SLOVENSKI STANDARD
SIST-TP CEN/TR 16596:2014

01-marec-2014

Električno-elektronski vmesnik med šasijo (podvozjem) s kabino in karoserijo vozil za zbiranje odpadkov

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

CAN-Schnittstelle zwischen Fahrgestellen und Aufbau von Abfallsammelfahrzeugen

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

Ta slovenski standard je istoveten z: **CEN/TR 16596:2013**

ICS:

13.030.40	Naprave in oprema za odstranjevanje in obdelavo odpadkov	Installations and equipment for waste disposal and treatment
43.040.15	Avtomobilska informatika. Vgrajeni računalniški sistemi	Car informatics. On board computer systems
43.160	Vozila za posebne namene	Special purpose vehicles

SIST-TP CEN/TR 16596:2014 **en**

TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

CEN/TR 16596

November 2013

ICS 43.040.15; 43.160

English Version

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

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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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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Ref. No. CEN/TR 16596:2013 E

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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 ≤ x ≤ 2;

— y represents the location of the plugs, 1 ≤ x ≤ 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:

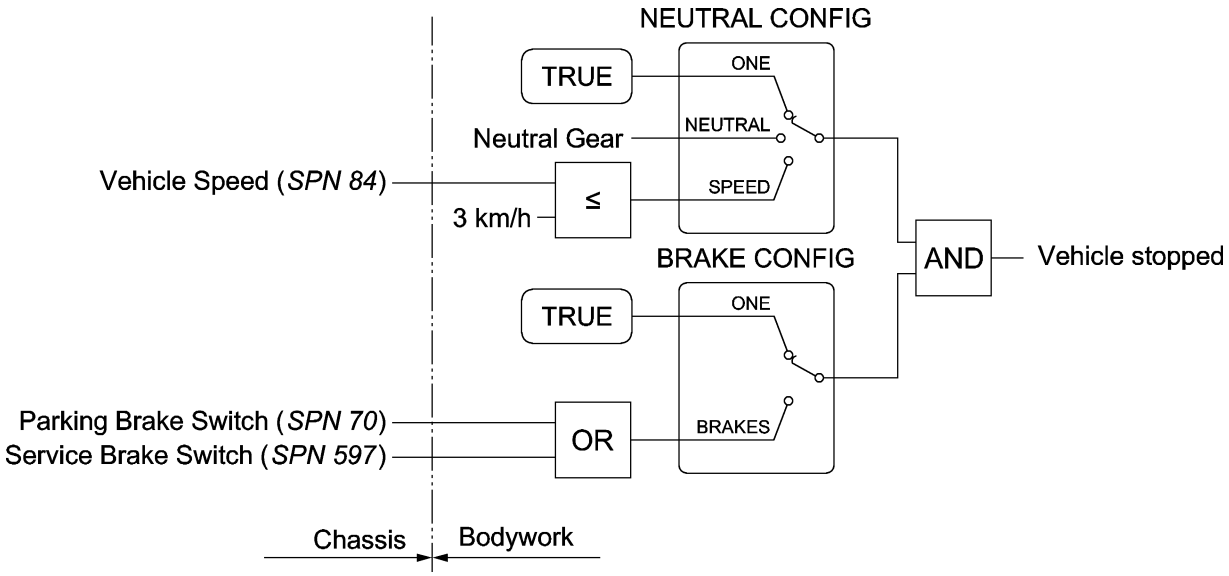

Figure 1 — Primary CAN information

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:

