



**Commercial  
Vehicles**

# Converter guidelines

## The new Transporter (as of model year 2025)



# Table of contents

<b>1 General information .....</b>	<b>9</b>
<b>1.1 Introduction .....</b>	<b>9</b>
1.1.1 Concept of this Owner's Manual .....	9
1.1.2 Means of representation .....	10
1.1.3 Vehicle safety .....	10
1.1.4 Operational safety .....	12
1.1.5 Note on copyright .....	12
<b>1.2 General information .....</b>	<b>13</b>
1.2.1 Product and vehicle information for converter .....	13
1.2.1.1 Contact in Germany .....	13
1.2.1.2 International contact .....	13
1.2.1.3 Electronic repair and workshop information from Volkswagen AG (erWin*) .....	14
1.2.1.4 Genuine Parts Online Ordering Portal* .....	14
1.2.1.5 Online Owner's Manual .....	14
1.2.1.6 European Type Approval (ETA) and EC Certificate of Conformity (CoC) .....	14
1.2.1.7 Worldwide Harmonized Light-Duty Vehicles Test Procedure (WLTP) .....	15
1.2.1.8 Notes on homologation of modifications and conversions .....	16
1.2.1.9 Manufacturer's declaration .....	16
1.2.2 Converter guidelines, consulting .....	17
1.2.2.1 Letter of non-objection .....	17
1.2.2.2 Application for the letter of non-objection .....	19
1.2.2.3 Legal entitlements .....	19
1.2.3 Warranty and product liability of the converter .....	20
1.2.4 Ensuring traceability .....	20
1.2.5 Badges .....	20
1.2.5.1 Positions on rear of the vehicle .....	20
1.2.5.2 Appearance of whole vehicle .....	21
1.2.5.3 Non-Volkswagen trademarks .....	21
1.2.6 Recommendations for vehicle storage .....	21
1.2.7 Compliance with environmental rules and regulations .....	22
1.2.8 Recommendations for inspection, maintenance and repair .....	23
1.2.9 Accident prevention .....	23
1.2.10 Quality system .....	24
<b>1.3 Planning bodies .....</b>	<b>25</b>
1.3.1 Selecting the basic vehicle .....	25
1.3.2 Vehicle modifications .....	26
1.3.3 Vehicle acceptance .....	28
<b>1.4 Special equipment .....</b>	<b>29</b>
<b>1.5 General product safety requirement .....</b>	<b>30</b>
1.5.1 Restraint system .....	32
1.5.2 Drilling and welding .....	32
1.5.3 Minimum requirements for the brake system .....	32
1.5.4 Road safety .....	33
1.5.5 Acoustic vehicle alarm system (AVAS) .....	33
1.5.6 High-voltage vehicle systems .....	33
<b>1.6 Conversion type .....</b>	<b>35</b>
1.6.1 Order codes .....	35
1.6.2 Conversion type – reference tables .....	38

1.7 Conversion – homologation .....	42
1.8 Electromagnetic compatibility (EMC) .....	43
1.8.1 Permitted aerial positions.....	45
1.9 Guidelines for the working cycle of the vehicle .....	46
1.9.1 Driving and operating characteristics of the vehicle .....	46
1.10 Directive on end-of-life vehicles (ELV) .....	47
1.11 Jacking up and lifting .....	48
1.11.1 Lifting with a jack.....	48
1.11.2 Lifting with a lifting platform .....	49
1.12 Noise, vibration, harshness (NVH).....	54
1.13 Vehicle transport aids and the storage of vehicles.....	55
1.14 Assemblies and ergonomics .....	58
1.14.1 General guidelines for assemblies .....	58
1.14.2 Driver’s operating area .....	58
1.14.3 Driver’s field of vision .....	58
1.14.4 Effect of the conversion on parking aids.....	59
1.14.5 Aids for getting in and out of the vehicle.....	59
1.14.6 Skid plate at front, rear and sides .....	60
1.14.7 Input values for calculation according to Worldwide Harmonized Light Vehicles Test Procedure (WLTP) .....	60
1.14.8 Table of vehicle dimensions .....	61
1.14.9 Dimensions for recommended main load areas.....	62
1.14.10 Vehicles with roof-mounted equipment.....	63
1.15 Hardware.....	65
1.16 Load distribution .....	66
1.16.1 Load distribution .....	66
1.16.2 Centre of gravity position .....	67
1.16.3 Test procedure for the height of the centre of gravity .....	68
1.16.4 Calculation of the height of the centre of gravity .....	70
1.16.5 Formulas .....	71
1.17 Towing.....	72
1.17.1 Ball coupling – requirements.....	72
1.17.2 Models with ball couplings (for EU).....	72
2 Running gear .....	76
2.1 Suspension system .....	76
2.2 Front suspension .....	77
2.2.1 Springs and spring suspension .....	77
2.3 Rear suspension.....	79
2.3.1 Springs and spring suspension .....	79
2.4 Wheels and tyres .....	81
2.4.1 Wheel clearance .....	81
2.4.2 Tyre manufacturers .....	81
2.4.3 Tyre Pressure Monitoring System (TPMS) .....	82
2.4.4 Spare wheel.....	82
2.4.5 Temporary repair kit.....	82
2.4.6 Painting of wheels .....	83
2.5 Brake system .....	84
2.5.1 General information .....	84
2.5.2 Kerb weight – data .....	85
2.5.3 Brake hoses – general information.....	86
2.5.4 Parking brake .....	86

2.5.5 Hydraulic brake – front and rear brakes .....	87
2.5.6 Anti-Lock Brake System – Electronic Stability Control.....	87
<b>3 Drive train .....</b>	<b>88</b>
3.1 Motor/electric drive .....	88
3.1.1 Selection of motor/electric drive for conversions .....	88
3.1.2 Motor/drive types .....	89
3.2 Engine cooling .....	90
3.2.1 Auxiliary heating systems .....	90
3.2.2 Fuel-operated auxiliary heaters .....	92
3.2.3 Restrictions to the air flow.....	92
3.3 Power take-off system.....	93
3.3.1 Auxiliary drive units.....	93
3.4 Automatic gearboxes.....	97
3.5 Clutch .....	98
3.6 Manual gearbox.....	99
3.7 Exhaust system.....	100
3.7.1 Extensions and optional exhaust systems .....	100
3.7.2 Exhaust pipes and brackets.....	102
3.7.3 Exhaust heat shields .....	102
3.7.4 Diesel particulate filter (DPF) .....	102
3.7.5 Manual initiation of regeneration (PR number 9HC).....	103
3.8 Fuel system.....	104
3.9 High-voltage system and electrified drive train .....	108
3.9.1 High-voltage system – health and safety information .....	108
3.9.2 Overview of the high-voltage system .....	111
3.9.3 De-energising the high-voltage system .....	114
3.9.4 Cooling of the high-voltage system .....	114
3.9.5 High-voltage battery.....	114
3.9.6 EV charging.....	117
<b>4 Electronics .....</b>	<b>118</b>
4.1 Overview of the electrical system .....	118
4.1.1 Changes to electrical architecture and functions .....	119
4.2 Instructions for cable installation and routing .....	121
4.2.1 Information on wiring harnesses.....	121
4.2.2 General information on wiring and routing .....	121
4.2.3 Arrangement of the output pins .....	122
4.2.4 Unused connectors .....	123
4.2.5 Earth connection .....	123
4.2.6 Prevention of squeaking and rattling .....	124
4.2.7 Prevention of water ingress .....	124
4.2.8 Splicing of wiring harnesses .....	124
4.2.9 Wiring specification .....	125
4.2.10 Electromagnetic compatibility (EMC) .....	126
4.2.11 Cable routing through plates.....	126
4.2.12 Drill protection zones – HV cable .....	128
4.2.13 Drill protection zones – HV modules, LV cables and connectors.....	131
4.2.14 No-drilling zones – earth connection.....	133
4.2.15 No-drilling zones – chassis earth .....	135
4.2.16 No-drilling zones – load compartment .....	137
4.2.17 Wiring harness for electrical system for ball coupling (PR number 1M5) .....	140



4.2.18 Electrical system for ball coupling .....	141
4.2.19 Ball coupling connectivity .....	142
4.2.20 Ball coupling connectivity (EU) .....	144
4.2.21 Ball coupling connectivity (Australia and New Zealand) .....	145
4.3 Communication network .....	146
4.3.1 CAN bus – system description and interface.....	146
4.3.2 Onboard supply control unit (BCM).....	150
4.4 Charging system .....	153
4.4.1 General information .....	153
4.4.2 Layout of the battery charging system .....	154
4.4.3 Smart regenerative charging (SRC) .....	157
4.4.4 SRC override .....	157
4.4.5 Retrofit High Performance mode .....	158
4.4.6 Check function.....	160
4.4.7 Guidelines on charge balancing.....	161
4.4.8 Circuit diagrams.....	162
4.4.9 Alternator features .....	162
4.5 Battery systems .....	165
4.5.1 Recommendations for connectivity and power consumption .....	166
4.5.2 Supply and earth connections for high-voltage circuits .....	169
4.5.3 Guidelines for the conversion of vehicles .....	170
4.5.4 Battery options.....	178
4.5.5 Battery rules.....	179
4.5.6 Battery configurations .....	180
4.5.7 Batteries of other manufacturers installed by the converter .....	181
4.5.8 Retrofitted +12-V power connections for loads over 200 A .....	183
4.5.9 Battery monitoring sensor (BMS) .....	186
4.5.10 Single and dual battery systems.....	187
4.5.11 Additional loads and charging systems.....	188
4.6 Battery protection .....	190
4.6.1 Interior lights and 12-V sockets.....	190
4.6.2 Standard battery monitoring (SBG) and load shedding.....	190
4.6.3 Power connections .....	191
4.6.4 How SBG and load shedding work.....	193
4.7 Interior air conditioning .....	196
4.7.1 Front interior air conditioning system .....	197
4.7.2 Rear interior air conditioning system .....	198
4.8 Instrument cluster (IPC) .....	199
4.9 Horn .....	200
4.10 Engine management system .....	201
4.10.1 Starting and starting with a warm engine.....	201
4.10.2 Start/stop system .....	202
4.10.3 Engine speed controller (PR number US2) system overview .....	204
4.10.4 Diesel particulate filter (DPF) and idling speed control .....	212
4.11 Tachograph.....	213
4.11.1 Legal regulations.....	213
4.11.2 Subsequent installation of tachograph and DSRC .....	214
4.11.3 Calibration and subsequent installation of the tachograph .....	216
4.12 Information and entertainment system .....	218
4.12.1 Package overview for audio main units (AHU) – multimedia entertainment system (ICE) .....	218

4.12.2 SYNC radio and SYNC radio with DAB .....	218
4.12.3 Reversing camera .....	220
4.12.4 Additional loudspeakers .....	223
4.13 Mobile phone .....	224
4.14 Exterior lighting .....	225
4.14.1 Reversing lights .....	225
4.14.2 Lights – front and rear fog lights.....	225
4.14.3 Load of the lighting system .....	226
4.14.4 Lights – warning lights / turn signals .....	226
4.14.5 Electrically operated exterior mirrors.....	226
4.14.6 Additional exterior lights .....	226
4.15 Interior lighting.....	227
4.15.1 Additional interior lights .....	227
4.15.2 Additional lighting for the rear interior .....	228
4.16 Emergency call systems.....	229
4.16.1 Routing the GNSS/5G aerial .....	230
4.17 Adaptive cruise control system .....	233
4.18 Blind Spot Information System (BLIS).....	235
4.19 Camera on the windscreen .....	237
4.20 Automatic wiper and headlight control for vehicles with large overhangs .....	238
4.21 Handles, locks, locking elements and access systems .....	240
4.21.1 Door – removal or modification .....	240
4.21.2 Central locking.....	242
4.21.3 Rear lid remote release / Tyre Pressure Monitoring System receiver (RKE/TPMS receiver).....	243
4.21.4 Aerials for keyless entry and keyless start (PEPS) .....	246
4.22 Fuses .....	247
4.22.1 Windscreen wipers .....	247
4.23 Connectors and connections .....	248
4.23.1 General information .....	248
4.23.2 External power supply point (CCP).....	249
4.23.3 Supply and earth connections for high-voltage circuits.....	251
4.23.4 Vehicle interface connector – technical data for planning .....	252
4.23.5 Intelligent interface for additional power tap incl. fuse (ISL) (PR no. VH2/VH3) .....	255
4.23.6 Functions of the battery monitor – fuse box .....	261
4.23.7 Additional vehicle signals/characteristics.....	265
4.24 DC/AC converter (inverter) 230 V (PPOB) .....	266
4.25 Earth connection.....	268
4.25.1 Earth connections .....	268
4.26 Acoustic vehicle alarm system (AVAS) .....	275
5. Body and paintwork .....	276
5.1 Body .....	276
5.1.1 Body design – general information .....	276
5.1.2 Welding.....	278
5.1.3 Parts made of boron steel.....	280
5.1.4 No-drilling zones on the floor: Transporter panel van with diesel engine .....	281
5.1.5 No-drilling / no-welding zones on the floor – BEV/PHEV .....	284
5.1.6 Transporter panel van – floor drilling – BEV/PHEV .....	287
5.1.7 Integrity of the front section for cooling, crumple zone, aerodynamics and lighting .....	288
5.2 Hydraulic lifting device .....	289
5.3 Shelf systems.....	293

5.4 Load compartment .....	295
5.4.1 Load compartment cargo securing devices.....	295
5.5 Interior partitions .....	297
5.5.1 Partition(s) – driver and passenger protection for Transporter panel van, Caravelle and window van .....	297
5.5.2 Partitions: motion sensors for anti-theft alarm .....	299
5.6 Body openings.....	301
5.6.1 Security, anti-theft system and catch .....	301
5.7 Interior equipment .....	305
5.7.1 Load compartment interior lighting .....	305
5.7.2 Plywood panelling/cladding.....	306
5.7.3 Side ventilation openings on the body .....	306
5.7.4 Floor specification for campers (BEV/PHEV variants only) .....	309
5.8 seats.....	310
5.8.1 Transporter panel van .....	310
5.8.2 Heated seats.....	310
5.8.3 Mounting positions for rear seats .....	310
5.9 Glass, frames and mechanisms .....	314
5.9.1 Heated windscreen and heated rear window .....	314
5.9.2 Rear and side windows .....	314
5.10 Airbag – Safety Restraint System (SRS).....	316
5.10.1 Airbags .....	316
5.11 Seat belt systems .....	322
5.11.1 Seat belts.....	322
5.11.2 No-drilling zone – B-pillar.....	323
5.11.3 Seat belt warning system .....	325
5.11.4 Wireless seat belt warning system .....	326
5.12 Roof.....	328
5.12.1 Roof ventilation .....	328
5.12.2 Roof carrier.....	329
5.12.3 Pop-up roof conversion.....	330
5.13 Corrosion protection measures .....	331
5.13.1 General information .....	331
5.13.2 Repair paint damage.....	331
5.13.3 Underseal and materials .....	331
5.13.4 Paint road wheels .....	332
5.13.5 Contact corrosion .....	332
5.14 Frame and structure .....	333
5.14.1 Mounting points and pipes .....	333
5.14.2 Drilling on the frame and reinforcing tubes.....	333
5.14.3 Water tank for campers .....	334
6 Homologation.....	335
6.1 Notes on the ISC parameters for conversions and modifications .....	335
7 List of changes .....	338

# List of abbreviations

AEIS.....	Auto Engine Idle Shutdown
AVAS .....	Acoustic Vehicle Alarm System
BCM .....	Body Control Module (central onboard supply control unit)
BEV .....	Battery Electric Vehicle
BLIS .....	Blind Spot Information System
CCP.....	Customer Connect Point
CoC.....	Certificate of Conformity
CSM.....	Combined Sensor Module
DPF .....	Diesel Particulate Filter
DSRC .....	Dedicated Short Range Communication
EFB.....	Enhanced Flooded Battery
EMC .....	Electromagnetic compatibility
EPAS.....	Electric Power Assist Steering
erWin .....	Electronic repair and workshop information from Volkswagen AG
FWD .....	Front-Wheel Drive
GNSS .....	Global Navigation Satellite System
GSM .....	Global System for Mobile Telecommunications
HEV .....	Hybrid Electric Vehicle
HVAC.....	Heating, Ventilation and Air Conditioning
IPDB .....	Instrument Panel Power Distribution Box
ISL .....	Intelligent interface with power tap (intelligent interface for additional power tap including fuse)
ODIS.....	Offboard Diagnostic Information System
PBG .....	Programmable battery monitoring function
PCM .....	Powertrain Control Module (engine control unit)
PEC.....	Battery Monitoring Sensor
PEPS.....	Passive Entry Passive Start
PHEV .....	Plug-in Hybrid Electric Vehicle
PPOB .....	Pro Power On Board (DC/AC converter for 230 V)
PTO .....	Power Take Off
PWM .....	Pulse Width Modulation
SBG .....	Standard Battery Guard
SFB.....	Smart Fuse Box
SoC.....	State of Charge
SRC.....	Short Range Communication
SYNC .....	Navigation, Communication and Entertainment System
UN ECE .....	United Nations Economic Commission for Europe
UPDB.....	Underhood Power Distribution Box
WLTP.....	Worldwide Harmonized Light-Duty Vehicles Test Procedure

# 1 General information

## 1.1 Introduction

These converter guidelines provide converters with important technical information which must be complied with when planning and manufacturing a body for road safety and operational reliability. The add-on, body, installation or conversion work required for this is referred to below as “body activities”.

Due to the vast number of converters and types of bodies, it is not possible for Volkswagen AG to predict all possible modifications which can occur due to the body activities, e.g. with regard to vehicle handling, stability, weight distribution, centre of gravity of the vehicle and its handling characteristics. Therefore, Volkswagen AG does not accept any liability for accidents or injuries arising from modifications of this kind made to its vehicles, especially if the changes have a negative effect on the vehicle as a whole. As a result, Volkswagen AG only accepts liability for its own design, production and instruction services. The converter itself is obliged to ensure that its body activities are not faulty in themselves, and also that they cannot result in faults or dangers on the vehicle as a whole. The Converter must also ensure the conformity of the body activities with the respective and applicable laws (in particular approval and registration processes). The Converter itself is liable in the event that this obligation is violated.

These converter guidelines are intended for professional converters. As a result, these converter guidelines assume corresponding background knowledge. Note that some work (e.g. welding on load-bearing parts) is only allowed to be performed by appropriately qualified personnel. This requirement exists in order to avoid risks of injury and to achieve the quality needed in the body activities.

### 1.1.1 Concept of this Owner's Manual

The following converter guidelines are divided into 6 chapters so that you can find information rapidly:

1. Introduction
2. Running gear
3. Drive train
4. Electronics
5. Body and paintwork
6. List of changes

#### Information

For more information, see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.2 “Converter guidelines, consulting”](#).

The limit values selected in [chapter 1.3 “Planning bodies”](#) must be complied with and must be used as the basis for planning.

### 1.1.2 Means of representation

The following means of representation are used in these converter guidelines:

#### Warning note

A danger note draws your attention to possible accident or injury risks to which you or other persons might be exposed.

#### Environmental note

An environmental note provides you with information about environmental protection.

#### Practical note

This note draws your attention to the risk of possible damage to the vehicle, as well as to regulations and provisions to be observed.

#### Information

This note indicates additional information.

### 1.1.3 Vehicle safety

#### Warning note

Before assembling external bodies or power units, it is essential that you read the chapters in these converter guidelines that are related to installation, as well as corresponding chapters in the instructions and information for the suppliers' power units and in the detailed Owner's Manual for the basic vehicle. Otherwise you will not be able to recognise dangers, and might expose yourself or others to danger.

We recommend that you use parts, power units, conversion parts or accessories that have been tested by Volkswagen AG for the corresponding vehicle type. Have the vehicle's safety checked immediately if non-recommended parts, power units, conversion parts or accessories are used.

**Warning note**

Special safety notes must be observed when working on electric vehicles. Failure to observe safety notes can result in a fatal electric shock.

**Information**

The required safety notes can be requested. Please contact us (see [chapter 1.2.1 “Product and vehicle information for Converter”](#)).

**Practical note**

It is essential that you comply with European vehicle approval or UNECE R regulations, as well as national registration regulations and also technical vehicle regulations. This is because body activities on the vehicle can alter the vehicle type under registration regulations and the operating permit may be invalidated.

This applies in particular to:

- Modifications which change the vehicle type approved in the operating permit
- modifications which might be expected to endanger road users or
- modifications which impair the exhaust or noise emissions characteristics

#### 1.1.4 Operational safety

##### Warning note

Incorrect interventions in electronic components and their software may result in these no longer functioning. Due to the networking of electronics, systems that were not modified can be affected.

Malfunctions to the electronics can significantly impair the operational safety of the vehicle.

Have work on or modifications to electronic components performed by a qualified specialist workshop which has the necessary specialist knowledge and tools for performing the necessary work.

Volkswagen AG recommends a Volkswagen AG customer service workshop for this purpose.

Service by a qualified specialist workshop is essential, in particular for safety-relevant work and work on safety-relevant systems.

Some safety systems only operate when the engine is running. Therefore, do not switch the engine off when driving.

#### 1.1.5 Note on copyright

The texts, pictures and data contained in these converter guidelines are subject to copyright.

This also applies to editions on CD-ROM, DVD or other media.



## 1.2 General information

The following pages contain technical guidelines for converters and equipment fitters on the design and assembly of bodies. The converter guidelines must be strictly adhered to when performing any modifications to the vehicle. The current version of the German edition of the converter guidelines is the exclusive authority for the most up-to-date information.

This also applies to legal claims. Should the converter guidelines include references to legal regulations, then no guarantee can be provided for the completeness and correctness of this content, or that it is up-to-date. Country-specific features can vary.

### 1.2.1 Product and vehicle information for converter

#### 1.2.1.1 Contact in Germany

If you have questions concerning vehicle models from Volkswagen Commercial Vehicles, you can contact us via the internet portals of Volkswagen AG ([www.customized-solution.com](http://www.customized-solution.com)) or via one of the following methods:

<b>Free hotline (from a German landline)</b>	00 800-2878 66 49 33 (00 800-CUSTOMIZED)
<b>Contact (email)</b>	<a href="mailto:customizedsolution@volkswagen.de">customizedsolution@volkswagen.de</a>
<b>Personal contacts</b>	<a href="https://www.customized-solution.com/de/de/service-informationen/kundenbetreuung">https://www.customized-solution.com/de/de/service-informationen/kundenbetreuung</a>

#### 1.2.1.2 International contact

Please contact the converter's support personnel at the responsible importer for technical advice relating to Volkswagen Commercial Vehicles models and as a point of contact for conversions.

To find the contact person responsible for you, please register on the Volkswagen AG Customized Solution portal (<https://www.customized-solution.com>).

Help is available for the registration option using the "Help" menu option.

<b>International hotline</b>	00-800-2878 66 49 33 (00-800-CUSTOMIZED)
<b>Email</b>	<a href="mailto:customizedsolution@volkswagen.de">customizedsolution@volkswagen.de</a>
<b>Personal contacts</b>	<a href="https://www.customized-solution.com/en/en/service-information/customer-care">https://www.customized-solution.com/en/en/service-information/customer-care</a>

### 1.2.1.3 Electronic repair and workshop information from Volkswagen AG (erWin\*)

Converter can access repair and workshop information, e.g.:

- Current flow diagrams
- Workshop Manuals
- Maintenance
- Self-study Programmes

via the Electronic Repair and Workshop Information System from Volkswagen AG (erWin\*).

<https://volkswagen.erwin-store.com/erwin/showHome.do>

Converter with Integrated or PremiumPartner status are eligible for discounted annual licences that can be requested in the Customized Solution portal under My Customized Solution portal/Requirements/Planning and Development.

Converters in export with the Partner status receive information in this regard from their point of contact at the importer.

\*Information system, subject to payment

### 1.2.1.4 Genuine Parts Online Ordering Portal\*

For the purchase of spare parts and for the research of Volkswagen Genuine Parts, our latest parts catalogues are available on the Internet in the “Genuine Parts Online Ordering Portal”:

<http://www.partslink24.com>

\*Information system, subject to payment

### 1.2.1.5 Online Owner’s Manual

Detailed information about the functions and handling of your vehicle can be found in your Owner’s Manual which is enclosed with your vehicle ex-works. In addition to the hard copy of the Owner’s Manual, the following link and VIN number of the vehicle can be used to receive the Owner’s Manual in electronic form.

[https://userguide.volkswagen.de/public/vin/login/de\\_DE](https://userguide.volkswagen.de/public/vin/login/de_DE)

### 1.2.1.6 European Type Approval (ETA) and EC Certificate of Conformity (CoC)

Directive (EU) 2018/858 of the European Parliament establishes the standard for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles.

Provisions were also adopted in these guidelines for the approval of vehicles produced in several stages: the multi-stage approval process. Accordingly, each manufacturer involved in the construction of a vehicle is itself responsible for the approval of modified or added scopes in its production stage.

The manufacturer may choose one of the four following methods:

- EU type approval (ETA)
- EU type approval for small series
- National small series type approval
- Individual approval

CoC = Certificate of Conformity. A document that verifies the conformity of certain goods – and therefore also of vehicles and bodies – in accordance with the recognised (international) standards. The purpose of this EC Certificate of Conformity is to facilitate the approval of goods on international markets. As a result, the document is needed above all in import and export as part of the customs clearance procedure.

The manufacturer, the owner of an EU type approval or EU small series type approval, is obliged to provide a Certificate of Conformity with every vehicle which corresponds to an approved type. If you are planning to apply multi-stage type approval, an agreement must be concluded in accordance with the 2018/858/EU regulation.

#### 1.2.1.7 Worldwide Harmonized Light-Duty Vehicles Test Procedure (WLTP)

New consumption values/ranges calculated in accordance with the new WLTP standards apply from September 2017 for new passenger cars entering the market and from September 2018 for new light commercial vehicles entering the market.

As of 1 September 2018, certified WLTP measurements must be available for all newly registered passenger cars. The rule enters into force for larger light commercial vehicles one year later on 1 September 2019. 28+6 markets in Europe are affected by the WLTP.

WLTP stands for Worldwide Harmonised Light-Duty Vehicles Test Procedure. This is a worldwide standardised testing procedure for determining fuel consumption/electric range and exhaust emissions.

It is replacing the NEDC (New European Driving Cycle) test procedure that has been in force since 1992.

Unlike the NEDC, the WLTP takes into account individual special equipment and conversion solutions for weight, aerodynamics, electrical system requirements (no-load current) and rolling resistance which have an impact on the fuel consumption/electric range and exhaust emissions. This includes, in particular, modifications that result in a larger end face, a different radiator inflow area, a higher kerb weight for the vehicle or changes to the tyre size or the rolling resistance. Special equipment that consumes power, such as the air conditioning system or seat heating, still remains switched off for the duration of the test procedure.

Before initial approval, conversions or add-ons where WLTP is relevant can be made if they are approved by way of an individual approval or multi-stage type approval.

The Volkswagen type approval can be used for the multi-stage type approval for vehicles with conversions or add-ons that remain within the ISC parameters/maximum technical specifications for bodies. If the body or conversion is outside the ISC parameters/maximum technical specifications defined by the manufacturer for bodies, the converter must demonstrate compliance with the exhaust gas emissions requirements/electric range.

Information about the ISC parameters/maximum technical specifications for add-on parts can be found on the Volkswagen CustomizedSolution portal. Please ask your technical service/test centre for advice if you have questions about alternatives.

To determine the consumption values of converted new vehicles in compliance with the WLTP procedure and to obtain a WLTP certification, the "WLTP Conversion Calculator" is available to you.

You can find more information as a Registered Converter on the Customized Solution portal/WLTP:

Germany/International: <https://www.customized-solution.com>

### 1.2.1.8 Notes on homologation of modifications and conversions

#### Amendments to legislation from 1 January 2022 Regulation (EU) 2018/858 EU and national (Art. 44 and Art. 45)

Affected: vehicle classes M1 and N1

For complete vehicles completed ex works at the OEM, the following applies:

Complete vehicles that have been modified with add-ons/conversions after completion at the OEM plant and before initial registration must resubmit CO<sub>2</sub>/consumption values for the second stage.

These can be identified using the WLTP Conversion Calculator in accordance with the available homologations. Options for calculating weight and/or aerodynamic changes are available. If individual values are not available for the respective conversion, it is possible to apply for homologation in consultation with the technical service and the regulatory authorities.

The vehicles are available ex works with full CoC\* and light-duty approval in accordance with WLTP. The maximum permissible mass after the conversion can be determined using the WLTP Conversion Calculator. Valid for the approved drive versions (see offer for countries). The values for the maximum vehicle weights depend on the drive/equipment combination of the basic vehicle and the conversion type.

#### Information

For all vehicles/engine-gearbox versions for which no values can currently be generated using the WLTP Conversion Calculator, please contact your responsible technical service and check whether multi-stage type approval is possible.

### 1.2.1.9 Manufacturer's declaration

We issue a manufacturer's declaration for the basic vehicle for the following scopes:

- Load increases and reductions
- Electromagnetic compatibility (EMC)
- Dangerous goods transport ADR 2017 for vehicles EX/II (explosive substances)

Please contact our customer support:

[nutzfahrzeuge@volkswagen.de](mailto:nutzfahrzeuge@volkswagen.de)

### 1.2.2 Converter guidelines, consulting

The converter guidelines define the requirements for converters/equipment fitters for construction and assembly of custom body-related parts and conversions for Volkswagen Commercial Vehicles.

The converter guidelines must be strictly adhered to when performing any modifications to the vehicle.

The statutory requirements, technical vehicle regulations and guidelines stated in the Directive are not comprehensive. When making modifications to vehicles, all applicable statutory requirements and all technical vehicle regulations and guidelines must be observed. The work safety regulations of the trade association and the Machinery Directive must be observed.

Ensure that no modification adversely affects the functional reliability and safety of the running gear, the body or the electric system. Modifications must only be performed by qualified specialists and in accordance with the generally acknowledged rules of the automotive industry.

Prerequisites for modifications to used vehicles:

The vehicle shall be in a good overall condition, i.e. structural parts such as longitudinal and cross members, pillars etc. shall not be corroded to such an extent that structural stability might be adversely affected.

Vehicles whose modifications might affect the validity of the general certificate of roadworthiness must be presented to an authorised testing centre for approval. It is recommended to clarify in advance with the relevant authority whether approval is required. Please contact us in case of inquiries for proposed modifications.

When inquiring about planned modifications, please enclose two sets of design drawings of the complete scope of the modification, including weights, centre of gravity and dimensions, which also clearly show how the body is attached to the chassis. Please also provide information about the intended operating conditions of the vehicle.

If bodies comply with the present converter guidelines, no additional approval by Volkswagen AG is required for the presentation of the vehicle at the relevant authority examining roadworthiness.

#### 1.2.2.1 Letter of non-objection

Volkswagen AG does not issue body approvals for non-Volkswagen bodies. It merely provides converters with important information and technical specifications for dealing with the product in these guidelines. As a result, Volkswagen AG recommends that all work should be carried out on the basic vehicle and the body in accordance with the current Volkswagen converter guidelines applicable to the vehicle in question.

Volkswagen AG does not recommend body activities which

- are not conducted according to these Volkswagen converter guidelines
- exceed the gross vehicle weight rating
- exceed the gross axle weight rating

Volkswagen AG issues letters of non-objection on a voluntary basis, as follows:

The assessment conducted by Volkswagen AG is exclusively based on the documents submitted by the converter who is carrying out the modifications. Only the expressly designated scopes are tested and ensured and essentially compatible.

The safety certificate relates to the presented whole vehicle, and not

- To the design of the overall body,
- Its functions or
- The planned use.

Non-objection is only possible if the design, production and assembly are carried out by the converter performing the modifications in accordance with the current technology and in compliance with the applicable converter guidelines of Volkswagen AG – and assuming any deviations from these guidelines have been declared to be technically safe. The letter of non-objection does not release the Converter who is performing the modifications from its responsibility for the product, or from its obligation to carry out its own calculations, tests and a trial of the whole vehicle in order to ensure that the operational safety, road safety and driving properties of the whole vehicle it has manufactured are acceptable. Accordingly, it is necessary to ensure that the Converter exclusively accepts its responsibility for ensuring that its body activities are compatible with the basic vehicle as well as the operational and road safety of the vehicle. It is expressly stated that the letter of non-objection from Volkswagen AG does not represent a technical approval for the investigated changes.

In the course of assessment of a presented vehicle, an assessment report is written as a means of obtaining a letter of non-objection (LONO report).

The following assessment results are possible:

- Classified as “safe”  
If the whole vehicle is classified as “safe”, the Sales department can subsequently issue the LONO certificate.
- Classified as “not safe”  
Classification as “not safe” in the individual categories:
  - + Basic vehicle configuration
  - + Impairment of the basic vehicle and possibly
  - + Sole body item
 leads to a corresponding classification of the whole vehicle. This means no LONO certificate can be issued initially.

In order for a not-safe classification to be resolved, the LONO report states the necessary modification for each item in question. In order for the letter of non-objection to be obtained, these points will have to be addressed by the converter and documented in a clearly comprehensible manner in a report along the same lines as the LONO report. On the basis of this detailed report, it is possible for the desk-review assessment to be completed with a positive result.

Depending on the defective points, it may be necessary not only to provide documentation of the defect resolution but also for the vehicle from the first inspection to be presented again. The first report indicates if it will be necessary for a new assessment to be carried out on the vehicle.

The assessment report may also contain “notes/recommendations”.

Notes/recommendations are technical remarks which do not have any effect on the letter of non-objection. They should be regarded as advice and suggestions for further consideration to support the continuous improvement of the final product for the customer.

In addition, “notes/recommendations solely relating to the conversion” can also be formulated. The notes and recommendations stated as “solely relating to the body/conversion” must be dealt with and documented before the vehicle can be included in the Converter portal.

#### Practical note

Country-specific laws, directives and approval regulations shall be observed!

### 1.2.2.2 Application for the letter of non-objection

Before starting any work on the vehicle, auditable technical documentation and drawings must be submitted to the responsible department as part of the letter of non-objection evaluation (see 1.2.1 “Product and vehicle information for Converter”).

Speedy handling of the request requires:

- Documents preferably in standardised digital formats (e.g. PDF, DXF, STEP)
- Technical data and documentation should be complete

The following details must be included:

- Vehicle type
  - + Vehicle design
  - + Wheelbase
  - + Frame overhang
- Vehicle identification number (if already available)
- Any deviations from these converter guidelines must be indicated on all documentation.
- Axle load calculation
- All data about dimensions, weight and centre of gravity (weighing certificate)
- Special operating conditions (e.g. poor road conditions, extreme dust, high altitude, or ambient temperature extremes)
- Certificates (e-registration, seat tensile test)
- Attachment of the body on the vehicle
- Type of fixation for the body or add-ons to the vehicle frame (e.g. bolted connections)
  - + Positioning
  - + Type
  - + Size
  - + Number
  - + Property class
- Type of fixation for the body or add-ons to the vehicle frame (bolting, bonding, welding)
- Photographic documentation of the conversion
- All documents must clearly correlate with the conversion (e.g. drawings marked with allocated numbers)
- General (functional) description of deviations from the production vehicle, or added components
- Electric wiring diagram
  - + Details of the consumption of additional electrical equipment

Complete documentation avoids the need for clarification queries and accelerates the processing.

### 1.2.2.3 Legal entitlements

- There is no legal entitlement for a letter of non-objection to be issued
- Due to ongoing technical development and the information derived from this, Volkswagen AG is entitled to refuse a letter of non-objection even if a comparable certificate had been issued formerly
- The letter of non-objection can be restricted to individual vehicles
- The subsequent issue of a letter of non-objection may be refused for vehicles that have already been completed or delivered
- The converter is solely responsible for:
  - + The function and compatibility of its body activities with the basic vehicle
  - + Road safety and operational reliability
  - + All body building activities and installed parts

### 1.2.3 Warranty and product liability of the converter

UN ECE Regulation No. 155 for vehicle cyber security and UN ECE Regulation No. 156 for vehicle software updates apply to all new vehicle types from the middle of 2022 and to all new vehicle registrations from the middle of 2024; these contain new requirements for automotive cyber security and updates.

Insofar as modifications are made to the vehicle, the Converter shall also ensure that these regulations are applied and complied with. The converter's or equipment fitter's warranty conditions apply to the converter's or equipment fitter's scope of supply. Therefore, warranty claims associated with complaints to this scope of supply cannot be made under the warranty conditions applicable to Volkswagen Commercial Vehicles.

Defects of bodies, installations and equipping provided by third parties as well as defects of the vehicle caused by the said bodies, installations or conversions are excluded from the Volkswagen warranty and also from the Volkswagen paint and body warranty. This also applies to accessories which were not installed and/or supplied by the vehicle manufacturer.

The converter or equipment fitter is solely responsible for the design and assembly of bodies and the execution of conversions.

All modifications must be documented by the converter or equipment fitter.

The converter is responsible for ensuring that all modifications it performs comply with the technical vehicle regulations, specifications and standards that apply in the countries of registration.

Due to the multitude of modifications and diversity of operating conditions, the information provided by Volkswagen AG is subject to the reservation that modified vehicles are not tested by Volkswagen AG. Modifications may affect the properties of the vehicle.

For reasons of liability, the converters/equipment fitters must provide the following information in writing to their customers:

"Due to the modifications\* to your Volkswagen Commercial Vehicles basic vehicle, the properties of your basic vehicle may have changed. Please understand that Volkswagen AG does not assume any liability for any negative effects resulting from the modifications\* to the vehicle."

In individual cases, Volkswagen AG reserves the right to demand evidence of the information being passed on to the customer.

No general legal entitlement for the approval of a body modification exists, even if such approval was previously granted.

If bodies comply with the present guidelines, no additional approval by Volkswagen AG is required for the presentation of the vehicle at the relevant authority examining roadworthiness.

\* At this point, the term "modification" may be substituted by a more precise description of the work performed, e.g. by "camping equipment installation", "wheelbase extension".

### 1.2.4 Ensuring traceability

Body dangers only detected after delivery can mean that subsequent measures in the market will be necessary (customer information, warning, call-back). To make these measures as efficient as possible, it is necessary to be able to trace the product after delivery. For this purpose, and in order to be able to use the central vehicle register (CVR) operated by the Federal Motor Transport Authority or comparable registers abroad for tracing the affected vehicle keepers, we strongly recommend that converters should store the serial number / identification number of their body linked to the vehicle identification number (VIN) of the base vehicle in their databases. For this purpose, it is also recommended that customers' addresses are stored and that subsequent owners are provided with a means of registration.

### 1.2.5 Badges

VW badges and VW emblems are trademarks of Volkswagen AG. VW badges and VW emblems are not allowed to be removed without authorisation, or to be attached in a different location.

#### 1.2.5.1 Positions on rear of the vehicle

VW badges and VW emblems which are enclosed in the delivery must be fitted in the location intended by Volkswagen.



### 1.2.5.2 Appearance of whole vehicle

If the vehicle does not correspond to the appearance and the quality requirements set by Volkswagen AG, then Volkswagen AG reserves the right to request removal of the Volkswagen AG trademarks.

### 1.2.5.3 Non-Volkswagen trademarks

Non-Volkswagen badges are not allowed to be attached next to Volkswagen badges.

### 1.2.6 Recommendations for vehicle storage

Extended storage times cannot always be avoided. The following measures are recommended to ensure that vehicle quality is not affected by long-term storage:

#### Carry out the following when the vehicle is delivered:

- Check on a weekly basis for aggressive deposits (e.g. bird droppings, industrial deposits) and clean if necessary
- 12-V battery: determine the SOC and, if necessary, complete the battery care programme (see the instructions “Carry out no later than every three months”)
- High-voltage battery: read the state of charge in the instrument cluster  
If the charging indicator is in the red area. This means:  $\leq 10\%$  or  $< 1/4$  or  $< 50$  km (depending on the display)  
Charge the high-voltage battery until the display shows a maximum of half full
- Set the tyre pressure to 3.4 bar (not the spare wheel)
- Open all front vents in the dash panel, set the blower to maximum and run for one minute
- Remove any paper and other objects from the storage compartments and surfaces in the vehicle interior (dash panel, seats, luggage space) except for items that serve to protect the surfaces
- If fitted, roll in the luggage compartment cover and the sun blinds
- In addition, for new vehicles: Correct the position of the transport protective hoods if necessary
- Record the date of delivery as a reference for all vehicle care measures

#### Carry out after no longer than six weeks:

- For vehicles stored without a solar panel:  
Battery care programme (see “Carry out after no longer than three months”)  
Do not disconnect the battery to do so!

#### Carry out after no longer than three months:

- Remove rust from brake disc  
When storing vehicles without solar panels: complete the battery care programme  
Do not disconnect the battery to do so!
- No battery status display in the dash panel insert:  
Measure the open-circuit voltage of the 12 V battery two hours after the last electrical equipment was active
  - a) At an open-circuit voltage between 11.6 V and 12.5 V: Fully charge immediately
  - b) If the open-circuit voltage is  $< 11.6$  V: Mark and fully charge the defective battery
- The totally discharged battery must be replaced before the vehicle is handed over to the customer

#### Practical note

To determine the exact residual capacity of the 12 V battery, please proceed in accordance with the test conditions in the Workshop Manual.

**Carry out after no longer than six months:**

- For vehicles stored with a solar panel:  
Carry out the battery maintenance programme (see “Carry out after no longer than three months”)  
Do not disconnect the battery!

**Information**

You can find further information about vehicle storage in the following documents:

- Owner’s Manual
- Vehicle care programme

**1.2.7 Compliance with environmental rules and regulations****Environmental note**

The following principles of environmentally friendly design and material selection should be followed right from the planning stage of add-ons or bodies, and the statutory requirements in the EU Directive on End-of-Life Vehicles 2000/53/EC should also be taken into account.

The converter is responsible for ensuring that all modifications it performs comply with the environmental regulations, specifications and standards that apply in the countries of registration and sale. These may go beyond the existing prerequisites of the basic vehicle and are the responsibility of the converter.

The converter must ensure that add-ons and bodies (conversions) comply with all applicable environmental rules and regulations, especially, but not only, EU directive 2000/53/EC concerning end-of-life vehicles and the REACH Regulation (EC) 1907/2006 relating to restrictions on the marketing and use of certain dangerous substances and preparations (“low flammability” and certain flame-retardant agents).

The registered keeper must keep all assembly documentation concerning the modification and hand it over together with the vehicle to the dismantler. This ensures that modified vehicles are processed in compliance with environmental rules and regulations at the end of their life cycle.

Materials which represent a potential risk such as halogen additives, heavy metals, asbestos, CFCs and chlorinated hydrocarbons shall be avoided.

- EU Directive 2000/53/EC must be adhered to
- Preferably, materials which allow valuable substance recycling and closed material cycles shall be used
- The material and production process shall be selected so that only low amounts of easily recyclable waste are generated
- Plastics shall only be used where these offer advantages in terms of cost, function or weight
- In the case of plastics, especially composite materials, only mutually compatible substances from one material family may be used
- With regard to components that are relevant for recycling, the number of plastic types used shall be kept as low as possible
- It is necessary to check whether a component can be manufactured from recycled material or with recycled additives
- Care shall be taken to ensure that recyclable components can be removed easily, e.g. by means of snap-lock connections, predetermined breaking points, good accessibility, use of standard tools

- Simple, environmentally friendly removal of the fluids shall be ensured by means of drain plugs etc.
- Wherever possible, the components shall not be painted or coated; instead, dyed plastic parts shall be used
- Components in areas at risk of accident shall be designed to be tolerant of damage, repairable and easy to exchange
- All plastic parts shall be identified according to the VDA material sheet 260 ("Components of motor vehicles; Identification of materials"), e.g. "PP-GF30R"

### 1.2.8 Recommendations for inspection, maintenance and repair

A service schedule outlining inspection and maintenance work must be provided for the modifications performed by the converter or equipment fitter. These instructions or schedules must include the maintenance and inspection intervals as well as the required operating fluids and materials and the spare parts. It is also important to specify parts and components with a limited service life which are to be checked at regular intervals in order to ensure service reliability and timely replacement where required.

This should be supported by a Workshop Manual including tightening torques, setting tolerances and other relevant specifications.

Special tools, including their source of supply, must also be stated.

Converters/equipment fitters must also state which work may only be performed only by themselves or by their authorised workshops.

If the converter's or equipment fitter's scope of supply includes electric, electronic, mechatronic, hydraulic or pneumatic systems, then current flow diagrams and diagnosis routines or similar documentation facilitating a systematic search for faults should be provided.

Please observe the Volkswagen AG Owner's Manual for the inspection, maintenance and repair of the basic vehicle.

Please only use brake fluids and engine oils approved by Volkswagen for your vehicle.

More information about brake fluids and engine oils can be found in the Owner's Manual for your vehicle:

[https://userguide.volkswagen.de/public/vin/login/de\\_DE](https://userguide.volkswagen.de/public/vin/login/de_DE) (see also chapter 1.2.1.5 "Online Owner's Manual").

### 1.2.9 Accident prevention

Converters shall ensure that the bodies comply with applicable legal rules and regulations as well as all regulations regarding work safety and accident prevention. All safety rules and the information material provided by accident insurance providers shall be observed.

All technically feasible measures must be taken to prevent unsafe operation.

Country-specific laws, directives and approval regulations must be observed.

The converter is responsible for the compliance with these laws, rules and regulations.

For further information about commercial freight traffic in the Federal Republic of Germany please contact:

<b>P.O. box address</b>	Berufsgenossenschaft für Fahrzeughaltungen Fachausschuss "Verkehr" Sachgebiet "Fahrzeuge" Ottenser Hauptstrasse 54 D-22765 Hamburg
<b>Telephone</b>	+49 (0) 40 39 80 -0
<b>Fax</b>	+49 (0) 40 39 80-19 99
<b>Email</b>	<a href="mailto:info@bgf.de">info@bgf.de</a>
<b>Home page</b>	<a href="https://www.bg-verkehr.de/">https://www.bg-verkehr.de/</a>

### 1.2.10 Quality system

Worldwide competition, increased quality requirements placed on the overall new Transporter product by customers, national and international product liability legislation, new forms of organisation and increasing pressure on costs mean that effective quality assurance systems are demanded in all areas of the automotive industry. The requirements of a quality management system of this kind are described in DIN EN ISO 9001.

For the reasons stated above, Volkswagen AG strongly recommends that all converters should set up and maintain a quality management system with the following minimum requirements:

Definition of responsibilities and authorisations including organisational plan.

- Description of the processes and procedures
- Appointment of quality management representative
- Performing contract and build feasibility checks
- Performing product checks based on specified instructions
- Regulating the handling of faulty products
- Documentation and archiving of test results
- Ensuring the quality records of employees are up to date
- Systematic monitoring of test equipment
- Systematic material and parts identification
- Performing quality assurance measures at the suppliers
- Ensuring the availability of process, working and test instructions, and that they are up to date, in the departments and in the workplace

## 1.3 Planning bodies

### Practical note

In addition to a user and maintenance friendly design (see [chapter 5.13 “Corrosion protection measures”](#)), the right choice of materials and therefore observance of corrosion protection measures are important during the planning of bodies.

### 1.3.1 Selecting the basic vehicle

The base vehicle needs to be selected carefully to ensure safe usage in the respective field.

When planning, please consider the following for the use in question:

- Wheelbase
- Engine/gearbox
- Final drive ratio
- Gross vehicle weight rating
- Seating version (number and arrangement)
- Electrical equipment (e.g. interior lighting, vehicle battery)

### Practical note

Before carrying out body building or conversion measures, the supplied base vehicle should be checked with regard to the fulfilment of applicable requirements.

You will find more information on the available vehicle versions and body versions in the sales documentation.

### Information

As standard equipment, the vehicles are supplied from the OEM's factory with full type approval (complete CoC paper, PR number 5EA).

For certain versions, the equipment “incomplete vehicle with incomplete CoC for Converter, PR number 5ET” can be delivered.

On the Volkswagen AG homepage, you can put together your vehicle using the configurator and view the special equipment available:

<https://www.volkswagen-nutzfahrzeuge.de/de/modelle.html>

### 1.3.2 Vehicle modifications

Before starting work on the body, the converter should check whether the vehicle is suitable for the planned body.

Build dimension drawings, product information and technical data can be obtained from the responsible department or via the communication system for the planning of bodies (see [chapters 1.2.1.1 “Contact in Germany”](#), [1.2.1.2 “International contact”](#) and [1.2.2 “Converter guidelines, consulting”](#)).

Furthermore, the special equipment available from the factory should be noted (see [chapter 1.4 “Special equipment”](#)).

Vehicles delivered ex works comply with European and national regulations (partially excluding vehicles for non-European countries). Vehicles must comply with European and national regulations even after the modifications have been made.

#### Warning note

Do not modify the steering, brake or drive system!  
Modifications to the steering, brake or drive system can result in these systems no longer working correctly and failing. This may result in the driver losing control of the vehicle and causing an accident.

**Warning note**

The voltage within the high-voltage vehicle electrics and high-voltage battery is life-threatening!

Touching damaged orange-coloured high-voltage wires and high-voltage battery may result in a fatal electric shock. The high-voltage system may be active even if the ignition is switched off!

- Never carry out any work on the high-voltage vehicle electrics, orange-coloured high-voltage wires, high-voltage components or high-voltage battery. Work on the high-voltage system may only be performed by qualified specialist companies with appropriate accreditation to perform such work
- Never modify, damage, dismantle or disconnect from the high-voltage system any of the orange-coloured high-voltage wires, high-voltage components or high-voltage battery
- Work in the vicinity of high-voltage components, high-voltage wires and on the high-voltage battery may not be carried out until after de-energisation. The high-voltage battery cannot be de-energised. The high-voltage disconnection may only be performed by suitably qualified and trained specialist staff
- If there is a fault in the high-voltage system, the drive is automatically deactivated where necessary, and a corresponding indicator may be displayed in the instrument cluster. Should this be the case, the drive will remain deactivated until the fault has been rectified by suitably qualified and trained specialist staff
- The Volkswagen guidelines must be observed when carrying out any work on the high-voltage system, in particular on the orange-coloured high-voltage wires, high-voltage components or high-voltage battery.

**Practical note**

Sufficient space must be provided in order to guarantee the function and operating safety of the power units.

Modifications to the noise encapsulation can have effects which are relevant to registration.

Modifications to the cooling and heating system and their components are not permitted.

**Practical note**

In all cases, please observe the instructions and warnings in the Owner's Manual of the vehicle.

**Practical note**

Modifications to the noise encapsulation can have effects which are relevant to registration.

**Practical note**

When converting vehicles of registration type N1 to M1, note that within the EU, the refrigerant must be converted to R1234yf for M1 registration.

**Information**

Please note that a majority of the EC directives announced to date have been annulled by Regulation (EC) 661/2009 "General Safety". The EC directives have been replaced by new EU directives or UNECE regulations with the same corresponding content.

**1.3.3 Vehicle acceptance**

The officially recognised appraiser or tester from the converter must be informed about modifications to the vehicle.

**Practical note**

Country-specific laws, directives and approval regulations shall be observed!



## 1.4 Special equipment

We recommend using the special equipment from Volkswagen AG that can be obtained with a PR number for optimum adaptation of the body to the vehicle.

You can obtain information on special equipment provided by Volkswagen under PR numbers from your authorised repairer or from your available contacts for product and vehicle information for Converter (see [chapters 1.2.1.1 “Contact in Germany”](#) and [1.2.1.2 “International contact”](#)).

### Information

You can also put together your vehicle in the configurator on the Volkswagen AG homepage and view the special equipment available:

<https://www.volkswagen-nutzfahrzeuge.de/de/modelle.html>

Special equipment (e.g. reinforced springs, frame reinforcements, anti-roll bars etc.) or equipment fitted later increase the kerb weight of the vehicle.

The actual vehicle weight and the axle loads should be determined and documented by weighing before and after the conversion. Not all additional equipment can be installed into every vehicle without problems. This applies in particular if it is fitted later on.

## 1.5 General product safety requirement

### Warning note

Do not exceed the permissible total vehicle mass, total towing mass, axle plates and trailer plate.

The wheel size and load-carrying capacity must not be changed.

The steering system must not be modified.

### Warning note

The exhaust system, especially the catalytic converter and the diesel particulate filter (DPF), can generate excessive heat. Make sure that suitable heat shields are present. Maintain a sufficient distance from hot components.

Pedal travel and functions must not be restricted.

Do not modify or remove heat shields.

Do not remove any stickers/badges from the original vehicle. Ensure good visibility.

### Warning note

Do not route any electrical cables together with the anti-lock brake system and traction control system cables, otherwise there is a risk of foreign signals. It is generally not recommended to route electrical cables on existing harnesses or pipes.

Do not place any warning labels on the original vehicle in other positions that are in the driver's field of vision, and do not remove them completely. Ensure that labels remain fully visible.

**Warning note**

For the traceability of components, it is essential that components that were removed during the conversion are reinstalled in the same vehicle in accordance with the manual procedures of the Volkswagen Commercial Vehicle Partners.

**Practical note**

Make sure that components removed during the conversion are kept clean and dry.

The Converter must ensure that each vehicle that they sell complies with European Directive 2001/95/EC on general product safety (in accordance with regular amendments) or applicable local legislation.

The Converter must also ensure that any modification made to a ~~Ford~~ Volkswagen Commercial Vehicle or component does not affect compliance with the European Data Protection Regulation or applicable local laws.

**Information**

Directive 2001/95/EC will be replaced by Regulation (EU) 2023/988 ("General Product Safety Regulation (GPSR)") from 13 December 2024.

The Converter shall indemnify Volkswagen from any liability for damage resulting from the following:

- Non-compliance with these Converter guidelines, in particular warnings
- Faulty design, production, installation, assembly or modification not originally specified by ~~Ford~~ Volkswagen
- Failure to comply with the basic principles of expediency inherent in the original product

See [1.2.1 Product- and vehicle information for Converter](#)

### 1.5.1 Restraint system

#### Warning note

Modifications to the restraint system are prohibited.

Airbags can explode. For safe removal and storage during conversion, follow the procedures in the Volkswagen repair manual.

#### Warning note

Do not change, modify or install in other locations: airbags, sensors and control units of the restraint system or its components.

Add-ons or modifications to the front section or the B-pillar of the vehicle can affect the time of deployment of the airbag and lead to an uncontrolled deployment.

For further information:

See: [5.10 Airbag – Safety Restraint System \(SRS\)](#)

### 1.5.2 Drilling and welding

Drilling and welding work on the frame and body must be carried out in accordance with the guidelines in the sections on welding and drilling on frame and pipe reinforcements.

See: [5.1.3 Parts made of boron steel](#)

See: [5.14 Frame and structure](#)

#### Warning note

Boron steel parts must not be drilled or welded, see [chapter 5.1 Body](#) in this manual.

### 1.5.3 Minimum requirements for the brake system

It is not recommended to make changes to the brake system. If a special conversion requires changes:

- Keep original settings
- Maintain certified brake load distribution

Modifications to the anti-lock brake system (ABS), the traction control system (TCS) and the Electronic Stability Control ESC (also known as ESP) are not permitted.

### 1.5.4 Road safety

The corresponding instructions should be strictly followed to ensure operational and road safety of the vehicle.

### 1.5.5 Acoustic vehicle alarm system (AVAS)

#### Warning note

Do not move or change the components of the AVAS system. The acoustic vehicle alarm system is required by law.

See: [4.26 Acoustic vehicle alarm system \(AVAS\)](#)

### 1.5.6 High-voltage vehicle systems

#### Warning note

All employees working on or making changes to the battery electric vehicle (BEV) Transporter panel van / window van or the plug-in hybrid electric vehicle (PHEV) must receive training on high-voltage vehicle systems (HV) before starting the work.

Work on high-voltage electric vehicles is only permitted after appropriate training has been completed:

“Work on electric vehicles” includes carrying out mechanical work and carrying out electrical work and switching activities on these vehicles.

“Electric vehicles” includes all possible types such as HEV (full hybrid), PHEV (plug-in hybrid electric vehicle), BEV (battery electric vehicle) or other versions.

“Appropriate training” means that you, as a person who has completed the training, have sufficient knowledge of the risks and that you have knowledge of the required safety measures to ensure that the work is carried out safely. The expertise acquired in this training is still up to date and still valid.

**Warning note**

Orange cables are part of the high-voltage system (450 V DC for BEV, 400 V DC for PHEV) and must not be modified or routed differently.

**Practical note**

There are limitations when adding additional electrical equipment. All power take-off consumption must be checked in accordance with the guidelines. Additional equipment and consumption may affect the weight and range of the vehicle.

## 1.6 Conversion type

### 1.6.1 Order codes

The following tables provide an overview of the options available to assist with the conversion. The planned use of the converted vehicle must be considered when selecting the appropriate specifications of the original vehicle.

Please ensure that the basic vehicle is ordered from your Volkswagen Commercial Vehicles Partner with all the necessary options.

The availability of options depends on the country.

If you have any questions regarding availability, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

#### Electronics

PR number	Name of the option	Description
1M5	Preparation for towing bracket	This option includes the electrical system for the ball coupling (connector and cable) without the physical ball coupling. Fulfills the requirements of certain fleet customers who install their own special ball coupling but need the electrical signals for the lights and the electronic functions provided by the basic vehicle, including trailer monitoring and side wind reduction. Includes 13-pin socket.
VH2/VH3	Intelligent interface for additional power tap including fuse	Contains the function of the programmable Volkswagen PBG battery monitor and provides interface connection signals. The intelligent commercial vehicle interface has configurable inputs and outputs.
US2	Idling speed boost option	Allows the engine to operate at increased idling speed. Used for the electric and mechanical power take-off system to drive additional equipment.
9HC	Manual DPF regeneration	Regeneration of the diesel particulate filter (DPF) initiated manually by the operator.
J0B+8FF	Two H8 AGM batteries	2 x 95 Ah H8 AGM batteries (approx. 2.4 kWh) Suitable for vehicles whose power requirements exceed the power of their standard battery when the engine is switched off. For example, conversions that require telematics/tracking systems. Located in engine compartment and in driver's seat carrier.
J0B+8FA	H8 AGM single battery	Absorbent glass mat (AGM) battery to power accessories that require constant power or short-term high power consumption. Located in engine compartment.
J1N+8FB	Two high-performance batteries	2 x 75 Ah H7 EFB (approx. 1.8 kWh), 2 x 80 Ah AGM battery (approx. 2 kWh) or 2 x 80 Ah SLI (approx. 2 kWh) batteries, depending on the selected vehicle option. Located in engine compartment and in driver's seat carrier.
J4E+8FA	Standard use battery	1 x 75 Ah EFB (approx. 0.9 kWh) or 80 Ah AGM technology (approx. 1 kWh), depending on the selected vehicle option. Located in engine compartment.
J1N+8FA	High-performance battery	80 Ah AGM battery or 80 Ah SLI (approx. 1 kWh) batteries, depending on the selected vehicle option. Located in engine compartment

PR number	Name of the option	Description
9Z3	230 V sockets: one on the seat frame, 1st SR inside, two on the D-pillar (not with 2nd heater and air conditioning unit), total output 2.3 kW	Sockets in vehicle interior for power output of up to 2.3 kW (eHybrid and e-Transporter only)
IP1	Multifunction interface pre-programmed. (Standard)	Programmable input/output control system that communicates via the vehicle's CAN network and enables the integration of electrical and digital systems in order to control devices and various vehicle functions via the Upfitter configuration.
IP4	Multifunction interface pre-programmed. (for emergency vehicles)	Pre-programmed with a basic configuration for government and military vehicles.
IP5	Multifunction interface pre-programmed. (for taxis)	Pre-programmed with a basic configuration for taxis / rental cars.

**Exterior**

PR number	Name of the option	Description
GE4	Anti-pick safety closing	Reinforced lock with anti-pick cylinder for the driver door (RepLock™/anti-pick lock)
GE0	Safety closing 1	Replacement of the standard door handles for the rear and side door SLD and RCD handles. Replaces the “pull” function of the door handles and is replaced by a mechanical activation of the door opening with a key. The package also includes the RepLock™/anti-pick lock for the driver door (see PR number G4E) as well as automatic locking of the side and rear doors when closing. In addition, cut protection is provided at the cable ducts between the body and the cab doors (LoomGuards), as well as protective plates to prevent the door locks of the rear and side doors from being drilled out (LatchShields).
GE2	Safety closing 2	Additional push-in locks with transverse locking (DeadLocks) and separate key on the front doors for driver and front passenger. Additional push-in locks with HookLock on the side and rear doors. Cut protection is provided at the cable ducts between the body and the cab doors (LoomGuards), as well as protective plates to prevent the door locks of the rear and side doors from being drilled out (LatchShields). The package also includes the RepLock™/anti-pick lock for the driver door (see PR number G4E).
GE3	Safety closing 3	Additional push-in locks with transverse locking (DeadLocks) and separate key on the front doors for driver and front passenger. Door opening replaced with key. The package also includes the RepLock™/anti-pick lock for the driver door (see PR number G4E). In addition, cut protection is provided at the cable ducts between the body and the cab doors (LoomGuards) as well as protective plates to prevent the door locks of the rear and side doors from being drilled out (LatchShields). External semi-automatic locks on the side and rear doors with drill-down protection inserts and a locking bolt made of hardened steel (ArmourShell).



**Interior**

PR number	Name of the option	Description
Q4H	Driver's cab seat package 12 ABH, "fabric-striped", with driver's seat and seat heating without front passenger seat	This seat package includes an option without a front passenger seat.
	Sortimo universal floor controller, control code 2	Scope of delivery: standard partition, one (side) load compartment sliding door, non-slip phenolic resin floor, shelves with storage boxes, end plates for a wide range of equipment, side load compartment sliding door.

**Camper conversions**

PR number	Name of the option	Description
F4L	Camper preparation package	Ideal for the installation of a compact kitchen in the rear part of the vehicle. Access via a side loading door and from the rear of the vehicle is still possible, while at the same time creating considerable living space. When this package is selected, it is not necessary to order a two-zone air conditioning system (9AI). A double battery option must be ordered with the Camper preparation package.

**Information**

For information on the availability of optional extras, please refer to the configurator for your country of registration.

### 1.6.2 Conversion type – reference tables

The Converter guidelines contain general and specific recommendations for conversion to the Transporter panel van series. The following tables can be used to find specific information about the individual conversion types in this manual.

#### Practical note

The following tables are for orientation purposes only.  
Before starting the conversion, the Converter manual (Converter guidelines) must be observed.

For all conversions that require a power supply:

See: [4.3 Communication network](#)

See: [4.22 Fuses](#)

Bulk material	
Transporter panel van	See: <a href="#">4.4 Charging system</a>
	See: <a href="#">4.11 Tachograph</a>
	See: <a href="#">5.2 Hydraulic lifting device</a>
	See: <a href="#">4.14 Exterior lighting</a>
	See: <a href="#">4.20 Automatic wiper and headlight control for vehicles with large overhangs</a>
Money transporter	See: <a href="#">4.4 Charging system</a>
	See: <a href="#">4.11 Tachograph</a>
	See: <a href="#">5.12 Roof</a>
	See: <a href="#">4.14 Exterior lighting</a>
Refuse collector	See: <a href="#">4.4 Charging system</a>
	See: <a href="#">4.11 Tachograph</a>
	See: <a href="#">4.15 Interior lighting</a>

Emergency services	
Ambulance (emergency) / fire brigade / armed forces / police	See: <a href="#">3.2 Engine cooling</a>
	See: <a href="#">4.4 Charging system</a>
	See: <a href="#">4.14 Exterior lighting</a>
	See: <a href="#">4.15 Interior lighting</a>
	See: <a href="#">4.17 Adaptive cruise control system</a>
	See: <a href="#">4.22 Fuses</a>
	See: <a href="#">5.2 Hydraulic lifting device</a>
	See: <a href="#">5.8 Seats</a>
	See: <a href="#">5.10 Airbag – Safety Restraint System (SRS)</a>
	See: <a href="#">4.20 Automatic wiper and headlight control for vehicles with large overhangs</a>

Retraining	
Workshop vehicles	See: <a href="#">4.4 Charging system</a>
	See: <a href="#">4.11 Tachograph</a>
	See: <a href="#">5.2 Hydraulic lifting device</a>
	See: <a href="#">5.3 Shelf systems</a>
	See: <a href="#">5.12 Roof</a>
	See: <a href="#">4.20 Automatic wiper and headlight control for vehicles with large overhangs</a>
Sales cars / mobile offices	See: <a href="#">4.4 Charging system</a>
	See: <a href="#">4.11 Tachograph</a>
	See: <a href="#">5.2 Hydraulic lifting device</a>
	See: <a href="#">5.3 Shelf systems</a>
	See: <a href="#">5.12 Roof</a>
	See: <a href="#">4.20 Automatic wiper and headlight control for vehicles with large overhangs</a>
Glass transport	See: <a href="#">4.4 Charging system</a>
	See: <a href="#">4.11 Tachograph</a>
	See: <a href="#">5.1 Body</a>
	See: <a href="#">5.3 Shelf systems</a>
Conversion – shelf system	See: <a href="#">4.4 Charging system</a>
	See: <a href="#">4.11 Tachograph</a>
	See: <a href="#">5.3 Shelf systems</a>
Rescue vehicles	See: <a href="#">4.4 Charging system</a>
	See: <a href="#">4.11 Tachograph</a>
	See: <a href="#">5.14 Frame and structure</a>
	See: <a href="#">4.20 Automatic wiper and headlight control for vehicles with large overhangs</a>

Window van	
Taxi	See: <a href="#">4.14 Exterior lighting</a>
	See: <a href="#">4.15 Interior lighting</a>
	See: <a href="#">5.8 Seats</a>
	See: <a href="#">5.9 Windows, frames and control mechanisms</a>
	See: <a href="#">5.10 Airbag – Safety Restraint System (SRS)</a>
	See: <a href="#">5.12 Roof</a>
	See: <a href="#">5.2 Hydraulic lifting device</a>
Mobility	See: <a href="#">4.14 Exterior lighting</a>
	See: <a href="#">4.15 Interior lighting</a>
	See: <a href="#">5.8 Seats</a>
	See: <a href="#">5.9 Windows, frames and control mechanisms</a>
	See: <a href="#">5.10 Airbag – Safety Restraint System (SRS)</a>
	See: <a href="#">5.12 Roof</a>
	See: <a href="#">5.2 Hydraulic lifting device</a>
Special installations	See: <a href="#">4.11 Tachograph</a>
	See: <a href="#">4.14 Exterior lighting</a>
	See: <a href="#">4.15 Interior lighting</a>
	See: <a href="#">5.8 Seats</a>
	See: <a href="#">5.9 Windows, frames and control mechanisms</a>
	See: <a href="#">5.10 Airbag – Safety Restraint System (SRS)</a>
	See: <a href="#">5.12 Roof</a>
	See: <a href="#">5.1 Body</a>
Wheelchair access	See: <a href="#">5.2 Hydraulic lifting device</a>
	See: <a href="#">5.3 Shelf systems</a>
	See: <a href="#">4.14 Exterior lighting</a>
	See: <a href="#">4.15 Interior lighting</a>
	See: <a href="#">5.8 Seats</a>
	See: <a href="#">5.9 Windows, frames and control mechanisms</a>
	See: <a href="#">5.10 Airbag – Safety Restraint System (SRS)</a>
	See: <a href="#">5.12 Roof</a>
	See: <a href="#">5.2 Hydraulic lifting device</a>
Window van / Caravelle	See: <a href="#">4.14 Exterior lighting</a>
	See: <a href="#">4.15 Interior lighting</a>
	See: <a href="#">5.8 Seats</a>
	See: <a href="#">5.9 Windows, frames and control mechanisms</a>
	See: <a href="#">5.10 Airbag – Safety Restraint System (SRS)</a>
	See: <a href="#">5.12 Roof</a>

Refrigerated vehicles	
Conversion – Transporter panel van	See: <a href="#">1.10 Directive on end-of-life vehicles (ELV)</a>
	See: <a href="#">4.4 Charging system</a>
	See: <a href="#">4.7 Interior air conditioning</a>
	See: <a href="#">4.22 Fuses</a>
	See: <a href="#">5.12 Roof</a>
Air conditioner compressor – installation	See: <a href="#">3.3 Power take-off system</a>

Recreational vehicles	
Camper conversion	See: <a href="#">1.6 Conversion type</a>
	See: <a href="#">1.8 Electromagnetic compatibility (EMC)</a>
	See: <a href="#">1.14 Assemblies and ergonomics</a>
	See: <a href="#">1.16 Load distribution</a>
	See: <a href="#">3.1 Engine / electric drive</a>
	See: <a href="#">3.8 Fuel system</a>
	See: <a href="#">4.1 Overview of the electrical system</a>
	See: <a href="#">4.2 Instructions for cable installation and routing</a>
	See: <a href="#">4.3 Communication network</a>
	See: <a href="#">4.4 Charging system</a>
	See: <a href="#">4.5 Battery systems</a>
	See: <a href="#">4.6 Battery protection</a>
	See: <a href="#">4.12 Information and entertainment system</a>
	See: <a href="#">4.14 Exterior lighting</a>
	See: <a href="#">4.16 Emergency call systems</a>
	See: <a href="#">4.21 Handles, locks, locking elements and access systems</a>
	See: <a href="#">4.23 Connectors and connections</a>
	See: <a href="#">4.25 Earth connection</a>
	See: <a href="#">5.1 Body</a>
	See: <a href="#">5.2 Hydraulic lifting device</a>
	See: <a href="#">5.3 Shelf systems</a>
	See: <a href="#">5.5 Interior partitions</a>
	See: <a href="#">5.7 Interior equipment</a>
	See: <a href="#">5.8 Seats</a>
	See: <a href="#">5.9 Windows, frames and control mechanisms</a>
	See: <a href="#">5.10 Airbag – Safety Restraint System (SRS)</a>
	See: <a href="#">5.11 Seat belt systems</a>
	See: <a href="#">5.12 Roof</a>
	See: <a href="#">5.14 Frame and structure</a>

## 1.7 Conversion – homologation

See [chapter 1.2.1.7](#), [chapter 1.2.1.8](#) and [chapter 6.1](#)

## 1.8 Electromagnetic compatibility (EMC)

### Warning note

Do not install any transmitter/receiver units, microphones, loudspeakers or other objects on or near the airbag cover, on the side of the seat backrests (of the front seats) or in areas of the front seats that could come into contact with an airbag that deploys.

