RADC 2.0

OPERATING MANUAL

aspoeck.com

SERVICE NOTES

- Please read these assembly instructions completely before starting assembly.
- These installation instructions are intended for workshops and attachment manufacturers Appropriate background knowledge is therefore assumed in these assembly instructions. It should be noted that some work may only be carried out by appropriately qualified personnel in order to avoid the risk of injury and to achieve the quality required for construction work.
- When making product improvements, we reserve the right to make technical and optical changes.
- If you have any questions or installation problems, call Aspöck customer service, the dealer or contact your authorized workshop.

LIABILITY PROVISIONS

General information:

- National mounting, installation and operating regulations must be observed.
- The product may only be used in accordance with the enclosed instructions and safety notes. Instructions can be found online at ***www.aspoeck.com***.
- No modifications may be made to the product unless only the original spare parts intended for this purpose or spare parts approved by Aspöck are used and installed by professionally qualified personnel.

Exclusion of warranty:

- Warranty for any product damage is excluded in the event of non-compliance with the instructions, with the product data sheet or in the event of use outside of the intended purpose or operating conditions.
- The warranty also does not cover products that have been damaged or are in poor operating condition due to hazards (including environmental hazards, road traffic hazards, hazards caused by third parties or circumstances beyond the control of Aspöck).
- Repair or replacement of a defective product does not result in the start of a new warranty period.
- Other warranty provisions can be found in item 10 of the Terms of Sales and Delivery (TSD) ***www.aspoeck.com***.

Exclusion of liability:

- Aspöck Systems accepts no liability for indirect damage, consequential damage and financial losses.
- Other (limiting) liability provisions can be found in item 11 of the Terms of Sales and Delivery (TSD) ***www.aspoeck.com***.
- Limiting product liability provisions are laid down in item 12 of the Terms of Sales and Delivery (TSD) ***www.aspoeck.com***.

INHALTSVERZEICHNIS

1. LIST OF SHORTCUTS

SHORTCUT	EXPLANATION
EMC	Electro-magnetic compatibility
ESD	Electrostatic discharge
PCB(A)	Printed circuit board (assembled)
OEM	Original equipment manufacturer
EOL	End of Line Test
CAN	Controller area network
EOM	End outline marker
ECU	Electronic control unit
OBD	On board diagnoses
RADC	Radar distance control
RLF	Road layer function
EBS	Electronic brake system

2. GENERAL INFORMATION

2.1 TARGET GROUP

This document is intended for qualified specialists from vehicle manufacturers and workshops.

2.2 SAFETY

2.2.1 INTENDED USE

The system may only be used to monitor the area behind the trailer when reversing commercial vehicles (class O3/O4). Any other use is considered improper. The manufacturer shall not be held liable for any damage resulting from improper use. The risk of such damage shall be borne by the driver of the vehicle. Proper use also includes compliance with the operating, maintenance and servicing instructions prescribed by the manufacturer. Use of the system is subject without exception to the country-specific traffic regulations in which the vehicle is operated. The manufacturer shall not be held liable for any damage resulting from unauthorised modifications to the system.

2.2.2 USED PICTOGRAM

These instructions contain information that must be observed for personal safety and to prevent personal injury and damage to property. These are highlighted by warning triangles and shown below depending on the degree of danger.

⚠ DANGER

The signal word indicates a hazard with a **high** level of risk which, if not avoided, could result in death or serious injury.

⚠ WARNING

The signal word indicates a hazard with a **medium** level of risk which, if not avoided, could result in death or serious injury.

⚠ CAUTION

The signal word indicates a hazard with a **low** level of risk which, if not avoided, could result in a minor or moderate injury.

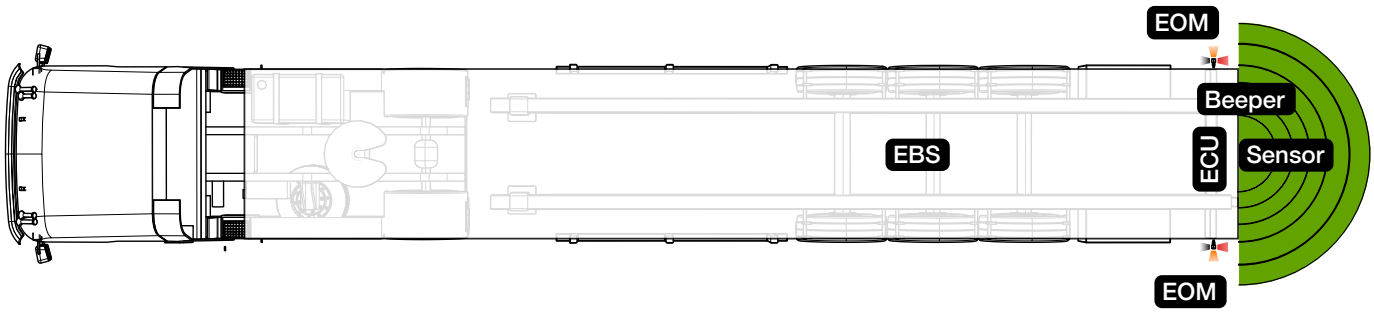
NOTE

A note in the context of these instructions is important information, a technical note, about the product or the relevant part of the instructions to which particular attention is to be paid.

3. SYSTEM DESCRIPTION

The RADC 2.0 supports the driver when reversing a towing vehicle with a trailer, in particular when docking with a loading ramp. For large vehicles with trailers, a large, non-visible area is created at the rear, which is monitored by the RADC 2.0. If there are any obstacles, the trailer brake is automatically activated (target braking).
For the assisted docking process at a loading ramp, the attached rear position lamps (EOM) signal the remaining distance to the obstacle or loading ramp by means of different flashing frequencies. In addition, the driver can be warned acoustically.

The RADC 2.0 can also be installed without modifying the vehicle‘s EBS. In this case, the function is limited to the visual warning by the EOMs and an optional acoustic warning by the beeper. In this variant, the HDSCS plug connection on the ECU must be sealed. (6.2 (K))



The RADC 2.0 fulfils the following regulations:

- ISO 26262 – Functional safety for road vehicles
- ECE R10 – Electromagnetic compatibility

3.1 SUPPORTED FUNCTIONS

Flashing EOM (Superpoint)

- visualisation of the ramp spacing

Beeper Alarm

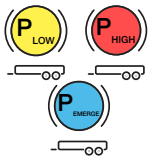
- Warnings when crossing traffic is detected (optional: signalling of different detection zones)

No EBS configuration required (Wabco/ZF, Haldex)

- ‘Plug and play’ through CAN data interface between RADC 2.0 and EBS (Wabco/ZF, Haldex compatibility with current EBS versions)
- Knorr on the analogue “RLF” brake

Manual deactivation of the system

- Option for the driver to completely deactivate it (9.2)



Different brake pressure values transmitted to the EBS

- Low pressure (haptic information for the driver)
- High pressure (last distance to ramp)
- Emergency braking pressure (cross-traffic)

Cross-traffic detection

- Emergency brake implementation, beeper warning

System based on UN ECE R158 regulation

Selbstdiagnose / Zustandsüberwachung

- Sensor, ECU, EBS brake readiness, power supply, open or overcurrent detection at outputs
- HARA, FMEA analysis

Customisable with RADC 2.0 configuration software

- Adjustment of sensor position, detection zones, brake pressures,...

RADC 2.0 ECU

- High-quality HDSCS and Superseal connectors.

3.2 REQUIREMENTS ON THE TRAILER

Electrical requirements

A prerequisite for the mounting of the RADC 2.0 is the power supply via the lighting functions of an existing ISO12098 connection from the truck to the trailer. The minimum requirement for activating the rear area monitoring function is the active supply wired in parallel to the reverse lamp. To ensure that the EOM lamps are switched on in forward gear, it is also necessary to connect the inputs to the ECU for the right and left parking lights to the ISO12098.

Further electrical/wiring information:

The supply voltage of the components can be between 9V and 32V. To read control signals correctly, voltage values above 11V are necessary. When operating on a 12V electrical system, care should be taken to use neither over-long cables nor cables with insufficient cross-section. Furthermore, flawless plug contacts must be ensured to prevent voltage drops.

Trailer EBS requirement

To control the automatic brake request, the RADC 2.0 is connected to the trailer EBS via CAN bus. For this purpose, appropriate cables are provided for the different brake system manufacturers.

- RADC 2.0 **Wabco** EBS TEBS-E (Subsystem oder GIO5)
- RADC 2.0 **Haldex** EBS Gen 4
- RADC 2.0 **Wabco** EBS TEBS-F (Subsystem)

If several devices are connected to the EBS CAN subsystem, the wiring in a line structure must be observed. The use of Aspöck AMP-CAN cabling is recommended for this purpose.

- AMP end device HDSCS 6pin and RADC 2.0 K1.2 - 6pin HDSCS 55° female

With Knorr-Bremse Trailer EBS, the brake request is controlled via a ground-free single-wire signal line.

- RADC 2.0 **Knorr** EBS G2 (9.5.1)

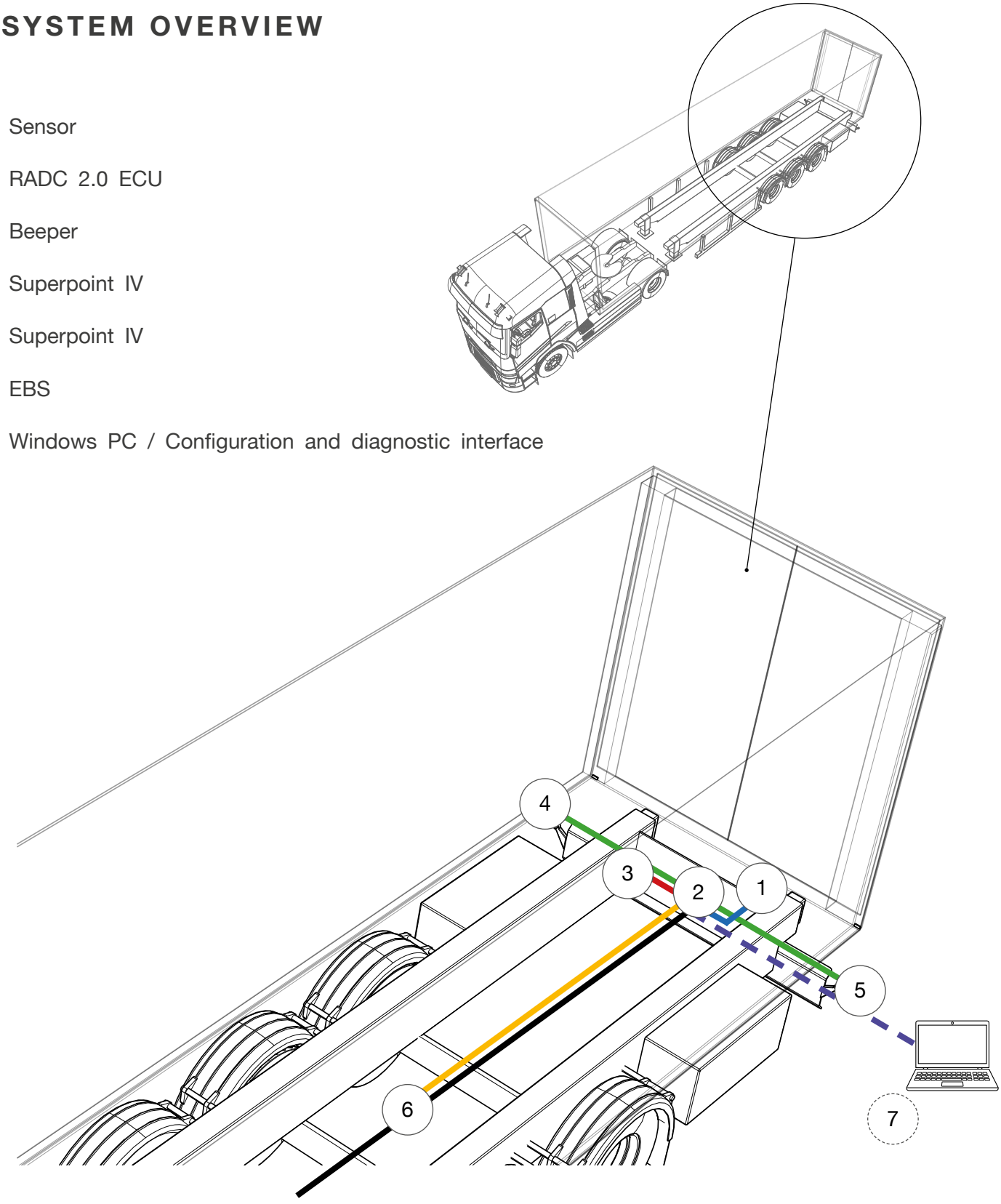
If possible, the SENS_SUP (IN-OUT connector pin 6) should be used for this on the TEBS G2.2 Premium. To do this, further configuration of the trailer EBS is necessary in order to store a brake pressure as a ‘Road Layer Function (RLF)’ at the input used.

Technical requirement

In order to properly mount all components of the RADC 2.0 on the trailer, it is necessary to observe all mounting dimensions and tolerances. Before starting the mounting, make sure that the required space is available on the trailer. This is essential to ensure the proper functioning of the RADC 2.0. The mounting dimensions, tolerances and hole patterns are described in the following chapters.

4. SYSTEM OVERVIEW

1. Sensor
2. RADC 2.0 ECU
3. Beeper
4. Superpoint IV
5. Superpoint IV
6. EBS
7. Windows PC / Configuration and diagnostic interface



5. COMPONENT OVERVIEW

1 Cable sensor

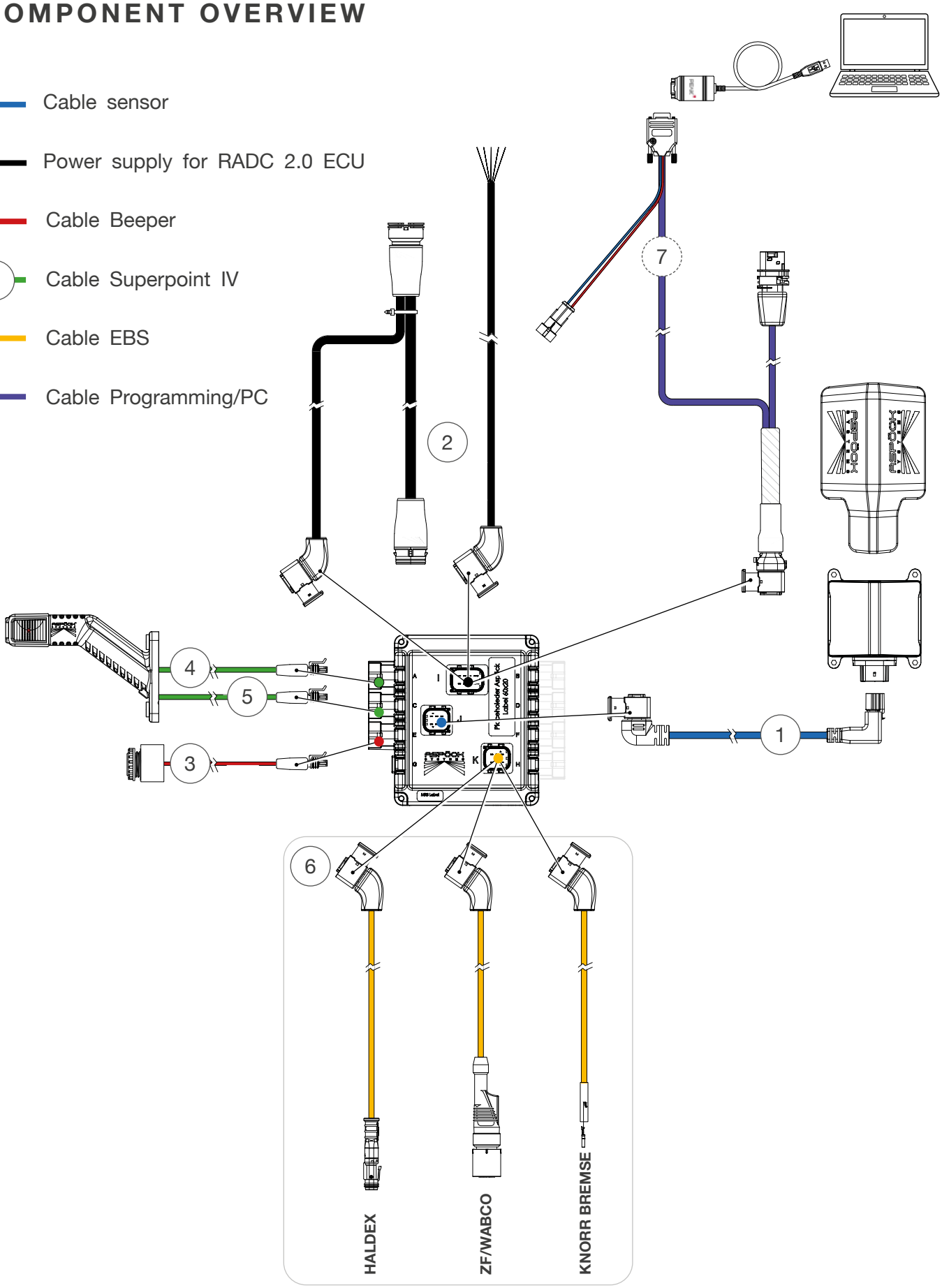
2 Power supply for RADC 2.0 ECU

3 Cable Beeper

4 5 Cable Superpoint IV

6 Cable EBS

7 Cable Programming/PC



5.1 COMPONENTS

5.1.2 BASIC COMPONENTS

	ORDER NB. OEM	ORDER NB. AM	VERSION	ADDITION	
BASIC COMPONENTS	75-0600-017	75-0600-011		RADC 2.0 ECU	Set
		---	[A]	RADC 2.0 ECU - Config 00 (Standard)	1 pcs.
		---		Screw EJOT Delta PT 40x14	4 pcs.
		---	[B]	RADC 2.0 - Sticker	1 pcs.
		---		Leaflet ECU	1 pcs.
		---		Leaflet Sensor	1 pcs.
	10-0350-977	---		Operating Manual	1 pcs.
	75-0213-127	75-0213-121	[C]	RADC 2.0 Sensor	1 pcs.
	78-7023-407	78-7023-404	[D]	RADC 2.0 Sensorcable	1 m
	78-7023-417	78-7023-414	[E]	RADC 2.0 Sensorcable	3 m
	---	15-7411-004		RADC 2.0 Sensorcover	Set
		---	[F]	RADC 2.0 Sensorcover	1 pcs.
		---		Screw EJOT Delta PT 45x20	4 pcs.
	---	15-7412-004		Aspöck ECU protection cap	Set
		---	[G]	Aspöck ECU protection cap	1 pcs.
		---		Screw EJOT Delta PT 40x14	4 pcs.
	31-3103-487	31-3103-484	[H]	SP IV R/W/O 2m 2p S.Seal RH	2 m
	31-3102-477	31-3102-474	[I]	SP IV R/W/O 2m 2p S.Seal LH	2 m
	75-0001-037	75-0001-034	[J]	RADC 2.0 Beeper 2p S.Seal	4 m

5.1.3 SPECIFIC COMPONENTS

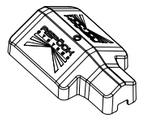
	ORDER NB. OEM	ORDER NB. AM	VERSION	ADDITION	
SPECIFIC COMPONENTS	78-7023-207	78-7023-204	[K]	RADC 2.0 power supply cable ASS3 17p.	0,3 / 5m
	78-7023-217	78-7023-214	[L]	RADC 2.0 power supply cable o. e.	5 m
	78-7023-037	78-7023-034	[M]	RADC 2.0 Wabco EBS3 - ECU	6 m
	78-7023-077	78-7023-074	[N]	RADC 2.0 Haldex EBS4 - ECU	6 m
	78-7023-007	78-7023-004	[O]	RADC 2.0 Knorr EBS3 RLF - ECU	6 m
	78-7023-707	---	[P]	RADC 2.0 K1.2 - ECU	6 m
	78-7023-717	---	[Q]	K1.2 CAN Splitter 1m/2m	1 / 2 m
	69-0048-087	---	[R]	Extension cable 2p S.Seal	3 m
	69-0048-007	---	[S]	Extension cable 2p S.Seal	1,5 m
	69-0354-007	69-0354-004	[T]	PCAN Adapter	
	69-0470-007	69-0470-004	[U]	Aspöck ECU programming cable	0,4 / 4m
	75-9012-027	---		Aspöck USB Dongle	

5.1.4 SPARE PARTS

	ORDER NB. OEM	ORDER NB. AM	VERSION	ADDITION	
SPARE PARTS	14-0414-034	---		Screw EJOT Delta PT 40x14	4 Stk.
	14-2045-014	---		Screw EJOT Delta PT 45x20	4 Stk.
	10-0211-397	10-0211-397	[B]	RADC 2.0 - Sticker	

RADC 2.0 - Overview

15-7411-004
incl. 4 screws
[F]



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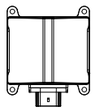

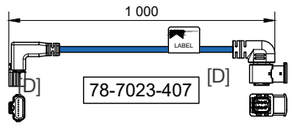

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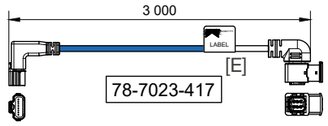

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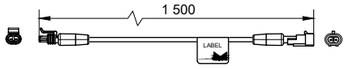

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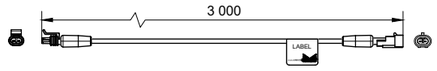

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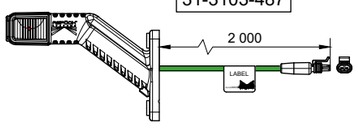

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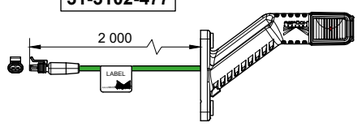

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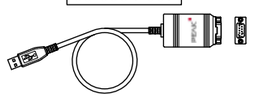

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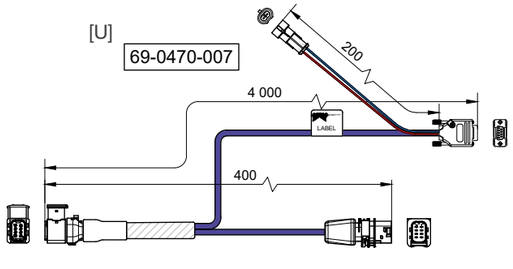

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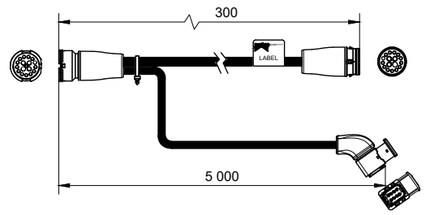

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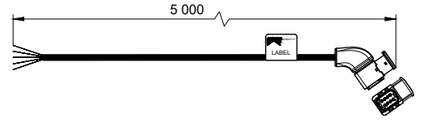
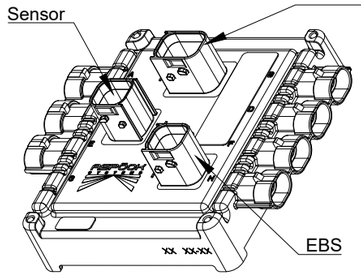


75-0600-017
incl. 4 pc. screws PT40x14
incl. sticker
[A]

+Power Supply

Sensor



15-7412-004
incl. 4 pc. screws
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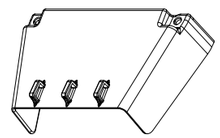

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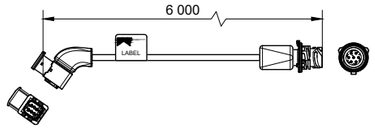
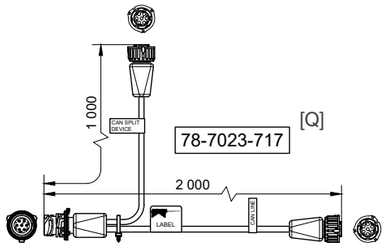
78-7023-707
[P]





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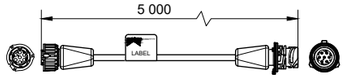
78-7021-307



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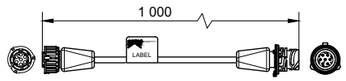

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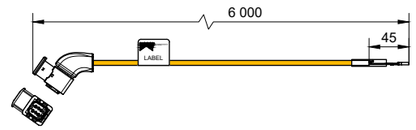

Knorr EBS
G2

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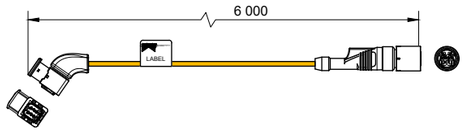

Wabco EBS
TEBS- E

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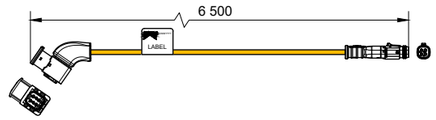
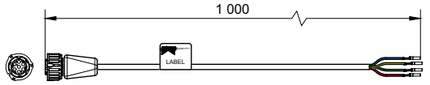


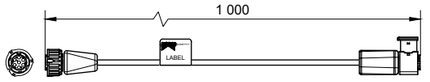
Haldex EBS
Gen 4

78-7022-057



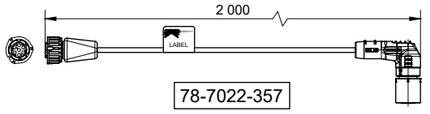
Knorr EBS
G2

78-7022-157



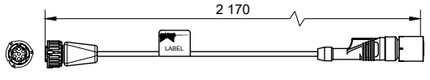
Knorr EBS
G3

78-7022-347



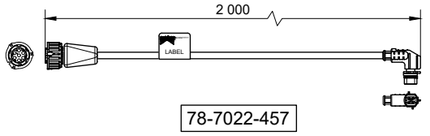
Wabco EBS
TEBS- E 90°

78-7022-357



Wabco EBS
TEBS- E

78-7022-367



Wabco EBS
Gio5

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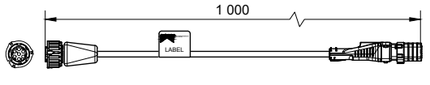

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TEBS- F

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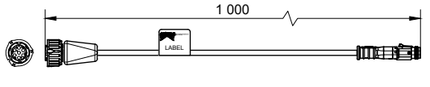
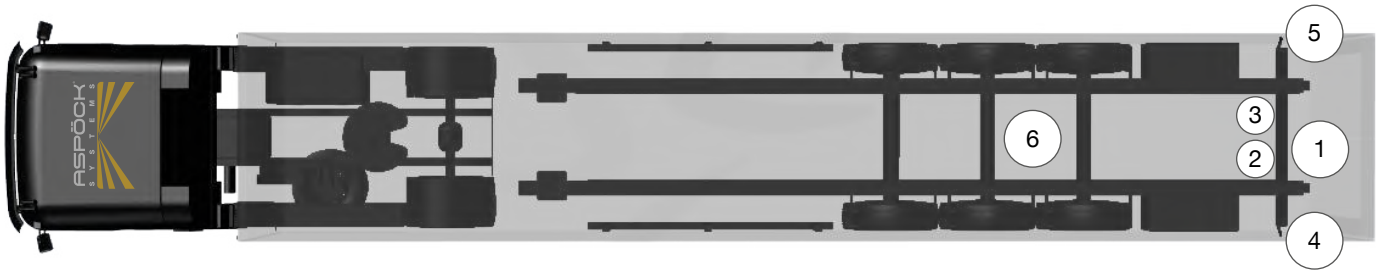


Haldex EBS
Gen 4

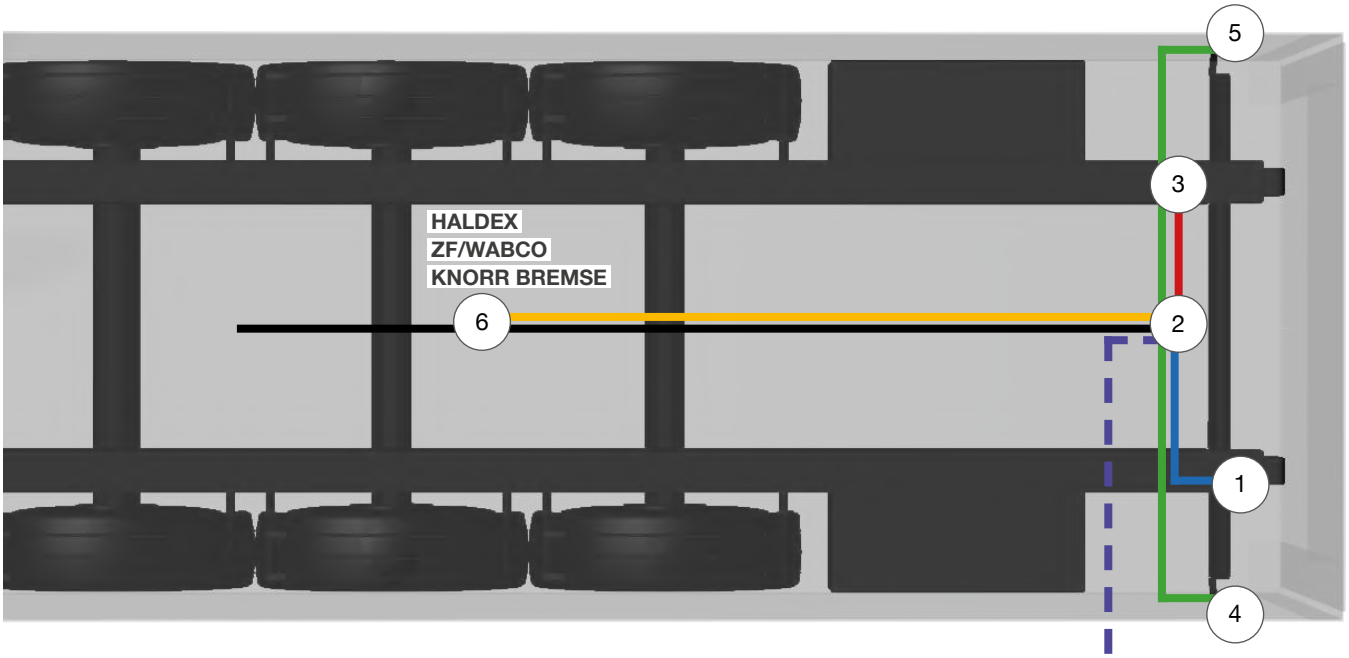
6. COMPONENTS AND ASSEMBLY

Careful assembly of the RADC 2.0 components takes time and requires familiarisation with the operating instructions. To ensure proper installation, it is necessary to follow all the information and instructions in this document.