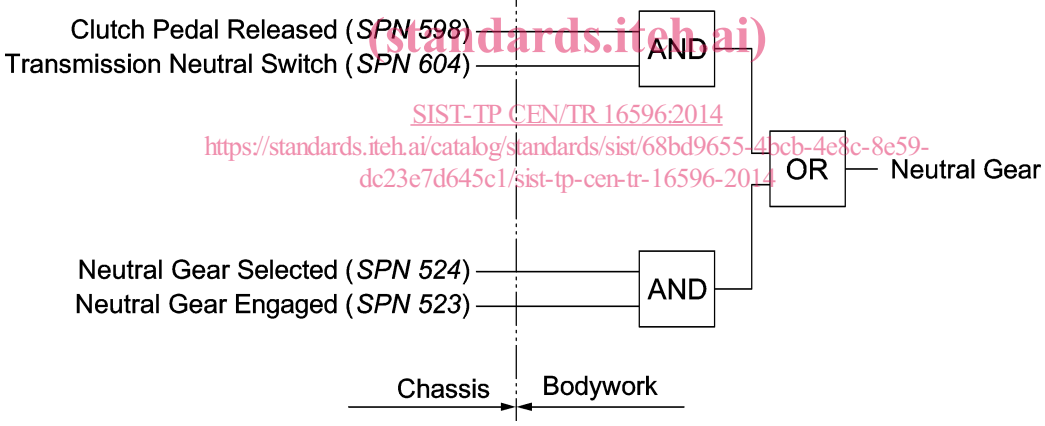

Figure 2 — Neutral gear information

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.

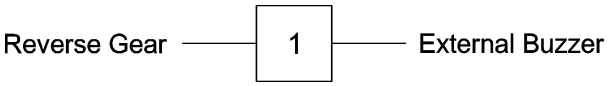

Figure 3 — Vehicle reversing

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:

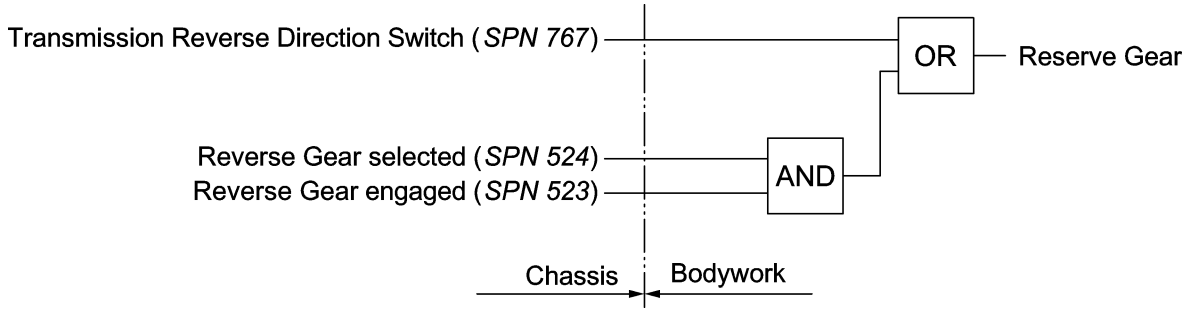

Figure 4 — Reverse gear information

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.

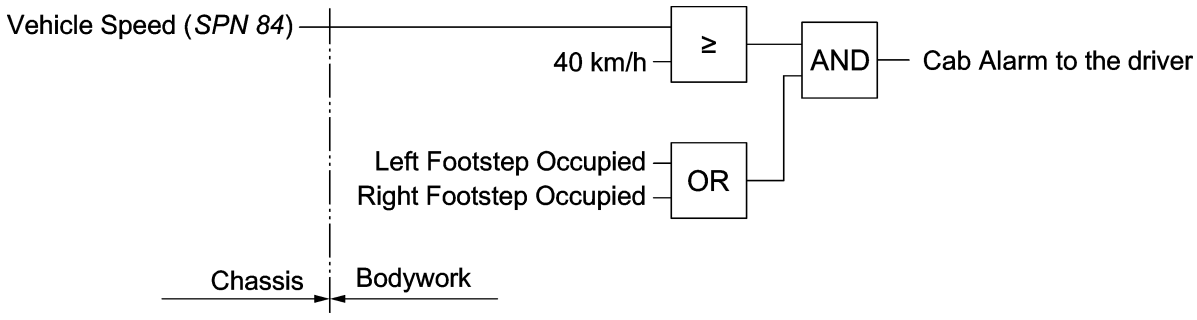

Figure 5 — Vehicle speed

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.