### Warning note

Do not attach the aerial cables to the original wiring, fuel lines or brake lines of the vehicle.

Maintain a distance of at least 100 mm between aerial/power cables and electronic control units and airbags.

### Information

The vehicle has been tested and certified for electromagnetic compatibility in accordance with the applicable legislation (UN ECE Directive 10 or corresponding national legislation). It must be ensured that any additional equipment installed in your vehicle complies with local legal regulations and other requirements.

### Information

High-frequency transmitters (e.g. mobile telephones or amateur radio transmitters) may only be installed in the vehicle if they comply with the parameters listed in the "Frequency overview" table. No special regulations or conditions apply for the installation or use.

### Information

Only mount the aerial in the positions shown on the roof of the vehicle.

### Information

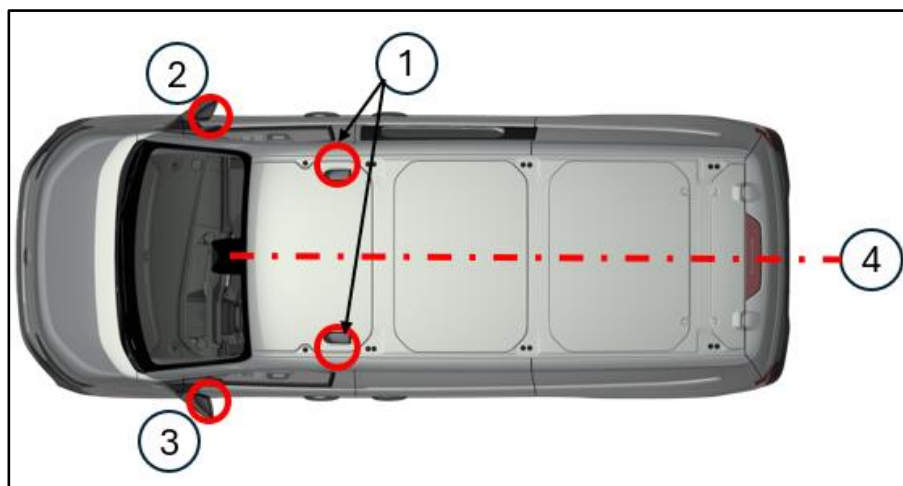
For EMC for conversions to police vehicles with reversing cameras, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

### Frequencies – overview

Frequency band – MHz	Maximum output power – watts (peak/RMS value)	Aerial position
1-30	50 W	1
50-54	50 W	2, 3
68-88	50 W	2, 3
142-176	50 W	2, 3
380-512	50 W	2, 3
806-870	10 W	2, 3



## 1.8.1 Permitted aerial positions



Element	Description
1	Position of the GNSS/5G aerial
2	Position of the FM DAB aerial
3	Position of FM-only aerial
4	Additional aerials must be positioned on the Y-0 centre line

**Information**

After installing high-frequency transmitters, you must check whether there is any interference from and to electrical devices in the vehicle in standby or transmission mode.

Check all electrical devices:

- With the ignition ON
- With the engine running
- During a road test at different speeds

Make sure that the electromagnetic fields generated by the transmitter inside the vehicle do not exceed the relevant human exposure limits.

## 1.9 Guidelines for the working cycle of the vehicle

### Information

Further information can be obtained from your national sales company or from a local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

The customer's usage profile and the estimated working cycles of the vehicle must be considered when selecting the appropriate specifications of the original vehicle.

In order to meet the customer's requirements, the drive, engine, gear ratio, total vehicle weight, total towing weight, axle load and load capacity of the original vehicle must be selected accordingly.

If possible, ensure that the original vehicle is delivered ex works with the required equipment options.

A high gear ratio is recommended for the following usage profiles:

- High payload
- Ball coupling
- Frequent stopping and starting
- Operation at high altitude and in the mountains
- Difficult terrain conditions, e.g. on construction sites

### 1.9.1 Driving and operating characteristics of the vehicle

### Warning note

The axle load, total vehicle weight, towing load and total towing weight must not be exceeded.

### Information

Raising the centre of gravity affects the driving behaviour and the handling.

### Information

The vehicle should be checked for its operational safety before being sold.

## 1.10 Directive on end-of-life vehicles (ELV)

The European Directive on end-of-life vehicles stipulates that environmental and recycling aspects must be taken into account when developing new components and vehicles. This includes requirements regarding:

- The total recyclability (85%) and recoverability (95%) of vehicles
- The restricted use of hazardous substances, including the complete avoidance of prohibited substances such as lead, hexavalent chromium, cadmium and mercury
- Publication of disassembly information
- The part marking according to the corresponding ISO standards: ISO 1043-1, ISO 1043-2 and ISO 11469 for plastics and ISO 1629 for rubber and latices
- The increased use of recycled materials
- Manufacturers shall bear the entirety or the majority of the return costs of end-of-life vehicles.

In addition to the provisions of the Directive on end-of-life vehicles, other environmental objectives should be taken into account, such as:

- Minimising costs and environmental impacts throughout the product life cycle
- Maximising the use of renewable materials such as natural fibres
- Minimising the presence of substances that impair the air quality in the vehicle interior / clean room, or cause allergic reactions. This relates to aspects such as smell, fogging of windows, toxicity and allergic reactions caused by materials of the interior equipment.
- No use of prohibited substances according to the Global Automotive Declarable Substance List (GADSL) under <https://www.gadsl.org>

To ensure consistent compliance with legal regulations as well as the long-term environmentally friendly operation of all Volkswagen products, all conversion work on the vehicle must be carried out in accordance with the provisions listed above.

However, this is not a complete list of all legal regulations that a converted vehicle must comply with.

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

## 1.11 Jacking up and lifting

### 1.11.1 Lifting with a jack

#### Warning note

Always park the vehicle on a firm, level surface. If the vehicle must be lifted on soft ground, the jack must be fitted with a suitable support to distribute the load. Secure the wheel diagonally opposite the jack with a wheel chock. Failure to comply with these instructions could result in injuries.

#### Warning note

Only the specified lifting points may be used to lift and support the vehicle.

Only use the jack holders and lifting points provided.

Never place wooden blocks or similar under the jack to lift the vehicle on soft ground. Failure to comply with these instructions could result in injuries.

#### Warning note

Do not jack up any of the high-voltage components, including the battery.

If the high-voltage box is used as a jack holder, this can lead to electric shock, injury, fire or death.

#### Practical note

The vehicle may only be lifted and supported at the lifting points provided for this purpose. Damage to the body, steering, suspension, engine, brake system or fuel lines could occur if other positions are used.

Ensure that the spare wheel can be accessed freely if the vehicle is being converted or the spare wheel is being stored in a new location.

**Practical note**

When positioning the jack, always ensure that there is sufficient clearance to components on the underbody of the vehicle in order to avoid damage.

**Information**

Instructions for handling the jack correctly can be found in the Owner's Manual.

**Information**

Make sure that the reinforcements are attached to the body to avoid structural damage to the original body or the lifting points.

**Information**

All changes to the vehicle must be noted in the user's manual or in the new description documents enclosed with the user documentation.

**1.11.2 Lifting with a lifting platform****Warning note**

If the vehicle is being lifted using a two-pillar lifting platform in order to remove the engine/gearbox or the rear axle, make sure that the vehicle is secured to the lifting platform with retaining straps to prevent it from tipping. Failure to comply with these instructions could result in injuries.

**Warning note**

Do not lift any of the high-voltage components, including the battery.

If the high-voltage box is used as a lifting point, this can lead to electric shock, injury, fire or death.

**Practical note**

When using a two-pillar lifting platform, lift adapters must be placed under the lifting points.

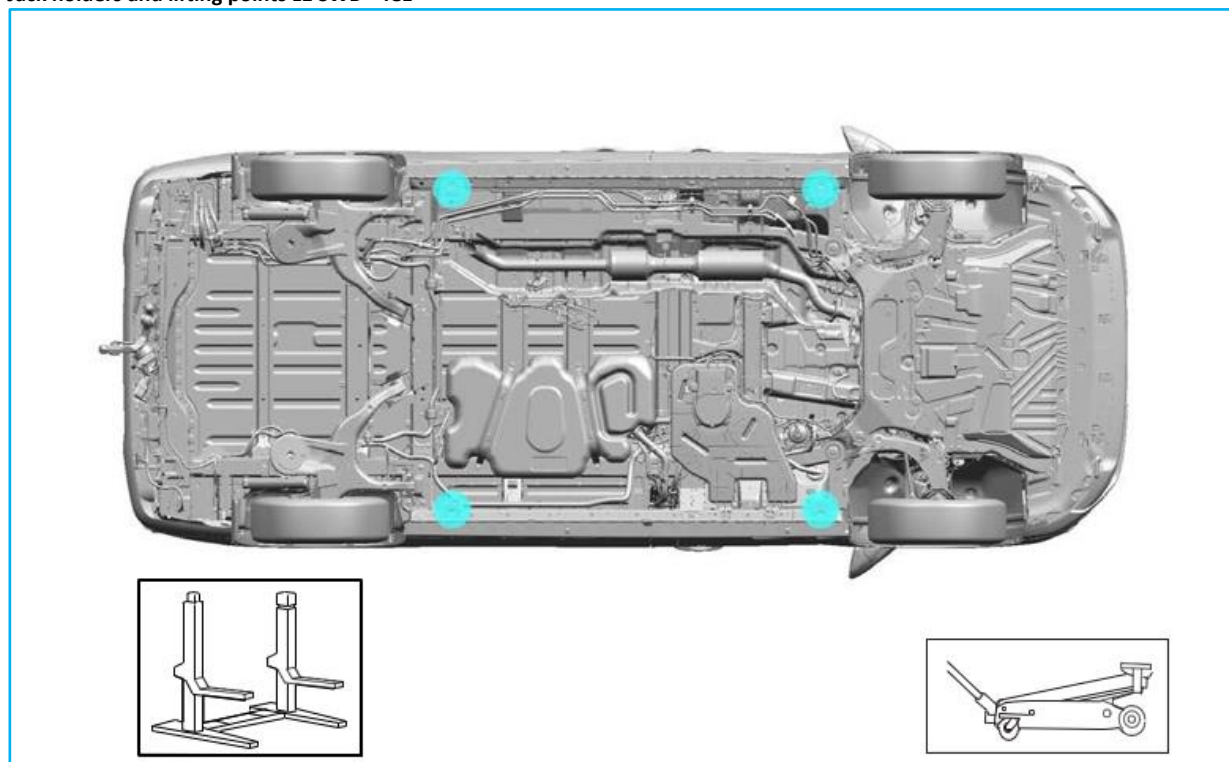
When lifting the vehicle with a two-pillar lifting platform, do not exceed the maximum kerb weight.

The vehicle may only be lifted and supported at the lifting points provided for this purpose.

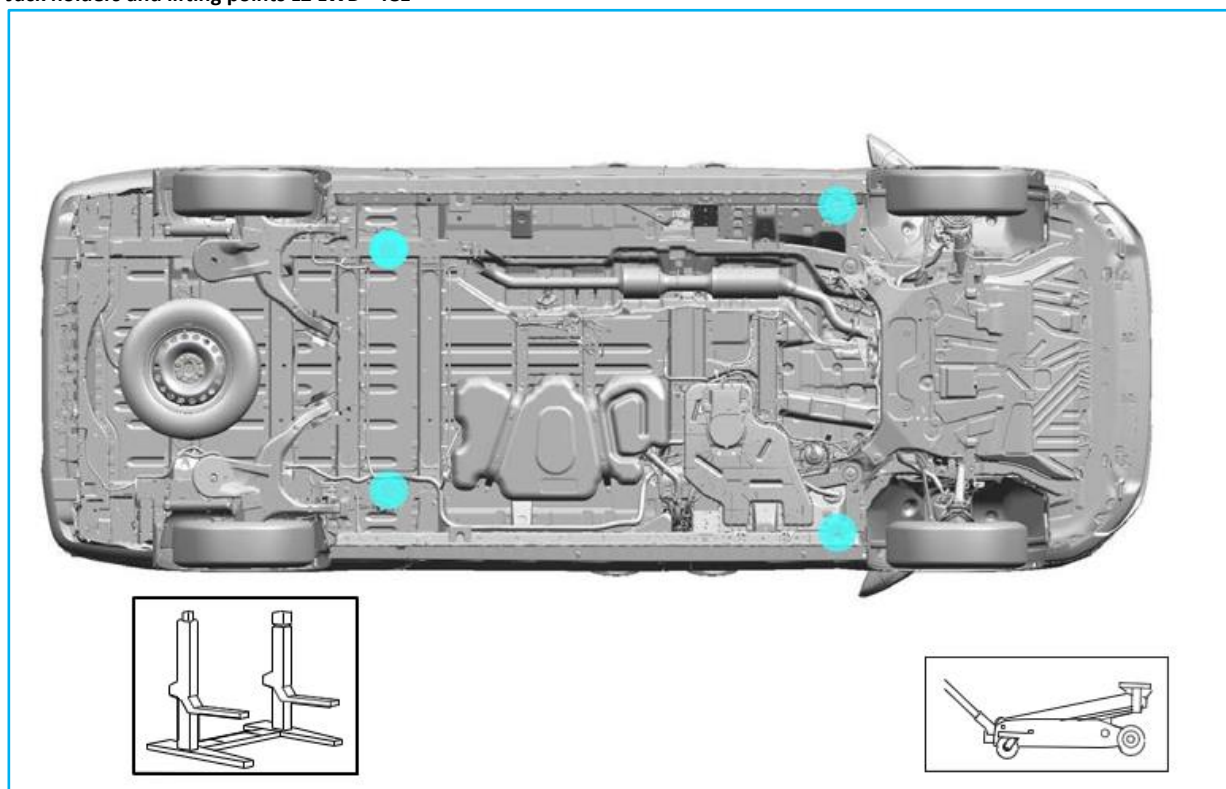
**Practical note**

When positioning the lifting gear, always ensure that there is sufficient clearance to components on the underbody of the vehicle to avoid damage.

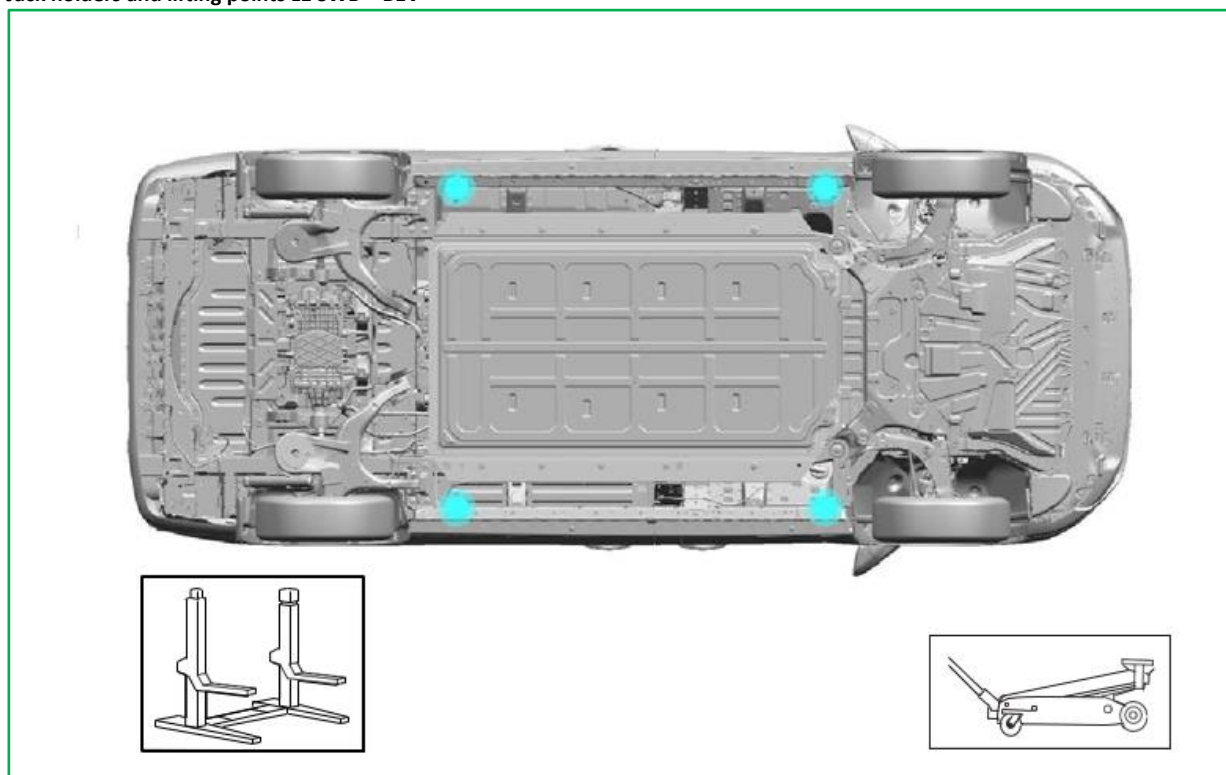
When lifting the L2 version with a two-pillar lifting platform, place blocks under the rear lifting points.

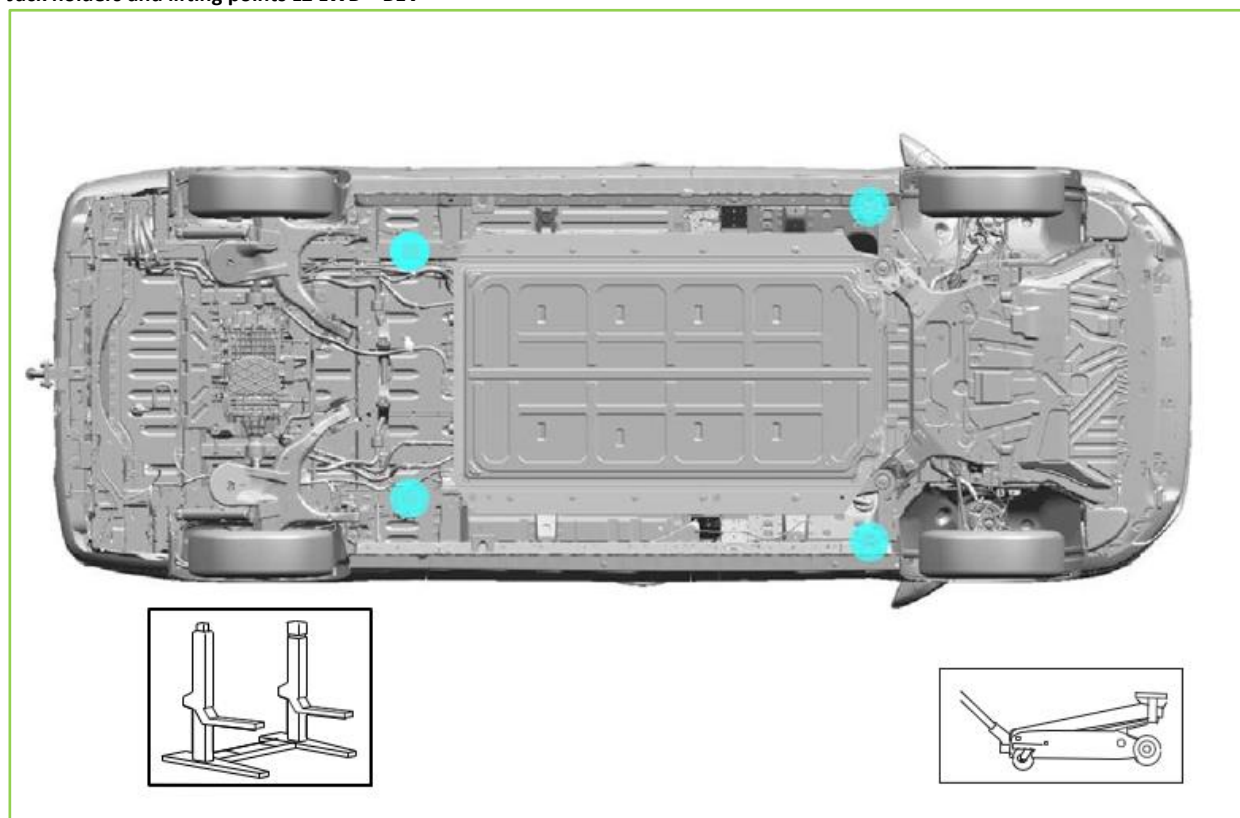
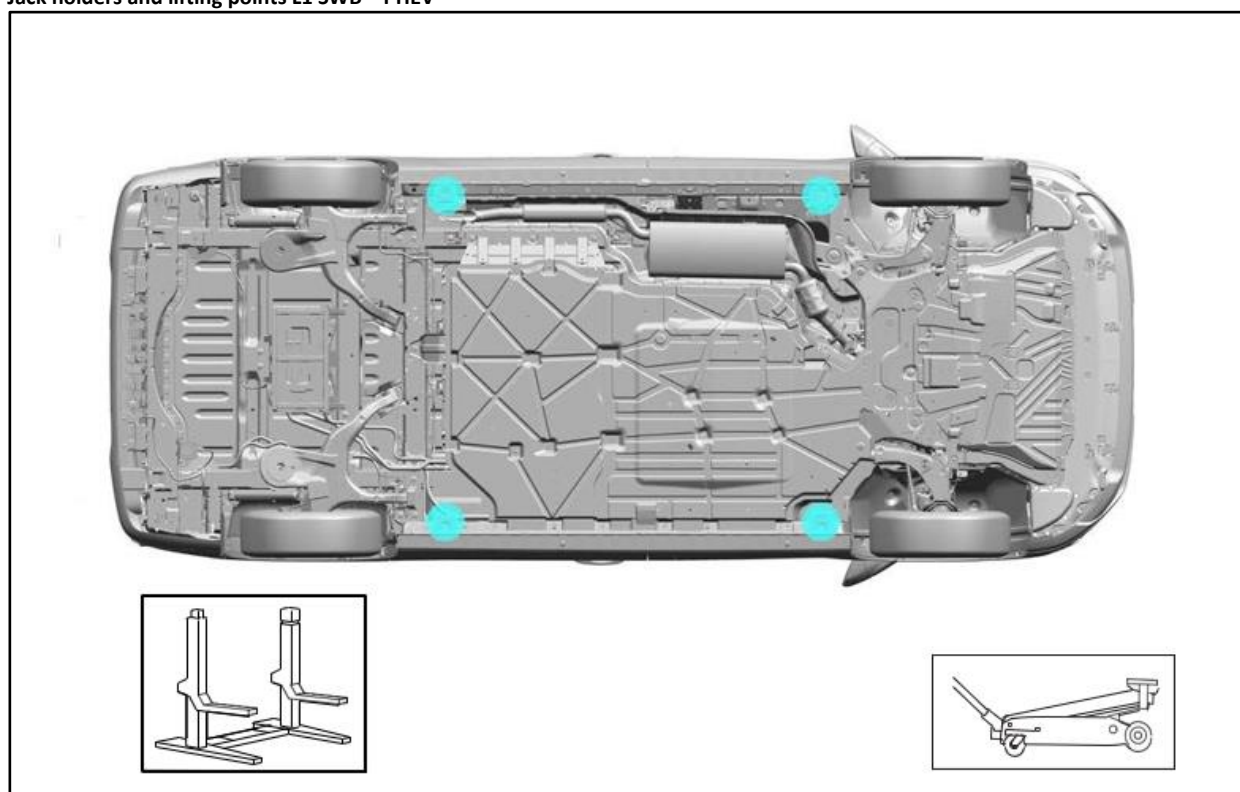
**Jack holders and lifting points L1 SWB – ICE**

## Jack holders and lifting points L2 LWB – ICE



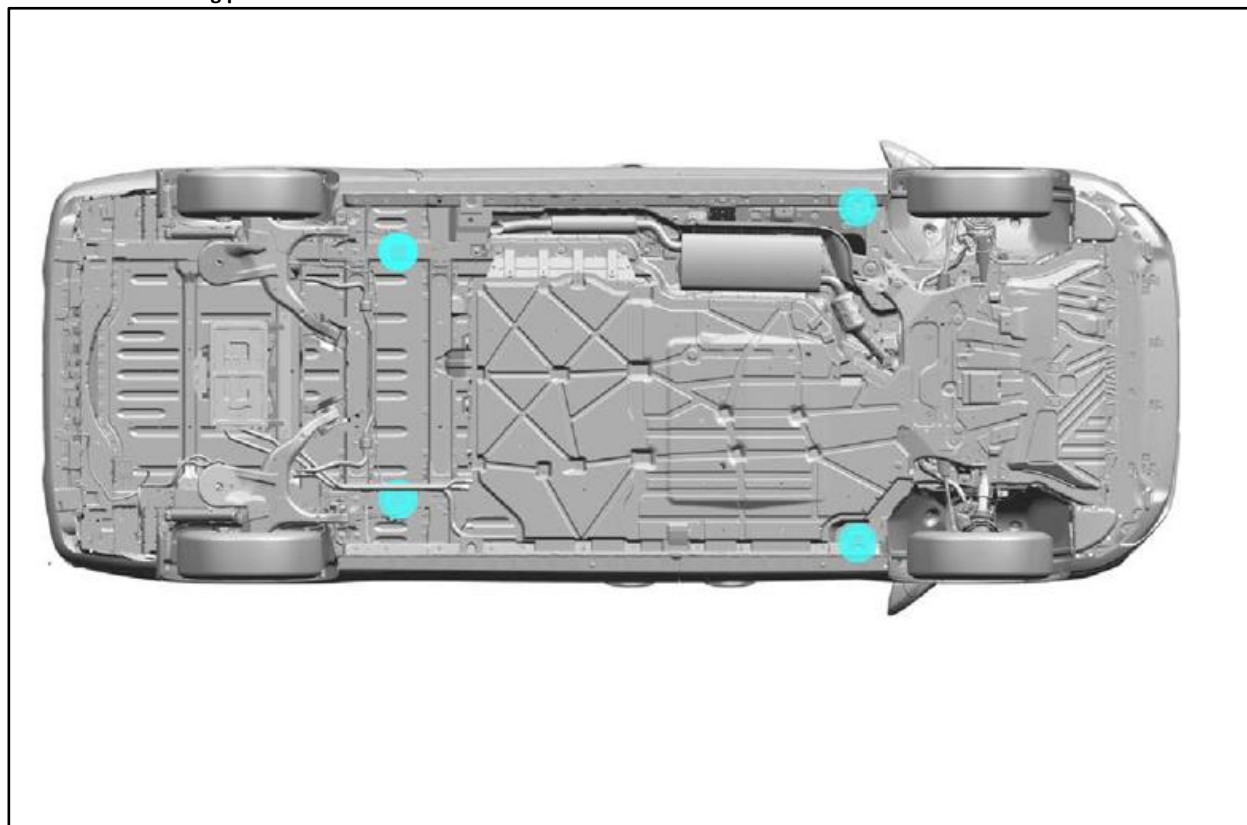
## Jack holders and lifting points L1 SWB – BEV



**Jack holders and lifting points L2 LWB – BEV****Jack holders and lifting points L1 SWB – PHEV**



## Jack holders and lifting points L2 LWB – PHEV



## 1.12 Noise, vibration, harshness (NVH)

### Warning note

Ensure that the modified vehicle fulfils all the relevant legal requirements.

Modifications to the drive train, engine, gearbox, exhaust, air intake system or tyres may affect the external noise level. For this reason, the external noise level must be checked after the conversion.

The interior noise level should not change as a result of the conversion. Reinforce sheet metal and structures to prevent vibration. Consider the use of sound-absorbing materials on sheet metal.

## 1.13 Vehicle transport aids and the storage of vehicles

### Warning note

Transport mode includes a calibration function for reducing the risk of corrosion of injectors. Leaving transport mode before upgrading/converting increases the risk of premature injector failure

### Practical note

Do not remove the protective cover from an unfinished vehicle until you start the conversion work.

Please also note:

- Raise the wipers and position them away from the windscreen
- Close all air intake openings
- Increase the normal tyre pressure by 0.5 bar
- Fully release the brakes and the parking brake
- Secure the wheels with wheel chocks to prevent the vehicle from rolling away

There is an increased risk of corrosion of the body during storage. Therefore, the regulations for storage and the maintenance intervals must be observed.

Complaints about corrosion due to improper storage, maintenance or use are not the responsibility of Volkswagen.

### Information

Further information on preparing the vehicle for storage can be found in the Owner's Manual.

Converter must determine their own procedures and precautions. This is particularly relevant when vehicles are stored outdoors and thus exposed to air pollution.

The following methods are most suitable for storage:

#### Short-term storage:

- If possible, vehicles must be parked in a closed, dry, well-ventilated room. This room should have a solid floor with water drainage and no vegetation, and should be protected from direct sunlight
- Vehicles must not be parked near or under foliage or close to water, as additional protective measures may be required for certain areas of the vehicle

**Long-term storage:**

- The battery must be disconnected, but not removed from the vehicle
- Remove the wiper blades and store them in the vehicle. Make sure the wiper arms are not in direct contact with the windscreen
- Remove the wheel caps (if present) and store them in the luggage compartment
- Engage first gear (manual gearbox) or put gearbox in park position “P” (automatic gearbox) and fully release the parking brake. Secure the wheels with wheel chocks if the vehicle is not parked on level ground
- Set the interior air conditioning to “external air supply” (open) to ensure ventilation if possible
- If protective film has been attached during production, it must remain on the vehicle until handover, but must be removed from the vehicle after six months at the latest (the date by which the protective film must be removed is stamped on the film)
- Make sure that all windows, doors, the bonnet, the tailgate, the luggage compartment pan lid, the folding roof and the roof opening panel are completely closed and the vehicle is locked

The pre-delivery inspection (PDI) is the last opportunity to ensure that a suitable vehicle battery has been installed before the vehicle is handed over. The battery must be checked and corrected if necessary before the vehicle is handed over to the customer. The test results must be entered in the PDI (Pre-Delivery Inspection) repair order.

**Batteries:**

To ensure that the battery is properly maintained and to prevent premature failure, the battery must be checked and recharged once a month when the vehicle is not in use. If a battery is stored for a longer period of time with less than the optimal charge, premature battery failure is possible.

**Battery discharge prevention:**

As part of the vehicle conversion process and to maximise the battery life and avoid premature failure of Volkswagen batteries, you must protect and prevent discharging of the battery during a conversion or while the vehicle is in storage. This includes, among other things, keeping the vehicle in transport mode for as long as possible, limiting the start-up processes on the company premises, and opening the doors as little and for as short a time as possible. The voltage MUST be checked at acceptance and before handover. If the voltage of the vehicle battery is below 12.4 V (standard battery and enhanced flooded battery) or 12.3 V (AGM battery), recharge using a suitable manufacturer-specific battery charger. Measure the voltage with the battery installed, the ignition switched off and the electrical equipment switched off (e.g. also interior and exterior lighting).

Manufacturers and Converter who are going to be working with BEV vehicles should develop a plan for recharging these vehicles.

Charging stations can be particularly important during vehicle acceptance if vehicles with insufficient charge levels arrive to go through the completion process.

It is recommended to set up charging stations at the parking spaces of the vehicles.

Converter should also consider the state of charge of the vehicle when it is leaving their company premises:

- BEV vehicles to be transported onwards after being converted should be entered in the Volkswagen transport system with the same charge level as when they left the assembly plant
- In other cases, the Converter should consider their customers' expectations and the transport modalities when defining requirements for the state of charge
- If the charge level of the high-voltage battery is less than 20%, charge the vehicle to 40%. This ensures that the charge level of the high-voltage battery is maintained between 20% and 40%

**Hybrid battery systems:** if the vehicle is stored for more than 30 days, the charge level should be approximately 50%.

See: [4.5 Battery systems](#)

Measure / storage period	Monthly	All 3 months
Keep the vehicle clean	X	-
Remove external dirt	X	-
Check battery condition – charge if necessary	X	-
Visual inspection of the tyres	X	-
Check the vehicle interior for condensation	-	X
Let the engine run until the coolant indicator has reached a temperature (60°C), if necessary with the air conditioner switched on	-	X

## 1.14 Assemblies and ergonomics

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

### 1.14.1 General guidelines for assemblies

#### Warning note

Do not modify, drill, cut or weld any suspension components, especially not on the steering rack, subframe or anti-roll bars, springs or shock absorbers, including the brackets.

The Converter must ensure that adequate clearance is maintained from moving components such as axles, fans, steering, brake system etc. under all driving conditions.

The Converter is liable for all components installed during the conversion. The prescribed service life must be ensured by suitable test procedures.

### 1.14.2 Driver's operating area

Controls and equipment to be used while driving must be easily accessible to the driver so as not to impact the driver's attention.

### 1.14.3 Driver's field of vision

#### Warning note

Ensure that the modified vehicle fulfils all the relevant legal requirements.

#### 1.14.4 Effect of the conversion on parking aids

##### Warning note

Ensure that the monitors installed in the passenger compartment comply with the requirements for interior equipment and the safety and security regulations.

The system will not operate if a retrofitted rear step or other equipment fitted in the rear is installed. The reverse brake assist system does not brake automatically if there is a risk of a collision.

##### Information

If a step is installed in the rear for which the rear parking aid must be deactivated, a service routine is available in ODIS (configuration of the rear step).

For conversions that require a reversing camera, the return signal can be recorded as described in the electrical section under “Reversing light”. See: [4.14 Exterior lighting](#)

#### 1.14.5 Aids for getting in and out of the vehicle

##### Steps

The original vehicle can be delivered with optional steps. Check the availability of this option.

Observe the specified ground clearance when attaching additional steps.

The Converter must ensure that movable steps are safely stowed away while driving. The step surface must be non-slip.

##### Warning note

Ensure that the modified vehicle fulfils all the relevant legal requirements.

If the conversion changes the type-approved dimensions, a new type approval must be obtained.

##### Practical note

Make sure that the reinforcements are attached to the body to avoid structural damage to the original body.

**Grab handles**

The original vehicle can be delivered with optional grab handles. Check the availability of this option.

**Warning note**

Before drilling, check whether drilling is permitted in the corresponding area.

**Practical note**

Make sure that the reinforcements are attached to the body to avoid structural damage to the original body.

**1.14.6 Skid plate at front, rear and sides**

The front skid plate must be designed in accordance with Directive ECE 93(1) or applicable national regulations.

The rear skid plate must be designed in accordance with Directive ECE 58(1) or applicable national regulations.

The side skid plate must be designed in accordance with Directive ECE 73(1) or applicable national regulations.

The respective current versions of the standards listed above must be used!

**Warning note**

Observe the applicable regulations.

**1.14.7 Input values for calculation according to Worldwide Harmonized Light Vehicles Test Procedure (WLTP)**

The following properties are required as part of the WLTP calculation for finished vehicles.

**Mass of the finished vehicle**

All modifications and changes that affect the actual mass of the vehicle must be taken into account. The definition of actual mass can be found in the provisions of Regulation 2017/1151, Annex XXI. The actual mass of the finished vehicle must be specified for the front axle and the rear axle. This weight distribution is relevant if the finished vehicle has different tyres at the front and the rear.

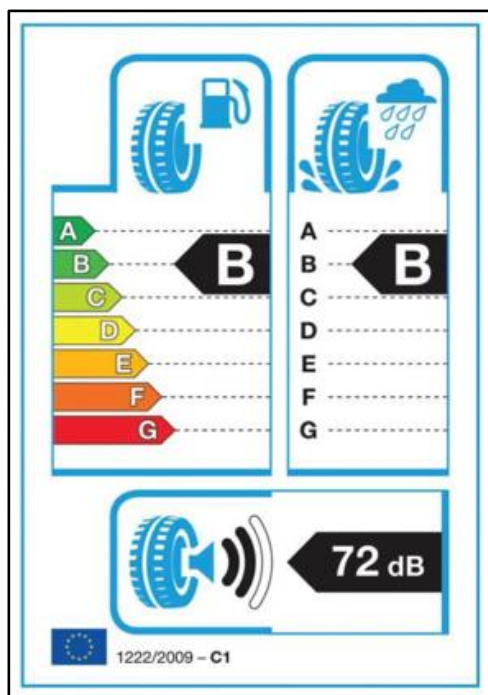
**End face**

All modifications and changes that affect the end face of the finished vehicle must be taken into account. Further information is provided later in this section.

**Rolling resistance of tyres**

Changes to the tyres of the finished vehicle must be taken into account. The efficiency class and tyre class are needed to determine the correct calculation. This information can be found on the tyre label, as in the following example.





#### Exceeding the limits of properties

For the Converter, the road approval of the original vehicle is binding; therefore, he must comply with the specified limits of the Converter guidelines and the emission type approval that apply to the vehicle. The Converter must ensure that the values remain within the specified limits in order to ensure conformity with the emission values. If the Converter intends to exceed the limits, they must contact the relevant technical service department or the vehicle type approval office. In such a case, the original approval may become invalid and the Converter may have to recertify the vehicle for the exceeded limits.

#### 1.14.8 Table of vehicle dimensions

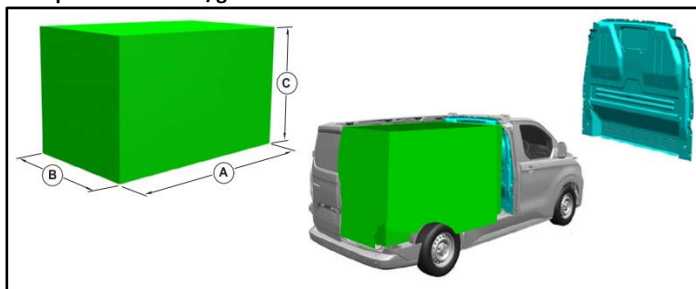
All dimensions are subject to manufacturing tolerances and refer to minimum specification models and do not include additional equipment.

Height dimensions are valid for the minimum to maximum weight range and are only used as reference values.

Transporter panel van, window van and Panel Van Plus (double cab)			
Wheelbase	Total length (mm)	Overall height (mm)	Remarks
L1 – 3100	5050	1958-2019	16-inch to 19-inch wheels
L2 – 3500	5450	1959-2010	16-inch to 19-inch wheels

### 1.14.9 Dimensions for recommended main load areas

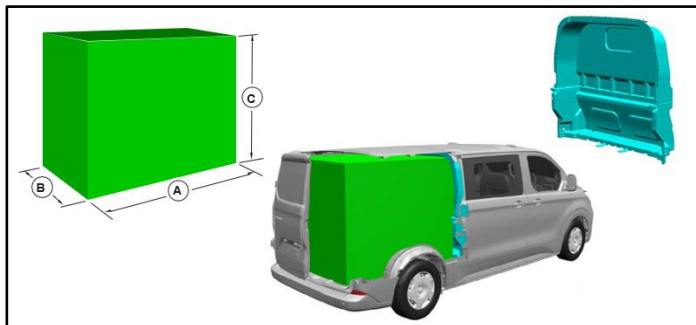
#### Solid partition – fixed/glazed



For vehicle heights, refer to the table of vehicle dimensions in this section of this manual.

Vehicle	A (mm)	B (mm)	C (mm)
L1 – H1	2357	1232	1282
L2 – H1	2757	1232	1282

#### Partition in Panel Van Plus with double cab



For vehicle heights, refer to the table of vehicle dimensions in this section of this manual.

Vehicle	A (mm)	B (mm)	C (mm)
L1 – H1	1447	1232	1282
L2 – H1	1847	1232	1282

### 1.14.10 Vehicles with roof-mounted equipment

#### Calculation of the end face of the vehicle with roof-mounted equipment

##### Information

More information can be found on the Customized Solution Portal / WLTP: Germany / International:  
<https://www.customized-solution.com>  
 To use this, you must register or login.

##### Information

The entire standard/optional equipment has already been taken into account, i.e. the end face of the original vehicle including the mirrors.

The roof-mounted equipment can be integrated below the roof. For the height dimension (A), measure only the part of the equipment that protrudes over the roof line. The Converter only has to calculate the end face of the attached equipment (AxB) in m<sup>2</sup>.

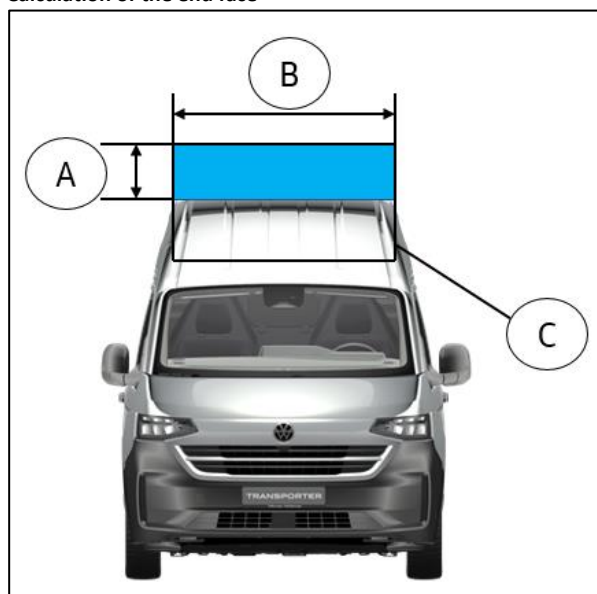
Applies to vehicles with a reference mass not exceeding 2,840 kg (kerb weight 2,740 kg).

See table below:

Model series	Body type	Drive type	Power [kW]	Drive train	Gearbox	Max. end face [m <sup>2</sup> ]	Max. tyre rolling resistance (tyre class)
Transporter panel van (N1)	All	2.0 EcoBlue	All	All	All	4.75	B
	All	BEV	All	All	1 gear	4.75	E
Window van (M1)	Low roof	2.0 EcoBlue	81	Front-wheel drive	Manual	4.75	B
	Low roof	2.0 EcoBlue	110	All	Manual/auto matic	up to 4.75	B
	Low roof	2.0 EcoBlue	125	All	Automatic	up to 4.3	B
	Low roof	BEV	All	All	1 gear	4.75	E

Further information on the ISC parameters can be found in [chapter 6.1 Notes on homologation of modifications and conversions](#).

## Calculation of the end face



Element	Description
A	Height of the roof-mounted equipment
B	Width of the roof-mounted equipment
C	Integrated roof-mounted equipment

## Information

As standard equipment, the vehicles are supplied from the OEM's factory with full type approval (complete CoC paper, PR number 5EA).

For certain versions, the equipment "incomplete vehicle with incomplete CoC for Converter, PR number 5ET" can be delivered.

On the Volkswagen AG homepage, you can put together your vehicle using the configurator and view the special equipment available:

<https://www.volkswagen-nutzfahrzeuge.de/de/modelle.html>

## 1.15 Hardware

For specification of hardware material and strength, refer to ISO 898-1, Nuts: ISE 898-2.

For information on the torque, please follow the Workshop Manual.

### Information

The Workshop Manuals are available on the Internet via the Electronic Repair and Workshop Information (erWin\*) operated by Volkswagen AG at:  
<https://volkswagen.erwin-store.com/erwin/showHome.do>

\*Information system from Volkswagen AG, subject to payment

## 1.16 Load distribution

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

### 1.16.1 Load distribution

#### Practical note

Do not exceed the gross axle weight rating.

Do not exceed the gross vehicle weight rating.

For vehicles with front-wheel drive (FWD), the front axle load must exceed 38% of the actual vehicle weight in all load cases.

### Information

Overloading the vehicle can excessively reduce the ground clearance of the vehicle.

The centre of gravity of the load capacity should be within the wheelbase of the vehicle.

### Information

Avoid one-sided load distribution.

Uneven load distribution may result in impermissible driving and braking behaviour.

Load distribution outside the permissible range can lead to unacceptable steering, driving and braking behaviour.

### 1.16.2 Centre of gravity position

The position of the centre of gravity shifts when weights are added to or removed from the vehicle. This can affect the steering behaviour and vehicle handling as well as the braking performance.

#### Lateral position

##### Warning note

This difference must not exceed 4% (absolute difference between left and right / total weight, in percent).

It is important to keep the centre of gravity in the transverse direction to the vehicle within certain limits.

The lateral centre of gravity is determined by the differences in the vertical wheel forces on the right (front axle load on the right plus rear axle load on the right) and left (front axle load on the left plus rear axle load on the left).

#### Vertical position – height of centre of gravity

The height of the centre of gravity of the vehicle is determined by the mass of the delivered basic vehicle and the incoming and outgoing masses. In physics, this relationship is described by Steiner's theorem.

The height of the centre of gravity affects the axle loads when braking. The height of the centre of gravity has an effect on roll stability. Safety systems only function properly within the focal limits specified in the following warnings:

##### Warning note

The table opposite shows the maximum vertical centre of gravity heights (CGv) by vehicle type. If the CGv is equal to or less than the specified values and no changes have been made to the components of the brake system, suspension and/or wheels and tyres, the converted vehicle complies with standard ECE 13-H, ANNEX 9 or ADR 35 or the applicable local regulations.

##### Warning note

If the CGv of the converted vehicle is higher than the specified values, Volkswagen AG does not guarantee compliance with standard ECE 13-H, ANNEX 9 or ADR 35 or the applicable local legislation.

### 1.16.3 Test procedure for the height of the centre of gravity

#### Measured value

The vehicle must be loaded in accordance with the test specifications specified in ECE13-H ANNEX 9 (vehicle weight) or ADR 35 or in accordance with the applicable national legislation.

To check the height of the centre of gravity, the method described below is suggested:

Four scales are required for this test. This test can also be carried out with two scales, but then requires more preparation and is less accurate.

First, the vehicle weights must be measured in a horizontal position. The front is then raised and the weights measured again. The higher it is raised, the more accurate the results will be. The height is restricted by various possible contact conditions: between vehicle parts and roof, floor and surroundings.

To improve the measurements, perform the following preparations:

- Prevent wheel movement, e.g. by using wheel chocks or spring fixings
- Increase the tyre pressure to the maximum permissible value
- It is important to remove all loads, such as loose parts, from the vehicle or to secure them properly
- Close the doors

Before measuring the vehicle, the engine must be switched off. After lifting, it should be rolled freely to relieve tension in the tyres and the suspension.

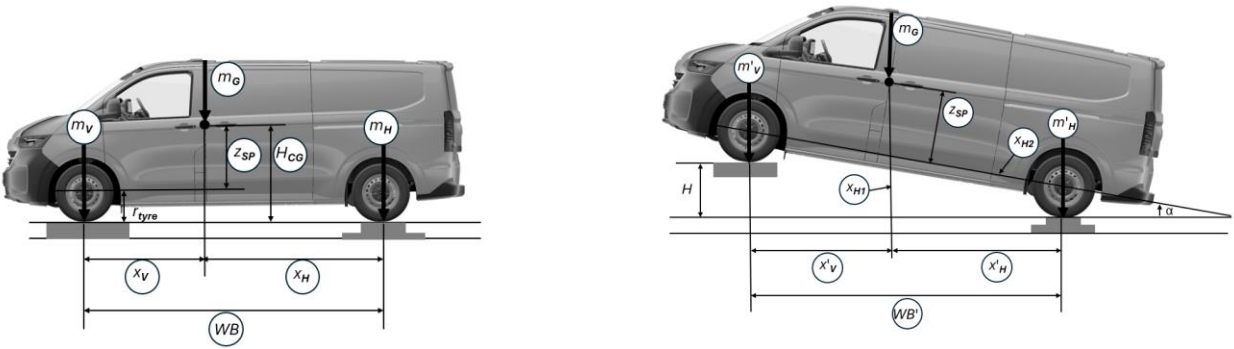
#### Calculation

To estimate the resulting centre of gravity (CGv), the axle load must be measured twice. The first measurement is carried out with the vehicle in a horizontal position and the second after the front of the vehicle has been lifted. To obtain reliable results, perform this test three times at different heights.

To improve the accuracy, the test is also performed in the reverse direction, with the rear end raised.

Vehicle	Wheelbase	Maximum height of the vertical centre of gravity (Cg <sub>v</sub> )
All vehicles of the Transporter panel van model with the exception of the Sport series	All	895 mm
Sport series only	All	800 mm





Variable to be measured or calculated, or known			Measured value		
			1st gear	2nd gear	3rd gear
Wheelbase	WB	mm			
Front axle load	mV	kg			
Rear axle load	mH	kg			
Total weight	mG=mV+mH	kg			
Inclined vehicle					
Front axle load	m'V	kg			
Rear axle load	m'H	kg			
Height (raised)	H	mm			
Tilt angle		Degree			
Centre of gravity height Z		mm			

Tilt angle:

Centre of gravity height Z:

$$\alpha = \arcsin \left[ \frac{H}{WB} \right]$$

$$z_{SP} = \frac{m_H - m'_H}{m_G \cdot H} \cdot WB^2 \cdot \cos \alpha$$
$$z = H_{CG} = z_{SP} + r_{tyre}$$

## 1.16.4 Calculation of the height of the centre of gravity

Specified or measured parameters	
Wheelbase	WB
Front axle load	mV
Rear axle load	mH
Front height	H
Calculated and additional parameters	
Centre of gravity height (CoG height)	ZSP
Total vehicle weight	mG
Distance from front axle to CoG (horizontal)	XV
Distance from rear axle to CoG (horizontal)	XH
Wheelbase (horizontal projection)	WB'
Front axle load	mV
Rear axle load	m'H
Distance from front axle to CoG (horizontal projection)	X'V
Distance from rear axle to CoG (horizontal projection)	X'H
Tilt angle	Arc sine
Front part of "Distance from rear axle to CoG (horizontal)"	XH1
Rear part of "Distance from rear axle to CoG (horizontal)"	XH2

## 1.16.5 Formulas

Masses and lengths. The total weight of the vehicle is the sum of the weights of the front and rear axles:

- $m_G = m_V + m_H$

The longitudinal distances between the centre of gravity and the wheel centres are:

$$x_V = \frac{m_H}{m_G} WB$$

$$x_H = \frac{m_V}{m_G} WB$$

In the case of inclined systems, the main variable is the tilt angle resulting from the quotients of the lifting height and the wheelbase:

$$\sin \alpha = \frac{H}{WB}$$

Similar to the equation for the horizontal system, the distance projected in the ground plane can be determined by the sum of the moments around the centres of the front and rear wheels:

The following equations apply:

$$x'_V = \frac{m'_H}{m'_G} WB'$$

$$x'_H = \frac{m'_V}{m'_G} WB'$$

$$WB' = WB \cos \alpha$$

$$x_{H2} = \frac{x'_H}{\cos \alpha}$$

$$x_{H1} = x_H - x_{H2}$$

The application of the proportional rule results in the height formula for the centre of gravity:

$$\frac{x_{H1}}{z_{SP}} = \frac{H}{WB'}$$

$$z_{SP} = \frac{m'_V - m'_H}{m'_G \cdot H} \cdot WB'^2 \cdot \cos \alpha, \quad \alpha = \arcsin \left[ \frac{H}{WB} \right]$$

or

$$z_{SP} = \frac{m'_H - m'_V}{m'_G \cdot H} \cdot WB'^2 \cdot \cos \alpha, \quad \alpha = \arcsin \left[ \frac{H}{WB} \right]$$

## 1.17 Towing

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

### 1.17.1 Ball coupling – requirements

If a ball coupling is required, the Converter should use a Volkswagen-approved ball coupling. For more details, contact your local Volkswagen Commercial Vehicles Partner.

### Information

The attachment of a ball coupling is not possible or permitted on all vehicles. For more information, contact an authorised dealership.

For more information on towing a trailer, see the Owner’s Manual for the vehicle.

### 1.17.2 Models with ball couplings (for EU)

### Information

When fitting a ball coupling to the longitudinal members, new bolts and nuts must be used for both upper holes on each side. For the bottom holes on each side where the impact bar is attached, the two bolts and nuts can be reused. See figures 1 and 2 in this chapter.

The Converter must observe the following when attaching ball couplings:

- Ball coupling loads must not exceed the specifications for standard vehicles
- To secure the ball coupling, see the figures 3 and 4 below; “Ball coupling for Transporter panel van, Caravelle and window van”
- All changes to the vehicle must be noted in the user manual or in the new description documents enclosed with the user documentation
- The maximum permissible draw bar weight of the ball coupling for all drive versions with internal combustion engines is 112 kg
- The maximum permissible draw bar weight of the ball coupling for all battery electric vehicles is 80 kg
- The regulations of ECE R5 must be observed when attaching ball couplings
- If holes are required on the vehicle chassis, pipe reinforcements must be used

### Information

The maximum permissible trailer draw bar weight for your vehicle can be found in the Certificate of Conformity, or you can ask your VW Commercial Vehicles partner for the value.

### Dimensions of the ball coupling

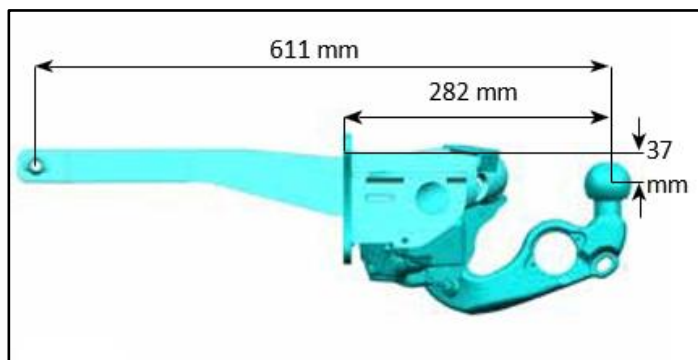


Fig. 1: Retractable ball coupling

The centre of the ball coupling is 1,088 mm from the centre line of the rear axle.

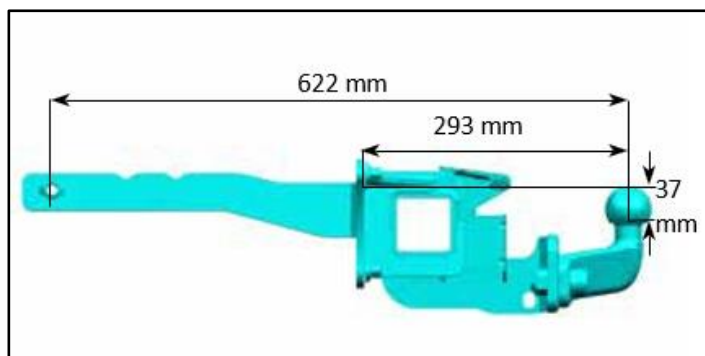


Fig. 2: Fixed ball coupling

The centre of the ball coupling is 1,100 mm from the centre line of the rear axle.

See: [4.2.18 Electrical system for ball coupling](#)

### Information

The attachment of a ball coupling is not possible or permitted on all vehicles. For more information, contact your VW Commercial Vehicles partner.

### Information

When installing a ball coupling in vehicles of the Transporter panel van, Caravelle and window van types, use all 10 mounting points as shown in the following figures.

#### Ball coupling for Transporter panel van, Caravelle-and window van (for EU)

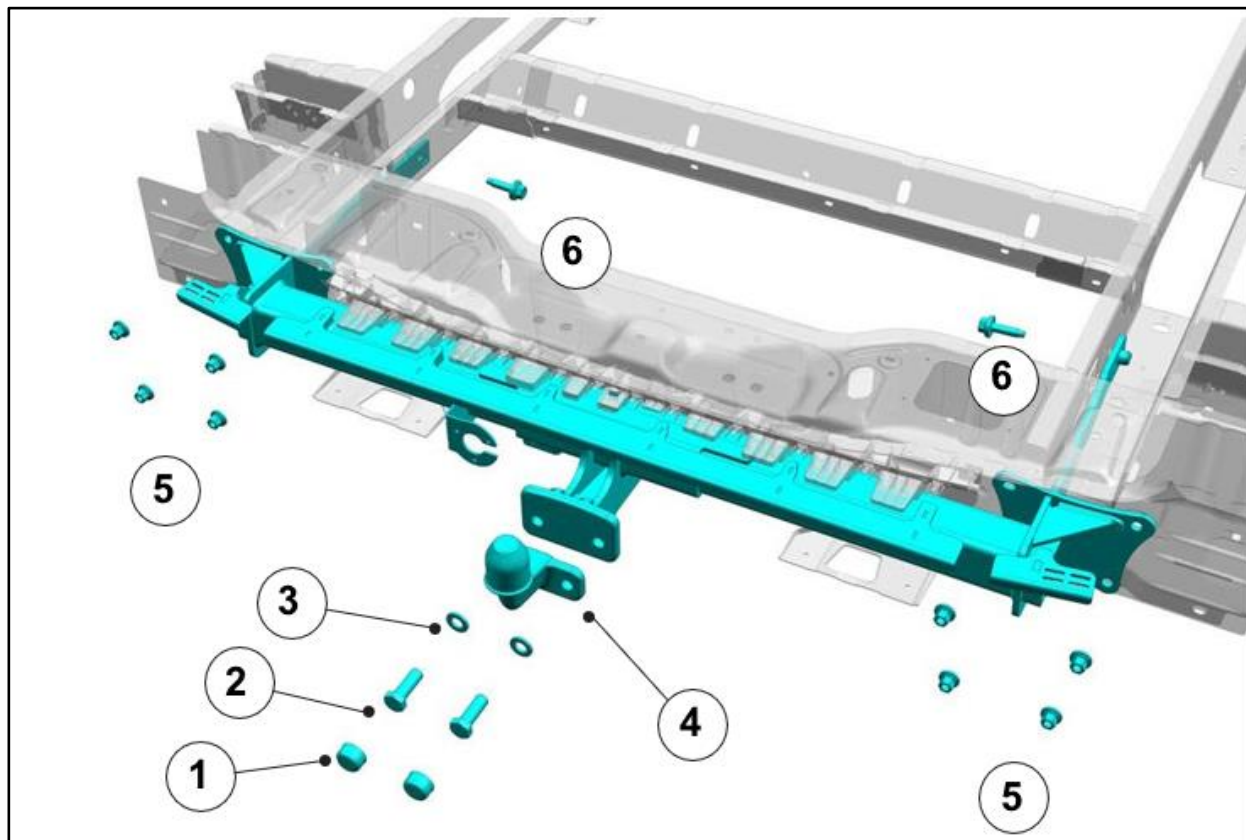


Fig. 3: Fitting the fixed ball coupling

Element	Description
1	Screw cap x 2
2	M16x45 screw – torque 256 Nm ( $\pm$ 25 Nm) x 2
3	M16 washer x 2
4	Tow hook
5	M10 nut – 62.5 Nm ( $\pm$ 9.4 Nm) x 8
6	M12x45 screw – 103 Nm ( $\pm$ 15.5 Nm) x 2

## Retractable ball coupling for Transporter panel van, Caravelle and window van

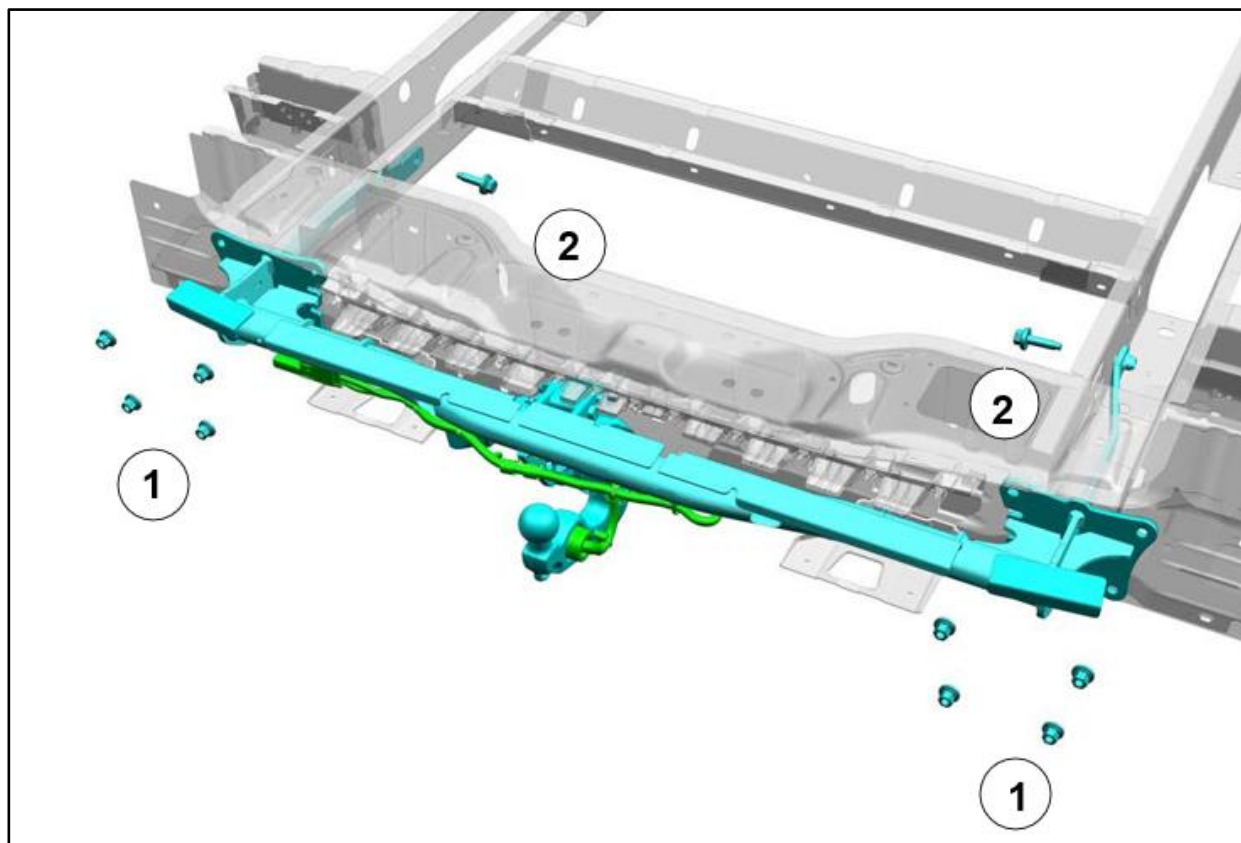


Fig. 4: Fitting the retractable ball coupling

Element	Description
1	M10 nut – 62.5 Nm ( $\pm$ 9.4 Nm) x 8
2	M12x45 screw – 103 Nm ( $\pm$ 15.5 Nm) x 2

## 2 Running gear

### 2.1 Suspension system

#### Warning note

Do not modify, drill, cut or weld any suspension components, especially not on the steering rack, subframe, lower transverse link or anti-roll bars, springs or shock absorbers, including the brackets.

The replacement of springs, shock absorbers and stop buffers (also between different Transporter versions) is not permitted, as changes in vehicle dynamics can affect the ESP system.

#### Practical note

CAUTION: Modifications to the suspension system may affect the vehicle's driving properties and service life.

#### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).



## 2.2 Front suspension

### 2.2.1 Springs and spring suspension

#### Warning note

Do not modify, drill, cut or weld any suspension components, especially not on the steering rack, subframe, lower transverse link or anti-roll bars, springs or shock absorbers, including the brackets.

#### Warning note

The replacement of springs, shock absorbers and stop buffers (also between different Transporter versions) is not permitted, as changes in vehicle dynamics can affect the ESP system.

#### Practical note

When performing welding work, the springs must be covered to protect them from welding spatter.

Do not touch the springs with welding electrodes or welding guns.

#### Practical note

Ensure that any loose or removed and reinstalled components are properly reinstalled, and that the torque is set according to the manufacturer's requirements.

#### Information

Do not make any changes to the wheelbase or track width, or frame extensions of any kind.

**Information**

During removal and installation, take care not to damage the surface or the corrosion protection of the springs.

**Information**

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

## 2.3 Rear suspension

### 2.3.1 Springs and spring suspension

#### Warning note

The replacement of springs, shock absorbers and stop buffers (also between different Transporter versions) is not permitted, as changes in vehicle dynamics can affect the ESP system.

#### Warning note

Springs must not be changed with regard to spring rate or spring height during the vehicle conversion. This can cause springs to fail or their function to be impaired, as well as other vehicle malfunctions for which Volkswagen AG cannot be held liable.

### Rear suspension

#### Warning note

Do not modify, drill, cut or weld any suspension components, especially not on the steering rack, subframe, springs or shock absorbers, including the brackets.

#### Practical note

When performing welding work, the springs must be covered to protect them from welding spatter.

Do not touch the springs with welding electrodes or welding guns.

#### Practical note

Do not install any additional axles.

**Practical note**

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

**Information**

Do not make any changes to the wheelbase or track width, or frame extensions of any kind.

**Information**

During removal and installation, take care not to damage the surface or the corrosion protection of the springs.

**Information**

Do not install any additional axles.

**Information**

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

## 2.4 Wheels and tyres

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

### 2.4.1 Wheel clearance

The distance between the tyre and the wing or wheel housing must be sufficient, even if snow or anti-skid chains are fitted and the wheel suspension is fully spring-loaded, so that the axle can also be twisted.

### Information

Ensure that only approved wheels and/or approved tyre sizes are installed.

Ensure that the wheel and the jack are accessible and that there is sufficient clearance in the wheel housing to enable the wheel to be changed after the conversion.

### 2.4.2 Tyre manufacturers

Replacement tyres should have the same brand, size, tread and load capacity as the manufacturer's original tyres. Under these conditions, the original tyre label should be sufficient. However, if the specified tyres and/or air pressure are changed, a new label should be applied over the original label.

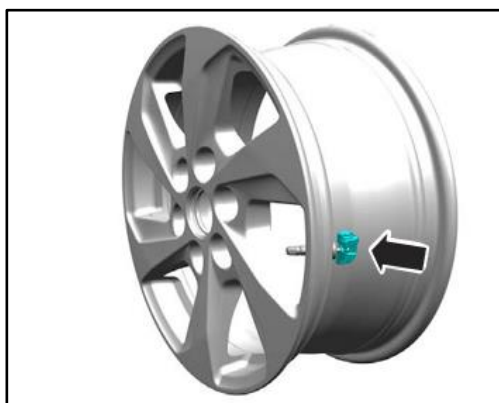
### 2.4.3 Tyre Pressure Monitoring System (TPMS)

Volkswagen TPMS is a direct system that works with physical pressure sensors. TPMS is calibrated according to the correct tyre pressure for the GVM (gross vehicle mass – gross vehicle weight) of the vehicle. If the spare wheel is ordered on a basic vehicle with TPMS, the tyre is not supplied with a TPMS sensor.