Overview of components and cables



1 Sensor
2 RADC 2.0 ECU
3 Beeper
4 Superpoint IV
5 Superpoint IV
6 EBS



Cable Superpoint IV
Cable EBS
Cable Beeper
Cable Sensor
Cable programming
Cable power supply RADC 2.0 ECU

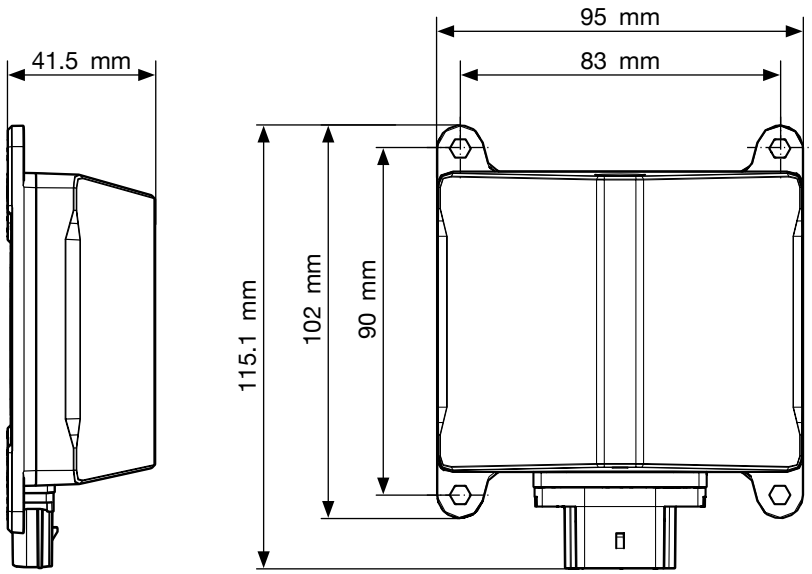
⚠ DANGER

All components and cables must not be routed or installed along heat sources or through areas that may be subject to impact or dirt abrasion.

6.1 SENSOR

The reversing sensor of the RADC 2 offers a detection angle of 180° with a detection range of 10m x 4m (maximum) and complies with the UN ECE R10 directive. The single radar is easy to install and can be user-friendly integrated into most vehicle systems to activate active braking and audible warnings when reversing.

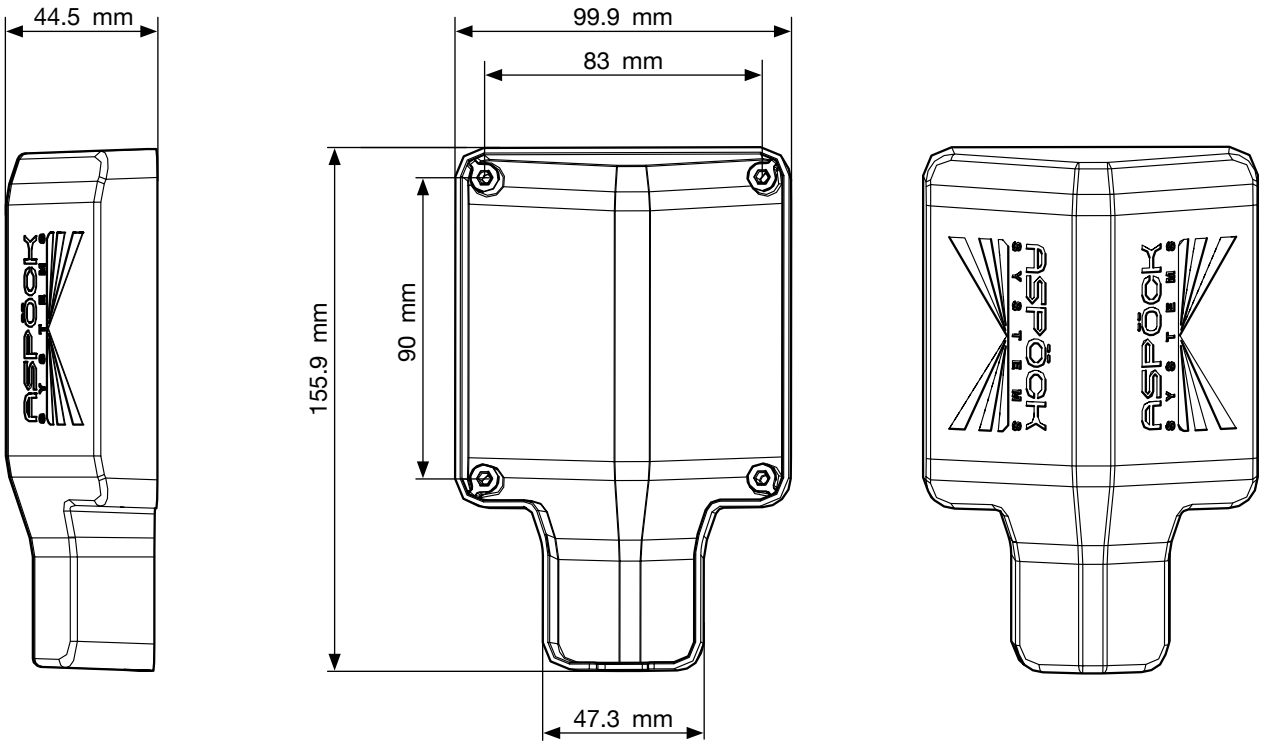
TECHNICAL DATA	
DETECTION RANGE	10 m x 4 m (maximal)
ANGLE OF DETECTION HORIZ.	180° (No blind spots)
DISTANCE ACCURACY	±0,2 m
DISTANCE RESOLUTION	0,5 m
MEASUREMENT (W/H/D)	115 x 95 x 43 mm
COMMUNICATION INTERFACE	CAN
OPERATING VOLTAGE	24 V
OPERATING TEMPERATURE	-40 °C - +80 °C
APPROVAL	UN ECE R10
PROTECTION CLASS	IP69K



6.1.1 SENSOR COVER

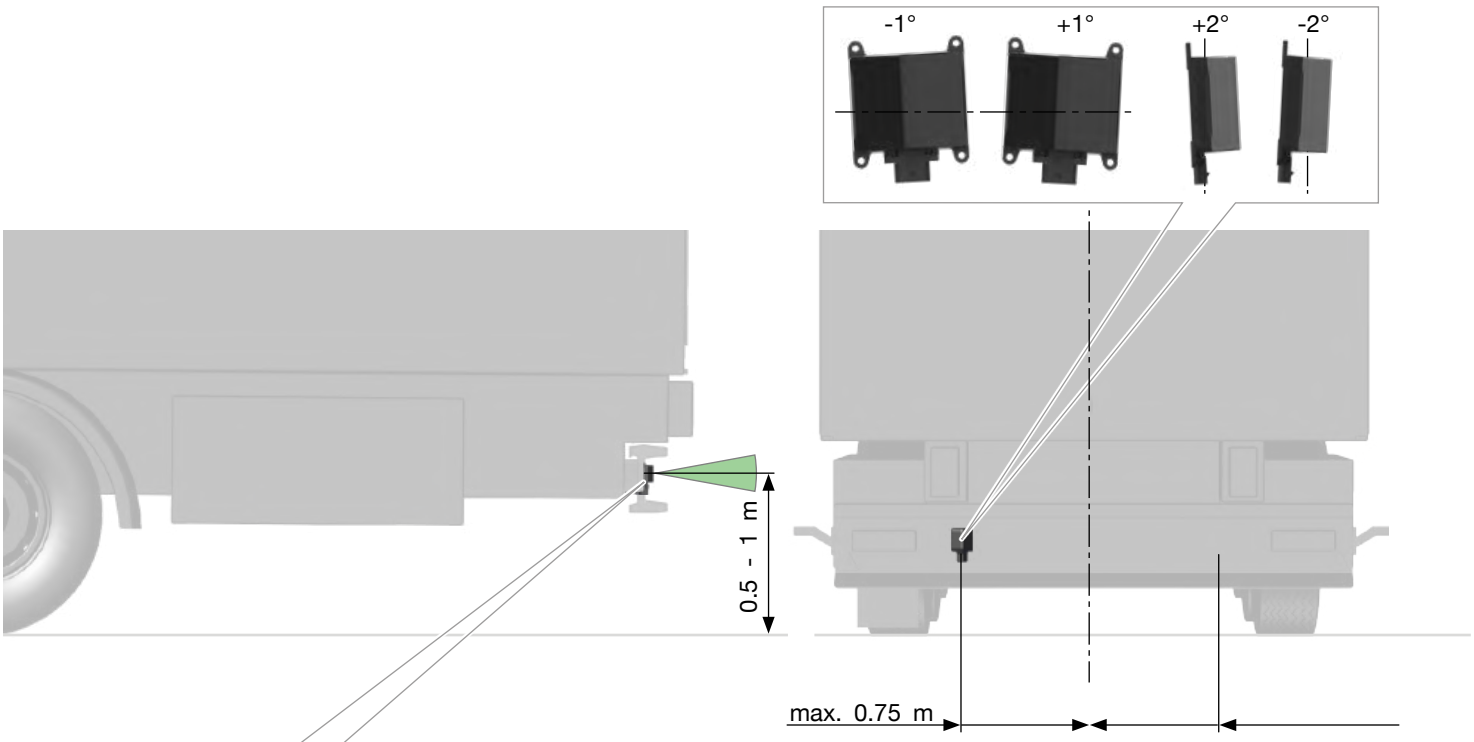
To protect the sensor from dirt and mechanical damage, the RADC 2.0 includes a cover for the sensor. The cover is screwed to the sensor during assembly in the same hole pattern.

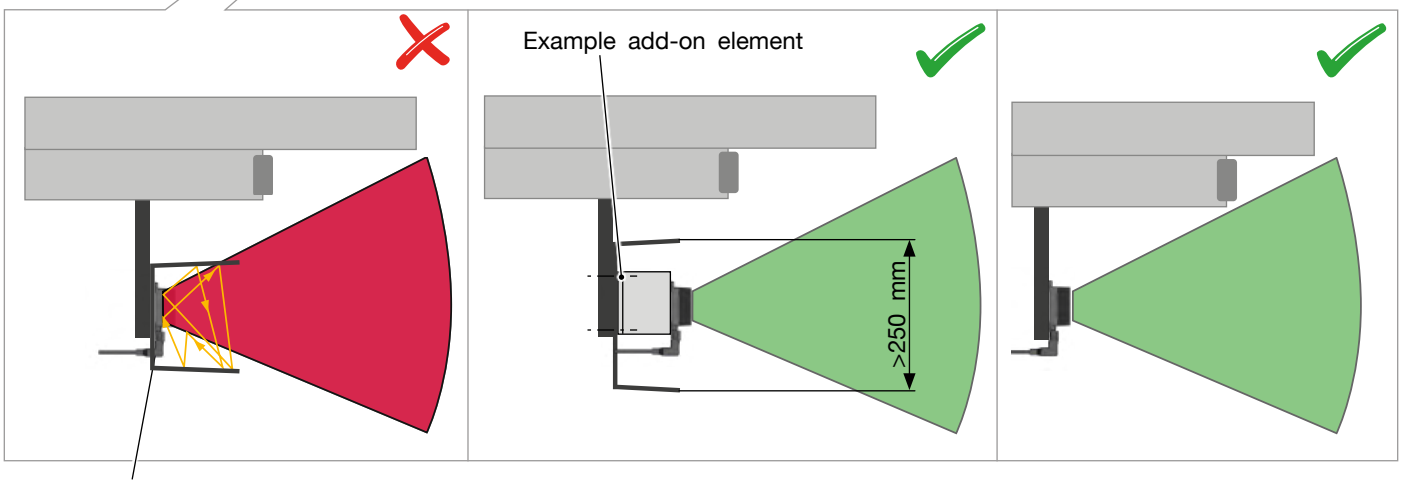
TECHNICAL DATA	
MEASUREMENT (W/H/D)	99.9 x 155.9 x 44.5 mm
MATERIAL	ABS
WEIGHT	55 g
COLOR	black



Mounting position

When mounting the sensor, it is important to ensure compliance with the vertical and horizontal deviation tolerances. If the sensor is mounted outside the tolerances, the performance of the sensor must be tested. The effective range of the sensor must not be covered or shielded by any attached parts at the rear or sides, as this may affect its function. (Malfunction of the sensor due to radar reflections) In the standard Aspöck mounting, the sensor is mounted on the left of the bumper next to the licence plate or, if possible, in the centre of the vehicle. The specified installation heights and installation depths must be observed.



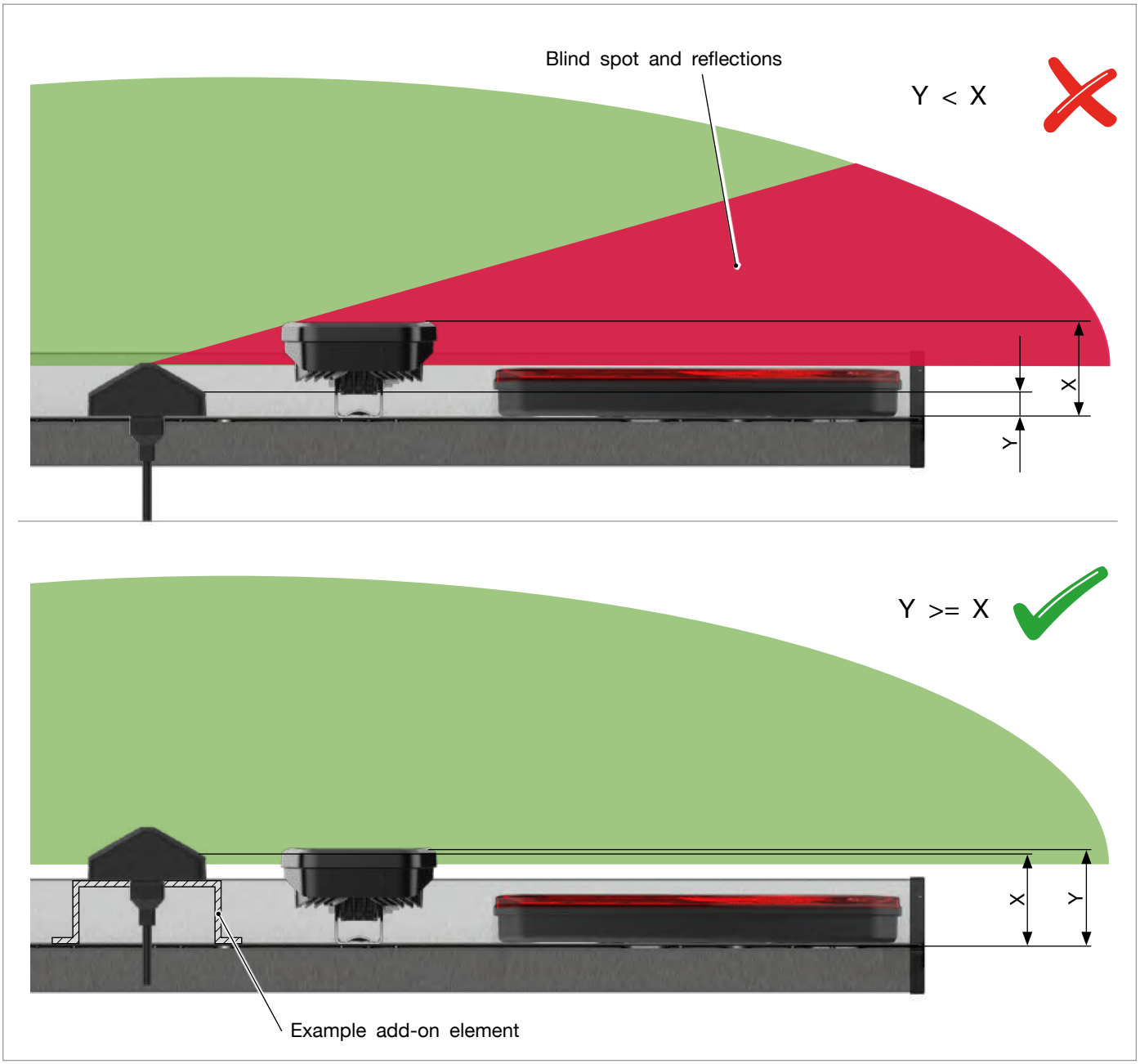


Radar reflections due to excessive depth

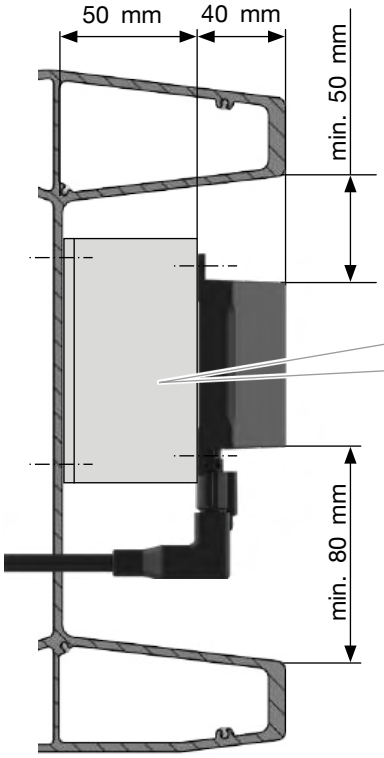
⚠ CAUTION

Since the actual installation situation can vary greatly in practice, radar reflections may occur even if the installation dimensions and tolerances are adhered to. To ensure that the RADC 2.0 works properly, the performance of the reversing system must be tested before final operation.

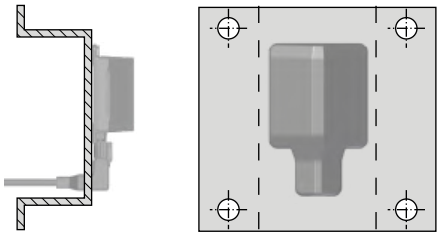
Example of an Aspöck bumper



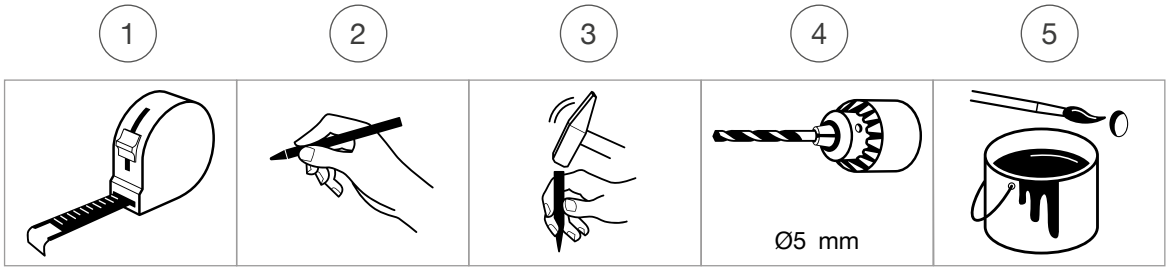
Example add-on element



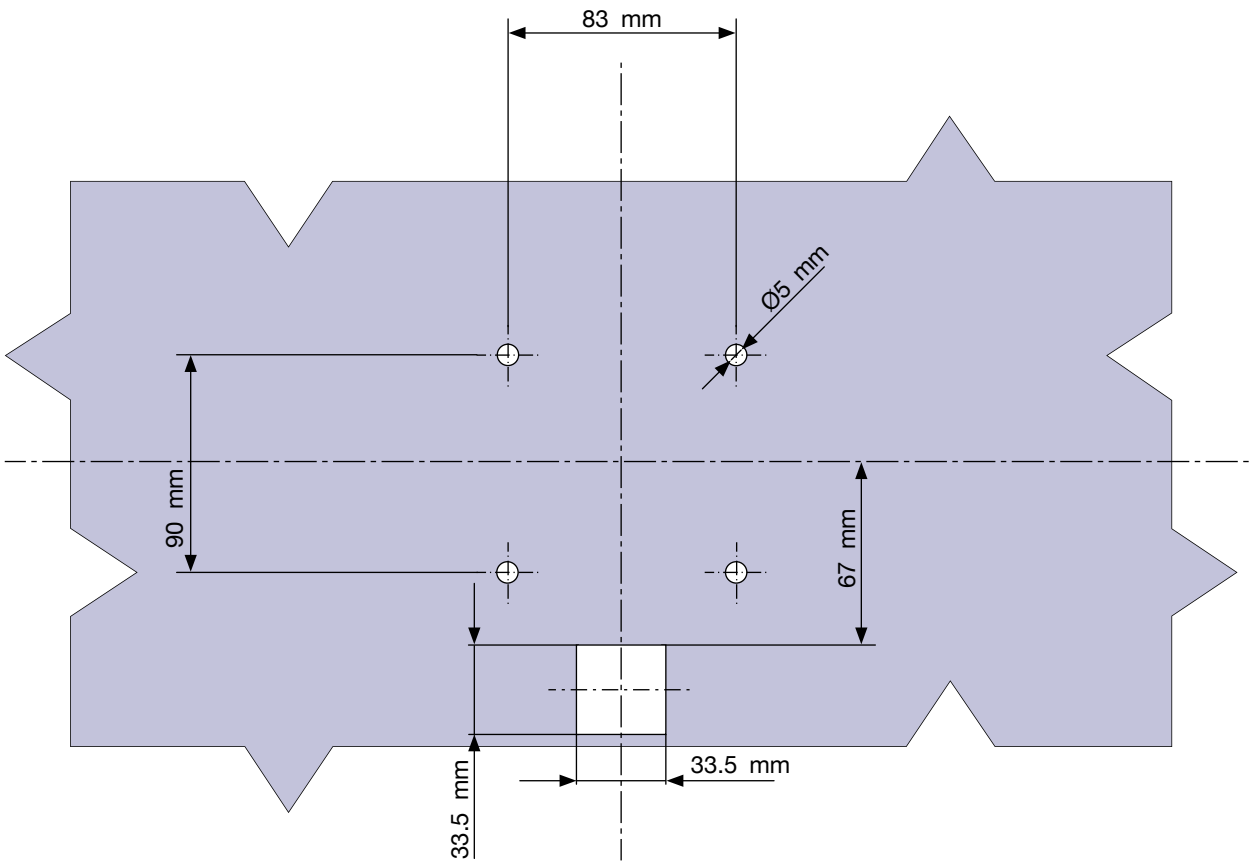
Example add-on element:
In order to achieve the necessary installation depth of the sensor, it may be necessary to fabricate an attachment and mount it on the trailer.



Preparation for assembly

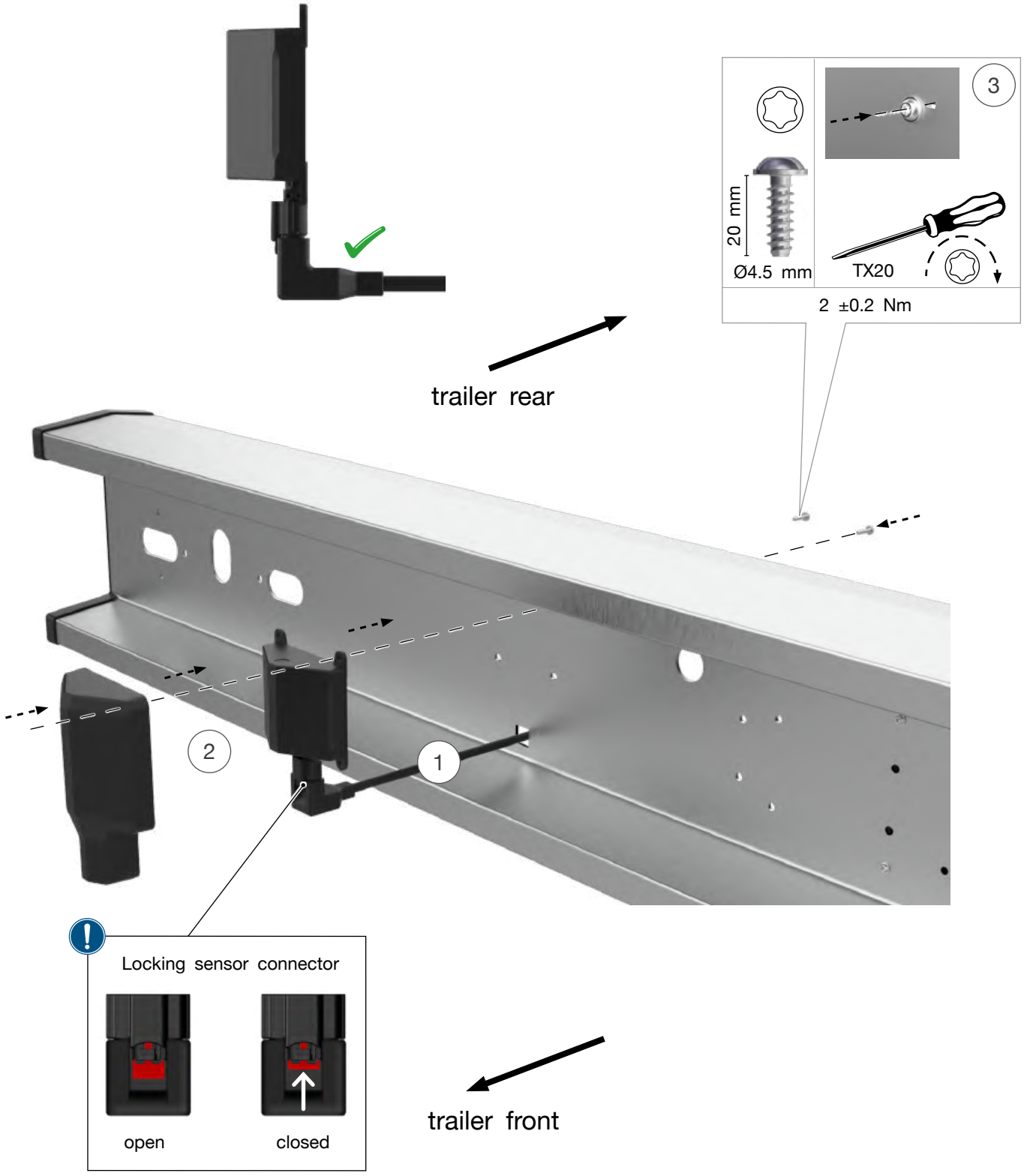


Hole pattern sensor/sensor cover



Mounting the sensor

Guide the sensor-side plug through the large lower drill hole. Insert the sensor plug into the sensor and lock it. Place the cover over the sensor and position both parts over the drill holes for the screws. The sensor is now screwed together with the cover from the inside.



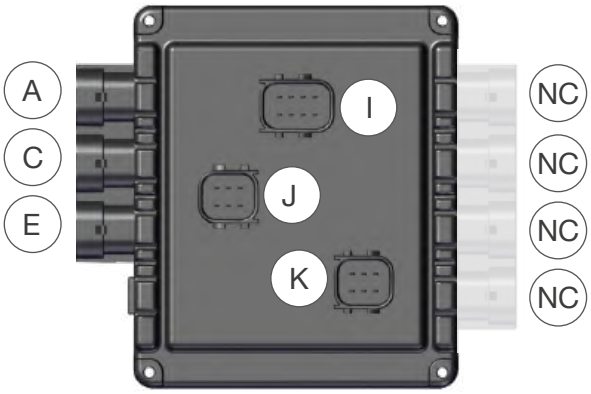
6.2 RADC 2.0 ECU

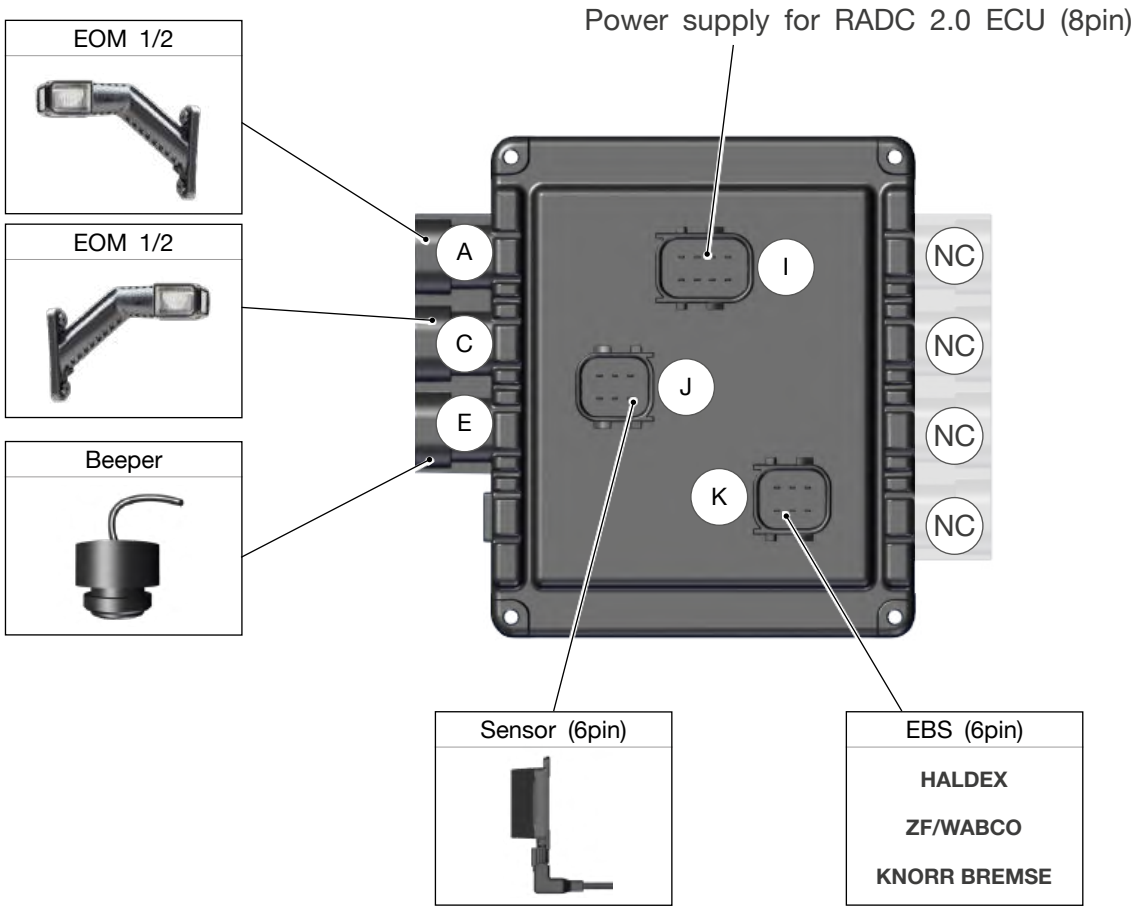
The RADC 2.0 ECU is the central unit of the RADC 2.0. On the one hand, it provides the connection to the EBS of various manufacturers and, on the other, to sensors, beepers and signal lamps.