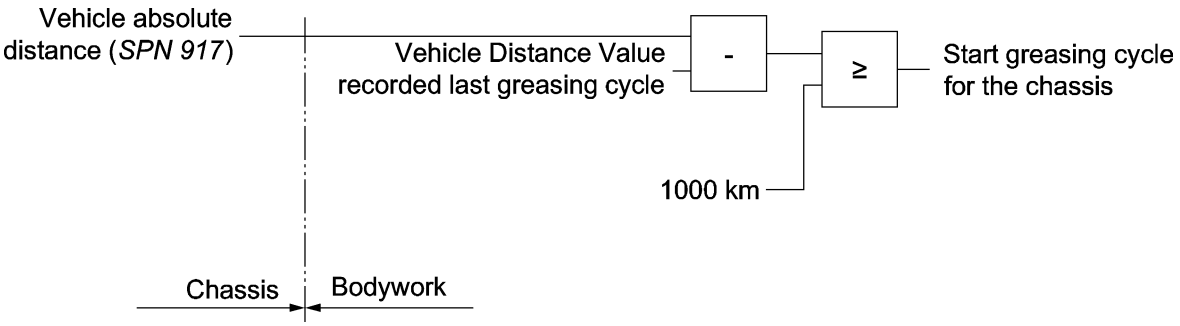

Figure 6 — Vehicle distance

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.

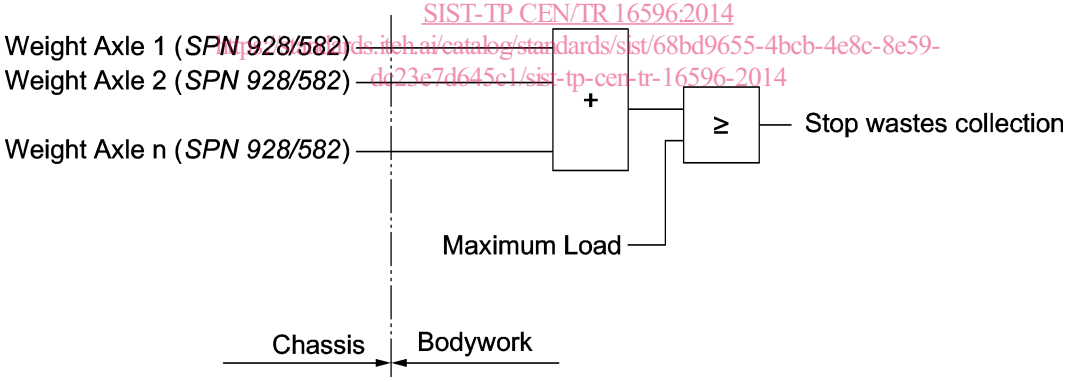

Figure 7 — Axles load distribution

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).