If you need to replace a road wheel and a tyre with the provisional spare wheel, the system will still detect a defect. This is to remind you to repair the damaged wheel and tyre and to refit it on your vehicle. To restore the system to proper operation, you must have the repaired wheel-tyre assembly reinstalled on the vehicle.

#### Information

When installing new tyres, ensure that the TPMS sensors are properly fitted in accordance with the specifications in the service documentation.



### 2.4.4 Spare wheel

When converting the vehicle or storing the spare wheel in a new location, ensure that the spare wheel can be accessed freely.

### 2.4.5 Temporary repair kit

If the vehicle does not have a spare wheel, a temporary repair kit is available in the event of an emergency, which is sufficient for the temporary repair of a single tyre. Both the compressor and the tyre sealant can be located in the front right-hand step.

You will find further information on using the breakdown set in the Owner's Manual.

For information on vehicles with a spare wheel, see [1.11 Jacking up and lifting](#)

#### 2.4.6 Painting of wheels

Cover the wheels during painting or paint repair work.

##### Practical note

Do not apply paint to the contact surfaces between the wheel hubs and the wheels, and also not on brake drums or brake discs, hubs and bores, or on surfaces under wheel nuts. Any further treatment in these areas may adversely affect the performance of the wheel hub and the safety of the vehicle.

## 2.5 Brake system

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

### 2.5.1 General information

The brake system must be fully functional after the conversion work has been completed. Vehicle brake operating conditions must be checked, including the warning systems and the handbrake.

Brakes are certified according to 71/320EEC and ECE R13H in the latest version or according to ADR 35 or applicable national legislation.

### Warning note

Do not prevent air flow to the brake system that is used to cool it.

### Practical note

Spoilers and wheel covers must not impair the cooling output.

### Practical note

In the case of converted vehicles equipped with AEBS (Autonomous Emergency Braking System) and in which significant changes are made in terms of mass and geometry, it is recommended that the vertical alignment and system function of the radar system be checked by a Volkswagen Commercial Vehicles Partner. For more information, see the Repair Manual or the Owner's Manual.



**Practical note**

Do not modify the front bumper or the grille. Any change affects the operation of the Adaptive Cruise Control (ACC) and the Autonomous Emergency Braking (AEB) due to the overlap of the radar and the front of the vehicle.

**Information**

The brake fluid level must remain visible.

The brake fluid reservoir of the sender vehicle is transparent so that the level can be checked from the outside without opening the reservoir, thus reducing the risk of contamination of the brake fluid. Never move the brake fluid reservoir.

The brake fluid reservoir must remain accessible for servicing work and for topping up brake fluid.

**Information**

Do not cover the radar. See [4.17 Adaptive Cruise Control](#)

**Information**

Do not paint the front grille of the vehicle as this may impair the operation of the radar.

**2.5.2 Kerb weight – data****Information**

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

### 2.5.3 Brake hoses – general information

The front and rear brake hoses must not rub, chafe or touch the body and chassis components. There must be sufficient clearance between full compression and expansion in all operating conditions, as well as from lock to lock in steering wheel turns.

Brake lines shall not be used to support or secure other components.

#### Practical note

Make sure the front and rear brake hoses are not twisted and that they keep the specified distance from body and chassis components.

### 2.5.4 Parking brake

#### Warning note

No changes may be made to the brake system.

No cable splices may be inserted into the electrical wires for the parking brake.

The electronic parking brake (EPB) must not be modified.

#### Practical note

A check must be carried out on vehicles that have been in the neutral position of the gearbox for an extended period of time during transport between the conversion locations, during which the parking brake has not been applied. Please follow the instructions in the Workshop Manual.

#### Information

The Workshop Manuals are available on the Internet via the Electronic Repair and Workshop Information (erWin\*) operated by Volkswagen AG at:  
<https://volkswagen.erwin-store.com/erwin/showHome.do>

\*Information system from Volkswagen AG, subject to payment

### 2.5.5 Hydraulic brake – front and rear brakes

#### Warning note

Do not change the brakes.

Do not change the cooling air supply and discharge of the brake disc.

### 2.5.6 Anti-Lock Brake System – Electronic Stability Control

#### Warning note

Do not make any modifications to the brake system, including Anti-Lock Brake System (ABS), Traction Control System (TCS), and Electronic Stability Control (ESC), also known as the Electronic Stability Program (ESP).

## 3 Drive train

### 3.1 Motor/electric drive

#### Warning note

Transport mode includes a calibration function for reducing the risk of corrosion of injectors. Leaving transport mode before upgrading/converting increases the risk of premature injector failure.

#### Practical note

Observe the device manufacturer's specifications regarding safety, guarantee and compliance with any legal regulations.

#### Practical note

The electric drive unit must not be changed on the Transporter panel van.

The drive shafts in the electric drive unit must not be changed on the Transporter panel van.

For the electrical connection of additional devices, see: [4.4 Charging system](#).

#### 3.1.1 Selection of motor/electric drive for conversions

The Converter is responsible for selecting the engine with the correct emission values according to the current EEC/EU regulations or legal regulations of the respective country, depending on the category and weight of the finished vehicle.

The weight is based on the reference weight, which is defined as the weight in roadworthy condition minus a flat weight of 75 kg for the driver plus a flat weight of 100 kg.

#### Information

Engines for light commercial vehicles with emission standard EU 6.2 are available for Transporter panel van vehicle conversions up to 2,840 kg.

### 3.1.2 Motor/drive types

2.0 l engines with front-/all-wheel drive (FWD/AWD) in accordance with emission standard EU 6.2 with DPF; 2.5 l PHEV and front-wheel drive; BEV with rear- and all-wheel drive:

Motor/electric drive	Max. output kW/rpm	Max. torque Nm, rpm	Emissions	Vehicle class	Gearbox/drive
2.0 l diesel	81 kW (110 PS) at 3,250–3,500 rpm	310 Nm at 1,500–2,250 rpm	Passenger car / LDT EU 6.2	M1/N1	Man. / FWD
	110 kW (150 PS) at 3,500 rpm	360 Nm at 1,500–2,500 rpm	Passenger car / LDT EU 6.2	M1/N1	Man. / FWD / AWD
	125 kW (170 PS) at 3,500 rpm	390 Nm at 1,750–2,500 rpm	Passenger car / LDT EU 6.2	M1/N1	Auto. / FWD / AWD
2.5 l petrol + Plug-in HEV	171 kW/ (232 PS)	205 Nm + 320 Nm	Passenger car / LDT EU 6.2	M1/N1	Auto. / FWD
Electrically driven BEV	85 kW ( 116 PS)	415 Nm	None	M1/N1	1-speed auto. / RWD
Electrically driven BEV	100 kW (136 PS)	415 Nm	None	M1/N1	1-speed auto. / RWD / AWD
Electrically driven BEV	160 kW (218 PS)	415 Nm	None	M1/N1	1-speed auto. / RWD / AWD
Electrically driven BEV	210 kW (286 PS)	415 Nm	None	M1/N1	1-speed auto. / RWD / AWD

LDT – Light duty

FWD – Front-wheel drive

RWD – Rear-wheel drive

AWD – All-wheel drive

Auto. – Automatic gearbox

Man. – Manual gearbox

rpm – revolutions per minute

## 3.2 Engine cooling

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

### Information

The installation must comply with the applicable legal regulations.

### 3.2.1 Auxiliary heating systems

#### Warning note

Volkswagen coolant additives are required for the cooling system to be fully functional. To prevent damage to the materials, only components approved by Volkswagen or components with the corresponding specification should be used.

Do not install any components in front of the radiator grille or in the air flow around the engine that may impair the engine cooling.

#### Practical note

Only make connections on the heater hose between the front cab heater and the water pump return nozzle.

#### Practical note

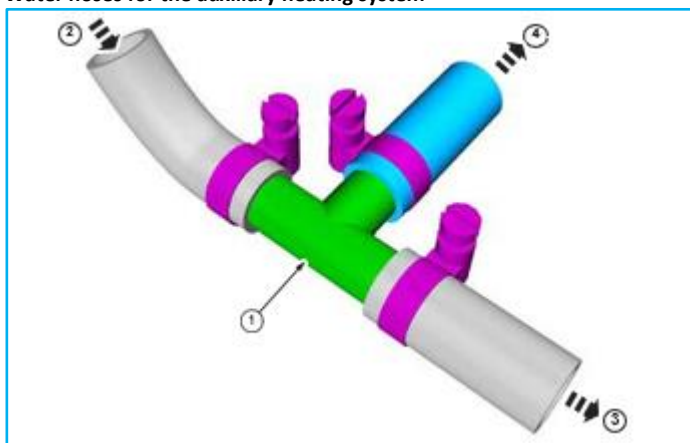
The original coolant volume (without auxiliary heater) of the vehicle must never be exceeded by more than 10%.

The coolant level must be maintained between the maximum and minimum lines in the cold state after filling and bleeding processes.

### Practical note

Only use coolant additives / anti-freeze additives (or additives with equivalent specification) recommended by the manufacturer. Do not use different types of coolant.

### Water hoses for the auxiliary heating system



Element	Description
1	Plug (aluminium or plastic)
2	Heating hose (maintaining heating fluid)
3	Original flow
4	To the auxiliary device

- The coolant flow to the cab heater takes precedence over the coolant flow to an auxiliary heater or hand wash device
- The coolant hose must run below the minimum level of the bleeder cylinder
- Use an aluminium or plastic T-piece with die-forged or bead ends to avoid sudden release of the hose. Reconnect the original coolant hose using the standard Volkswagen water hose clip or a suitable clip of equivalent specification as shown in the figure above. Make sure that the hose and the T-piece are correctly pressed in
- The pipe guide must be attached to the body structure or to suitable supports, avoiding electrical components or wires, hot or moving parts, and components of the brake or fuel system
- The hose must be heat-insulated with a suitable material if the distance to the exhaust components (exhaust manifold or exhaust gas recirculation) is less than 100 mm
- The vertical distance between the critical cooling components (radiator, fan hood and radiator brackets) and the inner and outer panels of the bonnet (assembly) must not be less than 15 mm at the construction position
- There must be a minimum clearance of 10 mm below the maximum engine torque between the engine and the flexible components (e.g. hoses or wiring harnesses) that are attached to the front metal plate

### 3.2.2 Fuel-operated auxiliary heaters

Make sure that exhaust gases from fuel-powered auxiliary heaters cannot be returned to the vehicle interior.

The exhaust gases must not enter the engine's intake system or the air intake for the passenger compartment ventilation. The heating system should be installed outside the passenger compartment. The heating system should not be close to moving parts. Paint damage resulting from body work must be fully protected against corrosion.

See: [5.13 Corrosion protection measures](#)

### 3.2.3 Restrictions to the air flow

#### Warning note

Do not install any components in front of the radiator grille or in the air flow around the engine that could impair the performance of the cooling system.

#### Practical note

Overheating in the engine compartment can reduce the robustness of components.

#### Information

When selecting suitable materials, please assume that the ambient temperature under the bonnet is around 130°C.



## 3.3 Power take-off system

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

### 3.3.1 Auxiliary drive units

If the correct belt is used, the tensioning is and remains fully automatic for the entire service life of the belt.

### Practical note

Only use components recommended by the manufacturer or components with comparable specifications.

Make sure that the diameter of the auxiliary drive pulley is smaller than the crankshaft pulley.

The protectors of the front drive belt must always remain in place. If protectors are removed, for example when attaching additional units, they must then be refitted for protection purposes.

### Practical note

If the vehicle is already equipped with an air conditioner compressor, do not integrate any other belt-driven auxiliary units into the existing belt drive. If it is necessary to keep the air conditioning system, an additional drive belt with a third crankshaft pulley must be used to drive the additional auxiliary unit.

**Information**

Do not remove any attachments from the crankshaft damper as it is tuned for optimum system resonance.

**Information**

The protectors protect the front drive belt system from stone chips and protect people from rotating parts that are switched on by the start/stop function.

The natural frequency of the engine bearing brackets (including the additional support unit fitted after installation) should be higher than the maximum excitation frequency of the main excitation order of the engine in question at maximum engine speed. In the case of four-cylinder in-line engines, this is the second engine order.

When repairing or installing a new auxiliary drive unit, i.e. a drive belt driven by a crankshaft pulley, the angular misalignment between the belt and the pulleys must not exceed  $\pm 0.5^\circ$ .

If the vehicle is not equipped with an air conditioner compressor, an additional auxiliary unit can be integrated in its place and the standard belt can be replaced by the optional longer standard air conditioning belt, provided the pulley is the same size and in the same position as the optional standard compressor. In this case, a maximum of 5 kW of power or 21 Nm of torque is available at each engine speed (based on the variable air conditioner compressor approved by Volkswagen).

## 2.0 EcoBlue

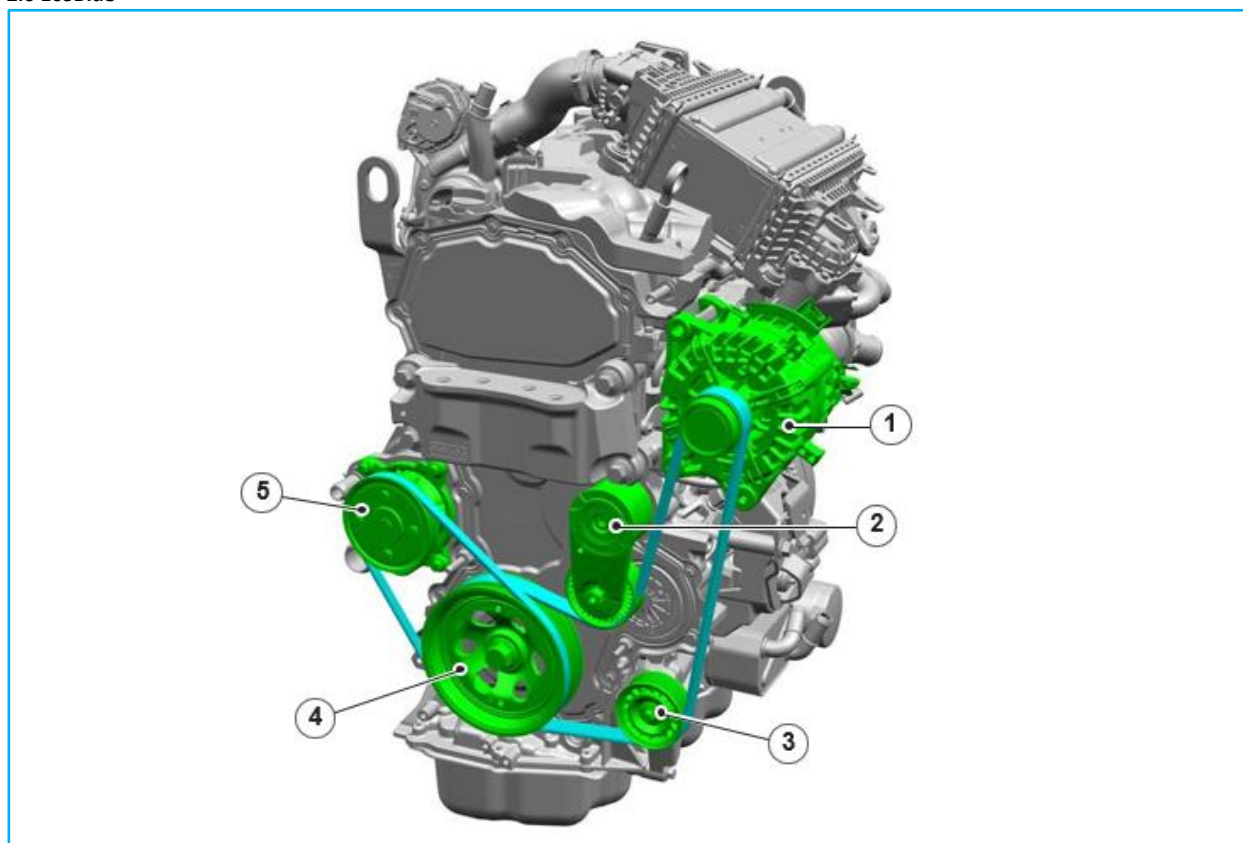


Fig. 1: Motor without AC

Element	Description
1	Alternator
2	Tensioning roller
3	Idler roller
4	Crankshaft pulley
5	Coolant pump

2.0 EcoBlue with optional air conditioning system

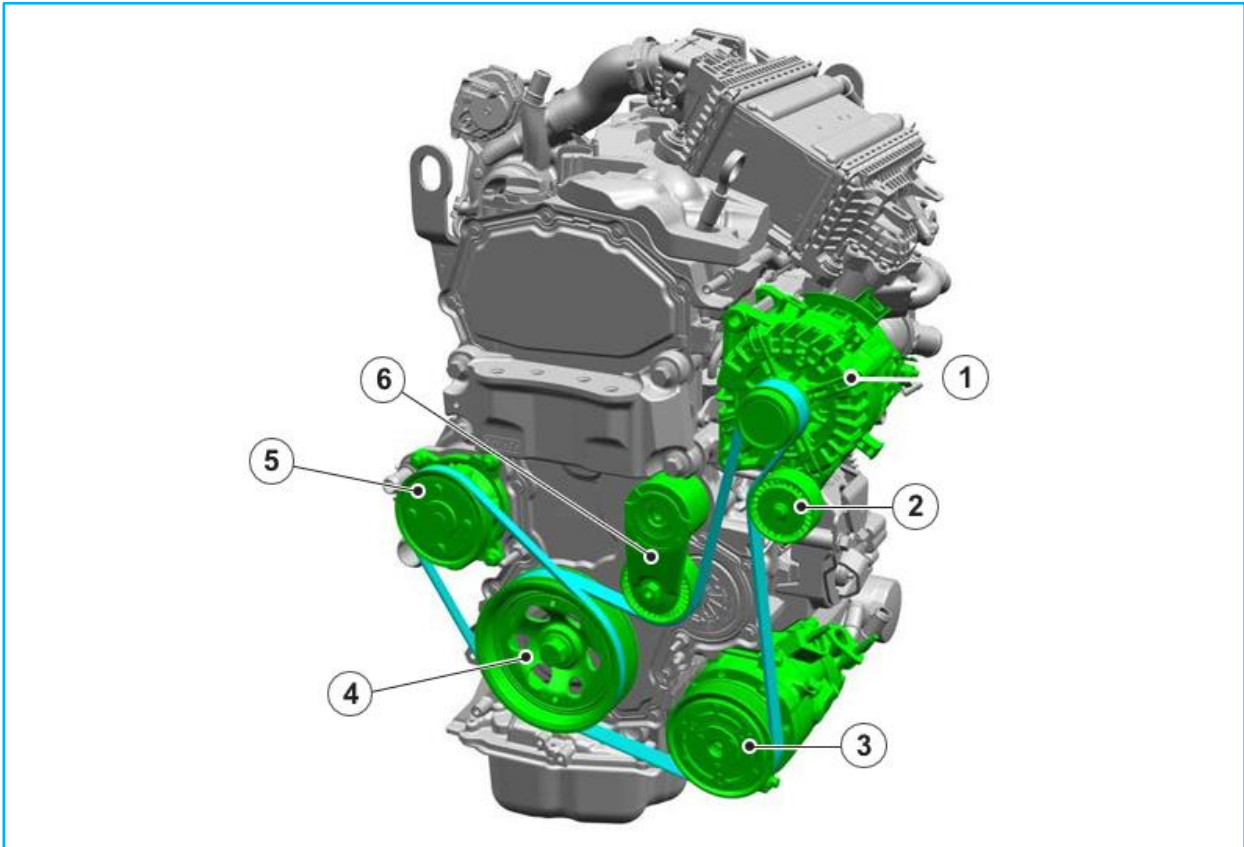


Fig. 2: Motor with optional AC

Element	Description
1	Alternator
2	Idler roller
3	AC compressor
4	Crankshaft pulley
5	Coolant pump
6	Tensioning roller

Figure	Motor
Fig. 1	Without AC
Fig. 2	With optional AC.

### 3.4 Automatic gearboxes

#### Warning note

Do not re-route the external shift cables.

#### Warning note

Do not change the external connectors.

#### 8-speed automatic gearbox, front-wheel drive

Gears	Basic gear ratio	Overall gear ratio – final drive 3.65
1st gear	4.484	16.367
2nd gear	3.146	11.483
3rd gear	2.872	10.483
4th gear	1.842	6.723
5th gear	1.414	5.161
6th gear	1	3.650
7th gear	0.742	2.708
8th gear	0.616	2.248
Reverse gear	2.882	10.519

## 3.5 Clutch

The manufacturer does not offer the option of a reinforced clutch system. The available final drive ratio depends on the weight of the specified sender vehicle.

It is necessary to select the drive, engine, gear ratio, total vehicle mass, total towing weight, axle plates and load capacity of the original vehicle to suit the customer order.

## 3.6 Manual gearbox

### Warning note

Do not re-route the external shift cables.

### Information

All 6-speed manual gearboxes with front-wheel drive are suitable for use with tachographs.

### 6-speed manual gearbox, front-wheel drive

Gear	Basic gear ratio	Overall gear ratio – final drive 4.93
1st gear	3.727	18.374
2nd gear	1.952	9.623
3rd gear	1.121	5.526
4th gear	0.780	3.845
5th gear	0.844	4.161
6th gear	0.683	3.367
Reverse gear	1.423	7.015

## 3.7 Exhaust system

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

### Warning note

Any modifications to the exhaust system or the passenger/load compartment must not cause exhaust gases to enter the vehicle.

### 3.7.1 Extensions and optional exhaust systems

#### Practical note

Non-standard systems must be tested for engine counter-pressure and comply with the legal requirements (noise and emissions).

#### Practical note

If pipes need to be bent, the bending radius must be at least 2.5 times the pipe diameter.

#### Practical note

Ensure that there is sufficient distance to hot and rotating components in all driving situations.



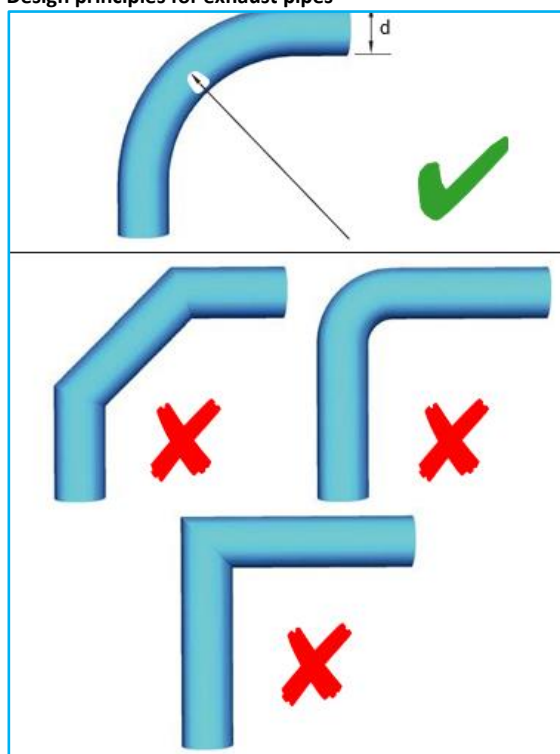
### Practical note

The exhaust must not be modified in front of the exhaust throttle valve. Following a repositioning of a thermal element (DOC, DPF, SCR or ASCR) or a sensor, the sender vehicle is no longer legally compliant with regard to emissions and type approval. The control of the DPF and SCR regeneration has been calibrated for the supplied system design and modifications may also cause component failure.

### Information

As far as possible, all pipe connections must be designed so that the gas flow runs from pipes with small diameters to pipes with large diameters.

#### Design principles for exhaust pipes



Element	Description
d	Diameter
r	Radius $\Rightarrow 2.5d$

### 3.7.2 Exhaust pipes and brackets

#### Practical note

Keep the original structure and the original heat shields.

#### Practical note

Do not install any components nominally closer than 150 mm (100 mm minimum distance) to the flame pipe, catalytic converter, diesel particulate filter or other parts of the exhaust system.

### 3.7.3 Exhaust heat shields

#### Exhaust heat shields

- Catalytic converters in particular have a high operating temperature
- Make sure that the existing heat shields are retained
- If necessary, install additional heat shields over the exhaust system to avoid fire hazard

#### Standard exhaust heat shields

#### Practical note

Standard heat shields can be obtained from your contract partner and easily attached. The installation of additional heat shields may be necessary after modifications to the exhaust system, especially when close to the ground.

### 3.7.4 Diesel particulate filter (DPF)

The DPF is part of the emission control systems installed in your vehicle. It filters harmful diesel particles (soot) out of the exhaust gas.

#### Regeneration

Unlike a normal filter that needs to be replaced regularly, the DPF is designed to self-regenerate or clean to maintain operational efficiency. The regeneration occurs automatically. Under certain driving conditions, however, it may be necessary to support the regeneration.

If only short distances are driven, or if there is frequent stopping and starting, occasional trips can support the regeneration under the following conditions:

- Drive the vehicle preferably on a main road or motorway for up to 20 minutes. Avoid prolonged operation at idling speed and always observe the speed limits and road conditions
- Do not switch off the ignition
- Drive in a gear lower than normal (if possible) to achieve higher engine speeds on this trip

**Warning note**

Do not park or idle the vehicle over dry leaves, dry grass or other combustible material. The DPF regeneration process produces very high exhaust gas temperatures. The exhaust emits a considerable amount of heat during and after DPF regeneration and after you have switched off the engine. Therefore, there is a potential fire hazard.

**3.7.5 Manual initiation of regeneration (PR number 9HC)**

When the vehicle is stationary, the DPF cannot start a regeneration process.

If the expected usage profile of the vehicle includes longer periods when the vehicle is stationary, it is strongly recommended that the original vehicle be ordered with manual initiation of regeneration.

Manual initiation of regeneration allows the driver/operator to perform a DPF regeneration manually when the vehicle is stationary after confirming that it is safe.

See: [4.10 Engine management system](#) (DPF and engine speed control)

## 3.8 Fuel system

### Warning note

Do not cut into the original fuel supply line.

### Warning note

Ensure that the modified vehicle fulfils all the relevant legal requirements.

### Warning note

Make sure that each individual system has an appropriate fuel cut-off.

The fuel system of PHEVs must not be modified.

### Practical note

Do not attach an additional fuel line to the PHEV fuel system.

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

### Information

Two options are available to order:

- 1) Additional fuel connection
- 2) Fuel-operated heater (including additional fuel connection)

### Information

For vehicles without options 1 or 2 (see above) that can be ordered, an additional fuel connection can be installed using the following procedure:

Lower the fuel tank:

- Empty the tank
- Disconnect the fuel lines at the connection point between the fuel tank and the urea tank
- Disconnect the breather pipe for the tank filler neck
- Seal lines with plugs to prevent fuel residues from escaping or dirt from entering
- Remove the filler pipe from the tank
- Remove the mounting screws of the two tank retaining straps
- Lower the fuel tank to gain access to the top of it; see the figure below for cutting the auxiliary nozzle

Reinstall the fuel tank:

- Raise the fuel tank, ensuring that fuel lines and electrical cables are not trapped
- Reattach straps, tighten screws to 80 Nm
- $\pm 12$  Nm
- Refit the filler pipe to the filler neck and tighten the hose clip to a torque of  $3.7 \text{ Nm} \pm 0.6 \text{ Nm}$
- Remove plug and reconnect fuel lines

### Practical note

Ensure that there is sufficient distance to hot and rotating components in all driving situations.

### Practical note

When cutting the connector, make sure there are no sharp edges or burrs left behind.

**Information**

The pipe of the additional fuel connection must be secured to the body structure using the pine-tree clip.

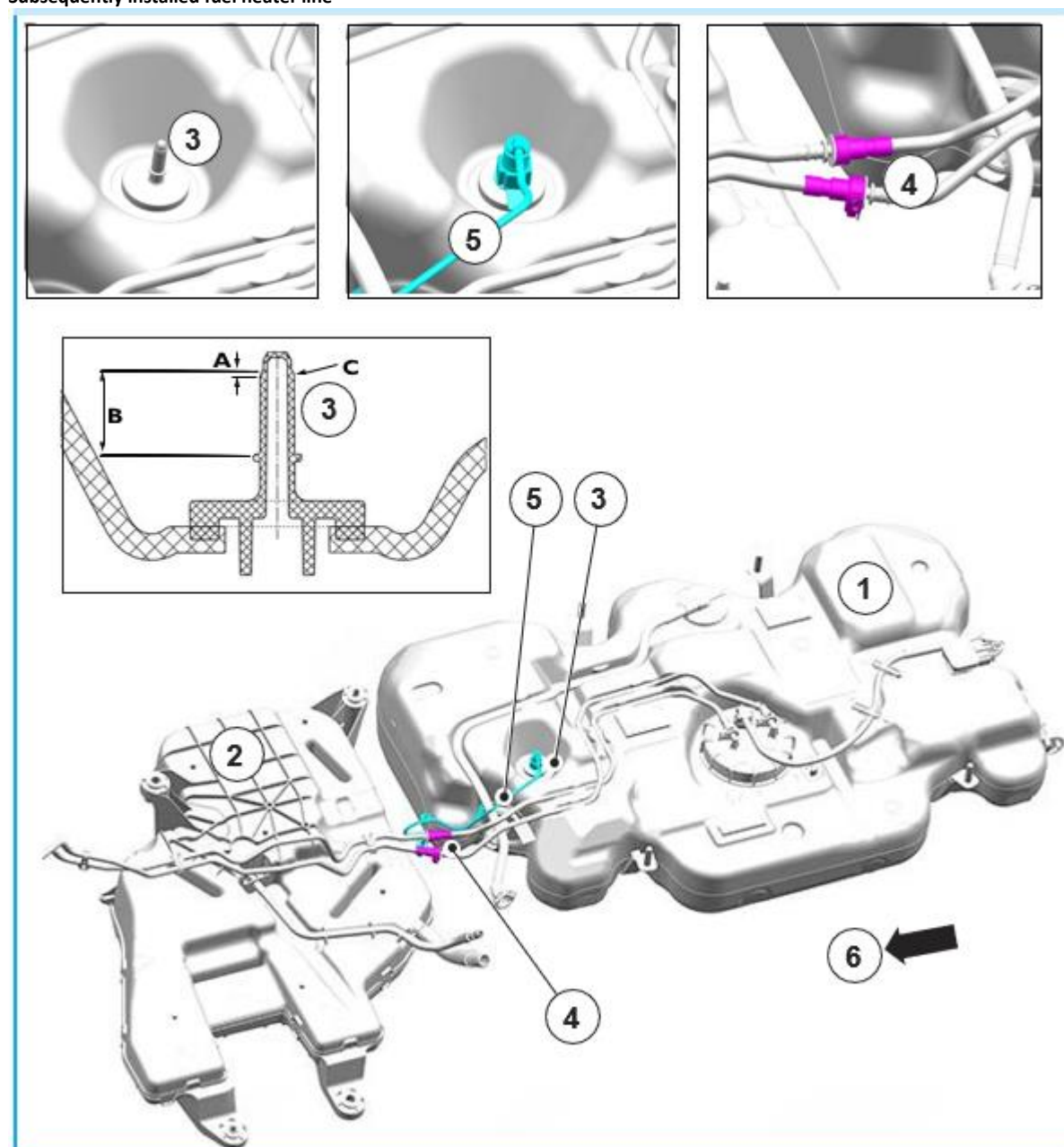
**Information**

Do not attach any components to existing electrical components, cables or fuel lines.

Further information

See: [5.1 Body](#) No-drilling zones in the floor – fuel tank with urea.

## Subsequently installed fuel heater line



Element	Description
1	Fuel tank
2	Urea tank
3	Auxiliary nozzle
4	Connection point for fuel lines
5	Auxiliary fuel line
6	Direction of travel
A	2 mm ±0.20
B	Position of cutting line 19.54 mm min. to 19.77 mm max.
C	For ø 7.89 mm plug

## 3.9 High-voltage system and electrified drive train

### Warning note

Before starting to make changes to the vehicle, please read the following overview of the health and safety precautions for the high-voltage system.

### 3.9.1 High-voltage system – health and safety information

### Warning note

The orange high-voltage cables, fastenings, channels, strain relief devices, earth cables or plugs must not be touched, drilled, altered or concealed.

Maintenance of the high-voltage system on this vehicle may only be carried out by qualified staff. The qualifications required vary by region. Observe local laws and legal guidelines regarding electric vehicle service. Failure to comply with these instructions can cause severe injuries or death.

To eliminate the risk of high voltage shock, always follow all warnings and service instructions, especially for disconnecting and isolating the system. The high-voltage system operates at approx. 450 V DC for BEV (400 V DC for PHEV), which is routed to its components and modules via high-voltage cables. The high-voltage cables and wires can be identified by their orange cable tie or orange cable sleeves. All high-voltage components are identified by warning signs with the high-voltage symbol. Failure to follow these instructions may result in serious or fatal injuries.

The low-voltage service plug must be open and unlocked for all work on the high-voltage system. Failure to comply with these instructions can cause serious injuries or death.



**Warning note**

Extreme heat, such as in paint drying ovens, leads to damage to the high-voltage battery. Before using a paint drying oven for more than 45 minutes or at temperatures above 60°C (140°F), the high-voltage battery must be removed. Failure to observe this instruction can result in damage to the high-voltage battery, which can lead to serious or fatal injuries due to a fire or explosion. Please see the workshop manual for the Transporter panel van / window van.

**Warning note**

When the high-voltage system is de-energised, the voltage in the high-voltage battery is not reduced. The battery pack is still live and remains dangerous. Contact with the internal parts of the high-voltage battery can lead to serious injury or death.

The powertrain software calibration must not be changed (this includes the electric vehicle control unit, the main drive control unit, the battery charging control unit, the battery control module and the anti-lock brake system control unit).

Direct contact with high-voltage components by staff, tools or devices should generally be avoided, including entering or leaning on them, putting tools on them, etc.

“High voltage” is defined in UN ECE 100 as:

- More than 60 V for DC circuits
- More than 30 V RMS value for AC circuits

Manufacturers and Converter should NOT plan to connect or change the high-voltage system or its components in any way. Integration into the vehicle's electrical system may only be carried out with the low-voltage mains (12 V) or with socket(s) with the “Pro Power Onboard” function (if applicable).

Only qualified Volkswagen service staff may attempt to diagnose or repair high-voltage components or systems. All employees involved in the development, production, modification or maintenance of vehicles with high-voltage systems (with content other than the high-voltage systems) must have a basic understanding of and be trained in the safety principles for HV systems.

Emergency Response Guidelines – Information for first responders can help with the development of an emergency plan in the event of damage to a vehicle with a high-voltage system.

The following production processes are not recommended for vehicles with high-voltage systems:

- Welding at any point on the chassis or the assembled body
- Cutting or drilling work in the vicinity of HV components
- Measures that generate considerable heat in the vicinity of high-voltage components, in particular in the vicinity of the high-voltage battery
- Curing of paint at over 60°C (140°F) or for more than 45 minutes

High-voltage sticker, example 1



High-voltage sticker, example 2



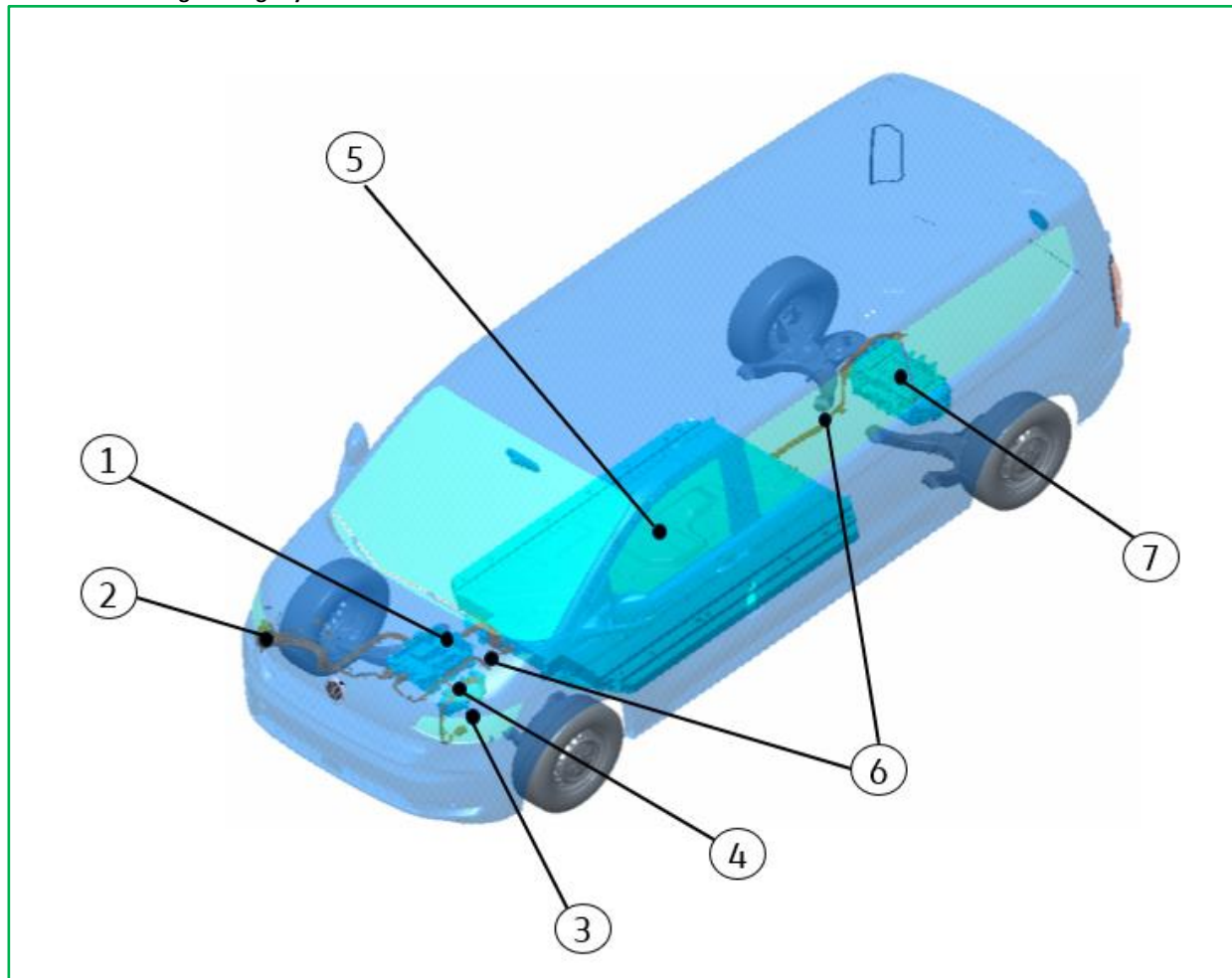
High-voltage sticker, example 3



### 3.9.2 Overview of the high-voltage system

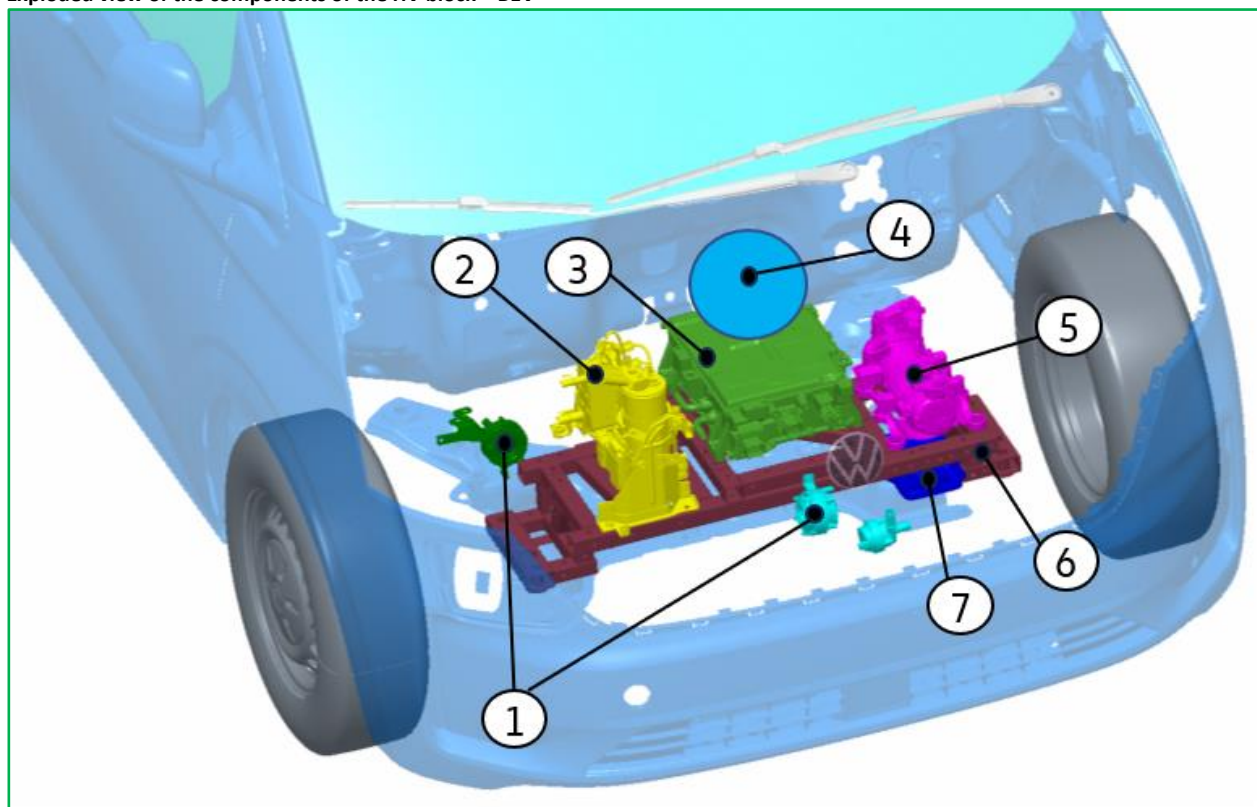
The high-voltage system of the Transporter panel van / window van consists of a high-voltage battery mounted centrally under the floor, a “block” of HV control systems mounted at the front under the “bonnet”, which are attached to the “megabrake”, and an electric drive unit that drives the rear wheels. These are connected by orange high-voltage cables and a system for cooling the components of the high-voltage system.

#### Overview of the high-voltage system – BEV



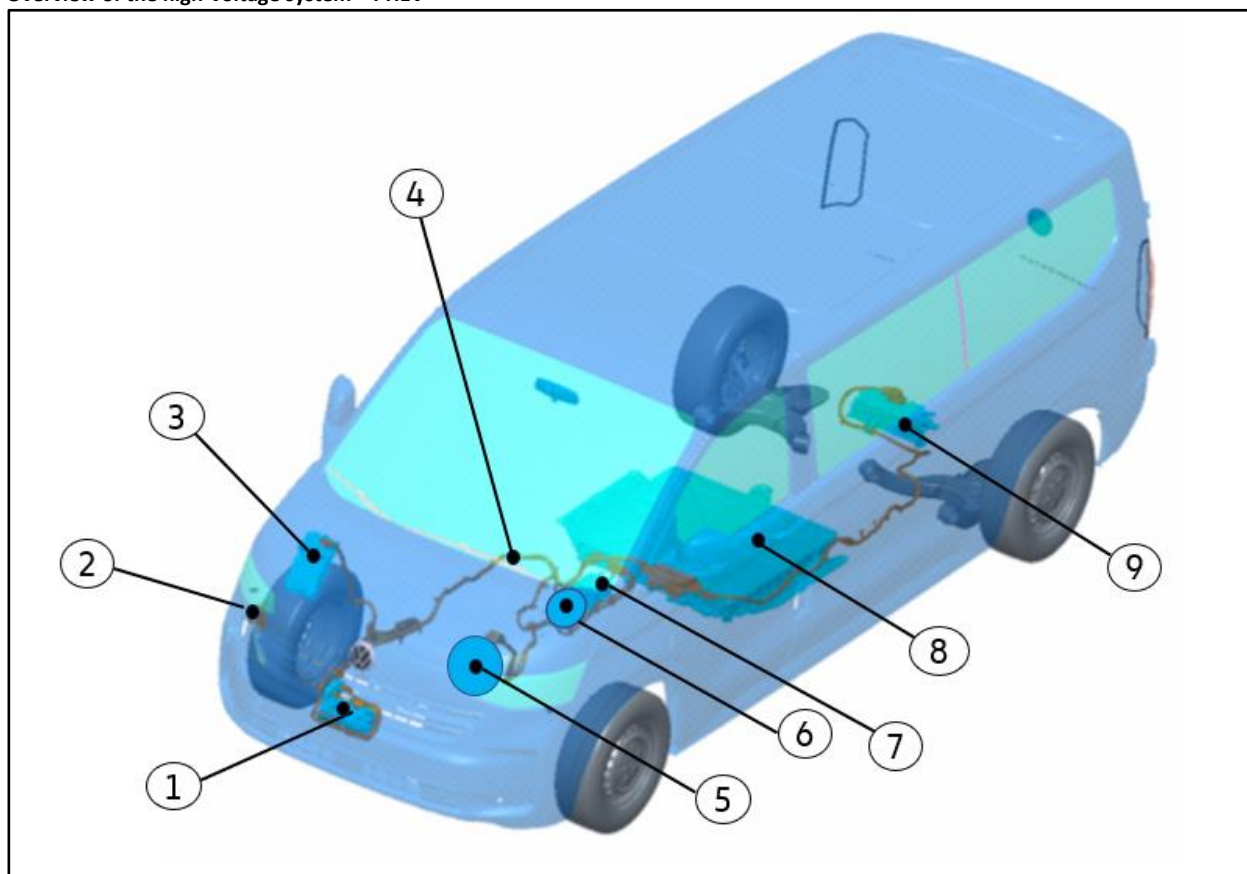
Element	Description
1	High-voltage module block
2	High-voltage charging connection
3	PTC heater
4	Electric air conditioner compressor
5	High-voltage battery pack
6	Orange high-voltage cable
7	Electric drive unit

Exploded view of the components of the HV block – BEV



Element	Description
1	Cooling pumps
2	Heat pump
3	DC converter
4	DC-AC converter (on-board alternator converter module)
5	Electric air conditioner compressor
6	Megabrace
7	PTC heater

## Overview of the high-voltage system – PHEV



Element	Description
1	Electric air conditioner compressor
2	High-voltage battery charging socket
3	DC converter
4	Orange high-voltage cable
5	Gearbox converter and housing
6	Charging module
7	PTC heater
8	PHEV electric drive battery
9	Pro Power On Board module

### 3.9.3 De-energising the high-voltage system

The procedure for disconnecting and connecting the high-voltage battery can be found in the workshop manual for the Transporter panel van.

#### Warning note

When the high-voltage system is de-energised, the voltage in the high-voltage battery is not reduced. The battery pack is still live and remains dangerous. Contact with the internal parts of the high-voltage battery can lead to serious injury or death.

#### Information

When the high-voltage system is de-energised, the 12 V low-voltage system remains live.

### 3.9.4 Cooling of the high-voltage system

#### Practical note

Do not modify the cooling system high-voltage battery for the Transporter panel van or the BEV/PHEV window van.

### 3.9.5 High-voltage battery

Observe the following precautions when working on or near high-voltage batteries.

- Do not cut open the high-voltage battery box. Do not penetrate the batteries or the box in any way
  - The high-voltage battery pack is located under the vehicle
  - The total voltage of the HV battery pack can be up to 450 V DC for a BEV and 400 V DC for a PHEV
  - The battery box is waterproof
  - The battery cells contain a liquid electrolyte that is absorbed in a special porous polymer film. Under most conditions, the electrolyte will not leak from the battery. However, if the battery is crushed, a small amount of electrolyte may leak out
  - Where possible, insulate the electrical components of the vehicle and avoid contact with them.
- If contact with the high-voltage system cannot be avoided, personal protective equipment (PPE) such as splash guard or safety goggles, gloves (butyl), an apron or a coat and rubber boots are required when handling damaged batteries. Contact with electrolyte can cause skin and/or eye irritation/burns. Rinse electrolyte on the skin with plenty of water for 10–15 minutes.

The high-voltage system has an earth-free reference voltage return line that is designed so that the high-voltage system is completely isolated from the running gear and the non-HV components and circuits. As part of the built-in safety functions of the high-voltage system, measurements between the HV data bus and the vehicle earth when the key status is “On” are monitored to detect HV leakage current or stray current to the running gear.

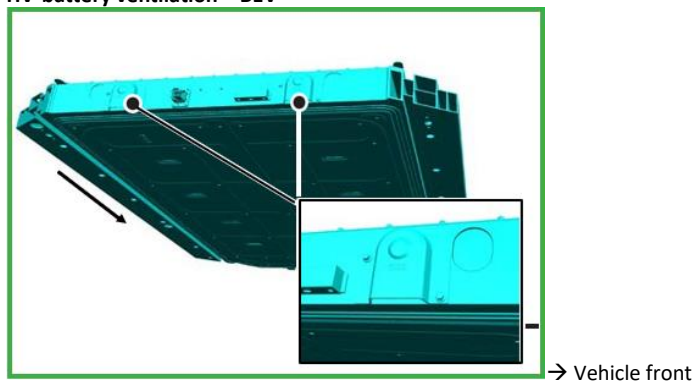
The power connections of the high-voltage battery are only activated if this is necessary for the operation of the vehicle, including:

- When the vehicle key is in the “On” or “Accessories” position (“Ready” indicator lights up in the instrument cluster)
- When the 12-volt vehicle battery has a low charge level, the high-voltage battery is activated to charge the 12-volt vehicle battery via the DC converter, even if the vehicle key is in the “Off” position
- When the vehicle is connected to a charging station (BEV only), the charging connection, the charging unit, the high-voltage battery and the wiring between these components can be active, so that high voltage is present even when the vehicle key is in the “Off” position

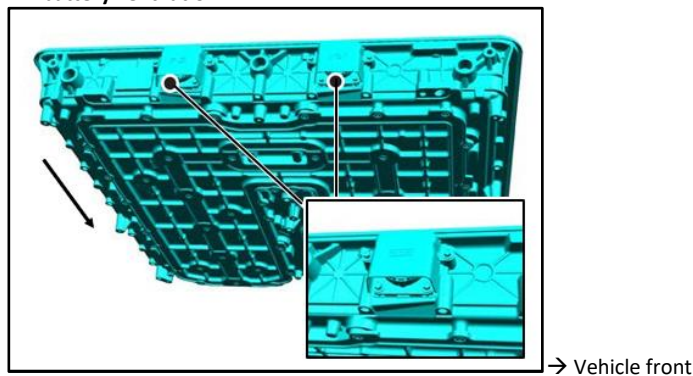
#### HV-battery ventilation

1. The high-voltage battery of the Transporter panel van / BEV window van is equipped with ventilation. There must be no additional components or obstacles (other than those installed by Volkswagen) in the same environment as the battery (e.g. the underbody) or at a distance of less than 150 mm from these devices.  
In addition, no components that may contain flammable liquids or gases may be added within a distance of 300 mm from these features
2. There must be no modifications or installed components that restrict the free area on the outside of the high-voltage battery or impede the free air flow around the battery (apart from the components installed by Volkswagen)
3. Any cut-outs or openings created between the vehicle interior and the underbody must be sealed in such a way that air cannot enter the vehicle interior from the underside of the vehicle
4. If primary entry/exit paths for the interior are located above or behind the rear axle(s), a metallic shield must be added to block any air flow from the battery in the direction of these entry/exit paths and to divert this air flow to a side/rear area that is not a primary entry/exit path

#### HV-battery ventilation – BEV



#### HV-battery ventilation – PHEV





## HV-battery earthing

### Warning note

The following figures show the points at which the high-voltage battery and the carrier are earthed. These points should NOT be used as additional earth connections / auxiliary earth connections for the low-voltage system (12 V).

### Warning note

Electrical earth paths (housing earths and/or earth straps and/or low-voltage cables) for high-voltage components on the Transporter panel van / window van may not be changed or modified in any way. Do not tamper with or modify any of these fasteners for HV components or earth points.

### Information

As part of the built-in safety features of the high-voltage system, the measurements between the HV circuits and the vehicle earth are taken via these earth paths. Therefore, the earth paths of the high-voltage battery must not be changed in any way.

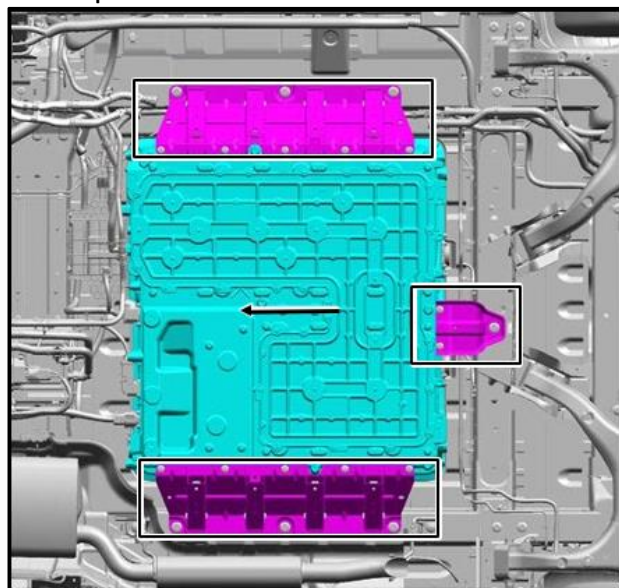
See: [4.2.14 No-drilling zones – earth connection](#)

### Earth fasteners for BEV HV battery



← Vehicle front

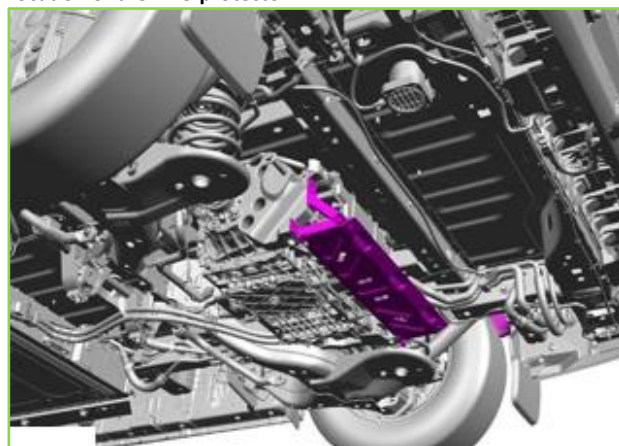


**BEV PDU protector**

← Vehicle front

**Practical note**

The BEV Transporter panel van / window van has a PDU protector that must NOT be removed.

**Location of the PDU protector – BEV****3.9.6 EV charging**

Please observe the Owner's Manual for the Transporter panel van / window van.

**Information**

The mobile chargers supplied with the vehicles should be reserved for the end customer only and should not be used during the manufacturing or delivery process in order to avoid damage or loss.

## 4 Electronics

### 4.1 Overview of the electrical system

#### Warning note

It is recommended to comply with the instructions in the electrical sections of the Converter guidelines. An incorrect setup, e.g. overloaded earth wires or insufficient protection of the retrofitted wiring, can lead to a serious system or vehicle failure.

#### Warning note

It is not permitted to install voltage amplifiers or other devices to increase the alternator / DC/DC output.

The installation of such devices will not only void the vehicle warranty, but may also damage the alternator and the engine monitoring system / powertrain control unit and possibly impair the compliance with legal regulations. Check the applicable regulations.

#### Warning note

When working on the vehicle's electrical system, it is strongly recommended that you always comply with the instructions in the Converter guidelines. Non-compliance with the instructions can lead to an increased risk of vehicle fire, serious injury and death.

#### Information

Since Volkswagen AG has no influence on the modification or installation of electrical components in auxiliary circuits, it cannot be held liable for such installations.

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

## 4.1.1 Changes to electrical architecture and functions

### Battery system

#### Warning note

The primary battery is now located under the bonnet.

All battery systems must be disconnected to ensure that the low-voltage system is completely switched off.

For further instructions on dual and triple battery systems

See: [4.5 Battery systems](#)

### Earth connections

For specific BEV and PHEV earth connections as well as common earth connections for all engine/electric drive versions

See: [4.25.1 Earth connections](#)

### Continuity strategy

Some signal cables and fuses may have changed position, which may affect the conversion design.

See: [4.3 Communication network](#).

On new BCM (onboard supply control unit) – output signals.

See: [4.23 Connectors and connections](#)

### Intelligent interface for additional power tap including fuse (VH2/VH3)

The ISL contains the function of the programmable Volkswagen battery monitoring PBG (PR number KB1) and provides interface connection signals. There are two configurations of the intelligent interface for additional power tap including fuse with power tap. The intelligent commercial vehicle interface for additional power tap including fuse (PR number VH2) has configurable inputs and outputs. It is housed in the front carrier (driver seat carrier). All versions have a power management function of up to 200 A.

See: [4.23.5 Intelligent interface for additional power tap incl. fuse \(ISL\) \(PR number VH2/VH3\)](#) for more information

**Programmable Volkswagen battery monitoring**

The programmable battery monitoring function from Volkswagen is now available in the ISL (PR number VH2 / PR number VH3).

See: [4.23.5 Intelligent interface for additional power tap incl. fuse \(ISL\) \(PR number VH2/VH3\)](#) for more information.

**Vehicle interface connector**

The vehicle interface connector is a 12-pin connector.

See: [4.23.4 Vehicle interface connector, Technical data for planning](#)

**GNSS/5G aerial**

The aerial for the Global Navigation Satellite System (GNSS)/5G has been introduced.

**FM/DAB aerial**

The FM/DAB aerials are now located in the exterior mirrors.

**Positions for PEPS aerials**

The position of the PEPS aerial can affect the conversion. Instructions:

See: [4.21.4 Aerials for keyless entry and keyless start \(PEPS\)](#)

**Retrofit connection point (CCP)**

The vehicles are equipped with 2 x external power supply points (CCP): 1 x 60 A "CCP1", 1 x 250 A "CCP2".

See: [4.23 Connectors and connections](#)

**Rear view camera system**

For optional sensors of the 360-degree camera and the reverse brake assist function, the following must be observed during conversions

See: [4.12.3 Reversing camera](#)

**Pro Power On Board (PPOB)**

Pro Power On Board is an optional function for BEV and PHEV versions. Instructions:

See: [4.24 DC/AC converter \(inverter\) 230 V \(PPOB\)](#)

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## 4.2 Instructions for cable installation and routing

### 4.2.1 Information on wiring harnesses

#### Information

For further information and recommendations regarding materials and devices for integration into the Volkswagen systems, power supply and earth, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

The following section contains fitting instructions for conversions that affect electrical components and/or electrical systems. The aim is to achieve robust integration of add-on systems without affecting existing systems by monitoring splice techniques, module package locations, electromagnetic compatibility (EMC) etc. The Converter must test its installation and ensure that the design and functions comply with all legal and homologation requirements.

### 4.2.2 General information on wiring and routing

Temperature requirements: The wiring in the vehicle interior must withstand the effects of heat at temperatures between -40°C and 85°C and be designed for full operation at temperatures between -40°C and 75°C. Wiring in the engine compartment and the underbody must withstand the effects of heat at temperatures between -40°C and 125°C and be designed for full operation at temperatures up to 105°C.

Ensure that the insulation is resistant to all fluids (e.g. petrol, oil, anti-freeze, brake fluid, gear oil and power steering oil) with which contact is possible.

If an electrical connector is to be located in a wet area, use a sealed connector. Wet areas include the engine compartment, wheel housings, underbody and doors.

Do not route wiring harnesses near spot welds or butt welds. Maintain a minimum distance of 15 mm from all welded joints of sheet metal under static and dynamic conditions. However, routing near weld spots or butt welds is generally not recommended.

If wiring harnesses are not laid in a corrugated tube or ductwork, the distance between the mounting points should not be greater than 300 mm.

A minimum distance of 25 mm must be maintained from sharp edges and a minimum distance of 35 mm from all moving parts of the parking brake. If these distances cannot be maintained, wiring harnesses must be routed in a corrugated or empty pipe.

For conversions with a throughput to the rear, suitable floor protection in the throughput is recommended.

Socket terminals with screws or flexible tongues are not recommended as low frequency vibrations that may occur in certain vehicles can cause the terminals to loosen.

All eyelets must have a second clamping device as strain relief and kink/break protection for single-core cables.

It is recommended to use a ratchet crimping tool to obtain the necessary crimping force.

It is not permitted to make a connection only by soldering. All connections must be crimped. Soldering may only be used in addition to crimping as a complementary connection method to reduce the contact resistance.

When routing cables through sheet metal holes, all holes must be protected by edge protection or a rubber grommet to prevent chafing.

All cables, whether single- or multi-core, must be provided with additional mechanical protection, such as cotton, PVC adhesive tape, a cable guide or a hose, depending on the environment in the vehicle.

It is recommended to use edge clips to secure the cables in all necessary places in the areas of the vehicle that are exposed to the weather. Do not use edge clips in areas of the vehicle that are not exposed to the weather.

#### 4.2.3 Arrangement of the output pins

When designing a wiring harness to connect a component, the female connectors (sockets) are usually located on the wiring harness side and the male connectors (plugs) on the component side. When positioning the output contact pins in a connector, make sure that the power supply and earth circuits are not directly next to each other. A minimum distance of 5 mm is required between the power supply and earth circuits.

##### Warning note

Do not use connections that go through the outer shell and penetrate the conductor.

##### Practical note

Only use connectors approved by Volkswagen.

Cutting vehicle cables is not recommended for the following reasons:

- The specification of the standard vehicle is only suitable for additional electrical equipment in combination with an additional fuse box available as a special vehicle option
- A connection error may occur in the long term
- There is a potential fire hazard due to overload

All connections with existing wiring must be permanently insulated. External connections must be watertight.

When developing or modifying circuits, the following must be taken into account:

- For the rated current for wiring, see the specification table (rated current for cable sizes) in this section
- In the event of a voltage drop, the terminal voltage at the electrical equipment must not drop below 95% of the battery voltage
- Do not cut into the factory-installed wiring harnesses
- Additional earth return lines must be provided for new systems
- For each component, an additional circuit diagram and associated instructions must be enclosed with the Owner's Manual. Alternatively, a separate manual can be created for the special equipment

If cables need to be extended, the connection may only be made at existing connection points, and only connectors approved by Volkswagen may be used.

Use only connecting cables approved by Volkswagen.

#### 4.2.4 Unused connectors

Wiring harnesses may have unoccupied wires / contact terminals, depending on the options ordered for the sender vehicle (e.g. seat heating). Volkswagen does not recommend using these connectors for purposes other than those intended.

#### 4.2.5 Earth connection

If a new earth connection is required, it should not be placed in a damp area; this applies in particular to earth connections with a high current flow. Earth connections should be located near the +12 V supply connections. This reduces the electromagnetic field generated by inrush/starting currents in particular, and improves electromagnetic compatibility.

Drill bit screws must not be used for earth connections:

- Never use moving structures (doors, flaps, tailgate) for earth connections, as hinges are not reliable earth conductors
- Do not use more than 2 eyelets or crimp connections per bolt for high-current applications
- Never position the connections of electrical components or earth connection nuts near the fuel tank or fuel lines
- Each individual piece of retrofitted electrical equipment must be equipped with its own earth conductor, which is directly connected to the body earth or the additional battery earth stud – see [“Additional loads and charging systems”](#) later in this section of the Converter guidelines
- It is not permitted to connect multiple earth wires together on an intermediate cable that is connected to a main earth cable
- If additional earth studs are required, it is recommended to install a bus bar with several studs that is connected directly to the negative battery terminal. See [“Additional loads and charging systems”](#)

See: [4.25 Earth connection](#) to find suitable earth points

#### 4.2.6 Prevention of squeaking and rattling

Wiring harnesses should be secured/supported every 150 to 250 mm; a maximum distance of 300 mm between mounting points must not be exceeded. All connectors should be actively secured. Use adhesive tapes that do not make noise when rubbing on metal or plastic.

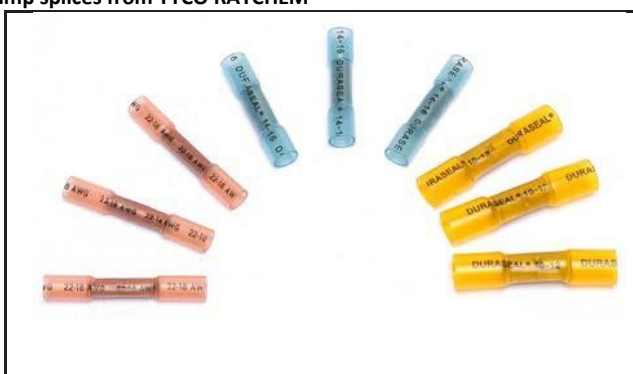
#### 4.2.7 Prevention of water ingress

Ensure that the wiring harness has drip loops to prevent water from entering the vehicle interior where the wiring runs from the outside of the vehicle to the inside. A drip loop is a section of cable that has been deliberately routed under the entry point into the vehicle. Water drops on the wiring harness migrate to the lowest point of the wiring harness due to gravity.

The wiring from the door to the passenger compartment should be done so that the door entry point is below the passenger compartment entry point, creating a drop-off bend.

#### 4.2.8 Splicing of wiring harnesses

##### Crimp splices from TYCO RAYCHEM



Volkswagen AG generally does not recommend splicing, as connections with this technology have varying characteristics that are difficult to assess. However, if splicing is unavoidable, it must be done with the shrink-on, sealed, nylon-insulated crimp splice DuraSeal (from TYCO RAYCHEM). For example, the D406 series. To improve the integrity of the splice it must be sealed with a heat-shrink hose. See figure above.



## 4.2.9 Wiring specification

Nominal current values based on wire diameter

ISO Wire cross- section mm <sup>2</sup> CSA	Wire resistance mΩ/m					
	Maximum			Minimum		
	Pure copper	Tin-plated copper	Nickel-plated copper	Pure copper	Tin-plated copper	Nickel-plated copper
0.13	136	140	142	-	-	-
0.22	84.8	86.5	87.9	-	-	-
0.35	54.4	55.5	56.8	-	-	-
0.5	37.1	38.2	38.6	-	-	-
0.75	24.7	25.4	25.7	22.7	23.3	23.6
1	18.5	19.1	19.3	17.0	17.6	17.7
1.5	12.7	13.0	13.2	11.7	11.9	12.1
2.0	9.42	9.69	9.82	8.66	8.91	9.03
2.5	7.60	7.82	7.92	6.99	7.19	7.28
3	6.15	6.36	6.41	5.66	5.85	5.89
4	4.71	4.85	4.91	4.33	4.46	4.52
5	3.94	4.02	4.11	3.62	3.70	3.78
6	3.14	3.23	3.27	2.89	2.97	3.01
8	2.38	2.52	2.60	2.19	2.32	2.39
10	1.82	1.85	1.90	1.68	1.70	1.75
12	1.52	1.60	1.66	1.40	1.47	1.53
16	1.16	1.18	1.21	1.07	1.09	1.12
20	0.955	0.999	1.03	0.870	0.919	0.948
25	0.743	0.757	0.774	0.688	0.701	0.716
30	0.647	0.684	0.706	0.595	0.629	0.650
35	0.527	0.538	0.549	0.489	0.500	0.510
40	0.473	0.500	0.516	0.435	0.460	0.475
50	0.368	0.375	0.383	0.343	0.350	0.357
60	0.315	0.333	0.344	0.290	0.306	0.316
70	0.259	0.264	0.270	0.243	0.248	0.254
95	0.196	0.200	0.204	0.185	0.189	0.193
120	0.153	0.159	0.159	0.146	0.149	0.152

To wire additional systems, use the cable sizes recommended by the system manufacturer or select a suitable size from the table “Rated current for cable sizes”.

#### 4.2.10 Electromagnetic compatibility (EMC)

##### Warning note

Do not route any other cables near the cables for the anti-lock brake system and the traction control system. There is a risk of unexpected signalling. It is generally not recommended to install additional wiring on existing wiring harnesses and pipes.

The installation and routing of the Volkswagen wiring has been fully validated and has passed the required EMC tests. However, Volkswagen AG accepts no liability for the EMC immunity of the vehicle if systems not approved by Volkswagen are installed.

Wiring must be secured in such a way that this does not adversely affect other wiring.