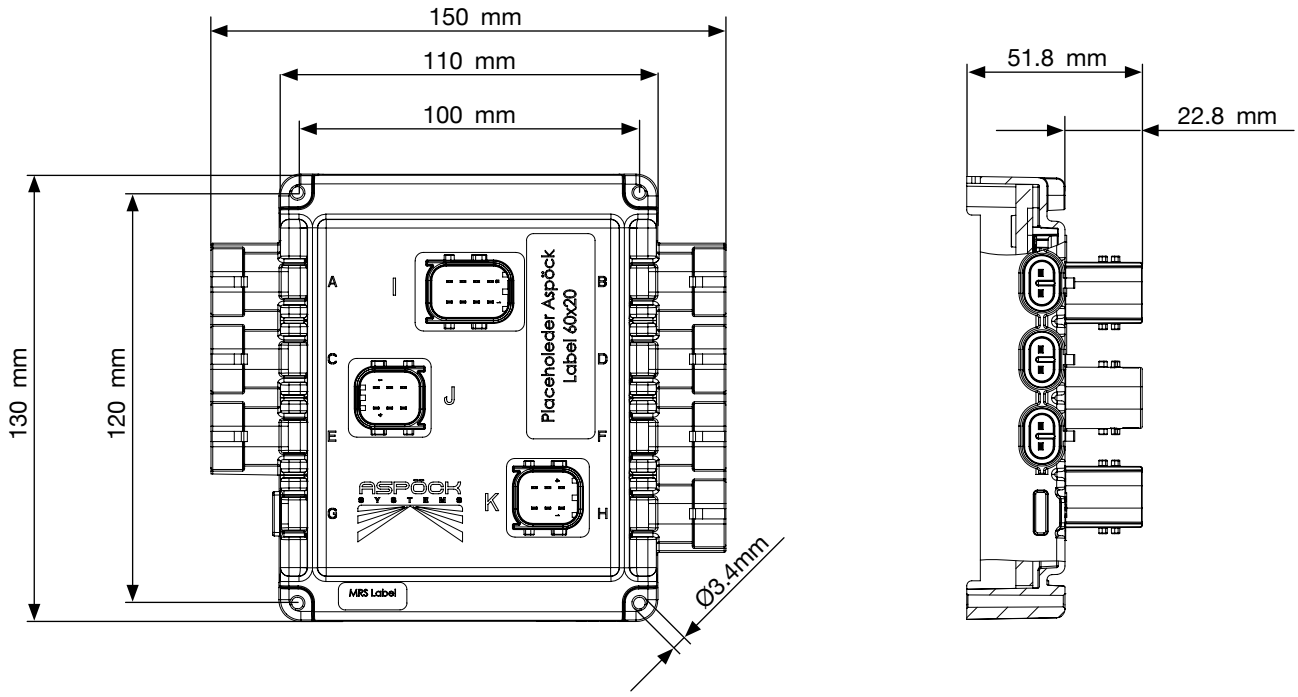
TECNICAL DATA	
HOUSING	PBT (GF20), back side moulded
MEASUREMENT (W/H/D)	132 x 152 x 52 mm
WEIGHT	350 g
OPERATING TEMPERATURE	-40 °C - +80 °C
PROTECTION CLASS (ISO20653)	IP6K9K
QUIESCENT CURRENT (BEI 24V)	65 mA
FUSE	5A (T)
VOLTAGE RANGE	9V – 32V
REVERSE POLARITY PROTECTION	Yes
INITIAL VOLTAGE	>6V
OVERVOLTAGE PROTECTION	>33V
EMC APPROVAL AND TESTING	ECE R10 ISO 7637-2, ISO 16750 RoHS, REACH-SVHC ADR ISO13766
CONFIGURATION	Can be configured using Aspöck RADC 2.0 configuration software

Pin assignment

- A EOM 1/2
- C EOM 1/2
- E Beeper
- I RADC 2.0 ECU
- J Sensor
- K EBS
- NC Not Connected




EOM 1/2
EOM 1/2
Beeper
Power supply for RADC 2.0 ECU (8pin)
A
C
E
I
J
K
NC
NC
NC
NC
Sensor (6pin)
EBS (6pin)
HALDEX
ZF/WABCO
KNORR BREMSE

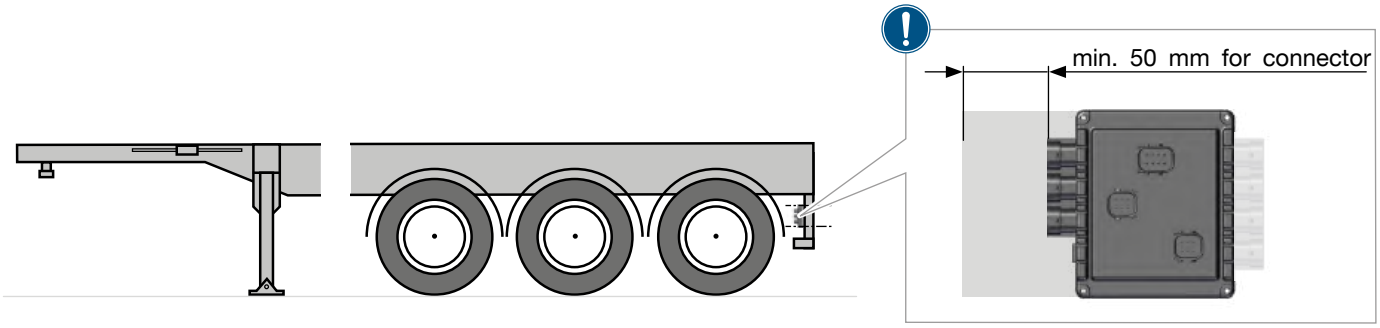

150 mm
110 mm
100 mm
130 mm
120 mm
Placeholeder Aspöck Label 60x20
MRS Label
Ø3.4mm
51.8 mm
22.8 mm

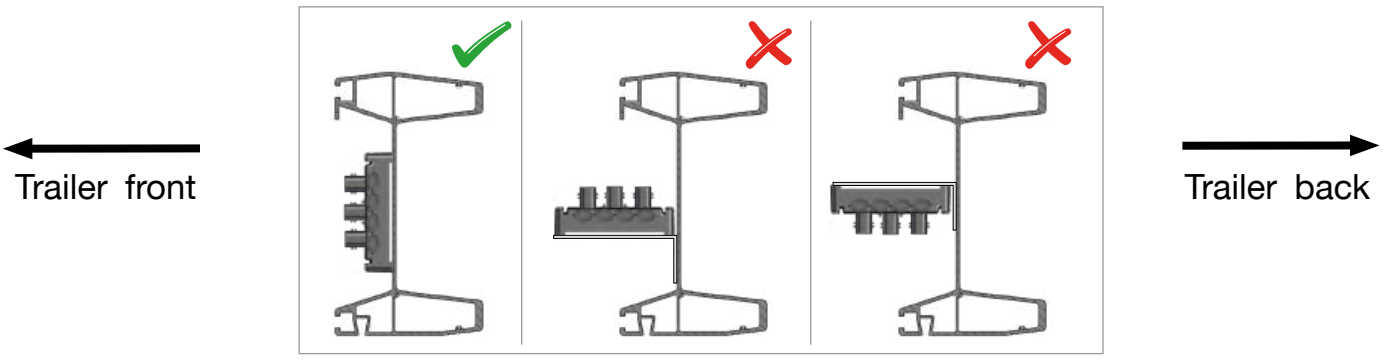
Mounting position

The RADC 2.0 ECU is installed in the centre of the inside of the trailer in the standard Aspöck construction. This keeps the cable lengths short and also makes any theft or damage more difficult. Other installation points for the RADC 2.0 ECU are possible, but the customer must then take into account the required cable lengths. The mounting orientation of the RADC 2.0 ECU must be vertical to prevent the ingress of water and dirt. The Aspöck RADC 2.0 optionally offers a protective cover for the RADC 2.0 ECU.

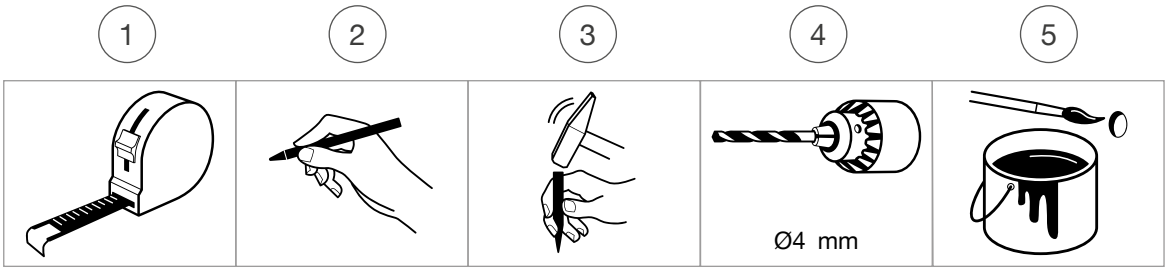
NOTE

Protected mounting required: The RADC 2.0 ECU must not extend beyond the vehicle‘s outline or beyond its delimitation. Installation in a protected area in the underrun protection or in frame parts is necessary. Mounting in the wheel splash zone is prohibited. (risk of stone chipping)

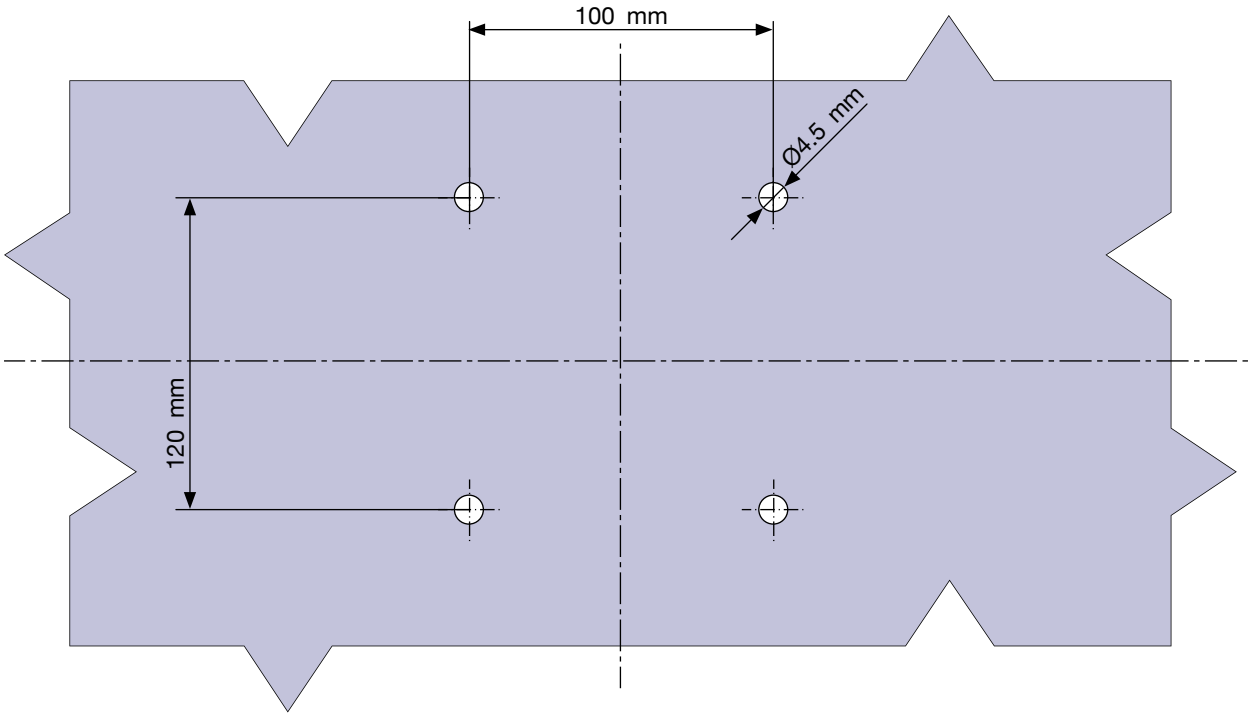




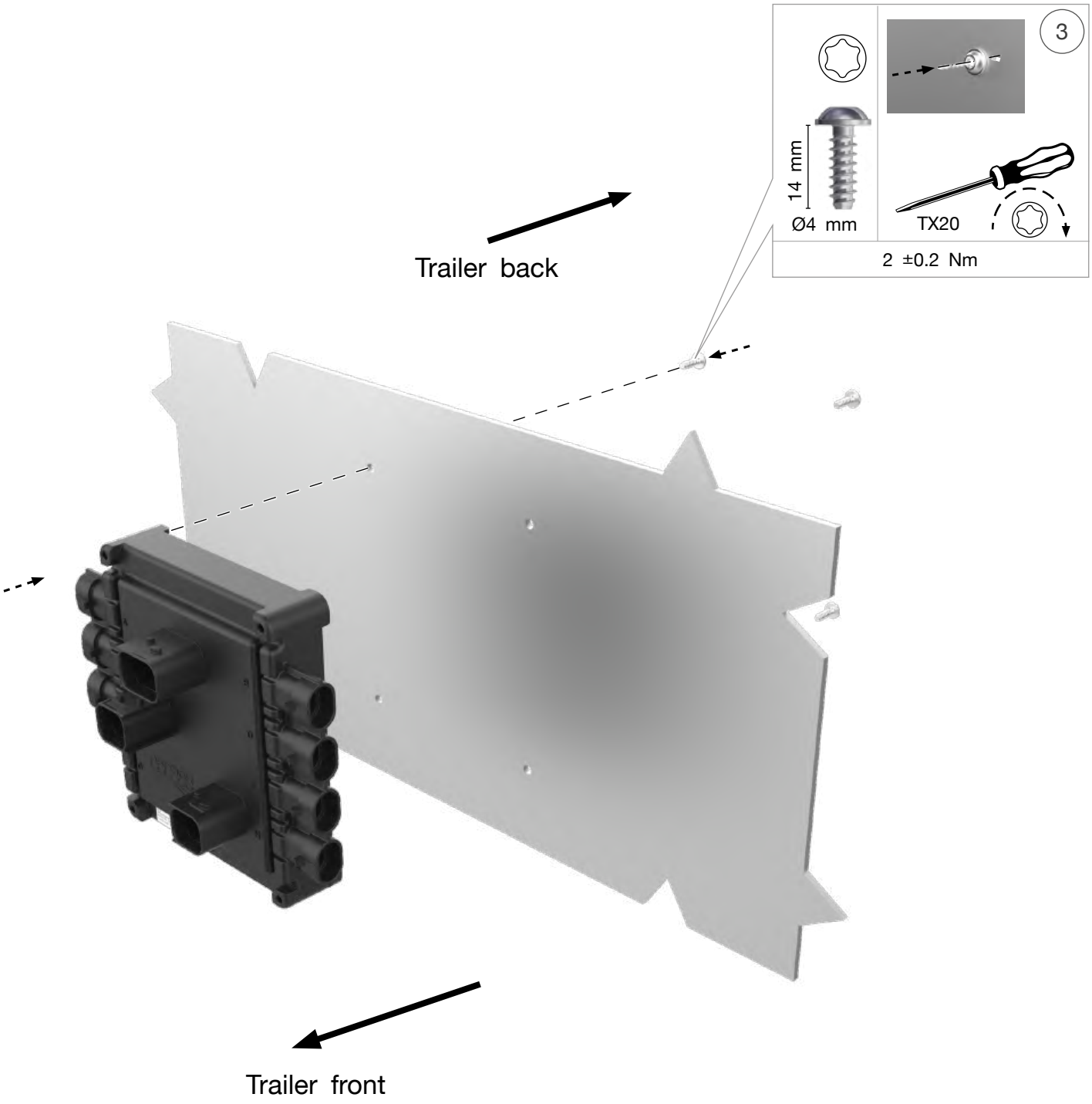
Preparation for assembly



Hole pattern RADC 2.0 ECU



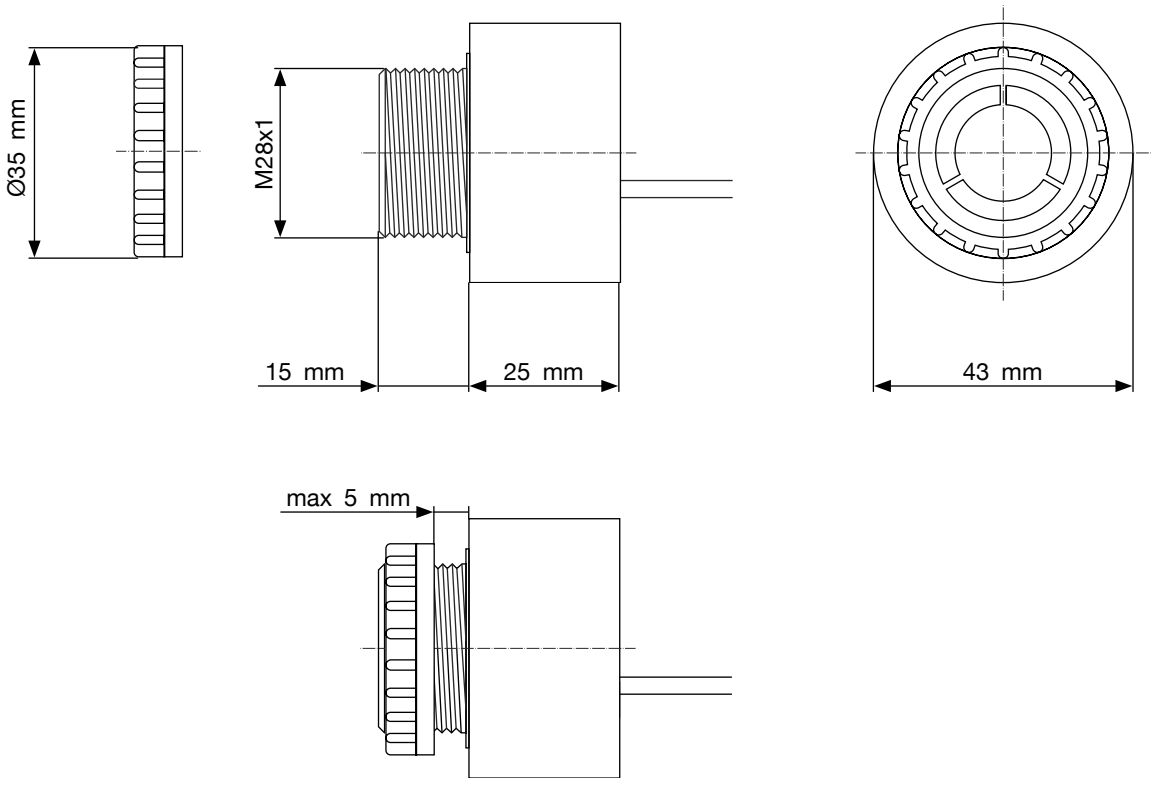
Mounting the RADC 2.0 ECU



6.3 BEEPER

A beeper with up to 90 dB is installed for acoustic warning when reversing.

TECHNICAL DATA	
SOUND PRESSURE LEVEL	~90 dB
AUDIO FREQUENCY	2.400 Hz
CONNECTOR	2p S.Seal
OPERATING VOLTAGE	24 V
OPERATING TEMPERATURE	-20 °C - 60 °C
CURRENT CONSUMPTION	20 mA
PROTECTION CLASS	IP68

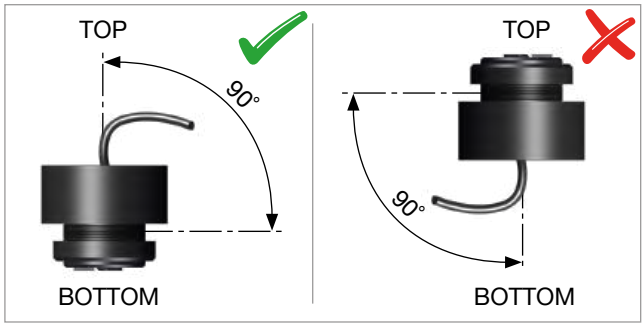


Mounting position

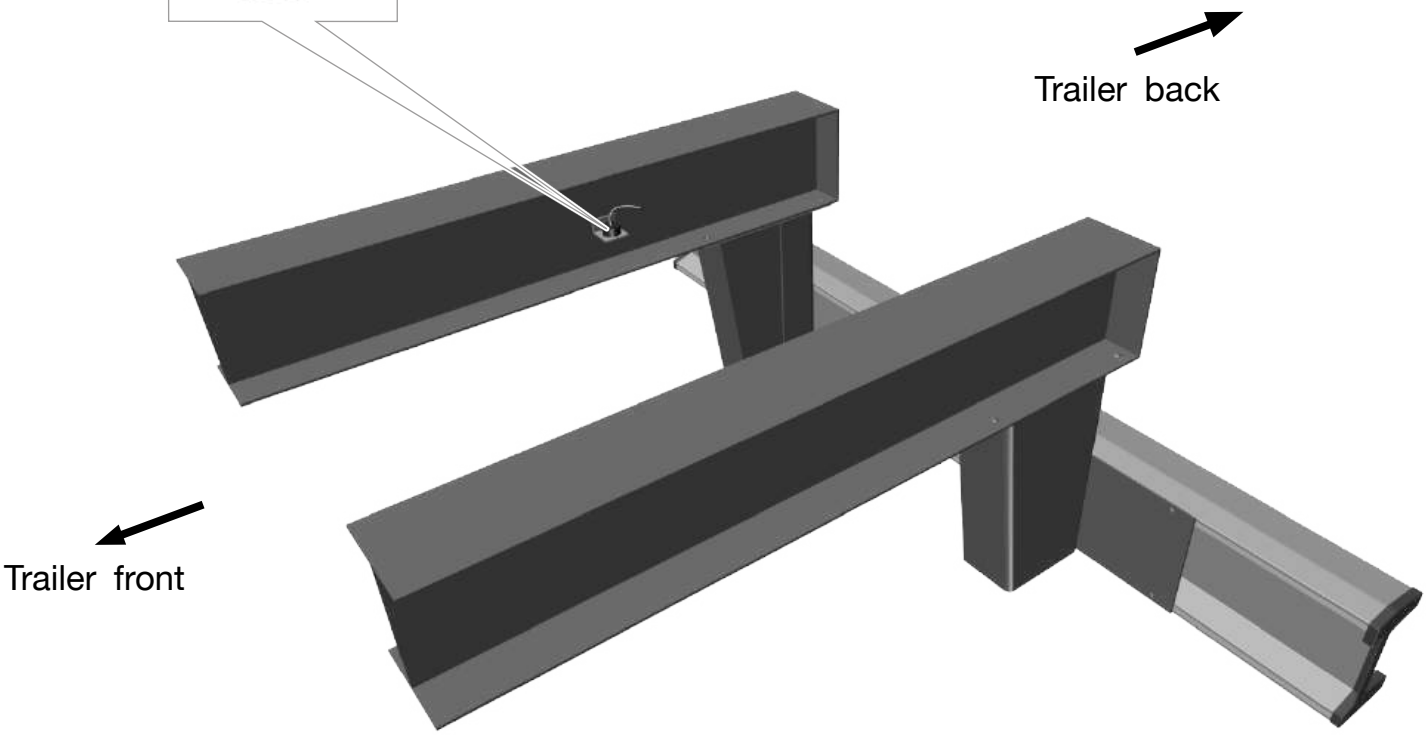
In the standard Aspöck construction, the beeper is mounted in the rear area of the trailer frame. Care must be taken to ensure that the sound outlet of the beeper is directed towards the road. This also protects the beeper from standing or entering water. To ensure vertical mounting, an additional bracket may need to be attached to the trailer (max. thickness 5 mm). The beeper must be installed in a bracket pointing downwards at 90°.

NOTE

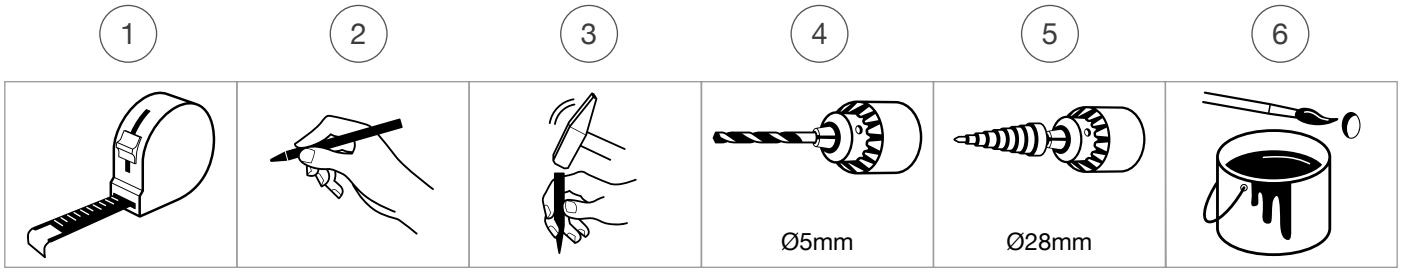
Protected mounting required: The component must not delimit the vehicle‘s outer perimeter (e.g. installation in the underrun protection or protected by a lamp plate). No mounting is permitted in the wheel spray area (stone impact), for example.



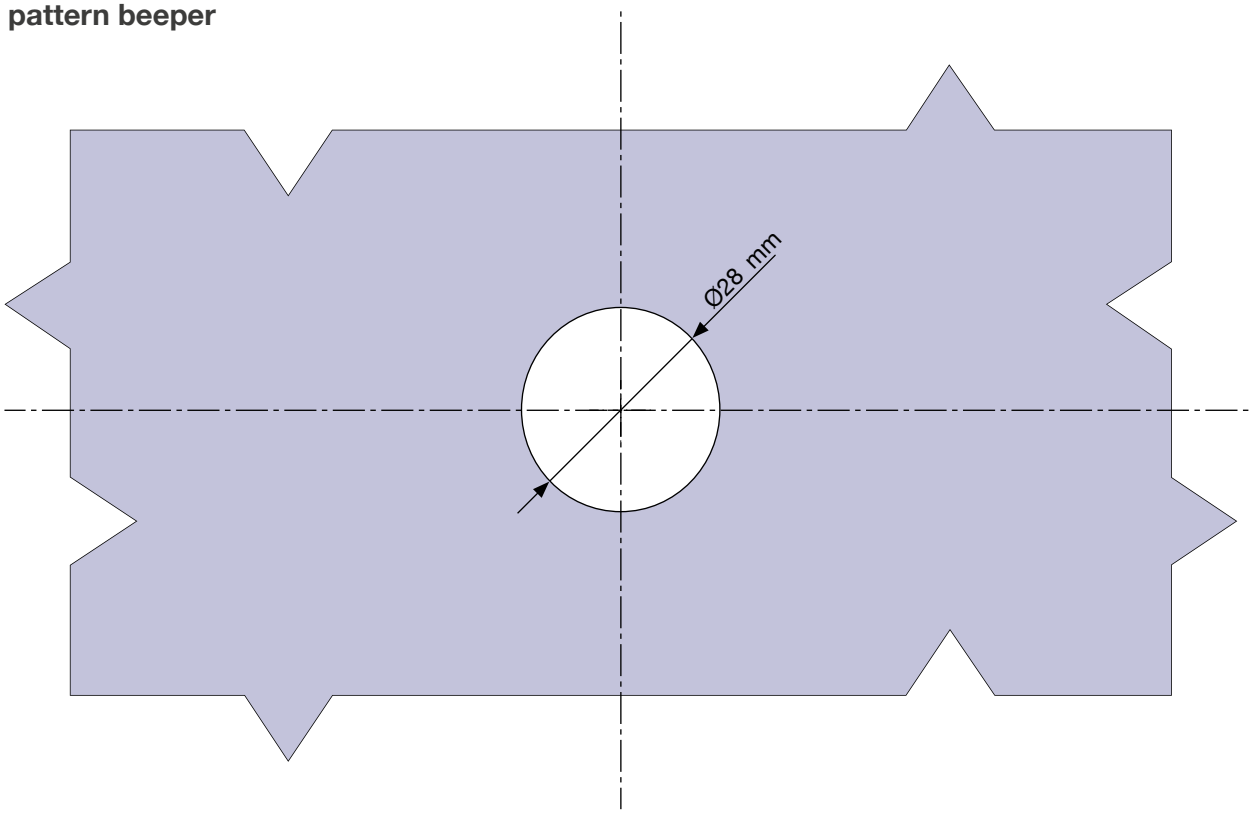
Example of beeper mounting



Preparation for assembly

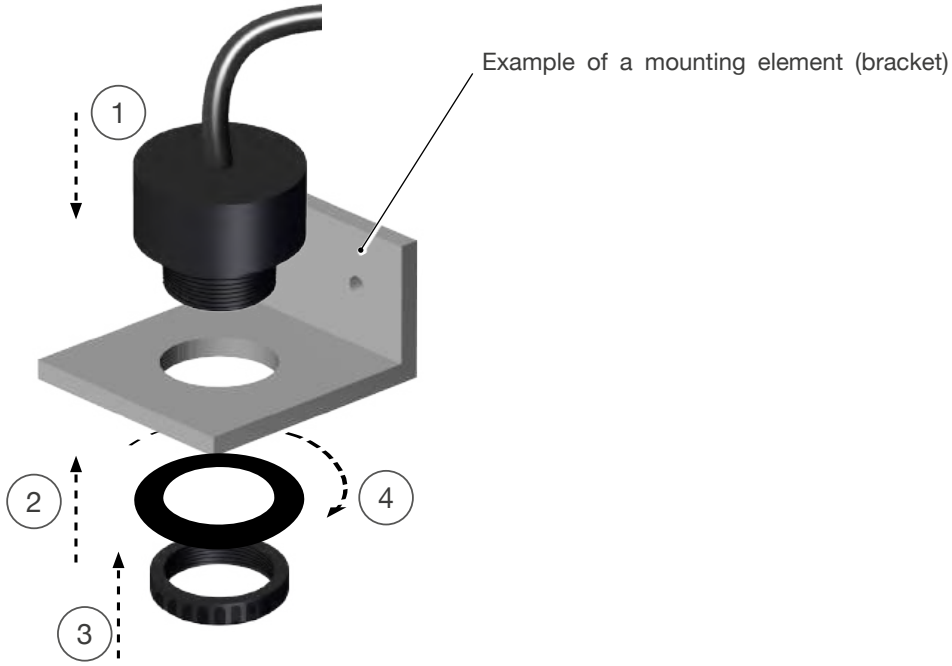


Hole pattern beeper



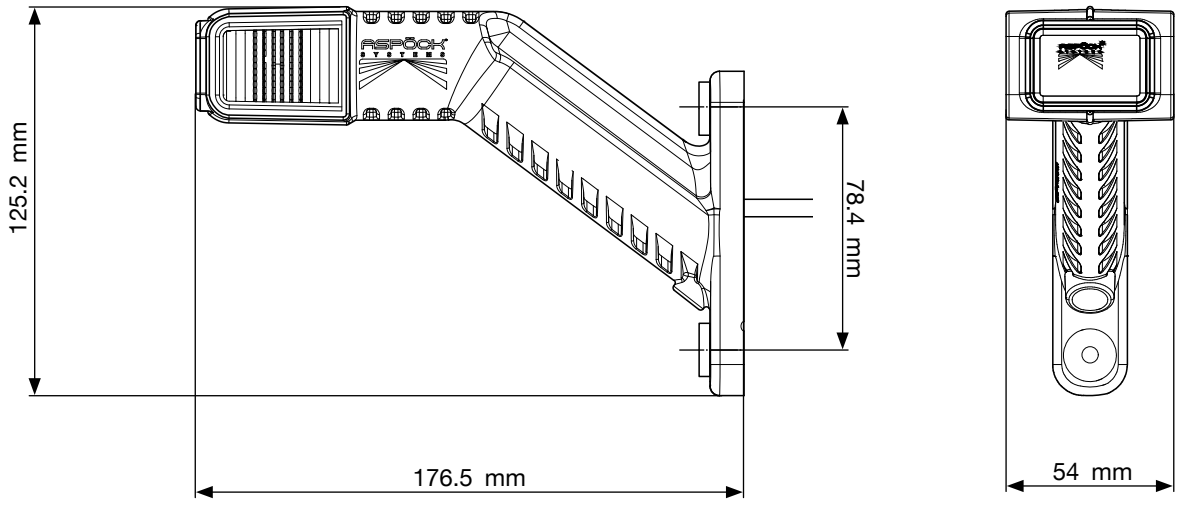
Mounting the beeper

Unscrew the mounting nut and insert the beeper from above into the hole. Place the washer from below and then tighten the beeper with the mounting nut.