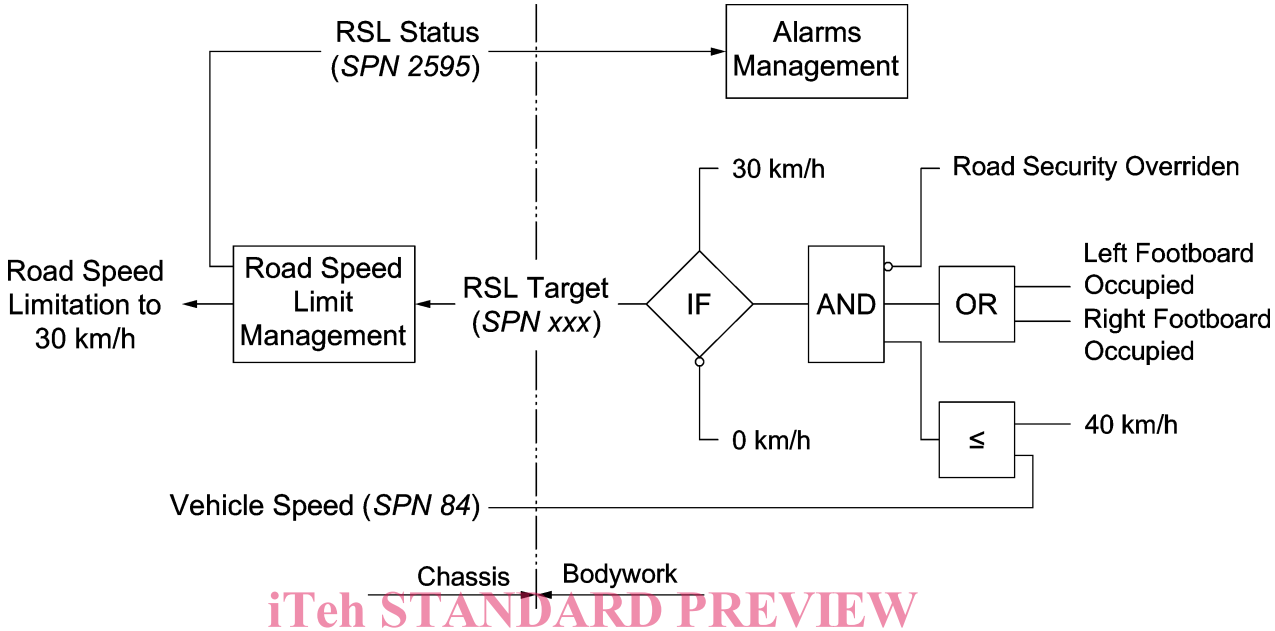

Figure 8 — Road speed limitation to 30 km/h

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.

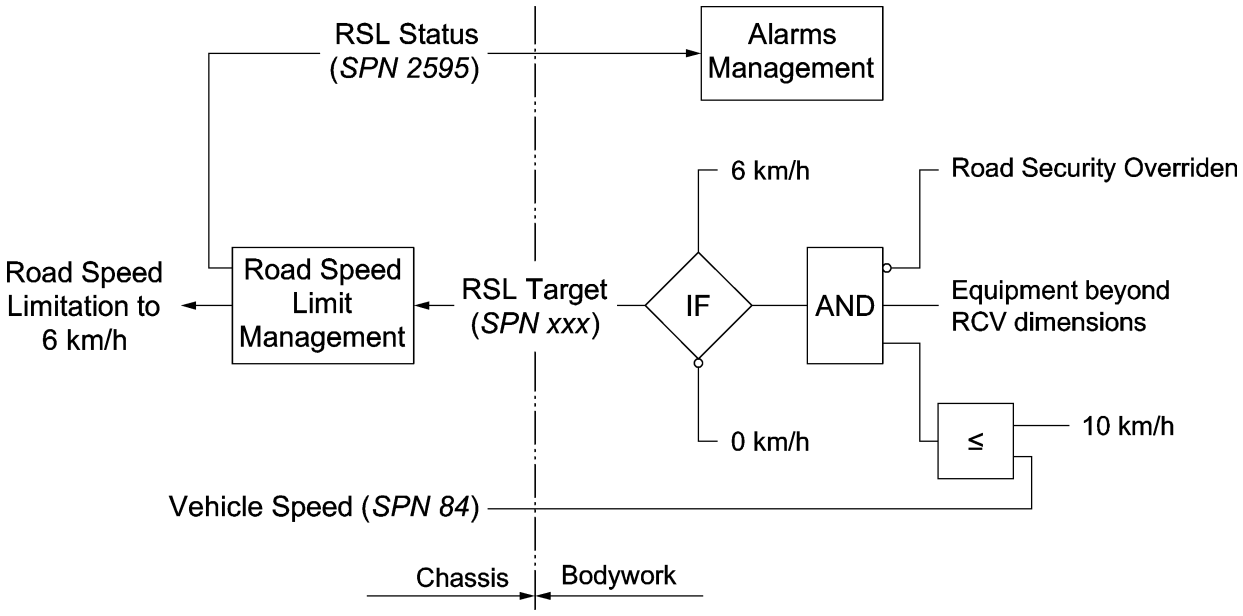

Figure 9 — Road speed limitation to 6 km/h

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).