The following distances must be maintained for single or bundled harnesses:

- 10 mm from fixed components (if not connected to them)
- 250 mm from the exhaust system
- 30 mm from rotating or moving components

See: [1.8 Electromagnetic compatibility \(EMC\)](#)

#### 4.2.11 Cable routing through plates

##### Warning note

Wiring harnesses that pass through sheet metal must be fed through protective grommets, which also ensure a watertight seal. A sealant similar to that used for windscreens should be used. Adhesive and tape are not acceptable.

##### Information

The corresponding connector must also fit through the opening.

##### Information

The maximum diameter of the additional wiring harness is 6 mm.

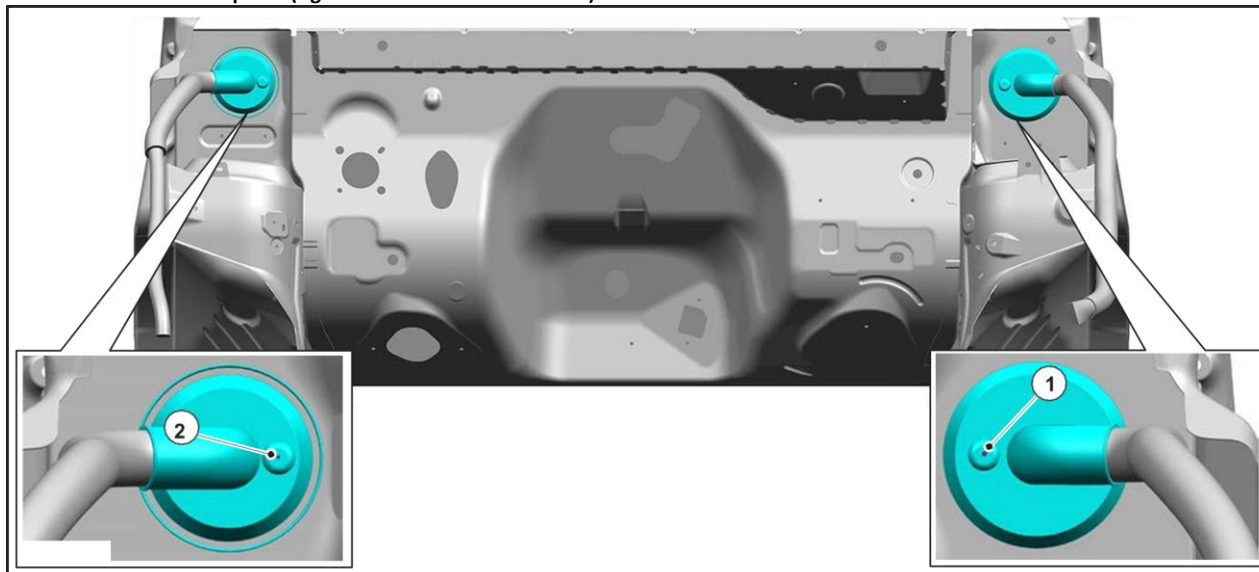
Two locations in the partition wall have been marked for additional holes for cable routing. See the following figure (view from the engine compartment) for the positions.

The rubber grommets at positions 1 and 2 shown in the following figure are fitted directly to the harnesses using polyurethane foam. It is not possible to add additional cables to the wiring harness. The grommets have a “notch” on the surface, on the engine compartment side, indicating the positions where an additional hole can be drilled using the following procedure:

- Ensure that there are no obstacles and/or components in the immediate vicinity in order to prevent damage to important systems
- Use a suitable tool such as a drill or an awl
- Press the drill or awl horizontally and parallel through the recess in the rubber grommet and ensure that the surface of the grommet is not pierced to more than 25 mm in order to prevent damage to parts on the cab side of the grommet

Hardware approved by Volkswagen is available to support further vehicle installations. Use only this hardware and approved parts for this purpose.

#### Front-wheel drive cross panel (right-hand drive vehicle shown)



Element	Description
1	Rubber grommet in partition, left
2	Rubber grommet in partition, right

#### 4.2.12 Drill protection zones – HV cable

##### Warning note

The orange high-voltage cables, fastenings, channels, strain relief devices, earth cables or plugs must not be touched, drilled, altered or concealed.

##### Warning note

Fasteners fitted by converters must point away from the battery so as not to damage the battery. Do not install any fasteners in the vehicle that would point towards the HV battery.

##### Warning note

During the vehicle inspection, components or structures installed by a Converter must not touch, penetrate, cut off or otherwise damage in any way the high-voltage network or parts thereof (in particular, additional fasteners that point towards the high-voltage battery or other electrical components).

##### Warning note

Do not change the high-voltage charging connection / mounting bracket

##### Warning note

Do not change the earth connections / connection points / fasteners for high and low voltage of the wiring harness for the charging connection.

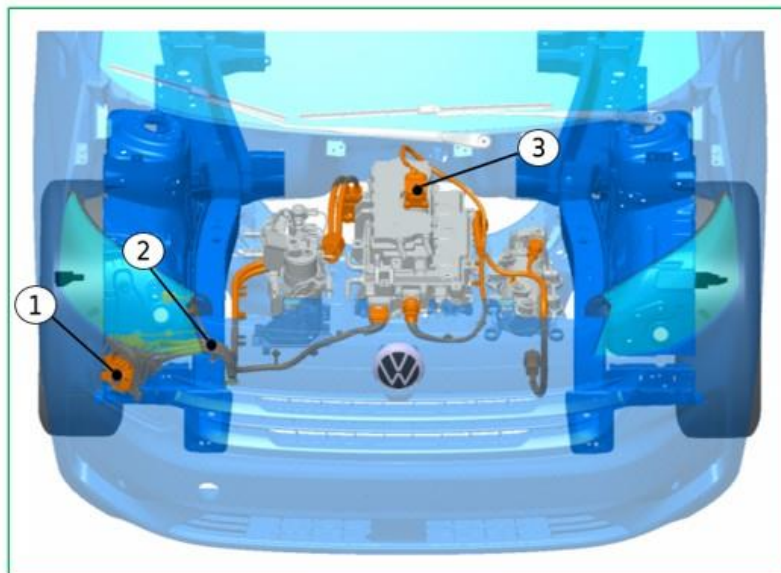
##### Warning note

The length of the orange high-voltage cables must not be changed.

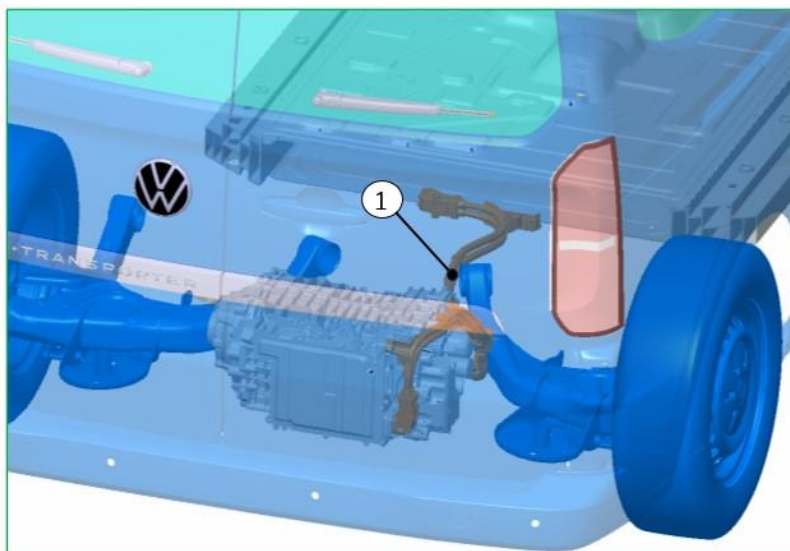
Do not remove the fasteners or protectors from the input cable charging connection.

**Practical note**

When drilling or performing other work on or near high-voltage cables, take appropriate protective measures to prevent damage.

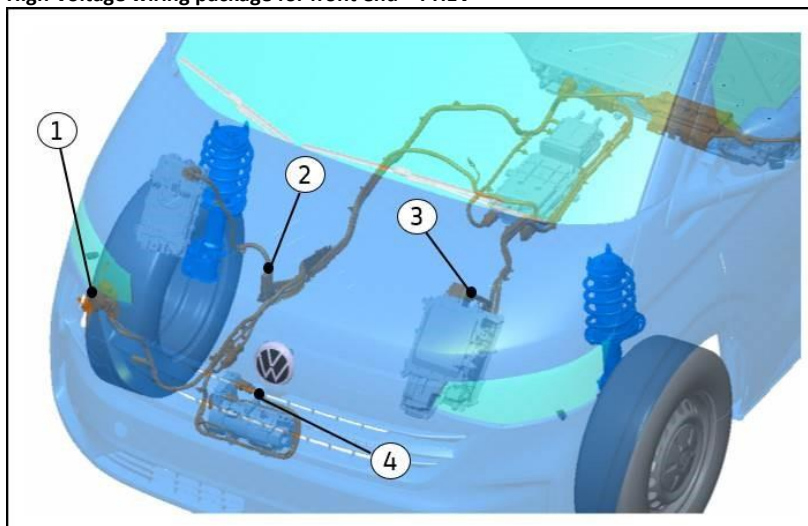
**High-voltage wiring package for front end – BEV**

Element	Description
1	High-voltage charging connection
2	Wiring harness for charging connection
3	Wiring harness – high-voltage auxiliary module

**Rear HV wiring package – BEV:**

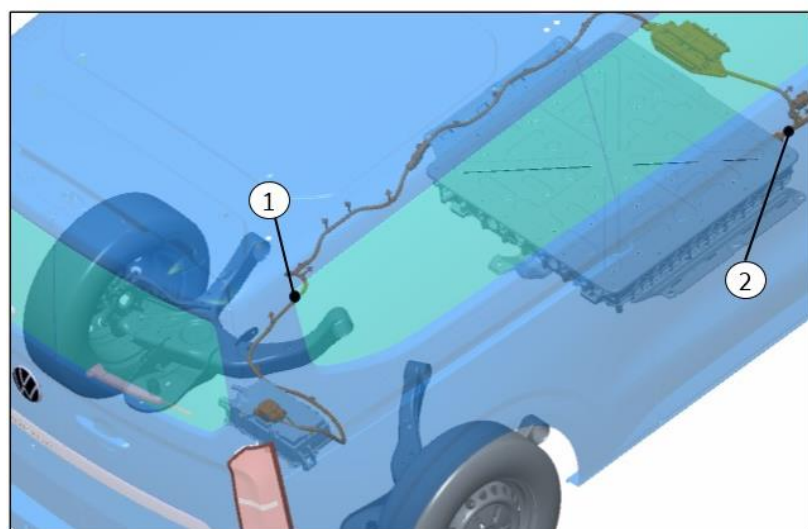
Element	Description
1	Electric drive unit for the high-voltage battery cable

### High-voltage wiring package for front end – PHEV



Element	Description
1	Wiring harness – charging connection to charging module
2	DC/DC wiring harness
3	High-voltage drive battery for drive converter
4	DC/DC wiring harness for electric air conditioner compressor

### High-voltage wiring package for rear end – PHEV



Element	Description
1	Connection wiring harness for high-voltage drive battery jumper for Pro Power On Board
2	Wiring harness – high-voltage auxiliary modules

#### 4.2.13 Drill protection zones – HV modules, LV cables and connectors

##### Practical note

Be careful when drilling or performing other work near the high-voltage cable that is connected to the high-voltage modules, as this could impair the performance of the vehicle. The low-voltage cable also contains an earth connection for high-voltage components.

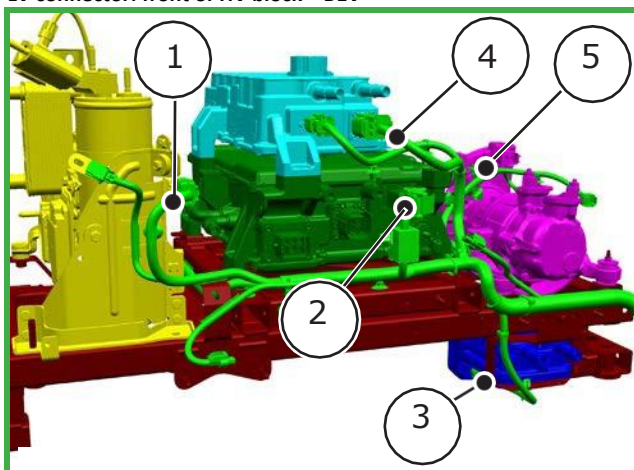
##### Warning note

Take protective measures when drilling or performing other work in the indicated areas to prevent damage to the components.

##### Warning note

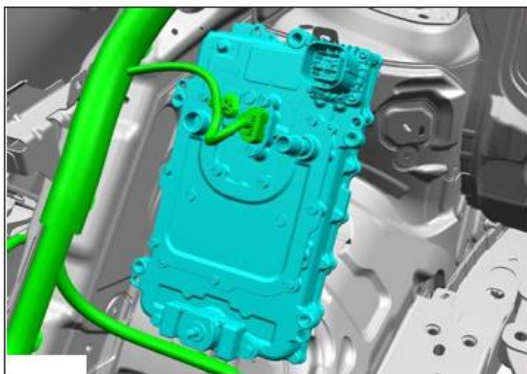
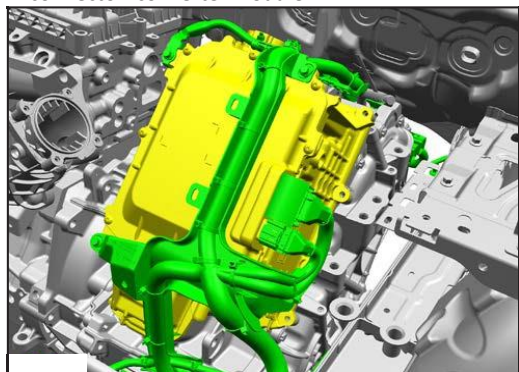
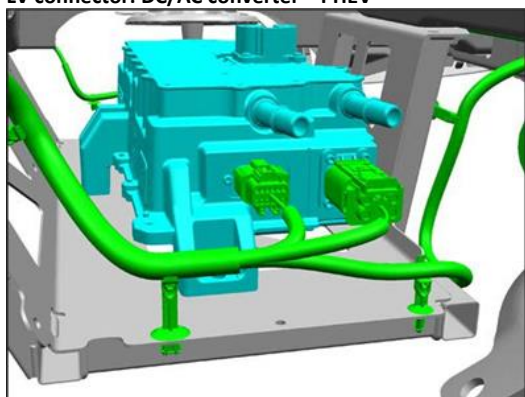
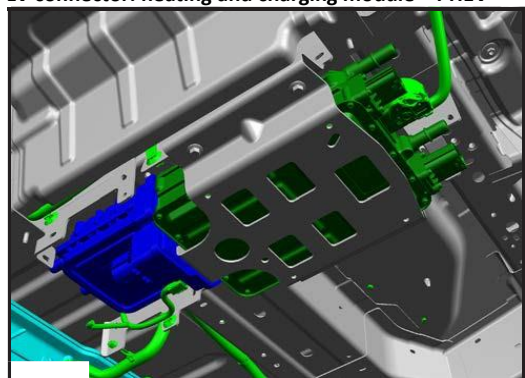
Do not change the existing low-voltage cable connections.

LV connector: front of HV block – BEV

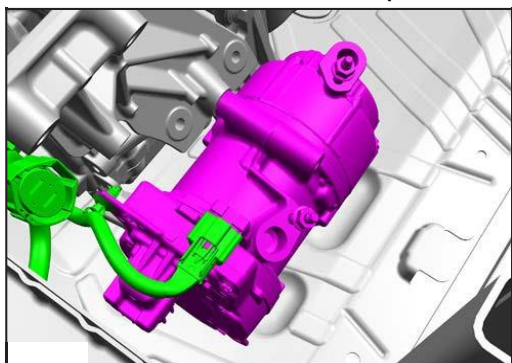


Element	Description
1	Heat pump
2	Charging unit / DC/DC converter
3	PTC heater
4	DC/AC converter
5	Electric air conditioner compressor



**LV connector: DC/DC converter – PHEV****LV connector: converter module – PHEV****LV connector: DC/AC converter – PHEV****LV connector: heating and charging module – PHEV**



**LV connector: electric air conditioner compressor – PHEV**

All positions of the BEV and PHEV high-voltage system components are shown in [section 3.9.2 Overview of the high-voltage system](#).

**4.2.14 No-drilling zones – earth connection****Warning note**

Take protective measures when drilling or performing other work on the high-voltage block or the electric drive unit to prevent damage to the components. HV earth connections in the vehicle must not be touched.

**Warning note**

Do not change the high-voltage earth connections or other connectors or connections.

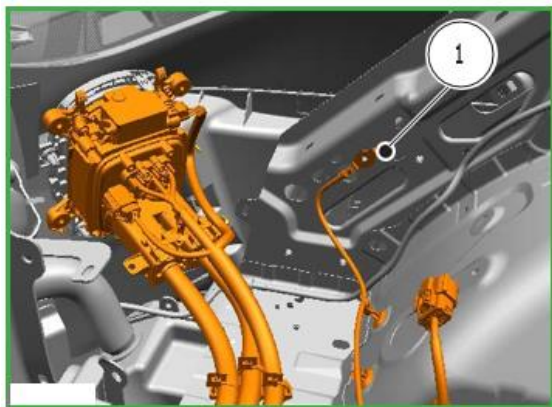
**Warning note**

In the Transporter panel van and the BEV/PHEV window van, the high-voltage circuit (HV) is not earthed with the body/chassis in the same way as the low-voltage system (12 V). As part of the built-in safety features of the HV system, the measurements between the HV circuits and the vehicle earth are made via these earth paths. Therefore, the earth paths of the HV modules must not be changed in any way.

**Warning note**

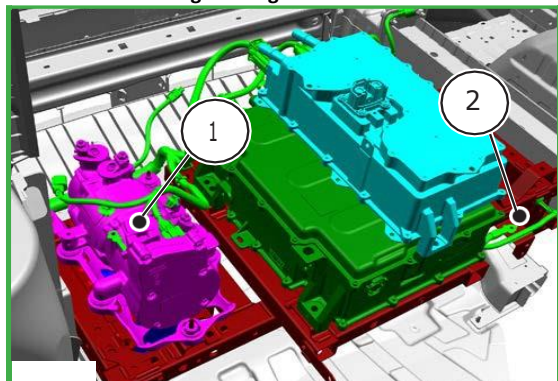
Do not change the earth connections / connection points / fasteners for high and low voltage of the wiring harness for the charging connection

#### Earth connection: charging connection HV cable earth – BEV



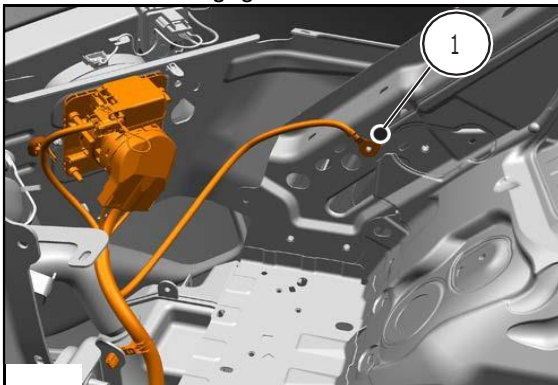
Element	Description
1	Charging connection HV cable earth – BEV

#### Earth connection: high-voltage modules LV cable earth – BEV



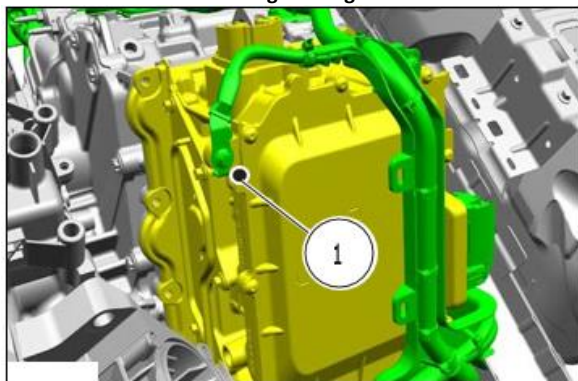
Element	Description
1	Electric air conditioner compressor LV cable earth
2	Earth of the LV cable at megabrace

#### Earth connection: charging connection HV cable



Element	Description
1	Charging connection HV cable earth – PHEV

#### Earth connection – PHEV high-voltage modules LV cable



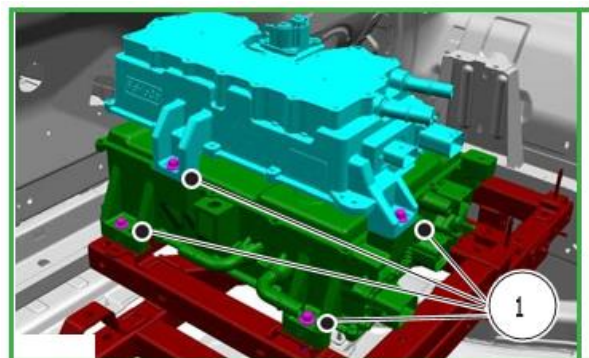
Element	Description
1	Converter module LV cable earth – PHEV

#### 4.2.15 No-drilling zones – chassis earth

##### Warning note

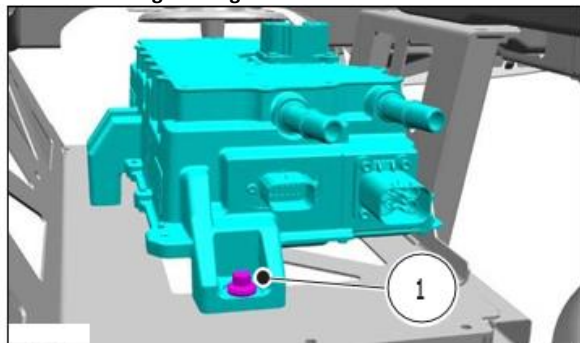
The location and connections of the earth path of the electric drive unit from the converter system controller to the electric drive unit or to the chassis cross member must not be changed.

#### Chassis earth: high-voltage modules – BEV



Element	Description
1	Earth connections for HV module block on the running gear

## Chassis earth: high-voltage modules – PHEV



Element	Description
1	PHEV – earth connection for DC/AC converter

## Chassis earth: high-voltage modules – PHEV



Element	Description
1	PHEV – earth connections for the charging module on the running gear

#### 4.2.16 No-drilling zones – load compartment

##### Warning note

Before drilling in the vehicle, check the no-drilling zones and the cable guide.

##### Information

See also chapter [5.11.2 No-drilling zone – B-pillar](#) for details on the restrictions in the area around the seat belt installation.

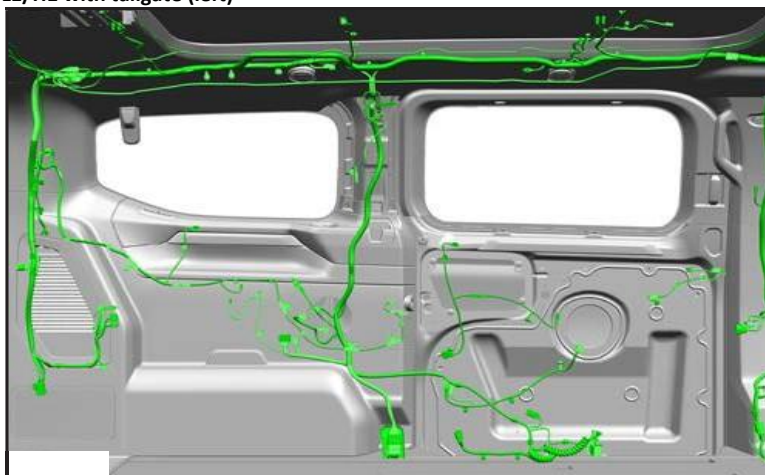
The following figures show the routing of the cables in the rear load compartment. This indicates the no-drilling zones in which the routing of cables should be avoided (e.g. when installing panels and shelves). Thread cutting screws must not be implemented in these areas either. Not all vehicle variants are shown. However, the routing in the areas of the B-, C- and D-pillars, roof traverses and doors is identical for all roof variants and wheelbases. The side of the vehicle on which the side loading door is located varies depending on the region. Before drilling, it is essential to check for other non-electrical systems, such as an underfloor fuel tank. See the following links for more information.

See: [5.1 Body](#) No-drilling zones

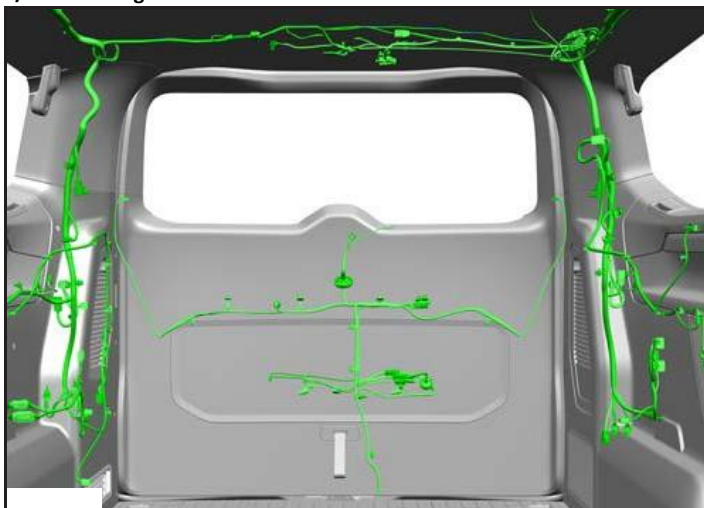
See: [5.3 Shelf systems](#)

See: [5.6 Body openings](#) No-drilling zones, load compartment cargo securing

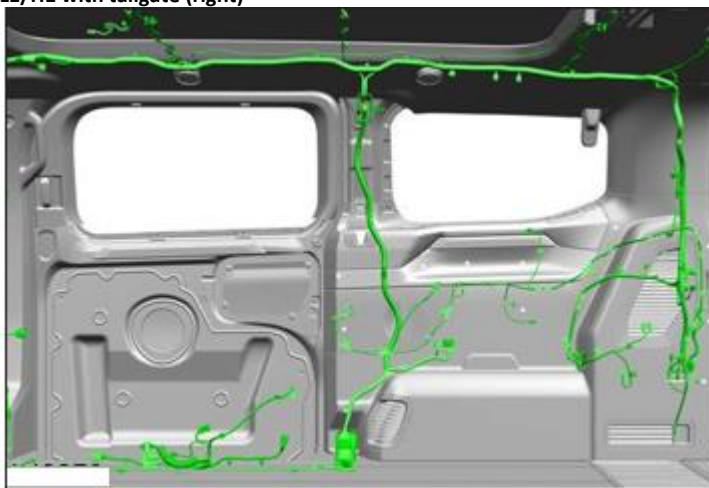
L1/H1 with tailgate (left)



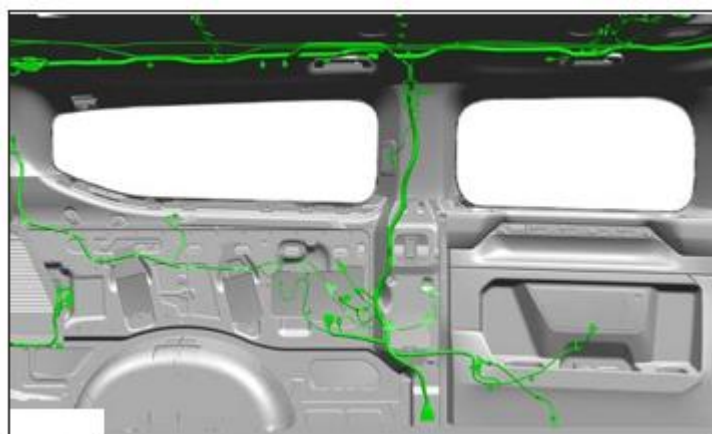
L1/H1 with tailgate



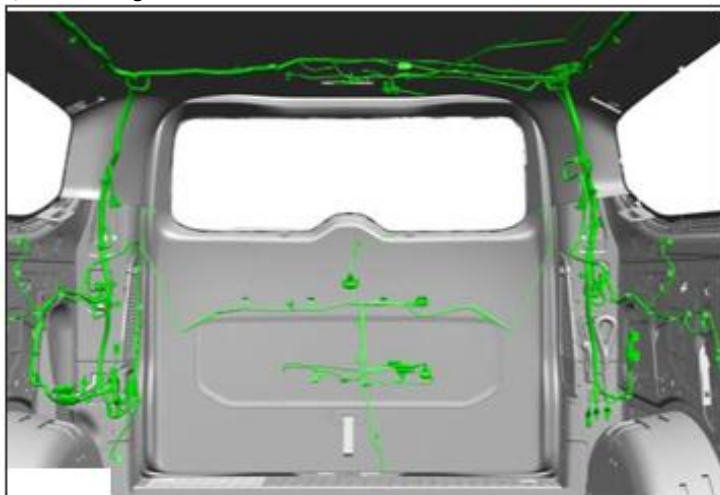
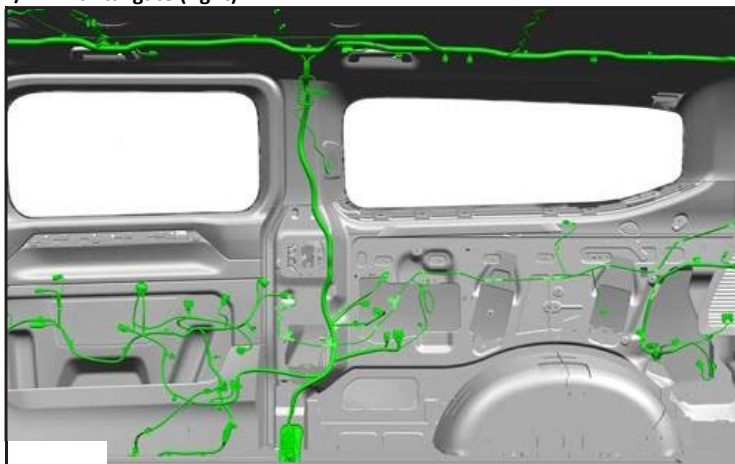
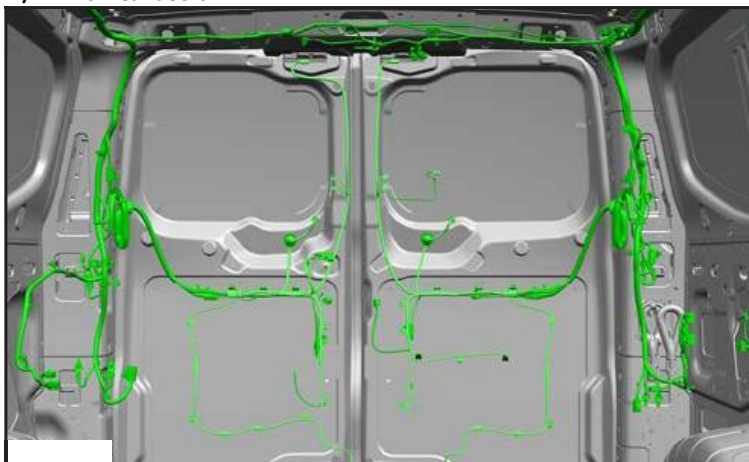
L1/H1 with tailgate (right)



L2/H1 with tailgate (left)





**L2/H1 with tailgate****L2/H1 with tailgate (right)****L1/H1 with rear doors**

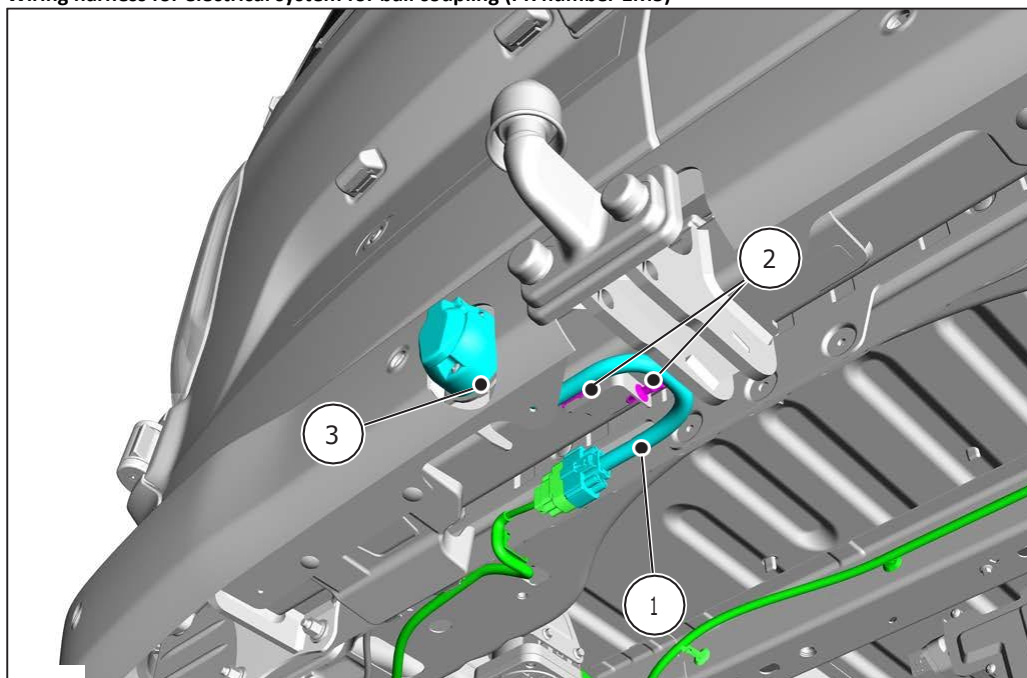
#### 4.2.17 Wiring harness for electrical system for ball coupling (PR number 1M5)

##### Information

If the wiring harness for the electrical system for the ball coupling is ordered, is it delivered in the glove compartment.

The following figure shows the routing for the wiring harness for the electrical system for the ball coupling (PR number 1M5).

##### Wiring harness for electrical system for ball coupling (PR number 1M5)



Element	Description
1	Wiring harness for electrical system for ball coupling
2	Positions of the cable clip X 2
3	Location of the 12-V socket



#### 4.2.18 Electrical system for ball coupling

##### Information

The Volkswagen system for the ball coupling is integrated into the Volkswagen parking aid system. When a trailer is connected, the system only communicates via the CAN bus. The reverse parking aid can be deactivated and reactivated via the Volkswagen Diagnostics and Repair System (ODIS).

##### Information

For ball couplings on Transporter panel vans, the connection must be made via the tail light cluster.

##### Information

If no ball coupling connectors are used, a suitable mounting and cover must be used to prevent the ingress of water and dirt.

##### Information

The trailer detection circuit is integrated into the Volkswagen ball coupling module. It can only be used on vehicles with central locking and an anti-theft alarm or CAT-1 alarm.

The electrical system for the ball coupling can be ordered as a 13-pin DIN connector for Europe or a 12-pin DIN connector for Australia and New Zealand as part of the original vehicle.

If it is necessary to add a ball coupling to an existing vehicle and to ensure compliance with the lighting regulations, the corresponding wiring harness can be purchased from your Volkswagen Commercial Vehicles Partner. It is not advisable to install non-Volkswagen ball coupling wiring due to the lighting being controlled by the onboard supply control unit (BCM) and compliance with the statutory lighting regulations. For more details about a wiring harness that can be connected to the vehicle's existing wiring harness, contact your Volkswagen Commercial Vehicles Partner.

The individual current drivers can each supply a current of 15 A, but operation with this maximum value is not recommended. A higher current flow is interpreted as a short circuit. If a short circuit is detected, the output is switched off.

The trailer module offers a battery charging output. This output enables a trailer battery to be charged with a maximum charging current of 10 A. If the current load exceeds 10 A, this output is switched off until the current consumption drops to below 10 A. The voltage at which this battery is charged is designed to maintain the charging current up to 10 A, but the battery cannot be fully charged or discharged. This voltage is approximately 13.5 V. A strategy for full charging should be implemented separately.

The maximum current of all circuits is limited to 30 A. If this value is exceeded, the battery charge output is switched off.

Overview:

- Max. continuous current: 10 A
- Switch-on condition:
  - Power supply mode  $\geq$  Accessory\_1
  - Total current consumption (all lights and battery charging circuit)  $< 30$  A
  - Continuous current of the battery charging output  $\leq 10$  A
  - $9\text{ V} < \text{trailer module supply voltage} < 16\text{ V}$
- Short-circuit detection: 30 A

#### 4.2.19 Ball coupling connectivity

If a ball coupling is to be installed, the correct cables and the correct module must be ordered. For the correct vehicle configuration, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

##### Information

It is imperative that a trailer is detected. As a result, at least one of the following lights must be connected in ON or stand-by mode (anti-theft mode): right or left brake light, left marker light or left turn signal.

If a trailer is detected, the trailer detection output (pin 5 on JP3) is set to low (switched through).

If the driver detects a short circuit or overheating, the affected output remains switched off until an ignition cycle is performed and the engine is restarted.

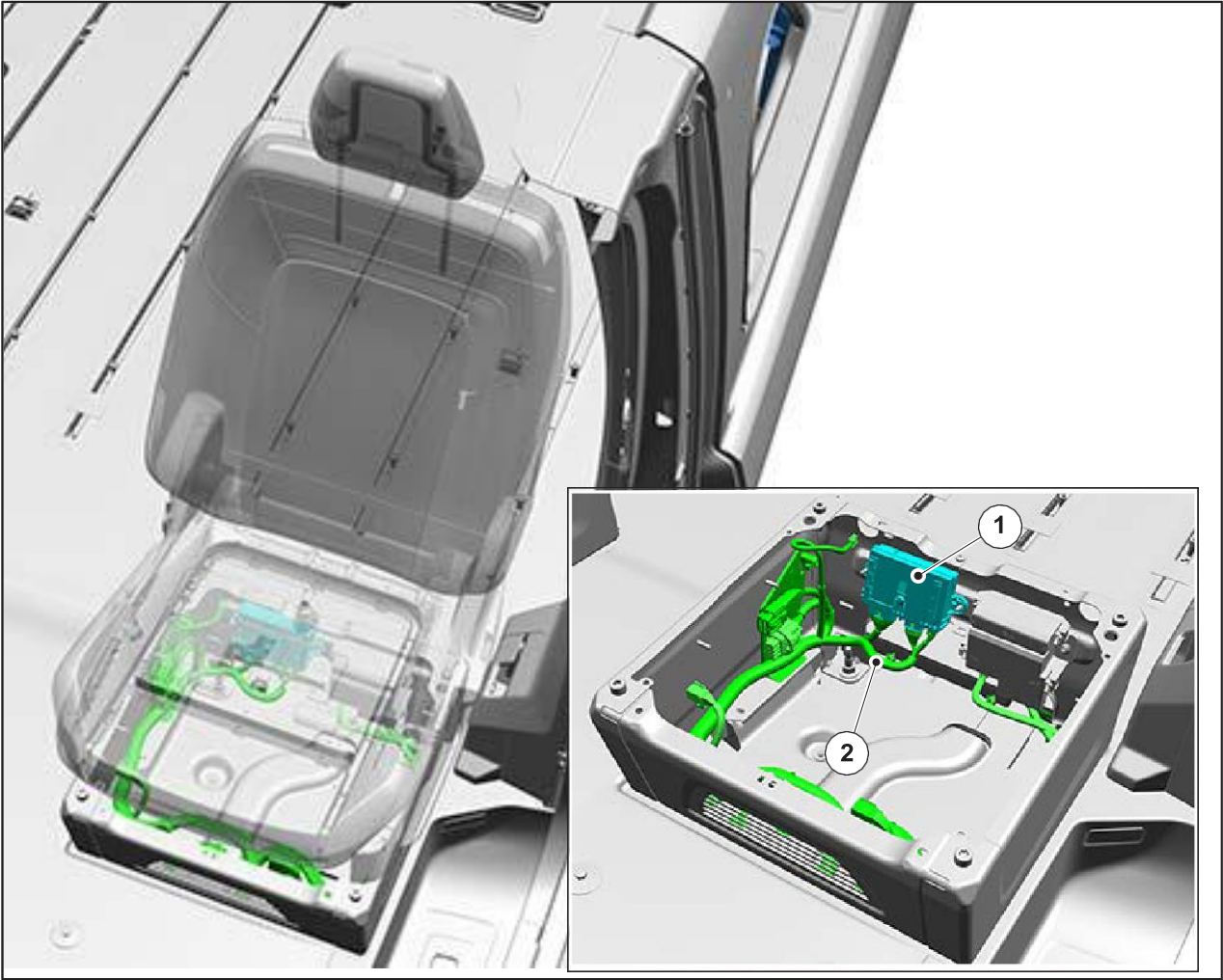
The trailer detector uses a strategy with a 1K ohm resistor when the lights are not actually on to detect that the trailer is connected. If the trailer lighting is already switched on, the affected current is checked.

The ball coupling module does not support incremental charges of the side marker lights on a trailer.

If these are necessary, they should also be controlled via separate relays.

The ball coupling functions are activated via the Volkswagen Offboard Diagnostic Information System (ODIS). A dealer fee may apply for this service. ODIS access can be purchased.

Ball coupling module and wiring harness



Element	Description	Part number
1	Ball coupling module	7TG907383B 7TG907383D 7TG907383E 7TG907383G 7TG907383J
2	Body main wiring harness	7TG970383 7TG970383A 7TG970383B 7TG970383C 7TG970383D 7TG970383E 7TG970383F 7TG970383G 7TG970383H 7TG970383J 7TG970383K 7TG970383L

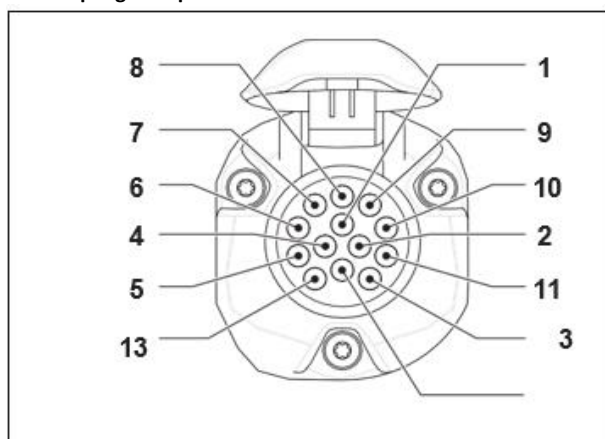
#### 4.2.20 Ball coupling connectivity (EU)

##### Ball coupling connectivity – 13-pin socket

Ball coupling connection		13-contact pin ball coupling connection	
Contact pin	Colour	Contact pin	Description
3	Yellow	1	Left turn signal
5	Grey/orange	2	Fog
1	Black	3	Light earth
6	Green	4	Right turn signal
13	Brown	5	Right side marker light
12	Red	6	Brake lights
14	Brown	7	Left side marker light, number plate light
11	Grey/brown	8	Reversing light
9	Violet/red	9	KL30 power supply
10	Grey/yellow	10	KL15 ignition
8	Black	11	Ignition current earth KL15
16	Black	13	Power supply earth

Pins that are not listed in the above table must not be used.

##### Ball coupling – 13-pin socket

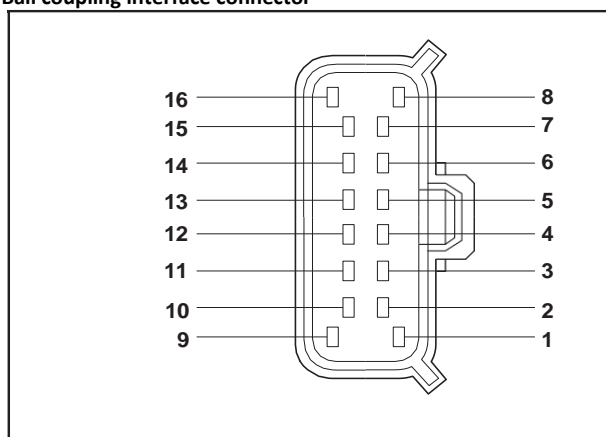


#### 4.2.21 Ball coupling connectivity (Australia and New Zealand)

##### Ball coupling connectivity – 12-pin socket

Ball coupling connection (See image below)		12-pin ball coupling connector – Australia and New Zealand	
Pin	Colour	Pin	Description
3	Yellow	1	Left turn signal
11	Black	2	Reverse gear
1	White	3	Light earth
6	Green	4	Right turn signal
Not connected	Blue	5	Electric brake
12	Red	6	Brake lights
13	Brown	7	Parking lights
Not connected	Not connected	8	Not connected
9	Contact pin	9	KL30 power supply
16	White	10	Earth
Not connected	Not connected	11	Not connected
Not connected	Not connected	12	Not connected

##### Ball coupling interface connector



## 4.3 Communication network

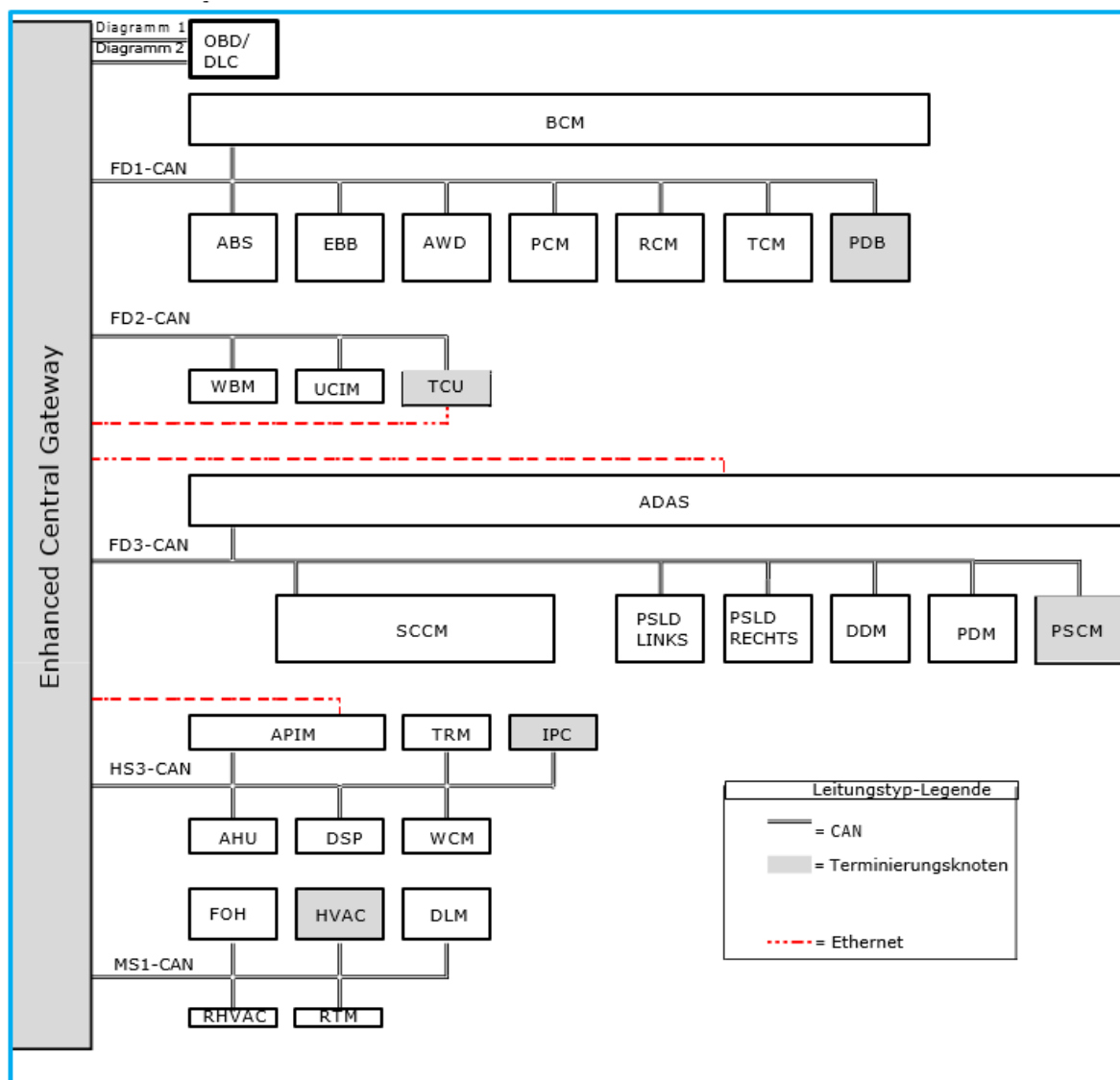
### 4.3.1 CAN bus – system description and interface

#### Warning note

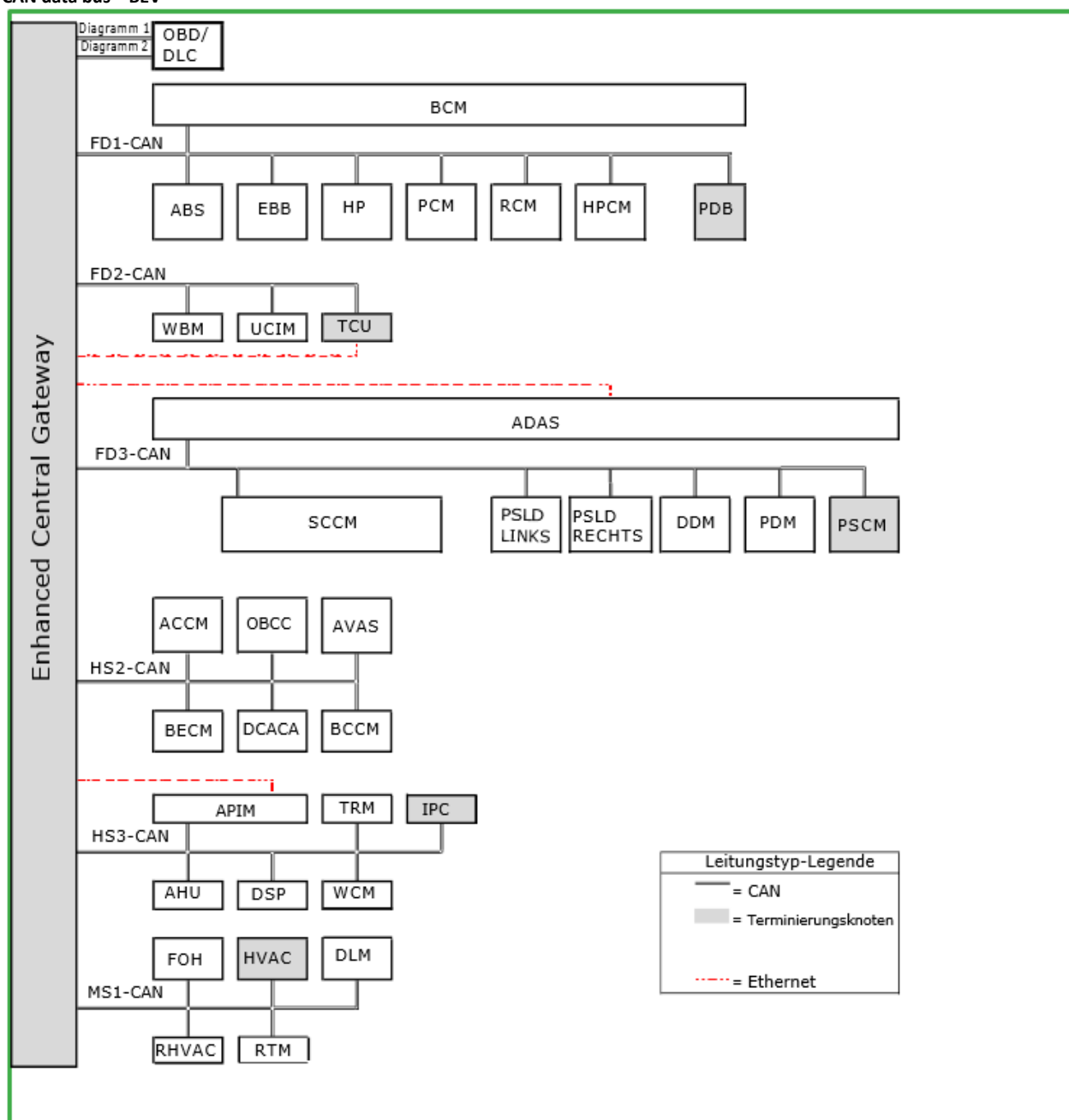
Do not modify or cut the wiring or connections of the CAN data bus interface or use them for other connections. Connecting impermissible CAN-based control units could impair the safety of the vehicle.

The CAN bus and the control unit network use proprietary messages for fast (FD), medium-speed (MS), high-speed (HS), private and public buses to communicate between the specified devices. In addition, there is localised use of the control unit sub-network (LIN) and ISO 9141 K-line serial connections.

#### CAN data bus – ICE



## CAN data bus – BEV



## CAN data bus – PHEV

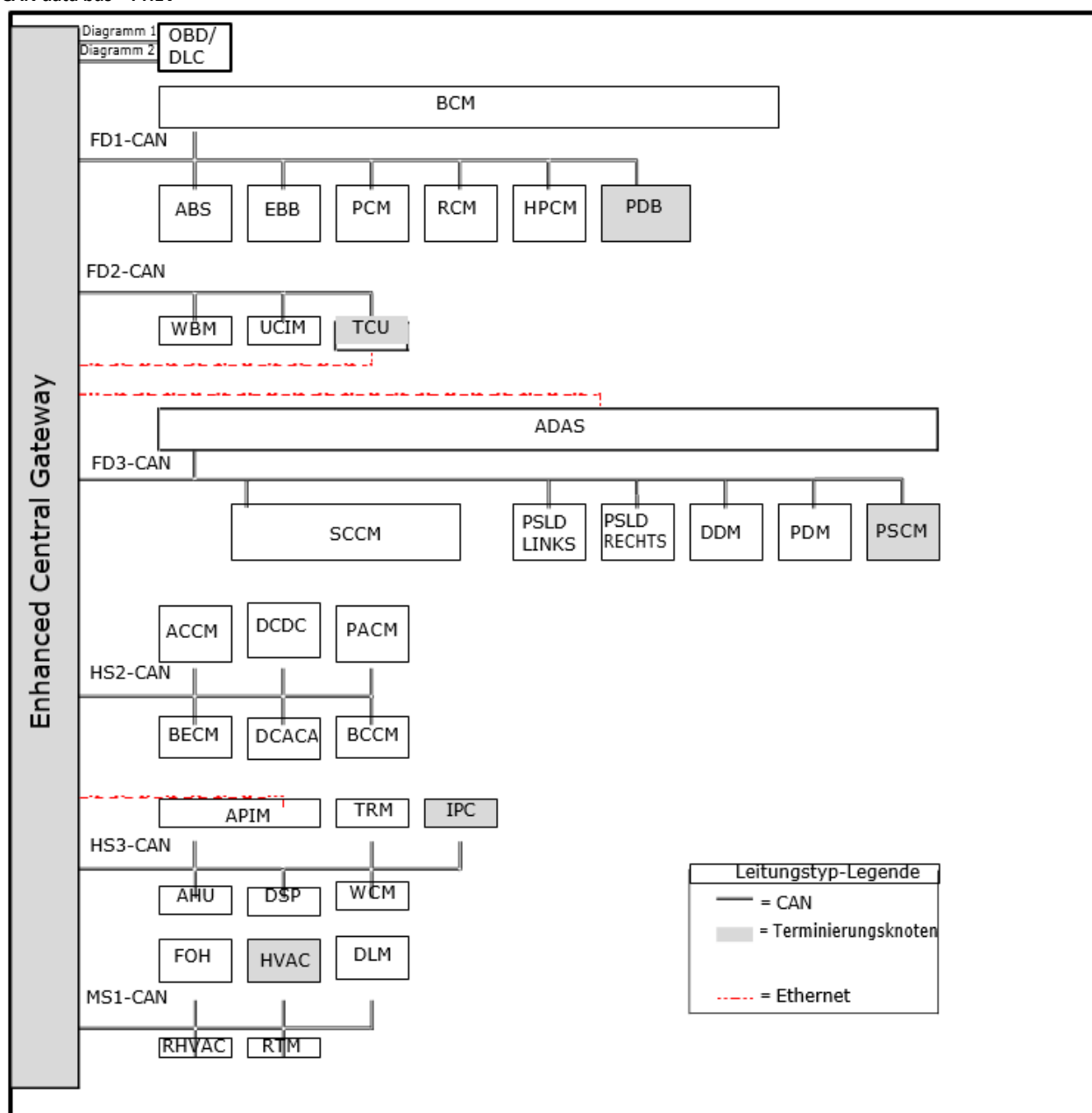


Table of the communication network system

Element	Description
FD1-CAN	Flexible data rate 1 – CAN
FD2-CAN	Flexible data rate 2 – CAN
FD3-CAN	Flexible data rate 3 – CAN
HS2-CAN	High speed 2 – CAN
HS3-CAN	High speed 3 – CAN

Element	Description
HVAC	HVAC control unit Heater / air conditioning system
IPC	Instrument cluster
IPMA	Front camera (lane guide camera)
OCC	Control unit – external battery charger
OB DLC	On-board diagnosis / diagnostic connector



MS1-CAN	Medium speed 1 – CAN
ABS	Control module – anti-lock brake system
ACCM	Air conditioning control module (HV compressor)
ADAS	Advanced driver assist system
AHU	Audio front module
APIM (Application Program Interface Manager)	Interface module – accessory protocol
AVAS	Acoustic vehicle alarm system
AWD	Automatic all-wheel drive
BCM	Onboard supply control unit
BCCM	Control unit – battery charging
BECM	Battery control module (micro hybrid controller)
PEC	Sensor – battery monitoring
DCACA	AC-DC converter for power to the box
DDM	Driver's door module
DLM	Locking module – driver's side
DSP	Digital signal processor – brand audio amplifiers
EBB	Electric brake servo
FOH	Fuel-operated heater
HP	Heat pump
HPCM	Powertrain control unit for hybrid electric vehicle

PCM	Powertrain control unit
PDB	Power distribution box
PDM	Passenger door module
PSCM	Power steering control unit
PSLD	Module – electric sliding door
HVAC	Rear HVAC control unit Heater / air conditioning system
RCM	Module – safety restraint system
RTM	Radio – transmitting/receiving unit (RKE and TPMS receiver)
SCCM	Steering column module (incl. absolute SAS)
TCM	Gearbox control unit
TCU	Telematics control unit
TRM	Trailer module (ball coupling)
UCIM (Upfitter Customizati on Interface Module)	Equipment currently not available
WBM	Wireless seat belt warning
WCM	Wireless charging module

### 4.3.2 Onboard supply control unit (BCM)

#### Warning note

In the event of unauthorised and/or incorrect connection to existing cables, either the corresponding systems may be switched off (overload protection) or the BCM may be permanently damaged.

#### Warning note

The BCM configuration of the vehicle must NOT be changed after the vehicle has left a Volkswagen production plant, with the exception of changes that can be made using the dealer's integrated diagnostic systems.

The BCM is the most important control unit in the vehicle's electrical system. It is responsible for controlling the majority of the vehicle's lighting, locking and safety systems.

#### BCM – top view in installation position



**BCM output information**

Function	Component	Load type	Max. load	Signs of overload
Left dipped beam	High-side PWM or DC for HID relays	Bulb/HID (via relay)	55 W	Output shutdown (1)
Right dipped beam	High-side PWM or DC for HID relays	Bulb/HID (via relay)	55 W	Output shutdown (1)
Left main beam	High-side PWM or DC for aperture – HID main beam	Bulb/HID aperture	55 W	Output shutdown
Right main beam	High-side PWM or DC for aperture – HID main beam	Bulb/HID aperture	55 W	Output shutdown
Left daytime running light	High-side PWM (configurable for Smart LED DRL / side marker light)	Bulb/smart LED	30 W	Output shutdown
Right daytime running light	High-side PWM (configurable for Smart LED DRL / side marker light)	Bulb/smart LED	30 W	Output shutdown
Front left side marker light	High-side PWM	Bulb	10 W	Output shutdown
Rear left side marker light	High-side PWM	Bulb	6 W	Output shutdown
Front right side marker light	High-side PWM	Bulb	10 W	Output shutdown
Rear right side marker light	High-side PWM	Bulb	6 W	Output shutdown
Left fog light	High-side PWM	Bulb	35 W	Output shutdown
Right fog light	High-side PWM	Bulb	35 W	Output shutdown
Front left turn signals	High-side PWM	Bulb	27 W	Output shutdown
Rear left turn signals	High-side PWM	Bulb	27 W	Output shutdown
Front right turn signals	High-side PWM	Bulb	27 W	Output shutdown
Rear right turn signals	High-side PWM	Bulb	27 W	Output shutdown
Number plate lights				
(and side marker lights)	High-side PWM	Bulb/LED	25 W	Output shutdown
Reversing light	High-side DC	Bulb + micro-relay	42 W + 250 mA	Output shutdown
Rear fog lights	High-side PWM	Bulb	2x 21 W	Output shutdown
Left brake light	High-side PWM	Bulb	2x 21 W	Output shutdown
Right brake light	High-side PWM	Bulb	2x 21 W	Output shutdown
High-level brake light	High-side PWM	LED	1x 16 W or LED chain	Output shutdown
Switch lighting	High-side PWM	LED	1.5 A at 16 V	Output shutdown
Power supply to the battery-saving function	High-side driver	Bulb	75 W	Output shutdown
Front interior light, entry light	High-side PWM	Bulb or LED	65 W	Output shutdown
Rear interior light, entry light	High-side PWM	Bulb or LED	65 W	Output shutdown

Horn	High-side relay driver	Micro-relay	250 mA	Output shutdown
Alarm siren	High-side driver	Electromechanical signal transmitter	4 A normal, 8 A inrush current for 10 ms	Output shutdown
Engine operating status	High-side relay driver	Micro-relay	250 mA	Output shutdown
Outputs – locking / double locking	Bidirectional driver	Locking motor (x 5 max.)	6 A per lock. 110 ms, pulsed	Output shutdown
Unlocking outputs	Bidirectional driver	Locking motor (x 5 max.)	6 A per lock. 110 ms, pulsed	Output shutdown

PWM=pulse width modulation / DRL=daytime running light / HID=gas discharge

Repeated overload of circuits can cause permanent output shutdown, which requires a reset by the dealership. Repeated resetting by the dealership can lead to permanent loss of function.

- (1) BCM does NOT support direct HID activation. Relays MUST be used for HID.

## 4.4 Charging system

### Warning note

Do not cut into the alternator cables.

### Information

The alternator systems use intelligent regenerative charging (SRC); see the corresponding section.

### Information

The alternator is controlled via LIN. It does not have the conventional signal line D+ (engine start).

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

### 4.4.1 General information

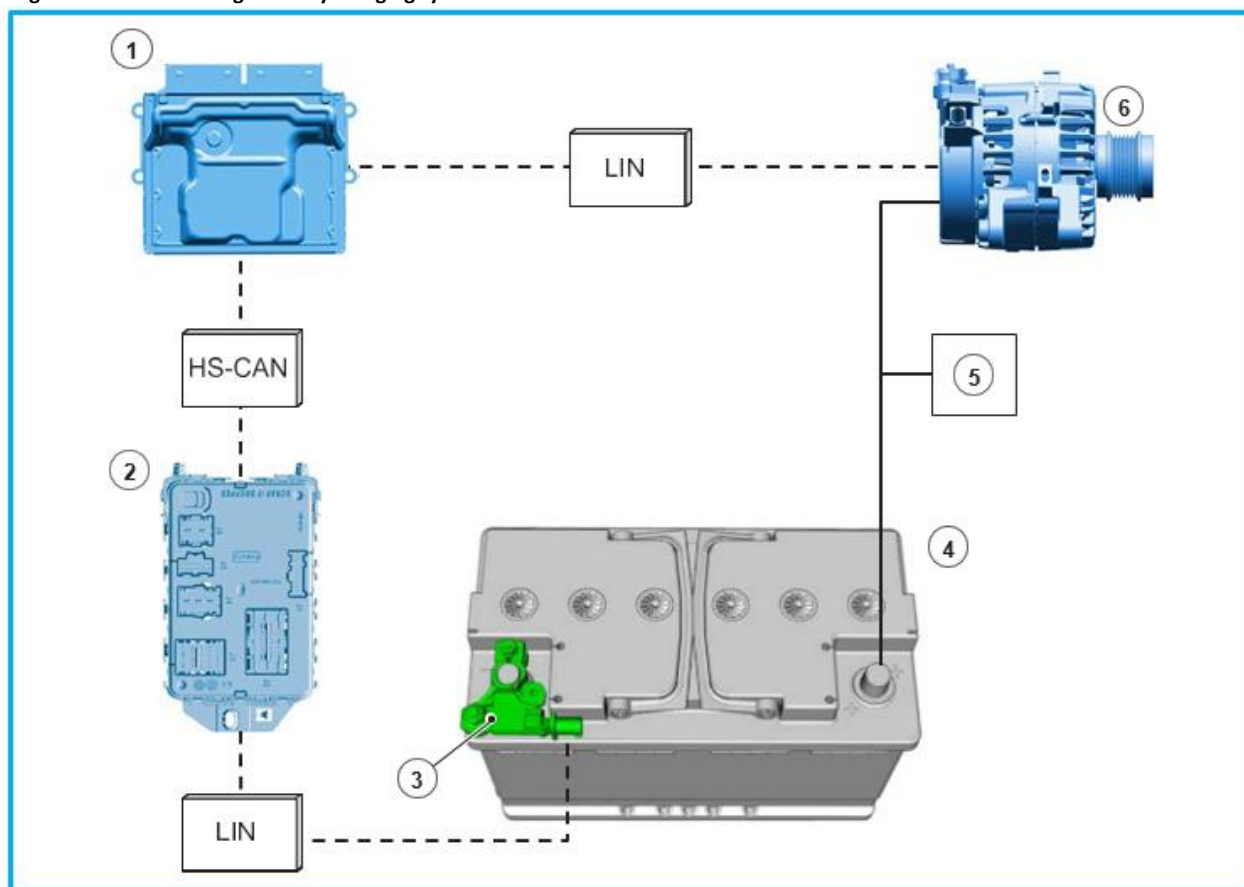
The battery capacity, the technology and the charge available from the alternator must be sufficient to ensure that the engine is started in unfavourable climatic conditions even after additional electrical equipment has been installed.

The driver's seat carrier contains additional connection points that can be used by the customer for special purposes, as well as CCPs. Vehicles with a single battery have a secured 60 A connection as standard. Vehicles with a double battery also have a switched 200 A connection. Other options are available for applications with higher power requirements.

See: [4.5 Battery systems](#)

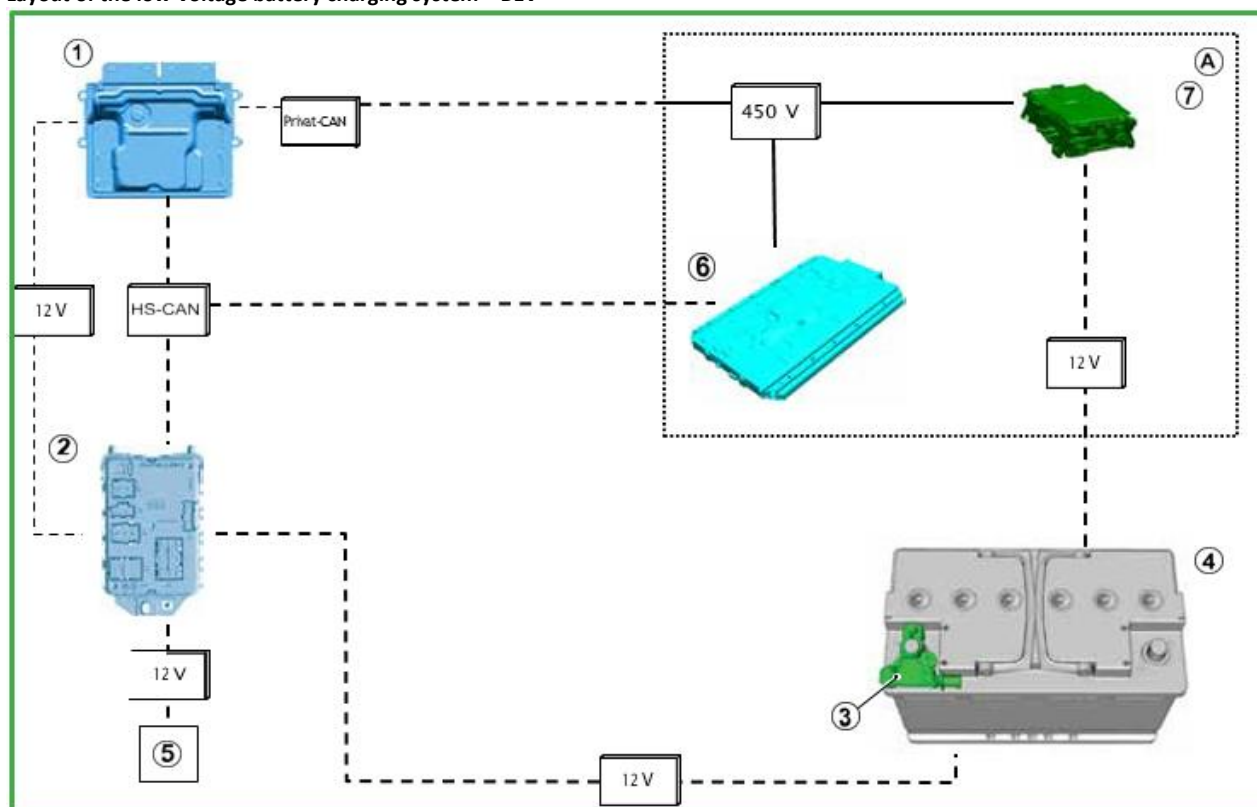
#### 4.4.2 Layout of the battery charging system

Diagram of the low-voltage battery charging system – ICE



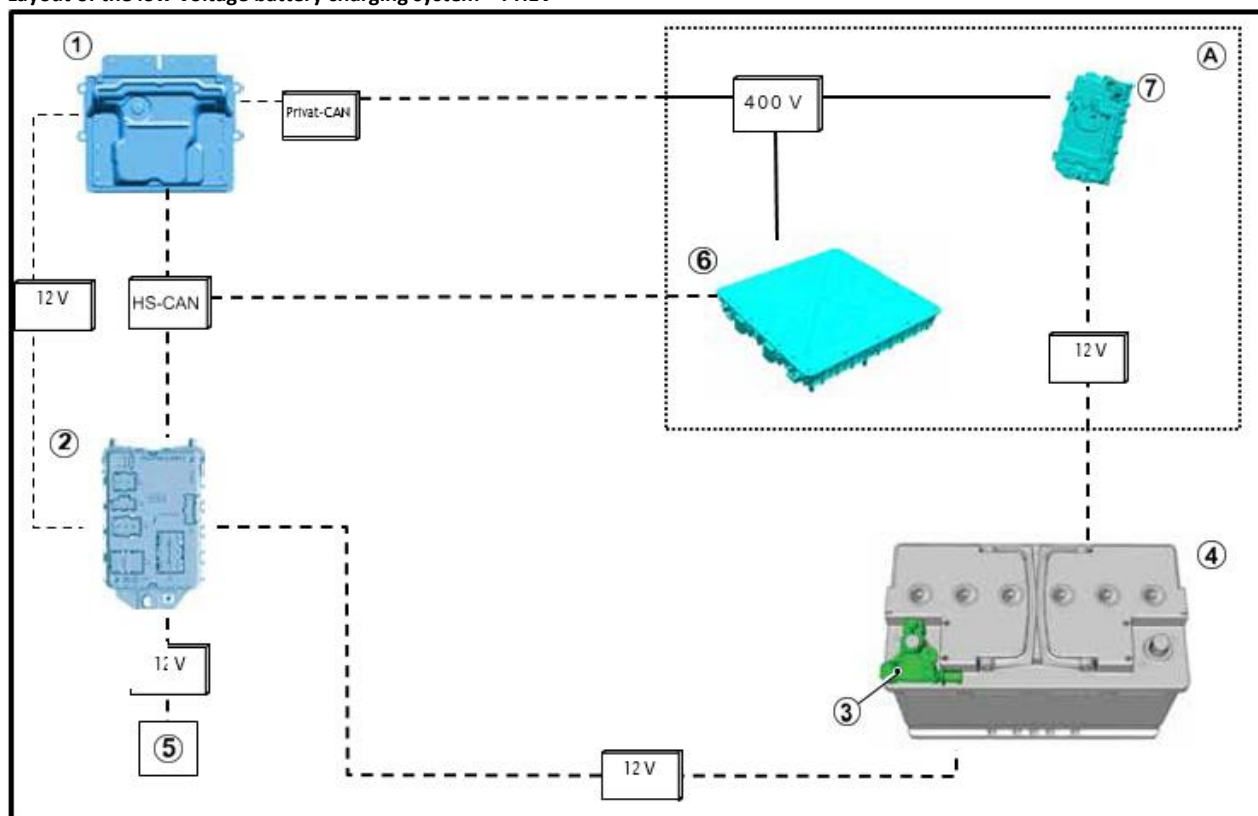
Element	Description
1	Powertrain Control Module (PCM) or engine control unit (ECM)
2	Onboard supply control unit (BCM)
3	Sensor – battery monitoring (BMS)
4	Battery – dual batteries are available as an upgrade option or together with specific features
5	Electrical equipment
6	Alternator

## Layout of the low-voltage battery charging system – BEV



Element	Description	Element	Description
1	Powertrain Control Module (PCM) or engine control unit (ECM)	5	Electrical equipment
2	Onboard supply control unit (BCM)	6	High-voltage battery
3	Sensor – battery monitoring (BMS)	7	High-voltage DC/DC converter
4	Battery	A	BECM

## Layout of the low-voltage battery charging system – PHEV



Element	Description	Element	Description
1	Powertrain Control Module (PCM) or engine control unit (ECM)	5	Electrical equipment
2	Onboard supply control unit (BCM)	6	High-voltage battery
3	Sensor – battery monitoring (BMS)	7	High-voltage DC/DC converter
4	Battery	A	BECM

## Summary of available charging modes

Charging mode		Approximate charging voltages (measured at jump-start connection point)
SRC	Intelligent regenerative charging – conventional charging mode	Minimum 12.2 – maximum 14.9
CC	Conventional charging – high charging voltage up to full battery charge and constant alternator voltage above 13.5 V, provided the battery temperature is not > 40°C. The actual voltage at the battery varies depending on the alternator load.	Minimum 13.5 – maximum 14.9
SS	Start/stop – 5-second delay from CC/SS lock activation to its effectiveness.	Not applicable

The voltages in the above table are approximate as the battery charging system is dynamic and the voltage can be changed at any time. There is also a regeneration mode that is activated regularly if the vehicle is stationary for more than 30 days. This may result in a voltage of up to 15.2 V.

For more information on start/stop, see [4.10 Engine management system](#)

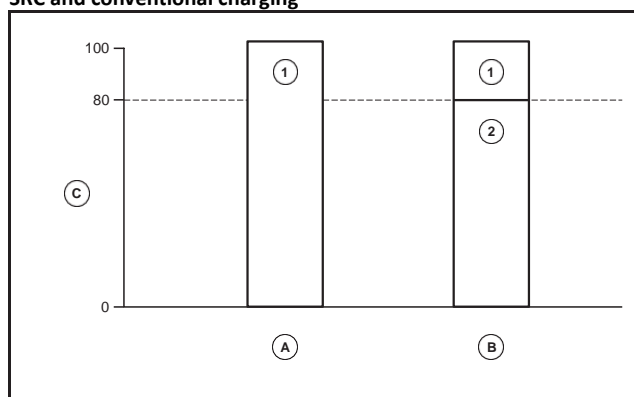


#### 4.4.3 Smart regenerative charging (SRC)

Smart regenerative charging uses information from the battery monitoring sensor to adjust the output power of the alternator in order to reduce fuel consumption. The output power of the alternator can be increased when the vehicle is decelerated in order to charge the battery without consuming any additional fuel. The output power of the alternator can also be reduced in order to reduce the engine load and thus the fuel consumption. In this situation, the electrical equipment is supplied by the battery. This feature can be disabled by using the Retrofit High Performance mode, as described later in this section.

In comparison, conventional charging aims to charge the battery at a constant rate that depends on the battery temperature.

**SRC and conventional charging**



Element	Description
A	Conventional charging
B	Smart regenerative charging (SRC)
C	Battery charge level (%)
1	Minimum 13.5 V on the battery during charging
2	Minimum 12.2 V on the battery during charging

#### 4.4.4 SRC override

SRC can be temporarily interrupted as follows:

- Start/stop button when vehicle is stationary
- Using the Retrofit High Performance mode

See: [4.10 Engine management system](#)

The start/stop deactivation switch also deactivates the SRC (LED warning lamp on). When it is deactivated and the vehicle is stationary, the engine is not switched off and the battery is charged by the alternator using conventional charging.

#### 4.4.5 Retrofit High Performance mode

##### Warning note

The Retrofit High Performance mode can lock the engine shutdown (AEIS). This is a safety measure to protect against carbon monoxide poisoning (CO). Do not use this function when the vehicle is in an enclosed space. Do not install the function in a vehicle that may be operating in an enclosed space. Do not allow carbon monoxide to accumulate.

##### Warning note

The Retrofit High Performance mode is a single method with various effects. Do not activate the Retrofit High Performance mode under incorrect conditions as this may have unintended consequences. When implementing automated control of the Retrofit High Performance mode, consider all possible effects.

##### Warning note

The Retrofit High Performance mode must not be permanently earthed. This would violate the requirements for emissions and type approval for the vehicle. If the fuel-saving functions are permanently deactivated, a new type approval must be carried out by the converter as part of the approval process.

##### Warning note

When installing automated systems to control the Retrofit High Performance mode, the details must be noted in the holder's vehicle documentation. The following holders must be informed of changes regarding the use of the Retrofit High Performance mode. The following holders of vehicles equipped with this must be informed of uses of the Retrofit High Performance mode.

**Practical note**

The Retrofit High Performance mode may only be used if this is necessary for the operation of retrofitted devices. When the equipment is switched off and during the normal driving cycle, all emission and fuel-saving functions must be active.

**Information**

If a vehicle is decommissioned for resale, the lock of the Retrofit High Performance mode must be removed from the vehicle.

**Introduction**

The Retrofit High Performance mode accepts only one input that can affect the following functions:

- SRC lock
- Start/stop lock
- AEIS lock (function limited in some countries)
- When the engine is switched off, the timer of the standard battery monitor (SBG) is disabled

An example of when it is not possible to switch to the Retrofit High Performance mode is the normal driving cycle when there are no additional loads. The solution may only be used for electrical equipment with high power consumption or strong mechanical power tapping on the front drive belt (FEAD), mainly when the vehicle is stationary.

The Retrofit High Performance mode is configuration-dependent and restrictions may apply.

**SRC lock (conventional charging)**

When SRC is locked (e.g. by the Retrofit High Performance mode), the system uses conventional charging.

This may be necessary for conversions that require a voltage in the range of 13.5 V to 14.9 V. Such applications include fast charging and charging of the additional battery, the compensation of a voltage drop, or large electrical loads with the engine running.

The voltage may also drop during the charging process, as the battery becomes hotter due to the charging/discharging cycles. This protects the battery from overcharging.

For additional information, see [4.6 Battery protection](#), load shedding.

**Start/stop lock**

This may be necessary if the charging system must provide voltage or high electrical power while driving, e.g. for cooling or emergency services.

**AEIS lock**

This may be necessary to maintain engine operation when the stationary vehicle is being used to generate mechanical or electrical energy. In normal AEIS operation, the engine is automatically switched off after 30 minutes if no driver input is made.

### Timer for standard battery monitoring when the engine is switched off

This may be necessary to prevent premature activation of the SBG when the engine is switched off.

See: [4.6 Battery protection](#), load shedding.

### Installation/access

The Retrofit High Performance mode is activated by earthing a specific circuit in a non-permanent shift strategy.

The Retrofit High Performance mode can be accessed via various vehicle connectors.

- As a repair kit for connection to the regular 12-pin vehicle interface connector in the driver's seat carrier
  - Interface connector, pin 3 – available in all non-camper variants
- Function in the programmable Ford Volkswagen battery monitor – active load or retrofitted sensors trigger an earth connection that is required to switch off the fuel-saving functions.

Examples:

- Avoid triggering DC/AC converters with high current flow at low voltage
- Charging additional batteries
- Continued engine operation
- Compensation for voltage drop
- Stabilisation of the voltage
- Retrofitted FEAD accessories that require continuous engine operation

Further information

See: [4.6 Battery protection](#)

See: [4.23 Connectors and connections](#)

#### 4.4.6 Check function

##### Information

There is a delay (of up to 5 seconds) between the activation of the Retrofit High Performance mode and its effect.

##### Information

If the 12 V SOC is already too low, the circuit is opened before the timer expires to allow the engine to start.

#### Check function: start/stop lock – for vehicles with start/stop function

1. Check the start/stop functions for intended function; see Owner's Manual for details
2. While driving, close the hardware input switch at a safe moment and check whether the start/stop function has been deactivated
3. Open the hardware input switch and ensure that the start/stop function has been restored

**Check operation: SRC lock, charge mode control**

1. Make sure the batteries are sufficiently charged. When charging, use the jump-start terminal and the earth connection in the engine compartment. Charging instructions can be found in the Owner's Manual.
2. Measure the voltage between the jump-start terminal and the earth connection in the engine compartment with the engine running and the SRC lock input circuit open. See the section on emergency situations in the Owner's Manual
3. With the engine running, earth the circuit for the Retrofit High Performance mode and measure the battery voltage. The voltage should be within the voltage ranges specified in the "Summary of available charging modes" table in [chapter 4.4.2](#). The voltage can depend on many factors, including total electrical load, active electrical equipment, battery condition and more. The charging current can vary between modes depending on the active loads
4. Open the switch again and check whether the voltage level has returned to the original value measured in step 2. SRC is activated

**Check function: AEIS lock, idling speed switch-off control (if present)**

1. Make sure that AEIS is present and working
2. Activate Retrofit High Performance mode
3. Check whether the engine is still running when the lock is activated
4. Check whether normal AEIS behaviour is resumed when the lock is not activated. For example, the engine is switched off after 30 minutes

**Check function: lock of timer for battery-saving when engine is switched off**

1. Set the preset timer of an SBG circuit, e.g.
  - CCP2
  - Other switched earth circuits supplied by the function
2. Activate Retrofit High Performance mode
3. Check whether the circuit remains switched on after the timer has expired

See: [4.6 Battery protection](#)

**4.4.7 Guidelines on charge balancing**

When retrofitting electrical equipment with medium to high loads, including additional batteries, a charge balancing test must be carried out. This includes all relevant electrical equipment of the production vehicle and retrofitted electrical equipment that must be active at the same time, whereby the battery voltage must not fall below 13 V. This ensures that the alternator is not damaged, additional batteries are charged, and the correct system function is maintained. SRC override is recommended to ensure that the alternator is in full load. Higher power can be obtained by increasing the idling speed using the engine speed controller option (PR number US2).

#### 4.4.8 Circuit diagrams

The complete vehicle wiring and circuit diagrams can be found in the Volkswagen Workshop Manuals.

See: [4.23 Connectors and connections](#) and see: [4.22 Fuses](#)

##### Information

The Workshop Manuals are available on the Internet via the Electronic Repair and Workshop Information (erWin\*) operated by Volkswagen AG at:  
<https://volkswagen.erwin-store.com/erwin/showHome.do>

\*Information system from Volkswagen AG, subject to payment

#### 4.4.9 Alternator features

##### Information

To calculate the corresponding engine speed (rpm), the alternator revolutions on axle (B) must be divided by the following factor: 2.79 for 2.0L diesel engine.

##### Information

These alternator curves do not contain a reserve output capacity, as this depends on the original equipment and the equipment options of the vehicle.

##### Information

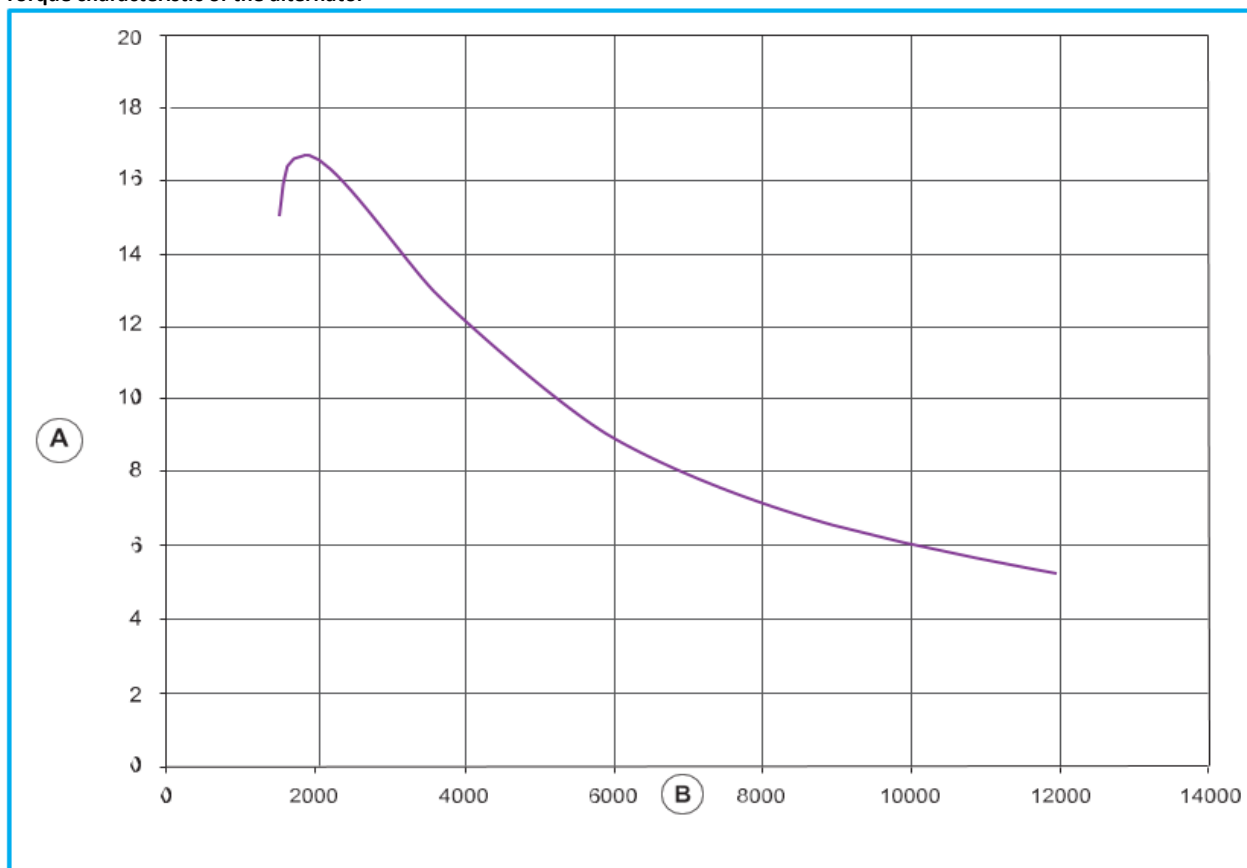
If the engine is running for extended periods of time, the higher temperatures are to be assumed.

The power curves of the alternator show the engine speed controller option (PR number US2) and the factory-set engine speed values for mode 1. This data can be used to calculate the charge balance values for the finished third-party system and are also the setpoints used by the programmable Volkswagen battery monitor (PR number KB1), which automatically returns to the range or the basic idling speed depending on the performance requirements of the third-party system.

See: [4.6 Battery protection](#)

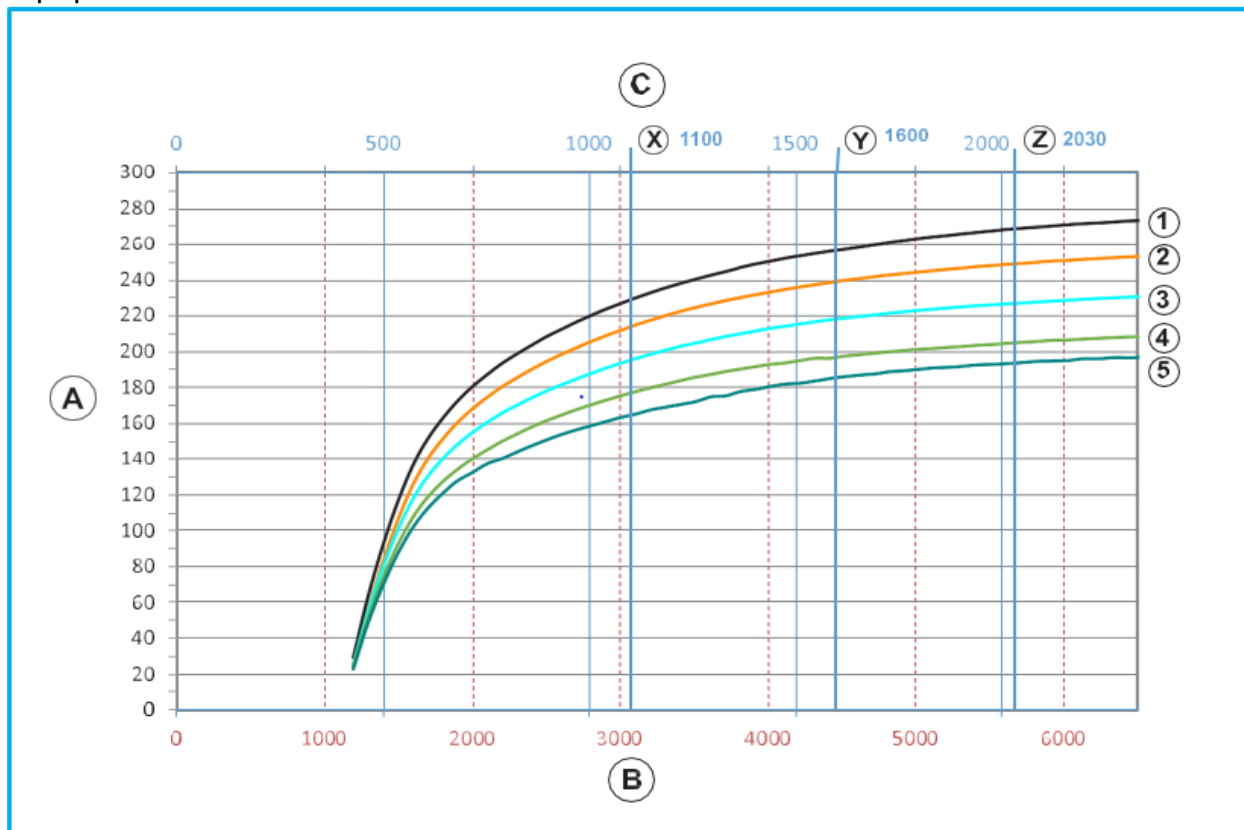
It must be taken into account that the Volkswagen system requires approx. 20 A for engine operation. All other active Volkswagen systems, such as blowers and lights, contribute to a further reduction in the available current rating for retrofit systems. We also recommended using the SRC override function (third-party high-power mode) to maximise the alternator power. An overloaded alternator will cause a voltage drop to less than 12.8 V and can cause damage, so this must be avoided.

Torque characteristic of the alternator



Element	Description
A	Torque (Nm)
B	Revolutions/minute (rpm)

Output power of the 240 A alternator



Element	Description
A	Output current (amps)
B	Alternator speed (rpm)
C	Engine speed (rpm)
X	rpm 1 standard
Y	rpm 2 standard
Z	rpm 3 standard
1	Temperature 0°C – voltage 14.1 V
2	Temperature 23°C – voltage 13.9 V
3	Temperature 60°C – voltage 13.5 V
4	Temperature 93°C – voltage 13.1 V
5	Temperature 116°C – voltage 12.9 V



## 4.5 Battery systems

### Warning note

For electric power take-off systems (PTO) that require switching from third-party systems, AGM high-performance batteries (PR number J1N+8FB or PR number J0B+8FF) must be ordered for the original vehicle. For more information, see the “Connectivity and power consumption recommendations” table later in this section. If the original vehicle is not equipped with the option Dual Battery H7 AGM (PR number J1N+8FB) or Dual Battery H8 AGM (PR number J0B+8FF), see the instructions for upgrading the battery under “Single and dual battery systems” later in this section.

### Practical note

Some batteries require a special charging profile. Therefore, a suitable battery charger (e.g. DC-DC charger) must be used for the selected battery. Please contact your battery supplier.

### Information

If an isolation relay is present, make sure the batteries are connected to the charging circuit.

The battery capacity, the technology and the charge available from the charging system must be sufficient to ensure that the engine is started in unfavourable climatic conditions even after additional electrical equipment has been installed.

### Information

Additional electrical equipment of the customer with a current consumption of more than 60 A must be regulated by the standard battery monitoring (SBG) and the load shedding system. For loads up to 200 A, see [chapter 4.23.5 Intelligent interface for additional power tap including fuse \(ISL\)](#). For loads above 200 A, see [section “Retrofitted +12-V power connections for loads above 200 A”](#)

**Information**

Do not make any further connections to the power distribution box (PDB), as excessive tightening could damage the PDB. Electrical equipment should be connected to the CCP.

**Information**

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

**4.5.1 Recommendations for connectivity and power consumption****Warning note**

If a retrofitted battery monitor is installed, it must be connected to the load shedding signal so that the EPAS (electronic steering) is protected in the event of an overload when the engine is running.

**Information**

Absorbent glass mat (AGM) batteries must be used for deep-cycle applications, i.e. batteries are regularly charged and discharged.

**Information**

With regard to battery discharge, the Converter must take into account the current consumption when operating the additional system, and any continuous current consumption that occurs when the ignition is switched off, even if the system is not in operation. A built-in torque converter consumes energy, for example, even without a connected load.

**Information**

Wherever possible, engine operation or active operation (BEV) of electrical devices reduces the discharge of the battery; both start and auxiliary batteries are used in conjunction with the charging system.

**Information**

User training and adequate regular battery maintenance help ensure proper battery operation.

**Information**

AGM batteries are required for a high 12 V power requirement when the engine is switched off / the battery charger is switched off / the DC/DC is switched off, e.g. when “rotating beacons are switched on for the entire work shift”. Standard liquid electrolyte batteries are not suitable for the routine use of high-voltage, low-voltage charging systems. Use 1 or 2 batteries according to the power consumption table.

The section is intended as a guide for the installation of the suitably dimensioned charging system.

Connection design	Recommended specification (PR no. in brackets)
Additional, fused relay outputs. For example: service vehicle.	Intelligent interface for additional power tap including fuse (VH2/VH3) AGM dual batteries (J1N+8FB/ J0B+8FF)
Conversions that require different vehicle signals such as from turn signals, brake lights, door contact switches and parking brake switches. For example: police van and ambulance.	AGM dual batteries (J1N+8FB/ J0B+8FF) Intelligent interface for additional power tap including fuse (VH2/VH3)

Engine condition	Current consumption	Recommended specification (PR no. in brackets)
<b>Loads during engine operation</b>	For applications in which the Converter exceeds the information under “Permanent current tap with high current flow” with the current requirement (total load of the basic vehicle plus the scope of the Converter).	Depending on the charge balance calculation, additional batteries and additional energy source.

Engine condition	Current consumption	Recommended specification (PR no. in brackets)
Loads when engine is switched off	<b>PERMANENT CURRENT TAP WITH LOW CURRENT FLOW:</b> up to 5 mA in addition with ignition off, e.g. low amperage peripheral chargers supplied by KL30.	Battery(s) of the sender vehicle
	<b>PERMANENT CURRENT TAP WITH MEDIUM CURRENT FLOW:</b> between 5 mA and 30 mA with ignition switched off, e.g. tracking systems (with resting state, no GPS), control systems, peripheral chargers with medium amperage supplied by KL30.	Dual batteries of the same type (standard for certain applications only)
	<b>PERMANENT CURRENT TAP WITH HIGH CURRENT FLOW:</b> between 30 mA and 175 A with the ignition off, e.g. GPS tracking systems, control systems, high amperage peripheral chargers supplied by KL30, OR vehicles with frequent/prolonged activation of the interior lighting, rear door locking/unlocking and opening. DO NOT EXCEED 175 A.	Limited engine running/charging cycles, two high-performance AGM batteries (J1N+8FB/ J0B+8FF). Frequent engine running/charging cycles, single high-performance H8 AGM battery (J0B+8FA). If possible, connect the electrical equipment to the intelligent fuse box (VH2/VH3) or retrofitted battery monitor. See: <a href="#">4.6 Battery protection</a> for load shedding.
	<b>CURRENT TAP WITH OCCASIONAL SHORT-TERM HIGH CURRENT FLOW:</b> between 40 A and 240 A with ignition switched off, e.g. cranes, tippers, tail lifts, 230 V converters, ambulances.	Two high-performance AGM batteries (J1N+8FB/ J0B+8FF) + intelligent interface with power tap (VH2/VH3) – max. 200 A. Additional batteries may be required – for more details see “Battery configuration, additional loads, start/stop and SRC” in this section. See: <a href="#">4.6 Battery protection</a> for load shedding.
Loads during engine operation	<b>PERMANENT CURRENT TAP WITH LOW CURRENT FLOW:</b> Up to 30 A, e.g. maintenance vehicle with water boiling point and additional lighting, but without additional systems.	Alternator of the sender vehicle
	<b>PERMANENT CURRENT TAP WITH HIGH CURRENT FLOW:</b> up to 240 A, e.g. ambulance, maintenance vehicle with high power requirement, refrigeration. BATTERIES MUST NOT BE COMPLETELY DISCHARGED, SYSTEM VOLTAGE MUST NOT FALL BELOW 13 V. For more details see “Battery configuration, additional loads, start/stop and SRC” in this section. Loads above 60 A must be connected to a regulated load-shedding connection.	If necessary, use an engine speed controller (US2) to improve the 12 V charging. For voltage support, it is recommended to use the Retrofit High Performance mode. Loads above 60 A must be connected to a regulated load-shedding connection.
	<b>CURRENT TAP:</b> Applications that require increased idling speeds, e.g. mobile breakdown vehicle, welding cart, mechanical auxiliary drive on the engine.	Engine speed controller (US2).

#### 4.5.2 Supply and earth connections for high-voltage circuits

##### Warning note

Self-locking crimped hexagon nuts **MUST** be used for the high-current bolt connections for the positive and negative battery terminals or the chassis earth. Do not use serrated washers or self-locking nuts with plastic inserts.

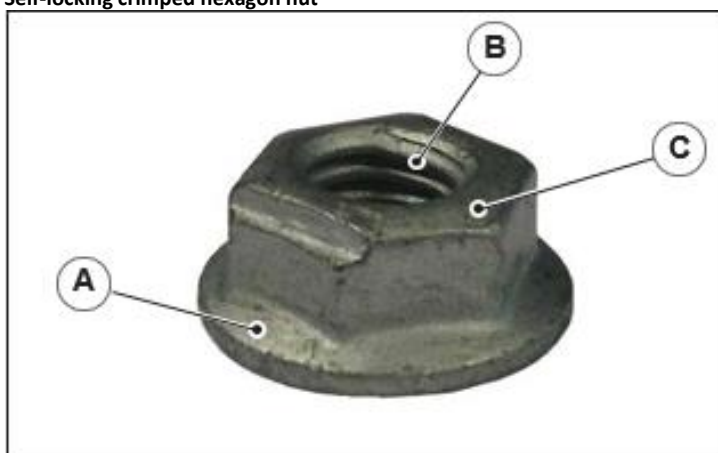
##### Warning note

For high-current applications, it is recommended to use only one eyelet per bolt. If the use of more than one eyelet per bolt cannot be avoided, the eyelet over which the most current flows must be positioned closest to the supply connection. Do not use more than two eyelets or crimp connections per bolt.

Further information

See: [4.23 Connectors and connections](#), external power supply points.

##### Self-locking crimped hexagon nut



Element	Description
A	Large flange for maximum surface current flow and large clamping force surface.
B	The crimping/securing function is only achieved by the deformed inner thread
C	The surface must be made of a low-resistance material that complies with the Restricted Substance Management Standards (RSMS).

### 4.5.3 Guidelines for the conversion of vehicles

#### Responsibilities and considerations

##### Warning note

The installation of voltage amplifiers or other devices to increase the alternator output is not permitted. The installation of such devices will void the vehicle warranty.

In addition, the alternator and the engine monitoring system (EMS) or the powertrain control unit may be damaged and the type approval of the vehicle may be affected. Check the applicable regulations.

The requirements for operating additional and special electrical devices vary. The Converter must therefore consider the following points when planning the installation:

- Compliance with legal regulations by the original vehicle
- Drivability and maintainability of the original vehicle
- Effects of the applicable legislation in relation to the proposed conversion, including the regulations in force in the country of sale
- Method of integrating the circuit into the original vehicle
- Materials and installation must meet the quality standards described in this section

#### Normal operating voltage

The electric system of the Transporter panel van is charged by a alternator. The vehicle electronics are powered by a 12-volt supply with a negative earth return line. The factory-installed equipment is designed to ensure full functionality in the range of 9 to 14 V for normal operation.

#### Voltage test and charging process

##### Warning note

Do not connect to any earth or +12-volt potential points other than those listed in the Owner's Manual. There is a separate charging connection under the bonnet. Improper handling can lead to strong leakage currents, especially when jump-starting with external batteries, which can damage the peripheral devices and especially the ECUs.

For voltage measurement, a tolerance of  $\pm 5\%$  of the default values measured with calibrated meters is permitted. Measure the voltage with the battery installed, the ignition switched off and the electrical equipment switched off (e.g. also interior and exterior lighting). Connect the positive battery terminal clamp of the voltmeter to CCP1 or the positive terminal, and the negative terminal to the negative battery terminal clamp of the battery. Alternatively, the voltage can also be measured in the engine compartment between the jump-start terminal and the earth connection in the engine compartment.

1. Cold batteries only react to charging current with a delay. For this reason, batteries should have a temperature of at least 5°C (41°F) before charging. This can take between four and eight hours at room temperature, depending on the initial temperature and the battery size
2. A fully discharged battery is slow to respond to the charging current and in some cases may not charge with the normal charger settings. For batteries in this state, charging can be started using a circuit for deeply discharged batteries or the fast-charging function of a charger
3. To determine if a battery can be charged, follow the charger manufacturer's instructions on using the circuit for discharged batteries or the fast-charging function

#### Removal of surface charge

Before performing manual voltage checks, make sure the battery is not damaged, is supplying a stable voltage, and has no surface charge like after the engine has been running.

To ensure that there is no surface charge, do not measure the battery voltage until the vehicle has been stationary for a long period of 24 hours with the ignition off and without electrical equipment. If this is not possible, an estimate can be made using the following method:

1. To reduce the surface charge present in the battery, turn on the headlights (main beam) for five seconds, or turn on the parking light for 15 seconds if the headlights do not turn on with the ignition off
2. Switch off the lights and wait until the additional switch-off loads reach their constant value. This usually takes 35 minutes after the ignition is switched off

#### Sensitivity and voltage tolerance

The Transporter uses multiplex vehicle electronics. It is recommended to use the corresponding Volkswagen original additional systems. Improper or incorrect connection of additional equipment can cause malfunctions or damage the vehicle, which will void the warranty.

#### Stored and maintenance vehicles

For vehicles remaining on the Converter's premises for more than seven days, the negative battery cable must be disconnected. Before delivery to the customer, reconnect the negative battery cable and check the battery voltage again. A full recharge with a suitable battery charger is required if the battery voltage drops below 12.4 V for standard and enhanced flooded batteries, or for AGM batteries or vehicles in which the starter does not turn.

For more information, see: [1.13 Vehicle transport aids and the storage of vehicles](#)

#### Transport mode

##### Warning note

The only way to put the vehicle back into transport mode is to use a diagnostic service tool with the correct safety clearance. If necessary, Volkswagen Commercial Vehicles Partners have the necessary tools and the correct authorisation.

If "Transport mode" is displayed in the instrument cluster, the functions of the vehicle may be limited. This mode of operation is activated mainly to protect the battery and to maintain the guarantee before delivery.

To switch from one mode to another, the brake pedal must be depressed five times and the hazard warning lights switch pressed twice (in any combination) within a 10-second period.

#### Information

To switch “temporarily” from transport mode to normal mode, leave the ignition on and turn the hazard warning light switch on and off twice within 10 seconds. The maximum duration of this temporary pause mode is then 120 minutes.

#### Information

To switch from “transport mode” to “normal mode”, leave the ignition on, press the brake pedal five times, and turn the hazard warning light switch on and off twice within a period of 10 seconds. The combination of actions is arbitrary.

#### Information

The vehicles should remain in “transport mode” during storage and before handover to the customer (if possible).

SBG, CCP2 and the load shedding system for retrofitted electrical equipment are “always off” in transport mode. PBG is blocked when the engine is running.

### Power disconnection

#### Warning note

The power must be disconnected for welding and working on the airbags. Disconnect all batteries, including the earth, and isolate the battery negative terminal(s).

#### Information

After disconnecting the power supply and before starting any further work, wait 15 minutes to ensure that the safety systems are completely deactivated.



After the battery is disconnected, the vehicle does not need to be reprogrammed. It retains its “normal” performance management settings and configurations. However, the timing of the locks of the central locking can shift if one of the locks has been opened manually in the meantime. The radio maintains all its settings.

The electronic security code no longer needs to be reprogrammed as it is integrated into the vehicle identification number (VIN) of the factory-installed Transporter system. The clock is initialised to 12:00 and must be set to the correct time according to the procedure in the customer manual.

### Earth connections

#### Information

If a battery monitor or isolation relay is present, make sure the batteries are connected to the charging circuit.

High electrical loads should be earthed directly to the vehicle body and not to the negative battery terminal. An earth connection to the negative battery terminal bypasses the BMS, which impairs the correct detection of the battery charge status. See the BMS section in this manual.

See: [4.6 Battery protection](#)

If a separate charging system is added, the earth wire of the charger must also be connected to the body.

See: [4.23 Connectors and connections](#)

### Tightening torque for battery cables

Tighten the battery cables on the battery clamp to a tightening torque of  $8.0 \pm 1.2$  Nm for a positive or negative battery terminal connection with/without BMS. See BMS later in this section for more information.

### Battery safety

#### Warning note

When handling batteries, take appropriate precautions, e.g. protective clothing and eye and hand protection.

#### Warning note

Ensure that batteries are charged in a well-ventilated room provided for this purpose.

**Warning note**

After the conversion, always ensure that the water drain hoses have not been disconnected.

**Warning note**

If a battery monitor is monitoring the supply via AGM dual batteries, it is recommended for the idling voltage not to be below 11.8 V, measured at the battery terminals.

**Battery type and capacity****Information**

If a Converter intends to install additional systems or accessory devices that consume additional power when the ignition is switched off or the engine is running, then AGM dual batteries should be specified. See “Recommendations for connectivity and power consumption” in [chapter 4.5.1](#) of the Converter guidelines for the relevant vehicle. Large electrical equipment can prevent the start / stop process, but only for the duration of the load by third parties. This is normal.

The original vehicle is equipped with a single or dual battery system. It is also important to read the relevant information about start/stop and the charging system.

The vehicle may be equipped with improved liquid electrolyte batteries or AGM batteries at the factory. Batteries with higher capacities are available as standard production options, and special vehicle options offer AGM technology for heavy electrical equipment and deep discharge applications.

Before installing additional electrical equipment, check that the battery nominal capacity, the technology, the existing wiring harnesses and the output power of the charging system are suitable for the additional load.

See: [4.5 Battery systems](#), table of recommendations for designing the current consumption and connections.

The battery capacity, the technology and the charge available from the charging system must be sufficient to ensure that the engine is started in unfavourable climatic conditions even after additional electrical equipment has been installed.

## Battery covers

### Warning note

It is important to replace the battery positive terminal cover after every change to the battery. If the battery cover is missing or damaged, a replacement part must be ordered and installed. It is recommended to check the installation as part of the quality control. See figure in [chapter 4.5.8 "Retrofitted +12-V power connections for loads above 200 A"](#) of the Converter guidelines.

## Avoiding battery discharge

As part of the vehicle conversion process and to maximise the battery life and avoid premature failure of Volkswagen batteries, you must protect and prevent discharging of the battery during a conversion or while the vehicle is in storage. This includes, among other things, keeping the vehicle in transport mode for as long as possible, limiting the start-up processes on the company premises, and opening the doors as little and for as short a time as possible. The voltage **MUST** be checked at acceptance and before handover. If the voltage of the vehicle battery is below 12.4 V for standard batteries and enhanced flooded batteries, or for an AGM battery, recharge using a suitable manufacturer-specific battery charger. Measure the voltage with the battery installed and the ignition and electrical equipment switched off, e.g. also interior and exterior lighting.

## Battery idle time

After reconnection, the BMS requires at least four hours of idle time to recalibrate to the battery charge status; see also the information on the BMS later in this section.

## Use of electrical equipment during the conversion

If electrical equipment is used during the conversion (e.g. several start cycles or doors open), check the battery at intervals of less than seven days and recharge if necessary.

Further information

See: [1.13 Vehicle transport aids and storage of vehicles](#)

## Loads with the engine switched off

When the ignition is switched off, electrical equipment should not cause a discharge of more than 25% within 40 days (normal mode). In principle, all loads must have protection. An additional battery may be required to supply systems that have a high continuous current consumption when the ignition key is removed, such as GPS vehicle tracking systems. This is intended to prevent the batteries from being discharged when the ignition is switched off and the BMS correlation of the charge state of the batteries from being disrupted. This power supply also requires its own protection with an appropriate capacity.

See: [4.6 Battery protection](#)

## Jump starting

The cables must not be connected directly to the battery for jump starting. Instead, special jump-start connections must be used for this purpose. Please refer to the user's manual. The bracket of the wiper motor must not be used as an earth as it is insulated from the body.

### Customer connection points (CCP) and other locations for the connection of electrical equipment

All peripheral devices that are connected to the power supply must be connected in one of the following ways either via the CCPs or via special fuses, such as: intelligent interface for additional power tap incl. fuse or CCP 60 A. For loads above 250 A (CCPs) or 200 A ISL, up to 240 A can be connected via the battery cable.

See: [4.6 Battery protection](#)

### Additional electrical systems

#### Information

If additional electrical systems are installed in the vehicle, the additional circuits must be protected by the necessary fuses. The intelligent interface for additional power tap incl. fuse is recommended.

When installing additional electrical systems in the vehicle, it is recommended to connect them to the ISL so that the existing electrical system is not impaired.

See: [4.22 Fuses](#)

Materials and the installation must meet the quality standards described in this section. All additional devices or components must be designed in such a way that they do not have any adverse effects on the electromagnetic compatibility (EMC) of the vehicle.

### Retrofit High Performance mode

The Retrofit High Performance mode is a Volkswagen function that is available to support the PTO of electrical and mechanical energy by third-party electrical equipment. It provides a longer power supply when the engine is switched off and helps maintain a higher voltage when the engine is running. This mode includes the SRC lock, start/stop lock, AEIS lock and override of the timer for battery-saving when the engine is switched off.

### Cable routing

To prevent damage when installing the additional components, pay particular attention to the routing of the wiring harnesses present in the vehicle. Please refer to the section on installing equipment with an electric drive motor.

### Installation of components with inductive loads

#### Warning note

If inductive loads such as electric motors are to be installed, the inrush current must be taken into account.

**Practical note**

Please note the following:

- All inductive loads must be controlled via relays whose contacts are designed for at least three times the maximum rated current of the motor
- All supply circuits for inductive loads must be protected individually, whereby the nominal value of the fuses must be matched to the motor
- All power supply cables must be designed with at least three times the rated current of the motor and routed as far as possible from the existing vehicle wiring
- All built-in inductive loads must be interference-free in accordance with European or applicable national EMC regulations to ensure that they do not impair the vehicle systems through electrical interference
- Include information on EMC emissions in the CE approval

**Airbags****Information**

Wait up to 15 minutes after disconnecting the power supply before starting any further work. Work on airbag systems may only be carried out by persons with the appropriate training.

Please note the following points:

- Disconnect all batteries, including the earth, and isolate the negative battery terminal(s)
- Unplug the connector from the airbag control unit

**Welding and cutting**

Due to the increased use of comfort and safety electronics in modern motor vehicles, extreme caution must be exercised when carrying out body work. Overvoltages that occur during welding and alignment work when finishing the body shell can damage electronic systems.

In particular, the safety regulations for carrying out welding or cutting work on vehicles with airbag systems must be observed.

For additional information on welding

See: [5.1 Body](#)

Please note the following points:

- Before starting welding or cutting work, disconnect the multi-pin connector of the alternator
- If welding or cutting work is to be carried out near a control unit, it must first be removed
- Never connect the negative wire of the electric welding unit near an airbag or a control unit
- Connect the negative wire of the electric welding unit near the welding point

#### 4.5.4 Battery options

##### Information

If unauthorised batteries or an incorrect configuration are used, the start/stop system or the SRC may not function properly.

Additional or different batteries must be checked for correct operation.

See: [4.10 Engine management system](#)

Start/stop and SRC

See: [4.4 Charging system](#)

#### Battery PR No. and options

Battery PR No.	Description	Quantity	Size
<b>Options for individual batteries</b>			
J4E+8FA	Enhanced flooded battery (EFB) (standard)	1	H7
J1N+8FA	800 A cold start current (80 Ah, 20 hours) AGM battery (standard)	1	H7
J0B+8FA	850 A cold start current (95 Ah, 20 hours) AGM battery	1	H8
<b>Single battery options with additional battery pre-wiring package (camper only) (1)</b>			
J1N+8FA	800 A cold start current (80 Ah, 20 hours) AGM battery	1	H7
J0B+8FA	850 A cold start current (95 Ah, 20 hours) AGM battery	1	H8
<b>Dual battery options</b>			
J1N+8FB	800 A cold start current (80 Ah, 20 hours) AGM battery	2	H7
J0B+8FF	850 A cold start current (95 Ah, 20 hours) AGM battery	2	H8

(1) Additional battery pre-wiring package with BMS and breather pipe for second battery

8FA = no second battery

#### 4.5.5 Battery rules

##### Information

If the battery pack is modified, it is also recommended to update the vehicle configuration.

##### Information

When adding additional systems, charge balance calculations are required that take into account the capacity of the charging system and the battery capacity.

- Batteries connected in parallel must be of the same type, have the same capacity and be listed in the Volkswagen battery table
- When the ignition is switched off, retrofitted batteries and electrical equipment must be disconnected from the standard Volkswagen system, or be disconnected by a Volkswagen or retrofitted battery monitoring system
- When charging the batteries externally, ensure that the maximum voltage of 15.2 V is not exceeded. Normal manufacturer-specific charging equipment should be below this voltage

If a second battery has to be installed in a vehicle with only one battery, install the associated cables/components and adapt them to the Volkswagen system architecture. The additional battery must have the same technology and performance specification as the existing battery. Alternatively, systems with one or two batteries can be upgraded to AGM high-performance batteries: system with H7 AGM dual battery (PR number J1N+8FB), H8 AGM dual battery (PR number J0B+8FF) or H8 AGM single battery (PR number J0B+8FA).

If the battery type of a vehicle is replaced by compatible components (see the battery configuration table), the vehicle must then be configured for the new battery types.

A further separation strategy is required for special conversions that require a retrofitted battery. This should be controlled by the engine operating signal on a normally open relay. An illustration of this arrangement can be found later in this section.

See: [4.4 Charging system](#)

The additional load caused by a battery requiring charging can exceed 60 A. If external loads are also connected, a relay or contactor controlled by the load shedding signal must be used for the isolation.

Important factors for choosing the battery

- Battery capacity in ampere hours for continuous discharge until empty. Example: a fully charged 80 Ah battery can deliver 4 A at 20°C for a period of 20 hours until it is empty
- The cold start current (CCA) is the maximum rated value for cold start requirements
- The battery system is recommended for low-cycle and micro-cycle requirements (loads with the engine switched off). For high power requirements when the engine is switched off (dual battery system) use H7 (PR number J1N+8FB), for lower power requirements (single battery system) when the engine is switched off, use a H8 AGM battery system (PR number J0B+8FA)

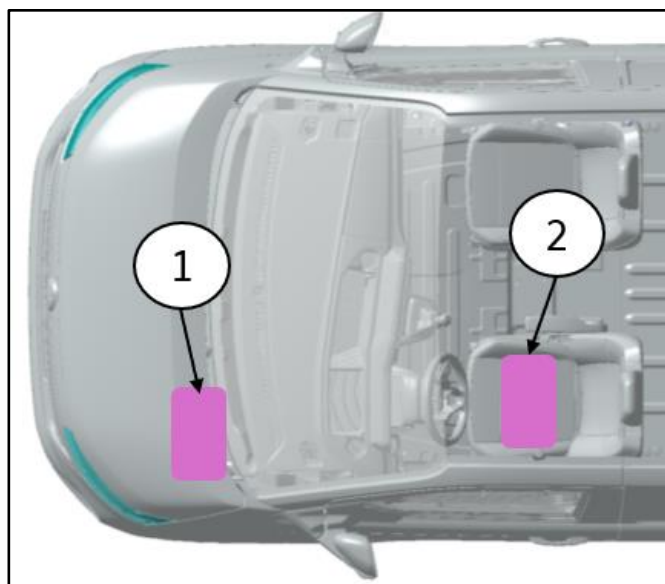
#### 4.5.6 Battery configurations

The starter battery is located in the engine compartment. The first additional battery is always located under the driver's seat. On left-hand drive vehicles in the left lower seat pan frame, on right-hand drive vehicles in the right lower seat pan frame.

There is an exception to this rule for campers.

The first additional battery is always housed in the left lower seat pan frame. The position for a second additional battery is in the right lower seat pan frame.

#### Battery configurations



Element	Description
1	Primary battery
2	Additional battery

#### Additional loads, start/stop and SRC

##### Information

The following battery configurations are NOT compatible with the start/stop system and SRC:

The start/stop system and SRC can only function properly if the vehicle has a correct battery configuration. The start/stop system and SRC cannot be guaranteed to function properly with the following configurations.

- Different battery types – example: 1 x AGM and 1 x liquid electrolyte
- Mixed sizes
- Battery types other than those listed in the “Battery part number and use” table
- Additional non-factory-installed batteries, e.g. three or more, if not disconnected from the installed power supply when the ignition is switched off
- If two Volkswagen batteries are configured, install only one battery
- If a single Volkswagen battery is configured, install a dual Volkswagen battery



Due to type approval, tax classification etc., it is not possible to retrospectively override the start/stop system and the SRC.

If the battery type of a vehicle with a start/stop system or SRC is replaced by compatible components (see battery configuration table), the vehicle must then be configured for the new battery types by the local Volkswagen Commercial Vehicles Partner.

However, the vehicle features must still be configured for SRC or start/stop to fulfil the type approval and vehicle tax class requirements.

#### 4.5.7 Batteries of other manufacturers installed by the converter

##### Warning note

To connect retrofitted electrical equipment that requires more than 60 A when CCP2 is not being used, all connections must be controlled either via the load shedding or the load shedding signal from the vehicle interface connector or from the intelligent fuse box. There must be no exceptions to this conversion strategy, as the signals protect the Volkswagen power supply from overloads and voltage drops that can affect critical systems such as the PBG. The 60-A CCP1 power supply of the advanced equipment version should not be used to supply a retrofitted battery.

##### Practical note

Do not mix H7 and H8 batteries in multiple-battery configurations (two or three batteries).

##### Information

It is the responsibility of the Converter to ensure that the vehicle's power supply is sufficient to supply both Volkswagen and retrofitted systems, especially if these systems can be active at the same time. The system voltage when the engine is running must not drop below 13.0 V while driving and when the Retrofit High Performance mode is active.

It is assumed that campers and all other conversions that require an additional battery would require more than 60 A. Therefore, the isolation should be done either via the 250-A external power supply point (CCP2), the 200-A intelligent interface for additional with power tap incl. fuse, or a retrofitted relay or contactor that is controlled by the load shedding signal. In all systems, there is an engine shut-off protection system that provides sufficient residual energy for the engine to be started in the future. Adequate capacities for wiring, fuses and energy sources must be calculated.

When discharged, the additional battery becomes a load that can be up to 100 A, thus increasing the energy requirement from the charging sources in addition to the loads of retrofitted electrical equipment.

See: [4.6 Battery protection](#)

If additional batteries are added, they should be connected via a separation mechanism such as CCP2, SFB or another battery monitor that is controlled by the load shedding signal. If the requirements of a retrofitted battery and additional systems exceed 250 A (CCP2) or 200 A (ISL/PBG programmable battery monitor), the connection to the 6 mm pin of the positive battery clamp is only permitted when connected to the load shedding signal. See [chapter 4.5.8 "Retrofitted 12-V power connections for loads over 200 A"](#) in this section.

If additional chargers are to be used, they must be connected directly to the retrofitted battery. The charging current can also be supplied to the batteries installed by Volkswagen when the isolation relays/switches are closed – but only as an emergency measure.

When converting from a non-compatible battery configuration to a compatible system, the start/stop system and SRC function require a certain amount of time (ignition OFF overnight and multiple ignition cycles) to regain full functionality.

See: [4.4 Charging system](#)

- For EMC conformity, an earth return cable is recommended, which is routed next to the +12-V supply cable
- When the engine is running, any unnecessary systems should be switched off so that the alternator can supply the main load of the third-party system. This information should be passed on to the end user by the Converter
- The Converter guidelines were followed in all relevant areas. According to this document, a connection to the Volkswagen battery clamp is permitted if the above criteria are fulfilled

#### 4.5.8 Retrofitted +12-V power connections for loads over 200 A

##### Warning note

Do NOT connect one and the same load to both CCP1 and CCP2. The system is not designed for these to interact because the fuses have different values.

##### Warning note

It is important for the battery positive terminal cover to be reinstalled after each conversion of the positive terminal of the battery. See the figure (battery tray image) below in this section of the Converter guidelines. If the positive terminal cover is missing or damaged, a replacement part must be ordered and fitted. It is recommended to check the installation as part of the quality control after the conversion.

The intelligent interface for additional power tap incl. fuse can be used for currents up to 200 A. For loads up to 250 A, use the CCP2 supplied with the second battery. For higher loads such as the starter cable it is recommended to use an ICE donor vehicle and to provide an interface to the starter circuit. For further information please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

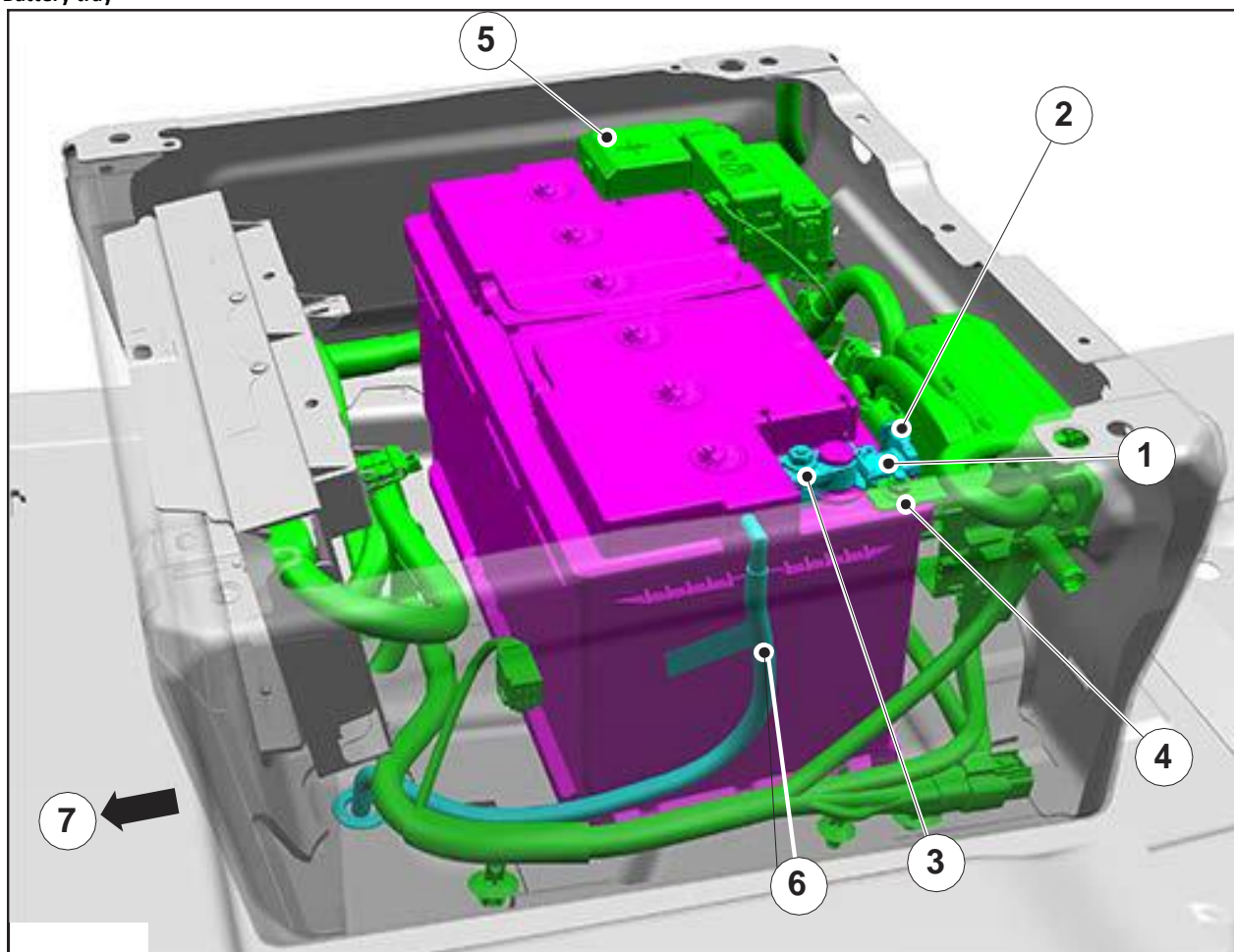
If a high power of more than 60 A is required but no ISL or CCP2 is being used, a third-party relay or contactor must be controlled by the load shedding signal from pin 4 in the vehicle interface connector. See: [4.6 Battery protection](#)

The protection must adhere to the following principles:

- If the load is applied for a longer period of time (continuous load for more than one hour), the fuse must not have a higher value than the alternator installed in the vehicle
- For short-term loads (e.g. peak loads of up to one minute), a secured 250-A cable may be installed. Conversion examples: crane, tipper, tail lift  
This is only permissible if tests carried out by the Converter prove that no problems arise (appropriate documentation must be maintained to confirm the tests) and the following criteria are met:
- No movement prior to full tightening of the nut (no risk of rotation). The retrofitted eyelet must sit firmly in the recess of the battery clamp and have the largest possible cross-sectional area (CSA) for the current flow
- The cable cross-section must be oversized
- See: [4.2 Instructions for cable installation and routing](#), table with wiring specifications. Example: 245 A requires a cable with a cross-section of 70 mm<sup>2</sup>
- The retrofitted positive cable is connected directly to the battery clamp, with the last supply for the BMS; see the following figure (battery tray image)
- The Volkswagen BMS must not be deformed. The connection eye may have to be turned over; see position 4 in the following figure (battery tray image)
- In addition to the BMS, only one additional cable (retrofitted cable) may be connected to the 6-mm bolt

- The self-locking 6-mm nut from Volkswagen must be reused and tightened to  $8 \text{ Nm} \pm 1.2 \text{ Nm}$ . Additional lock washers are not permitted
- A mega-wire fuse must be integrated as close as possible to the 6-mm bolt. For short-term load peaks, such as for tippers, cranes and tail lifts, do not exceed 250 A.
- For applications with continuous power consumption such as high-performance inverters, the mega-fuse must not have a higher value than the alternator installed in the vehicle. The saturation voltage of the alternator must be greater than 13.0 V during full load tests. An AGM dual battery system (PR number J1N+8FB) must be installed in this vehicle version. See “Single to dual battery systems” and the table “Recommendations for connectivity and power consumption” in this section of the Converter guidelines
- If higher power consumption is required for longer periods (longer than one hour), an alternator with a higher ampere rating must be installed. See “Single to dual battery systems” and the table “Recommendations for connectivity and power consumption” in this section of the Converter guidelines
- For applications with the engine running, Retrofit High Performance mode must be used.
- See: 4.4 Charging system, start/stop override and configurable charging
- Efficient isolation of third-party devices when they are not required, in order to minimise battery discharge / deep discharge. The load shedding signal control provides this
- End-customer use, including load cycles, must be tested at various temperatures and driving cycles and under the most unfavourable conditions
- The testing of the Converter’s system must confirm that there is no heating up of the Volkswagen or third-party cables or of the connection points used, unless a heat protection device is installed
- The testing of the Converter’s +12-V wire must show that it is not possible to loosen the Volkswagen battery cable clamp
- Third-party systems must not impair Volkswagen systems due to voltage drop or switch-on/start-up currents (functionality or warnings)
- If the third-party systems still function when the engine is switched off, the tests must also be carried out when the vehicle is in this state
- A charge balancing calculation must be performed to verify that the battery and the alternator have the correct values
- If the load at idling speed causes saturation of the alternator (full load and voltage less than 13.0 V), an engine speed control system must be used to increase the output power of the alternator at idling speed

## Battery tray



Element	Description
1	Battery monitoring sensor (BMS) 7TG915181A
2	Plug connection – control unit sub-network (LIN) and battery positive power supply +12 V (B+)
3	Connection to negative battery terminal clamp of main battery – see “Tightening torque – battery cable”
4	1x nut M6. Do not loosen or unscrew.
5	Battery positive terminal cover
6	Battery breather pipe
7	Front of the vehicle

#### 4.5.9 Battery monitoring sensor (BMS)

##### Practical note

The jumper cable must not be permanently removed from the BMS.

##### Information

If the no-load current does not drop below the intended minimum value until after 30 minutes, the system is probably still active due to an intervention by the timer of the battery-saving function. This could be caused by an open door or a switched-on interior light. Auxiliary devices connected to an auxiliary socket consume energy until the battery reaches a low charge level.

The BMS continuously monitors the status of the main battery (or the dual battery). To do this, it is screwed directly onto the negative terminal of the battery. It is recommended that you do not remove it. However, if removal is necessary, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

The BMS recalibrates itself at regular intervals. This occurs during rest periods when the ignition is switched off. This rest period must be at least 4 hours. If the system cannot recalibrate, it is impossible to accurately measure the battery charge level. In this case, the start/stop system may deactivate itself.

Note that when the ignition is switched off, there is a 15-mA load due to systems installed by Volkswagen. Equipment from other manufacturers should ideally be switched on via the ignition or when the engine is running. Regardless of the battery system, discharging over a long period of time requires charging over a long period of time. See the "Recommendations for connectivity and power consumption" table at the end of this section.

After installing the additional system provided by the converter, measure the total no-load current consumption with the ignition switched off either with a current shunt or with an ammeter calibrated to milliamperes (mA) with tap terminals. Carry out this test 10 minutes after switching off the ignition with the doors closed so that the vehicle is in the resting state.

##### Information

The Workshop Manuals are available on the Internet via the Electronic Repair and Workshop Information (erWin\*) operated by Volkswagen AG at:  
<https://volkswagen.erwin-store.com/erwin/showHome.do>

\*Information system from Volkswagen AG, subject to payment

#### 4.5.10 Single and dual battery systems

Check if an upgrade to a single AGM H8 high-performance battery system (PR number JOB+8FA) is sufficient or if a higher current rating is required.

See also: [4.6 Battery protection](#)

#### Conversion from single to dual battery configuration

##### Information

If high-current applications are required, it is recommended to always order dual batteries as a factory option due to the different battery positions

All dual battery configurations must be AGM technology. If the standard battery is a single enhanced flooded battery (EFB), it is not permitted to use a second EFB to obtain a dual battery configuration.

See: [4.4 Charging system](#) and

See: [4.10 Engine management system](#)

#### Conversion from dual to triple battery configuration

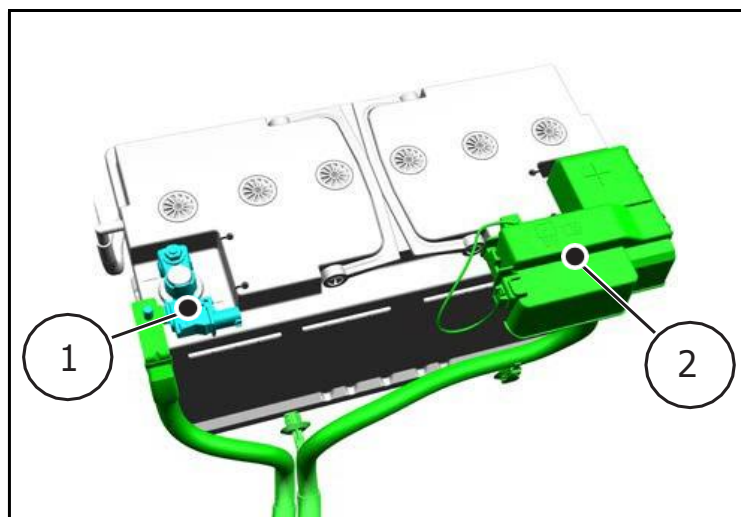
If a triple battery is required, a sender vehicle with H8 dual batteries and intelligent interface with additional power tap incl. fuse (VH2/VH3) must be ordered.

The following parts are required to support the triple battery system:

Mini-fuse box unit for connection to the B+ terminal of the third battery

7TG915181B – Battery monitoring system (BMS)

Volkswagen offers the triple battery system as a factory option. If it is previously necessary, the following layout is recommended:



Element	Description
1	Sensor – battery monitoring
2	Mini-fuse box unit

### Conversion to high-performance batteries

When converting to AGM high-performance batteries, it is necessary to replace the original battery with two AGM batteries of the same type. The battery cables and component part numbers for the individual options are listed later in this section.

When changing the battery capacity or technology, the vehicle configuration must be updated after installing the new batteries. Contact your national sales company or your local Volkswagen Commercial Vehicles Partner with the vehicle identification number of the vehicle. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

If the battery configuration is not set correctly, this can lead to malfunctions in the SRC/SC and the start/stop system.

### 4.5.11 Additional loads and charging systems

#### Information

Do not make any further connections to the power distribution box (PDB), as excessive tightening could damage the PDB. For applications that require a permanent installation for energy generation for jump start requirements (e.g. conversion to an emergency vehicle), please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

#### General components when converting from a single battery system to a system with a single AGM-H8 battery

Part number	Description	Quantity
7TG915418A	Battery heat shield (not required for BEV)	1
7TG915415A	Battery tray	1
--.--	Bracket for battery tray (H8)	1
7TG805531 or 7TG805531A	Battery reinforcement for crash safety	1
WHT012359	Screw and washer MP6	1
WHT011807 or WHT011808	Screw M08x1.25x25.0 HEX FLNG HD	2



## Conversion to AGM high-performance batteries

Part number	Description (PR number)	Quantity
7TG915089G or 7TG915105H	800 A cold start current (80 Ah, 20 hours) AGM battery (J1N/8FA/8FB/8FF)	2
2HJ915100F or 7TG915105J	850 A cold start current (95 Ah, 20 hours) AGM battery (J0B/8FA/8FB/8FF)	2

## Battery cables and components

Battery cables and components																
Part number	PR number															
		T02*	T02*	T23*	L0L*	L0R*	J4E+8FA	J1N+8FB/8FF	*	*	*	3TB	34A	VH0	VH2	VH3
		All diesel engines	All 4-cylinder petrol engines (PHEV)	All electric motors (BEV)	All left-hand drive vehicles	All right-hand drive vehicles	Single battery	Dual battery	Without additional battery pre-wiring	Additional battery pre-wiring 1 for dual battery	Additional battery pre-wiring 2 – for triple battery	Rotating seats for non-driver area	Rotating driver’ s seat	Without ISL – no rotating seat	ISL – no rotating seat	ISL for camper/rotating seat
7TG971228G	X			X			X	X				X		X		
7TG971228AM	X			X		X	X					X				
7TG971228Q	X						X	X					X	X		
7TG971228AS	X					X			X	X			X			X
7TG971228K	X				X		X	X				X		X		
7TG971228AE, 7TG971228L or 7TG971228M		X			X		X	X				X		X		
7TG971228AF, 7TG971228N or 7TG971228P			X		X		X	X				X		X		
7TG971228AN	X				X	X	X					X			X	
7TG971228AG		X			X	X	X					X			X	
7TG971228AH			X		X	X	X					X			X	

\* – See Electronic Repair and Workshop Information System of Volkswagen AG (erWin)

<https://volkswagen.erwin-store.com/erwin/showHome.do> – Information system from Volkswagen AG, subject to payment

## 4.6 Battery protection

### Information

If a retrofitted battery monitor is installed, it must be connected to the load shedding signal so that the EPAS (electronic steering) is protected in the event of an overload when the engine is running.

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

### 4.6.1 Interior lights and 12-V sockets

12-V sockets and interior lighting are both controlled by timers and charge status monitoring. Both are reset when the vehicle wakes up, e.g. when a door is opened. They are switched off earlier if the battery is low.

- 12-V sockets – 30 minutes after the ignition is switched off
- Interior lighting – 10 minutes after the ignition is switched off (there are options with interior lighting extended to 30 minutes)

### 4.6.2 Standard battery monitoring (SBG) and load shedding

#### Warning note

When connecting retrofitted electrical equipment, these fitting instructions must be observed to avoid low system voltage during normal vehicle operation.

#### Warning note

The load shedding system must not be switched off or disrupted.

**Warning note**

For vehicles with a single or dual battery, a battery monitor should always be installed if a power supply is required when the engine is switched off. The programmable battery monitoring from Volkswagen (PBG) is available with the intelligent interface for additional power tap incl. fuse (VH2/VH3).

If a retrofitted battery monitor is installed, it must be connected to the load shedding signal so that the electromechanical power steering (EPAS) is protected in the event of an overload when the engine is running.

**Information**

It is recommended to keep the vehicle battery in a good state of charge to avoid load shedding events.

Load shedding is a system protection function to absorb strong voltage drops when the engine is running. When the engine is switched off, this system helps prevent the battery from being discharged to such an extent that it is not possible to start the engine. In order to protect the system from sudden voltage dips, it will be necessary in rare cases under extreme conditions to disconnect retrofitted electrical equipment with high current consumption. All retrofitted electrical equipment that have a total output of more than 60 A must be connected in one way or another via the load shedding control.

It is expected that the retrofitted system will be tested with loads from the Volkswagen system in the load balancing to ensure that the voltage does not drop below 13.0 V with the engine running. If the vehicle detects that the voltage is too low, a temporary load shedding occurs. If this occurs regularly, it indicates a significant problem that requires attention.

When the engine is switched off, the system uses an SBG to help prevent the battery from discharging too much.

In order to avoid the risk of load shedding when the engine is running during stationary power take-off (PTO), two systems are recommended:

1. **Override function for Retrofit High Performance mode**

This helps maintain the highest possible voltage by forcing the charging system into conventional charging mode

2. **Engine speed control**

This can help to increase the current output of the charging system by increasing the idling speed of the engine. It is expected that the retrofitted system will be tested with loads from the Volkswagen system in load balancing to ensure that the voltage does not drop below 13.0 V with the engine running

#### 4.6.3 Power connections

This section explains where power connections can be made for retrofitted electrical equipment, depending on the power that is taken. Earth connections are not checked. See: [4.25 Earth connection](#)

## Connections without SBG and load shedding

### Information

Suitable for up to 60 A in total

A total limit of 60 A applies to all non-sheddable retrofitted electrical equipment in all locations, including the following:

- Retrofit connection point 1 (CCP1)
- Camper connection (C connector)

See: [4.23 Connectors and connections](#)

All higher current loads of retrofitted electrical equipment must be regulated via the Volkswagen load shedding system.

Optionally, retrofitted electrical equipment with a current consumption of less than 60 A can also be connected to the load shedding controller to take advantage of the resulting protection against battery discharge.

Electrical equipment with continuous power consumption must be connected to the load shedding system.

## Connections with SBG and load shedding

This provides a level of protection for the battery when the vehicle is parked and a level of protection for system voltages when the vehicle is running.

Control by load shedding is required if the total additional electrical load is greater than 60 A. Control by load shedding is also optional for connections with a total of less than 60 A.

Load shedding for retrofitted systems can be implemented in one of these three ways:

1. Direct use of the provided isolation signal for retrofitted components
  - This is a switched earth system
  - The control line can reduce relay coil currents up to a total of 10 A for connected retrofitted control relays
  - The control signal is sent to the following locations:
    - 12-pin standard interface connector in the driver's seat carrier (contact pin 4)
  - The control signal must be used with a retrofitted relay when the retrofit connection point 2 (CCP2), see below, or PBG cannot be used. This control is also recommended when connecting recreational batteries
2. Use of retrofit connection point 2
 

CCP2 is a connection point for the shedding of high current loads that ensures stable current availability during ongoing vehicle operation

  - Loads up to 250 A can use CCP2
  - CCP2 is offered in one of the following options:
    - Dual battery / high-performance battery
    - Intelligent interface for additional power tap incl. fuse
    - Camper sender vehicles
3. Using the intelligent interface for additional power tap incl. fuse
 

Loads up to 200 A can use the intelligent interface for additional power tap incl. fuse (ISL).

See: [4.6 Battery protection](#)

#### 4.6.4 How SBG and load shedding work

##### Warning note

Changes to the configurations may void the vehicle warranty.

##### Warning note

Make sure that the Retrofit High Performance mode does not accidentally remain active when the battery is being charged by the vehicle.

Using the Retrofit High Performance mode to override a connection time limit allows more energy to be drawn from the vehicle battery. Excessive energy currents that pass through the battery can void the battery warranty.

##### Warning note

Avoid unintended consequences when automating the Retrofit High Performance mode. The Retrofit High Performance mode can prevent AEIS when it is activated with the engine running. Using the Retrofit High Performance mode can interrupt this safety function and keep the engine running. Engines running in enclosed spaces cause the air to accumulate CO, which can lead to CO poisoning and death. CO can escape into adjacent enclosed spaces. The AEIS lock can be deactivated at a Volkswagen Commercial Vehicles Partner.

### Standard battery monitoring — vehicle off

The standard battery monitor (SBG) works when the vehicle is switched off. The SBG is used to protect the vehicle battery from being discharged.

It disconnects the controlled circuits of the retrofitted components when the battery is low or after a certain period of time. The switch-off time is 30 minutes for vehicles with a single battery and 75 minutes for vehicles with two AGM batteries. Dual AGM batteries have a lower charge level threshold and can provide longer battery life.

See: [4.6 Battery protection](#)

Normally, the SBG is configured to reconnect when the vehicle is unlocked. The circuits are then closed before the vehicle is started.

For campers, reconnection does not occur when the vehicle is unlocked. Instead, the reconnection is postponed until approx. three seconds after the ignition is switched on so that the vehicle can be started first. This is intended for vehicles with AGM batteries. In this configuration, the load shedding circuits for retrofitted electrical equipment are disconnected as soon as both the key is removed and the driver's door is opened. Vehicles other than campers can be configured for the same behaviour by a Volkswagen Commercial Vehicles Partner.

The Retrofit High Performance mode locks the timer so that the SBG only monitors for low charge level. The user must ensure that the Retrofit High Performance mode is not used during normal driving, unless this is required for retrofitted devices.

See: [4.4 Charging system](#)

The SBG does not issue a warning if an external battery charger is connected to the vehicle. It does not automatically connect all batteries when an external battery charger is being used. These functions are described in more detail in connection with the PBG.

Consider using the PBG if additional functionality is required, or at up to 200 A.

### Load shedding – vehicle ON

In rare situations with very high electrical requirements, the system must be able to react in such a way that the voltage does not become too low. Material loads, including some third-party loads, will never be shed. Loads above 60 A must be connected to the load shedding function.

Load shedding capability is required when the vehicle is switched on to prevent the voltage from becoming too low while driving.

### Short-term disconnection – influencing factors

- Extreme environmental conditions
- High electrical system load at the limit or already above the power supply capacity – including by retrofitted electrical equipment
- Transient loads that are high for short periods of time, such as inrush currents

If the system voltage drops very significantly, it is possible for retrofitted electrical equipment controlled by the function to be disconnected. This is done for at least 4 seconds.

After a load shedding, retrofitted components can be reset and reinitialised.

Battery configuration

See: [4.5 Battery systems](#)

### Driver notification

Driver notifications in the instrument cluster inform the driver that the third-party connections have been reset and that this may be an indication of an overload condition.

A message is displayed briefly on the instrument cluster (IPC). The message is basically “Electrical energy-saving function active, functions switched off”.

If the warning occurs frequently, it is recommended to check the power requirements; additional power generating equipment may be required.

No message is output when the power supply is restored. If CCP2 or PBG is installed, a click may be audible in the front seat area.

### Longer-term disconnection

If the 12-V charge level is very low after a load is shed, the load shedding remains active until the 12-V charge level has recovered significantly. This will take longer if the batteries are cold or old. This status prevents the park assist from being activated.

## 4.7 Interior air conditioning

### Warning note

The information provided in this section is for reference purposes for the converter. Any unauthorised modifications to the interior air conditioning system will cause the system to malfunction.

### Warning note

Do not use a coolant based on propylene glycol.

### Information

In the interior air conditioning system of the Transporter panel van, identical parts are used by other vehicles that may have higher-quality equipment versions or systems. As a result, in addition to contact pins that are not generally used, there are other contact pins that are not available and can block functions or even cause damage when used for external purposes.

- Never attach hoses or pipes to the gearbox dipstick or any other component of the fuel and brake system.
- Do not route heating or refrigerant lines near or directly over components of the exhaust system, including exhaust manifolds.
- Avoid routing hoses in the wheel housing or in the area of the wheels where there is a risk of stone chips. If cables need to be routed in these areas, protect them accordingly from stone chips
- Do not route cables along sharp edges. Use protective covers to protect against cuts and chafing.



#### 4.7.1 Front interior air conditioning system

##### Pin assignment for interior air conditioning system J1

###### Connection – C1

Contact pin	Description
Contact pin 1	Earth
Contact pin 2	Reference voltage return line
Contact pin 3	Reference voltage
Contact pin 8	Temperature (left) flap – feed A
Contact pin 9	Temperature (left) flap – feed B
Contact pin 10	Temperature (left) flap position feedback
Contact pin 11	Relay output – front blower
Contact pin 19	Air recirculation flap position feedback
Contact pin 20	MS1 – CAN bus High
Contact pin 21	MS1 – CAN bus Low
Contact pin 23	Air flap 1 – feed A
Contact pin 24	Air flap 1 – feed B
Contact pin 25	Air flap 1 position feedback
Contact pin 26	Output for PWM command – front blower
Contact pin 27	Air recirculation flap feed A
Contact pin 28	Air recirculation flap feed B
Contact pin 29	Defroster flap (dedicated – driver-oriented mode only) – feed B
Contact pin 30	Defroster flap (dedicated – driver-oriented mode only) – feed A
Contact pin 31	Defroster flap (dedicated – driver-oriented mode only) – position feedback
Contact pin 32	Battery voltage

Pins not listed in the above table must not be used.

###### Connection – C2

Contact pin	Description
Contact pin 1	Supply of right seat heater element with battery voltage
Contact pin 2	Supply of left seat heater element with battery voltage
Contact pin 13	Temperature (right) door – feed A
Contact pin 14	Temperature (right) door – feed B
Contact pin 15	NTC sensor – seat heating, right
Contact pin 16	Output – seat heater element, left
Contact pin 17	Output – seat heater element, right
Contact pin 18	Temperature (right – double zone only) flap position feedback
Contact pin 23	Air flap 2 (driver-oriented mode only) – feed B
Contact pin 24	Air flap 2 (driver-oriented mode only) – feed A
Contact pin 25	Air flap 2 (driver-oriented mode only) – position feedback
Contact pin 28	Retrofit customer access 1
Contact pin 30	NTC sensor – seat heating, left

Pins not listed in the above table must not be used.

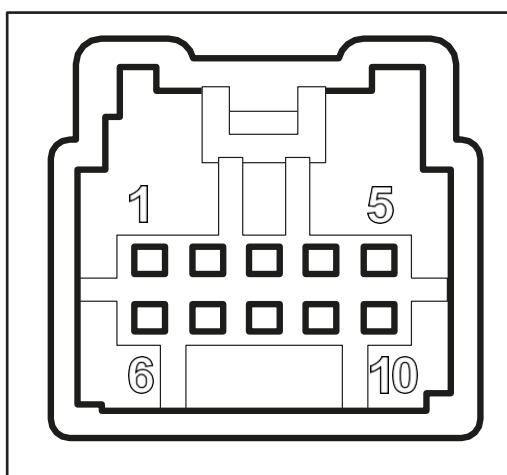
**Connection – C3**

Contact pin	Description
Contact pin 6	Rear temperature flap – position feedback
Contact pin 8	Rear mode (air distribution) door – position feedback
Contact pin 9	Rear blower motor output/return
Contact pin 11	Rear temperature flap – feed B
Contact pin 12	Rear temperature flap – feed A
Contact pin 15	Rear mode (air distribution) flap – feed B
Contact pin 16	Rear mode (air distribution) flap – feed A
Contact pin 18	Rear blower motor PWM input

Pins not listed in the above table must not be used.

**4.7.2 Rear interior air conditioning system****Pin assignment for interior air conditioning J2**

**Connector C1 (physically positioned in the rear of the vehicle)**



Contact pin	Description
Contact pin 1	MS1 – CANH
Contact pin 2	MS1 – CANL
Contact pin 5	GND
Contact pin 6	VBATT

Pins not listed in the above table must not be used.

## 4.8 Instrument cluster (IPC)

### Warning note

Do not modify or cut the wiring or connections of the CAN data bus interface or use them for other connections.

Most functions are controlled via the CAN bus interface.

### Instrument cluster

Connector pin (C1)	Description	Cable colour	
2	Return line – fuel level sensor	Green/blue	-
3	Earth	Black/violet	-
4	Switch – gearbox park position detection	Green	-
8	12-V power supply	Grey/red	-
10	Fuel level sensor	Yellow/violet	-
11	Switch – low wash fluid level	Grey	-
12	High-speed CAN bus – High	Green/blue	Two twisted wires
13	High-speed CAN bus – Low	White/green	

Pins not listed in the above table must not be used.

## 4.9 Horn

Any other retrofitted horn (e.g. a pneumatic horn) must be controlled by a separate relay supplied by the horn circuit.

## 4.10 Engine management system

### Practical note

Do not make any further connections to the circuits associated with the engine monitoring system.

### Information

It is not necessary to disconnect or remove engine control units from the current circuit.

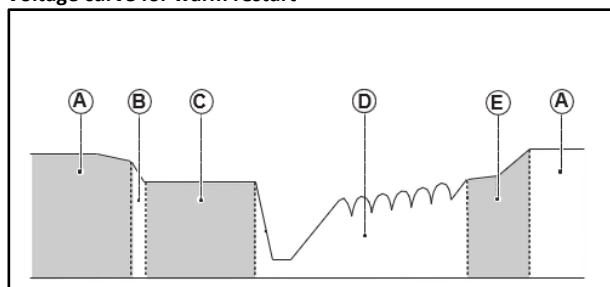
### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

### 4.10.1 Starting and starting with a warm engine

When starting with a warm engine, the battery voltage drops to 7 V for 100 ms, followed by a period of voltage ripple to provide an output power to raise the voltage back to 12.3 V. This can take up to 5 seconds. All third-party modules must have sufficient stability for the voltage curve when restarting again with a warm engine.

Voltage curve for warm restart



Element	Description
A	Engine on
B	Fuel shut-off
C	Engine off (automatically switched off)
D	Starting the engine
E	Engine on

#### 4.10.2 Start/stop system

##### Warning note

If required by the system, the start/stop function can be deactivated, which results in an automatic restart of the engine. Under normal conditions, the engine only restarts automatically if the clutch or accelerator pedal is depressed.

##### Warning note

It is therefore essential to switch off the ignition before opening the bonnet or carrying out servicing work.

Always switch off the ignition before leaving the vehicle, otherwise the system may have stopped the engine but still be in the ignition mode.

##### Warning note

The system may not work if additional electrical equipment remains connected while the ignition is switched off.

Do not change the covers of engine areas with moving parts, e.g. around the V-belt etc.

#### General information

The start/stop system reduces fuel consumption and CO<sub>2</sub> emissions by shutting down the engine during idle periods in which no drive power is required, and then automatically restarting it to start off.

#### Start/stop logic

Automatic engine stops and starts are controlled by the start/stop logic in the engine control unit (ECM). It is linked to a series of vehicle and powertrain signal circuits, sensors and switches to automatically stop and restart the engine according to the applied start/stop strategy.

The idle stop is a start/stop strategy for vehicles with a manual gearbox that stops the engine (if the stop is not prevented by function locks) when the vehicle is stationary, the gearbox is in neutral AND the clutch pedal is fully released. The engine is restarted when the clutch pedal is depressed with the gearbox in neutral.

Stopping in the drive position is a start/stop strategy for vehicles with an automatic gearbox that stops the engine (if the stop is not prevented by function locks) when the vehicle is stationary, the gearbox is in drive, the brake is applied AND the accelerator pedal is released. When the brake is released or the accelerator pedal is depressed, the engine is restarted. The engine is also stopped in the park position (without the brake being applied).

## Locks

Sometimes the engine does not switch off or requests an automatic restart because one or more system locks are activated. The engine only switches off after all function locks have been removed, which may only occur at a certain time after the conditions relating to the gearbox/pedals have been met.

Typical examples of system locks are:

- Ambient temperature is below the lower limit or above the upper limit for the start/stop function
- Coolant temperature is below threshold value (value depends on ambient temperature)
- Windscreen heating is switched on
- Battery charge for start/stop insufficient, power consumption too high, battery too cold or battery is defective
- Driver's door has been opened and the vehicle has not yet reached 5 km/h
- By engine management system (e.g. during DPF regeneration)
- The ABS warning lamp lights up or the vehicle is stationary on a steep incline
- High electrical load with a total current consumption of more than 70 A by the vehicle
- Engine speed control system is active
- Unknown battery installed or BMS defective or removed
- Start/stop button pressed (LED lights up)
- Accelerator or clutch pedal not released
- Constant loads will discharge more than 25% of the charge level within 40 days with the ignition switched off. BMS cannot correctly detect the charge level
- Vehicle is in factory or transport mode
- Retrofit High Performance mode has been activated

## Engine stop override / restart after terminating engine start

The engine stop override is another feature of the start/stop system in vehicles with a manual gearbox, which also responds when the start/stop system is switched off or locked. When the engine stops is overridden, an engine restart is triggered if the clutch pedal is fully depressed immediately after the automatic stop is triggered. This allows the driver to end the engine stop without having to activate the ignition key or press the start button. This motor stop override takes effect 5 seconds after the motor has stopped.

## Switching off the start/stop system – start/stop button with LED lit

The driver can switch off the automatic start/stop function using the start/stop button on the dash panel. An orange LED in the button lights up to indicate that the function is deactivated. Pressing the button again (LED does not light up) activates the automatic start/stop function. The automatic start/stop function is reactivated by switching the ignition off and on again. This also locks the SRC function when the vehicle is not moving.

See: [4.4 Charging system](#)

## Using the start/stop button

Only for vehicles with alternators, the start/stop deactivation button also deactivates the SRC when it is pressed (when the LED indicator lamp is on). When the SRC function is deactivated and the vehicle is stationary, the engine is not switched off and the battery is charged by the alternator using conventional charging. The function only takes effect after a delay of a few seconds.

## Automated idling switch-off (AEIS)

### Warning note

AEIS is a safety function that switches off the engine after a specified time has elapsed. Engines running in enclosed spaces can accumulate carbon monoxide (CO). Carbon monoxide is toxic and can cause death. Using the Retrofit High Performance mode under these conditions can block the AEIS and thus deactivate this safety function. In enclosed spaces, avoid deactivating AEIS as a result of the Retrofit High Performance mode.

The AEIS can be deactivated as a result of the Retrofit High Performance mode, which causes the engine to operate continuously at idling speed. The Retrofit High Performance mode behaves differently with the engine running or stopped. Using the Retrofit High Performance mode while the engine is running can affect pollutant emissions, and it may be necessary to perform a new type inspection on the vehicle.

See: [4.4 Charging system](#)

### 4.10.3 Engine speed controller (PR number US2) system overview

#### Information

For engine speed control with an automatic gearbox, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)), while under certain conditions this function may be restricted.

This function can be used to increase the speed of the engine. The power of the engine can then be used to drive additional devices. Additional equipment can be driven by a drive belt system (FEAD) at the front of the engine (similar to the air conditioner compressor).

Converter should also take into account increased engine cooling requirements, which may arise from the vehicle conversion or from prolonged operation of the engine under a load while the vehicle is stationary.

See section [3.3.1 Auxiliary drive units](#)

### 3 Operating modes

This function has the following three basic operating modes:

1. Three-speed mode: the driver can select one of three preset speed values: 1,100, 1,600 and 2,030 rpm. As these values cannot be overridden easily, the risk of damage to the additional devices caused by them being used at unintended speeds is minimal. In this operating mode, the vehicle speed is significantly limited (up to approx. 2.5 mph). This is the default mode when the option is ordered from the factory.



2. Variable speed mode: in this mode, the speed can be increased or decreased using control buttons. The speed can be varied between 1,300 and 3,000 rpm in increments of 25 rpm.  
Pressing once increases the speed by 25 rpm. If the speed change button is held down, the change is 250 rpm per second. In this operating mode, the vehicle speed is significantly limited (up to approx. 2.5 mph). The variable mode can be activated by calling up "Learning mode". Alternatively, a dealership can select the mode via the Volkswagen Offboard Diagnostic Information System (ODIS).
3. Idling speed increase: note that this mode is not permitted for automatic gearboxes, as increasing the idling speed can affect the creep torque. In this operating mode, the normal idling speed of the engine (in 25 rpm increments) can be increased to any value in the range between 900 and 1,200 rpm. In this operating mode, the vehicle speed is not limited because in this operating mode, the idling speed of the engine is increased in order to reduce the probability of the engine stalling during normal vehicle operation through the use of an additional device. For example, cooling units that cool the load compartment. The idling speed increase can only be switched on by a dealership using the ODIS tool.

### System availability

This function is integrated in the latest powertrain control module (PCM) software on all models with diesel engines.

If the function is not ordered specifically from the factory, it is not activated by default.

For vehicles ordered without this function, it can be activated by a dealership via the Volkswagen Offboard Diagnostic Information System (ODIS). A fee is charged by the dealership for this service.

Vehicles with a start/stop system can be converted to speed control. However, before activating this speed control, the customer should switch off the start/stop system. For more information, see "Effects of the start/stop system" in this section.

Fitting location of the cable loop

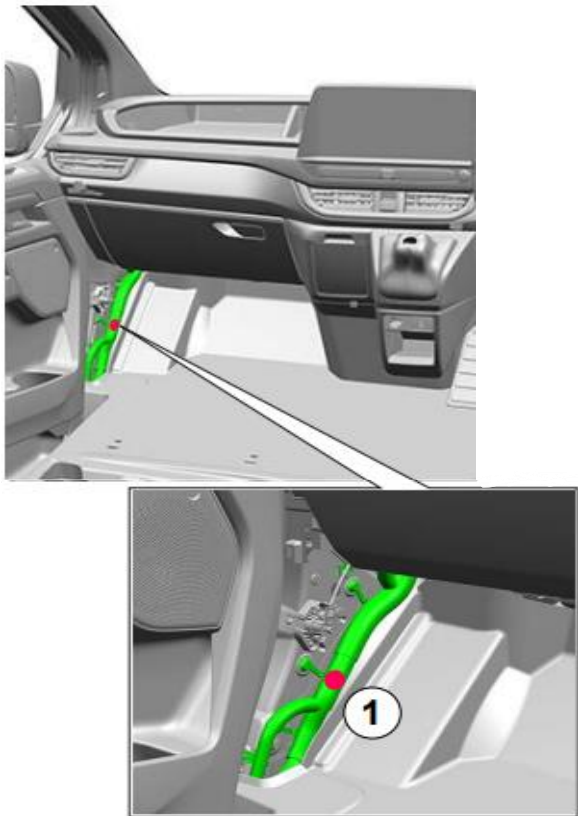


Fig.: Vehicle shown as right-hand drive, same position of cable loop for left-hand drive vehicles

1	Engine speed cable loop
---	-------------------------

Control of the function

Information

Volkswagen does not supply the control unit.

The speed control software is controlled via a cable loop (green and white) in the main wiring harness. If this cable loop is cut, two cables are available for connecting a control unit to the PCM. The cable loop is always located on the left side of the vehicle.

Integrating the control unit into the circuit requires resistors between the cut green and white cables. This type of circuit is known as a resistance network – see figure below (resistance network circuit).

The PCM software monitors the circuit with the green and white cables; if certain resistors are detected, they are interpreted as different inputs for controlling the function. The control unit does not necessarily have to be installed in the dash panel, but can be installed in a location that is most suitable for the respective conversion. If the control unit is to be installed in a location where adverse conditions prevail, the Converter must take appropriate measures to ensure that the control unit is able to withstand these conditions.

In left-hand drive vehicles, the cable loop is secured with tape to the wiring harness that supplies the fuse/relay box, which is located behind the dash panel lower trim to the left of the steering wheel, and is accessed via the bottle holder. For removing the trim, see the workshop manual.

In right-hand drive vehicles, the cable loop is secured with tape to the wiring harness that supplies the dash panel 64-pin main connector, which is located behind the dash panel lower trim and is accessed via the glove compartment; see figure above (fitting locations of cable loop). For removing the trim, see the workshop manual.

### Resistance network

The resistance network circuit acts as a voltage divider. The PCM has an internal reference voltage of 5 V. Before the current flows through the resistance network, it flows through an internal 320-ohm resistor (not shown above).

Between the 320-ohm resistor and the earth there is also a (second) 220-nF capacitor (not shown above) in the PCM to reduce the EMC effects.

To ensure stable operation, switches with a debouncing specification of ideally 0 ms should be selected.

Starting from the right side of the diagram, only 2,110 ohms are in the circuit when the key-operated switch is closed and the PCM software detects this as operational speed mode (key-operated switch closed=off, open=on). A key-operated switch is recommended in this position if:

- The control unit is located on the outside of the vehicle; as a key is required, the “speed control” operating mode cannot be activated by anyone simply pressing a button.
- A key-operated switch that allows the key to be removed in the on or off state could also be used to protect against theft. If the “idling speed control” operating mode is activated by a key and the key is then removed, this operating mode cannot be deactivated again quickly and easily. If a foot pedal is operated in the “three speeds” or “variable speed” operating mode, the engine switches off, which means that the vehicle cannot easily be stolen. For the latest software update, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

If one of the three middle switches is operated in the “three speeds” mode (when the function is activated), the engine speed is increased to the corresponding value stored for the three switch positions (standard 1,100, 1,600 or 2,030 rpm). If the switch is operated again, the idling speed is reduced to the normal value.

In the “variable speed” operating mode, the same three switches are used to increase or decrease the speed or to set the normal idling speed.

Because the software in the PCM responds to the status change, it is recommended to use these three middle switches as microswitches. If the idling speed is increased, the corresponding command is executed when the button is released. If the idling speed is reduced to the normal value, the command is executed when the button is pressed.

The last button (left in figure below (resistance network circuit)) acts as a cut-off switch for the engine. It is recommended to use this as a red oversized microswitch. This command is executed when the button is pressed.

To reduce the EMC effects, all cables between the PCM and the resistance network control unit must be shielded and twisted (33 twists per metre).

The tolerance of all resistors must be  $\pm 5\%$  or better.

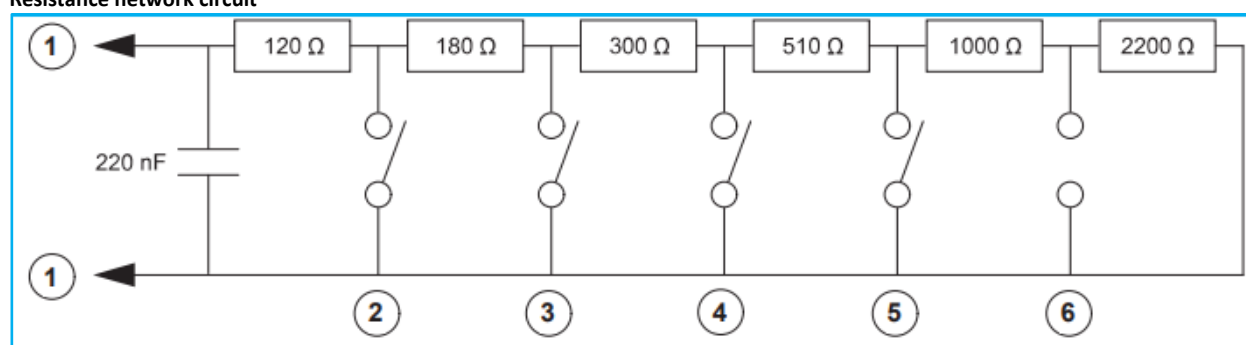
The switching contact, connector and wiring harness (between the green and white wires and the switching device) must have a total resistance of max. 5 ohms.

The wiring harness from the PCM to the resistance network control unit must be at least 100 mm from other wiring harnesses, in particular wiring harnesses with high loads.

Even if not all switches are required, the resistance network must be completely set up with all switches in the correct position.

The 2 green and white cables must be connected to the control unit via a high-quality two-pole connector.

#### Resistance network circuit



Element	Description
1	To the green and white cable
2	Switch off the engine
3	Speed 1 on/off or variable control "idling speed"
4	Speed 2 on/off or variable control "negative (-)"
5	Speed 3 on/off or variable control "positive (+)"
6	Idling speed control ready or idling speed increase on/off

#### Changing the default settings

##### Information

The step value of 25 rpm per actuation or 250 rpm per second with continuous button actuation cannot be changed using any of the methods below.

If the function is activated (either via the corresponding factory configuration or using the ODIS diagnostic device of a contract partner), 3-speed mode with the three preset speed values 1,100, 1,600 and 2,030 rpm is set as standard.

There are two ways to change this preset:

1. Using the ODIS diagnostic system at a Volkswagen Commercial Vehicles Partner (may be invoiced).

ODIS can be used to switch freely between the three operating modes, and it is also possible to switch off (deactivate) the function. The 3 preset idling speeds can be modified within the range allowed for the operating mode, as described in this section. ODIS access can be purchased.

2. Via an integrated “learning mode”

The “learning mode” of the vehicle can be used to switch between standard operation with 3 speeds and operation with variable speeds; however, this method cannot be used to switch back.

#### Activating the “learning mode”

1. Make sure that the control unit for idling speed control is connected but switched off
2. Start the engine (gearbox in neutral, no pedals depressed, parking brake on)
3. Wait a few seconds for the diagnostic lamps on the dash panel to go out
4. Depress and release clutch pedal
5. Depress and release brake pedal
6. Repeat steps 4 and 5 four times (depress the clutch and brake pedals five times each in succession)

#### Information

Steps 4 to 6 must be started within 10 seconds of starting the engine.

The vehicle should now be in “learning mode”.

After successfully starting “learning mode”, the engine speed increases briefly to 1,000 rpm and then drops back to the normal idling speed. This can be tracked by observing the tachometer during step 6 (above).

#### Switching between the operating modes

#### Information

If the engine stalls when the brake pedal is depressed for the first time, the vehicle is not in learning mode or this has been deactivated. In this case, the process must be restarted.

1. Activate learning mode (see instructions above)
2. Activate the idling speed control unit (set key-operated switch to “On”)

If the vehicle is already in 3-speed mode (default setting):

3. Depress and release the brake pedal five times

The vehicle should now be in variable speed mode. The new settings can be saved and the learning mode can be ended (see below)

OR

4. Depress the brake pedal once and release it again

The vehicle is now in 3-speed mode. The new settings can be saved and the learning mode can be ended (see below).

This procedure makes it easy to switch between the two operating modes of the idling speed control unit.

#### Changing the three preset speeds in 3-speed mode

##### Information

If the engine speed reacts to the first pressing of the speed switch, the vehicle is not correctly in “learning mode”. In this case, the process must be restarted. If the engine stalls when the brake or accelerator pedal is depressed, the vehicle is not in learning mode or has been deactivated. In this case, the process must be restarted.

1. Activate “learning mode” (see instructions above)
2. Activate the idling speed control unit (set key-operated switch to “On”)
3. Depress the brake pedal once and release it again
4. Press and release the speed switch to be reprogrammed
5. Increase the engine speed with the accelerator pedal to the desired value and keep this value (in 3-speed mode, only speeds between 1,200 and 3,000 rpm can be selected)
6. Press and release the same speed switch again to reset the stored speed to the current speed
7. Release the accelerator pedal
8. Repeat steps 4 to 7 for the remaining speed switches

The three new speeds are now programmed. The new settings can be saved and the “learning mode” can be ended (see below).

## Save the new settings and end “learning mode”

### Information

If the engine stops, the settings have been saved and “learning mode” has ended. In learning mode, the steps must be carried out in the correct sequence and within a certain time exactly as specified, otherwise the programming will fail. In this case, several attempts may be required to change the default settings in the required order and with due regard to the time limit.

1. In active “learning mode” and with activated speed control shifting, fully depress and release the clutch pedal at least 5 times in rapid succession. It is normal for the engine to stop the last time the pedal is depressed, but if the engine does not stop after at least 5 depressions of the clutch pedal, switch off the ignition after this sequence.
2. Restart the engine and test the new settings. If necessary, repeat the above steps.

### Troubleshooting – reasons why speed control is aborted or may fail

The software for the idling speed control monitors the vehicle data when the speed control mode is activated and deactivates the idling speed control and/or stops the engine when signals are detected that prevent proper operation. Examples:

- If the engine temperature increases too much, the idling speed control is deactivated to protect the engine.
- If the oil warning lamp comes on, the idling speed control is deactivated to protect the engine.
- If the fuel tank level warning lamp lights up, the idling speed control is deactivated so that the vehicle can be driven to a filling station.
- If an exhaust emissions warning lamp lights up, e.g. ABS/traction control system, speed control may not be possible.
- When the vehicle speed exceeds 2.5 mph in the “three speeds” or “variable speed” mode, the engine speed control is deactivated. As a rule, the parking brake must be applied when the idling speed control is active. In some cases, however, it may be necessary to move the vehicle at “creep speed”.
- The software checks whether switches are stuck on the control unit when it is switched on. This can cause the idling speed control to be deactivated. If the switch is held down too long, it can be interpreted by the software as a stuck switch.
- The software monitors the foot pedals. If they are depressed, the engine can switch off in the “three speeds” and “variable speed” operating modes (but not in the “idling speed increase” operating mode).
- Speed control is not possible if the resistance of the switching circuit increases significantly above 2,110 ohms or if a short circuit occurs.
- If an attempt is made to convert the power take-off system (PTO) on a vehicle without an anti-lock brake system (ABS), the idling speed control fails. The reason for this is that the vehicle speed is detected by a gearbox speed sensor and/or the clutch must be depressed in order to engage a gear when the idling speed control is activated.
- The engine should be running before the control box of the engine speed controller changes from OFF to ON. The control box of the engine speed controller must be switched off before the ignition is switched from OFF to ON or from ON to OFF. If the “control box of the engine speed controller” remains on before the ignition switch is switched from OFF to ON, the engine may not be able to restart (revs and then stalls) or the speed button requests from the “engine speed control” will be ignored for the 3-speed mode / mode with variable speed.

#### 4.10.4 Diesel particulate filter (DPF) and idling speed control

##### Warning note

Do not park or idle the vehicle over dry leaves, dry grass or other combustible material. The DPF regeneration process generates very high exhaust gas temperatures. During and after the DPF regeneration and after the engine is switched off, the exhaust emits a great deal of heat. Therefore, there is a potential fire hazard.

The diesel particulate filter (DPF) filters soot from the exhaust gases and thus improves the emission values. The condition of the DPF is monitored by the vehicle's electronic systems. Under normal driving conditions, a regeneration function for cleaning the filter is triggered automatically. When the DPF is full, a red engine warning lamp lights up on the instrument cluster and the DPF must be specially cleaned by a Volkswagen Commercial Vehicles Partner.

In vehicles with DPF that are operated with the engine under load when the speed control is active and the idling speed is increased, soot accumulation may occur over time. When the vehicle is stationary, the DPF cannot start a regeneration process. It is therefore recommended that converters instruct the drivers to interrupt long periods of time with active idling speed control with phases of normal operation so that the DPF can regenerate. In engine speed control mode, rapid engine speed changes should be avoided where possible, as temporary engine speed spikes lead to increased soot formation. If the idling speed control is to be used for longer periods, it is strongly recommended to also define the option for manual soot particle filter regeneration (OCR) in conjunction with the idling speed control (request availability of the option from the local Volkswagen Commercial Vehicles Partner). OCR allows the driver/operator to manually perform a DPF regeneration when the vehicle is stationary after confirming that this is safe.

For more information about DPF, see: [3.7 Exhaust system](#)



## 4.11 Tachograph

### Information

For further information on installing a tachograph, speed sensor or a unit for dedicated short range communication (DSRC), please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

It is recommended that every vehicle that requires a tachograph system be sent to an authorised Continental "Tachograph Service Center" (formerly known as Siemens VDO) for software installation and calibration.

Volkswagen AG is not responsible for the calibration of tachographs.

Details of all recommended service locations can be found on the websites of Continental/VDO. There you will also find details of the applicable regulations and the operation of tachographs.

### 4.11.1 Legal regulations

#### Warning note

According to current legislation, all tachographs require the same cable connections.

### Information

Digital tachograph (DTCO) and DSRC (Dedicated Short Range Communication) aerials are legally required by EU Regulation 165/2014 from June 2019.

#### Pin assignment

For detailed information on the pin assignment, please contact your national sales company. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

#### Cabling

The cabling for the tachograph consists of three parts:

- Wiring harness – driving speed sensor, see Figure 1 in [chapter 4.11.2](#) for cable guide
- Wiring harness – tachograph, see Figure 2 in [chapter 4.11.2](#) for securing and cable guide
- DSRC wiring harness, see Figure 2 in [chapter 4.11.2](#) for securing and cable guide

#### 4.11.2 Subsequent installation of tachograph and DSRC

##### Information

For instructions on subsequent installation, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

##### Information

If a tachograph is required, it is recommended to order this already for the original vehicle.

#### Cable guide – speed sensor of the tachograph

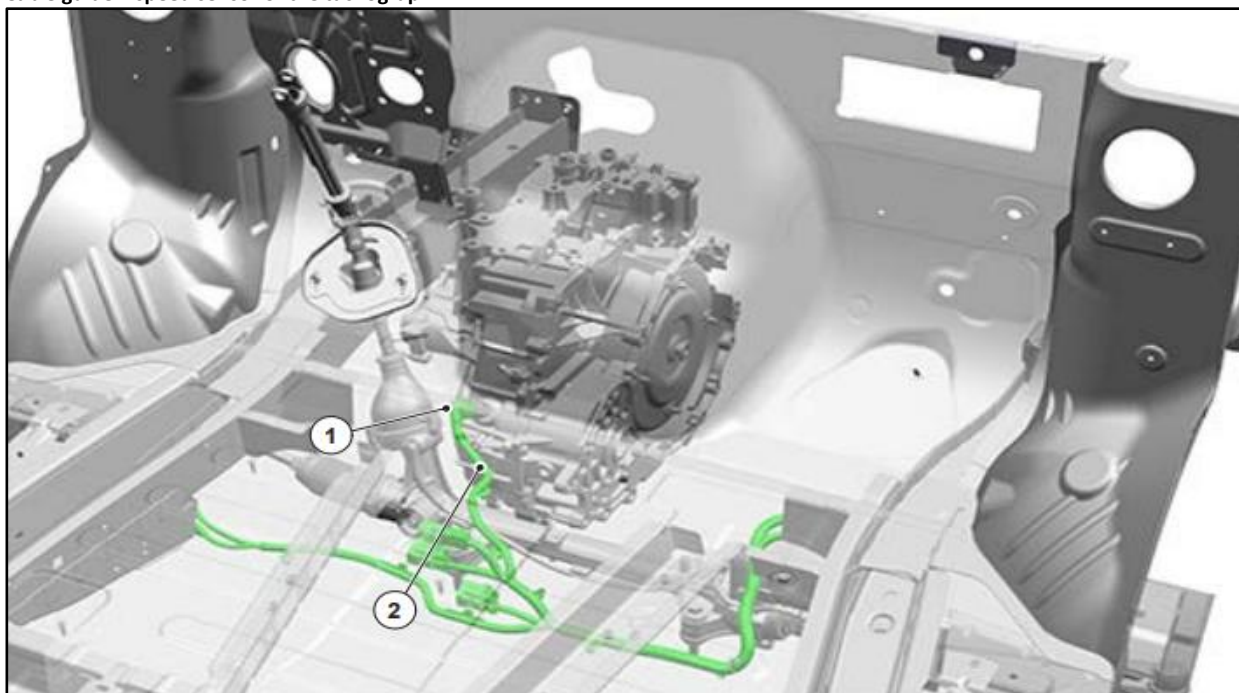


Fig. 1: Cable guide – speed sensor of the tachograph

Element	Description
1	Main wiring harness
2	Speed sensor wiring harness for tachograph
3	Clips
4	Speed sensor in the gearbox

## Wiring harness – tachograph and DSRC

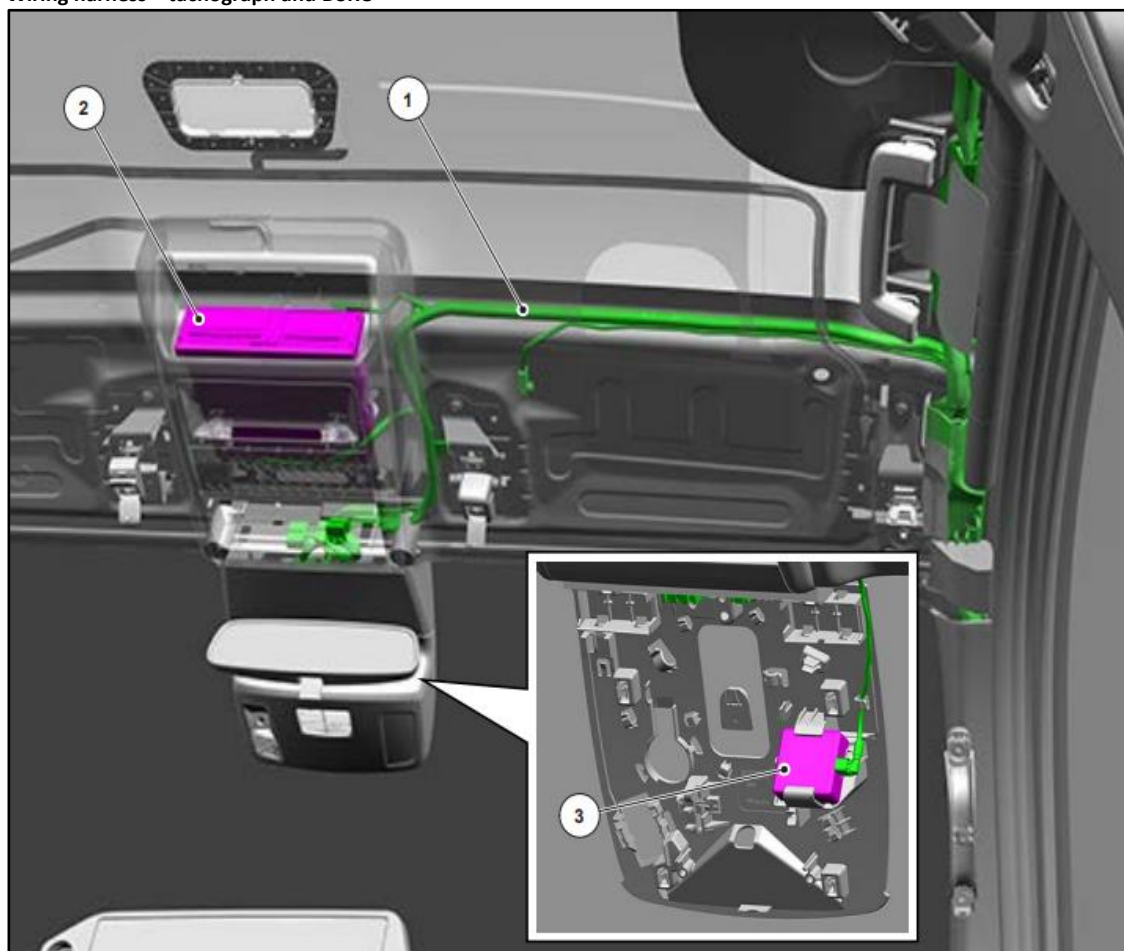


Fig. 2: Wiring harness – tachograph and DSRC

Element	Description
1	Wiring harness – tachograph
2	Tachograph, digital main unit
3	DSRC

**Information**

The ordered original vehicle must be equipped with a roof console and the correct trim version (headliner) to support the installation of a tachograph and DSRC.

**Information**

If for some reason the DSRC support must be moved or secured to the windscreen, please observe the installation instructions in the workshop manual.

If the system was not ordered with the original vehicle, the DSRC wiring harness must be installed. Please observe the fitting instructions in the workshop manual. It is recommended that the Volkswagen Commercial Vehicles Partner installs both the DSRC unit and the wiring harness.

Volkswagen installs the tachograph, speed sensor and DSRC in the original vehicle as recommended. The system still needs to be calibrated by a Continental/VDO workshop. Your local Volkswagen Commercial Vehicles Partner will organise the calibration of the tachograph.

#### 4.11.3 Calibration and subsequent installation of the tachograph

EU legislation requires the DTCO (digital tachograph) to be calibrated and certified before the vehicle is allowed to drive. The activation must be carried out by a Continental/VDO Volkswagen Commercial Vehicles Partner. The Volkswagen Commercial Vehicles Partner organises the calibration of the tachograph.

##### Information

The tachograph and the instrument cluster receive their vehicle speed signal from independent sources, with the result that different route values can be reported from both.

#### Parts required for retrofitting the digital tachograph and the speed sensor

Parts required for retrofitting the digital tachograph and the speed sensor	
Part number	Description
Installation parts	
--.-- *	Support – roof console
--.-- *	Support – tachograph console
7TG903145	Bracket – radio receiver
Attachment	
--.-- *	Rivet (4 required)
WHT012564	Clip
WHT010411	Bolt
Tachograph	
7TG957039A	Digital main device 4.1 EU countries
7TG957039	Digital main device 3.0a AETR countries
Engine speed sensor	
7TG903419A 7TG903419C	Speed sensor
7TG903419 7TG903419B	Speed sensor (length difference)
Wiring harness	
--.-- *	Wiring harness – tachograph
--.-- *	Wiring harness – engine speed sensor

\* Please contact your Volkswagen Commercial Vehicles Partner

**Parts required for retrofitting a DSRC**

Part number	Description
<b>Installation parts</b>	
--,-- *	DSRC cover
--,-- *	DSRC plate
<b>DSRC unit</b>	
7TG035540A 7TG035540B	Aerial – DSRC
<b>Wiring harness</b>	
--,-- *	DSRC wiring harness

\* Please contact your Volkswagen Commercial Vehicles Partner

## 4.12 Information and entertainment system

### 4.12.1 Package overview for audio main units (AHU) – multimedia entertainment system (ICE)

The installed standard multimedia system depends on the market region, body variant and vehicle model.

#### Information

Depending on the planned retrofit option, it is important to order parts of the correct version, including a new dash panel wiring harness, dash panel and cover.

#### Information

For further details on the information and entertainment system, and on parts and signals, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

#### AHU/multimedia ICE packages

ICE package	Description
2	Radio with SYNC Gen4
3	Navigation (NAV) SYNC Gen4 with DAB

### 4.12.2 SYNC radio and SYNC radio with DAB

#### Information

The FM/DAB dual aerials mounted in the exterior mirrors are connected to the radio via black coaxial cables. There are two coaxial cables for the diversity aerial.

The SYNC radio is connected to the dash panel wiring via two 32-pin connectors.

**SYNC radio main connector J1**

Pin	Description	Type	Pin	Description	Type
1	Battery	Input	17	External CD input L -	Input
2	Front right loudspeaker -	Output	18	Not connected	-
3	Front right loudspeaker +	Output	19	CAN – High	Input/output
4	Earth	Input	20	Not connected	-
5	Rear left loudspeaker -	Output	21	Not connected	-
6	Rear left loudspeaker +	Output	22	Not connected	-
7	Front left loudspeaker -	Output	23	Not connected	-
8	Front left loudspeaker +	Output	24	Shield and earth RVC	Earth
9	Rear right loudspeaker -	Output	25	RVC -	Input
10	Rear right loudspeaker +	Output	26	Microphone -	Input
11	Not connected	-	27	External CD input L -	Input
12	Not connected	-	28	External CD input L +	Input
13	Microphone screen	Earth	29	LIN	Input/output
14	RVC +	Input	30	CAN – Low	Input/output
15	Microphone +	Input	31	Not connected	-
16	External CD input L +	Input	32	Not connected	-

**SYNC radio main connector J2**

Pin	Description	Type	Pin	Description	Type
1	Not connected	-	17	Not connected	-
2	Not connected	-	18	SDL – High	Input/output
3	Not connected	-	19	Warning sound input +	Input
4	Not connected	-	20	Stereo input left +	Input
5	Middle left loudspeaker -	Output	21	Stereo input right +	Input
6	Middle left loudspeaker +	Output	22	Aux1 -	Input
7	Not connected	-	23	AE/CD	Output
8	Not connected	-	24	Not connected	-
9	Middle right loudspeaker -	Output	25	Not connected	-
10	Middle right loudspeaker +	Output	26	Not connected	-
11	AUX1+	Output	27	Not connected	-
12	AUX1 protector	Earth	28	Not connected	-
13	Not connected	-	29	SDL – Low	Input/output
14	Not connected	-	30	Warning sound input -	Input
15	Not connected	-	31	Stereo input left -	Input
16	Not connected	-	32	Stereo input right -	Input

### 4.12.3 Reversing camera

#### Information

Only vehicles with SYNC radio support the installation of the Volkswagen camera.

The SYNC module has three contact pins.

- Contact pin C5-1 digital video input current (+)
- Contact pin C5-2 digital video input current (-)

The sync module supplies power to the reversing camera via a coaxial cable, preferably in a single throughput to minimise signal loss. The reversing camera communicates with the sync module via the interface for data transmission (LVDS (Low Voltage Differential Signalling)).

In addition, certain parameters are reconfigured on the vehicle. This must be done at an authorised Volkswagen Commercial Vehicles Partner in order not to void the guarantee.

The images from the reversing camera are only displayed on the screen when reverse gear is engaged.

### Reverse brake assist system

#### Information

Do not paint or modify the reversing camera or the rear bumper as this will impair the function of the reverse brake assist system.

The reverse brake assist system does not support changes to the power steering system.

The reverse brake assist system does not support modification of the traction control system or the ABS system.

Modifications to the door locking system or the removal of doors can impair the reverse brake assist system.

Attaching accessories at the rear of the vehicle will impair the functionality of the reverse brake assist system; in these cases, the function should not be used – otherwise incorrect reverse brake assist system events may occur.



**Information**

Do not block the reversing camera.

Do not move or change the camera attachment positions or brackets, as this impairs the functioning of the camera and the reverse brake assist system.

The cameras attached to the vehicle must not be disconnected or removed.

Do not block any part of the field of view of the reversing camera.

Any object attached in the field of view of the front camera or the cameras in the exterior mirror impairs the camera's 360-degree view.

**Information**

Changes to the track width are not recommended because the dynamic guidelines will then not correspond to the turning circle of the vehicle.

**360° camera****Information**

Any change to the track width will result in the dynamic guidelines not corresponding to the turning circle of the vehicle.

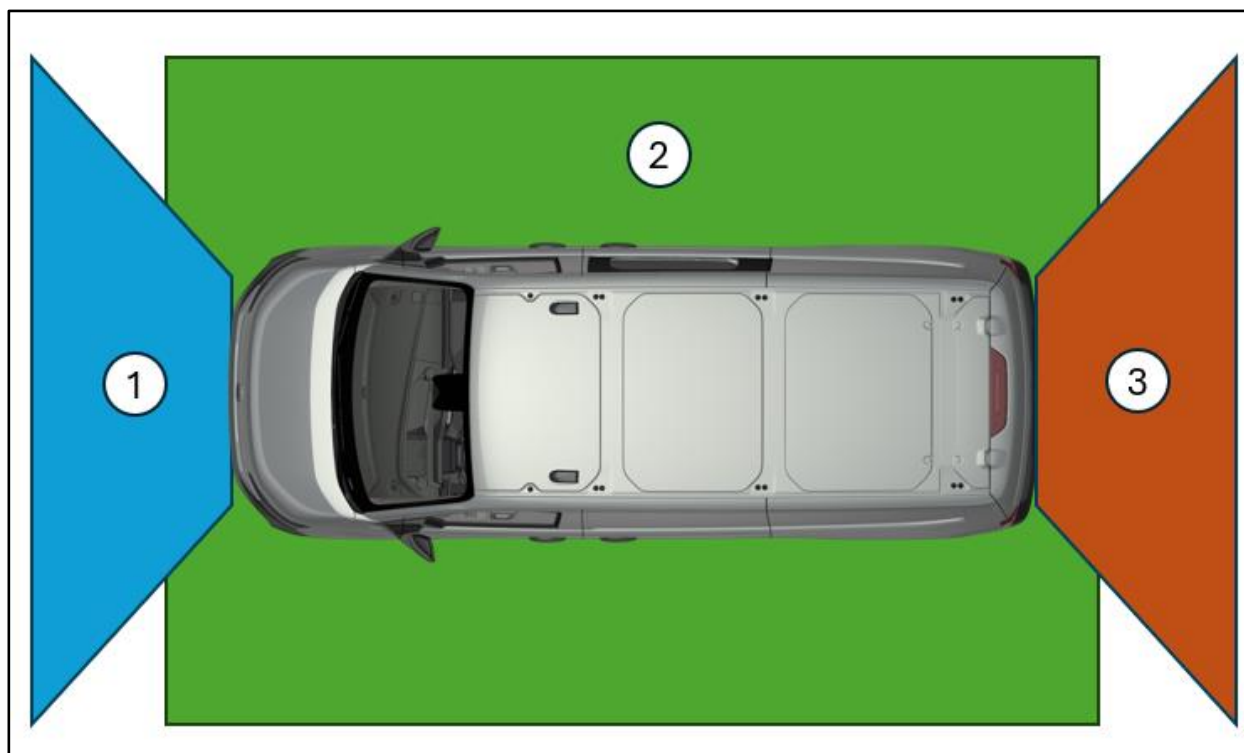
**Information**

Attaching length adjusters for the towing device to the side mirrors may interfere with the camera's 360-degree view.

NOTE: Do not block the field of view of any of the overhead view cameras.

Any object attached in the field of view of the front camera or the exterior mirror cameras impairs the camera's 360-degree view.

## Camera field of view



Element	Description
1	Field of view of the front camera
2	360°-camera field of view
3	Field of view of the reversing camera

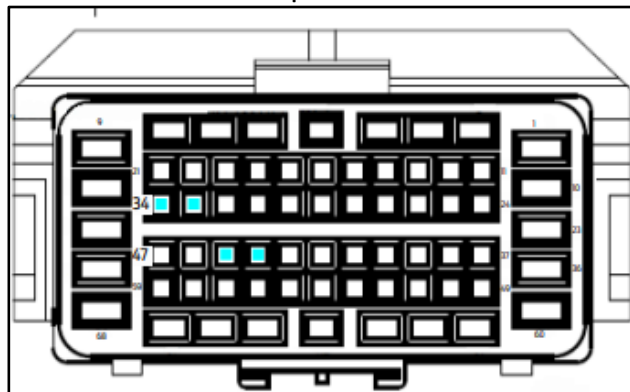
#### 4.12.4 Additional loudspeakers

Wiring for the rear loudspeakers is only present in the dash panel wiring harness if there are 6 or 10 loudspeakers. The wiring harness supports rear loudspeakers only when 6 or 10 loudspeakers are requested.

If the rear loudspeakers are not present in the body wiring harness for basic versions, but the wiring harness supports 6 or 10 loudspeakers, the rear loudspeakers can be spliced into the audio connection wiring harness on the back of the AHU. Each loudspeaker should have a resistance of 4 ohms.

When installing rear loudspeakers in a camper conversion, the audio control module must be reconfigured with the Volkswagen Offboard Diagnostic Information System (ODIS).

**Cable connector for rear loudspeakers**



Element	Description
Contact pin 45	Rear left loudspeaker +
Contact pin 46	Rear left loudspeaker -
Contact pin 33	Rear right loudspeaker -
Contact pin 34	Rear right loudspeaker +

Loudspeaker options	Additional equipment PR number
6 radio loudspeakers	8RL
10 radio loudspeakers	9VJ

## 4.13 Mobile phone

### Warning note

The installation of a system not approved by Volkswagen is not recommended; the compatibility of this system with connected systems is not guaranteed. Possible secondary damage is not covered by the warranty.

Volkswagen offers the installation of wireless hands-free telephone systems (Bluetooth) ex works, including voice recognition. However, these systems can also be retrofitted as an accessory set by your Volkswagen Commercial Vehicles Partner.

## 4.14 Exterior lighting

### Warning note

Ensure that the modified vehicle fulfils all the relevant legal requirements.

### Warning note

Do not modify the basic system (controlled by the onboard supply control unit (BCM) and the multiplex communication system) or use feeds from cables or control units connected to it.

### Warning note

Due to significant differences in the wiring and the activation/configuration between the headlight types, it is not possible to retrofit headlights with Bi-Xenon HID (gas discharge) on vehicles not originally built with them.

### 4.14.1 Reversing lights

The reversing lights are switched on by a high-side driver in the onboard supply control unit (BCM). Additional equipment connected to the circuit of the reversing lights that takes up additional power, e.g. a reversing buzzer, should be connected using relays. Connecting such electrical equipment directly to the circuit of the reversing lights can damage the onboard supply control unit.

The total load of the reversing lights must not exceed 3 A (42 W) or 250 mA for a relay.

### 4.14.2 Lights – front and rear fog lights

### Information

The vehicle's fog lights are switched off when a trailer is connected.

When planning the wiring, the local regulations regarding the connection to other fog lights and rear fog lights must be observed. The maximum permissible load for the standard system is:

- Fog light – 2 x 35 W (controlled by plus-side driver)
- Rear fog light – 2 x 21 W (controlled by plus-side driver)

#### 4.14.3 Load of the lighting system

The BCM output circuits for the exterior lighting provide overload protection. If the overload condition is not corrected, the corresponding output is permanently deactivated to protect the driver electronics. If the overload condition is not corrected, the vehicle must be presented to a dealership and/or the onboard supply control unit must be replaced.

#### 4.14.4 Lights – warning lights / turn signals

Standard system configuration on each side:

- 1 x front turn signal 21 W and 1 x turn signal repeater 5 W (shared output) – max. power consumption 27 W
- 1 x rear turn signal 21 W (single output) – max. power consumption 27 W

#### 4.14.5 Electrically operated exterior mirrors

##### Warning note

Do not modify the basic system (controlled by the onboard supply control unit (BCM) and the multiplex communication system) or use feeds from cables or control units connected to it.

##### Information

These options are not intended for retrofits or conversions.

#### 4.14.6 Additional exterior lights

The entire power supply for additional exterior lamps must be tapped as required via the intelligent interface for additional power tap incl. fuse using a suitable switch and/or relay.

See: [4.22 Fuses](#)

See: [4.23 Connectors and connections](#)

#### Load of the lighting system

BCM outputs	Control unit	Max. load	Vehicle
Power – number plate and side marker lights(1)	High-side driver	27 W	2 x 5 W
Front side marker light / parking light – each side(3)	High-side driver	10 W	5 W
Rear side marker light / parking light – each side	High-side driver	6 W	5 W
Front turn signal – each side	High-side driver	27 W(2)	21 W+5 W(4)
Rear turn signal – each side	High-side driver	27 W(2)	21 W

(1) Number plate and side marker light, maximum 27 W. LED side lights are recommended, if available.

(2) Turn signal supply. Smaller loads trigger the error “Bulb defective”.

(3) Only available for variants with side marker lights with bulbs (not available for combined LED DRL / side marker lights).

(4) If DCUs are installed, the 5-W turn signal repeaters are connected to the appropriate driver/front passenger DCU.

## 4.15 Interior lighting

### 4.15.1 Additional interior lights

#### Warning note

The maximum permissible load of the interior lights must not exceed 7 A (105 W).

The power supply for additional interior lighting can be provided by direct access to the connector in the cab light.

The power supply for additional load compartment lighting can be provided by direct access to the connector in the load compartment lights.

For additional information on the BCM, see: [4.3 Communication Network](#)

The battery-saving system provides power for the interior lighting for a limited period of time.

#### Power supply for interior lighting

The UPDB and the onboard supply control unit provide power for the interior lighting:

- UPDB C2-56 provides the power output for the battery-saving function / switchable light for the roof console light, all reading/entry lights, sun visor lights, glove compartment lighting, and the light in the cab used as an office. The maximum load for this output is 2.2 A.
- BCM J3-02 provides the output power for all step entry lights. The maximum load for this output is 5 A.
- BCM J3-12 provides the output power for all load compartment lights and the luggage compartment lighting. The maximum load is 5 A.
- BCM J4-10 provides the output power for the underfloor lighting or the picnic lamps. The maximum load is 1.6 A (this output is switched on and off manually via the underfloor lighting switch at the rear of the vehicle)

#### Information

In the front and rear of the Caravelle (seat lights) LEDs are used whose control unit is located in the front roof console light. The rear seat lights are controlled directly from this. No further lights can be added to this circuit for the roof lights.

Each circuit for the interior lighting is earthed locally in the respective lamp. It depends on the vehicle type which lamps are connected to the cab or load compartment circuit. To determine which lamps are connected to the rear or load compartment circuit:

- Set all lamps with a switch to the entry lighting
- Close all doors and wait until the lights are switched off
- Open rear loading door or tailgate
- All interior lights that are switched on are located in the rear load compartment or rear area
- Some types of vehicles may not have lights connected to the rear circuit

If fluorescent lamps are required, they must not be connected to the existing passenger compartment or load compartment lighting as they are not compatible with the pulse width modulated (PWM) lighting circuit; this can lead to premature failure of the fluorescent lamps. If fluorescent lamps are required, they must be connected to the intelligent interface for additional power tap incl. fuse.

For more information on the required parts and configurations, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

#### **4.15.2 Additional lighting for the rear interior**

Where higher power is required, it should be branched off from the intelligent interface for additional power tap incl. fuse using a suitable switch or relay.

For more information, see: [4.23 Connectors and Connections](#)



## 4.16 Emergency call systems

### Information

Volkswagen AG is not responsible for the reception test or a possible loss of performance due to a defective conversion or defective reinstallation.

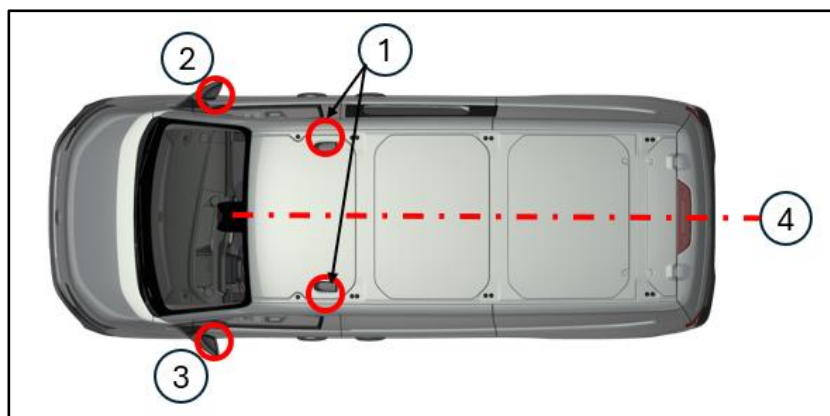
### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

### Information

Do not move the microphone, the SOS switch (both in the roof console) or the eCall loudspeaker (under the steering wheel) as this could affect the hands-free audio performance of the eCall emergency call system.

### Positions for aerials



Element	Description
1	Location for GNSS/5G aerials
2	Position of the FM DAB aerial
3	Position of FM-only aerial
4	Additional aerials must be positioned on the Y-0 centre line

#### 4.16.1 Routing the GNSS/5G aerial

Modifications in which the aerial does not have to be moved:

- Wind deflector on the roof (converter must ensure that the part is non-metallic)
- Cooling unit mounted on the front of the box construction (minimum distance of 100 mm to the aerial, max. dimensions from the box to the front of the vehicle: width: 1,300 mm, depth: 500 mm)
- Other non-metallic constructions on the roof
- Non-continuous metallic structures on the roof (e.g. ladders)
- Modifications in which the aerial does not have to be moved:
- Cab on roof with metal components
- Other continuous metallic structures above the aerial that are larger and closer to the aerial than a cooling unit (e.g. wind deflector)
- If the aerial must be moved for the conversion, it is recommended to use the existing vehicle aerials and seal the roof openings so that they are waterproof. It is the responsibility of the Converter to ensure sufficient waterproofing. The following information is recommended for the moving:
- The aerials must be fitted on the plate (base plate/plane). A metal base plate of 150 mm around the hole is mandatory. No openings or recesses are permitted. The base plate can be fitted to a plastic/fibre glass roof. The aerial has two functions:
  - GNSS is required for the vehicle location system. This requires the reception of satellite signals from above
  - GSM (cellular) is required for the “telephone” communication, which depends on a clear line of sight to ground towers. Consequently, a converted aerial must take these requirements into account and be installed at the highest point, avoiding any indentations if possible
- The surface of the base plate does not need to be earthed at the vehicle; it serves as a reflective surface and not as an earth connection
- Maintain a minimum distance of 50 mm from all electronic (powered) equipment and wiring harnesses that are not part of the aerial system
- The surface of the base plate does not need to be earthed at the vehicle; it serves as a reflective surface and not as an earth connection
- Suitable fastenings and seals are required to secure the base plate to the roof plate, e.g. 4 x rivets

The construction/fastening of the aerial base requires punch-outs with specific shapes to prevent it from rotating and align it correctly.

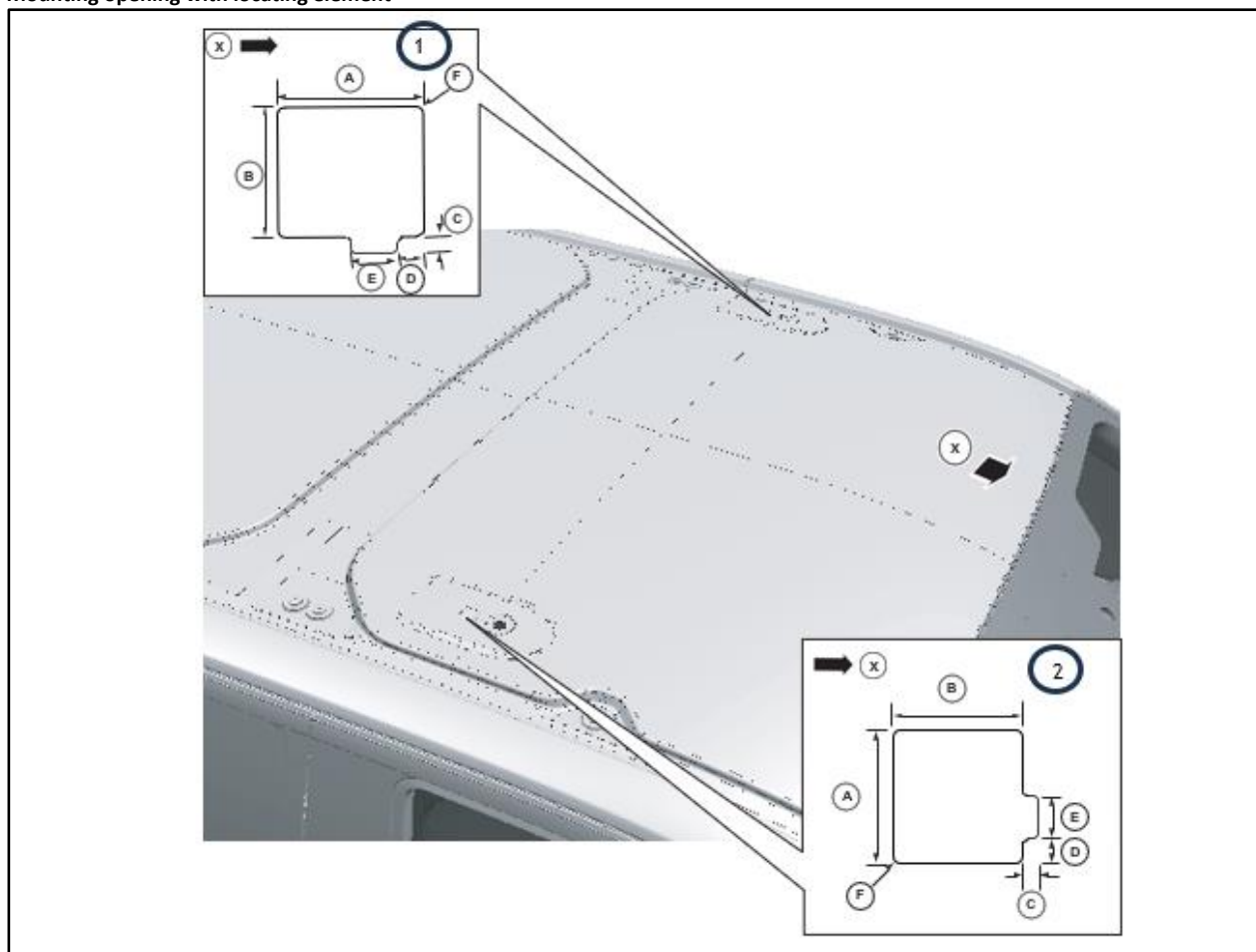
The roof shown above and the installation position on the roof are for illustration purposes only. The aerial support (in this version as a split roof bridge) can be used for sheet thicknesses from 0.7 mm to 1.5 mm.

The aerial must be as close as possible to the horizontal, <20° to the horizon. The aerial is fixed to the base plate by means of a fastener inserted from the bottom. The fastener engages in the aerial base. The Converter must perform reception checks outside a building to ensure that the system is functioning properly.

- GNSS (free memory space):
  - Check whether a DTC (Diagnostic Trouble Code) was stored due to an aerial that is not connected
  - For vehicles equipped with a navigation system: search for a route in the onboard navigation system to check the GNSS connection within a reasonable period of time
  - For vehicles without a navigation system:
  - Disconnect the battery, reconnect it, and check that the correct time is set

## – GSM:

- Check whether a DTC was stored due to an aerial that is not connected
- Check whether the screen shows a 4G icon and the signal strength
- Cable extension (to be prepared by the converter)
- The entire cable route from the connected component (audio main unit / SYNC module / telematics control unit)
- to the aerial must not exceed 8 m for GNSS connections and 6 m for cellular connections
- For extensions, the special cable types for GNSS and GSM as well as connectors from the following table must be used:

**Mounting opening with locating element**

Element	Description
A	25 mm
B	25 mm
C	3.2 mm
D	5 mm
E	8 mm
F	1 mm common radius x 8
X	Front of the vehicle
1	Left trim
2	Right trim
Tolerance of + or – 0.1 mm is common	

Aerial	Part numbers – connectors for split roof bridges	Rosenberger No.	Connector/socket	Function	Single/double/quadruple	Colour	Key code
7TG035534A	*	AMZ005-000-E	Bush	GSM/GNSS	Quadruple	Green	E
7TG035534	*	AMZW17-000-C	Bush	GNSS	Individually	Blue	C
7TG035503D	*	AMZ005-000-D	Bush	GSM	Quadruple	Purple	D

Aerial	Part numbers – wiring harness connectors	Rosenberger No.	Connector/socket	Function	Single/double/quadruple	Colour	Key code
7TG035534A	*	AMZ040-C00-E	Connector	GSM/GNSS	Quadruple	Green	E
7TG035534	*	AMZ010-C00-C	Connector	GNSS	Individually	Blue	C
7TG035503D	*	AMZ040-C00-D	Connector	GSM	Quadruple	Purple	D

\* See Electronic Repair and Workshop Information System of Volkswagen AG (erWin)

<https://volkswagen.erwin-store.com/erwin/showHome.do> – Information system from Volkswagen AG, subject to payment

## 4.17 Adaptive cruise control system

### Warning note

For conversion vehicles equipped with adaptive cruise control and on which significant changes are made in terms of mass and geometry, it is recommended that the vertical alignment and the system function of the radar system be checked by a Volkswagen Commercial Vehicles Partner. For more information, refer to the Workshop Manual or the Owner's Manual.

### Information

Do not cover the radar of the cruise control system or the short-range front radar; see the positions of the radar units in the figure below. If the radar sensors are covered, the operation of the adaptive cruise control system or the pre-collision assist system may be impaired.

### Information

Do not paint the front grille of the vehicle, as this may impair the operation of the radar of the cruise control system.

## Radar – cruise control system



Element	Description
1	Radar units – adaptive cruise control system

## 4.18 Blind Spot Information System (BLIS)

### Warning note

The Blind Spot Monitor (blind spot information system (BLIS)) does not work if retrofitted parts are located in the detection range of the multi-beam radar modules; these are installed in the rear side panels, one on each side.

### Information

Do not attach bumper stickers and/or repair mastics in these areas, as otherwise the system performance may be impaired.

### Information

The Blind Spot Monitor alarm indicators may turn on in heavy rain, even if no vehicle is in the blind spot.

### Information

If the vehicle is equipped with a ball coupling with a trailer module at the factory and is towing a trailer, the sensors automatically switch off the Blind Spot Monitor. For vehicles with a ball coupling without a factory-fitted trailer module, it is recommended to switch off the Blind Spot Monitor manually. Using the Blind Spot Monitor in trailer mode without the Blind Spot Monitor trailer package results in poor system performance.

**Installation position of Blind Spot Monitor**

Element	Description
1	Multi-beam radar modules



## 4.19 Camera on the windscreen

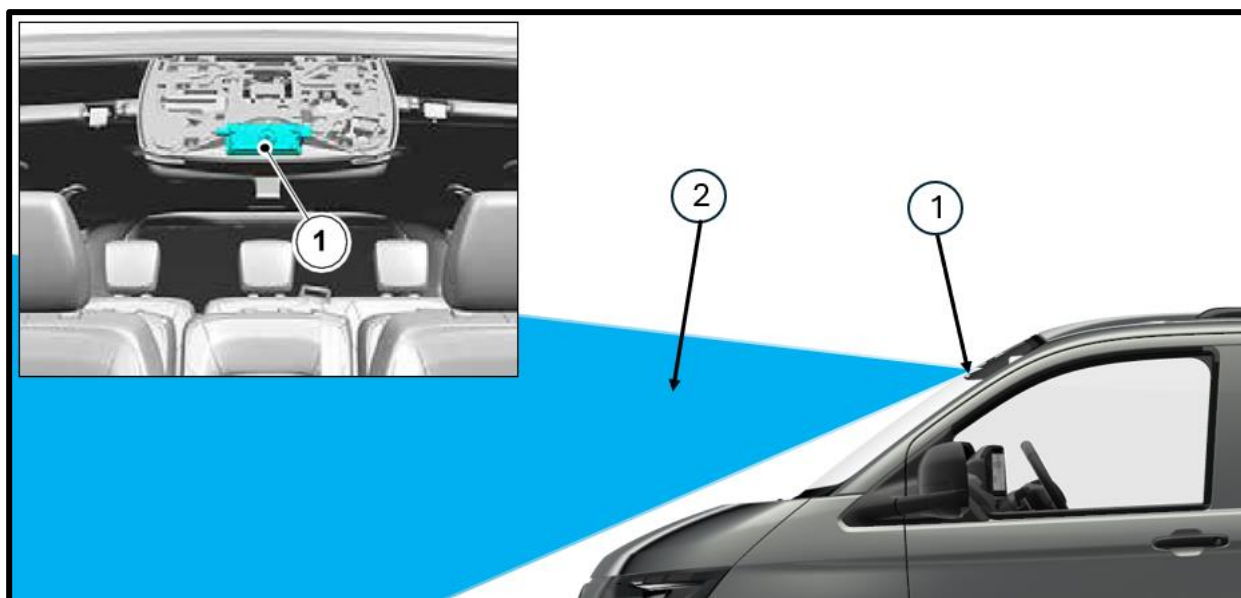
### Information

The functions of the camera on the windscreen (if available: pre-collision assist, lane keeping system, main-beam control, traffic sign recognition, intelligent speed assist, lane departure warning, automatic main beam control, traffic sign recognition, intelligent speed assistant, wrong-way driving warning, adaptive cruise control system) do not work if a conversion or installation is in the field of view of the camera on the windscreen.

For conversion vehicles equipped with a camera on the windscreen and on which significant changes are made in terms of mass and geometry, the camera sensor must be recalibrated.

For more information on vehicles with large overhangs

See: [4.20 Automatic wiper and headlight control for vehicles with large overhangs](#)



Element	Description
1	Camera on the windscreen behind the interior mirror trim
2	Field of vision of camera, horizontal direction, and downwards to the edge of the bonnet of the vehicle

## 4.20 Automatic wiper and headlight control for vehicles with large overhangs

### Information

If the converted vehicle has an overhang that could completely or partially cover the position of the rain/light sensor on the window, see the figure below. This can impair the sensor's ability to detect light or moisture as intended in the calibration, and impair its normal operation.

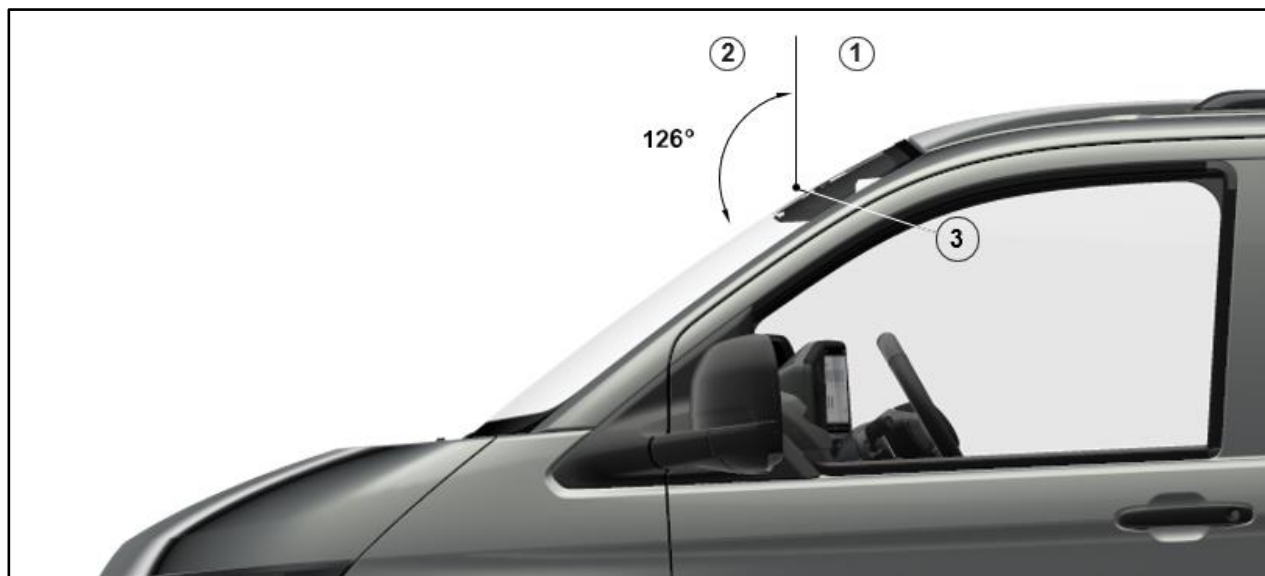
If a sender vehicle is equipped with these functions, the vehicle can be switched to manual wiper and headlight operation as described below:

For windscreen wipers, there is a menu option in the instrument cluster to change the wipers to intermittent wipe mode instead of rain detection. This setting should be used.

With automatic headlight control, replacing the headlight switch with a non-automatic switch will eliminate the automatic position and the system will operate as if no sensor is present. If the automatic headlight switch remains, the dipped beam may remain on instead of the daytime running lights when the ignition is switched on and the switch is in the automatic position. A Volkswagen Commercial Vehicles Partner can provide information about which switch must be ordered and installed.

Please note: if the headlight switch does not have an automatic position (or automatic is not selected on the original switch), automatic main beam (with the camera facing forwards) is not available and is not displayed in the instrument.

## Automatic wiper and headlight control for vehicles with large overhangs



Element	Description
1	Rear conversion or installation area (area 1) in which automatic headlights and wipers function correctly
2	Front conversion or installation area (area 2) in which the automatic headlights and wipers do NOT function correctly – the function must not be intended for the sender vehicle or must be deactivated by the Volkswagen Commercial Vehicles Partner.
3	Installation position of the automatic sensor

## 4.21 Handles, locks, locking elements and access systems

### 4.21.1 Door – removal or modification

#### Warning note

If an additional third-party control system is integrated into the Volkswagen locking/unlocking system, the crash event CAN signal must be used to disable the third-party control system and trigger a crash unlocking within the locking system if a relevant event occurs.

#### Information

If modified doors are equipped with door contact switches, they should have the polarity NORMALLY CLOSED, i.e. the switch is closed when the door is closed, in order to maintain the alarm and interior lighting functions.

#### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

If the doors need to be removed, such as for variants that do not require doors, certain circuits must be connected to each other so that no door contact switch warnings appear on the instrument cluster. The interior lighting also remains switched on in this case.

A status can be specified by configuring the onboard supply control unit (BCM) as follows. The circuits of the door contact switch must be earthed when the door is closed. This does not apply to the bonnet contact switch.

- J1-05: Bonnet contact switch in OEM bonnet locking only
- J4-30 Front left door contact switch – earth
- J4-24 Front right door contact switch – earth
- J4-43 Door contact switch of rear right swing door
- J6-18 Door contact switch of rear left swing door
- J4-45 Door contact switch of left sliding door
- J4-15 Door contact switch of right sliding door

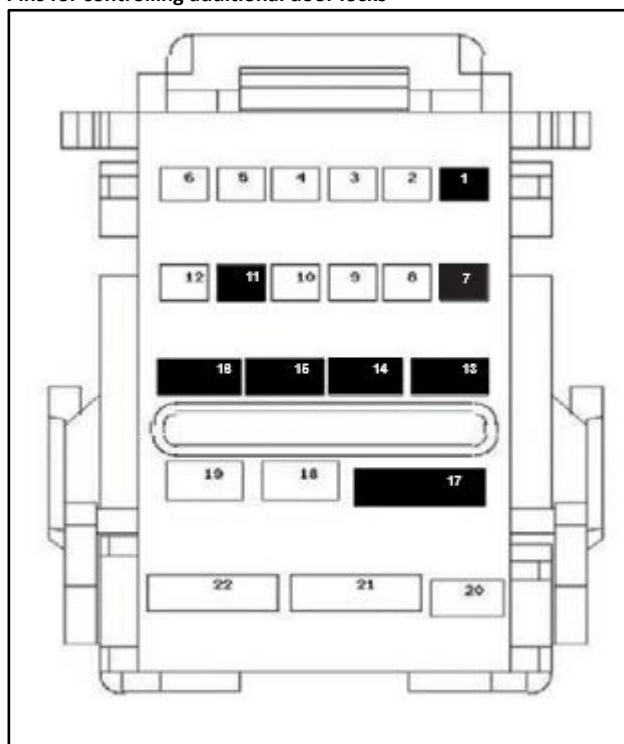
The following circuits should always be earthed when the catch is locked, and when there is a circuit break in the unlocked state. If there is no earthing in the locked state, the catch might not be locked:

- J4-44 Feedback from front left door lock
- J4-22 Feedback from front right door lock
- J4-42 Feedback from rear right sliding door lock
- J4-07 Feedback from rear left sliding door lock

For vehicles that ordered only with the sliding side door, only the door contact switch of the sliding door is supported.

Reconfiguration to prevent double locking – this function can only be reconfigured to central locking by a Volkswagen Commercial Vehicles partner.

### Pins for controlling additional door locks



Element	Description
J3-13	Passenger door unlocking
J3-07	Driver door unlocking
J3-14	Unlock sliding door on driver side
J3-01	Unlock sliding door on passenger side
J3-16	Central locking
J3-17	Double locking of front doors
J3-15	Double locking of rear side door
J3-11	Unlock tailgate
C2-44	Unlock rear right load compartment door (pin in IPDB*)
C2-37	Unlock rear left load compartment door (pin in IPDB*)

\*IPDB — power distribution box in the dash panel

#### 4.21.2 Central locking

The locking is controlled by the onboard supply control unit. As part of the security system, there are locking feedback circuits from the catch to the BCM on specific contact pins of the locking circuit. If changes are made to these contact pins, the proper locking function cannot be guaranteed. However, it is possible to add additional catches via relays (max. 300 mA coil current permitted) for each unlocking circuit. Each locking and unlocking pulse duration is 110 ms.

It is strongly recommended to use Transporter panel van lock mechanisms, as they are activated by the BCM over the correct period of time.

**Locking configurations** The following are specific locking scenarios that were identified by customers:

1. Locking by closing the door – this is a configurable parameter in the BCM.
2. Reconfiguration to prevent double locking – this function can only be reconfigured to central locking by a Volkswagen Commercial Vehicles Partner.

#### 4.21.3 Rear lid remote release / Tyre Pressure Monitoring System receiver (RKE/TPMS receiver)

##### Warning note

For optimum performance , the RKE/TPMS receiver must be a minimum distance of 25 mm from any metal parts and 100 mm from high switching loads.

##### Information

It is recommended that the RKE/TPMS be equipped with a dedicated earth cable and an earth stud; do not combine with cables from other modules.

##### Information

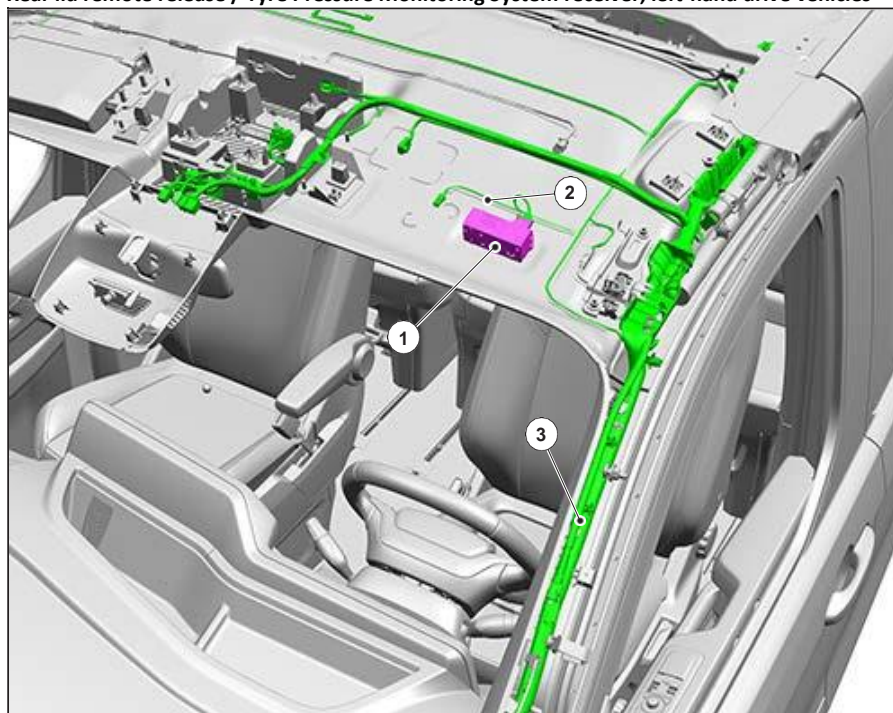
If the RKE/TPMS receiver is removed during a conversion, the backup slot/backup button must be used to start the vehicle. Information about identifying the backup slot can be found in the Owner's Manual for your vehicle.

The RKE/TPMS receiver is supplied via a connection to the wiring harness and then earthed at the A-pillar earth connection.

For location of earth connections, see: [4.25 Earth connection](#)

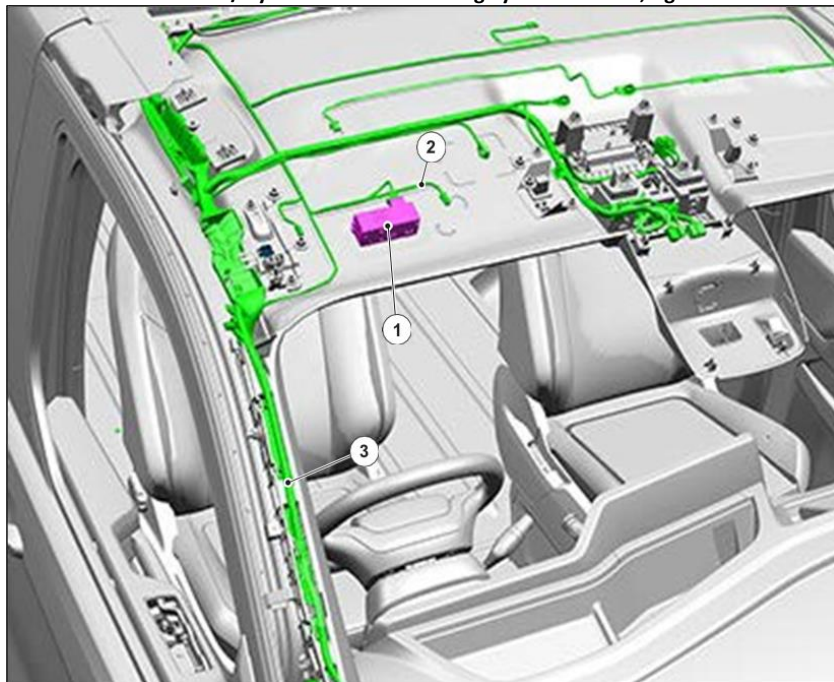
For additional information, see: [2.4 Wheels and tyres](#)

## Rear lid remote release / Tyre Pressure Monitoring System receiver, left-hand drive vehicles



Element	Description
1	Receiver for remote control RF
2	Front light connection cable
3	Roof wiring harness, left front to rear



**Rear lid remote release / Tyre Pressure Monitoring System receiver, right-hand drive vehicles**


Element	Description
1	Receiver for remote control RF
2	Front light connection cable
3	Roof wiring harness, left front to rear

#### 4.21.4 Aerials for keyless entry and keyless start (PEPS)

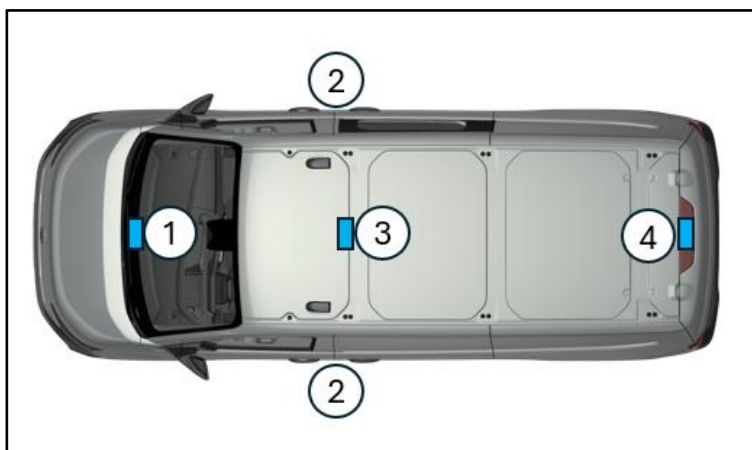
##### Warning note

Moving the PEPS aerial may have a negative effect on its calibration and may therefore impair the remote control detection for the keyless start.

The PEPS system consists of three internal aerials and two external aerials. The three internal aerials ensure that the keyless start function is working, and are located in the dash panel, the roof traverse and the tailgate. The precise positioning of these aerials is crucial, as each generates a magnetic field within certain areas for the detection of key remote controls. The overarching guideline for the positioning of PEPS aerials is about ensuring that the aerials are both centred and evenly distributed relative to the vehicle structure. Moving these aerials may affect the effective operation of the PEPS system.

On the other hand, the two external aerials located in the front door handles on the driver and front passenger sides provide keyless entry.

Any modification to these door handles can affect the keyless entry functionality.



Element	Description
1	IP interior aerial
2	External aerial – door handle
3	Interior aerial – roof traverse
4	Interior aerial – tailgate

## 4.22 Fuses

### Warning note

Under no circumstances should the nominal value of the standard fuses in the vehicle be increased. There are no spare fuses (BCM) in the power distribution box (PDB), smart relay box (SRB), or onboard supply control unit (BCM). The Converter must provide additional fuses as required.

### Information

Only use Volkswagen fuses. Other fuses can impair the tried and tested fuse strategy.

### 4.22.1 Windscreen wipers

The basic wiper system (controlled by steering column module and multiplex architecture via LIN) should not be changed.

### Information

The power supply to the wiper motors is limited by the size of the cables and the associated relays. If other wipers are installed, they must correspond to the specifications of the Volkswagen wipers.

See: [5.9 Windows, frames and control mechanisms](#)

## 4.23 Connectors and connections

### Warning note

The CAN data bus should not be manipulated as this can lead to the failure of safety-critical components such as the anti-lock brake system (ABS).

### Warning note

Do not use connections that go through the outer shell and penetrate the conductor.

### Practical note

Only use connectors approved by Volkswagen.

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

### 4.23.1 General information

#### Main fuses

To protect the battery system from direct short circuits to earth or excessively high continuous loads, a 500 A main fuse is installed in the pre-fuse box under the driver's seat. Peripheral devices installed by the Converter must not use this fuse as it is only intended to protect the starting and charging system.

This main fuse cannot be repaired; only use a replacement part from Volkswagen.

## Cabling

### Information

Use only connecting cables approved by Volkswagen.

Do not disconnect the vehicle wiring harnesses under any circumstances, because:

- The specification of the original vehicle is only suitable for additional electrical equipment in conjunction with the intelligent interface for additional power tap incl. fuse (PR number VH2/VH3).
- A connection error may occur in the long term
- There is a potential fire hazard due to overload

All connections with existing wiring must be permanently insulated. External connections must be watertight and have a drip loop.

If cables must be extended, the connection may only be made at existing connection points. If splicing into existing cables cannot be avoided, see the splicing instructions in this manual.

See: [4.2 Instructions for cable installation and routing](#)

### 4.23.2 External power supply point (CCP)

#### Warning note

CCP2 must not be used to switch off inductive loads directly; an additional control contactor must be installed for this purpose.

#### Warning note

Before this is connected to the vehicle, the main earth of the vehicle must be disconnected in order to interrupt the 12-V system.

#### Warning note

Use only the kit approved by Volkswagen to add fuses to the CCPs.

#### Warning note

Do NOT connect one and the same load to both CCP1 and CCP2. The system is not designed for interaction as the fuses have different values.

**Practical note**

Before connecting CCPs, disconnect the earth cable of the battery to prevent short circuits. The tightening torque for CCP1 (M6) is 5.2–7.2 Nm, and for CCP2 (M8) 5.9–8.1 Nm.

**Information**

If additional power cables are installed, the protector must be upgraded to allow the routing of the additional cables. The cover is pre-marked in the relevant areas so that it can be opened easily.

**Information**

There is a maximum of two CCPs. These points are always located in the driver's seat carrier and are protected by a cover (CCP bolt cover). CCP1 can provide a maximum current of 60 A, CCP2 a maximum current of 250 A.

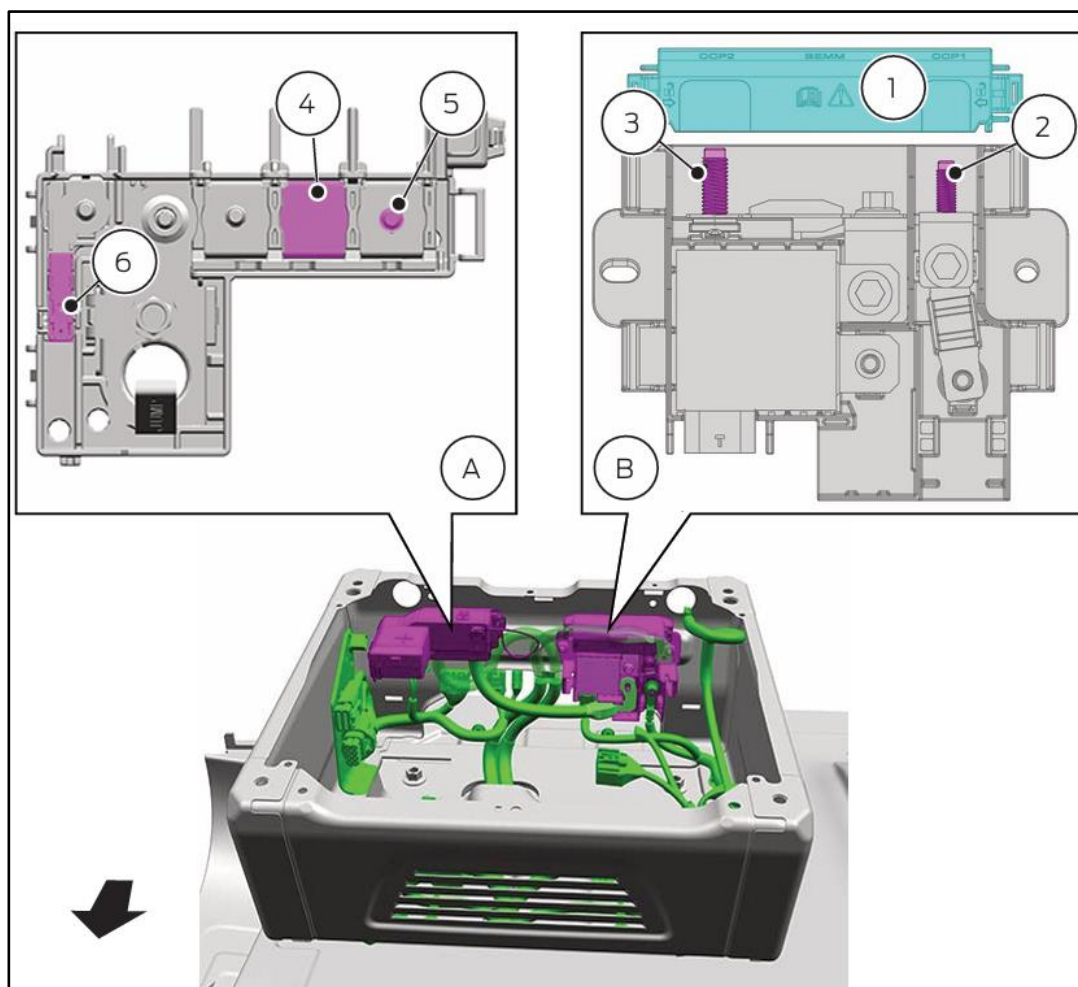
Most vehicles with a single battery do not have CCP2. Only vehicles with a dual battery or certain equipment options have a CCP2; ask your local Volkswagen Commercial Vehicles partner for details. If CCP2 is required, order kit 7TG937605B or 7TG937605C.

CCP2 is subject to the operation of the standard battery monitoring [SBG]. See [4.6.4 Operation of SBG and load shedding](#)

Before removing the CCP cover (CCP bolt cover), slide the driver's seat carrier forward to enable sufficient access so that it is not necessary to remove any body trim. The image below shows the right-hand drive version.

For power and earth connections for high-current circuits, see: [4.5 Battery systems](#)

### Location of CCP and pre-fuse box



Element	Description
A	Pre-fuse box for additional battery
B	CCP box
1	CCP bolt cover (removed)
2	CCP1 60A power connector
3	CCP2 250A power connector
4	Shunt
5	Supply connection for CCP box
6	BMS (Battery Monitor Sensor)

#### 4.23.3 Supply and earth connections for high-voltage circuits

For retrofitted connections of earth and +12-V power supply cables to the Volkswagen system

See: [4.5 Battery systems](#)

All peripheral devices connected to the power supply with more than 60 A must be connected via the CCPs using special fuses, such as the intelligent interface for additional power tap incl. fuse. If the vehicle does not provide sufficient power via the CCPs, see [“Retrofitted +12-V power connections for loads over 200 A”](#) in this section of the Converter guidelines.

Campers: If when installing an additional battery and an additional battery circuit high loads are to be supplied that overtax the CCP supplies or are generally high (in particular loads when the ignition is switched off), an isolation switch isolation relay should be installed and controlled via the load shedding signal.

This protects the vehicle starter battery for starting the engine and maintains the system voltage while driving. In this case, cables, fuses and alternators must be designed accordingly. If you are not sure which battery to connect to what, and which system requirements must be fulfilled, contact your national sales company or your local Volkswagen Commercial Vehicles Partners. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

See: [4.5 Battery systems](#)

#### 4.23.4 Vehicle interface connector – technical data for planning

##### Warning note

Signals 3 and 5 on the vehicle interface connector are only used for tapping and cannot be loaded with consumers with high current consumption.

##### Warning note

The maximum rated current for signal 6 is 10 A and for signal 8 15 A. These values must not be exceeded under any circumstances, and this applies to the total requirements of the Volkswagen system and the retrofitted systems.

##### Warning note

The ends of unconnected cables in connectors must be insulated to prevent a short circuit to earth.

The vehicle interface connector provides a direct connection for signals. The installation position is shown in the following figure; the available signals are listed in the following table.

The part number of the vehicle interface connector is 0ZD972097C and is available in the vehicle. In order to access the vehicle signals via this connector, the converter must follow the guidelines for installing and routing the cables and install terminals in the corresponding connector.

See: [4.2 Instructions for cable installation and routing](#)

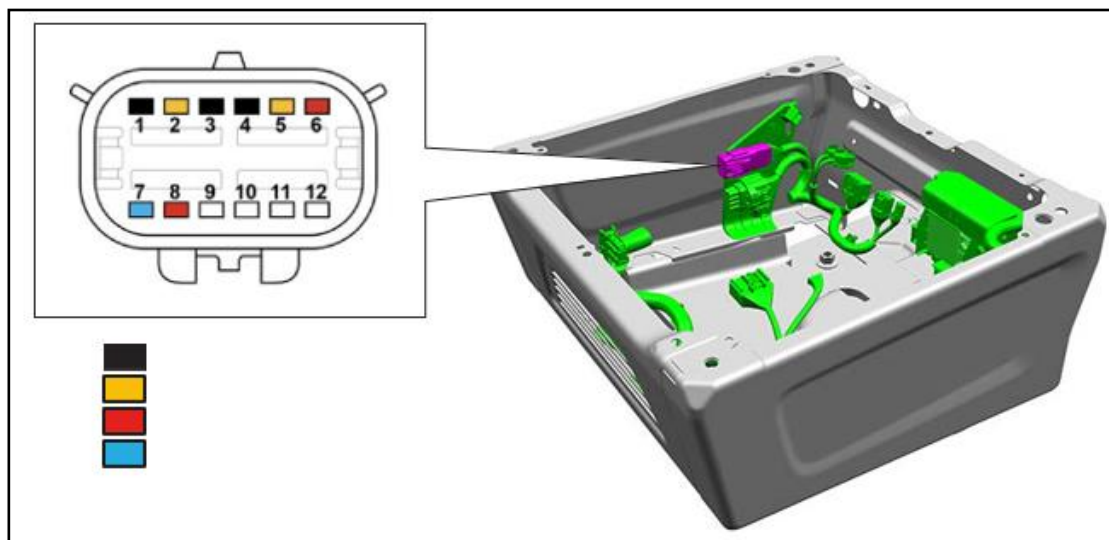
If the vehicle is equipped with an intelligent interface for additional power tap incl. fuse, the vehicle interface connector is occupied by the corresponding wiring harness. In this case, these signals and a number of additional functions are available via the C1 connector. For more details, see [chapter 4.23.5 Intelligent interface for additional power tap incl. fuse \(ISL\) \(PR number VH2/VH3\)](#)



**Warning note**

Do NOT connect one and the same load to both CCP1 and CCP2. The system is not designed for interaction as the fuses have different values.

Pin 5: The vehicle speed signal is a square wave connected to the DC current, the frequency of which changes in proportion to the vehicle speed. This supplies a square wave signal (50% duty cycle), whereby a frequency of 138 Hz corresponds to a speed of 100 km/h.



Signals – 12-pin vehicle interface connector	
1	Earth
2	Engine start
3	SRC lock / Retrofit High Performance mode
4	Load shedding / standard battery monitoring
5	Vehicle speed
6	Engine running/start terminal 15 (10 A)
7	Illumination of the IP switch
8	+12 V KL30 (15 A)
9	No connection
10	No connection
11	No connection
12	No connection
	Earth
	Signal
	Current
	FET power supply

## Ignition

Pin 6: The ignition signal is protected by a 10-A fuse. At the following ignition positions, +12 V is present: Electrical equipment (I) and ignition ON

(2). Not active when ignition is OFF (0) or when starting

(3) Although this connection can supply equipment directly, it is recommended to connect a relay with a converter, especially for applications with high current consumption.

## Switch lighting

Pin 7: The illumination signal of the switch may only be used for identification purposes. The PWM signal is only designed for dimmable low-current lighting (max. 300 mA) and is not suitable for controlling a relay.

## Engine start

### Warning note

Do not cut the alternator cables and do not use the alternator as a source for a "D+ signal".

The 10-A earth signal for load shedding must be used for the power control. The engine-in-operation function can only be used for current control if the load shedding signal has the overall control, e.g. to activate a current supply relay. Engine-in-operation can be used for other systems such as telematics and data loggers.

Pin 4: Load shedding with battery SOC protection. The switched earth signal is a signal that must always be the primary control signal in order to control third-party loads with a total of more than 60 A.

See: [4.6 Battery protection](#)

The engine-in-operation function can only be used for current control if the load shedding signal has the overall control, e.g. via a current supply relay.

Engine-in-operation can be used for other systems such as telematics and data loggers. This function supplies current when the engine is running and disconnects when the engine is switched off if the battery reaches the timer value or the state of charge value. When the engine is running, the signal goes off if the voltage drops below 11 V. This is to protect critical systems such as EPAS (electromechanical power steering). The voltage of the system should not be below 13 V for an extended period. If this is the case, the demand for the additional equipment is higher than the power supply, and additional energy sources such as additional alternators may be required.

Pin 2: The engine running signal only supports one test lead or one relay control, which is linked to the load shedding signal by an AND function.

This engine-in-operation signal is earthed (max. current sink 250 mA), it does not supply a positive output (open circuit), and it is only active when the engine is running.

The signal is not present for:

- Key positions – OFF (0), Electrical equipment (I), Ignition ON, Engine OFF (II), Start (III)
- Key in position II while engine stopped by start/stop system
- Engine operating but load above 250 mA (activation of two or more relays due to error)

For vehicles with a start/stop system, the signal can be switched on/off up to 300,000 times. Therefore, control relays are required that provide the appropriate service life for this number of operating cycles.

## Vehicle speed

### Properties of the square wave

Specifications	
Maximum level – high signal	Battery voltage
Minimum level – high signal	3.67 V
Maximum level – low signal	1.1 V
Minimum level – low signal	-1.1 V
Max. earth offset	±1.0 V
Rise time	10 $\mu$ s <= tr <= 250 $\mu$ s
Fall time	10 $\mu$ s <= tf <= 250 $\mu$ s
Duty cycle	50% $\pm$ 10%
Pulse frequency	2.2 Hz/MPH (1.3808 Hz/KPH)

### 4.23.5 Intelligent interface for additional power tap incl. fuse (ISL) (PR no. VH2/VH3)

#### Warning note

High-current device

#### Information

The intelligent interface for additional power tap incl. fuse cannot be retrofitted and must therefore be ordered for factory installation.

If a third battery is retrofitted: see [4.5.10. Single and dual battery systems](#) – conversion from dual to triple battery

The intelligent interface for additional power tap incl. fuse (ISL) is a 12-V device with low power consumption that offers a high output power for energy management from 10 A to 200 A and has fully relay-controlled battery protection. It also includes the Split Charge function, including CCP2 control, see: [4.23 Connectors and connections](#). The ISL can also be coupled with external battery chargers to distribute the power supply to both the starter battery and the connected additional batteries.

The intelligent interface for additional power tap incl. fuse (ISL) uses software-controlled intelligent fuses that allow multiple component configurations in order to customise the system to the customer's individual needs. Software-controlled fuses mean that the software can reset the fuses without the need to replace components. The switch-on current and the fast/slow trip profile can be adapted for the connection of various third-party equipment.

The intelligent interface for additional power tap incl. fuse (ISL) includes the function of the programmable Volkswagen battery monitor PBG and offers interface connection signals. There are two ISL configurations. The ISL (PR number VH2) has configurable inputs and outputs.

The ISL uses software-controlled MOSFETs to protect your upgrade and reduce the need for traditional fuse replacement. The fuses can be automatically reset by completing an ignition cycle.

The ISL is available in both twin and triple H8 12-V battery configurations. The ISL is available for diesel (ICE), plug-in hybrid (PHEV) and fully electric (BEV) vehicles. Engine speed control is also available for ICE configurations.

There are two ISL configurations. PR number VH2 and PR number VH3. The VH2 has configurable inputs and outputs. Both configurations have an energy management capacity of up to 200 A.

ISL provides a private Wi-Fi connection for over-the-air updates of future released software.

For further information please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

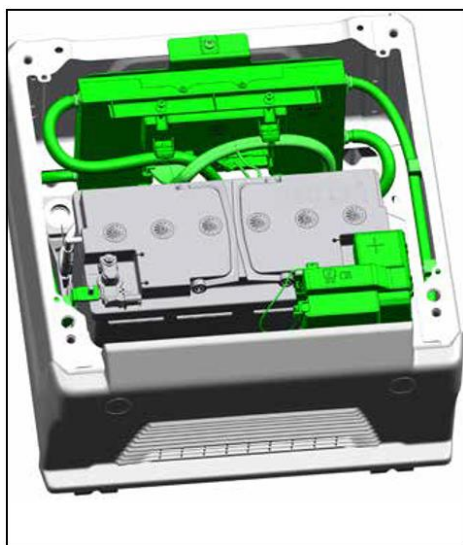
For PR number VH2, the position is controlled by the driver and always under the driver's seat base – static seat.

PR number VH3 is always positioned under the left seat base – rotary seat.

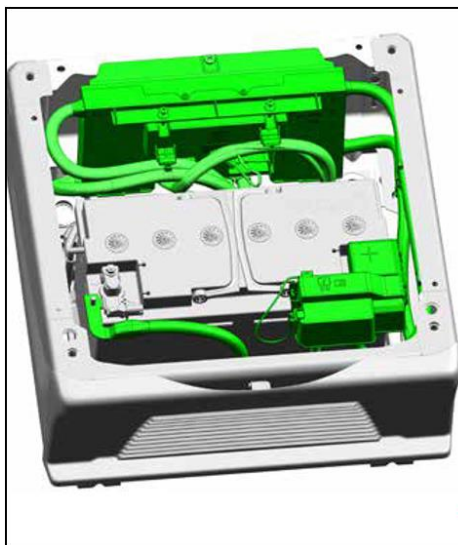
There are subtle differences between the installation of the intelligent interface for additional power tap incl. fuse in vehicles with rotating seats and vehicles with fixed seats.

Position of the intelligent interface for additional power tap incl. fuse – standard vehicles (VH2) – static seat and rotary seat (VH3).

**Position of the ISL – static seat**

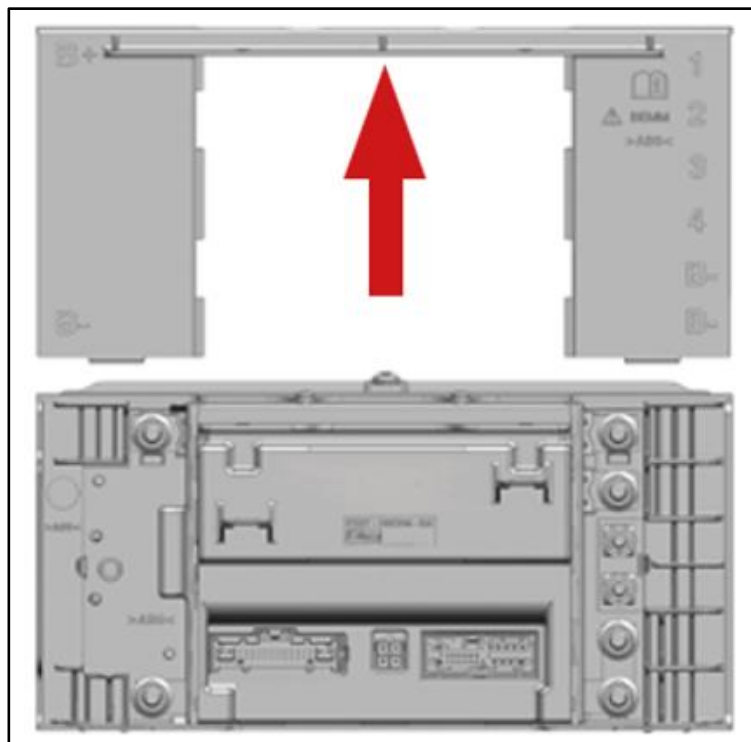


**Position of the ISL – rotary seat**

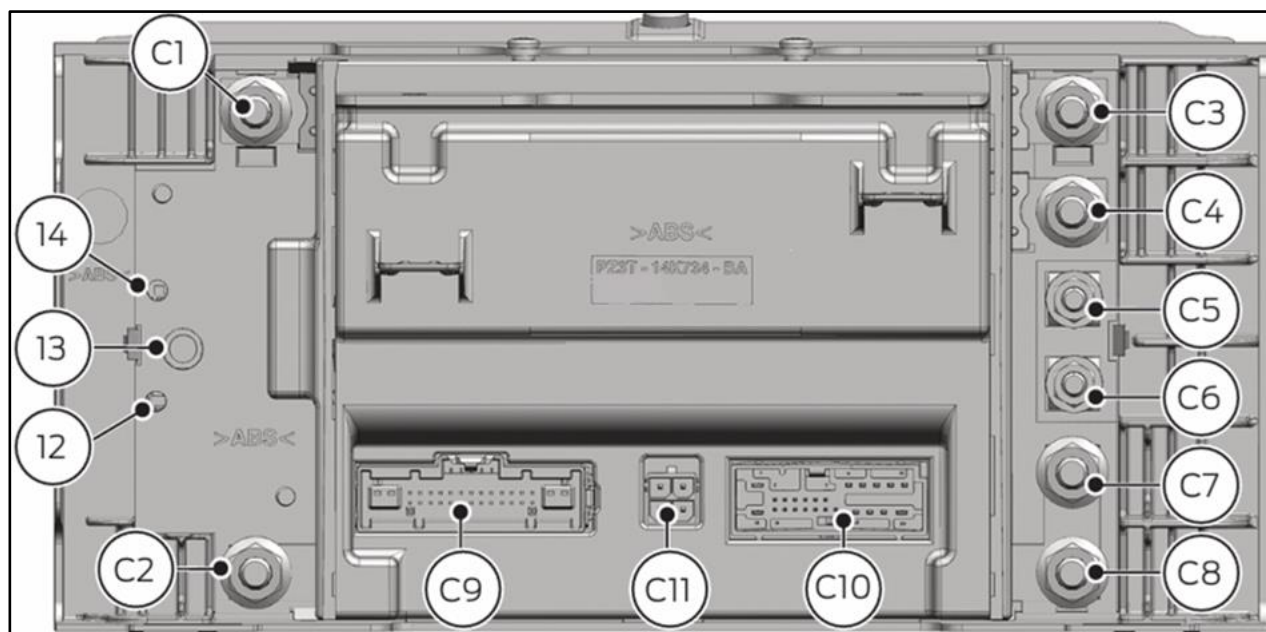


**Removal of the cover from the intelligent interface for additional power tap incl. fuse (ISL)**

When access to the seat base is established, the ISL can be accessed. To remove the cover of the ISL, slide it up. After the cover is removed, all pins, eyelets and Wi-Fi activation button are accessible. Removing the cable clips from the elements on the housing of the intelligent interface for additional power tap incl. fuse makes access easier if necessary. To replace the cover, align the cover with the profiles and push it back down until it is fully in place.

**Removing the ISL cover**

## Information about the vehicle connector



No.	Description	No.	Description
C1	Positive battery connection B+	C8	Additional battery 2, negative battery connection B-
C2	Negative battery connection B-	C9 *	30-pin vehicle connector
C3	Additional battery 1, positive battery connection B+	C10	24-pin retrofit interface connector
C4	Additional battery 2, positive battery connection B+	C11	Not assigned!
C5	40 A MOSFET output	12	Wi-Fi LED
C6	40 A MOSFET output	13	WiFi button
C7	Additional battery 1, negative battery connection B-	14	Status LED

## 30-pin vehicle plug C9 \* Not to be used by the Converter

Pin	Description
1	B+ Volkswagen battery +12 V power 15 A
2	Ignition terminal 15 +12 V input 10 A
3	Activate the CCP relay input
4	Deactivate CCP relay +12 V
5	Not assigned!
6	Deactivate CCP relay – earth (100 ms)
7	No connection
8	BMS LIN (read only)
9	Vehicle speed input
10	Activate CCP relay +12 V
11	No connection
12	Activate CCP relay – earth (100 ms)

13	No connection
14	BMS-2/3 LIN (ISL TxRx)
15	Deactivate CCP relay input
16	Engine operation input
17	Earth – module
18	Temperature sensor cable +
19	SRC output for lock – earth / Retrofit High Performance mode
20	Temperature sensor cable -
21	No connection
22	No connection
23	No connection
24	No connection
25	Speed regulator -
26	Speed regulator +
27	EPAS load shedding input – earth
28	No connection
29	No connection
30	No connection

**24-pin connector C10 (retrofit interface connector)**

Pin	Description
1	20 A MOSFET output
2	BMS additional battery
3	No connection
4	Request to open relay immediately – earth
5	Request to close relay immediately – earth
6	SRC input for lock / Retrofit High Performance mode
7	Auto. Speed controller – earth
8	10 A MOSFET output
9	10 A MOSFET output
10	10 A MOSFET output
11	Engine operation output – earth
12	No connection
13	20 A MOSFET output
14	No connection
15	Ignition output
16	Input 1
17	Input 2
18	Input 3
19	Input 4
20	Input 5
21	Input 6
22	Input 7
23	Input 8
24	20 A MOSFET output

The intelligent interface for additional power tap incl. fuse has 8 inputs and 8 outputs. Each input controls a corresponding output. The inputs are high-side controlled, support both digital and analogue signals, and operate in the +12-V range. The following table shows which input pin number controls which output pin number:

**Inputs and outputs of the intelligent interface for additional power tap incl. fuse**

Input	Pin		Output	Pin
Input 1	C10-16	controls	Output 1 – 10 A	C10-8
Input 2	C10-17	controls	Output 2 – 10 A	C10-9
Input 3	C10-18	controls	Output 3 – 10 A	C10-10
Input 4	C10-19	controls	Output 4 – 20 A	C10-1
Input 5	C10-20	controls	Output 5 – 20 A	C10-13
Input 6	C10-21	controls	Output 6 – 20 A	C10-24
Input 7	C10-22	controls	Output 7 – 40 A	C5-1
Input 8	C10-23	controls	Output 8 – 40 A	C6-1



#### 4.23.6 Functions of the battery monitor – fuse box

The intelligent interface for additional power tap incl. fuse (ISL) must be used for the programmable battery monitor function (PBG).

##### Warning note

The maximum protected current at the intelligent interface for additional power tap incl. fuse is 200 A. The continuous current load capacity depends on the retrofitted system and the conversion.

##### Warning note

The ISL can disconnect the retrofitted system when the engine is running or switched off. If sensitive devices are installed in the retrofitted system, the Converter must ensure that there is protection against a power interruption.

##### Warning note

The system cannot be ordered with the Volkswagen 400-W inverter.

##### Information

Battery monitor should always be used when a power supply is required when the engine is switched off.

##### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

#### Intelligent interface for additional power tap including fuse – system overview

The battery monitor is an intelligent energy management system that provides power for retrofitted electrical systems when the engine is running or switched off.

## Function

- State of Charge Protection: The ISL opens the internal relay when the state of charge (SoC) of the vehicle batteries drops to a certain percentage. This ensures that the vehicle remains ready to start. To avoid starting problems, it is recommended to charge the batteries via a mains charger or while the engine is running, after a disconnection due to the charge level.
- Cable temperature monitoring: The ISL disconnects the internal relay when the power cable temperatures rise above a certain temperature to avoid heat problems on the cables. It is recommended to leave the system at rest for at least 10 minutes after a disconnection due to the cable temperature.
- Alternator protection: The ISL disconnects the internal relay if the voltage level drops below a certain threshold value during engine operation in order to protect the alternator. The system will automatically reconnect after 4 minutes when the system voltage recovers.
- Mains charger protection: The ISL automatically detects the connection of a mains charger and distributes the charge to all batteries in the system, including the retrofitted batteries. ISL also recognises and responds when the mains charger is connected to the retrofitted battery.
- Charging the retrofitted battery: The ISL monitors the voltage of the retrofitted battery when the engine is switched off and activates a conventional charge level when the retrofitted battery has to be charged.
- Load shedding: The ISL accepts the onboard supply control unit (BCM) as the master at the load shedding signal when the engine is running. If the BCM requests the disconnection of retrofitted electrical equipment, the ISL immediately interrupts the connection until the disconnection command is cancelled by the BCM. When the engine is switched off, the ISL is the master for disconnecting retrofitted electrical equipment.
- Control of the intelligent interface for additional power tap incl. fuse (ISL): The logic of the ISL controls the internal relay with the engine running (except for the onboard supply control unit signal as the master for EPAS load shedding) and with the engine stopped. The status of the power supply main relay is replicated to the output signal of the ISL. Accordingly, when the power supply main relay is connected, the ISL is also connected. Otherwise, both are disconnected.
- Engine-in-operation signal: The ISL provides a 1,000 mA low-side driver output signal for retrofitted systems when the engine is running. The signal can be used to indicate to the retrofitted component that the engine is running.
- Retrofit High Performance mode – SRC / start/stop / AEIS lock / SBG time limit lock: The ISL sends a Retrofit High Performance mode signal to the vehicle to temporarily suspend the functions. An earth input is available to the user at the interface connector that can be used to suppress these functions. For this purpose, the input is connected to earth if required by the retrofitted device. The function controls the voltage in a narrow range of 13.5 V to 15.25 V, where SRC varies between 12.2 V and 15.2 V. The Retrofit High Performance mode must not be used permanently. The ISL also sends a temporary blocking signal to charge the retrofitted battery if necessary. The function must be used for applications with high current requirements during engine operation in order to avoid voltage dips.
- Immediate relay opening: The ISL opens the contacts immediately when the input for immediate opening of the relay is earthed. It is not recommended to use the function as a safety switch. The function is only effective if the module and the connections are set up correctly. A separate safety switch is recommended for protection.
- Immediate relay closing: The ISL immediately closes the relay contacts when the input for immediate relay closing is earthed and the input for immediate opening is inactive.
- Automatic speed control: The ISL automatically changes the engine speed to increase the efficiency of the alternator and achieve a higher output power. This is necessary when high current demand causes a voltage drop in the system and the idling speed of the engine is not sufficient for the alternator to deliver the required voltage. The function is equipped with open wires on the 24-pin retrofit interface connector of the ISL. The Converter must complete the system in accordance with these instructions:

1. There are two contact pins for the speed control – speed control 1 and 2 – (C9 connector pin and 25) which must be connected to the engine speed cable loop of the vehicle. To check that the pins are connected correctly, the voltages between the pins must be checked after the connection. The voltage must be 4.34 V when the function is not activated and 4.65 V when the function is activated. If the voltage is 1.84 V, the connection must be reversed.
2. There is a speed activation pin (C10 connector pin 7) that must be switched to earth for activate the function and to open circuit to deactivate the function. The switched earth connection must be set up by the Converter.
3. If the system is activated and the pins for the speed control are connected to the speed cable loop, the system will automatically increase the engine speed by one step after 1 minute if the voltage remains below 14.0 V. The preset speeds are 1,100, 1,600 and 2,030 rpm. If the voltage remains above 14.5 V for 1 minute while the engine speed is increased, the system will lower the engine speed until idling speed is reached.

**Intelligent interface for additional power tap incl. fuse, diagnosis mode**

Function/signal	Status	LED colour sequence*
12-V Volkswagen battery (battery detection and power supply)	OK	G
	Low voltage	OO
12-V converter (battery detection)	OK	G
	Low voltage	OOO
	Open circuit	RRR
Alternator protection during engine operation	OK	G
	Lower voltage limit	RRRR
Power disconnection warning	Not triggered	G
	Triggered	OOOOO
External battery charger – engine off	Not identified	G
	>13.5 V detected	O-O
	IGN2 detected	R-R
Overvoltage protection (>15.8 V)	Not identified	G
	Overvoltage	RRO
Retrofit High Performance mode – output for locking	Not triggered	G
	Triggered	OO-O
Retrofit High Performance mode – input for locking	Not triggered	G
	Triggered	O-OOO
Immediate opening of the relay contacts	Not triggered	G
	Triggered	OO-OO
Immediate closing of the relay contacts	Not triggered	G
	Triggered	OOO-O
Ignition position 2 (IGN2) – engine on	OK	G
	Open circuit	RRR-RR
Internal ISL error	No error	G
	Soft voltage reset (ignition cycle)	RRR-R

\*Green (G), red (R), orange (O), dash (-)

**General LED status**

Function / signal	LED colour sequence
No error	G
Volkswagen battery low	OO
Converter battery low	OOO
Converter battery open	RRR
Alternator malfunction during engine operation	RRRR
Current disconnection malfunction	OOOOO
Malfunction with the connected external battery charger	O-O
External battery charger for ignition has a fault	R-R
Overvoltage warning malfunction	RRO
SRC lock malfunction	OO-O
Converter SRC lock	O-OOO
Emergency relay open	OO-OO
Immediate relay closing	OOO-O
Ignition position 2 status	RRR-RR
ECRM internal soft reset	RRR-R
Battery malfunction	GOR- -GOR
All battery malfunctions	OR- -OR- -OR
Battery One malfunction	OG
Battery Two malfunction	OGG
Battery Three malfunction	OGGG
Fuse 1 error	RG
Fuse 2 error	RGG
Fuse 3 error	RGGG
Fuse 4 error	RGGG
Fuse 5 error	RGGGGG
Fuse 6 error	RGGGGGG
Fuse 7 error	RGGGGGGG
Fuse 8 error	RGGGGGGGG
Fuse 9 error	RGGGGGGGGG

\*Green (G), red (R), orange (O), dash (-)

**ISL – Additional information**

- The ISL is protected with 200 A. If necessary, the mega-fuse can be downgraded by the Converter.
- During normal operation, you may hear a click when the relay contacts open and close. The operator must be informed of this if necessary.
- The +12-V main power supply is tapped from the battery cable. This interface must not be modified. If additional taps are required, they must be connected to the CCPs. See: [4.23 Connectors and connections](#)
- For long-term operation with a high load, the values and times specified below are possible. The system automatically disconnects to protect the wiring:
  - Up to 120 A=continuous
  - 121 A to 140 A=20 to 26 minutes
  - 141 A to 160 A=14 to 20 minutes
  - 161 A to 175 A=8 to 14 minutes
  - 176 A to 200 A=6 to 12 minutes
- The system automatically disconnects the load for approximately 10 minutes to cool down after the maximum wire temperature has been reached.  
Different system conditions can lead to a longer waiting time and shorter usage times, e.g. cable cross-section, cable length, and impedance in the system. It is recommended that the Converter tests the finished system to record the usage time and the cooling time.
- The 200 A mega-fuse of the programmable battery monitor (PBG) has a slow tripping characteristic that enables higher currents for a short period of time. Example: 270 A = min. 30/max. 1,800 seconds. For system-specific questions, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).
- Mains chargers have multi-stage operation (including trickle charging) – this function must be checked before installation, as the system connects all batteries to the battery charger.
- Before setting up power and signal connections, the Converter must de-energise the system to avoid the risk of contact between the +12 V and the vehicle body.
- For high load applications, the total system impedance must be calculated to be able to respond to voltage drops. Use a power cable that is as short as possible with the correct cross-section area.

See: [4.1 Overview of the electrical system](#) for the wiring specification table.

**4.23.7 Additional vehicle signals/characteristics****Warning note**

When wiring high-side driver outputs for specific lighting, the additional signal taps, relays and peripheral devices must be compatible with a pulse width modulation (PWM) frequency of 200 Hz.

For details on the vehicle signals and functions, please refer to [chapter 4.4.8 Circuit diagrams](#).

## 4.24 DC/AC converter (inverter) 230 V (PPOB)

### Information

2 kW DC/AC converter (inverter) 230 V (PR number 9Z3) is only available for BEV and PHEV versions.

### Information

PPOB for campers is supplied on a transport bracket, which must be changed for the final installation. A longer cable (845 mm) is also supplied to provide greater flexibility for final positioning.

On vehicles with right-hand rear side trim, the unit is attached behind the supplied access panel.

If a rear socket plate is required and must be installed in the body, the following parts are required:

7TG919309 or 7TG919309B: EU socket for Transporter panel van

UK socket for Transporter panel van\*

### PPOB for Transporter panel van



\*Cable length from the tip of the strain relief to the grommet: 425 mm

EU socket for camper\*

UK socket for camper\*

PPOB plate holder\*

\* – See Electronic Repair and Workshop Information System of Volkswagen AG (erWin\*) <https://volkswagen.erwin-store.com/erwin/showHome.do> (information system of Volkswagen AG subject to a charge)

The PPOB function will not work until the rear socket is installed (is reset during the next ignition cycle).

The rear outlet is water resistant, but should be installed in such a way that it is protected from direct water spray. The cable connections are sealed and do not need to be protected from the weather.

The rear socket should be installed on a vertical surface.

#### PPOB for campers



\*Cable length from the tip of the strain relief to the grommet: 845 mm

#### Location of the PPOB socket plate



## 4.25 Earth connection

### 4.25.1 Earth connections

#### Warning note

For high-current applications, it is recommended to use only one eyelet per bolt. If the use of more than one eyelet per bolt cannot be avoided, the eyelet over which the most current flows must be positioned closest to the supply connection. Do not use more than two eyelets or crimp connections per bolt.

The earth connections recommended for use are shown in the figure below and the table below.

The bracket of the wiper motor must not be used as an earth as it is insulated from the body.

#### Practical note

Use only the specified earth connections. Using other connections can cause malfunctions.

Make sure all earth connections are tightened to the correct torque.

#### Information

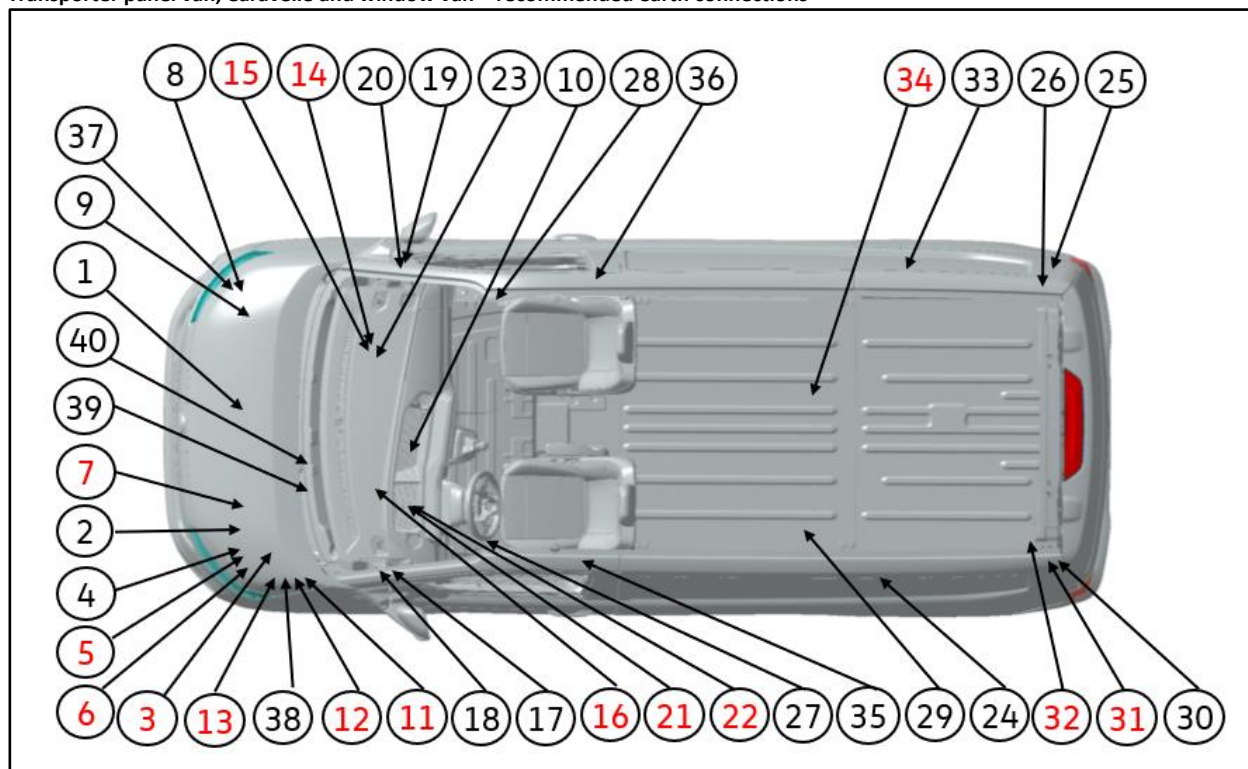
The numbers of the earth connections (GP) are used as a reference to clarify the position of the respective GP.

Earth cables must be routed to the existing Volkswagen earth connections. For very high current consumers, it is recommended to connect the earth directly to the connection near the battery earth connection.

See: [4.5 Battery systems](#)

If a new earth connection is required, avoid areas exposed to the weather, especially for high-current earth connections. Earth connections should be located near the +12 V supply connections. This reduces the electromagnetic field generated by inrush/starting currents in particular, and improves electromagnetic compatibility.