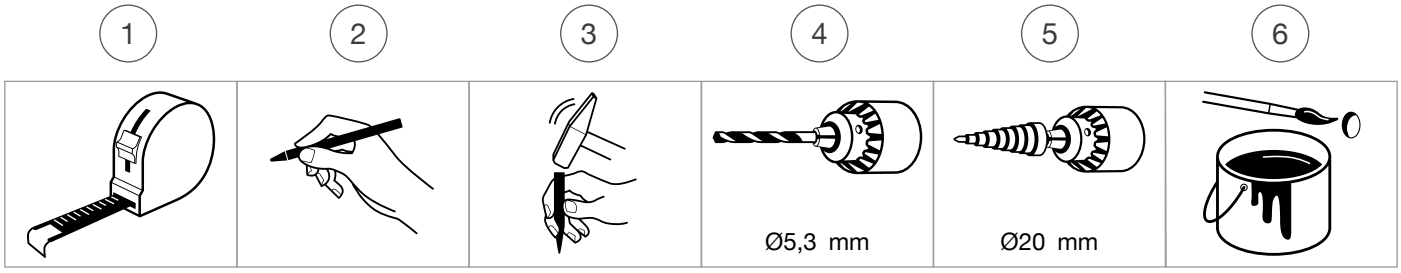


6.4 SUPERPOINT IV

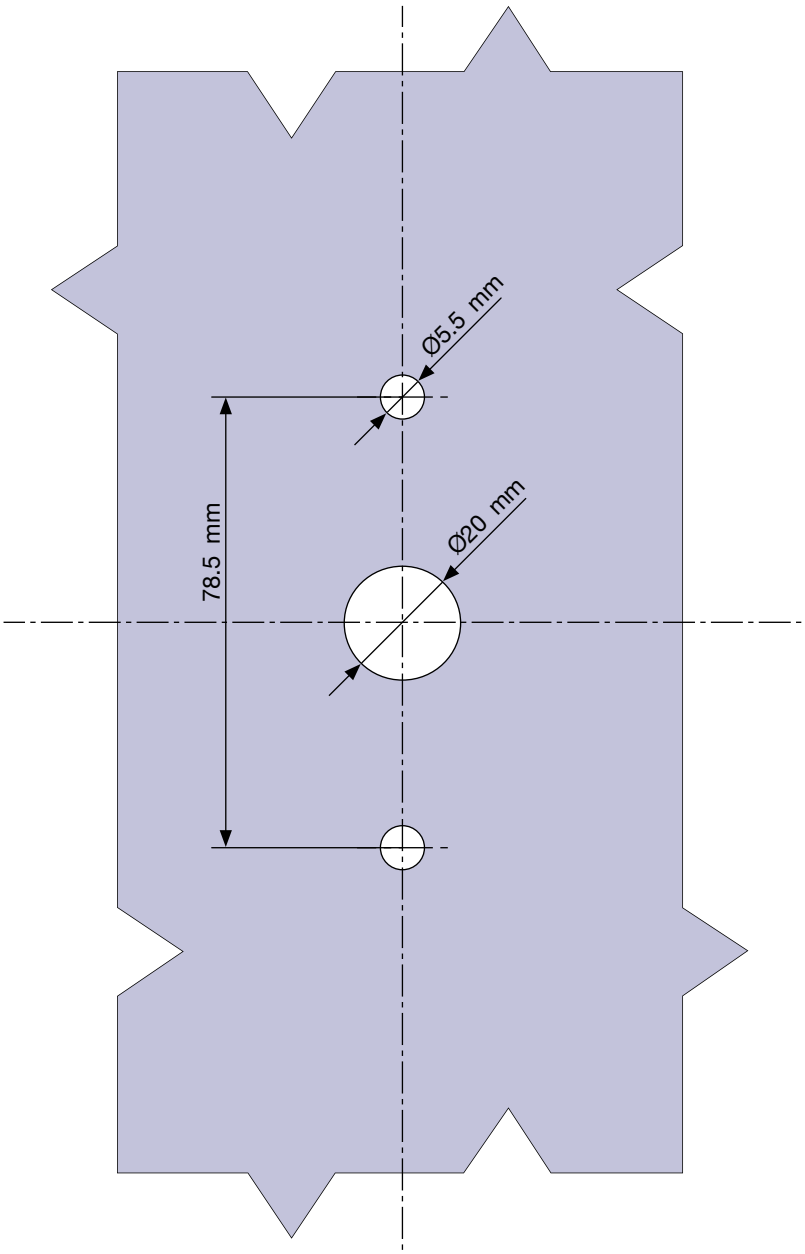
In order to guarantee the visual warning of the RADC 2.0 when reversing the trailer, end outline marker lamps must be mounted on the rear of the trailer. These are controlled directly by the RADC 2.0 ECU of the RADC 2.0 and support the driver when reversing by means of different flashing frequencies. The ECE R48 mounting guidelines must be adhered to.
If Aspöck Superpoint IV end outline marker lamps are already in use, these can be connected to the ECU of the RADC 2.0 by means of extension cables. Otherwise, these must be mounted at a suitable point on the trailer.



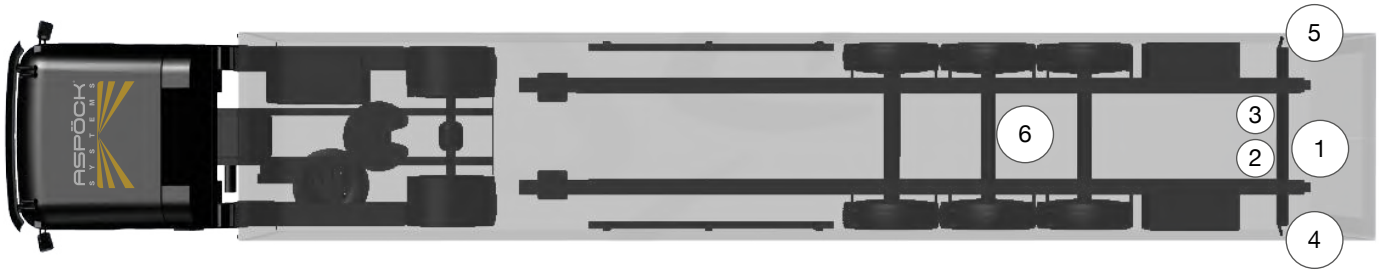
Preparation for assembly



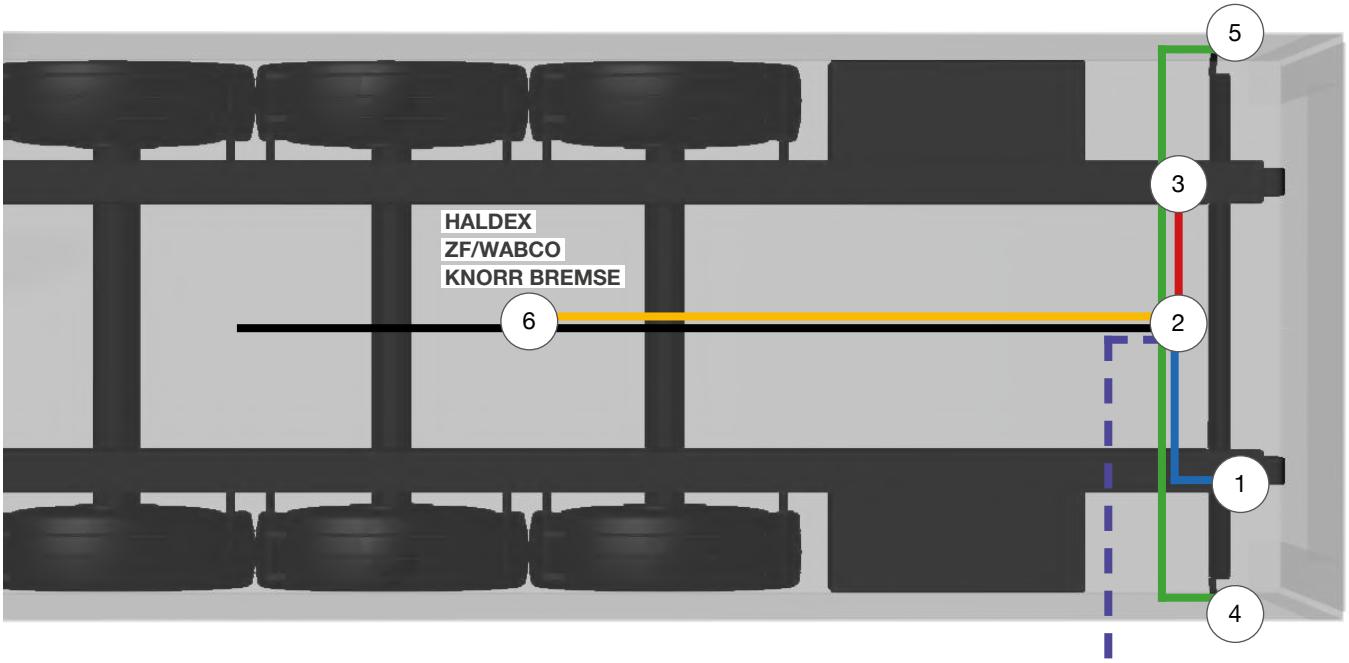
Hole pattern Superpoint IV



7. CABLING



1	Sensor	2	RADC 2.0 ECU	3	Beeper
4	Superpoint IV	5	Superpoint IV	6	EBS



1	Cable Sensor	2	Power supply ECU	3	Cable Beeper
4 5	Cable Superpoint IV	6	Cable EBS	7	Cable Programmierung/PC

Übersicht Kabel / RADC 2.0 ECU

1 Cable Sensor

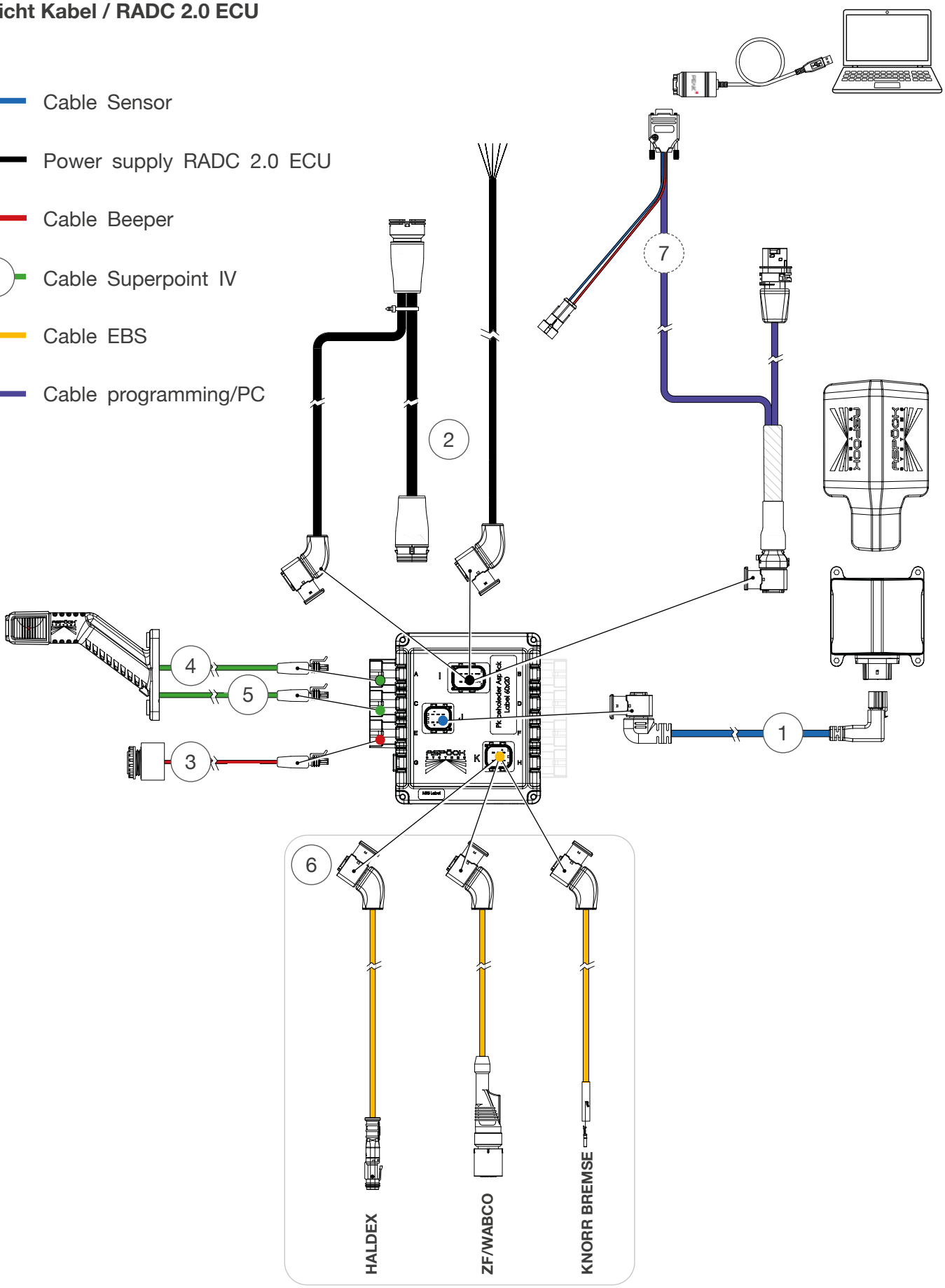
2 Power supply RADC 2.0 ECU

3 Cable Beeper

4 5 Cable Superpoint IV

6 Cable EBS

7 Cable programming/PC



⚠ DANGER

Components and cables must not be routed or installed along heat sources or through areas that may be subject to impact or dirt abrasion.

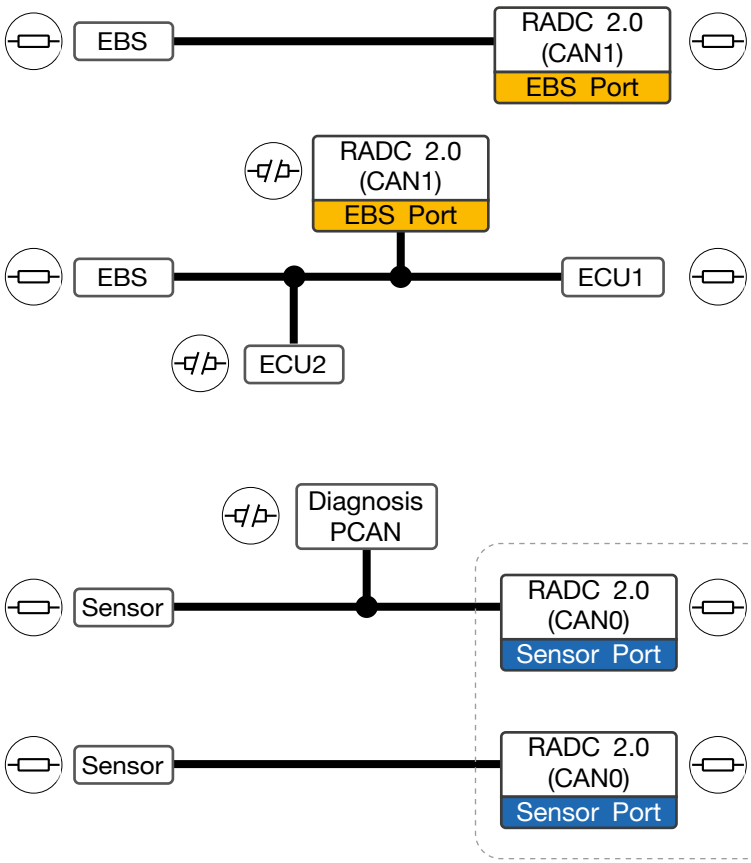
Once all components of the RADC 2.0 have been securely mounted on the trailer, the components can be wired up. When routing the cables, care should be taken to ensure that they are not routed through heat sources or areas that could cause damage. All cables must be firmly attached to the trailer, unnecessarily small bending radii must be avoided and strain relief must be provided at the connectors.

8. CAN-TERMINATION

A CAN connection should always consist of a single line with a maximum of two defined ends. Each end must be terminated by a terminal resistor. Usually, the terminal resistor is located in the connected CAN device.
A CAN network with more than two end resistors does not allow for reliable communication. For this reason, it is necessary that additional devices are only operated with the resistor switched off. Undermined devices must be connected at the short end of a path (max. 1 m).

CAN termination for the RADC 2.0 is activated via a setting in the RADC 2.0 configuration software. (9.4)

CAN Termination Examples



CAN0 is always terminated

9. RADC 2.0 CONFIGURATION SOFTWARE

The RADC 2.0 offers the possibility to adjust the trailer width, the sensor position, the individual detection zones and the different brake pressures within the limits of predefined threshold values. This is done with the help of the provided RADC 2.0 configuration software. Before operating the RADC 2.0, it is necessary to download the RADC 2.0 configuration software and configure the required parameters according to the trailer used. These settings are then transferred to the RADC 2.0 ECU by connecting the laptop to the ECU using an optional cable (9.4) via a USB port on the laptop. The RADC 2.0 configuration software also offers the option of saving multiple parameter setups so that they can be reloaded at a later date and imported into the RADC 2.0 ECU.

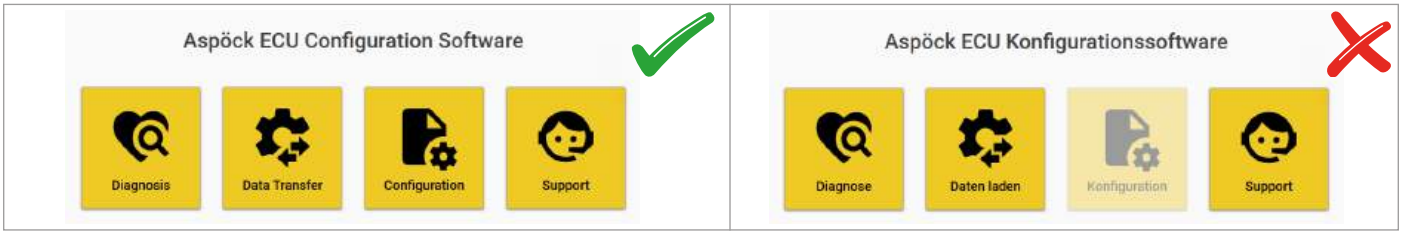
HINWEIS

To use the Aspoeck RADC 2.0 configuration software, a special USB stick called “Aspoeck RADC Software Dongle” is required. Before use, the “Aspoeck Dongle Driver” must be installed, which is the driver for the USB stick. Without this installation and the connected USB stick, the Aspoeck RADC 2.0 configuration software cannot be used. The driver can be downloaded from Aspöck Connect platform (**https://connect.aspoeck.com**).
If you have any further questions or encounter any problems, please contact Aspöck‘s technical support team directly: **radc.support@aspoeck.com**

9.1 ASPOECK RADC SOFTWARE DONGLE

The Aspoeck software dongle must be plugged in to transfer configured parameters or parameter setups to the ECU or to read them (9.4.1, 9.4.2). A reminder message is displayed in the bottom left corner.

Status: Please install DESkey driver and insert DESkey security dongle into local USB port to activate.
Status: Please insert DESkey security dongle into local USB port to activate.



9.2 REGISTER AND DOWNLOAD THE RADC 2.0 CONFIGURATION SOFTWARE

System requirements for the computer:

- Operating system: Windows 11 (x64/ARM64), Windows 10 (x64) or Linux
- One available USB port (USB 1.1, USB 2.0 or USB 3.0) or one available port on an active, connected USB hub.

Step 1: Registration and software download

- Register on Aspöck Connect **(https://connect.aspoeck.com)** and download the Aspöck RADC 2.0 configuration software. (two-factor authentication)

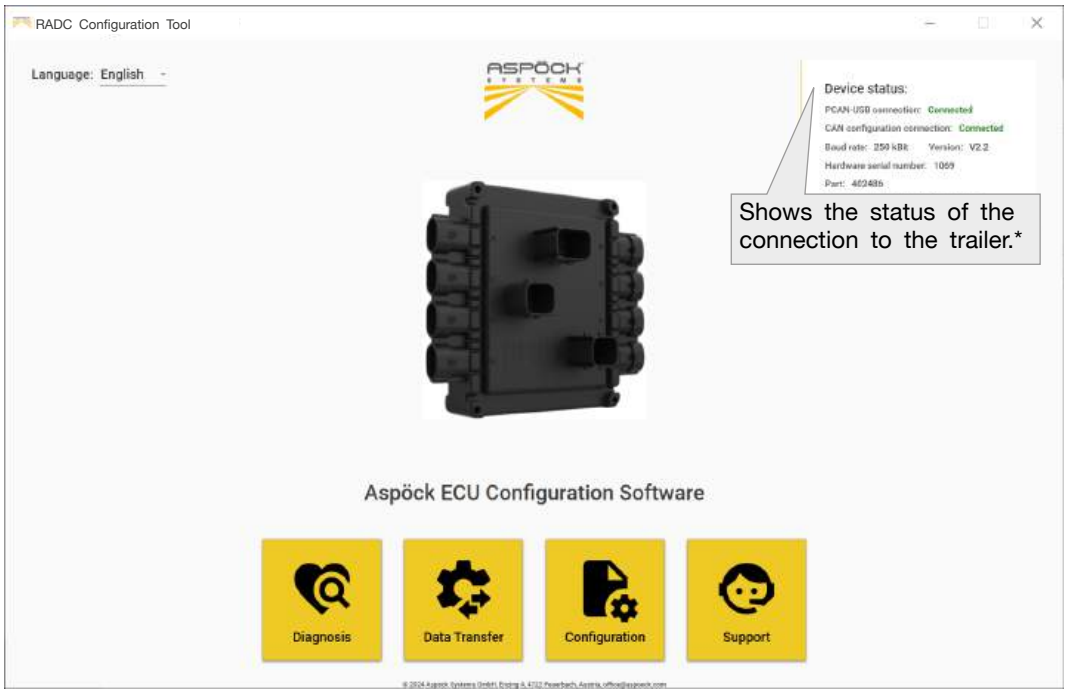
Step 2: Save file

- Save the downloaded file on your laptop/PC.

9.3 STARTING THE RADC 2.0 CONFIGURATION SOFTWARE

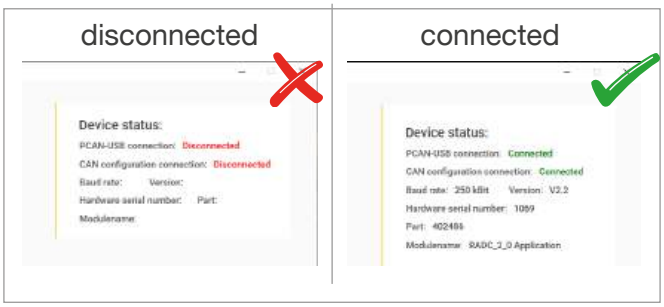
- Open the folder in which the file is stored
- Double-click on the RADCConfigTool.exe file to start the RADC 2.0 configuration software

9.3.1 RADC 2.0 CONFIGURATION SOFTWARE OVERVIEW



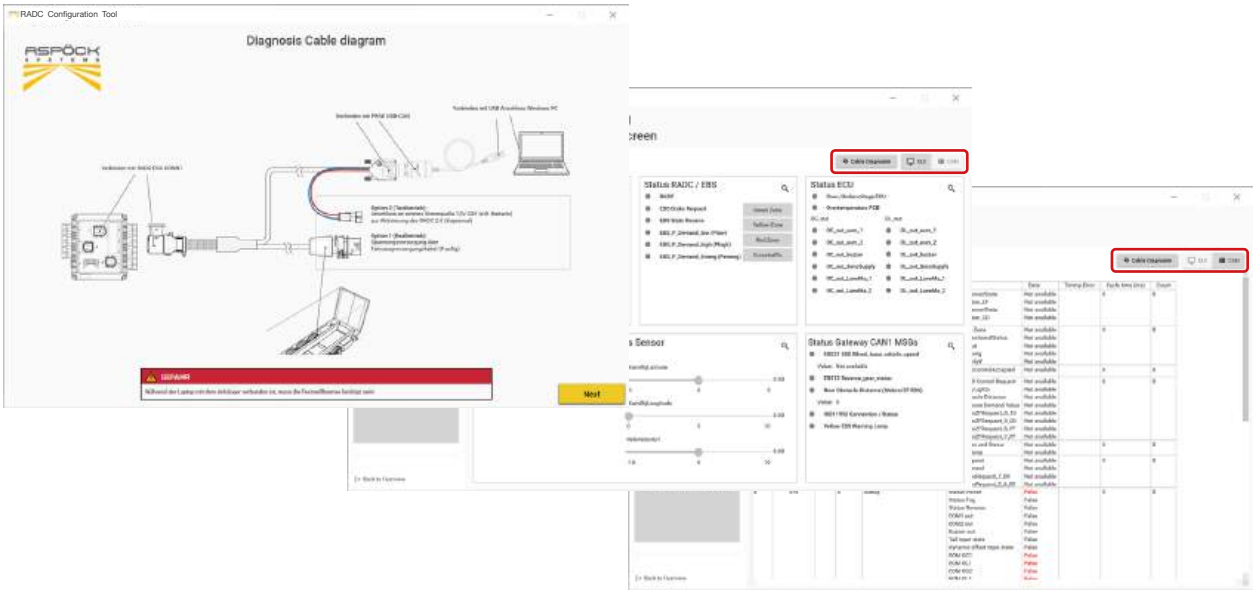
Device status

*The device status indicates whether a laptop is currently connected to the vehicle‘s RADC 2.0 ECU. It is not necessary to be connected to the vehicle to configure the parameters. The laptop only needs to be connected to the ECU if parameter setup files that have already been saved are to be transferred to the ECU or the configuration parameters are to be changed directly. (9.5)



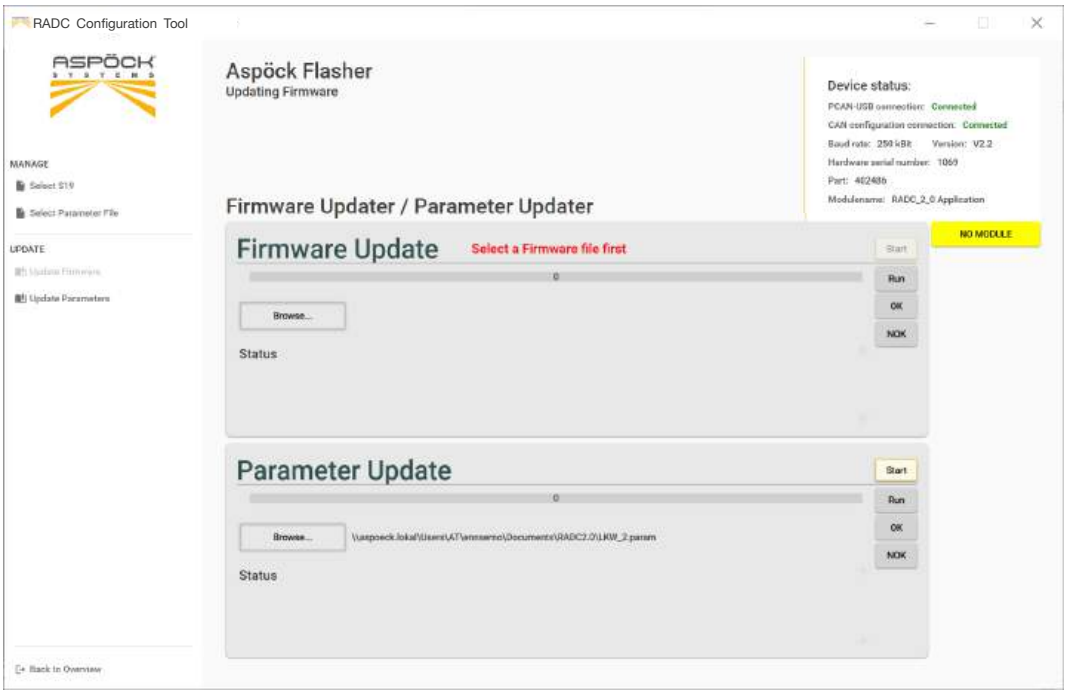
Diagnosis

The diagnostic mode of the RADC 2.0 configuration software provides an overview of the status of the RADC 2.0 system. Any system malfunctions are displayed and simplify the search for possible causes.
The laptop must be correctly connected to the RADC 2.0 ECU. (9.5)



File transfer

In file transfer mode, the RADC 2.0 ECU can be updated to a new firmware version. In the event of damage to the ECU, a stored parameter setup file can be reloaded.
The laptop must be correctly connected to the RADC 2.0 ECU. (9.5)



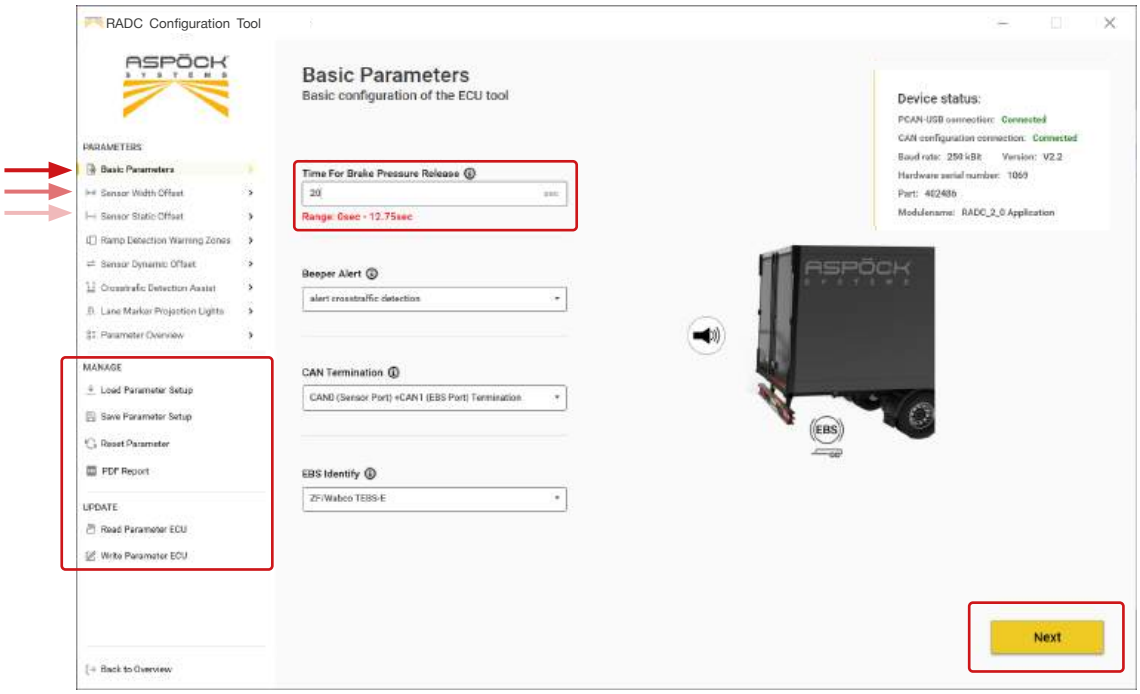
9.4 CONFIGURE RADC 2.0

The RADC 2.0 can now be configured step by step. Presets are defined for each value, which can be adopted if necessary. If values are entered that are outside the parameters, this is indicated by an error message in red text. These must be corrected. Press the Next button at the bottom of each page to apply the selected parameters. All parameters can be corrected, saved and adjusted at any time. Parameter setup files that have already been saved can be loaded.

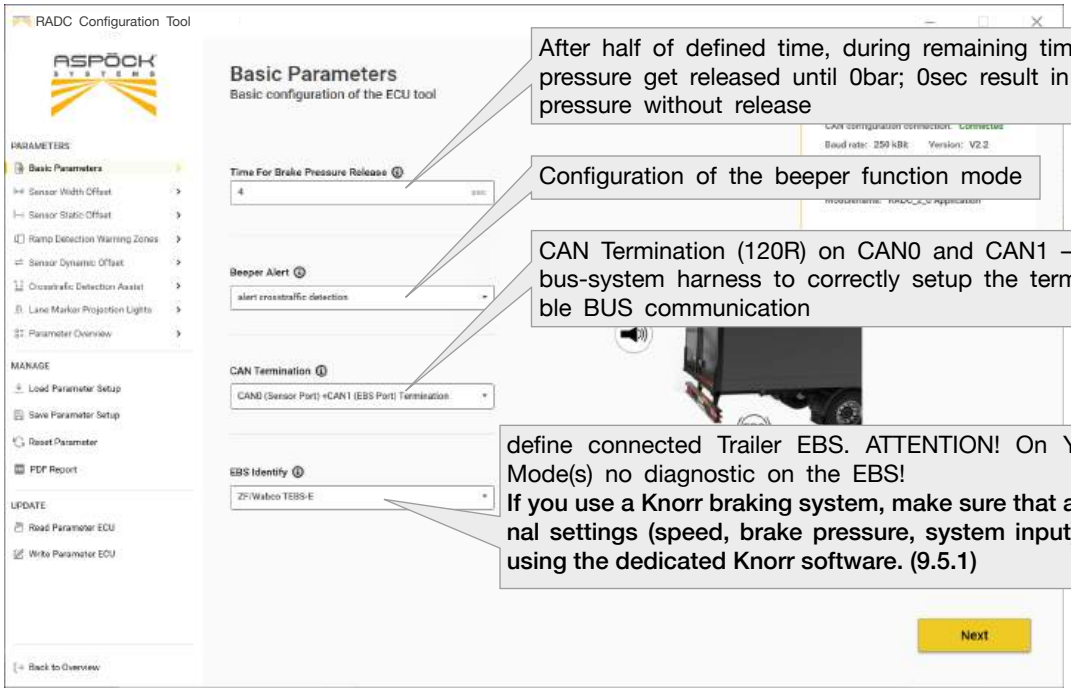
HINWEIS

To use the Aspoeck RADC 2.0 configuration software, a special USB stick called “Aspoeck RADC Software Dongle” is required (9.1).

Explanation Overview



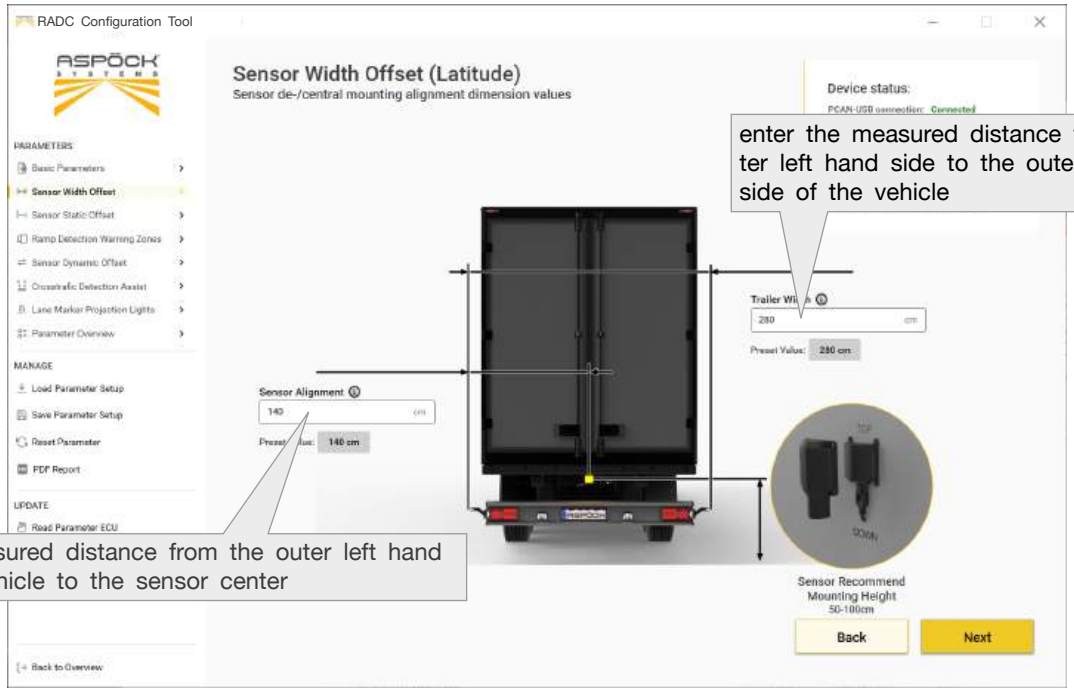
Basic parameters



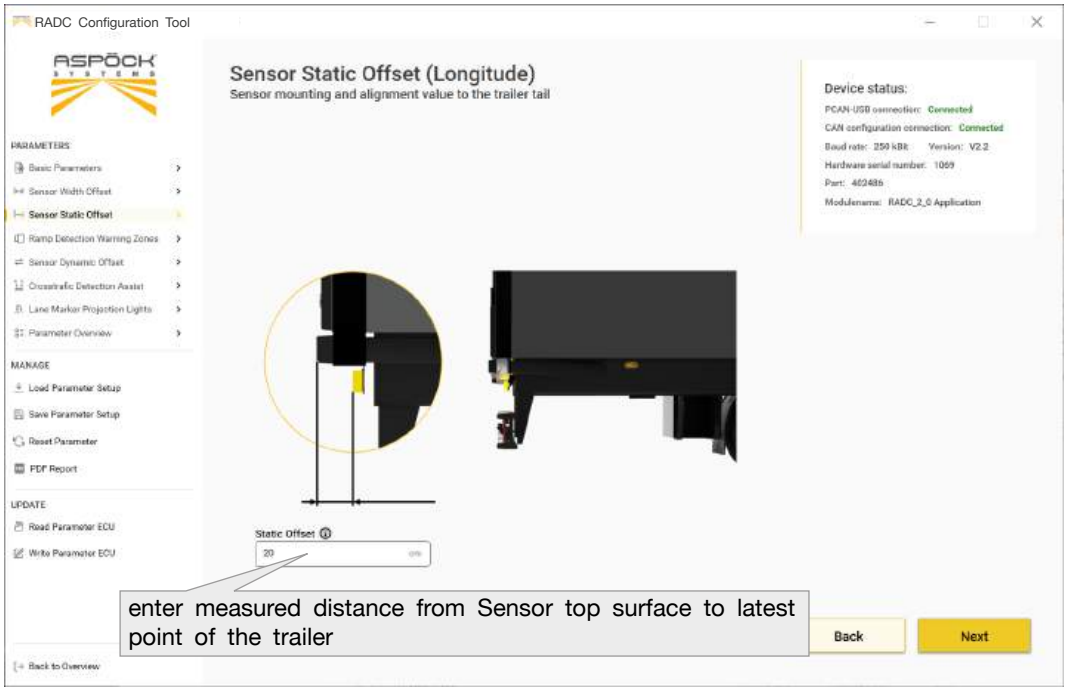
NOTE

The RADC 2.0 can also be installed without interfering with the vehicle's EBS. In this case, the function is limited to the visual warning by the EOMs or an optional audible warning by the beeper. In this variant, the HDSCS plug connection on the ECU must be sealed. (6.2 (K))

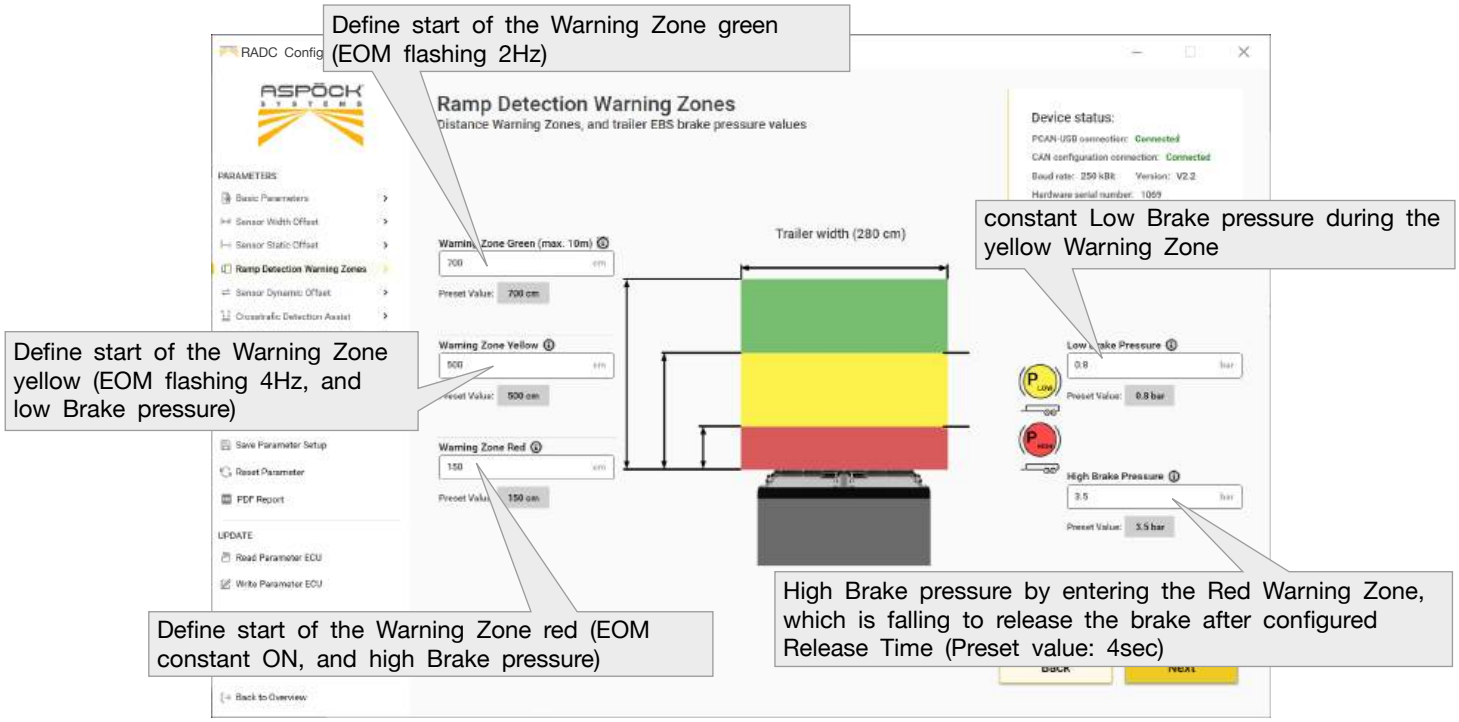
Sensor Width Offset



Sensor Static Offset (Length)



Ramp Detection Warning Zones

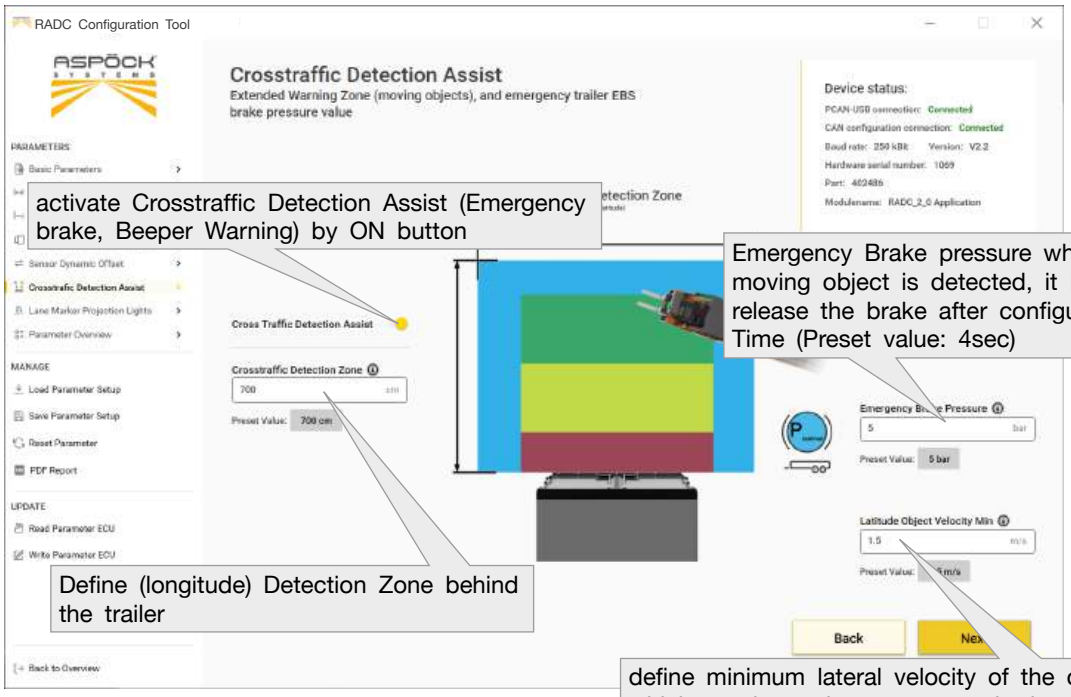


Sensor Dynamic Offset (Length)

„enter measured distance from Sensor Top surface to latest excess length of the trailer.
Extended trailer length is activated by active High-Level on CONN-J Pin 5“

„Conversion Value from Analog Signal [V] to distance in [cm]. Example: 1V/cm means 10cm by an 10V input signal. Extended trailer length is read by an Analog Signal (0…10V) on CONN-J Pin 5“

Crosstraffic Detection Assist



activate Crosstraffic Detection Assist (Emergency brake, Beeper Warning) by ON button

Emergency Brake pressure while an lateral moving object is detected, it is falling to release the brake after configured Release Time (Preset value: 4sec)

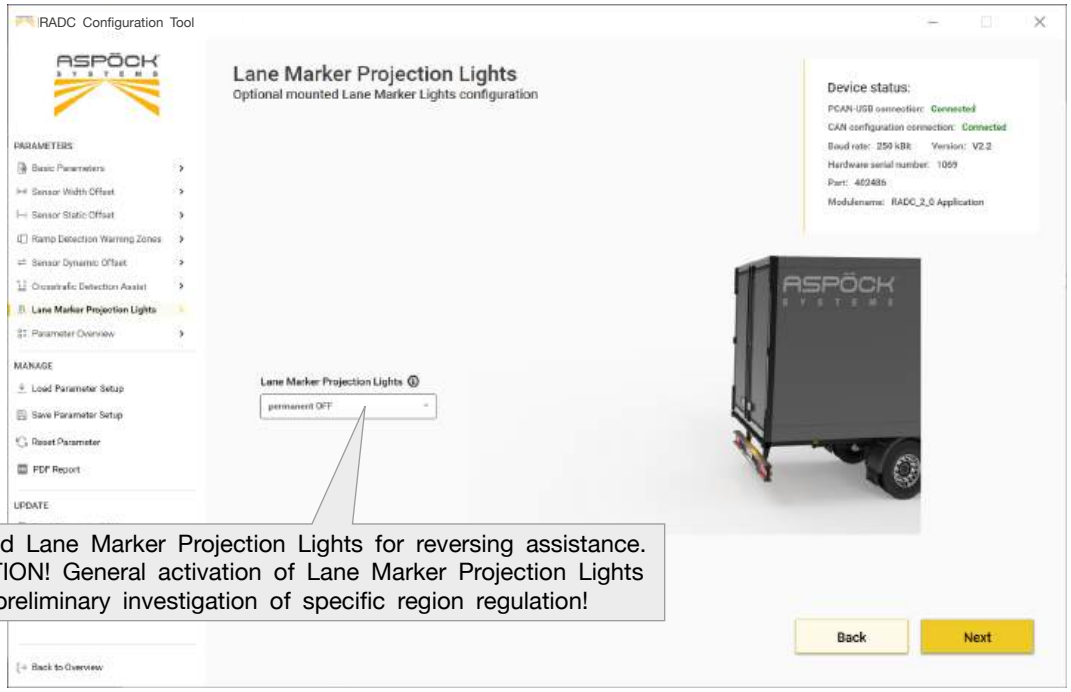
Define (longitude) Detection Zone behind the trailer

define minimum lateral velocity of the object, on which to trigger the emergency brake

⚠ WARNING

When Cross Traffic Assist is deactivated, the driver will no longer receive an audible warning and the emergency braking maneuver will no longer be carried out. This can result in serious damage when reversing.

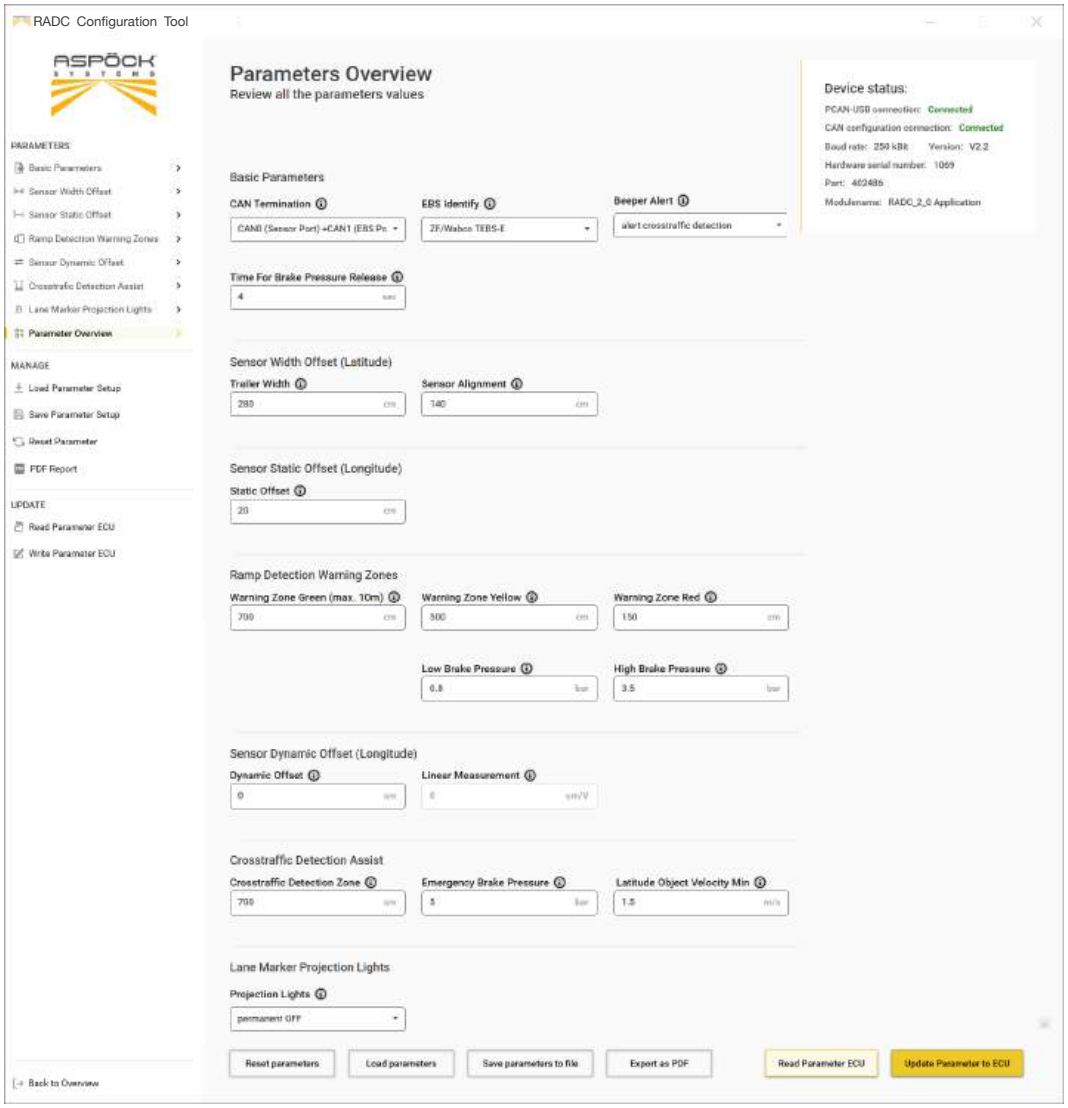
Lane Marker Projection Lights



activated Lane Marker Projection Lights for reversing assistance. ATTENTION! General activation of Lane Marker Projection Lights needs preliminary investigation of specific region regulation!

Parameter setup overview

All configured values can be checked and, if necessary, corrected in the overview.



9.4.1 PARAMETER SETUP READ OUT/WRITE

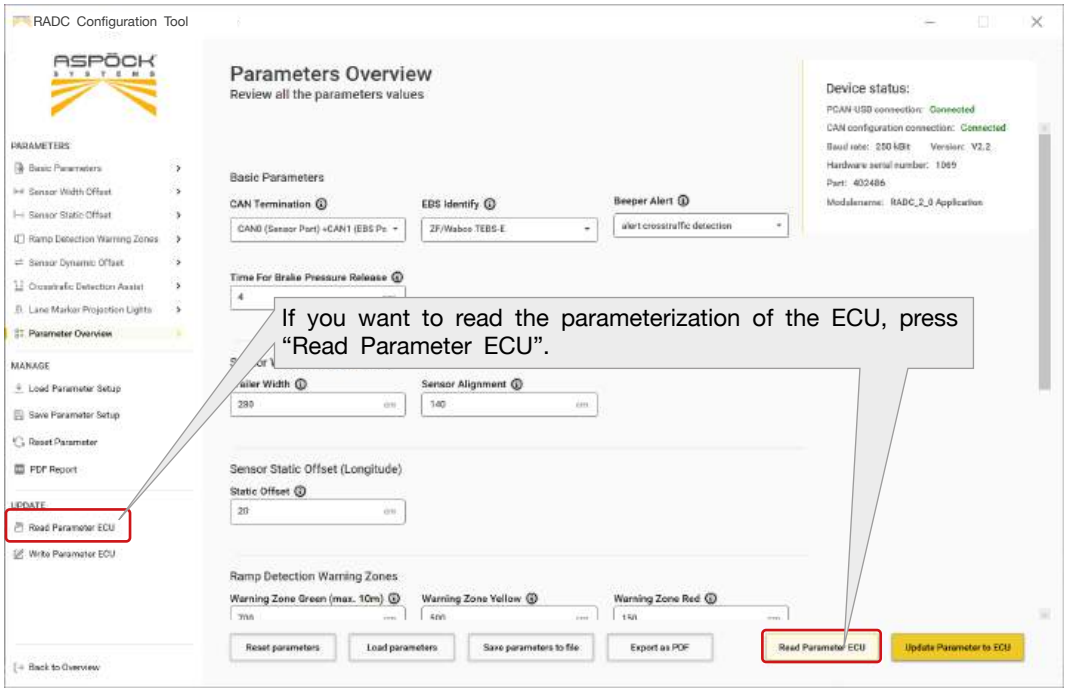
NOTE

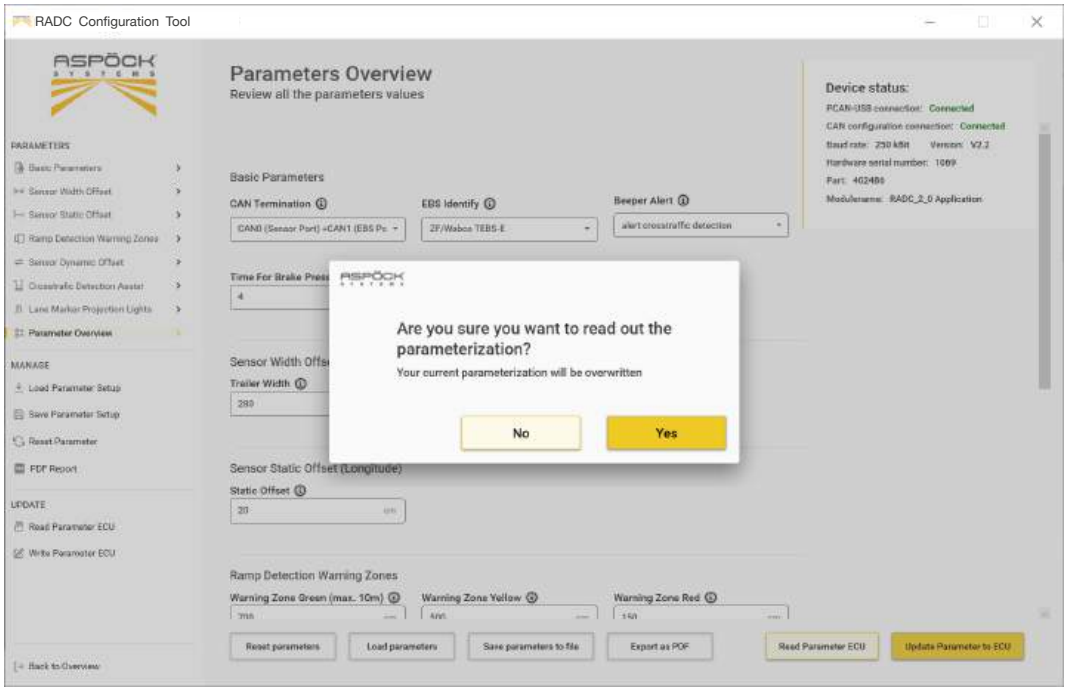
Before creating new parameter setups, it makes sense to read out and save the parameter setup initially stored on your ECU. This enables you to restore the original parameter setup at a later point in time, for example, if the ECU is damaged.

To transfer the configured parameters to the ECU or to read parameter setups from the ECU, a connection between the laptop and the ECU must be established. (9.5)

Read parameter setup

If the parameter setup of the RADC 2.0 ECU is read out, the currently configured parameters on your laptop/PC will be overwritten.



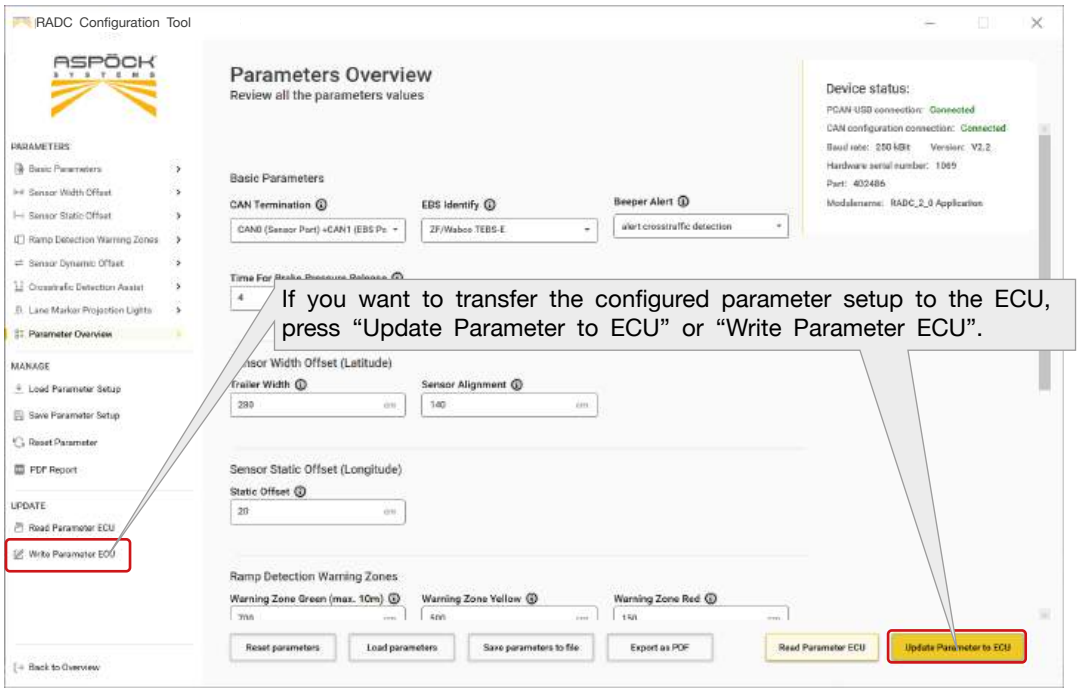


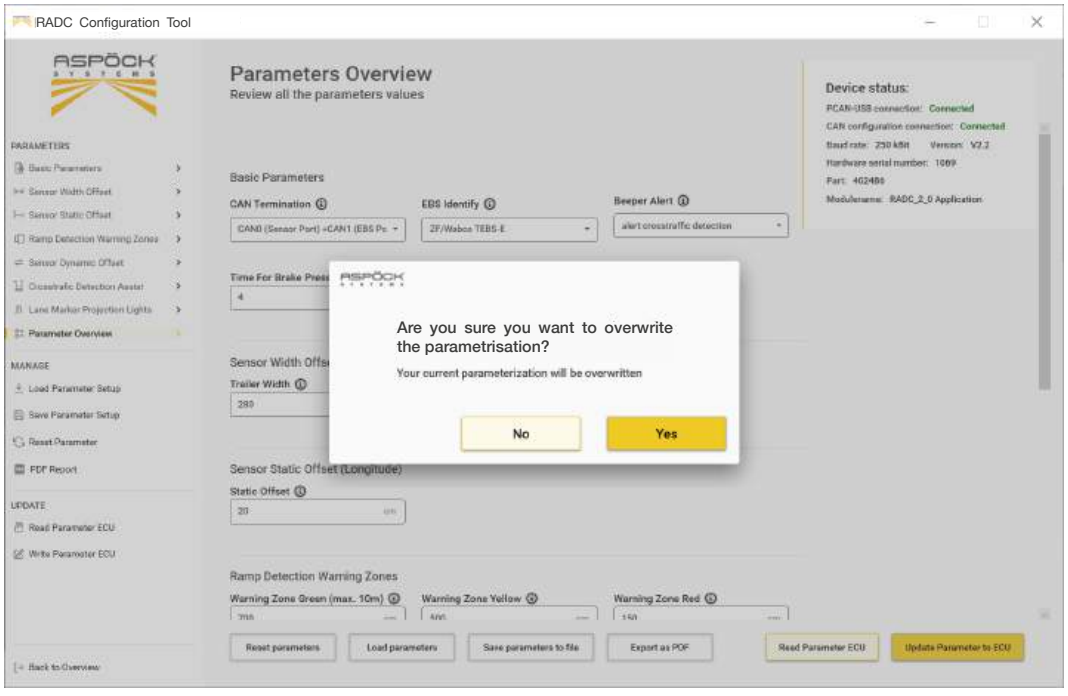
NOTE

This action cannot be undone. To make the entered parameters available at a later point in time, they can be saved on the laptop beforehand. -> "Save Parameter Setup" or "Save Parameter to file" (9.4.2)

Write parameter setup.

The currently configured parameter setup is written to the RADC 2.0 ECU.





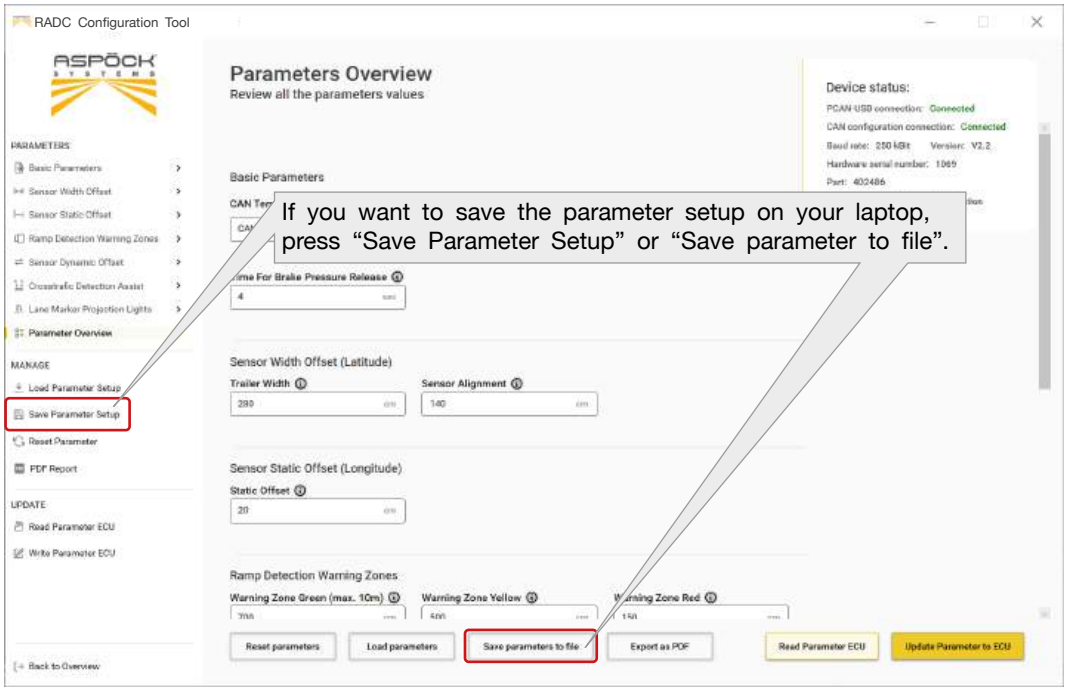
NOTE

This action cannot be undone. To make the entered parameters available at a later point in time, they can be saved on the laptop beforehand. -> “Save Parameter Setup” or “Save Parameter to file” (9.4.2)

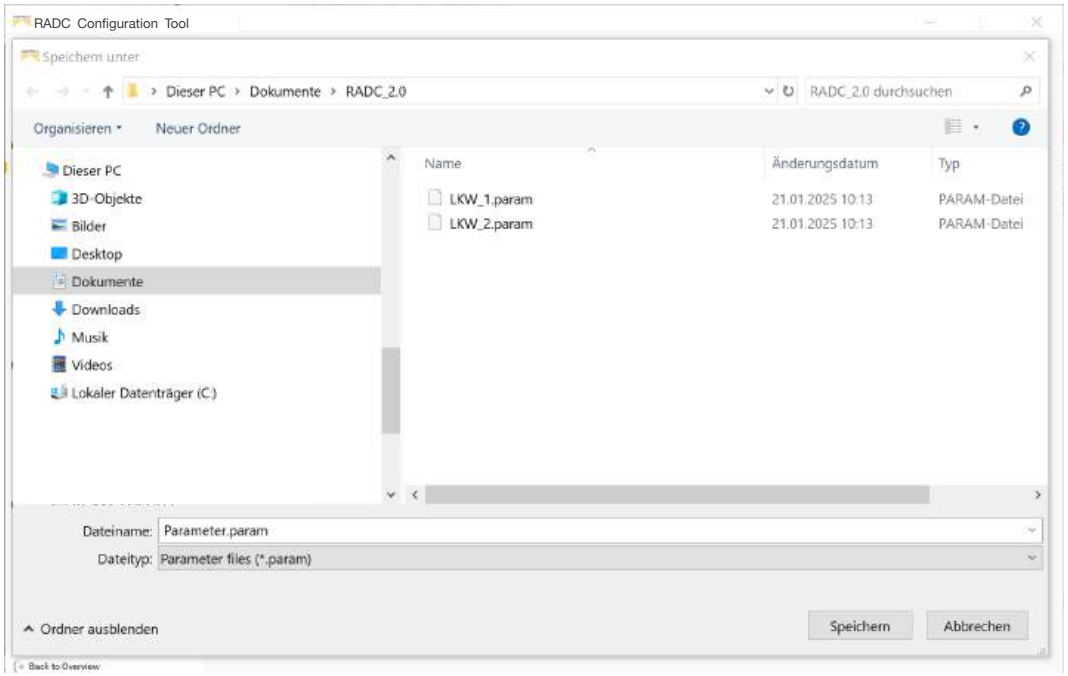
9.4.2 PARAMETER SETUP SAVE/LOAD/RESET

Save parameter setup

To optimize the parameter setup and to be able to reuse it at a later time, it makes sense to save it. To do this, it is not necessary to establish a direct connection to the RADC 2.0 ECU.

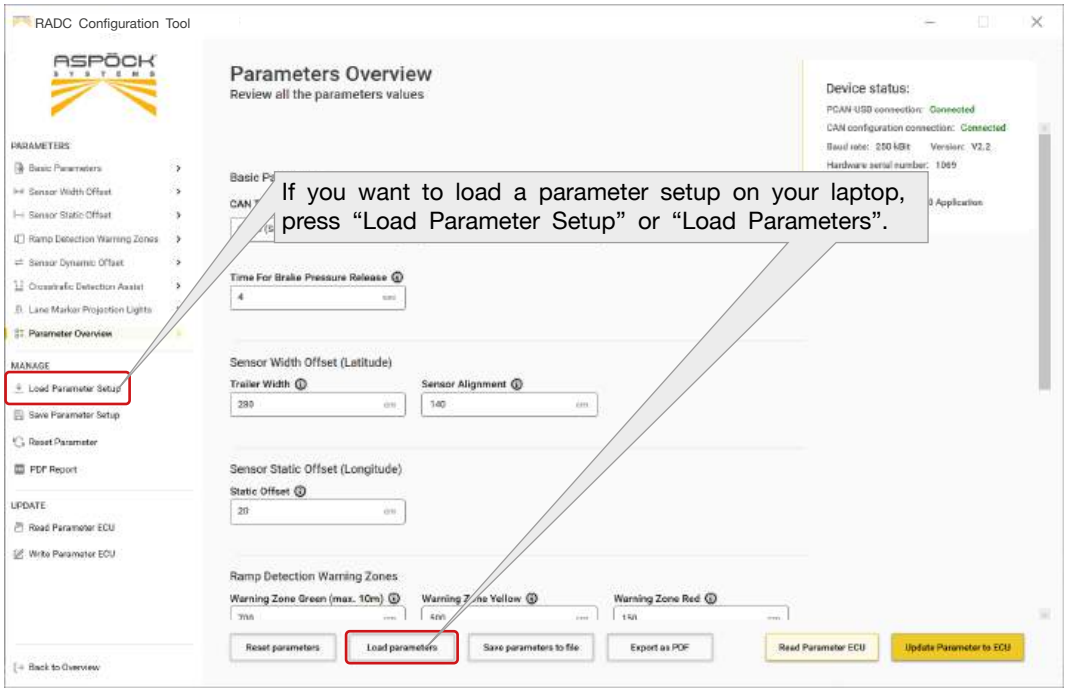


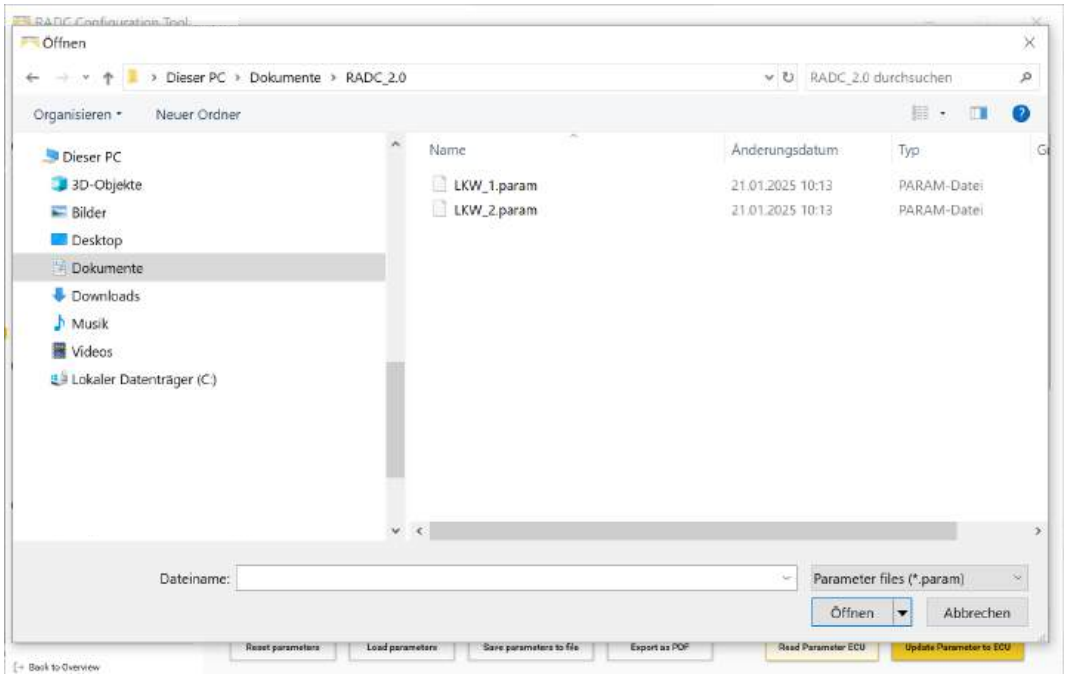
Multiple parameter setups can be stored on the laptop/PC. These can be loaded at any time to adjust them if necessary.



Load parameter setup

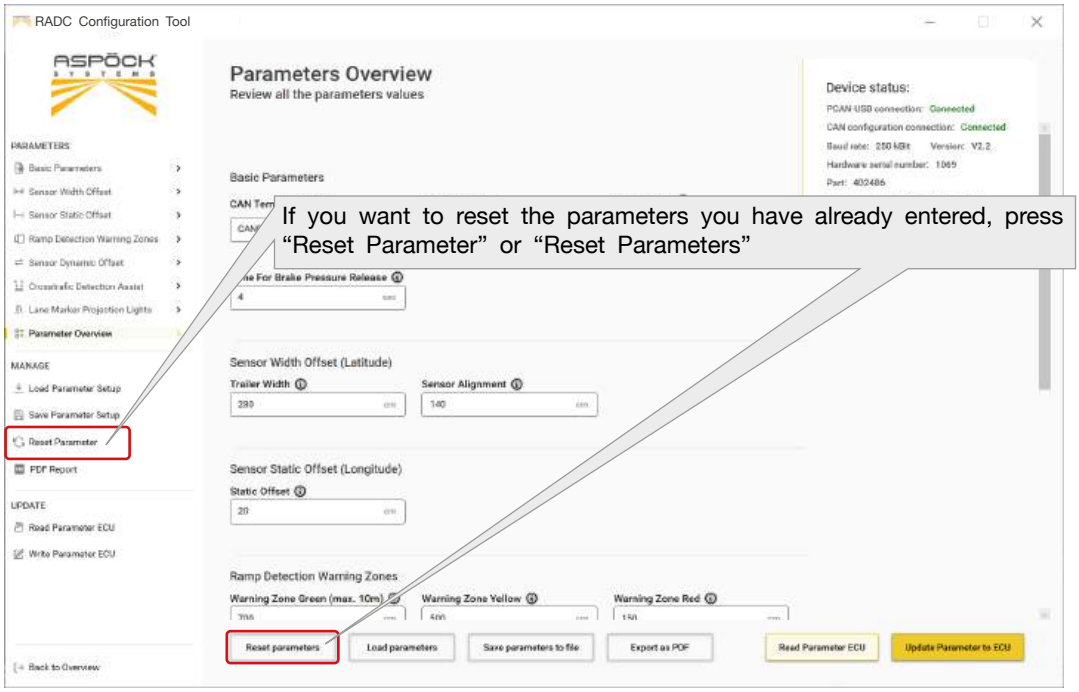
Stored parameter setups can be loaded and, if necessary, reconfigured at any time. This does not require a direct connection to the RADC 2.0 ECU.

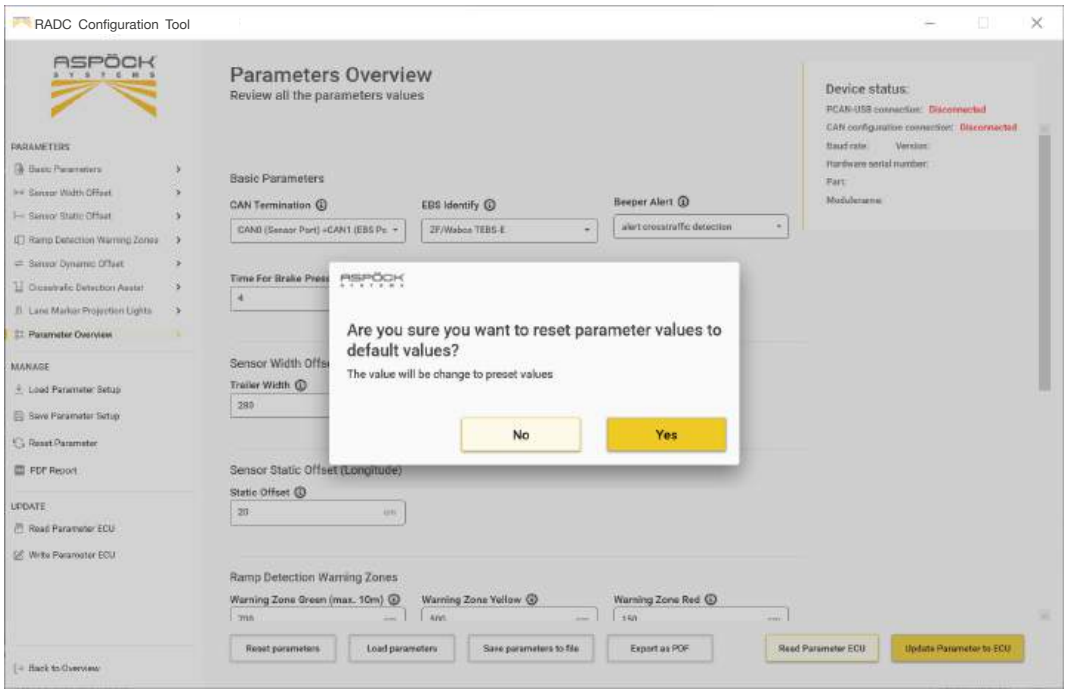




Reset parameter setup

All parameters that have already been entered can be reseted to their original values.

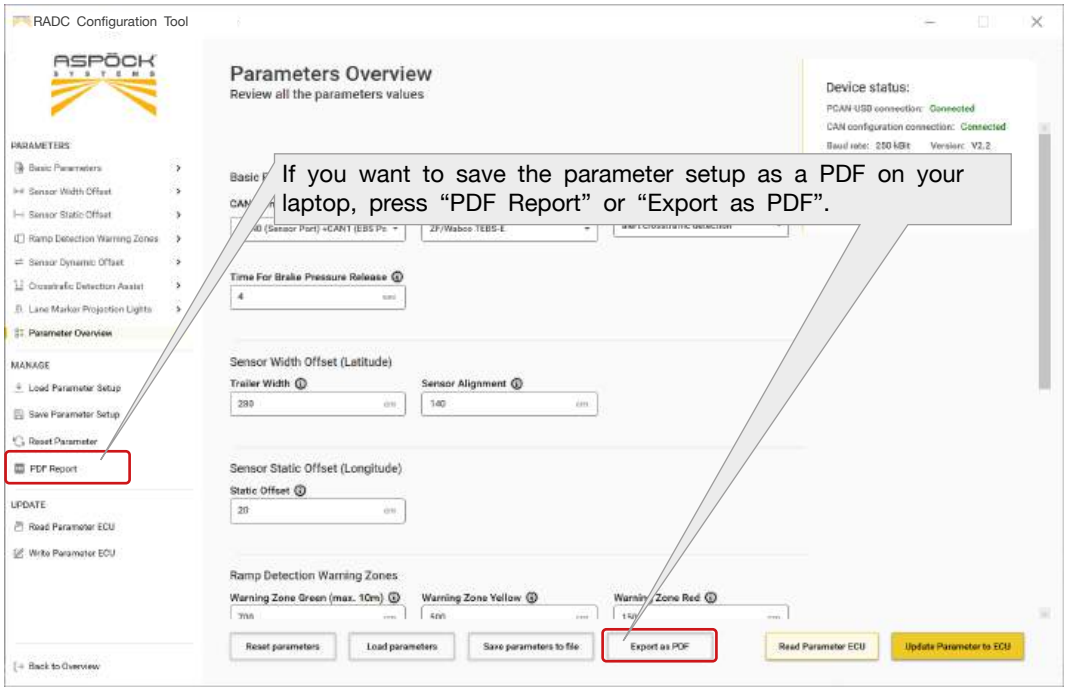


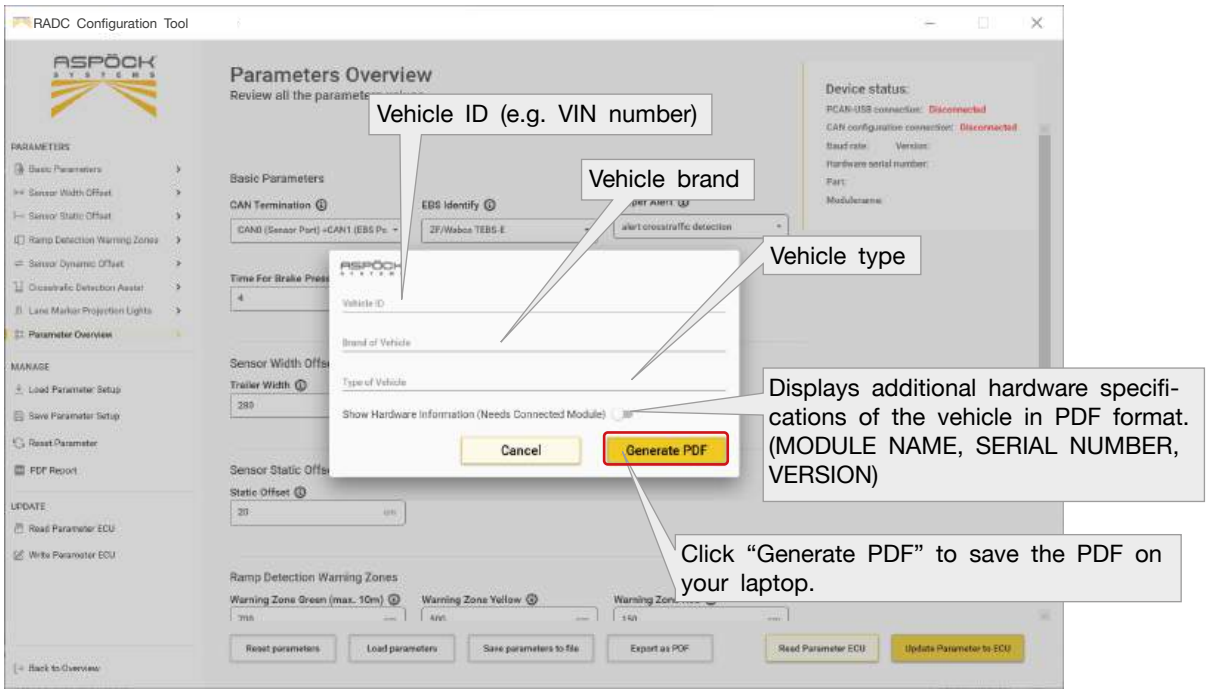


9.4.3 SAVE PARAMETER SETUP AS PDF

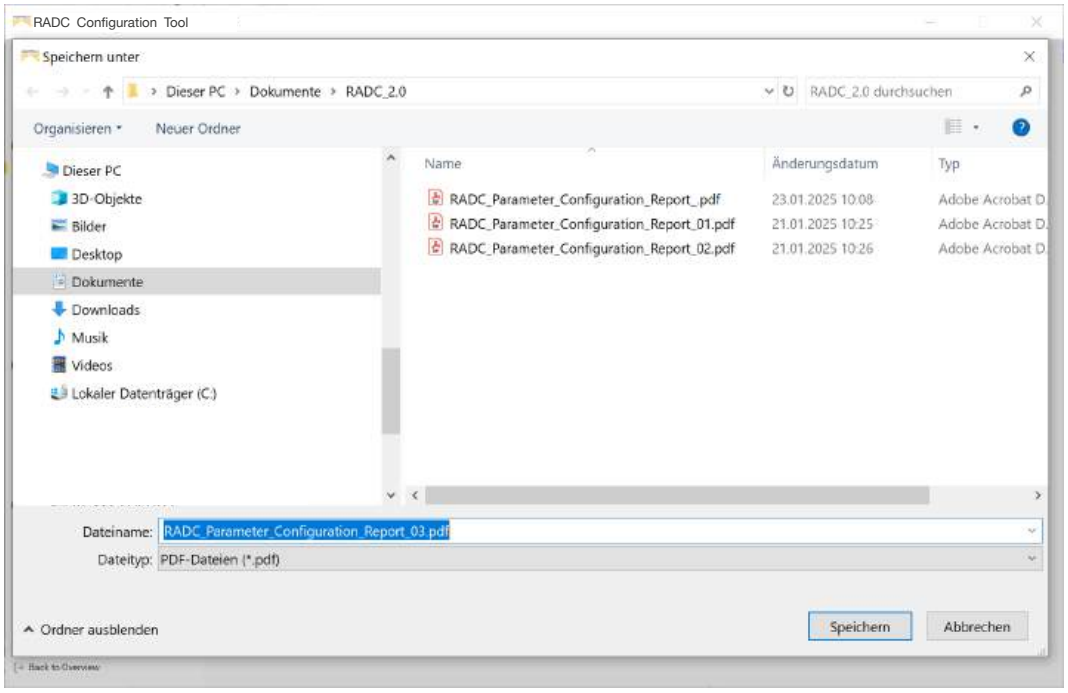
Create parameter setup PDF

The parameter setup can be exported as a PDF file for storage on the ECU for documentation purposes or for keeping as evidence in the vehicle. The PDF can also be used as a basis for a new configuration in the event of damage to the ECU.





Multiple parameter setup PDFs can be stored on the laptop.

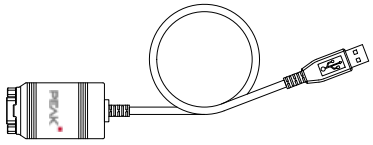


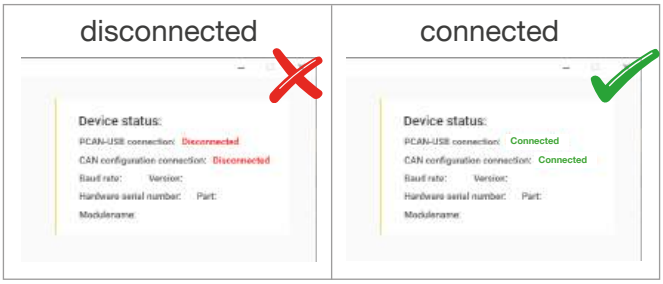
9.5 CONNECT RADC 2.0 ECU TO PC

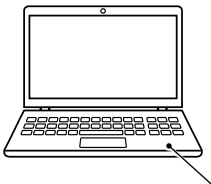
To transfer new configuration parameters to the RADC 2.0 ECU or to perform a fault diagnosis, the laptop must be connected to the ECU, vehicle and laptop as follows. The parking light on the vehicle must be switched on. Optionally, an external power supply can also be connected to the ECU if no vehicle power supply is available.

NOTE

To connect the laptop to the vehicle correctly, the device driver for the PCAN USB adapter must be installed.
https://www.peak-system.com/quick/DrvSetup

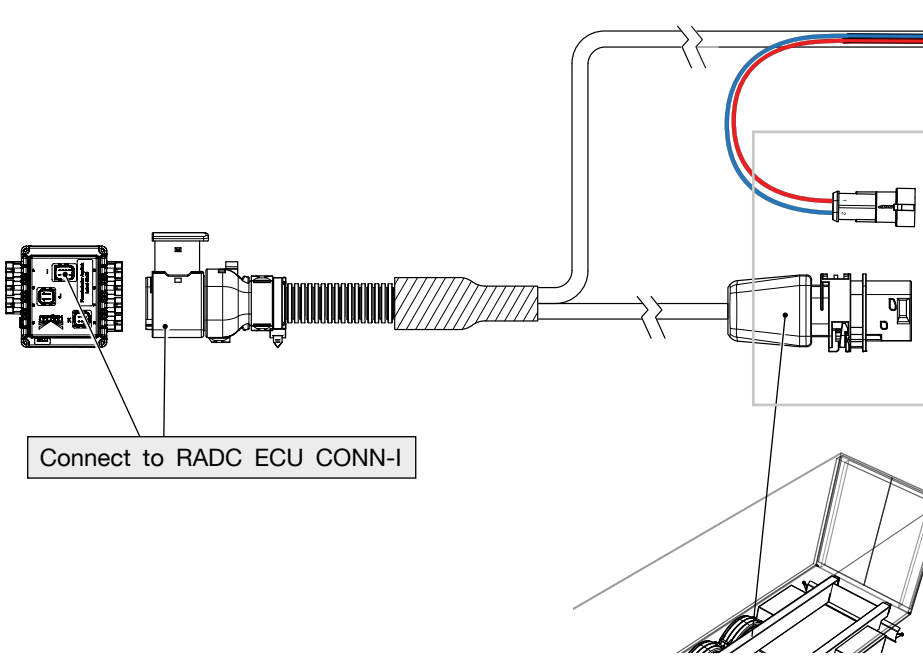






Connect to USB port on Windows PC

Connect to PEAK USB-CAN



Option 2 (test operation):
Connect to an external power source 14V-33V (e.g. battery) to activate RADC 2.0 (Superseal)

Option 1 (live operation):
Power supply via vehicle supply cable (8-pole)

Connect to RADC ECU CONN-I

HINWEIS

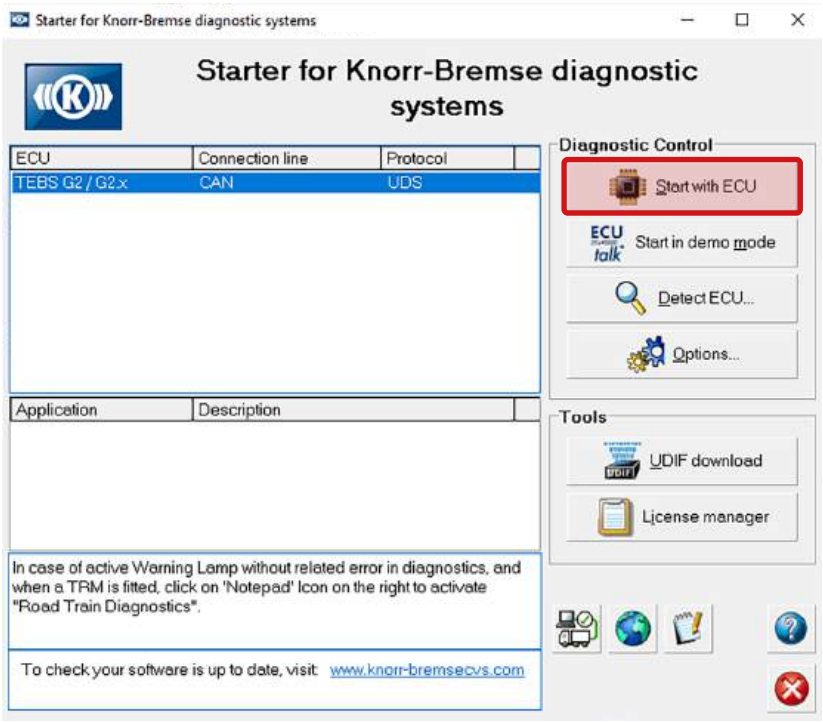
To use the Aspoeck RADC 2.0 configuration software, a special USB stick called “Aspoeck RADC Software Dongle” is required (9.1).

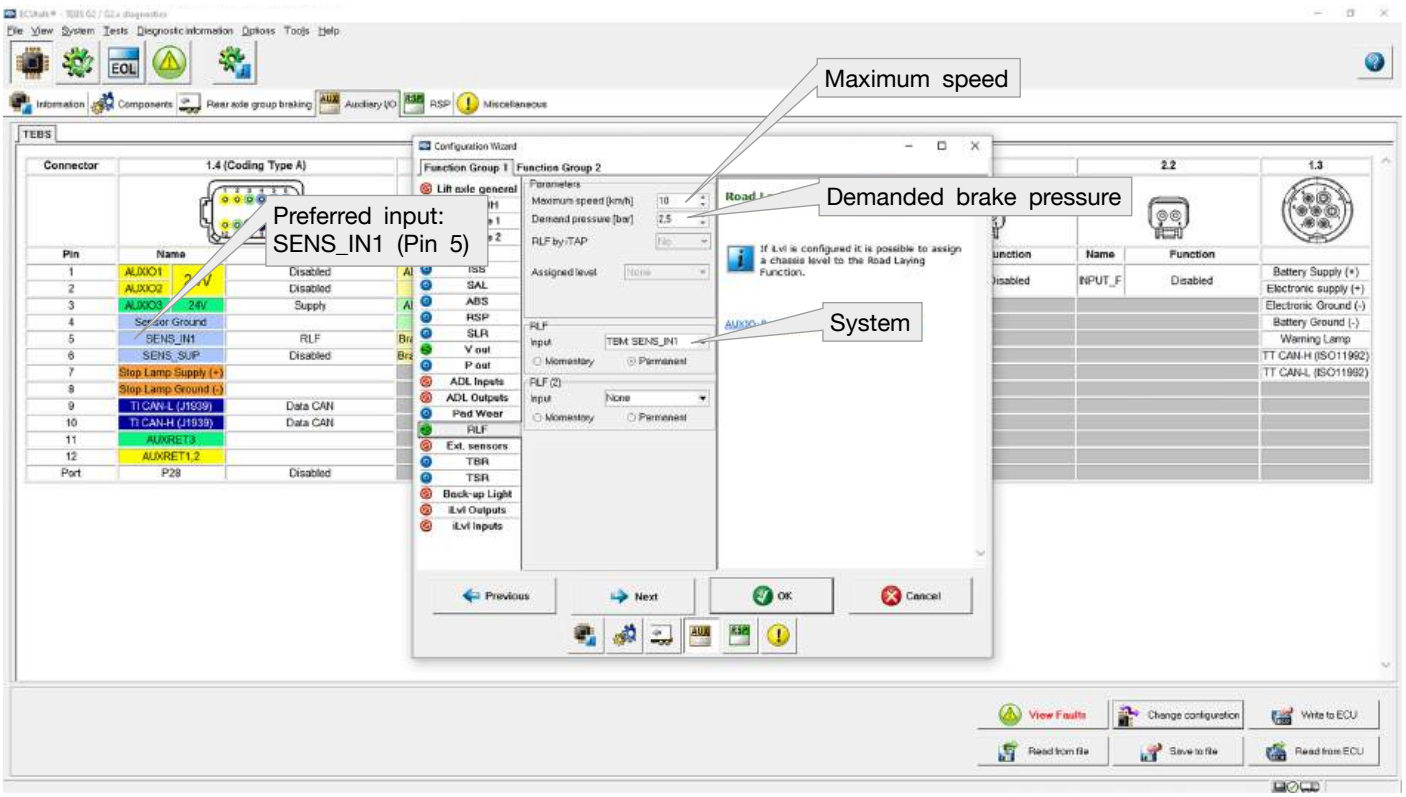
⚠ DANGER

The parking brake must be applied while the laptop is connected to the trailer.

9.5.1 PROGRAMMING KNORR BREMSE

If possible, the SENS_SUP (IN-OUT connector pin 6) should be used for this on the TEBS G2.2 Premium. This requires further configuration of the trailer EBS in order to store a brake pressure as a “Road Layer Function (RLF)” at the input used.





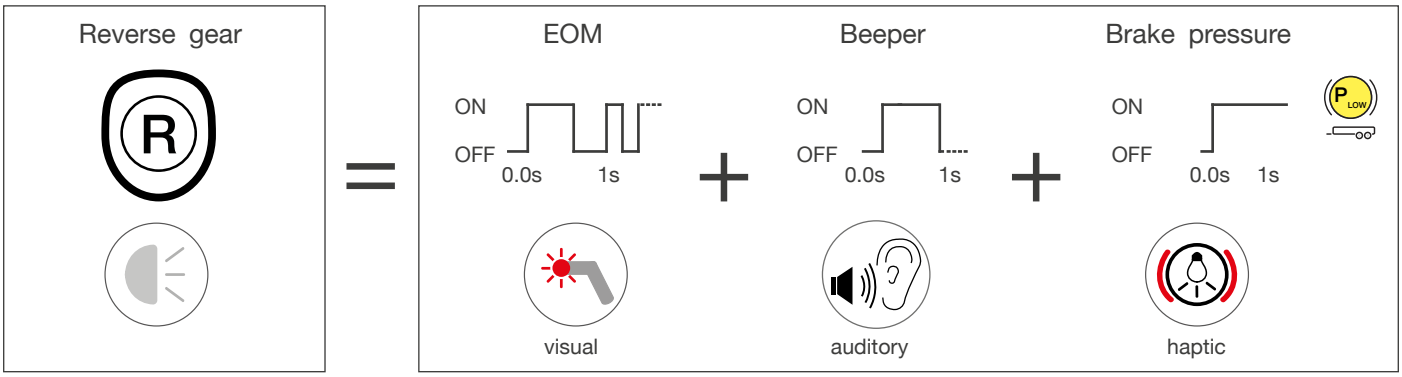
10. HANDLING

10.1 ACTIVATION OF THE SYSTEM

ON

RADC 2.0 is activated when the driver engages reverse gear. The driver is informed of this by an activation sequence:

- EOM lamps light up for 1 second
- Beeper sounds for 1 second
- Brake pressure is activated for 1 second



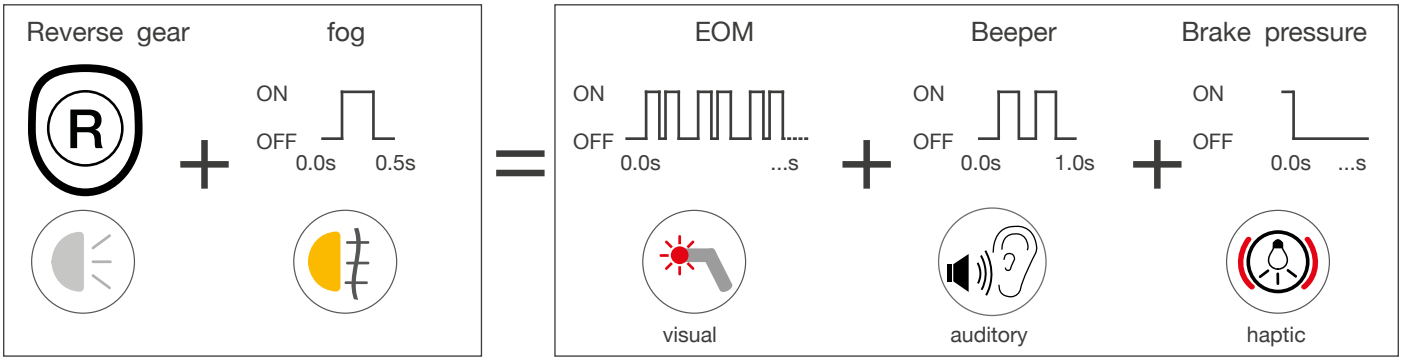
10.2 DEACTIVATING THE SYSTEM

OFF

In certain driving situations (e.g. active brake pressure in winter road conditions or very confined maneuvering spaces), it sometimes makes sense to switch off the system to prevent an annoying brake intervention. To deliberately deactivate the RADC 2.0 reversing system, proceed as follows:

With reverse gear engaged (active reverse lamp), the rear fog lamp (Fog) must be switched on for at least 0.5 seconds. The RADC 2.0 is now deactivated.

- The deactivated system is indicated visually by the EOM double flash.
- The beeper signals the deactivation of the system with two short tones.
- Any requested brake pressure is reduced to 0 bar.



⚠ DANGER

When reversing with the RADC 2.0 system switched off, no objects can be detected behind the vehicle. To avoid damage, make sure that there are no objects or obstacles in the area behind the vehicle.

NOTE

Deactivating the RADC 2.0 by the driver is canceled by re-engaging reverse gear and the system is automatically reactivated.

11. WARNING FUNCTIONS

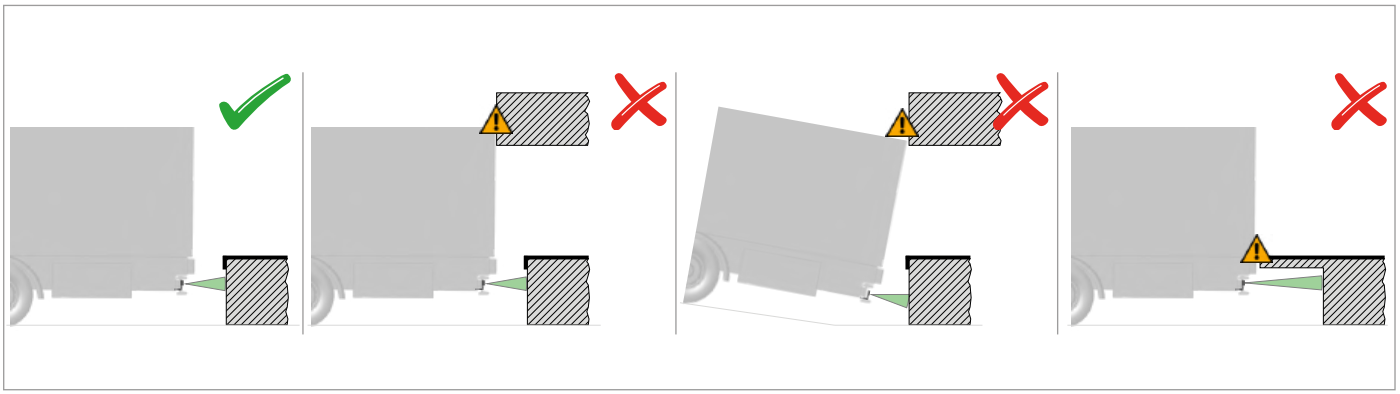
11.1 AUDIBLE/VISUAL WARNING FUNCTIONS

To alert the driver to objects when reversing or approaching a ramp to avoid damage, the RADC 2.0 is equipped with audible (beeper), visual (EOM) and haptic (EBS brake intervention) warning functions. In addition, the system also warns of moving objects entering the danger zone (cross-traffic zone warning). The driver is warned of the presence of moving objects in these defined danger zones by means of different flashing frequencies of the EOMs and acoustic signals from the beeper. If a hazard is detected, the system automatically engages the trailer‘s braking system. To ensure proper functioning, the speed when reversing must not exceed 6 km/h.

11.2 DETECTION ZONES / RAMP TYPES

When reversing a towing vehicle with a trailer, the RADC 2.0 helps the driver to monitor the area behind the vehicle, especially when docking at a loading ramp. However, different types of ramps can affect the detection accuracy of the sensor and must be taken into account by the driver. For example, the sensor cannot detect roof overhangs on the building or obstacles caused by sloping ramp approaches.

Example of ramp types

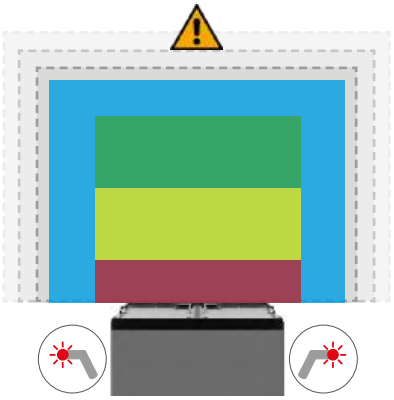


⚠ DANGER

The RADC 2.0 supports the driver when reversing a towing vehicle with a trailer, in particular during the difficult docking process at the loading ramp. Since sensor detection cannot account for all types of ramps, it is the driver‘s responsibility to evaluate the situation and react accordingly to avoid damage.

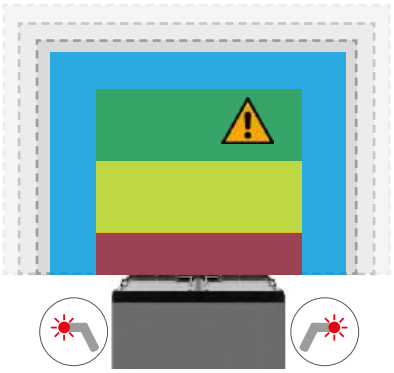
When the system is activated (reverse gear engaged/max. 6 km/h), the RADC 2.0 detects the following zones and automatically activates the respective mode, which is indicated acoustically and visually.

1 **No object in detection zone**
Object in detection zone (gray)



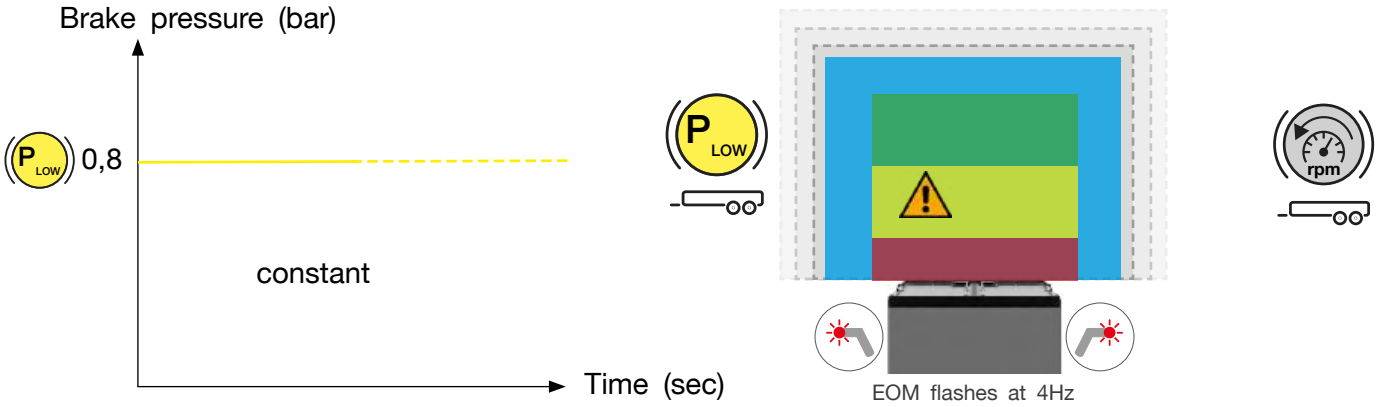
EOM flashes at 1Hz

2 ***Object in detection zone (green)***



EOM flashes at 2Hz

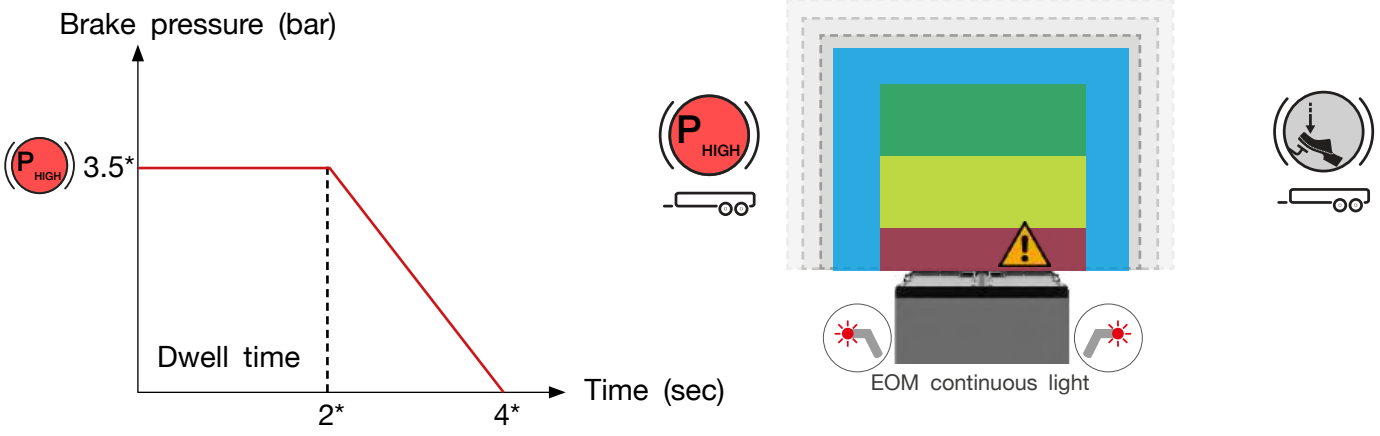
3 Object in detection zone (yellow)



⚠ DANGER

Despite the automated intervention of the RADC 2.0 in the braking system when reversing, the system must be actively supported. If an object is detected in the yellow detection range (brake pressure is automatically increased slightly), the engine speed must be reduced.

4 Object in detection zone (red)

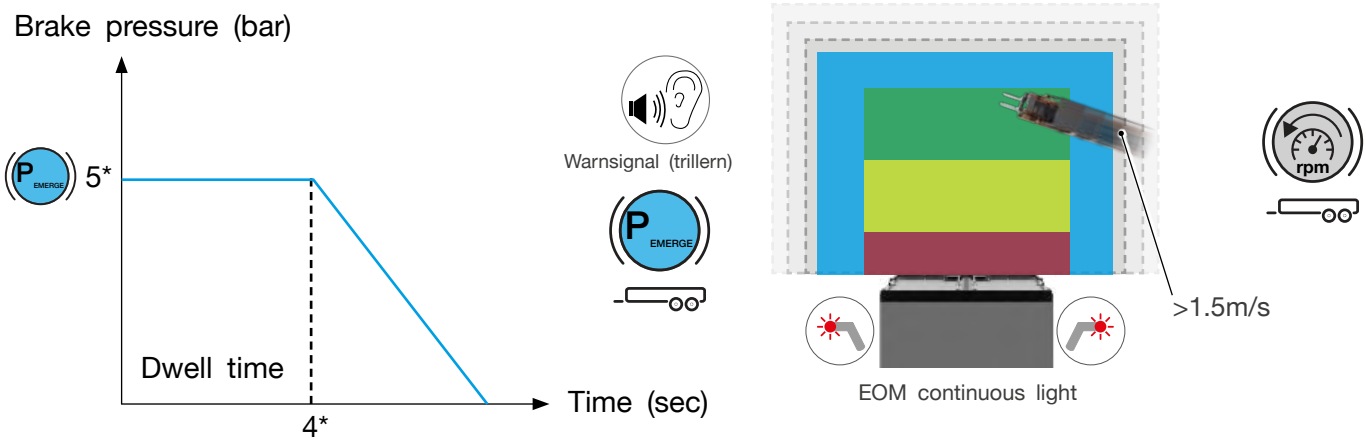


Basic configuration – can be customized in the RADC 2.0 configuration software (9.4).

⚠ DANGER

Despite the automated intervention of the RADC 2.0 in the braking system when reversing, the system must be actively supported. If an object is already in the red detection area (brake pressure is automatically increased), the brake must also be actively applied by the driver. The brake pressure applied by the detected red braking zone (P HIGH) is reduced in a controlled manner to 0 bar after a configured dwell time (basic configuration 2 s) by means of a falling ramp. This allows the docking process to be completed in a controlled manner over the last short distance on the ramp without any disruptive braking resistance.

5 Moving object in cross-traffic zone (blue)

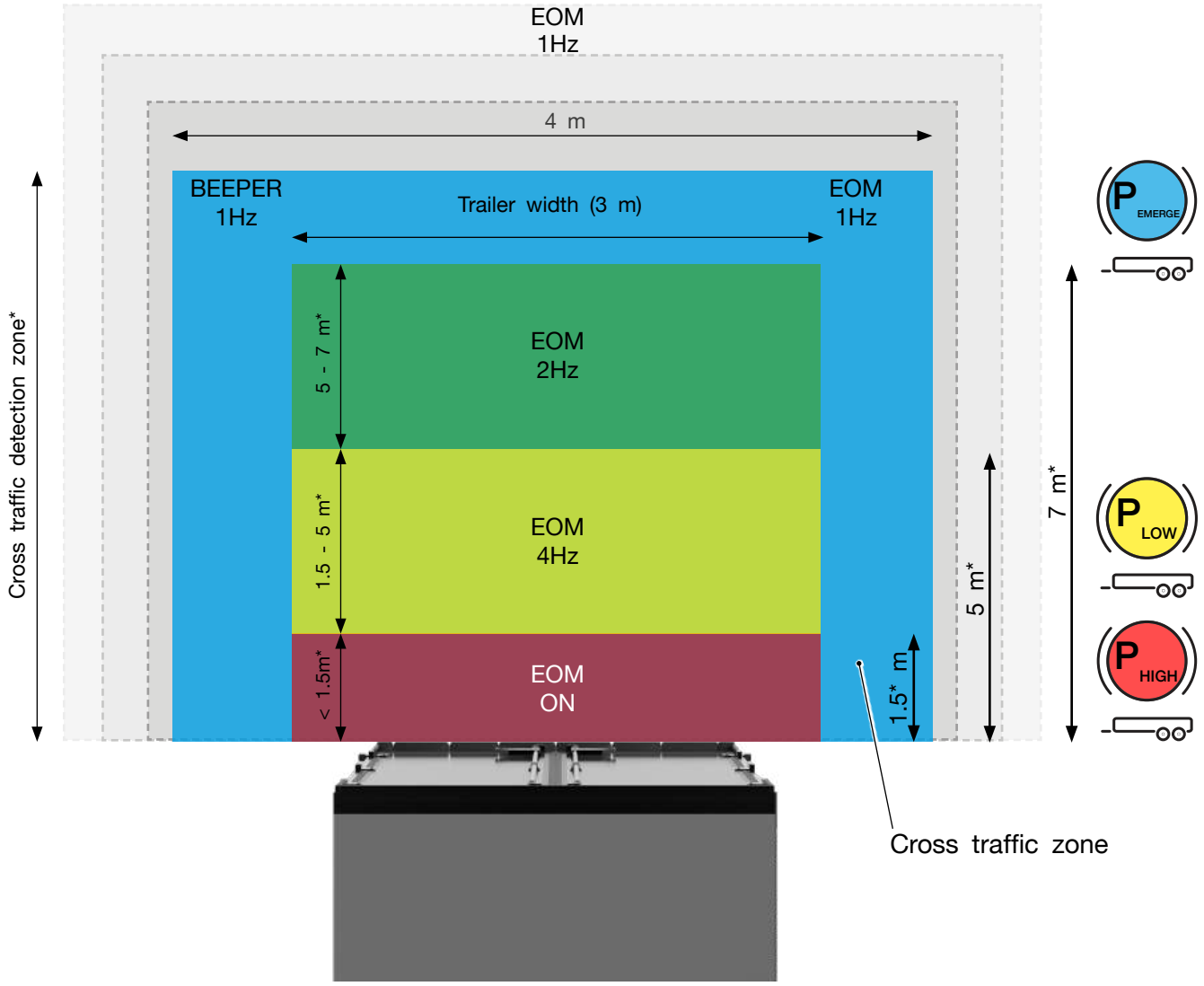


Basic configuration – can be customized in the RADC 2.0 configuration software (9.4).

⚠ DANGER

Despite the automated intervention of the RADC 2.0 in the braking system when reversing, the system must be actively supported. If an object (> 1.5 m/s) moves into the blue detection area (brake pressure is automatically increased), the speed of the motor must be reduced. The brake pressure (P EMERGE) applied by the detected blue braking zone is reduced in a controlled manner to 0 bar after a configured dwell time (basic configuration 4 s) by means of a falling ramp.

11.3 DETECTION ZONE OVERVIEW



*Settings can be customized in the RADC 2.0 Configuration Software (9.4).

	Beeper	EOM	Brake pressure
R	----------	EOM continous light on parking light on no EOM continous light on parking light off	----------
R	warning signal (trill)	EOM continous light	Emergency brake pressure*
	-----	EOM 1Hz	-----
	-----	EOM 2Hz	-----
	-----	EOM 4Hz	low*
	-----	EOM continous light	high*

12. INITIAL START-UP AND TEST

NOTE

The accuracy (response behavior) of the RADC 2.0 can vary due to the different reflection properties of the materials to be detected. Furthermore, the height and width of the object to be detected are also crucial for the detection accuracy of the RADC 2.0.

There are three different ways to test the functionality of the RADC 2.0:

- **12.2 Initial operation and test/shutdown**
- **12.3 Initial operation and test/operation**
- **12.4 Initial operation and test/computer-assisted**

One of these tests must be carried out to ensure the functionality of the RADC 2.0.

12.1 INITIAL START-UP AND TEST/STANDSTILL

Prerequisites for checking the RADC 2.0 for correct function while stationary:

- Free area in the detection range behind the trailer (at least 6 m to 11 m)
- Mounted (6.) and configured (9.4) RADC 2.0 system
- Trailer brake readiness, i.e. active ISO7638 connection (coupled towing vehicle or through an existing test stand)
- Aspöck ECU programming cable available
- Supply with external power source 14 V-33 V (9.5 Option 2)

When starting up at a standstill, the supply and activation (reverse gear) of the RADC 2.0 is simulated via an external power source.
The activation sequence (10.1) is carried out immediately after the connector of the power source for the system‘s self-diagnosis. The following functions are activated for a period of one second:

- Both EOMs continuously lit
- One-time beeper signal (low) brake pressure request to the EBS and subsequent release of the brake pressure

If the activation sequence differs from the function, possible causes should be sought in the malfunction section (14.).

If the system goes into operation after the activation sequence (constant flashing of the EOMs), the detection zones can be checked:

- Test object made of metal (height >=1 meter / width >=25 mm)

- Place the test object in the green detection zone
  -> faster flashing of the EOMs (11.2 (2))

- Fast movement of the test object across the rear area -> triggering of the cross-traffic detection (11.2 (5)) -> EOMs light up continuously + high braking pressure with subsequent lowering, acoustic warning signal (trilling)

- Placing the test object in the yellow detection zone -> EOMs flash quickly + low braking pressure (11.2 (3))
- Placing the test object in the red detection zone -> EOMs light continuously + high brake pressure with subsequent lowering (11.2 (4))
- Manual deactivation by switching on the rear fog light -> double flash of the EOMs (10.2)
- (Re-)activation of the system by disconnecting and reconnecting the external power source -> Restart with activation sequence (10.1)

12.2 INITIAL START-UP AND TEST/DRIVING MODE

The requirements for checking the RADC 2.0 for correct function while driving are:

- Free area in the detection range behind the trailer (at least 6 m to 11 m)
- Mounted (6.) and configured (9.3) RADC 2.0 system
- Operational readiness of the trailer brake, i.e. active ISO7638 connection (coupled towing vehicle)

When starting up in driving mode, the RADC 2.0 is activated by engaging reverse gear. The activation sequence (10.1) for self-diagnostics is carried out immediately. The following functions are activated for a period of one second:

- Both EOMs are continuously lit
- The beeper emits a single audible signal
- (Low) brake pressure request to the EBS and subsequent release of the brake pressure

If the activation sequence differs from the function, possible causes should be sought in the malfunctions section (14.).

If the system goes into operation after the activation sequence (constant flashing of the EOMs), the detection zones can be checked.
The test object is placed at a sufficient distance (> 10 m) behind the trailer. When reversing, the test object is now approached (< 6 km/h)

1. Static object:

- Test object made of metal (height >=1 meter / width >=25 mm)
- When the test object is reached in the green detection zone -> the EOMs flash faster (11.2 (2))
- When the test object is reached in the yellow detection zone -> rapid flashing of the EOMs + low braking pressure (11.2 (3))

⚠ Danger

During the test, it must be ensured that there are no other objects in the test area behind the vehicle.

- Test object reaches the red detection zone -> EOMs light up continuously + high braking pressure with subsequent reduction (11.2 (4))
- Manual deactivation by switching on the rear fog light -> double flash of the EOMs (10.2)
- (Re-)activation of the system by engaging reverse gear again -> restart with activation sequence (10.1)

2. Cross traffic

To check the cross-traffic warning, the vehicle must be stationary with the engine running and secured. (Handbrake must be active!) Now an object is moved at least 1.5 m/s into the cross-traffic zone (11.3) behind the trailer. It must be ensured that all acoustic, optical and haptic warning functions of the RADC 2.0 work properly. (11.1)

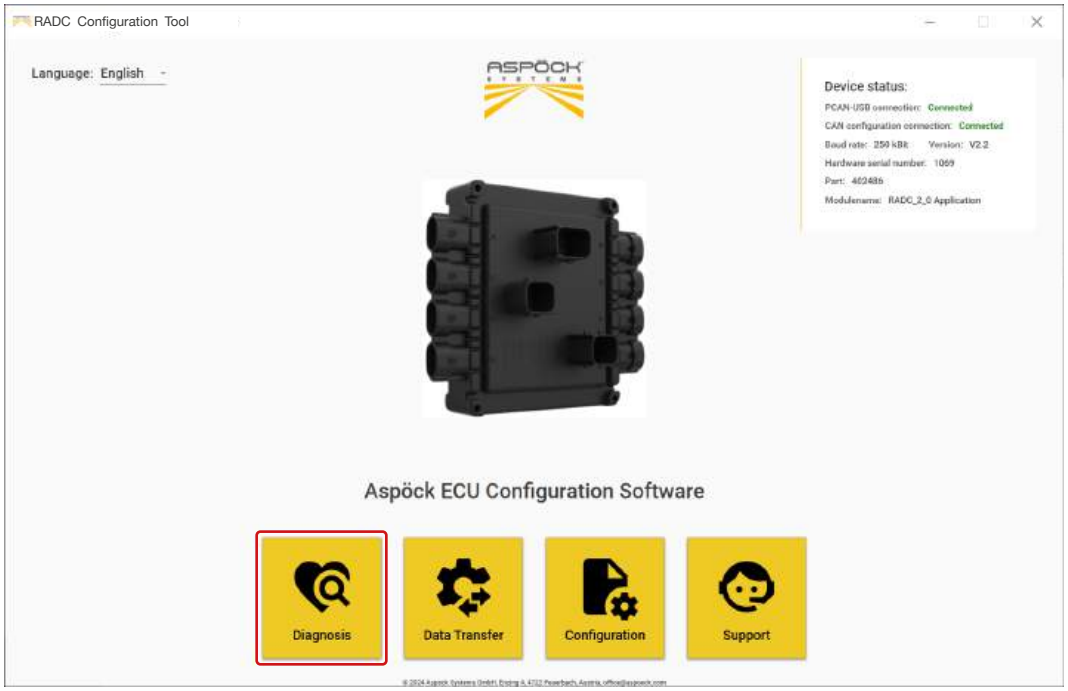
- Test object made of metal (height >=1 meter / width >=25 mm)
- Fast movement (>1.5 m/s) of the test object transversely into the rear area of the trailer -> triggering of the cross-traffic detection (11.2 (5)) -> continuous illumination of the EOMs + high brake pressure with subsequent lowering + audible warning signal (trilling)

12.3 INITIAL START-UP AND TEST/ COMPUTER-ASSISTED

If the initial operation according to point 12.1 or 12.2 is not possible because the test environment cannot be created as part of the production line, for example, a test for the full range of functions of the RADC 2.0 must be carried out in diagnostic mode with the help of the configuration software.

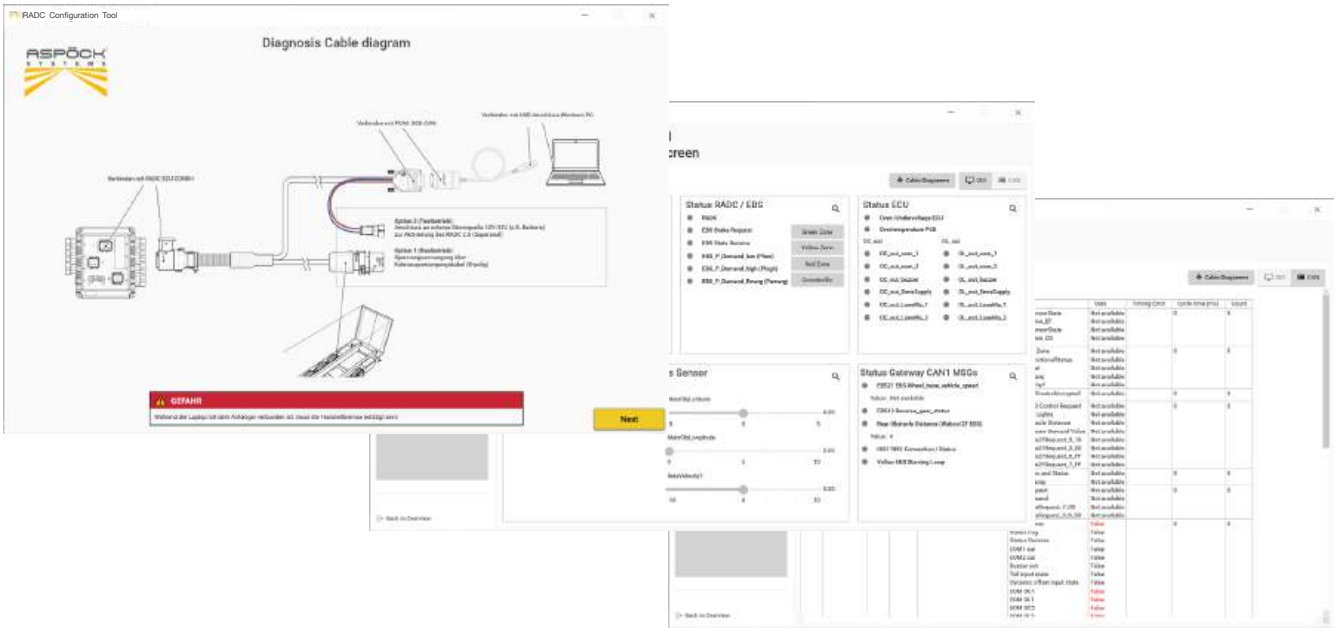
Download and registration of the RADC 2.0 configuration software (9.2)

Start RADC 2.0 configuration software



Start diagnosis mode

The diagnostic mode of the RADC 2.0 configuration software provides an overview of the status of the RADC 2.0 system. Any system malfunctions are displayed and simplify the search for possible causes.
The laptop must be connected correctly to the RADC 2.0 ECU. (9.5)



13. WORKSHOP INSTRUCTIONS

13.1 MAINTENANCE

The Aspöck RADC 2.0 is basically maintenance-free. However, it is important to regularly ensure that the sensor is not dirty and that all the cable plug-in connections and the cabling itself are in good order.

13.2 REPAIR

If a malfunction is indicated, a diagnosis must be carried out to identify the fault (see 14.1 Diagnosis). If an error message continues to appear after the diagnosis has been carried out and all system components have been checked, a specialist workshop must be contacted immediately to repair the fault.

14. MALFUNCTIONS

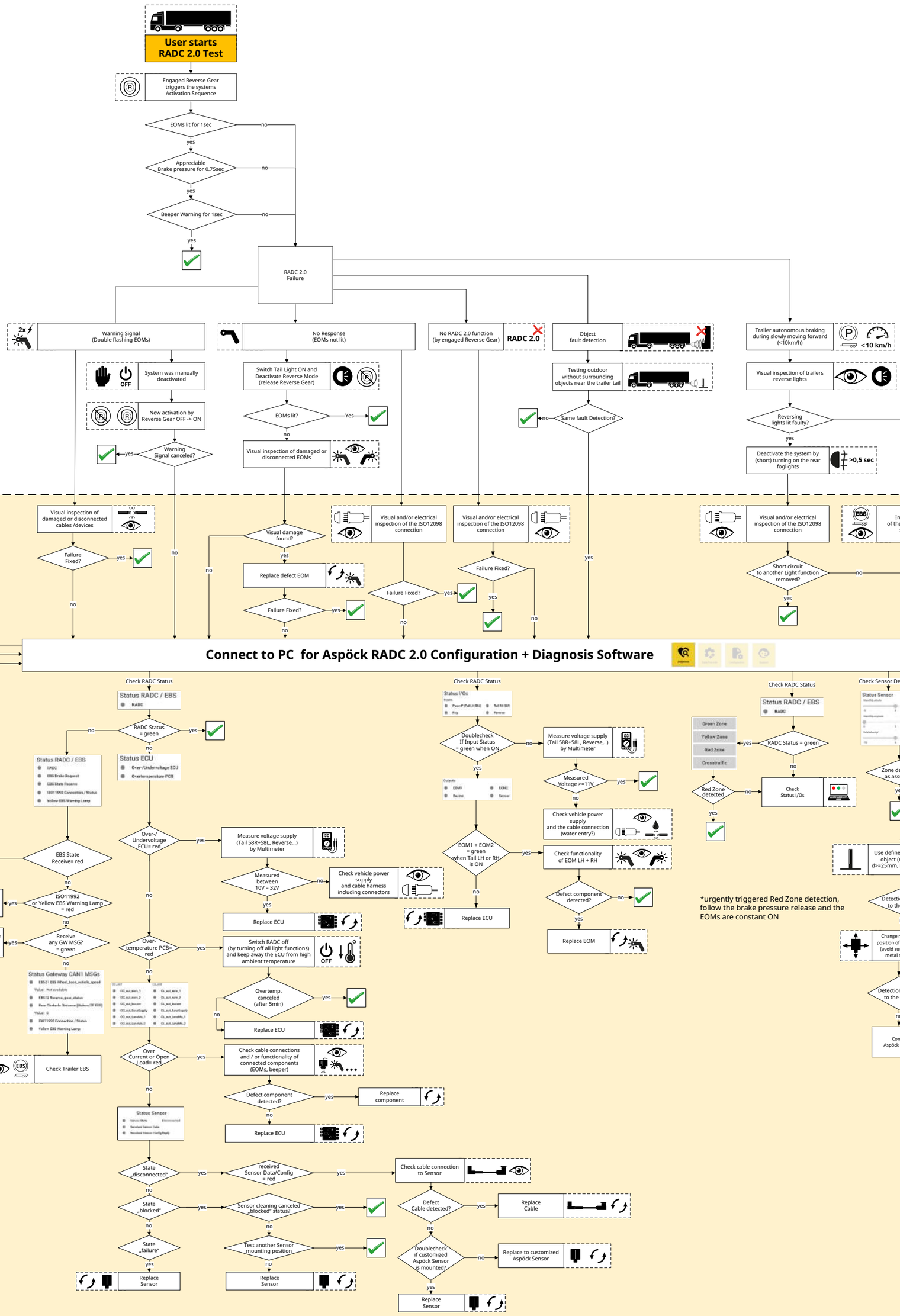
If the RADC 2.0 is not working properly, this can have various causes.

- Malfunction of sensor
- Malfunction due to defective wiring
- EBS error
- ECU error
- Speed >11 km/h
- System is switched off by Fog

The error can possibly be localized or found using a diagnostic matrix in section 14.1.

14.1 DIAGNOSIS MATRIX

To rectify a problem as quickly as possible, proceed as follows.

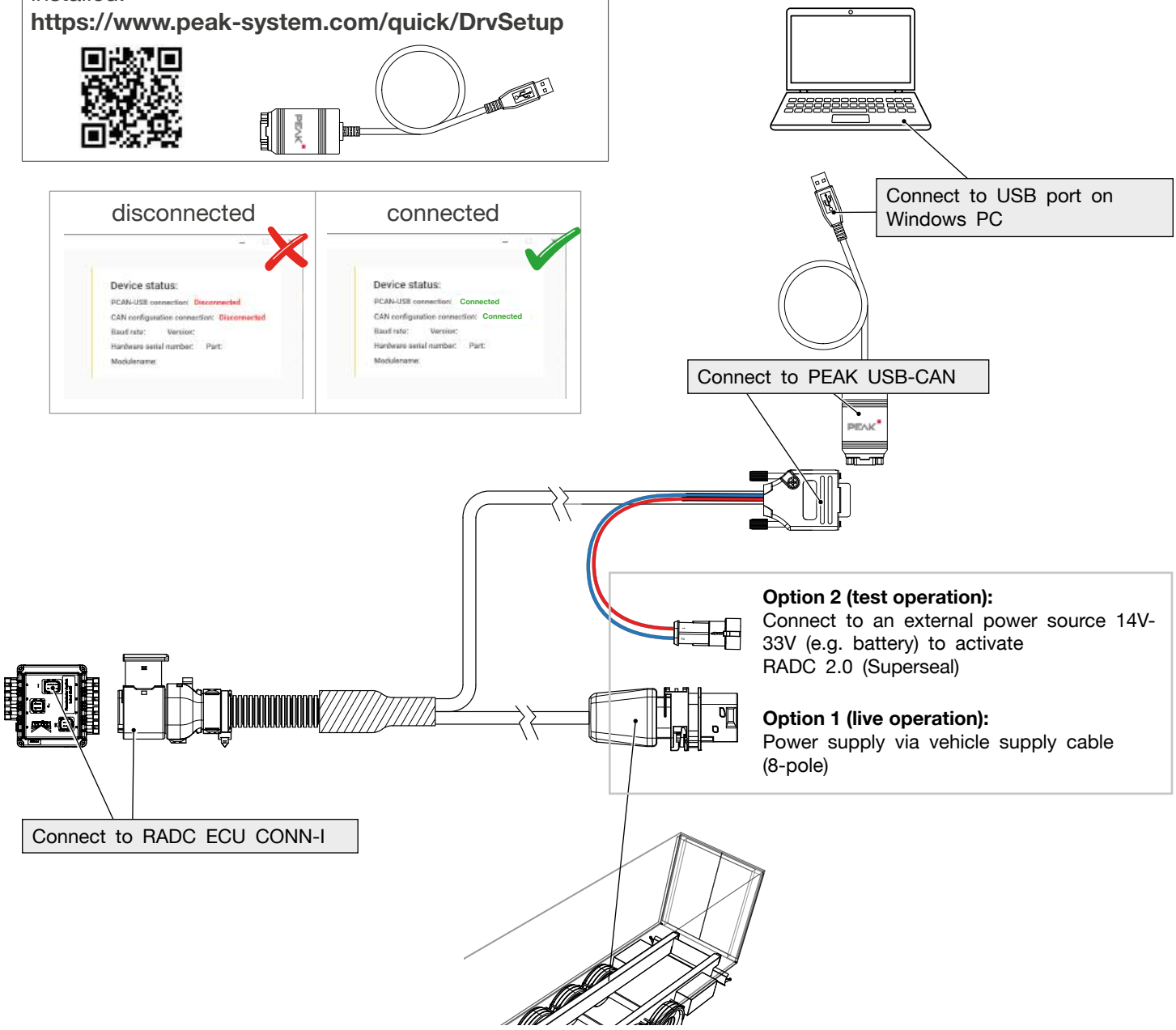


14.2 MANUAL DIAGNOSIS / PC

To perform a manual diagnosis of the RADC 2.0 ECU, a laptop can be connected to the ECU, vehicle and laptop as follows. The parking lights on the vehicle must be switched on. Optionally, an external power supply can be connected to the ECU if the vehicle power supply is not available.

NOTE

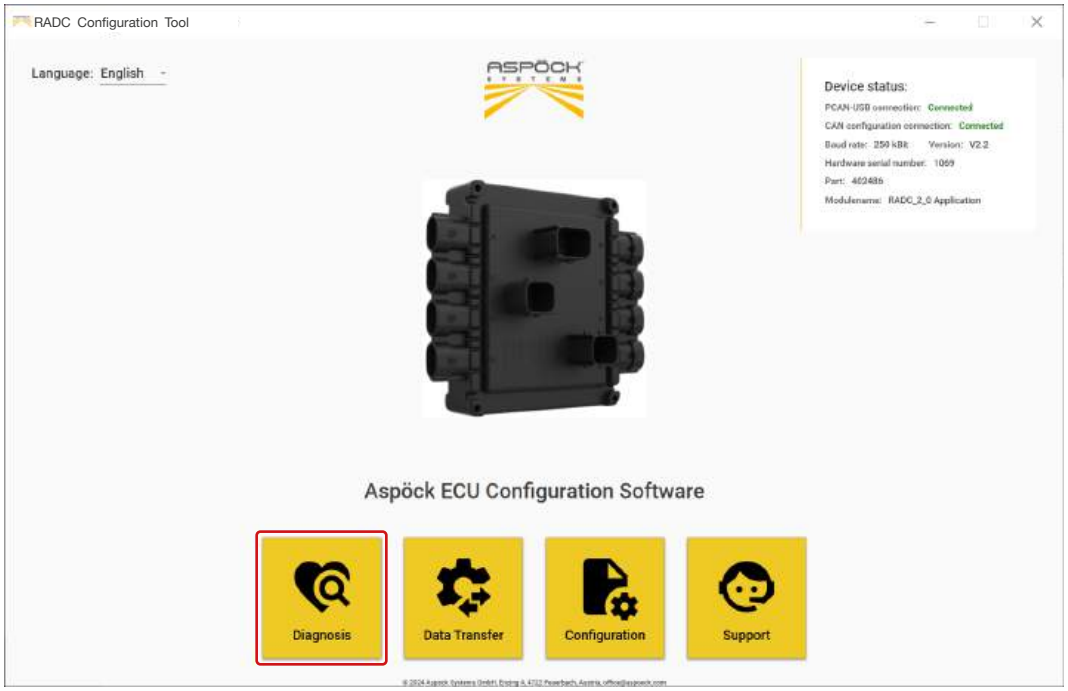
To connect the laptop to the vehicle correctly, the device driver for the PCAN USB adapter must be installed.
https://www.peak-system.com/quick/DrvSetup



⚠ DANGER

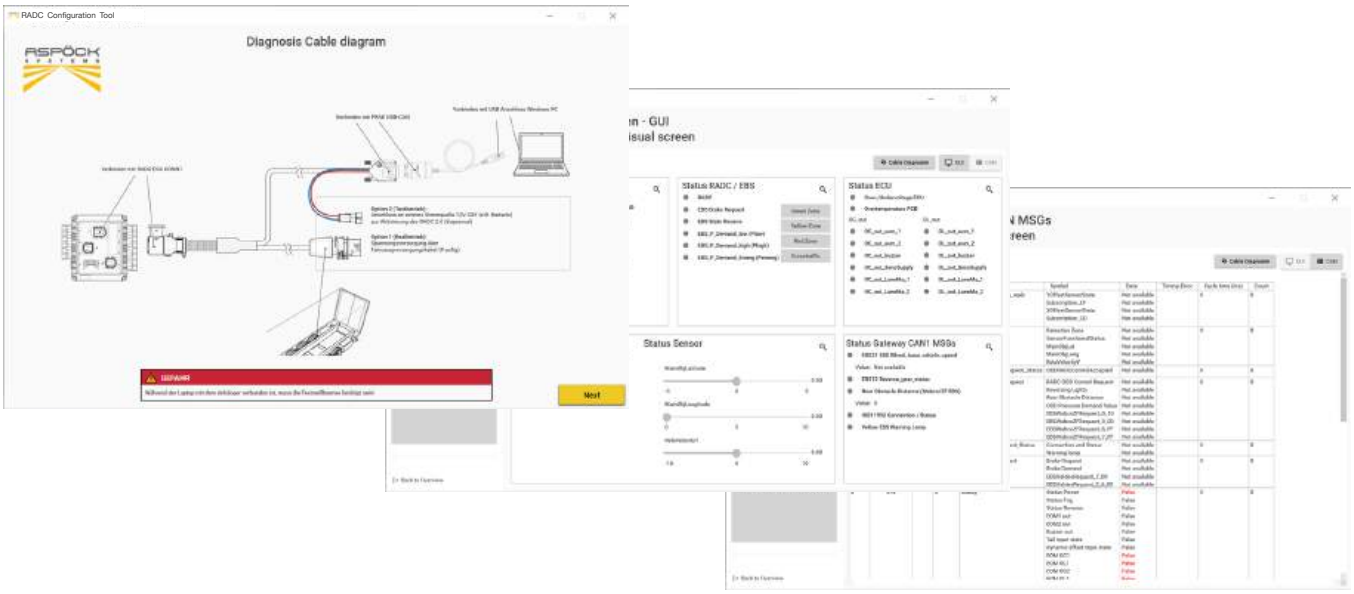
The parking brake must be applied while the laptop is connected to the trailer.

Start RADC 2.0 configuration software (9.2, 9.3)



Start diagnosis mode

The diagnostic mode of the RADC 2.0 configuration software provides an overview of the status of the RADC 2.0 system. Any system malfunctions are displayed and simplify the search for possible causes. (14.1)
The laptop must be connected correctly to the vehicle or RADC 2.0 ECU. (14.2)



14.4 SELF DIAGNOSIS

Before the RADC 2.0 is activated by engaging reverse gear, the system performs a self-diagnosis of voltage, overcurrent, open outputs and temperature. The error diagnosis (ECU, EBS and sensor) is also carried out during detection mode and constantly monitored.

14.4.1 GENERAL SYSTEM SELF DIAGNOSIS

- Supply voltage in the range between 11V-32V
- EOM 1 - open output or overcurrent
- EOM 2 - open output or overcurrent
- Beeper - open output or overcurrent
- Excessive temperature RADC 2.0 ECU

If an excessive temperature or excessive/low voltage of the power supply is diagnosed, the system goes into error mode and visualizes this with the EOM lamps flashing twice.

If the vehicle is reversing (reverse signal) and the RADC is not operating due to a lack of power supply (tail lights OFF) or if the EOMs are not able to operate (cable break, defective EOM lamps), this is indicated by the EOMs not lighting up.

14.4.2 SENSOR SELF-DIAGNOSIS

A malfunction of the sensor can be caused by dirt, a lack of power supply or a general malfunction. If a fault is diagnosed, the system goes into error mode and visualizes this by the EOM lamps flashing twice. However, if there is a problem with the EOM lamps, the error mode can also be indicated by non-illuminated EOMs.

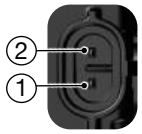
14.4.3 BRAKE SELF-DIAGNOSIS

A brake malfunction can be caused by an EBS error, the unavailability of the brake interface or a general malfunction of the brake. If an error is diagnosed, the system goes into error mode and visualizes this by the EOM lamps flashing twice. However, if there is a problem with the EOM lamps, the error mode can also be indicated by unlit EOMs.
For a precise analysis, it is necessary to examine and rectify the malfunction using the software of the respective brake manufacturer.

15. CIRCUIT DIAGRAMS AND PIN ASSIGNMENTS.

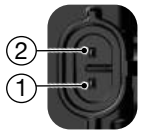
15.1 PIN ASSIGNMENT RADC 2.0 ECU

CONN-A
Superseal 2pol



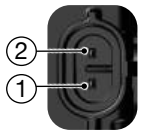
PIN Number	Input / Output
1	Ground
2	Power Supply EOM 2

CONN-C
Superseal 2pol

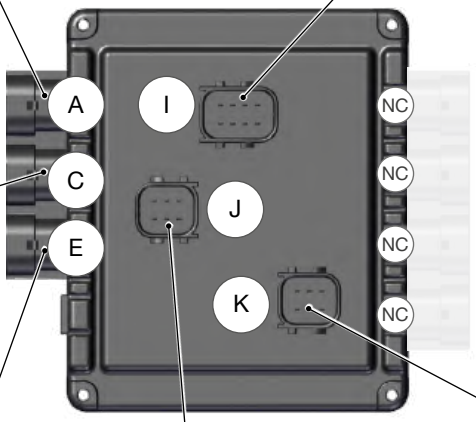


PIN Number	Input / Output
1	Ground
2	Power Supply EOM 1

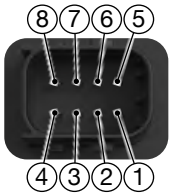
CONN-E
Superseal 2pol



PIN Number	Input / Output
1	Ground
2	Power Supply Beeper



CONN-I
HDSCS 8pol code black(A)



PIN Number	Input / Output
1	Reverse light
2	Ground
3	Position light R
4	Position light L or Power+
5	Power Supply output ECU
6	Fog light or switch input
7	CAN0 High
8	CAN0 Low

CONN-K
HDSCS 6pol code black(A)

PIN Number	Input / Output
1	Power Supply output EBS
2	Ground
3	CAN1 High
4	CAN1 Low
5	EBS AUX+
6	EBS AUX-

CONN-J
HDSCS 6pol code grey(B)

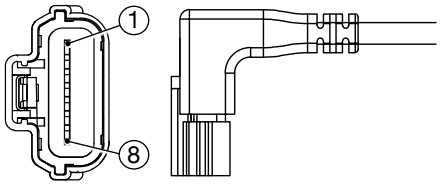
PIN Number	Input / Output
1	Power Supply output Sensor
2	Ground
3	CAN0 High
4	CAN0 Low
5	Analog Input
6	LIN

15.2 PIN ASSIGNMENT CONNECTOR/CABLE

RADC 2.0 Sensor Cable 1m - Directional Sensor

PIN NO	INPUT /OUTPUT	PIN COLOR
1	VCC	
2	-	
3	-	
4	Ground	
5	-	
6	-	
7	CAN High	
8	CAN Low	

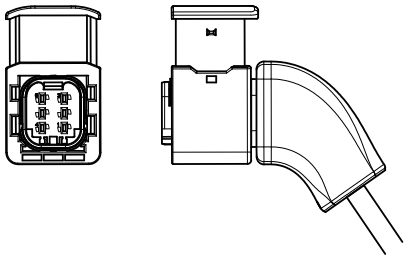
Molex



RADC 2.0 Sensor Cable 1m Direction - ECU

PIN NO	INPUT /OUTPUT	PIN COLOR
1	VCC	
2	Ground	
3	CAN High	
4	CAN Low	
5	-	
6	-	
7	-	
8	-	

6p. HDSCS female



RADC 2.0 Knorr EBS3 RLF - ECU 6m - Direction EBS

PIN NO	INPUT /OUTPUT	PIN COLOR
1	-	-
2	-	-
3	-	-
4	Sensor Supply [SENS_SUP] (5V or Tri-state Input)	◯
5	Sensor Input 1 [SENS_IN1] (Analogue or Tri-state)	◯
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-
11	-	-
12	-	-

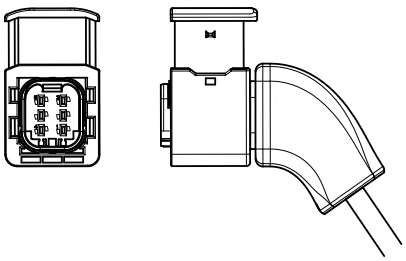
Option1

preferred

RADC 2.0 Knorr EBS3 RLF - ECU 6m - direction ECU

PIN NO	INPUT /OUTPUT	PIN COLOR	PIN COLOR BRIDGE
1	+VDC Bat		●
2			
3			
4			
5	EBS AUX +		●
6	EBS AUX -	◯	

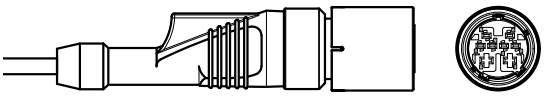
6p. HDSCS female



RADC 2.0 Wabco EBS3 - ECU 6m - Richtung EBS

PIN NO	INPUT /OUTPUT	PIN COLOR
1	+VDC Bat	
2	CAN2 High	
3	CAN2 Low	
4	Ground	
5	-	
6	-	
7	-	
8	ABS rotational speed	

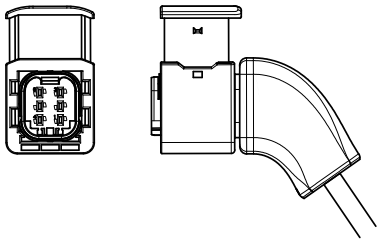
WABCO 449 437 060 0



RADC 2.0 Wabco EBS3 - ECU 6m - Richtung ECU

PIN NO	INPUT /OUTPUT	PIN COLOR
1	-	-
2	-	-
3	CAN2 Low	
4	CAN2 High	
5	-	-
6	-	-

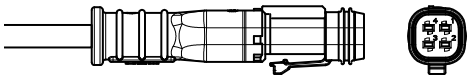
6p. HDSCS female



RADC 2.0 Haldex EBS4 - ECU 6m - Richtung EBS

PIN NO	INPUT /OUTPUT	PIN COLOR
1	+VDC Bat	
2	CAN High	
3	CAN Low	
4	Ground	

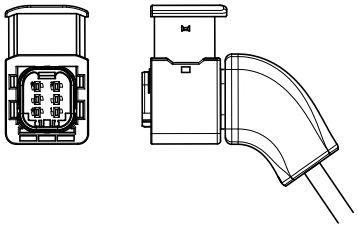
4p. Haldex CAN for EB+ Gen4



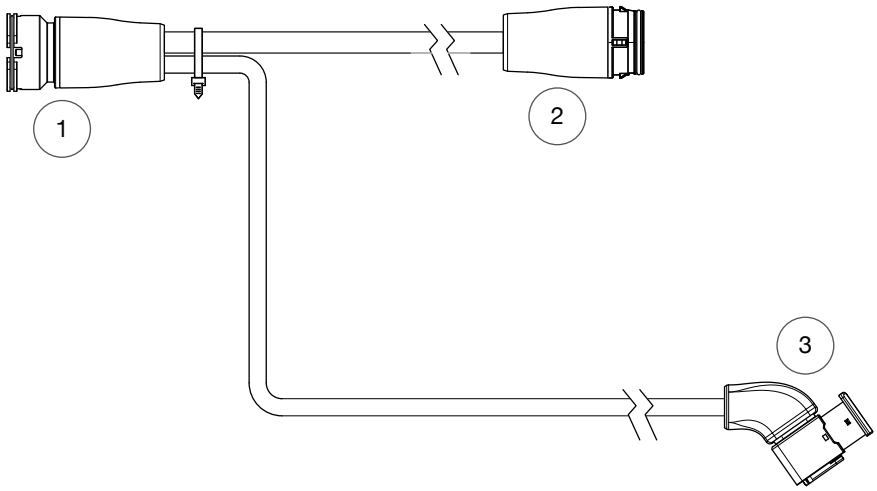
RADC 2.0 Haldex EBS4 - ECU 6m - Richtung RADC 2.0 ECU

PIN NO	INPUT /OUTPUT	PIN COLOR
1	-	-
2	-	-
3	CAN2 Low	
4	CAN2 High	
5	-	-
6	-	-

HDSCS 6pin Female

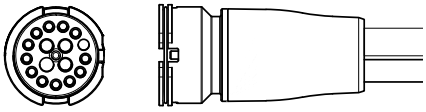


RADC 2.0 power supply cable ASS3 17p.

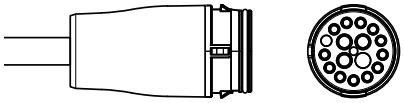


STECKER		1	2	3
PIN NO	INPUT /OUTPUT	PIN COLOR MALE	PIN COLOR FEMALE	PIN COLOR
1	Direction indicator LH			-
2	Direction indicator RH			-
3	Fog light			
4	Ground			
5	Tail light LH			
6	Tail light RH			
7	Stop light			-
8	Reverselamp			
9	feed current+			-
10	Brake pad wear indicator			-
11	Trailer brake control			-
12	Bogie lift			-
13	Earth for electronics			-
14	Dataline			-
15	Dataline			-
16	N/A	-	-	-
17	N/A	-	-	-

ASS3 Male 1

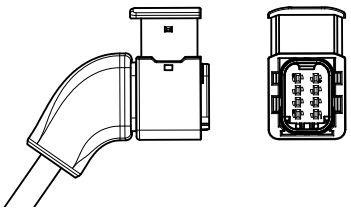


ASS3 Female 2



CONNECTOR		3
PIN NO	INPUT /OUTPUT	PIN COLOR
1	Reverse lamp	
2	Ground	
3	Tail light RH	
4	Tail light LH	
5	-	-
6	Fog light	
7	N/A	-
8	N/A	-

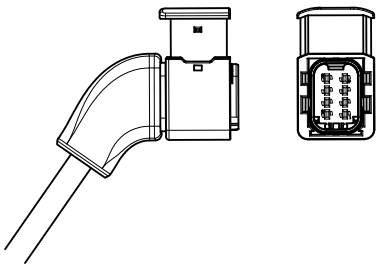
HDSCS 8pin Female 3

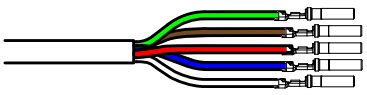


RADC 2.0 power supply cable o. e.

PIN NUMMER	EINGABE / AUSGABE	PIN FARBE
1	Reverse lamp	
2	Ground	
3	Tail light RH	
4	Tail light LH	
5	-	-
6	Fog light	
7	N/A	-
8	N/A	-

HDSCS 8pin Female

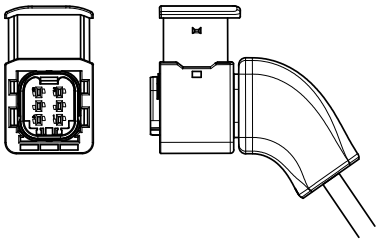




RADC 2.0 K1.2 - ECU 6m

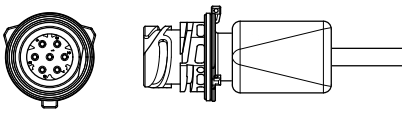
PIN NO	INPUT /OUTPUT	PIN COLOR
1	-	-
2	-	-
3	CAN High	
4	CAN Low	
5	-	-
6	-	-

HDSCS 6pin Female



PIN NO	INPUT /OUTPUT	PIN COLOR
1	-	-
2	+VDC Bat	
3	-	-
4	-	-
5	Ground	
6	CAN Low	
7	CAN High	

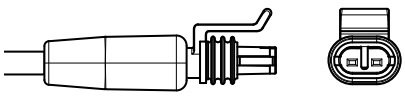
7p.AMP male



SP IV R/W/O 2m 2p S.Seal RH

PIN NO	INPUT /OUTPUT	PIN COLOR
1	Ground	
2	+VDC	

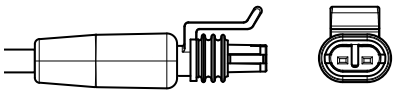
2p.S.Seal female



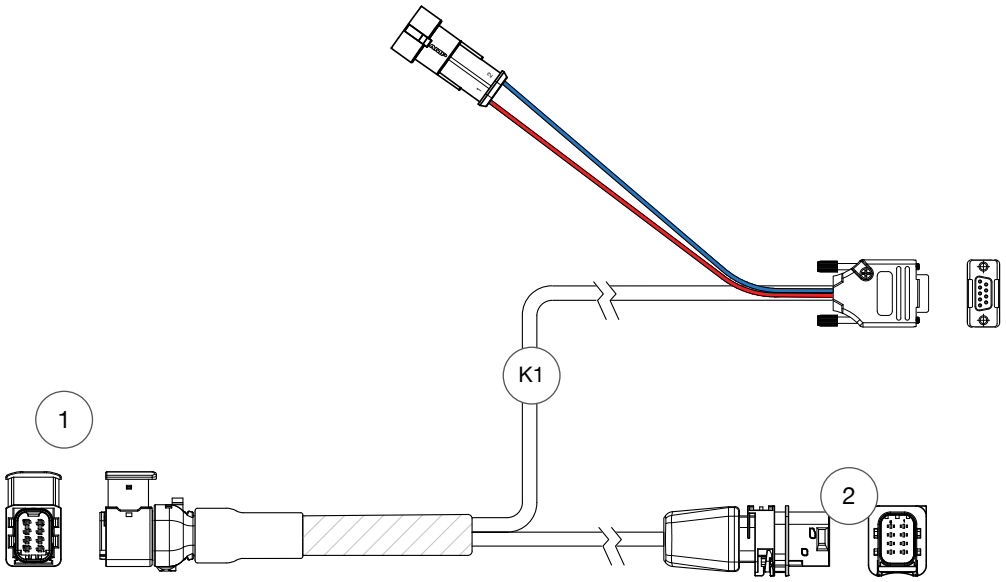
RADC 2.0 Beeper 0,6m 2p S.Seal

PIN NO	INPUT /OUTPUT	PIN COLOR
1	Ground	
2	+VDC	

2p.S.Seal female

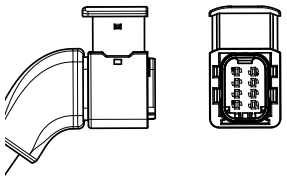


Aspöck ECU programming cable

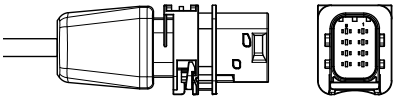


CONNECTOR		1	2	K1	BRIDGE
PIN NO	INPUT /OUTPUT	PIN COLOR	PIN COLOR	PIN COLOR	PIN COLOR
1	Reverse lamp				
2	Ground				
3	Tail light RH				
4	Tail light LH				
5	-	-	-		
6	Fog light				
7	CAN0 High				
8	CAN0 Low				

8p. HDSCS female cover cap (1)

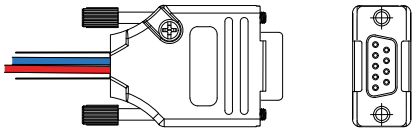


8p. HDSCS male (2)



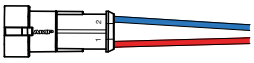
PIN NO	INPUT /OUTPUT	PIN COLOR
1	-	-
2	CAN0 Low	
3	-	-
4	-	-
5	-	-
6	-	-
7	CAN0 High	
8	-	-
9	-	-

9pin D-Sub female



PIN NO	INPUT /OUTPUT	PIN COLOR
1	Reverse lamp	
2	Ground	

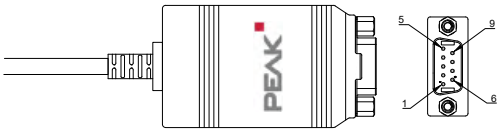
male S.Seal



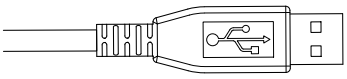
PCAN Adapter

PIN NO	INPUT /OUTPUT	PIN COLOR
1	-	-
2	CAN0 Low	
3	Ground	
4	-	-
5	-	-
6	Ground	
7	CAN0 High	
8	-	-
9	-	-

PCAN



USB 1.1, USB 2.0 and USB 3.0



16. DISPOSAL

- **Decommissioning and disposal:** Please observe the applicable legal requirements for decommissioning and disposing of this product. In particular, observe the regulations for disposing of batteries, equipment and electrical systems.
- **Electrical appliances:** Collect electrical appliances separately from household or commercial waste. These can be recycled or disposed of properly. If possible, pass the old appliance on for internal disposal or contact the manufacturer for specific instructions.
- **Environmental protection:** Electrical and electronic equipment must be collected separately from unsorted municipal waste and disposed of or recycled properly. Improper disposal can harm health and the environment. Contact a specialized company or the relevant authorities for detailed information.
- **Packaging:** Packaging must be disposed of separately. Paper, cardboard and plastics can be recycled.

THE ART OF LIGHTS

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