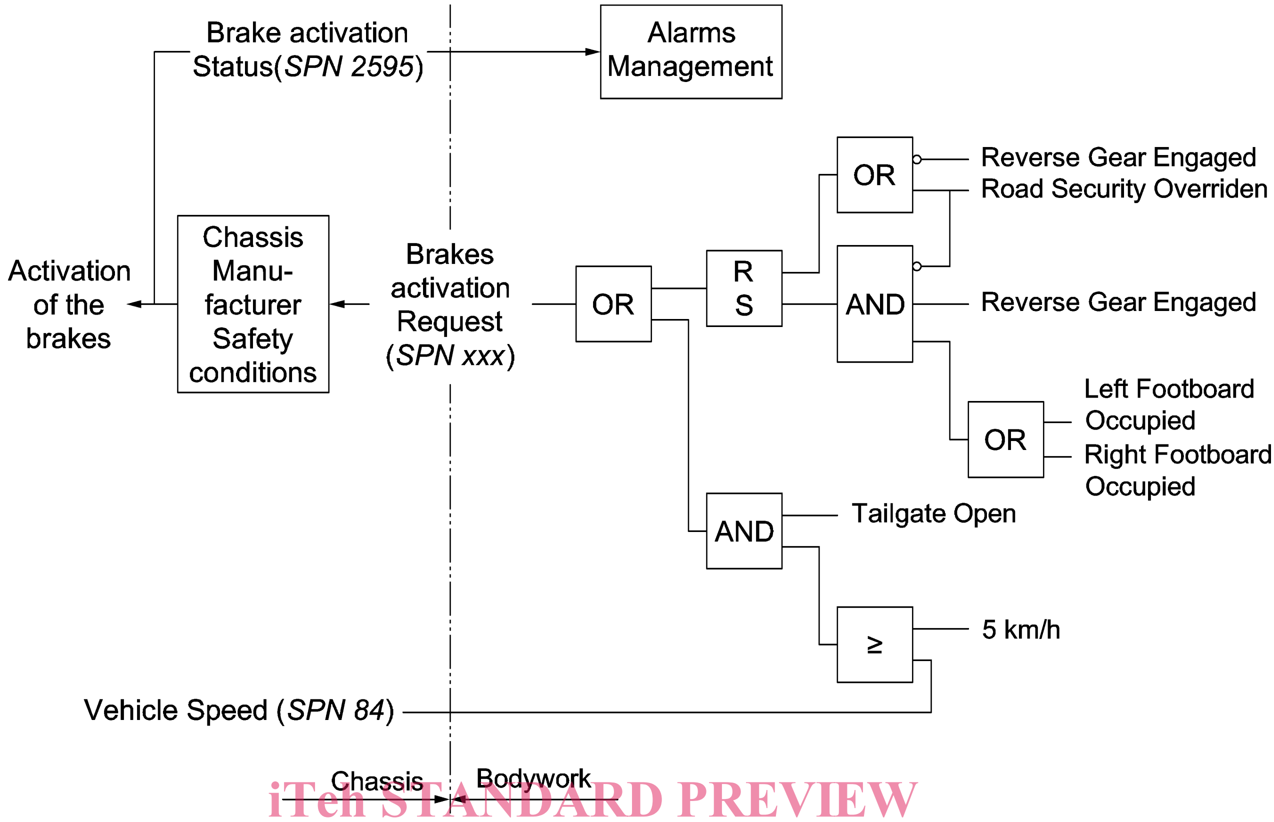

Figure 10 — Brakes system activation

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: