speed target is now computed depending on the exact oil flow the movement in progress needs.

In this mode, the conditions to manage the speed up are still the same as those described for fixed speed up; see Figure 13.

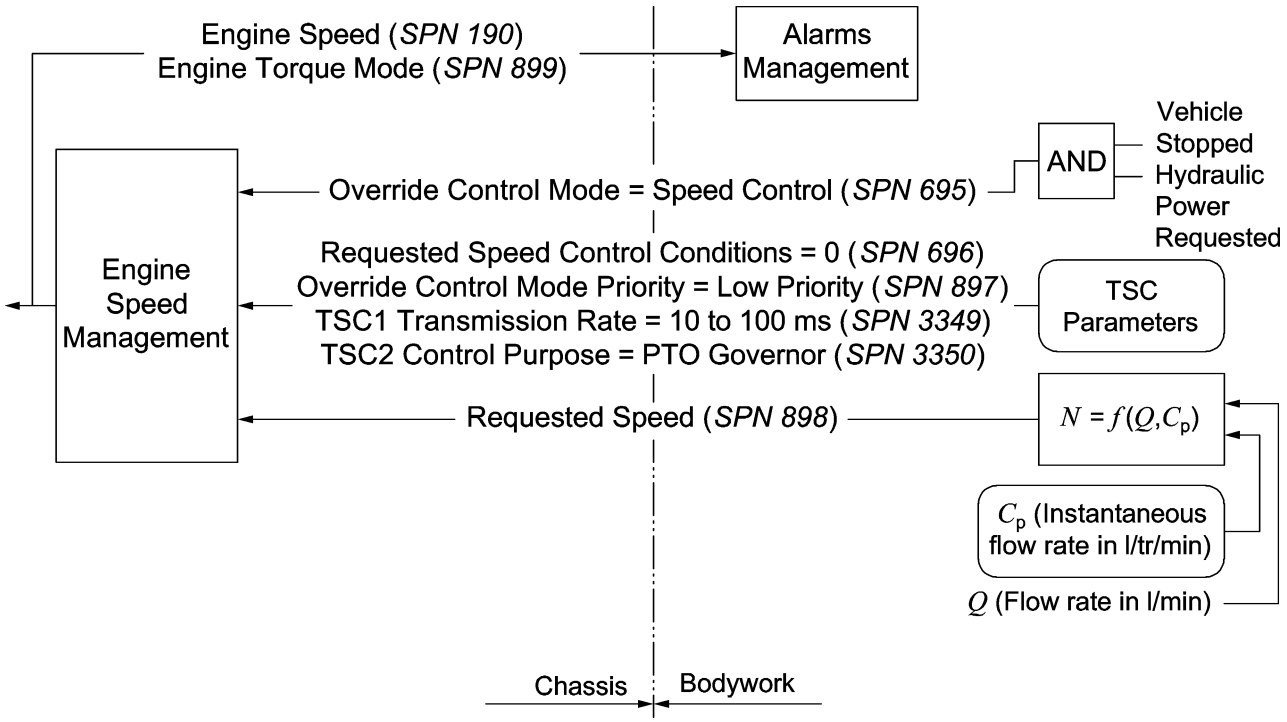


Figure 13 — Variable speed up

5.3.10.3 Limited engine speed

Priority classification: PC2.

When the hydraulic pump cannot run faster than a limited value, the engine speed is controlled so that a maximum speed cannot be exceeded during travelling. If the accelerator pedal is kicked down during travelling, this mode is cancelled; see Figure 14.

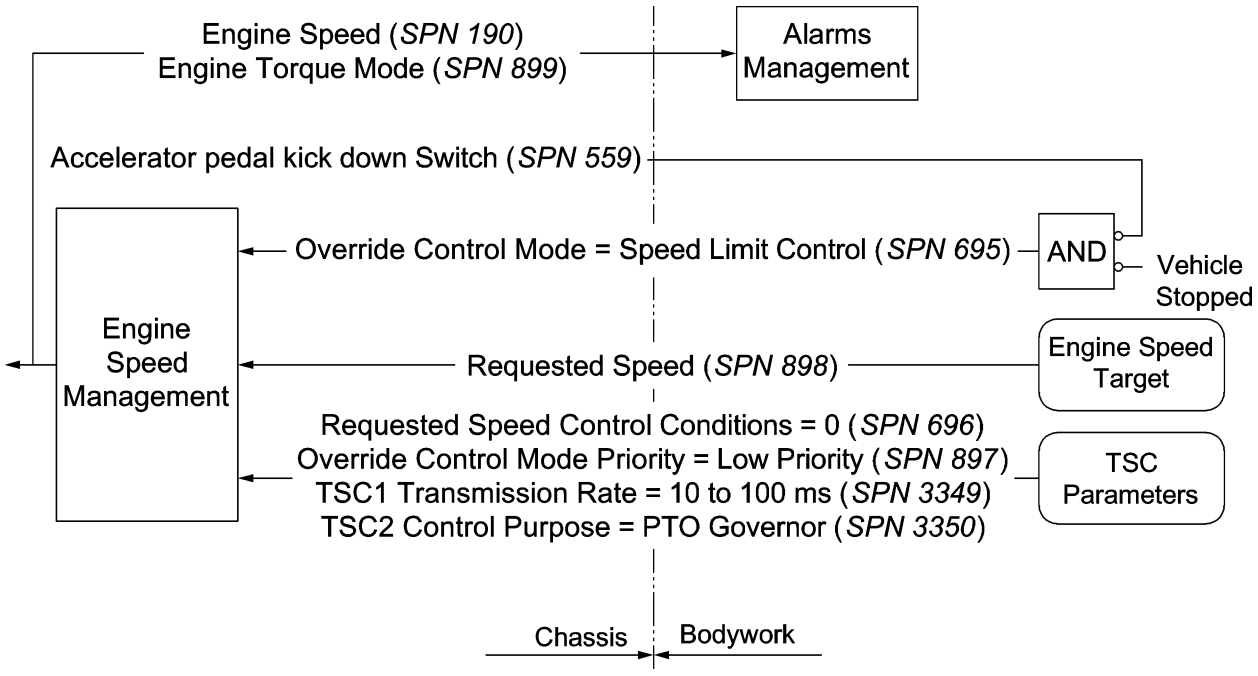


Figure 14 — Limited engine speed

5.3.11Torque control

5.3.11.1 Torque curve

Priority classification: PC3.

The requested information for torque management is given in Figure 15:

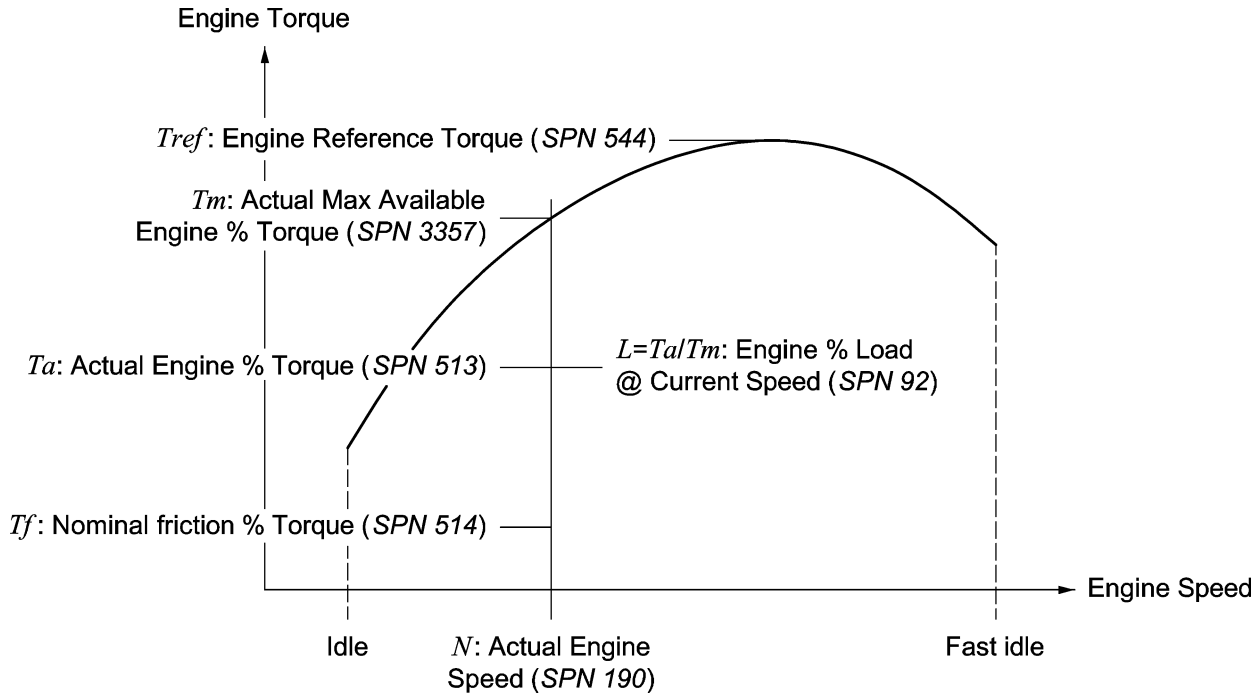


Figure 15 — Requested information for torque management

5.3.11.2 Torque managed by chassis

Priority classification: PC3.

The RCV's ECU can easily compute the *Actual Hydraulic Percent Torque (T_H)* depending on the measured pressure *(p)* in the circuit, the *Instantaneous Flow Rate (Cp)* of the hydraulic pump and the *Engine Reference Torque*. The value of the requested torque is sent to the engine when a movement is requested.

See Figure 16.

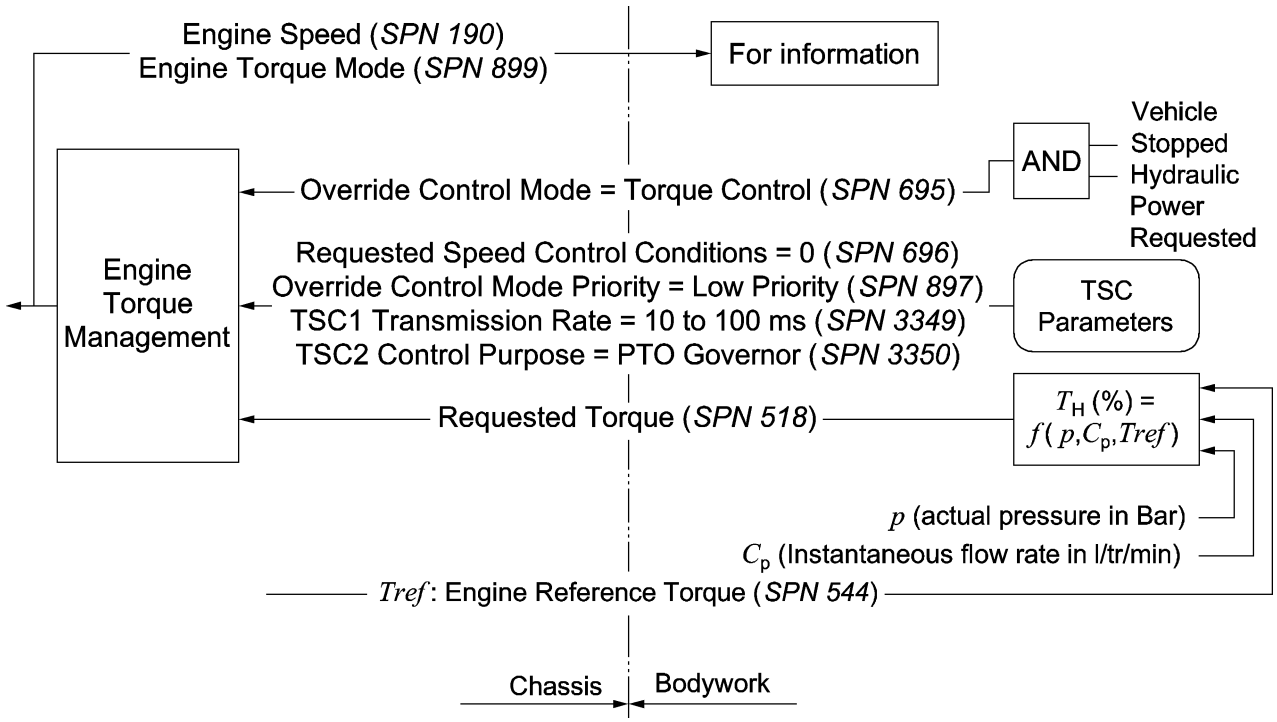


Figure 16 — Torque managed by chassis

5.3.11.3 Managed by RCV

Priority classification: PC3.

First, the engine speed is adjusted to get the sufficient flow rate as described in 5.3.11.2. In parallel the *Torque Difference (ε_T)* between the *Actual Maximum Available Engine Percent Torque (T_m)* and the *Actual Engine Percent Torque (T_a)* is monitored by the RCV's ECU. If the hydraulic load is increasing and the *Torque Difference (ε_T)* becomes close to zero:

— the Instantaneous Flow Rate (*C*p) of the hydraulic pump is decreased so that Actual Maximum Available Engine Percent Torque (T_m) is never exceeded;

— the engine speed is readjusted so that the flow rate is kept.

See Figure 17.

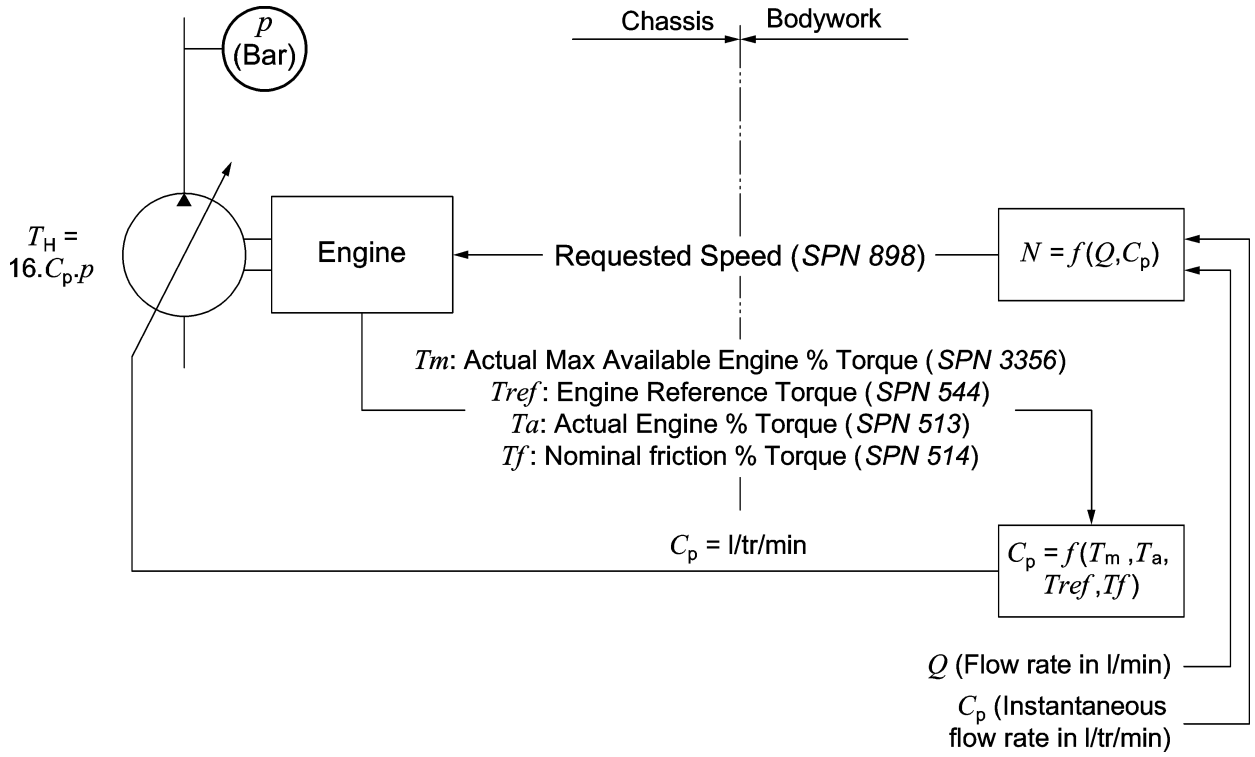


Figure 17 — Torque managed by RCV

5.3.12Prohibition of air suspension control

Priority classification: PC2.

RCVs for collection of bulky waste may be equipped with two stabilisers at the rear. When these stabilisers are down, the pneumatic suspension may be deflated. When the stabilisers are lifted, the regulation of the pneumatic suspension is not fast enough to keep the vehicle at its nominal level and the rear of the RCV hits the ground. To manage this problem, the regulation of the air suspension is prohibited when the stabilisers are moving down and until they are up again in their travel position.

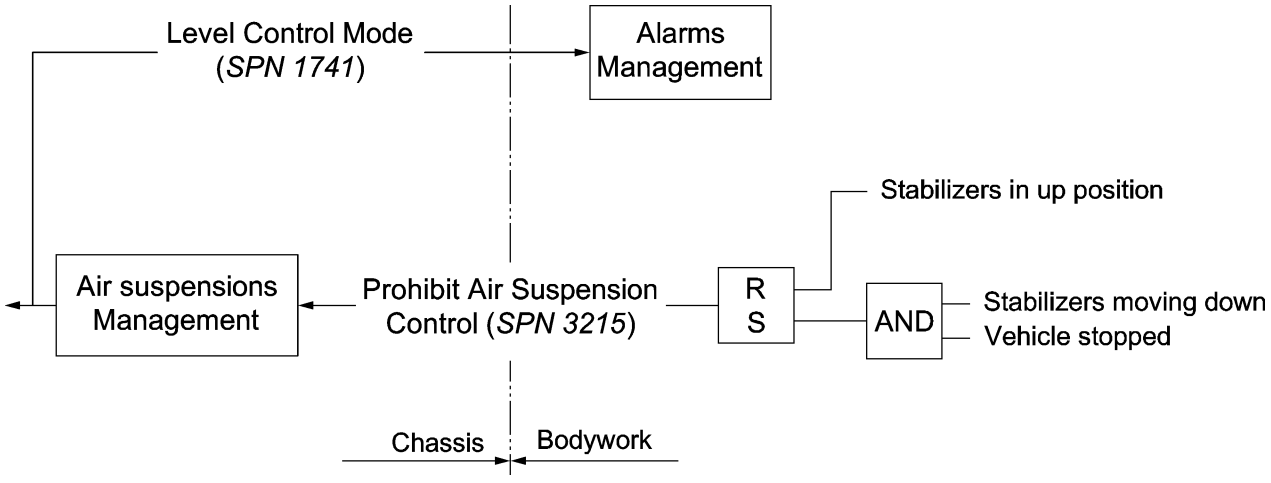


Figure 18 — Prohibition of air suspension control

5.3.13Air suspension position control

Priority classification: PC2.

The air suspension is kneeled in certain situations below 10 km/h:

— kneeling request front axle *(SPN 1830);*

— kneeling request rear axle *(SPN 1829);*

— nominal level request front Axle *(SPN 1751);*

— nominal level request rear Axle *(SPN 1750);*

— kneeling information *(SPN 1742);*

— nominal level front axle *(SPN 1734);*

— nominal level rear axle *(SPN 1733).*

For RCV with rear lift axle it is necessary to know if the axle is up or down to manage the weight axle load by weighing system between the bodywork and the chassis-cab:

— lift axle 1 position *(SPN 1743);*

— lift axle 2 position *(SPN 1822).*

5.3.14Fuel consumption

Priority classification: PC3.

This shall be available for users who want statistics and optimisation of the collection tours:

— total used fuel *(SPN 250);*

— fuel level *(SPN 96)*;

— engine fuel rate *(SPN 183);*

— catalyst tank level (Add blue) *(SPN 1761);*

— trip PTO moving fuel used *(SPN 1002);*

— trip PTO non-moving fuel used *(SPN 1003).*

5.3.15Remote start and stop of the engine

Priority classification: PC3.

Used during assembly of the bodywork on the chassis-cab or for stop and start function:

— remote start request*;*

— remote stop request*;*

— remote start consent*;*

— remote stop consent.

The remote start consent and remote stop consent are the information sent from the chassis-cab the bodywork to know if the remote start request and remote stop request are allowed.

The remote start request and remote stop request are sent from the bodywork to the chassis-cab.

5.3.16Ambient temperature

Priority classification: PC3.

For the operatives standing on the footboards, RCVs are provided with heated handles in winter time. With this information, the heating of the handles can be controlled according to the air ambient temperature:

— ambient air temperature *(SPN 171).*

5.3.17Lighting

Priority classification: PC3.

Because standard rear lights can be hidden by the operatives when they are standing on the footboards, RCVs use dual lights fitted at the top of the tailgate. Therefore it is useful that these lights are controlled and supervised by CAN.

Lighting command:

— right turn signal lights *(SPN 2369);*

— left turn signal lights *(SPN 2367);*

— right stop light *(SPN 2373);*

— left stop light *(SPN 2371);*

— tractor marker light *(SPN 2377);*

— rear fog lights *(SPN 2389);*

— rotating beacon light *(SPN 2385).*

Lighting status:

— right turn signal lights *(SPN 2370);*

— left turn signal lights *(SPN 2368);*

— right stop light *(SPN 2374);*

— left stop light *(SPN 2372);*

— tractor marker light *(SPN 2378);*

— rear fog lights *(SPN 2390);*

— rotating beacon light *(SPN 2385).*

5.3.18Other uses

Priority classification: PC3:

— driver’s request percent engine torque *(SPN 512);*

— accelerator pedal 1 position *(SPN 91);*

— brake pedal position *(SPN 521);*

— engine % load at current speed *(SPN 92);*

— seconds *(SPN 959);*

— minutes *(SPN 960);*

— hours *(SPN 961);*

— month *(SPN 963);*

— day *(SPN 962);*

— year *(SPN 964);*

— local minutes offset *(SPN 1601);*

— local hour offset *(SPN 1602);*

— driver’s door open *(SPN 3413, SPN 3416);*

— battery potential *(SPN 158, SPN 168).*

Annex A
(normative)

Architecture of the electric-electronic interface

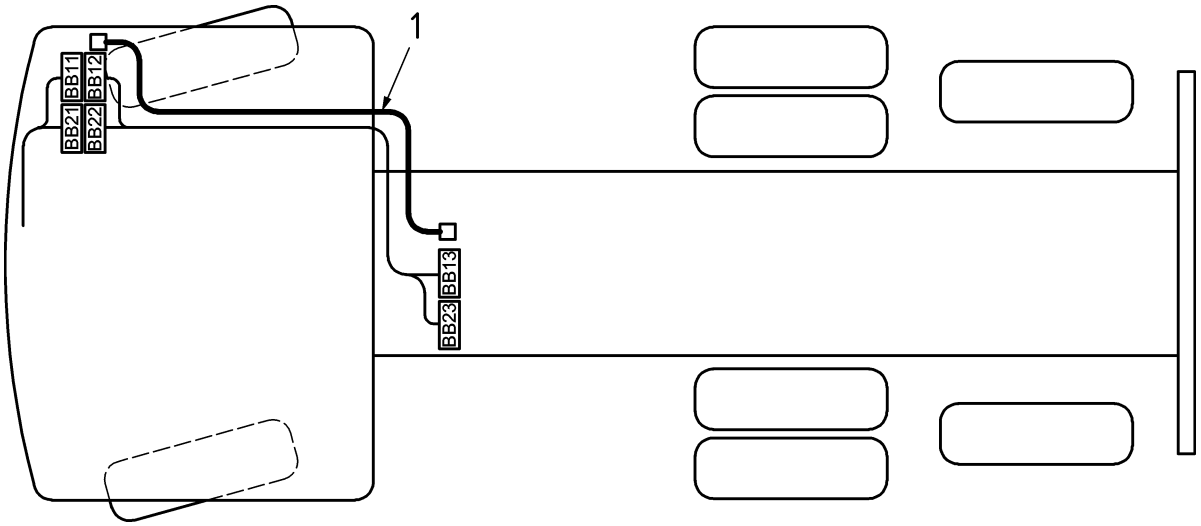


Figure A.1 — Electric-Electronic Interface – Chassis-cab alone

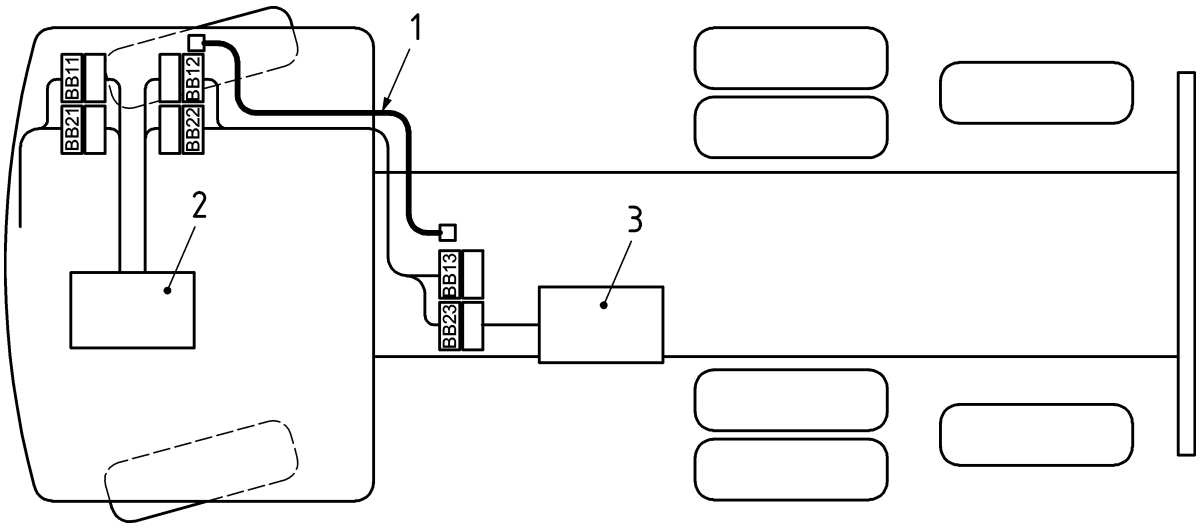
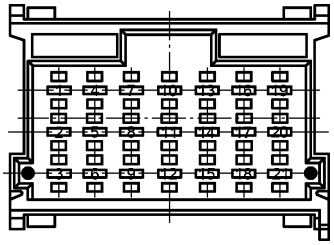


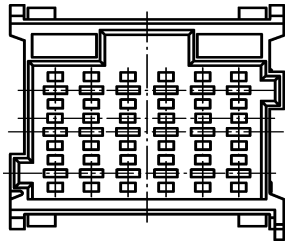
Figure A.2 — Bodywork system connected inside and outside the cab

Annex B
(normative)

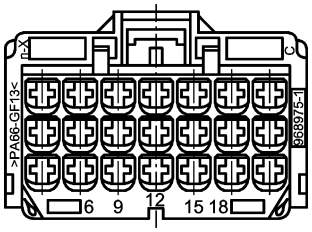
Plugs



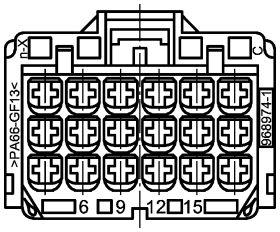
a) BB11



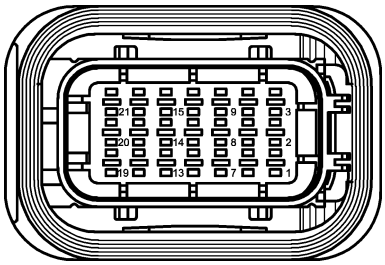
b) BB21



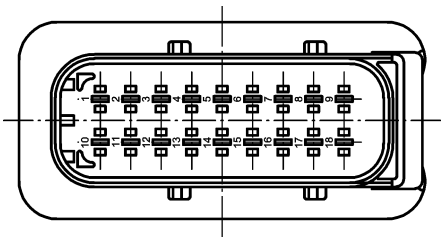
c) BB12



d) BB22



e) BB13



f) BB23

Figure B.1 — Plugs

Annex C
(normative)

Pin-out and defined signals

Table C.1 — Pin-out and defined signals

Line 1: Plugs BB11, BB12, BB13 - 21 Ways							
Pin connected			Signal	Wire size mm^2	Direction	Description	Comments
BB11	BB12	BB13					
1	1	1	+24VDC not switched	2,5	CH- > BW[a]	Power supply from battery	30 - 15A
4	4	4	+24VDC not switched	2,5	CH- > BW	Power supply from battery	30 - 15A
7	7	7	+24VDC switched	2,5	CH- > BW	Power supply switched after ignition	15 - 15A
10	10	10	+24VDC switched	2,5	CH- > BW	Power supply switched after ignition	15 - 15A
13	13	13	+24VDC switched	1,0	CH- > BW	Power supply switched after ignition	15 - 5A
3	3	3	Ground	2,5	CH- > BW	Power supply	31 - 15A
6	6	6	Ground	2,5	CH- > BW	Power supply	31 - 15A
9	9	9	Ground	2,5	CH- > BW	Power supply	31 - 15A
12	12	12	Ground	2,5	CH- > BW	Power supply	31 - 15A
15	15	15	Ground	1,0	CH- > BW	Power supply	31 - 5A
2	2	2	CAN 1 H	0,5	CH- > BW	Chassis - Bodybuilder CAN	Twisted pair complying with
5	5	5	CAN 1 L	0,5	CH- > BW	Chassis - body CAN	
-	8	8	CAN 2 H	0,5	BWIU[c]	CAN reserved bodybuilder	
-	11	11	CAN 2 L	0,5	BWIU	CAN reserved bodybuilder	
-	14	14	Emergency stop,	1,0	BWIU	Emergency stop circuit 1, closed loop to cab	

			circuit 1				
-	17	17	Emergency stop, circuit 1	1,0	BWIU		
-	19	19	Emergency stop, circuit 2	1,0	BWIU	Emergency stop circuit 2, closed loop to cab	
-	20	20	Emergency stop, circuit 2	1,0	BWIU		
-	16	16	Reserved/Spare	1,0	BWIU	Reserved bodybuilder	
-	18	18	Reserved/Spare	1,0	BWIU	Reserved bodybuilder	

Line 2: Plugs BB21, BB22, BB23 - 18 Ways

Pin connected			Signal	Wire size mm^2	Direction	Description	Comments
BB21	BB22	BB23					
1	1	1	Engine revolution	1,0	CH- > BW	W-signal of the alternator as of frequency	Refer to Annex D for signal characteristics
2	2	2	Driving speed	1,0	CH- > BW	Driving speed frequency signal, Standardised signal of the actual road speed from the tachograph (C3 signal, connector B7)	Refer to Annex E for signal characteristics
3	3	3	Reverse gear engaged	1,0	CH- > BW	Request signal for the activation of the reverse gear selection (automatic / semi-automatic gear box, when reverse selected) (manual gear box, when the reverse gear is shifted)	+24 V if engaged
4	4	4	Parking light on	1,0	CH- > BW	Parking light / side lights is the light that gets turned on by the first turn of the light switch of the truck The signal is needed as information for the BB to illuminate his instruments/ body.	+24 V if on
5	5	5	PTO engaged	1,0	CH- > BW	Information from the chassis that the PTO is actually engaged.	+24 V if engaged
6	6	6	Chassis ready	1,0	CH- > BW	Chassis is ready to work (shall be configurable by chassis manufacturer/dealer)	See Annex F for the configuration on chassis side +24 V if ready

7	7	7	Park brake engaged	1,0	CH- > BW	Park brake is engaged	+24 V if engaged
8	8	8	Neutral gear engaged	1,0	CH- > BW	Neutral gear is engaged	+24 V if engaged
9	9	9	Clutch pedal depressed	1,0	CH- > BW	Clutch pedal is depressed	+24 V if depressed
10	10	10	Not used	1,0		Free	
11	11	11	Not used	1,0		Free	
12	12	12	Engage PTO	1,0	BW- > CH[b]	Body ready to work, signal for activation of the PTO can be given	Maximum rpm restriction if required programed in pin 12 +24 V: engage the PTO
13	13	13	Request for working RPM	1,0	BW- > CH	Body requests working RPM (pre-set value by chassis manufacturer/dealer)	Ramp increasing > 400 rpm/s (to be confirmed by the chassis manufacturer) +24 V: Request RPM
14	14	14	Request for driving restrictions EN 1501–1	1,0	BW- > CH	The driving limitations mend are listed in EN 1501–1 (reversing inhibit with speed limitation to 30 km/h). Shall operate as defined in the last update of EN 1501–1:2011; the 30 km/h limitation logic described there, it is decided by the body builder. The reversing protection is not affected because a reversing protection over 30 km/h is not required. Override logics are controlled by the bodybuilder.	+24 V: Initiates the vehicle restrictions
15	15	15	Request for speed limit	1,0	BW- > CH	2nd Speed limitation to a parametric value (e.g. 6 km/h when out of body form of the RCV)	+24 V: Initiates the vehicle restrictions.
16	16	16	Request for deflation of rear axle air susp.	1,0	BW- > CH	Makes it possible to lower the chassis when exchanging body works or others where a stable position is required.	+24 V: Activates the lowering of the chassis
17	17	17	Request for beacon	1,0	BW- > CH	The warning beacon should be turned on throughout the chassis switch and /or the body switch. The importance is that the wire is available.	See Annex G +24 V: Switch beacons on.

18	18	18	Inhibit air suspension	1,0	BW- > CH	Makes it possible to prevent the air suspension to become unpressurised when something is lifted. Used to inhibit the air suspension regulation for vehicles with jack legs.	+24 V: Air suspension regulation is inhibited

a Signal from chassis to bodywork.

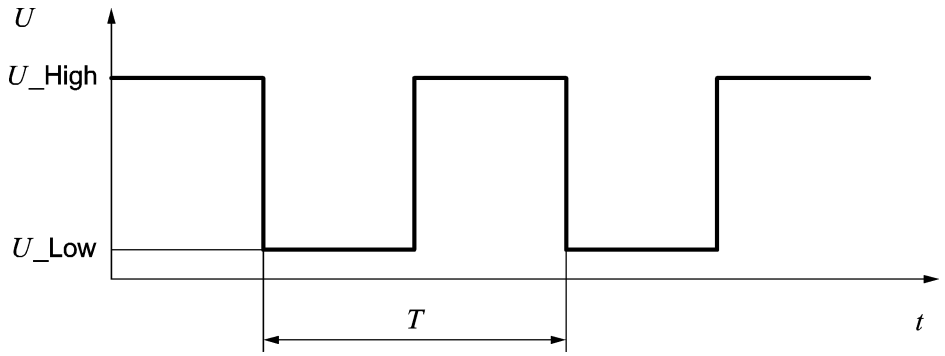
b Signal from bodywork to chassis manufacturer.

c Bodywork internal use only.

Annex D
(normative)

Characteristics of the engine revolution signal

Available on the plug W+ of the alternator, the engine revolution is given by a relation of type $\omega = \frac{K}{T}$.



Key

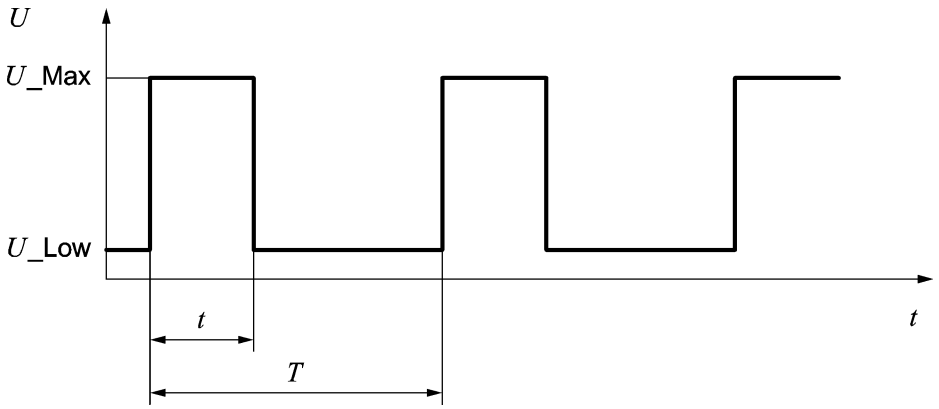
Cyclic rate	50 %
Frequency range	0 < 1/*t* < 1 kHz
U_High	16 V < U_High < 34 V
U_Low	0,5 V < U_Low < 5,5 V
Maximum current	0,1 A

Figure D.1 — Engine revolution signal

Annex E
(normative)

Characteristics of the driving speed signal

Available on the plugs B6 and B7 of the speed controller, the vehicle speed is given by a relation of type $V = \frac{K \times t}{T}$.



Key

U_High	U_High > 5,5 V
U_Low	U_Low < 1,5 V
Maximum current	0,5 mA
Frequency (1/T)	1/*t* < 1 528 Hz
Pulse duration (t)	0,64 ms < *t* < 4 ms
Pulse duration accuracy	1 %
Speed controller constant (pulse/Km)	4 000 < k < 25 000

Figure E.1 — Driving speed signal

Annex F
(normative)

Configuration of the information: chassis ready

The information chassis ready to work shall be configurable by the chassis-cab manufacturer according to the following combinations:

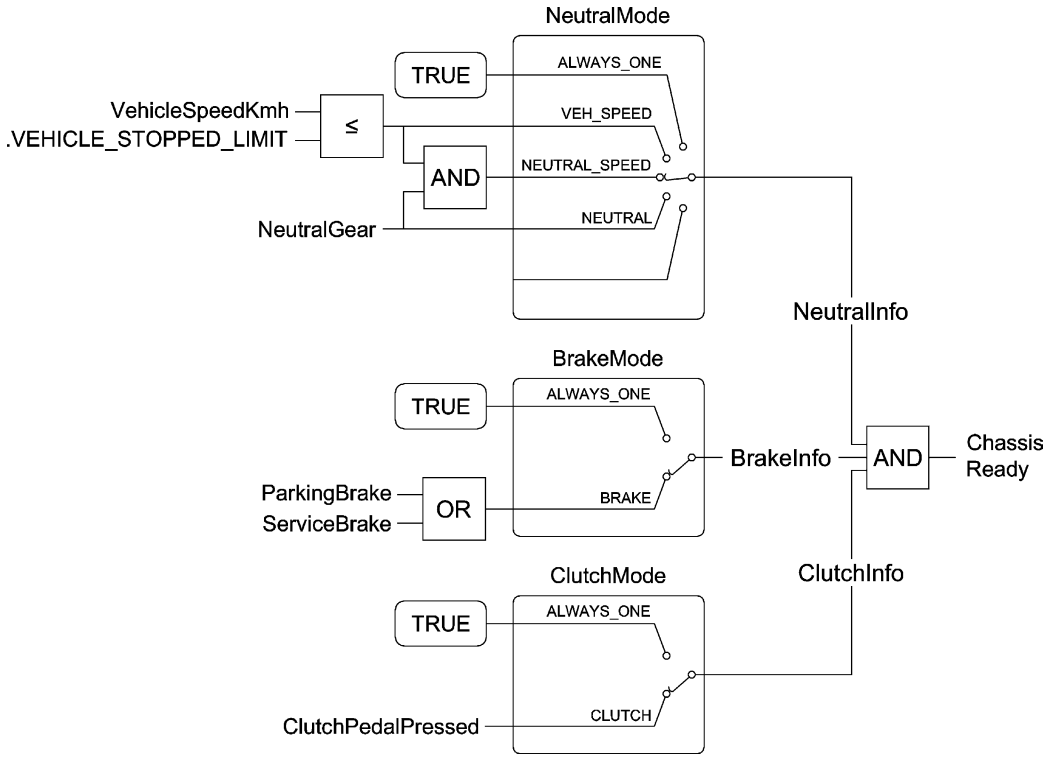


Figure F.1 — Configuration: chassis ready

Annex G
(normative)

Control of the beacon

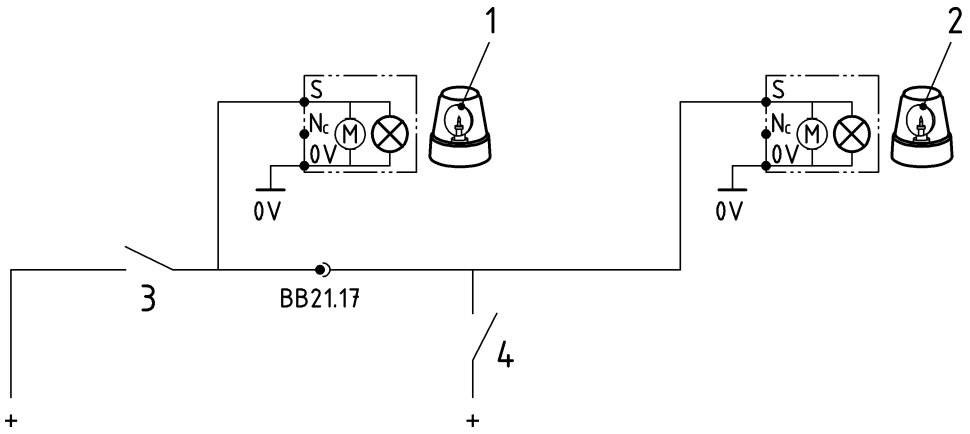


Figure G.1 — Beacon wiring diagram

Annex H
(normative)

CAN messages transmitted by bodywork

Table H.1 — Signals transmitted by bodywork

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
ASC2	**Air suspension control # 2**	**100 ms**	**8**	**210d**	**230d**	**3**	**53760**	**00D200**	**0C D2 00 55**	**85d**	□						
											□	1	1–2	2984	Automatic traction help	0 Disable Automatic traction help | 1Enable Automatic traction help | 2 Reserved | 3 Take no action	
											□		3–4	1749	Kneeling Request Left Side	0 No kneeling request | 1 kneeling request | 2 Reserved | 3 Take no action	
											□		5–6	1748	Kneeling Request Right Side	0 No kneeling request | 1 kneeling request | 2 Reserved | 3 Take no action	
											□		7–8	1747	Kneeling Control Mode Request	0 Automatically actuated | 1 Manually actuated | 2 Reserved | 3 Take no action	
											✓	2	1–4	1751	Nominal Level Request Front axle	0 No level request | 2 Normal Level 2 (activate speed dependent level) | 3–15 Take no action	PC2
											✓		5–8	1750	Nominal Level Request Rear axle	0 No level request | 2 Normal Level 2 (activate speed dependent level) | 3–15 Take no action	PC2

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											□	3	1–4	1753	Level Control Mode Request	0000 Normal operation,(i.e. the system performs a “"pure”" control of the vehicle height) 0001 Traction help (load transfer),(i.e. the driven axle is loaded to a maximum value given by legislation or design) 0010 Load fixing,(i.e. the driven axlen is loaded to a value defined by the driver) 0011 Pressure ratio 1,(i.e. the ratio between the pressures at the driven axle and at the third axle is controlled, so that the ratio equals a fixed value 1)	
											□		5–6	1752	Lift Axle 1 Position Request	0 | Lift Axle Position Down | Lift Axle Position Up | 2 Reserved | Take no action	
											□		7–8	1828	Lift Axle 2 Position Request	0 | Lift Axle Position Down | Lift Axle Position Up | 2 Reserved | Take no action	
											□	4		1718	Damper Stiffness Request Front Axle	Factor: 0,4 % | Offset: 0 % | Range: 0..100 %	
											□	5		1719	Damper Stiffness Request Rear Axle	Factor: 0,4 % | Offset: 0 % | Range: 0..100 %	
											□	6		1720	Damper Stiffness	Factor: 0,4 % | Offset:	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															Request Lift/Tag Axle	0 % | Range: 0..100 %	
											✓	7	1–2	1830	Kneeling Request Front Axle	0 No kneeling request | 1 kneeling request | 2 Reserved | 3 Take no action	PC2
											✓		3–4	1829	Kneeling Request Rear Axle	0 No kneeling request | 1 kneeling request | 2 Reserved | 3 Take no action	PC2
											✓		5–6	3215	Prohibit Air Suspension Control	0 Not prohibited |1 Prohibited | 2 Error | 3 Not available	PC2
											□		7–8		Not used		
											□	8			Not used		
LC	**Lighting command**	**On event (<1s)**	**8**	**254d**	**65d**	**3**	**65089**	**00FE41**	**OC FE 41 55**	**85d**	□						
											□	1	1–2	2403	Running light	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	2351	Alternate Beam Head Light Data	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	2349	Low Beam Head Light Data	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	2347	High Beam Head Light Data	0 Off | 1 On | 2 Error | 3 Not available	
											□	2	1–2	2387	Tractor Front Fog Lights	0 Off | 1 On | 2 Error | 3 Not available	
											✓		3–4	2385	Rotating Beacon Light	0 Off | 1 On | 2 Error | 3 Not available	PC3

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											✓		5–6	2369	Right Turn Signal Lights	0 Off | 1 On | 2 Error | 3 Not available	PC3
											✓		7–8	2367	Left Turn Signal Lights	0 Off | 1 On | 2 Error | 3 Not available	PC3
											□	3	1–2	2391	Back Up Light and Alarm Horn	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	2375	Center Stop Light	0 Off | 1 On | 2 Error | 3 Not available	
											✓		5–6	2373	Right Stop Light	0 Off | 1 On | 2 Error | 3 Not available	PC3
											✓		7–8	2371	Left Stop Light	0 Off | 1 On | 2 Error | 3 Not available	PC3
											□	4	1–2	2383	Implement Clearance Light	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	2381	Tractor Clearance Light	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	2379	Implement Marker Light	0 Off | 1 On | 2 Error | 3 Not available	
											✓		7–8	2377	Tractor Marker Light	0 Off | 1 On | 2 Error | 3 Not available	PC3
											✓	5	1–2	2389	Rear Fog Lights	0 Off | 1 On | 2 Error | 3 Not available	PC3
											□		3–4	2357	Tractor Underside Mounted Work Lights	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	2359	Tractor Rear Low Mounted	0 Off | 1 On | 2 Error | 3 Not available	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															Work Lights		
											□		7–8	2361	Tractor Rear High Mounted Work Lights	0 Off | 1 On | 2 Error | 3 Not available	
											□	6	1–2	2363	Tractor Side Low Mounted Work Lights	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	2365	Tractor Side High Mounted Work Lights	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	2353	Tractor Front Low Mounted Work Lights	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	2355	Tractor Front High Mounted Work Lights	0 Off | 1 On | 2 Error | 3 Not available	
											□	7	1–2	2397	Implement OEM Option 2 Light	0 Off | 1 On | 2 Error | 3 Not available	
											□		3-4	2395	Implement OEM Option 1 Light	0 Off | 1 On | 2 Error | 3 Not available	
											□		5-6	2406	Implement Right Facing Work Light	0 Off | 1 On | 2 Error | 3 Not available	
											□		7-8	2597	Implement Left Facing Work Light	0 Off | 1 On | 2 Error | 3 Not available	
											□	8	1-2	2393	Lighting Data		

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															Request Command		
											□		3–4	2401	Implement Right Forward Work Light	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	2399	Implement Left Forward Work Light	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	2405	Implement Rear Work Light	0 Off | 1 On | 2 Error | 3 Not available	
PTODE	**Power Takeoff Drive Engagement**	**100 ms**	**8**	**253d**	**164d**	**6**	**64932**	**00FDA4**	**18 FD A4 55**	**85d**	□						
											✓	1	1–2	3455	Enable switch - Transfer case output shaft PTO	0 Off | 1 On | 2 Error | 3 Not available	PC2 - If chassis equipped
											✓		3–4	3454	Enable switch - Transmission output shaft PTO	0 Off | 1 On | 2 Error | 3 Not available	PC2 - If chassis equipped
											✓		5–6	3453	Enable switch - Transmission input shaft PTO 2	0 Off | 1 On | 2 Error | 3 Not available	PC2 - If chassis equipped
											✓		7–8	3452	Enable switch - Transmission input shaft PTO 1	0 Off | 1 On | 2 Error | 3 Not available	PC2 - If chassis equipped

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											□	2			Not used		
											□	3	1–2	3459	Engagement consent - Transfer case output shaft PTO	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	3458	Engagement consent - Transmission output shaft PTO	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	3457	Engagement consent - Transmission input shaft PTO 2	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	3456	Engagement consent - Transmission input shaft PTO 1	0 Off | 1 On | 2 Error | 3 Not available	
											□	4			Not used		
											□	5	1–2	3463	Engagement status - Transfer case output shaft PTO	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	3462	Engagement status - Transmission output shaft PTO	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	3461	Engagement status - Transmission	0 Off | 1 On | 2 Error | 3 Not available	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															input shaft PTO 2		
											□		7–8	3460	Engagement status - Transmission input shaft PTO 1	0 Off | 1 On | 2 Error | 3 Not available	
-	-										□	6–8	-	-	Not used	-	-
TSC1	**Torque Speed control # 1**	**10 ms**	**8**	**0d**	**218d**	**3**	**0**	**0**	**0C 00 00 55**	**85d**	□						
											✓		1–2	695	Override Control Mode	0 Override disabled | 1 Speed control | 2 Torque control | 3 Speed/Torque limit control	PC2
											✓	1	3–4	696	Requested Speed Control Conditions	0 Rapid transition with possible overshoot to speed target 1 Speed target overshoot optimised for driveline not connected 2 Speed target overshoot optimised for driveline connected 3 Speed target overshoot optimised for several driveline connected	PC2
											✓		5–6	897	Override Control Mode Priority	0 Highest priority | 1 High priority | 2 Medium priority | 3 Low priority	PC2
											□		7–8		Not used		
											✓	2–3		898	Requested Speed / Speed Limit	Factor: 0,125 rpm/bit | Offset: 0 rpm | Range: 0 to 8 031,875 rpm	PC2

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											✓	4		518	Requested Torque / Torque Limit	Factor: 1 % /bit | Offset: −125 % | Range: −125 % to 125 %	PC3
											✓	5	1–3	3349	TSC1 transmission rate	000 = 1 000 ms transmission rate 001 = 750 ms transmission rate 010 = 500 ms transmission rate 011 = 250 ms transmission rate 100 = 100 ms transmission rate 101 = 50 ms transmission rate 110 = 20 ms transmission rate 111 = 10 ms transmission rate (STD)	PC2
											✓		4–8	3350	TSC1 Control purpose	00000 = P1 = Accelerator Pedal/Operator Selection 00001 = P2 = Cruise Control 00010 = P3 = PTO Governor 00011 = P4 = Road Speed Governor 00100 = P5 = Engine Protection 00101 - 11110 = P6-P31 = Reserved for SAE Assignment 11111 = P32 = Temporary Power Train	PC2
											□	6–8			Not used		

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
RCV1	**Refuse Collection Vehicle #1**	**100 ms**	**8**	**255d**	**19d**	**3**	**65299**	**00FF13**	**0C FF 13 55**	**85d**	□						
											□	1	1–2				
											□		3–4				
											✓		5–6		Remote brake activation request	0 OFF | 1 ON | 2 Error | 3 Not available	PC1
											□		7–8		Not used		
											□	2	1–2		Not used		
											□		3–4		Not used		
											□		5–6		Not used		
											□		7–8		Not used		
											✓	3	1–2		Remote engine start request	0 OFF | 1 ON | 2 Error | 3 Not available	PC3
											✓		3–4		Remote engine stop request	0 OFF | 1 ON | 2 Error | 3 Not available	PC3
											□		5–6		Not used		
											□		7–8		Not used		
											□	4	1–2		Not used		
											□		3–8		Not used		
											✓	5			Target Road Speed Limit (RSL)	Factor:1 km/h | Offset: 0 km/h | Range: 0..250 km/h	PC1 - Same as SPN 74
											□	6–8			Not used		

Annex I
(normative)

CAN messages received by bodywork

Table I.1 — Signals received by bodywork

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
ASC1	**Air Suspension Control #1**	**100 ms**	**8**	**254d**	**90d**	**3**	**65114**	**00FE5A**	**0C FE 5A xx**	**xxx**	□						
											✓	1	1–4	1734	Nominal level front axle	0 Level not specified | 1 Normal level 1 | 2 Normal level 2 | 3 Normal level 3 | 4 preset Level | 5 Customer Level | 6 Upper Level | 7 Lower Level | 8...13 Not defined | 14 Error | 15 Not available	PC2
											✓		5–8	1733	Nominal level rear axle	0 Level not specified | 1 Normal level 1 | 2 Normal level 2 | 3 Normal level 3 | 4 preset Level | 5 Customer Level | 6 Upper Level | 7 Lower Level | 8...13 Not defined | 14 Error | 15 Not available	PC2
											□		1–2	1738	Below Nominal level -	0 Not below | 1 Below |	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															front axle	2 Error | Not defined	
											□		3–4	1754	Below Nominal level - rear axle	0 Not below | 1 Below | 2 Error | Not defined	
											□		5–6	1737	Above Nominal level front axle	0 Not above | 1 Above | 2 Error | Not defined	
											□		7–8	1736	Above Nominal level rear axle	0 Not above | 1 Above | 2 Error | Not defined	
											□		1–2	1740	Lowering control mode front axle	0 Lowering not active | 1 Lowering active | 2 Error | 3 Not available	
											□		3–4	1755	Lowering control mode rear axle	0 Lowering not active | 1 Lowering active | 2 Error | 3 Not available	
											□		5–6	1739	Lifting control front mode axle	0 Lifting not active | 1 Lifting active | 2 Error | 3 Not available	
											□		7–8	1756	Lifting control mode rear axle	0 Lifting not active | 1 Lifting active | 2 Error | 3 Not available	
											✓	4	1–4	1742	Kneeling information	0 Not active | 1 Active | 2 Kneeling level reached | 3 Lifting active | 4 Kneeling aborted | 5–13 Not defined | 14 error | 15 Not available	PC2

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
																0000 Normal operation,(i.e. the system performs a “"pure”" control of the vehicle height) 0001Traction help (load transfer),(i.e. the driven axle is loaded to a maximum value given by legislation or design) 0010 Load fixing,(i.e. the driven axlen is loaded to a value defined by the driver)	
											✓		5–8	1741	Level control mode	0011 Pressure ratio 1,(i.e. the ratio between the pressures at the driven axle and at the third axle is controlled, so that the ratio equals a fixed value 1) 0100 Pressure ratio 2,(i.e. the ratio between the pressures at the driven axle and at the third axle is controlled, so that the ratio equals a fixed value 2) 0101 Optimum traction 1,(i.e. the pressure at the driven axle is controlled at a fixed value 1) 0110 Optimum traction 2,(i.e. the pressure at	PC2

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
																the driven axle is controlled at a fixed value 2) 1001 Control prohibited	
																0111–1101 Not defined 1110 Error 1111 Not available Vehicle Application Layer - SAE J1939/71 (through December 1999) - p. 200	
											□	5	1–2	1746	Security device	0 Not active | 1 Active | 2 Error | 3 Not available	
											□		3–4	1745	Vehicle motion inhibit	0 Vehicle may be moved | 1 Vehicle motion is inhibited | 2 Error | 3 Not available	
											□		5–6	1744	Door release	0 Door may not be opened | 1 Door may be opened | 2 Error | 3 Not defined	
											✓		7–8	1743	Lift Axle 1 position	0 Lift axle position down / tag axle laden | 1 Lift axle position up / tag axle unladen | 2 Error | 3 Not available	PC2 - If chassis equipped with liftable axle
											□	6	1–2	1824	Actual level front axle in bumper range	0 Actual level above bumper range | 1 Actual level within bumper range	
											□		3–4	1823	Actual level rear axle in	0 Actual level above bumper range | 1 Actual	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															bumper range	level within bumper range	
											□		5–6		not defined		
											✓		7–8	1822	Lift axle 2 position	0 Lift axle position down / tag axle laden | 1 Lift axle position up / tag axle unladen | 2 Error | 3 Not available	PC2 - If chassis equipped with liftable axle
											□	7	1–2	1826	Suspension Remote control #1	0 Not active | 1 Active	
											□		3–4	1825	Suspension Remote control #2	0 Not active | 1 Active	
											□		5–8		not defined		
											□	8	1–4	1827	Control refusal information	0 Request not refused | 1 Axle load limit reached (load transfer) | 2 Would exceed load limit (Tag axle) | 3 Bogie differential not locked | 4 Above speed limit | 5 Below speed limit | 6–13 Not defined	
											□		5–8		not defined		
AMB	**Ambient conditions**	**1 s**	**8**	**254d**	**245d**	**6**	**65269**	**00FEF5**	**18 FE F5 xx**	**xxx**	□						
											□	1		108	Barometric pressure	Factor: 5 mbar/bit | offset: 0 | range: 0 .. 1,250 bar	
											□	2–3		170	Cab Interior temperature		

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											✓	4–5		171	Ambient Air Temperature	Factor: 0,0312 5 °C/bit | offset: −273 | range: −273 .. 1 735,0°C	PC3
											□	6		172	Air Inlet Temperature		
											□	7–8		79	Road surface temperature		
CCVS	**Cruise Control Vehicle Speed**	**100 ms**	**8**	**254d**	**241d**	**6**	**65265**	**00FEF1**	**18 FE F1 xx**	**xxx**	□						
											□	1	1–2	69	Two speed axle switch	00 Low speed range | 01 High speed range	
											✓		3–4	70	Parking brake switch	0 Not set | 1 Set | 2 Error | 3 Not available	PC2
											□		5–8		Not defined		
											✓	2–3		84	Wheel-based vehicle speed	Factor: 1/256 km/h/bit | offset: 0 | range: 0..250,996 km/h	PC1
											□	4	1–2		Cruise control active	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4		Cruise control enable switch	0 Off | 1 On | 2 Error | 3 Not available	
											✓		5–6	597	Brake switch	0 Off | 1 On | 2 Error | 3 Not available	PC2
											✓		7–8	598	Clutch switch	0 Off | 1 On | 2 Error | 3 Not available	PC2
											□	5	1–2	599	Cruise control set switch (on when s- or r+ pressed)	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	600	Cruise control	0 Off | 1 On | 2 Error | 3	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															coast switch (s- switch status)	Not available	
											□		5–6	601	Cruise control resume switch (r+ when speed recorded)	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	602	Cruise control accelerate switch (r+ switch status)	0 Off | 1 On | 2 Error | 3 Not available	
											□	6		86	Cruise control set speed	Factor:1 km/h/bit | offset: 0 | range: 0 .. 250 km/h	
											□	7	1–5	976	PTO state	0 Off/Disabled | 5 Set (at least one PTO engaged) | 31 Not Available	
											□		6–8	527	Cruise control state	0 Off/Disabled | 1 Hold | 2 Accelerate | 3 Decelerate/Coast | 4 Resume | 5 Set | 6 Accelerator override | 7 Not available	
											□	8	1–2	968	Idle increment switch	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	967	Idle decrement switch	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	966	Engine test mode switch	0 Off | 1 On | 2 Error | 3 Not available	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											□		7–8	1237	Engine shutdown AD61override switch	0 Off | 1 On | 2 Error | 3 Not available	
DC2	**Door Control 2**	**100 ms**	**8**	**253d**	**165**	**6**	**64933**	**00FDA5**	**18 FD A5 xx**	**xxx**	□						
											□	1	1–2	3412	Lock Status of Door 1	0 Off | 1 On | 2 Error | 3 Not available	
											✓		3–4	3413	Open Status of Door 1	0 Off | 1 On | 2 Error | 3 Not available	PC3
											□		5–6	3414	Enable Status of Door 1	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	3415	Lock Status of Door 2	0 Off | 1 On | 2 Error | 3 Not available	
											✓	2	1–2	3416	Open Status of Door 2	0 Off | 1 On | 2 Error | 3 Not available	PC3
											□		3–4	3417	Enable Status of Door 2	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	3418	Lock Status of Door 3	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	3419	Open Status of Door 3	0 Off | 1 On | 2 Error | 3 Not available	
											□	3	1–2	3420	Enable Status of Door 3	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	3421	Lock Status of Door 4	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	3422	Open Status of Door 4	0 Off | 1 On | 2 Error | 3 Not available	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											□		7–8	3423	Enable Status of Door 4	0 Off | 1 On | 2 Error | 3 Not available	
											□	4–8			Information doors 5 to 10	0 Off | 1 On | 2 Error | 3 Not available	
DD	**Dash Display**	**1 000 ms**	**8**	**254d**	**252d**	**6**	**65276**	**00FEFC**	**18 FE FC xx**	**xxx**	□						
											□	1		80	Washer fluid level	Factor: 0,4 % | Offset: 0 % | Range: 0..100 %	
											✓	2		96	Fuel level	Factor: 0,4 % | Offset: 0 % | Range: 0..100 %	PC3
											□	3		95	Fuel filter differential pressure	Factor: 2 kPa | Offset: 0 kPa | Range: 0..500 kPa	
											□	4		99	Engine oil filter differential pressure	Factor: 0.5 kPa | Offset: 0 kPa | Range: 0..125 kPa	
											□	5–6		169	Cargo ambient temperature	Factor: 0,031 25 °C | Offset: −273 °C | Range: −273 ..1 735 °C	
											□	7–8			Not defined		
EBC1	**Electronic Brake Controller 1**	**100 ms**	**8**	**240d**	**1d**	**6**	**61441**	**00F001**	**18 F0 01 xx**	**xxx**	□						
											□	1	1–2	561	ASR Engine control active	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	562	ASR Brake control active	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	563	Anti-Lock Braking (ABS) active	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	1121	EBS brake switch	0 Off | 1 On | 2 Error | 3 Not available	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											✓	2		521	Brake pedal position	Factor: 0,4 %/bit | offset: 0 | range: 0..100 %	PC3
											□	3	1–2	575	ABS Off-road switch	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	576	ASR On-Road switch	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	577	ASR “Hill holder” switch	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	1238	Traction control override switch	0 Off | 1 On | 2 Error | 3 Not available	
											□	4	1–2	972	Accelerator internal switch	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	971	Engine derate switch	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	970	Engine auxiliary shutdown switch	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	969	Remote accelerator enable switch	0 Off | 1 On | 2 Error | 3 Not available	
											□	5		973	Engine retartder selection	Factor: 0,4 %/bit | offset: 0 | range: 0..100 %	
											□	6	1–2	1243	ABS fully operationnal	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	1439	EBS red warning signal	0 Off | 1 On | 2 Error | 3 Not available	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											□		5–6	1438	ABS/EBS amber warning signal (Powered vehicle)	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	1793	ATC/ASR Information signal	0 Off | 1 On | 2 Error | 3 Not available	
											□	7		1481	Source address of controlling device for brake control	Factor: 1 | Offset: 0 | Range: 0..253	
											□		1–2		Not defined		
											□		3–4	2911	Halt brake switch	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	1836	Trailor ABS status	0 Off | 1 On | 2 Error | 3 Not available	
											□	8	7–8	1792	Tractor-Mounted trailer ABS warning signal	0 Off | 1 On | 2 Error | 3 Not available	
EC1	**Engine Configuration 1**	**On Request**	**39**	**254d**	**227d**	**6**	**65251**	**00FEE3**	**18 FE E3 xx**	**xxx**	□						
											□	1–2		188	Engine Speed At Idle, Point 1	Factor: 0,125 rpm/bit | Offset: 0 rpm | Range: 0..8 031,875 rpm	
											□	3		539	Engine Percent Torque At Idle, Point 1	Factor: 1 %/bit | Offset: −125 % | Range: −125..125 % | Operational: 0..125 %	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											□	4–5		528	Engine Speed At Point 2	Factor: 0,125 rpm/bit | Offset: 0 rpm | Range: 0..8 031,875 rpm	
											□	6		540	Engine Percent Torque At Point 2	Factor: 1 %/bit | Offset: −125 % | Range: −125..125 % | Operational: 0..125 %	
											□	7–8		529	Engine Speed At Point 3	Factor: 0,125 rpm/bit | Offset: 0 rpm | Range: 0..8 031,875 rpm	
											□	9		541	Engine Percent Torque At Point 3	Factor: 1 %/bit | Offset: −125 % | Range: −125..125 % | Operational: 0..125 %	
											□	10–11		530	Engine Speed At Point 4	Factor: 0,125 rpm/bit | Offset: 0 rpm | Range: 0..8 031,875 rpm	
											□	12		542	Engine Percent Torque At Point 4	Factor: 1 %/bit | Offset: −125 % | Range: −125..125 % | Operational: 0..125 %	
											□	13–14		531	Engine Speed At Point 5	Factor: 0,125 rpm/bit | Offset: 0 rpm | Range: 0..8 031,875 rpm	
											□	15		543	Engine Percent Torque At Point 5	Factor: 1 %/bit | Offset: −125 % | Range: −125..125 % | Operational: 0..125 %	
											□	16–17		532	Engine Speed At High Idle,	Factor: 1 %/bit | Offset: −125 % | Range: −125..125 % |	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															Point 6	Operational: 0..125 %	
											□	18–19		545	Engine Gain (Kp) Of The Endspeed Governor	Factor:1/1280 %/rpm/bit | Offset: 0 | Range: 0..50,2 %	
											✓	20–21		544	Engine Reference Torque	Factor: 1Nm/bit | Offset: 0 | Range: 0..64 255 Nm	PC3
											□	22–23		533	Engine Maximum Momentary Override Speed, Point 7	Factor: 1 %/bit | Offset: −125 % | Range: −125..125 % | Operational: 0..125 %	
											□	24		534	Engine Maximum Momentary Override Time Limit	Factor: 0,1s/bit | Offset: 0 | Range: 0..25 s	
											□	25		535	Engine Requested Speed Control Range Lower Limit	Factor: 0,125 rpm/bit | Offset: 0 rpm | Range: 0..8 031,875 rpm	
											□	26		536	Engine Requested Speed Control Range Upper Limit	Factor: 0,125 rpm/bit | Offset: 0 rpm | Range: 0..8 031,875 rpm	
											□	27		537	Engine Requested Torque Control Range Lower Limit	Factor: 1 %/bit | Offset: −125 % | Range: −125..125 % | Operational: 0..125 %	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											□	28		538	Engine Requested Torque Control Range Upper Limit	Factor: 1 %/bit | Offset: −125 % | Range: −125..125 % | Operational: 0..125 %	
											□	29–30		1712	Engine Extended Range Requested Speed Control Range Upper Limit	Factor: 0,125 rpm/bit | Offset: 0 rpm | Range: 0..8 031,875 rpm	
											□	31–32		1794	Engine Moment of Inertia	Factor: 0,004 kg-m^2/bit | Offset: 0 rpm | Range: 0..257,02 kg-m^2	
											□	33–34		1846	Engine Default Torque Limit	Factor: 1 %/bit | Offset: −125 % | Range: −125..125 % | Operational: 0..125 %	
											□	35		3344	Support Variable Rate TSC1 Message	Factor: 256 states/8 bit | Offset: 0 | Range: 0..255	
											□	36		3345	Support TSC1 Control Purpose Group 1	Factor: 256 states/8 bit | Offset: 0 | Range: 0..255	
											□	37		3346	Support TSC1 Control Purpose	Factor: 256 states/8 bit | Offset: 0 | Range: 0..255	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															Group 2		
											□	38		3347	Support TSC1 Control Purpose Group 3	Factor: 256 states/8 bit | Offset: 0 | Range: 0..255	
											□	39		3348	Support TSC1 Control Purpose Group 4	Factor: 256 states/8 bit | Offset: 0 | Range: 0..255	
EEC1	**Electronic Engine Controler #1**	**20ms**	**8**	**240d**	**004d**	**3**	**61444**	**00F004**	**0C F0 04 xx**	**xxx**	□						
											✓	1	1–4	899	Engine torque mode	0 Low idle, no request | 1 Accel pedal | 2 Cruise control | 3 PTO A | 4 Speed limitation | 5 ASR control | 6 Trans. control | 7 ABS | 8 Torque limiting | 9 High speed governor | 10 Brake | 14 Other | 15 Not available	PC2
											□		5–8		not defined		
											✓	2		512	Driver's demand engine % torque	Factor: 1 % | Offset: −125 % | Range: 0..125 %	PC3
											✓	3		513	Actual engine % torque	Factor: 1 % | Offset: −125 % | Range: −125..125 % | Operational: 0..125 %	PC3
											✓	4–5		190	Engine speed	Factor: 0,125 rpm | Offset: 0 rpm | Range:	PC2

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
																0..8 031,875 rpm	
											□	6		1483	Source address of controlling device for engine control	Factor: 1 | Offset: 0 | Range: 0..253	
											□	7	1–4	1675	Engine starter mode	0x00 Normal operation 0x01 Starter is running and gear is in neutral 0x02 Starter is running but gear is not in neutral OR neutral gear diagnosis not OK 0x03 Cranking is finished due to that the engine is running 0x04 Cranking prohibited due to engine running 0x05 NA 0x06 Cranking prohibited due to gearbox not in neutral	
																0x07 Cranking prohibited due immobiliser not responding 0x08 Cranking is prohibited due to starter overheat 0x09 NA 0x0A NA 0x0B NA	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
																0x0C Cranking prohibited due to unknown reason, i.e. sensor error, PTO activation, starter has been activated for too long time or cog wheel synchronisation error 0x0D Safety Mode 0x0E Error condition	
											□		5–8		not defined		
											□	8			not defined		
EEC2	**Electronic Engine controler #2**	**50 ms**	**8**	**240d**	**003d**	**3**	**61443**	**00F003**	**0C F0 03 xx**	**xxx**	□						
											□	1	1–2	558	Accelerator Pedal 1 low idle switch	0 Off | 1 On | 2 Error | 3 Not available	
											✓		3–4	559	Accelerator Pedal kick-down switch	0 Off | 1 On | 2 Error | 3 Not available	PC3
											□		5–6	1437	Road speed limit status	0 On | 1 Off | 2 Error | 3 Not available	
											□		7–8		Accelerator Pedal 2 low idle switch	0 Off | 1 On | 2 Error | 3 Not available	
											✓	2		91	Accelerator Pedal 1 position	Factor: 0,4 % | Offset: 0 % | Range: 0..100 %	PC3
											✓	3		92	Engine Percent load at current	Factor: 1 % | Offset: 0 % | Range: 0..125 % | Clipped to 0 during	PC3

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															speed	engine braking	
											□	4		974	Remote accelerator pedal position	Factor: 0,4 % | Offset: 0 % | Range: 0..100 %	
											□	5		29	Accelerator Pedal 2 position	Factor: 0,4 % | Offset: 0 % | Range: 0..100 %	
											□	6	1–2	2979	Vehicle Acceleration Rate Limit Status	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–8		Not defined		
											✓	7		3357	Actual Maximum Available Engine – Percent Torque	Factor: 0,4 % | Offset: 0 % | Range: 0..100 %	PC3
											□	8			not defined		
EEC3	**Electronic Engine Controler #3**	**250 ms**	**8**	**254d**	**223d**	**6**	**65247**	**00FEDF**	**18 FE DF xx**	**xxx**	□						
											✓	1		514	Nominal friction - percent torque	Factor: 1 % | Offset: −125 % | Range: 0..125 %	PC3
											□	2–3		515	Engine's desired operating speed	Factor: 0,125 rpm | Offset: 0 rpm | Range: 0..8 031,875 rpm	
											□	4		519	Engine's operating speed asymmetry adjustment	Range: 0..250	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											□	5–8			not defined		
ETC2	**Electronic Transmission Controler #2**	**100 ms**	**8**	**240d**	**005d**	**6**	**61445**	**00F005**	**18 F0 05 xx**	**xxx**	□						
											✓	1		524	Select gear	Factor: 1 | Offset: −125 | Range: −125..125 (FBh is park)	PC2
											□	2–3		526	Actual gear ratio	Factor: 0,001 | Offset: 0 | Range: 0..64 255	
											✓	4		523	Current gear	Factor: 1 | Offset: −125 | Range: −125..125 (FBh is park)	PC2
											□	5–6		162	Transmission requested range	ASCII | Offset: 0 | Data Range: 0 to 255 per byte	
											□	7–8		163	Transmission current range	ASCII | Offset: 0 | Data Range: 0 to 255 per byte	
ETC5	**Electronic Transmission Controler #5**	**100 ms**	**8**	**254d**	**195d**	**7**	**65219**	**00FEC3**	**1C FE C3 xx**	**xxx**	□						
											□	1	1–2	778	Transmission High Range Sense Switch		
											□		3–4	779	Transmission High Range Sense Switch		
											□		5–8		Not defined		
											✓	2	1–2	767	Transmission Reverse Direction	0 Off | 1 On | 2 Error | 3 Not available	PC1

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															Switch (BVM only)		
											✓		3–4	604	Transmission Neutral Switch (BVM only)	0 Off | 1 On | 2 Error | 3 Not available	PC2
											□		5–6	903	Transmission Forward Direction Switch		
											□		7–8		Not defined		
											□	3–8			Not defined		
HRVD	**High Resolution Vehicle Distance**	**1 000 ms**	**8**	**254d**	**193d**	**6**	**65217**	**00FEC1**	**18 FE C1 xx**	**xxx**	□						
											✓	1–4		917	High resolution total vehicle distance	Factor: 5 m | Offset: 0 m | Range: 0..21 055 406 km	PC2
											□	5–8		918	High resolution trip distance	Factor: 5 m/bit | Offset: 0 m | Range: 0..21 055 406 km	
LD	**Lighting data**	**On event**	**8**	**254d**	**64d**	**6**	**65088**	**00FE40**	**18 FE 40 xx**	**xxx**	□						
											□	1	1–2	2404	Running light	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	2352	Alternate Beam Head Light Data	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	2350	Low Beam Head Light	0 Off | 1 On | 2 Error | 3 Not available	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															Data		
											□		7–8	2348	High Beam Head Light Data	0 Off | 1 On | 2 Error | 3 Not available	
											□	2	1–2	2388	Tractor Front Fog Lights	0 Off | 1 On | 2 Error | 3 Not available	
											✓		3–4	2386	Rotating Beacon Light	0 Off | 1 On | 2 Error | 3 Not available	PC3
											✓		5–6	2370	Right Turn Signal Lights	0 Off | 1 On | 2 Error | 3 Not available	PC3
											✓		7–8	2368	Left Turn Signal Lights	0 Off | 1 On | 2 Error | 3 Not available	PC3
											□	3	1–2	2392	Back Up Light and Alarm Horn	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	2376	Center Stop Light	0 Off | 1 On | 2 Error | 3 Not available	
											✓		5–6	2374	Right Stop Light	0 Off | 1 On | 2 Error | 3 Not available	PC3
											✓		7–8	2372	Left Stop Light	0 Off | 1 On | 2 Error | 3 Not available	PC3
											□	4	1–2	2384	Implement Clearance Light	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	2382	Tractor Clearance Light	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	2380	Implement Marker Light	0 Off | 1 On | 2 Error | 3 Not available	
											✓		7–8	2378	Tractor Marker	0 Off | 1 On | 2 Error | 3	PC3

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															Light	Not available	
											✓	5	1–2	2390	Rear Fog Lights	0 Off | 1 On | 2 Error | 3 Not available	PC3
											□		3–4	2358	Tractor Underside Mounted Work Lights	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	2360	Tractor Rear Low Mounted Work Lights	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	2362	Tractor Rear High Mounted Work Lights	0 Off | 1 On | 2 Error | 3 Not available	
											□	6	1–2	2364	Tractor Side Low Mounted Work Lights	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	2366	Tractor Side High Mounted Work Lights	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	2354	Tractor Front Low Mounted Work Lights	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	2356	Tractor Front High Mounted Work Lights	0 Off | 1 On | 2 Error | 3 Not available	
											□	7	1–2	2398	Implement OEM Option 2 Light	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	2396	Implement OEM Option 1 Light	0 Off | 1 On | 2 Error | 3 Not available	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											□		5–6	2407	Implement Right Facing Work Light	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	2598	Implement Left Facing Work Light	0 Off | 1 On | 2 Error | 3 Not available	
											□	8	1–2		Not defined		
											□		3–4	2402	Implement Right Forward Work Light	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	2400	Implement Left Forward Work Light	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	2394	Implement Rear Work Light	0 Off | 1 On | 2 Error | 3 Not available	
LFC	**Fuel Consumption (Liquid)**	**On request**	**8**	**254d**	**233d**	**6**	**65257**	**00FEE9**	**18 FE E9 xx**	**xxx**	□						
											□	1–4		182	Trip fuel	Factor: 0,5 L/bit | offset: 0 | range: 0 .. 2 105 540 607,5 L	
											✓	5–8		250	Total fuel used	Factor: 0,5 L/bit | offset: 0 | range: 0 .. 2 105 540 607,5 L	PC3
LFE	**Fuel Economy (Liquid)**	**100 ms**	**8**	**254d**	**242d**	**6**	**65266**	**00FEF2**	**18 FE F2 xx**	**xxx**	□						
											✓	1–2		183	Engine Fuel Rate	Factor: 0,5 L/bit | offset: 0 | range: 0 .. 3 212,75 L	PC3
											□	3–4		184	Engine Instantaneous	Factor: 1/512 km/L/bit | offset: 0 | range: 0 ..	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															Fuel Economy	125,5 km/L	
											□	5–6		185	Engine Average Fuel Economy	Factor: 1/512 km/L/bit | offset: 0 | range: 0 .. 125,5 km/L	
											□	7–8		51	Engine Throttle Position	Factor: 0,4 % | Offset: 0 % | Range: 0..100 %	
MVS	**Maximum Vehicle Speed Limit Status**	**1 000 ms**	**8**	**253d**	**229d**	**6**	**64997**	**00FDE5**	**18 FD E5 xx**	**xxx**	□						
											□	1		2588	Maximum Vehicle Speed Limit 1	Factor:1 km/h | Offset: 0 km/h | Range: 0..250 km/h	
											□	2		2589	Maximum Vehicle Speed Limit 2	Factor:1 km/h | Offset: 0 km/h | Range: 0..250 km/h	
											□	3		2590	Maximum Vehicle Speed Limit 3	Factor:1 km/h | Offset: 0 km/h | Range: 0..250 km/h	
											□	4		2591	Maximum Vehicle Speed Limit 4	Factor:1 km/h | Offset: 0 km/h | Range: 0..250 km/h	
											□	5		2592	Maximum Vehicle Speed Limit 5	Factor:1 km/h | Offset: 0 km/h | Range: 0..250 km/h	
											□	6		2593	Maximum Vehicle Speed Limit 6	Factor:1 km/h | Offset: 0 km/h | Range: 0..250 km/h	
											□	7		2594	Maximum Vehicle Speed	Factor:1 km/h | Offset: 0 km/h | Range:	

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															Limit 7	0..250 km/h	
											✓	8		2595	Applied Vehicle Speed Limit	Factor:1 km/h | Offset: 0 km/h | Range: 0..250 km/h | 251 (0xFB): No vehicle speed limit is selected	PC3
PTODE	**Power Takeoff Drive Engagement**	**100 ms**	**8**	**253d**	**164d**	**6**	**64932**	**00FDA4**	**18 FD A4 xx**	**xxx**	□						
											□	1	1–2	3455	Enable switch - Transfer case output shaft PTO	0 Off | 1 On | 2 Error | 3 Not available	
											□		3–4	3454	Enable switch - Transmission output shaft PTO	0 Off | 1 On | 2 Error | 3 Not available	
											□		5–6	3453	Enable switch - Transmission input shaft PTO 2	0 Off | 1 On | 2 Error | 3 Not available	
											□		7–8	3452	Enable switch - Transmission input shaft PTO 1	0 Off | 1 On | 2 Error | 3 Not available	
											□	2			Not used		
											✓	3	1–2	3459	Engagement consent - Transfer case output shaft PTO	0 Off | 1 On | 2 Error | 3 Not available	PC2 - If chassis equipped

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											✓		3–4	3458	Engagement consent - Transmission output shaft PTO	0 Off | 1 On | 2 Error | 3 Not available	PC2 - If chassis equipped
											✓		5–6	3457	Engagement consent - Transmission input shaft PTO 2	0 Off | 1 On | 2 Error | 3 Not available	PC2 - If chassis equipped
											✓		7–8	3456	Engagement consent - Transmission input shaft PTO 1	0 Off | 1 On | 2 Error | 3 Not available	PC2 - If chassis equipped
											□	4			Not used		
											✓		1–2	3463	Engagement status - Transfer case output shaft PTO	0 Off | 1 On | 2 Error | 3 Not available	PC2 - If chassis equipped
											✓		3–4	3462	Engagement status - Transmission output shaft PTO	0 Off | 1 On | 2 Error | 3 Not available	PC2 - If chassis equipped
											✓	5	5–6	3461	Engagement status - Transmission input shaft PTO 2	0 Off | 1 On | 2 Error | 3 Not available	PC2 - If chassis equipped
											✓		7–8	3460	Engagement	0 Off | 1 On | 2 Error | 3	PC2 - If

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
															status - Transmission input shaft PTO 1	Not available	chassis equipped
											□	6–8			Not used		
TD	**TimeDate**	**10s**	**8**	**254d**	**230d**	**6**	**65254**	**00FEE6**	**18 FE E6 xx**	**xxx**	□						
											✓	1		959	Seconds	Factor: 0,25 s | Offset: 0 s | Range: 0..59,75 s	PC3
											✓	2		960	Minutes	Factor: 1 min | Offset: 0 min | Range: 0..59 min	PC3
											✓	3		961	Hours	Factor: 1 h | Offset: 0 h | Range: 0..23 h	PC3
											✓	4		963	Month	Factor: 1 month | Offset: 0 month | Range: 1..12 month	PC3
											✓	5		962	Day	Factor: 0.25 day | Offset: 0 day | Range: 0..31,75 day	PC3
											✓	6		964	Year	Factor: 1 year | Offset: 1985 year | Range: 1 985..2 235 month	PC3
											✓	7		1601	Local minute offset	Factor: 1 min | Offset: −125 min | Range: −59..59 min	PC3
											✓	8		1602	Local hour offset	Factor: 1 h | Offset: −125 h | Range: −23..23 h	PC3

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
TI1	**Tank Information 1**	**1s**	**8**	**254d**	**86d**	**6**	**65110**	**00FE56**	**18 FE 56 xx**	**xxx**	□						
											✓	1		1761	Catalyst Tank Level	Factor: 0,4 % | Offset: 0 % | Range: 0..100 %	PC3
											□	2		3031	Catalyst Tank Temperature	Factor:1 °C | Offset: −40 °C | Range: −40 .. 210 °C	
											□	3–4		3517	Catalyst Tank Level 2	Factor: 0,1 mm | Offset: 0 mm | Range: 0..6 425,5 mm	
											□	5	1–5	3532	Catalyst Tank Level Preliminary FMI	Factor: Binary | Offset: 0 | Range: 0..31	
											□		6–8		Not defined		
											□	6–8			Not defined		
VEP1	**Vehicle Electrical Power #1**	**1 s**	**8**	**254d**	**247d**	**6**	**65271**	**00FEF7**	**18 FE F7 xx**	**xxx**	□						
											□	1		114	Net Battery Current	Factor: 1 A/bit | Offset: −125 A | Range: −125..125 A	
											□	2		115	Alternator Current	Factor: 1 A/bit | Offset: −125 A | Range: 0..250 A	
											□	3–4		167	Charging System Potential (Voltage)	Factor: 0,05 V/bit | Offset: 0 | Range: 0 .. 3212,75 V	
											✓	5–6		168	Electrical Potential (Voltage)	Factor: 0,05 V/bit | Offset: 0 | Range: 0 .. 3 212,75 V	PC3

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											✓	7–8		158	Battery Potential (Voltage), Switched	Factor: 0,05 V/bit | Offset: 0 | Range: 0 .. 3 212,75 V	PC3
VW	**Vehicle Weight**	**1 000 ms**	**8**	**254d**	**234d**	**6**	**65258**	**00FEEA**	**18 FE EA xx**	**xxx**	□						
											✓	1		928	Axle location	0F = front axle, 1F = rear axle 1, 2F = rear axle 2	PC2
											✓	2–3		582	Axle weight	Factor: 0,5 kg/bit | Offset: 0 | Range: 0 .. 32 127,5 kg	PC2
											□	4–5		180	Trailer weight	Factor: 2 kg/bit | Offset: 0 | Range: 0 .. 128 510 kg	
											□	6–7		181	Cargo weight	Factor: 2 kg/bit | Offset: 0 | Range: 0 .. 128 510 kg	
											□	8			Not defined		
RCV1	**Refuse Collection Vehicle #1**	**100 ms**	**8**	**255d**	**19d**	**3**	**65299**	**00FF13**	**0C FF 13 xx**	**xxx**	□						
											□	1	1–2				
											□		3–4		Not used		
											✓		5–6		Remote brake activation status	0 OFF | 1 ON | 2 Error | 3 Not available	PC3
											□		7–8		Not used		
											□	2	1–2		Not used		
											□		3–4		Not used		

Memo	Name / comments	Repetition rate	Data length	PDU format	PDU specific	Priority	PGN (D)	PGN (HEX)	Identifier (HEX)	Source Address	Requested	Byte	Bit	SPN	Data content	Value	Comments
											□		5–6		Not used		
											□		7–8		Not used		
											✓		1–2		Remote engine start consent	0 OFF | 1 ON | 2 Error | 3 Not available	PC3
											✓	3	3–4		Remote engine stop consent	0 OFF | 1 ON | 2 Error | 3 Not available	PC3
											□		5–6		Not used		
											□		7–8		Not used		
											□		1–2		Not used		
											□	4	3–8		Not used		
											□	5			Not used		
											□	6–8			Not used		

Bibliography

[1] EN 1501-2, *Refuse collection vehicles and associated lifting devices — General requirements and safety requirements — Part 2: Side loaded refuse collection vehicles*

[2] EN 1501-3, *Refuse collection vehicles and their associated lifting devices — General requirements and safety requirements — Part 3: Front loaded refuse collection vehicles*

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