**Transporter panel van, Caravelle and window van – recommended earth connections**


Earth connection points marked in red are safety-critical and must not be used as additional earth connection points

\* When electrical/electronic devices are connected to the circuit, they can receive earth interference signals/feedback

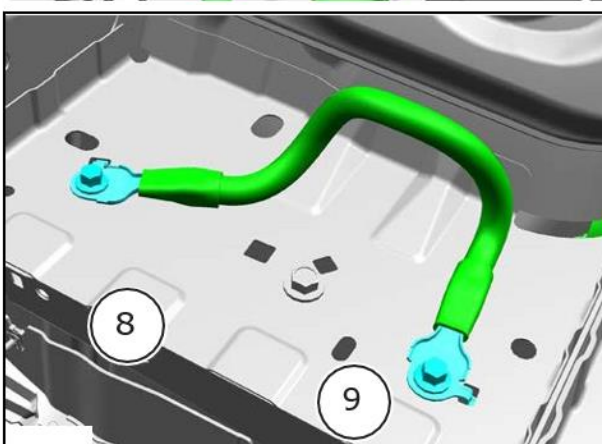
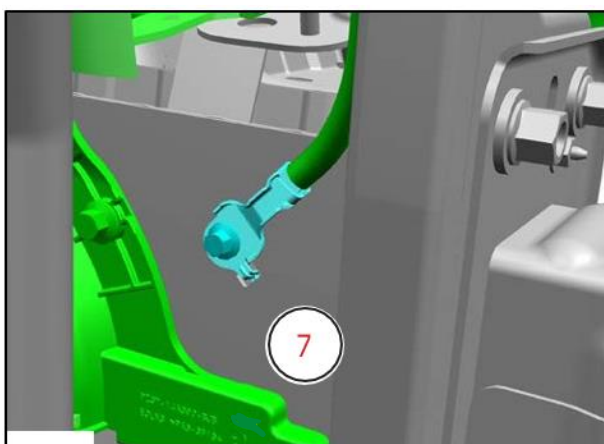
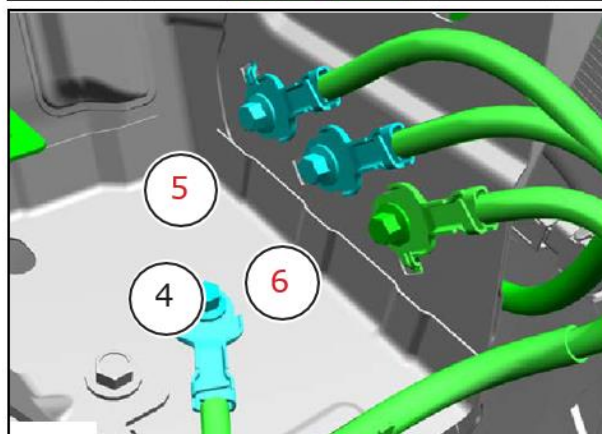
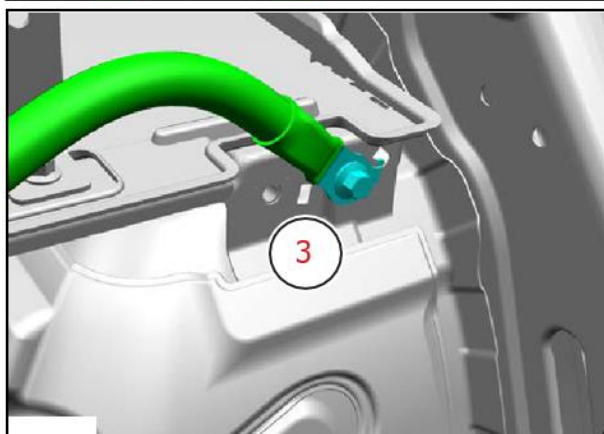
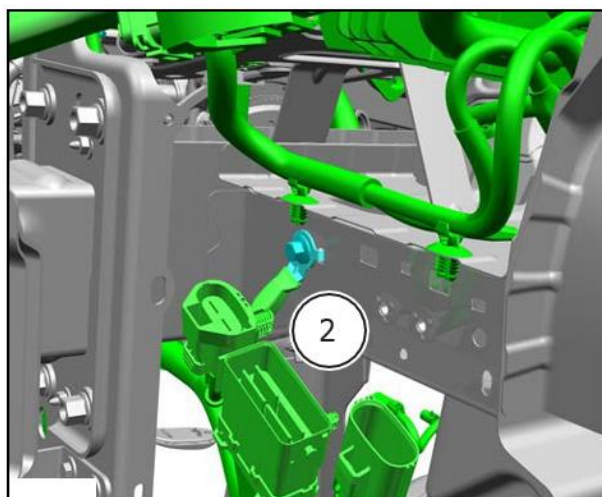
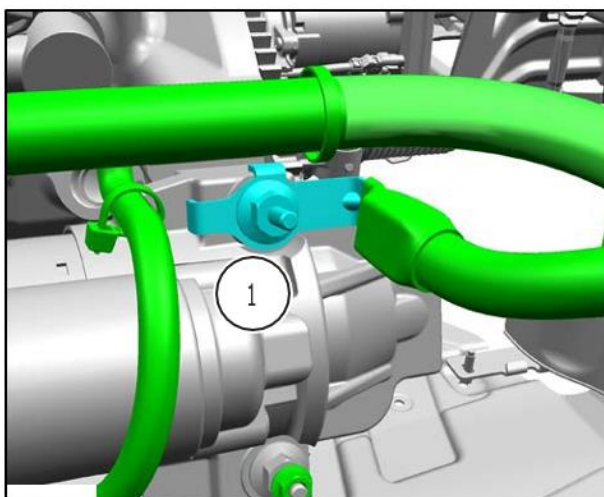
No.	Installation position	Type (using the earth connection)	Vehicle type	Drive train	Wiring harness
1*	Engine compartment, front	Main battery to engine	V/B/K camper	ICE	14305
2	Engine compartment, left	Earth strap from engine to frame	V/B/K camper	PHEV/BEV	7C078/14K011
3	Engine compartment, left	Main battery to engine	V/B/K camper	All drives	14301
4*	Engine compartment, left	Radiator fan	V/B/K camper	All drives	14290
5	Engine compartment, left	GDM (Grounding Points in the Vehicle)	V/B/K camper	All drives	14290
6	Engine compartment, left	TCM, A/C connection, UPBD	V/B/K camper	All drives	14290
7	Longitudinal member, front left	PCM	V/B/K camper	All drives	14290
8	Engine compartment, right	Earth strap	V/B/K camper	ICE	90A000
9	Engine compartment, right	Earth strap	V/B/K camper	ICE	90A000
10	Floor panel, front	Earth for additional battery	V/B/K camper	ICE	14300
11	Engine compartment, left	RF headlights, horn	V/B/K camper	All drives	90A000
12	Engine compartment, left	EBB (electronic brake servo)	V/B/K camper	All drives	90A000
13	Engine compartment, left	EBB (electronic brake servo)	V/B/K camper	All drives	90A000
14	Cross member, right	Instrument cluster, ICP, diagnosis	V/B/K camper	All drives	92A000
15	Cross member, right	AHU, sync 4.0	V/B/K camper	All drives	92A000
16	Cross member, left	Air conditioner, EPB SW, display	V/B/K camper	All drives	92A000
17	A-pillar, left	UPBD, power supply Windscreen	V/B/K camper	All drives	90A000
18	A-pillar, left	IPDB, electrical window regulator	V/B/K camper	All drives	90A000
19	A-pillar, right	Additional PDB and retrofit	V/B/K camper	All drives	90A000
20	A-pillar, right	Electric window regulator, mirror, roof, retrofit, DRW	V/B/K camper	All drives	90A000

No.	Installation position	Type (using the earth connection)	Vehicle type	Drive train	Wiring harness
21	Longitudinal member, front left	EPAS	V/B/K camper	All drives	3C221
22	Longitudinal member, front left	EPAS	V/B/K camper	All drives	3C221
23*	Cross member, right	Heater fan, diagnosis	V/B/K camper	All drives	92A000
24*	Body side, centre left	Electric side load compartment door, left	V/B/K camper	ICE	93A000
25	D-pillar, right	Roof console	V/B/K camper	ICE	94A000
26*	D-pillar, right	Electric side load compartment door on right, blower motor in rear	V/B/K camper	ICE	94A000
27	Floor panel, front	Driver's seat assembly	V/B/K camper	ICE	90A000
28	Floor panel, front	Front passenger seat assembly, AC socket	V/B/K camper	ICE	90A000
29*	Longitudinal member rear left	Fuel pump	V/B/K camper	ICE	14406
30	D-pillar, left	Amplifier, parking brake motor, ball coupling earth	V/B/K camper	ICE	93A000
31	D-pillar, left	Intel. torque coupling (solenoid switch)	V/B/K camper	All drives	14406
32	Longitudinal member rear left	LHD PSD, rear wiper, catches, control unit	V/B/K camper	ICE	93A000
33	Body side, centre right	Electric side load compartment door, right	V/B/K camper	ICE	94A000
34	Cross member 3	NOX, PM sensor, active solenoid switch, exhaust	V/B/K camper	ICE	14406
35	Left B-pillar	Rear seat heating, rear background lighting	V/B/K camper	PHEV/BEV	90A000
36	B-pillar, right	Rear seat heating, rear ambient lighting	V/B/K camper	PHEV/BEV	90A000
37	Engine compartment, right	Earth strap	V/B/K camper	BEV	90A000
38	Engine compartment, left	HV components	V/B/K camper	PHEV/BEV	90A000
39	Engine compartment, front	BEV air conditioner compressor	V/B/K camper	BEV	14K011
40	Engine compartment, front	Cylinder block	V/B/K camper	PHEV	7C078

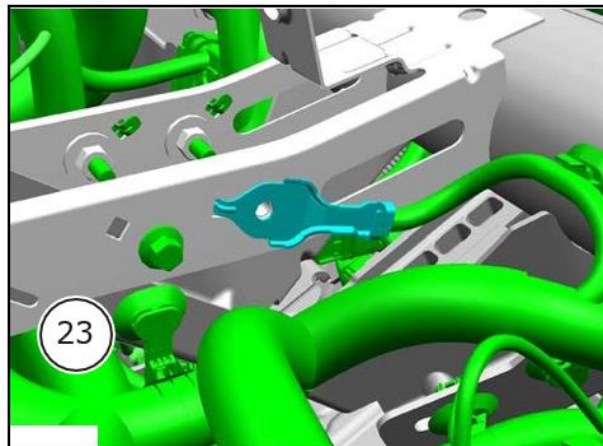
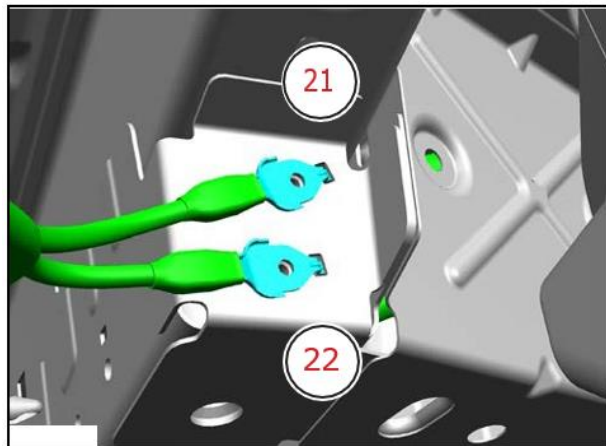
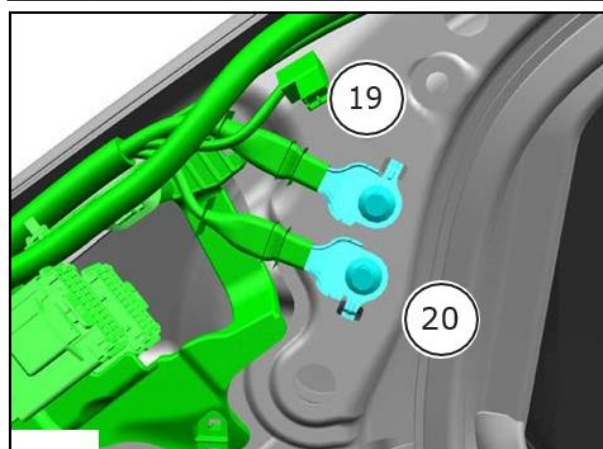
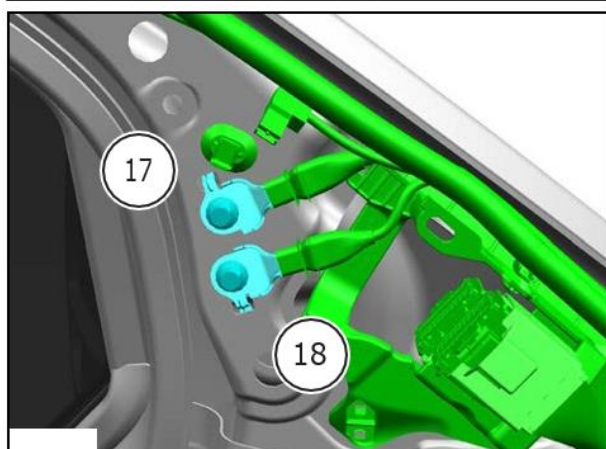
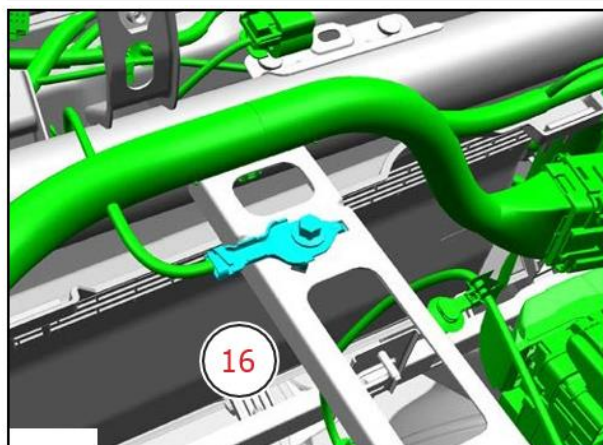
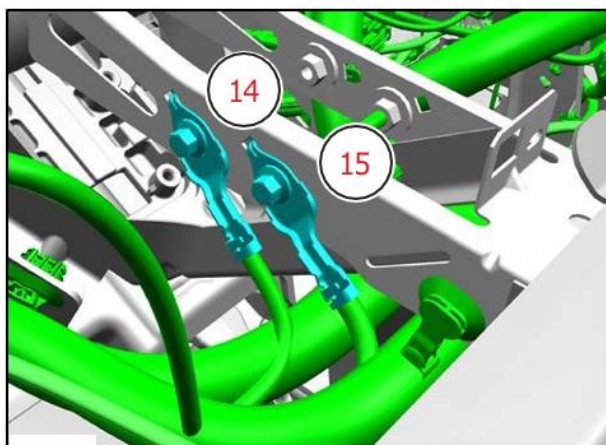
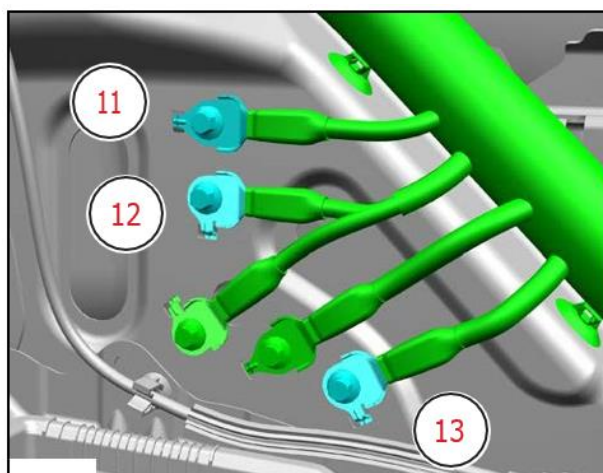
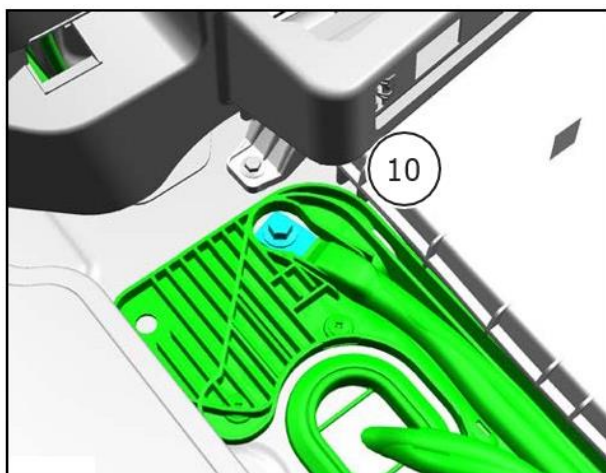
V = van

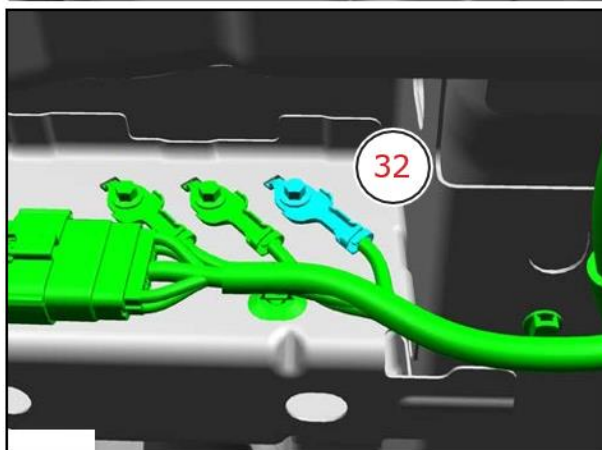
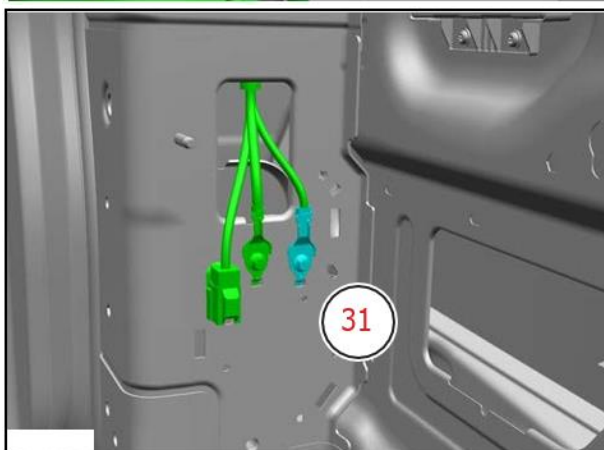
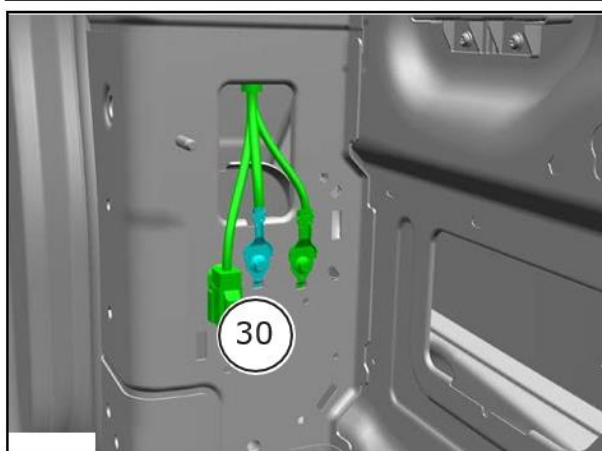
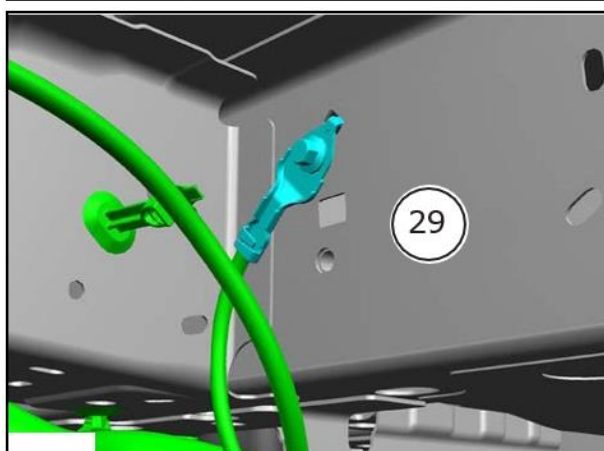
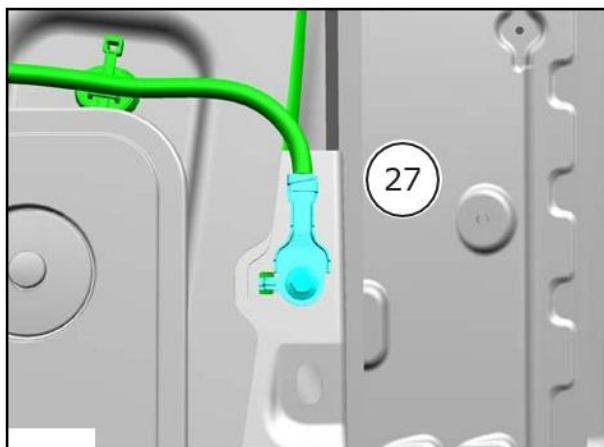
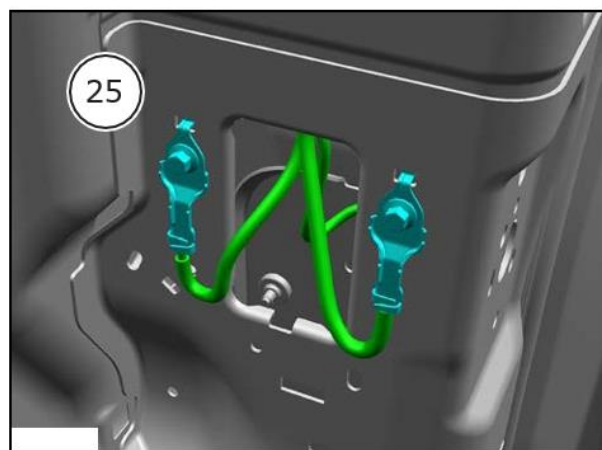
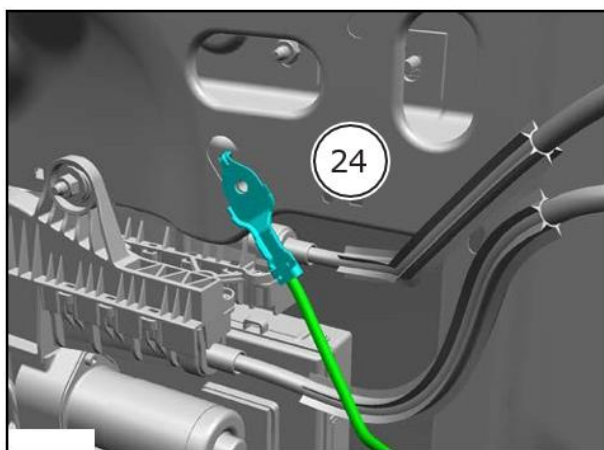
B = bus

K = window van

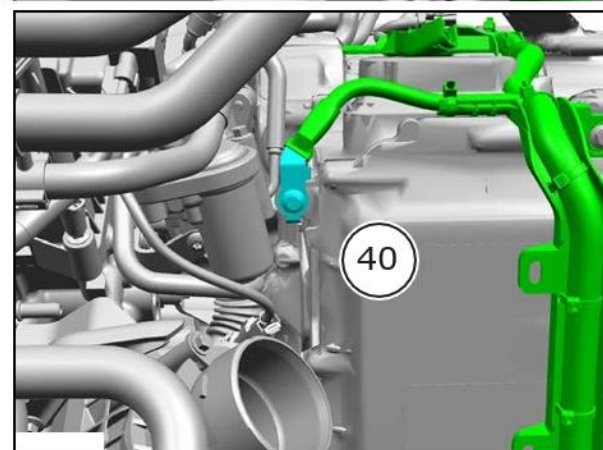
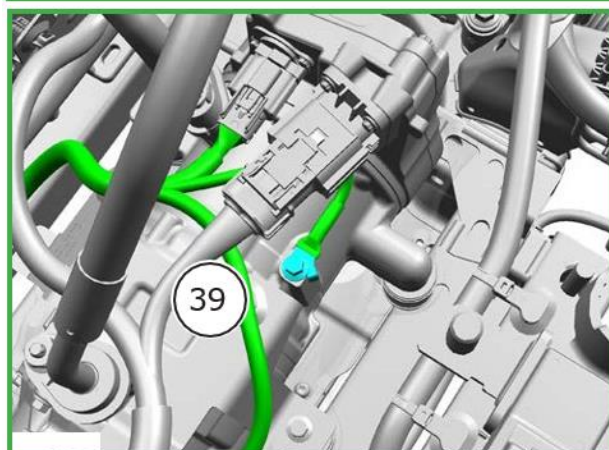
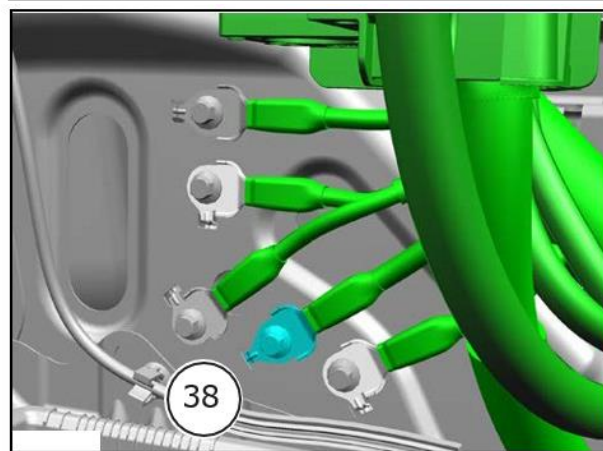
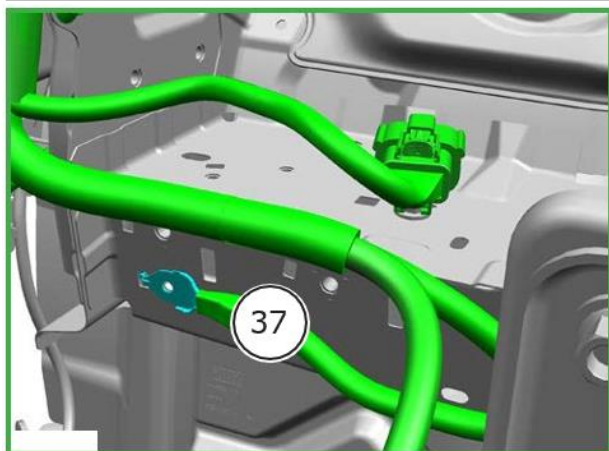
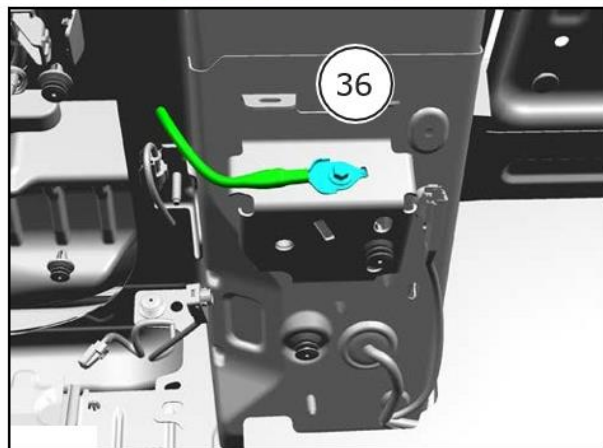
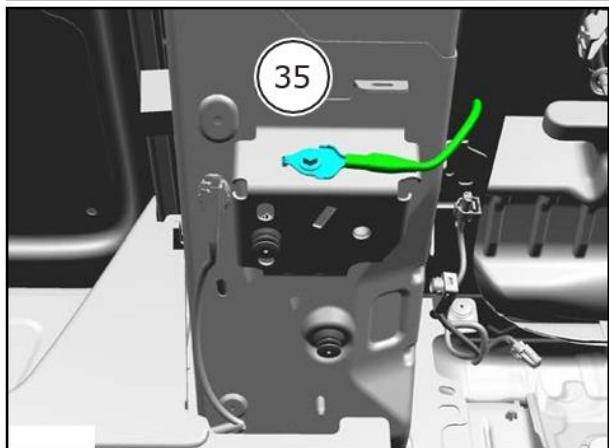
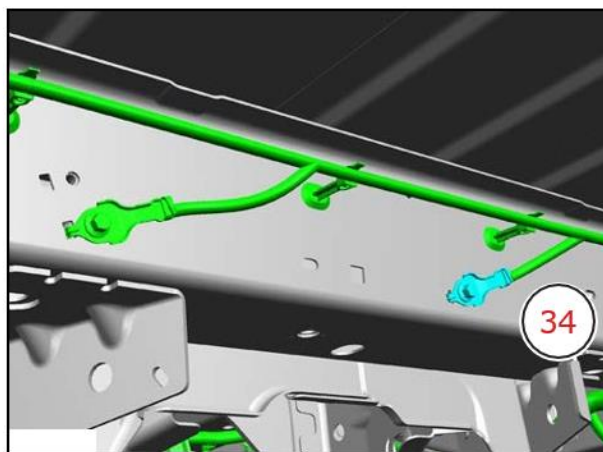
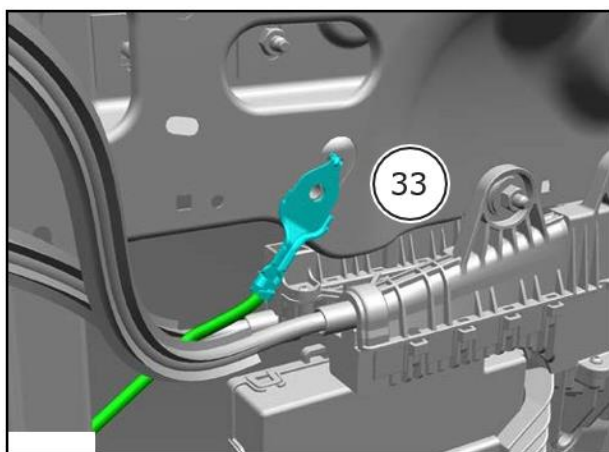












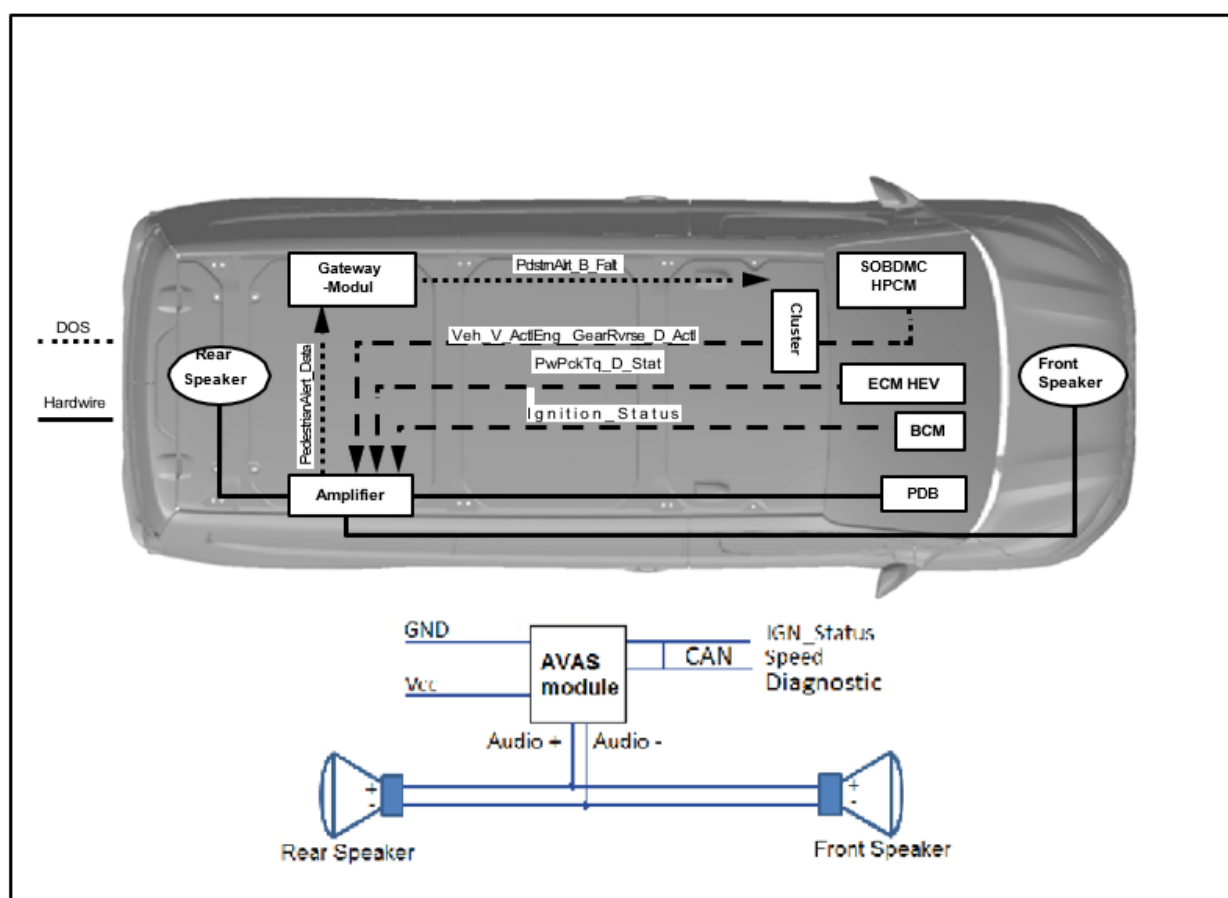
## 4.26 Acoustic vehicle alarm system (AVAS)

### Warning note

The components of the AVAS system must not be modified or their position in the vehicle changed. The warning of the vehicle's acoustic warning system is required by law.

All Transporter panel van / window van BEV/PHEV vehicles are equipped with AVAS (Acoustic Vehicle Alerting System). It is not permitted to remove the AVAS speaker, change its position or conceal it.

### AVAS system



## 5. Body and paintwork

### 5.1 Body

#### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

#### 5.1.1 Body design – general information

#### Warning note

All fastener or cable holes in the floor, sides or roof must be sealed with plugs, grommets or tape to prevent harmful liquids, gases and heat from entering the interior. Seal components must be resistant to a temperature of at least 95°C and should retain their sealing function at this elevated temperature for at least 30 minutes.

#### Warning note

Extreme heat, such as in paint drying ovens, leads to damage to the high-voltage battery. Before using a paint drying oven for more than 45 minutes or at temperatures above 60°C (140°F), the high-voltage battery must be removed. Failure to observe this instruction can result in damage to the high-voltage battery, which can lead to serious or fatal injuries due to a fire or explosion. Please observe the Volkswagen Transporter panel van Workshop Manual.



**Warning note**

The following components, as they were installed by Volkswagen AG, must not be removed, moved, changed or modified in any way:

- High-voltage battery, battery connector, battery holder (support structure), subframe, energy absorption elements, brackets and hardware
- Structure of the front section, including aluminium extrusion profile (“megabrake”), brackets and hardware

**Warning note**

All fasteners through the vehicle floor, sides or roof must be sealed.

Before drilling, see figure in [chapter 5.1.3](#) to identify the parts made of boron steel.

Before drilling floor panels, check the no-drilling zones; see section [5.1.4 No-drilling zones](#) on the floor: Transporter panel van with diesel engine.

**Practical note**

Uneven load distribution may result in unacceptable vehicle handling and braking behaviour.

For vehicle conversions, the following points should be observed:

- Ensure that the structural integrity of the vehicle is maintained.
- Do not drill into closed frame body components.
- Make sure that modifications to the body or add-on structures allow an even load distribution.
- Repaint metal edges after cutting or drilling. All metal edges must comply with the safety regulations for internal and external safety.

Make sure that the body is completely sealed after cutting and drilling to prevent vapours, water, salt, dust and the like from entering the vehicle. Use sealing and finishing materials approved by Volkswagen, as well as corrosion protection for the underbody. See: [5.13 Corrosion protection measures](#)

- Make sure that fasteners in the B-pillar area do not interfere with the seat belts and seat belt rollers.
- Check that chips/debris from work on the B-pillar do not contaminate the seat belts:

For individual fasteners on the floor, see “Frame drilling and tube reinforcement”. See: [5.14 Frame and structure](#).

For load compartment lashing (load lashing points). For additional no-drilling zones. See: [4.2 Instructions for cable installation and routing](#) and see: [5.6 Body openings](#).

### 5.1.2 Welding

#### Warning note

Before welding, refer to the figure in [chapter 5.1.3](#) to identify the parts made of boron steel.

Before welding work is carried out on a vehicle body, all safety measures must be taken to protect persons, parts and electrical components.

#### Electronic components

#### Information

After disconnecting the power supply and before starting any further work, you must wait up to 15 minutes, depending on the truck. Work on airbag systems may only be carried out by specially trained personnel.

Due to the increased use of comfort and safety electronics in modern motor vehicles, extreme caution must be exercised when carrying out body work. Overvoltages that occur during welding and alignment work when finishing the body shell can damage electronic systems.

In particular, the safety instructions for welding work on vehicles with airbag systems must be observed.

Please note the following points:

- Disconnect the earth cable from the battery and cover the negative terminal
- Unplug the connector from the airbag control unit
- For welding work in the immediate vicinity of a control unit, the control unit must be removed beforehand
- Never connect the negative wire of the electric welding unit near an airbag or a control unit
- Connect the negative wire of the electric welding unit near the welding point

#### Before welding

The interior surfaces of the new body parts must be pre-painted if they are no longer accessible after assembly. The welding flanges are treated with special welding primer.

The connection areas are not always accessible from the inside later on, so prepare these areas so that no soot is produced by burning paint during the welding.

### Information

To ensure that the factory corrosion protection is not destroyed, the working area must be kept as small as possible.

Do not touch cleaned metal with your bare hands. The moisture on your hands causes the metal to corrode.

#### Procedure:

- Use a pinch brush to remove the primer or the paint and zinc layers in the welding area to prevent paint carbonisation
- Thoroughly clean and dry the welding area with a sheet metal cleaning agent
- Coat all sides of the welded flanges with a welding primer and allow to dry

### Information

The welding primer may only be applied thinly to the spot welding area in order to minimise spatter when welding.

#### The following points must be observed when welding:

- Zinc melts at approx. 420°C
- Zinc evaporates from a temperature of approx. 900°C
- The degree of heating determines the impairment of the zinc layer and thus the corrosion protection
- Resistance spot welding technology is particularly suitable for welding galvanised sheets, as there is no large-area heating
- In the case of electrolytically galvanised panels, the welding point does not require any special preparation as the zinc coating does not need to be removed

#### After welding

During the work, body panels are often heated up to a high temperature, which damages the corrosion protection. Follow-up work on the affected areas is therefore important:

- Level the weld seams and clean thoroughly with silicone remover. Dry with a lint-free cleaning cloth
- If the work area is accessible from the inside, the transition area to the paint must be ground for all types of joints so that the primer adheres well afterwards
- If the work area is not accessible from the inside and the cleaning and grinding work cannot be carried out, ensure that as little contamination as possible is present in the area of the repair. This means that the wax can enter the work area unhindered during the subsequent cavity sealing

### Information

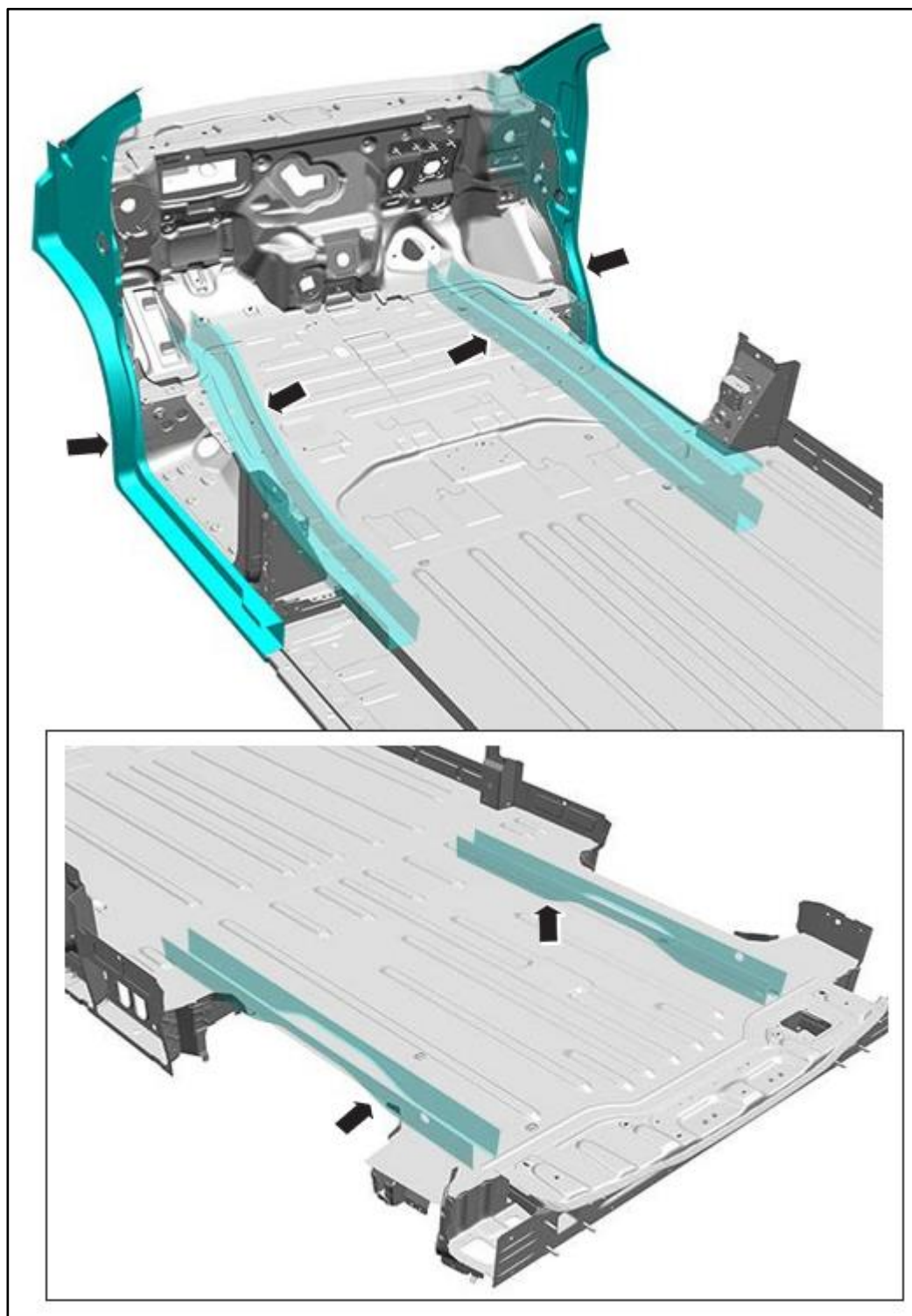
When cleaning the areas, apply only a small amount of sheet metal cleaner to the cleaning cloth. Make sure that no cleaner gets into the connecting flange to prevent the welding primer from being washed away.

### Primer after welding

A primer should be applied to the welded flanges after cleaning. The factory corrosion protection in the flange area must also be checked. Any damage must also be pre-primed.

#### 5.1.3 Parts made of boron steel

Parts made of manganese boron steel – no-drilling and no-welding zones



#### 5.1.4 No-drilling zones on the floor: Transporter panel van with diesel engine

##### Warning note

All fasteners through the vehicle floor, sides or roof must be sealed.

##### Warning note

Take particular care when drilling in the floors of the passenger compartment and the rear load compartment. The fuel tank, the DEF tank (urea), the brake pipes, the exhaust, the electric cables and the differential (four-wheel drive only) are located under the vehicle floor.

It is recommended to obtain CAD data from the Transporter panel van in order to understand the positioning of the vehicle components and the location of the fuel tank / AdBlue tank, fuel filler neck, routing of the wiring harness, coolant lines, and hydraulic brake lines. Suitable CAD data can be obtained from Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

When drilling holes / attaching fasteners to the vehicle floor, all components below the floor must be taken into account. It is strongly recommended to use drilling-depth stops. The depth of the stop must not exceed 25 mm (1.0").

##### Information

Repaint metal edges after cutting or drilling. All metal edges must fulfil the requirements for exterior and interior protection.

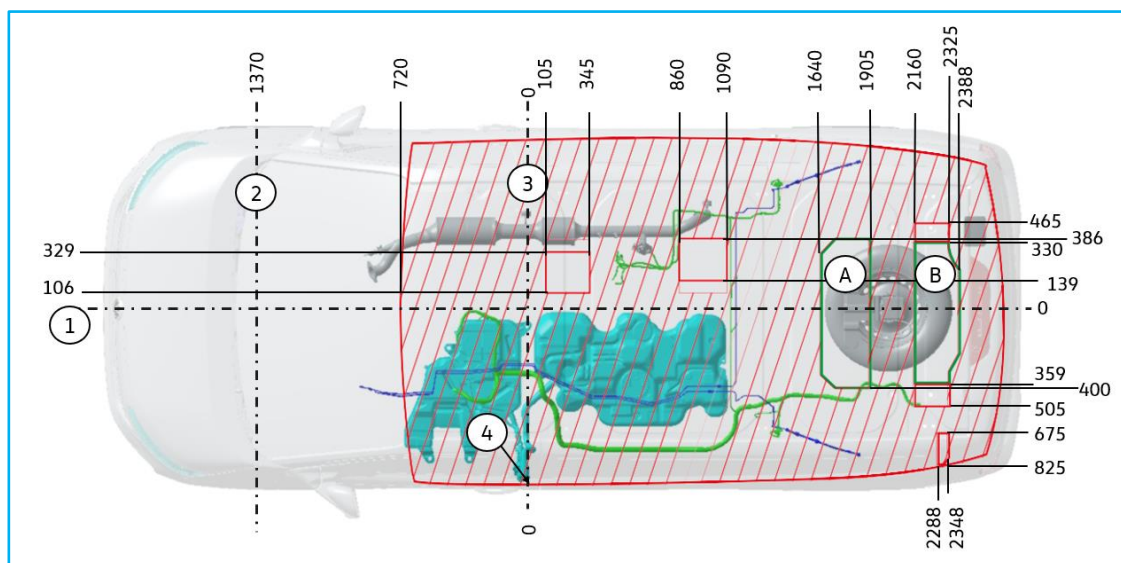
##### Information

All fasteners through the vehicle floor, sides or roof must be sealed.

See:

[5.1.1 Body design – general information](#)

[5.13 Corrosion protection measures](#)

**No-drilling zones – L1**

The view shows a vehicle with front-wheel drive

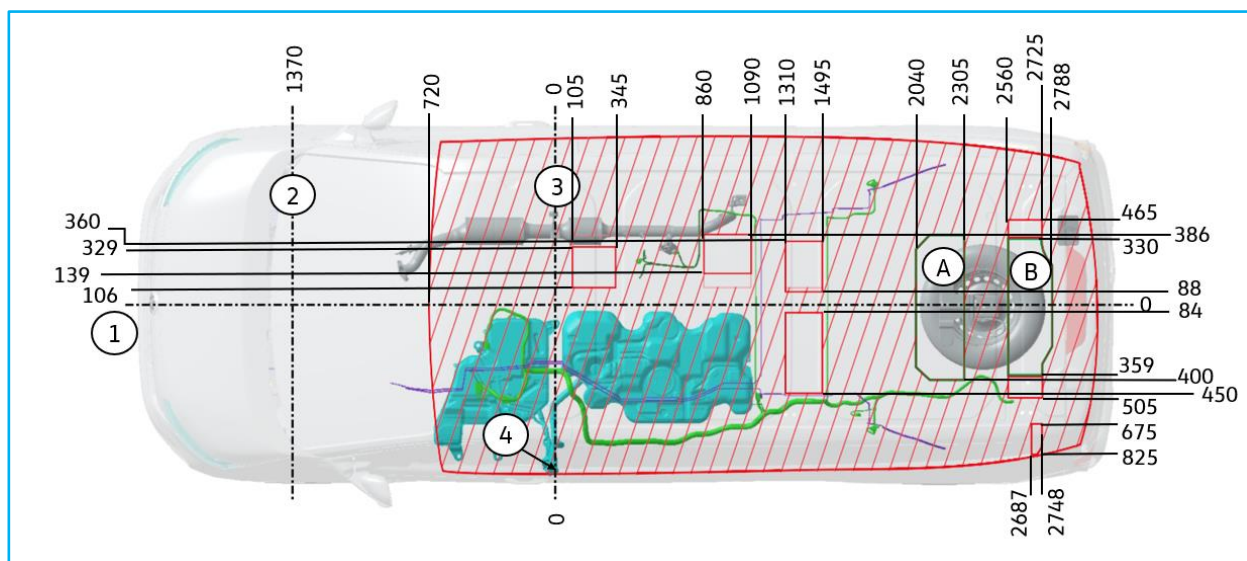
**No-drilling zones on the vehicle floor – special care must be taken in the shaded area**

1	Centre line of the vehicle	4	Fuel filler neck – B-pillar
2	Centre line of the front axle	A	In this area, drilling is only possible for FWD (not AWD) and when the spare wheel has been removed
3	Centre line of the B-pillar	B	Drilling in this area is only possible if the spare wheel has been removed

**Colour code**

	Fuel tank / AdBlue tank		Brake lines
	Wiring harness		

## No-drilling zones – L2



The view shows a vehicle with front-wheel drive

## No-drilling zones on the vehicle floor – special care must be taken in the shaded area

1	Centre line of the vehicle	4	Fuel filler neck – B-pillar
2	Centre line of the front axle	A	In this area, drilling is only possible for FWD (not AWD) and when the spare wheel has been removed
3	Centre line of the B-pillar	B	Drilling in this area is only possible if the spare wheel has been removed

## Colour code

	Fuel tank / AdBlue tank		Brake lines
	Wiring harness		

### 5.1.5 No-drilling / no-welding zones on the floor – BEV/PHEV

#### Warning note

It is strongly recommended that you do not drill, weld, or perform any other work to prevent damage to the components under the vehicle floor, including the components of the high/low-voltage system, the high/low-voltage cables, and the coolant/alternating current/brake lines.

See separate instructions in [section 5.1.6 Transporter panel van – floor drilling – BEV/PHEV](#)

#### Warning note

Do not weld on the high-voltage battery, the box or the tray.

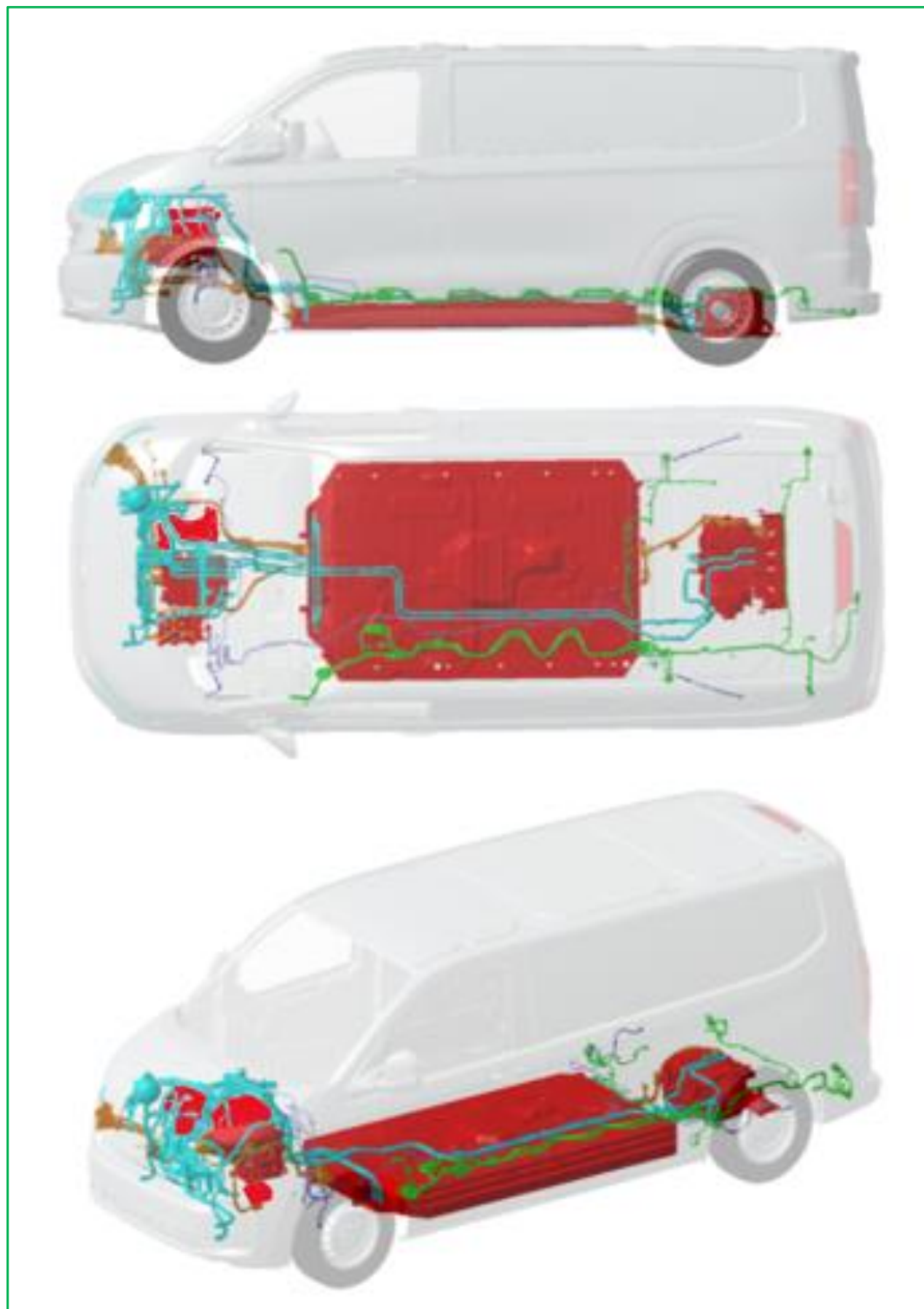
Do not earth welding equipment to the battery, the battery box or the battery tray.

The following two figures show the paths of high/low-voltage systems and cables, coolant/alternating current/brake lines, and the location of the battery/bracket and electric drive assembly for luggage compartment floors L1 and L2 for BEV and PHEV.

It is STRONGLY recommended that the Converter use 3D CAD data on the Transporter panel van to understand the placement of vehicle components, such as the routing of high and low voltage harnesses, coolant lines, alternating current lines, hydraulic brake lines, the exact position of the rear wheel drive unit, etc. CAD data can be obtained from Volkswagen Commercial Vehicles ([see chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

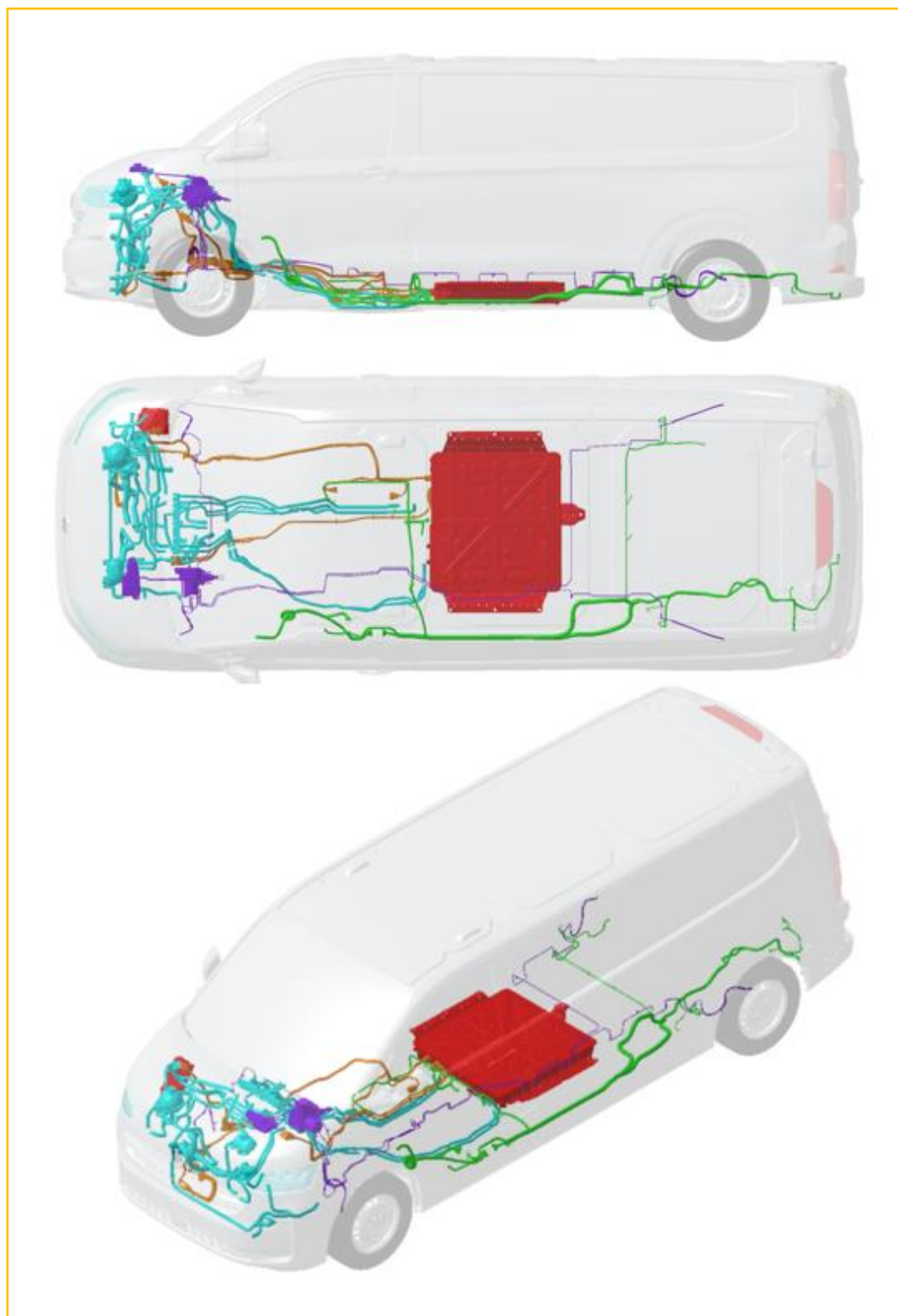







## No-drilling / no-welding zones on the vehicle floor – Transporter panel van, Caravelle, window van BEV



Colour key			
	High-voltage components		Brake lines
	Low-voltage cables		Coolant pipes
	High-voltage cables		

## No-drilling / no-welding zones on the vehicle floor – Transporter panel van, Caravelle and window van PHEV



Colour key			
	High-voltage components		Brake lines
	Low-voltage cables		Coolant pipes
	High-voltage cables		

### 5.1.6 Transporter panel van – floor drilling – BEV/PHEV

#### Warning note

All fastener or cable holes in the floor, sides or roof must be sealed with plugs, grommets or tape to prevent harmful liquids, gases and heat from entering the interior. Seal components must be resistant to a temperature of at least 95°C and should retain their sealing function at this elevated temperature for at least 30 minutes.

It is recommended not to drill holes in the areas marked in [section 5.1.5](#). However, some limited holes and fasteners are permitted on the load area of the BEV Transporter panel van variant, provided the following guidelines are expressly observed:

It is STRONGLY recommended that the Converter use CAD data on the Transporter panel van to understand the placement of vehicle components, such as the routing of high and low voltage harnesses, coolant lines, AC lines, hydraulic brake lines, the position of the rear wheel drive unit, etc. CAD data can be obtained from Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

Take protective measures when drilling or doing other work behind the B-pillar to prevent damage to the components under the floor of the Transporter panel van. Do not touch HV earth connections in the vehicle:

- When making holes / attaching fasteners to the vehicle floor to secure retrofitted parts, all components below the floor must be taken into account
- It is strongly recommended to use drilling-depth stops. The depth of the stop must not exceed 25 mm (1.0")
- Fasteners (including PlusNut® or equivalent) that protrude below the vehicle floor must not exceed 25 mm (1.0") (Figure 1)

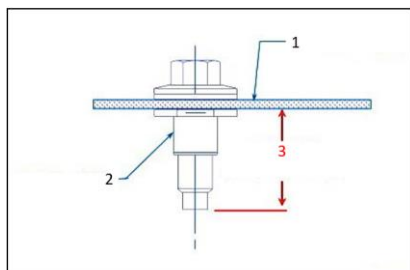


Fig. 1

1 – Vehicle floor (ref.)

2 – PlusNut or equivalent (ref.)

3 – 25 mm (1 inch) MAXIMUM DEPTH

- Fasteners (and/or alternative fastening methods) that protrude below the vehicle floor must be AT LEAST 50.8 mm (2.0") away from all surrounding high-/low-voltage cables and/or coolant lines and/or hydraulic brake lines to prevent damage/crushing. (Figure 2)

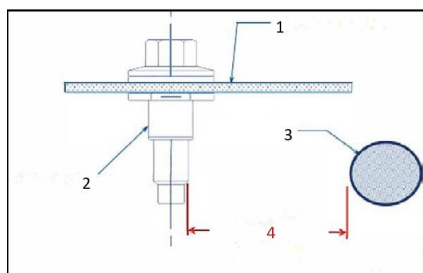


Fig. 2

- 1 – Vehicle floor (ref.)
- 2 – PlusNut or equivalent (ref.)
- 3 – Wiring harness (ref.)
- 4 – 50.8 mm [2 inches] MINIMUM DISTANCE

#### Information

Repaint metal edges after cutting or drilling. All metal edges must fulfil the requirements for exterior and interior protection.

See:

- [5.1.1 Body design – general information](#)
- [5.13 Corrosion protection measures](#)

### 5.1.7 Integrity of the front section for cooling, crumple zone, aerodynamics and lighting

#### Cooling system:

The continuous air circulation in the front part of the vehicle and in the engine compartment must not be impaired by the installation of additional devices.

#### Lighting:

Do not modify the lighting system under any circumstances.

#### Crumple zone:

Do not cut, drill or weld on components relevant to crash behaviour. Do not add any materials in the crumple zone. This could adversely affect the calibration of the frontal crash sensor.

## 5.2 Hydraulic lifting device

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

### General information

#### Warning note

Do not cut off structural supports under any circumstances.

Vehicles equipped with a lifting device must be designed so that they are stable even under adverse conditions when the supporting lugs are extended (if present).

Do not lift the vehicle off the ground.

#### Practical note

Safety devices must be used to ensure that the support feet are extended during operation of the lifting device.

Safety devices must be used to ensure that the support feet are securely stowed before starting to drive.

### Information

There are no mounting points in the floor. It is the responsibility of the converter to fix the device in place from below using the appropriate reinforcements.

For more information, see: [5.14 Frame and structure](#).

The Converter is responsible for:

- The attachment of stickers for safe use of the devices
- The separate laying of electrical and hydraulic lines at a distance from the original Volkswagen equipment
- The use of a suitable clip when attaching to the body and the subframe
- The installation of a main switch in the cab to isolate the entire system

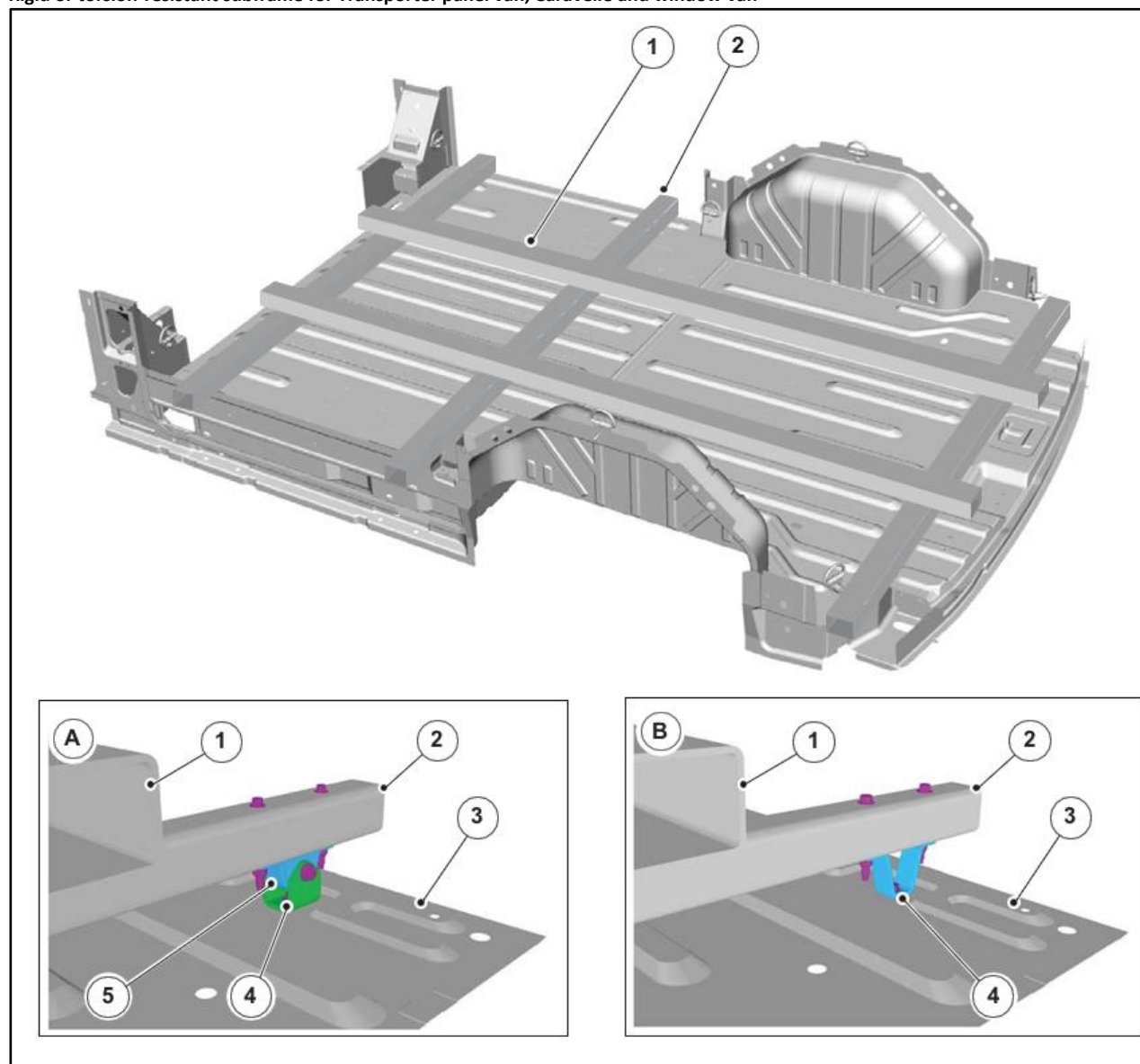
## Cranes and lifting platforms

It is recommended to design subframes in such a way that no harmful load is placed on the vehicle structure. Use flexible support bearings or rigid bearings for the installation in the vehicle. For information on the design principle, see the following figure.

For Transporter panel van / Caravelle and window van:

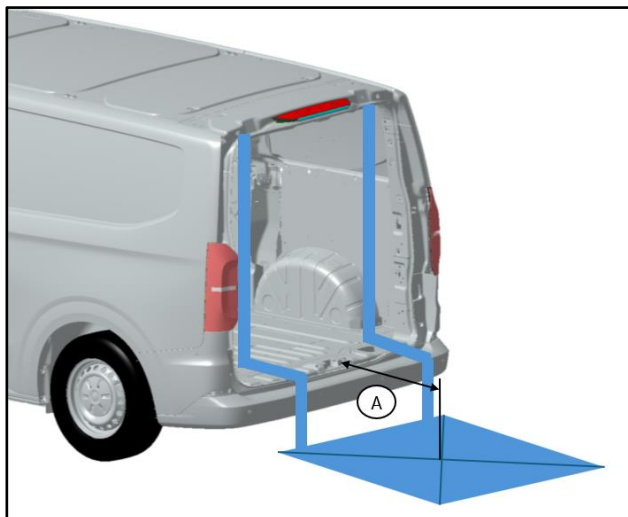
- M8 screws with property class 8.8 or higher are recommended for fastening each support bearing
- Every other contact point with the floor should be padded to avoid point loads and to ensure the functionality of the elastic support bearings
- Very rigid subframes should not be rigidly fixed to the floor. The figure below shows an example of an elastic support bearing. Flexible bushes should have a play of +/-12 mm at a deflection of 1.0 mm per 100 kg, with only the rear pair of brackets for securing the load compartment cargo being fixed
- Support feet, if required, must be attached directly to the subframe
- Support feet must be designed in such a way that they do not cause any adverse stresses on the vehicle construction when the equipment is being operated
- It is recommended to install the subframe at a certain distance from the ground as shown in the figure below

## Rigid or torsion-resistant subframe for Transporter panel van, Caravelle and window van



Element	Description
A	Flexible support
B	Rigid support
1	Longitudinal subframe
2	Subframe beam
3	Vehicle underbody
4	Attachment to the floor with suitable reinforcements
5	Flexible support bearing

## Hydraulic tail lifts



Element	Description
A	1,000 mm

It is recommended to secure the tail lift frame laterally at the top and bottom using reinforcements and through-bolts. It is also recommended to design and position the reinforcements so that the load can easily be stored in an adjacent reinforced body area. When mounted on the rear door symmetrical to the centre line of the vehicle, the load capacity is up to 700 kg at 1,000 mm from the bottom edge to the centre of the load.

When installed asymmetrically to the centre line of the vehicle or when mounted on the side loading door, the load capacity is up to 500 kg at 1,000 mm from the bottom edge to the centre of the load. Pillar lifting devices with adjustable swivel arm range that are only attached to a rear door pillar have a reduced loading capacity of 100 kg at a maximum range of 1,000 mm.

No further stabilisation equipment is required to move loads as described above. Hydraulic low-frame side panels are not recommended for the Transporter panel van, Caravelle or window van.

Larger deviations from the centre line and/or larger loads must be compensated by additional stabilisation equipment, e.g. support feet or jacks. It is recommended not to exceed the load limits and thus the load capacity of the vehicle body.

The Converter is obliged to attach a sticker to the converted vehicle indicating that the equipment may only be used in conjunction with extended support feet/jacks. In addition, the Converter is responsible for the safe operation of the equipment.



## 5.3 Shelf systems

To install a shelf system, the areas marked in the following figure are recommended as mounting points.

- Frames should be rigid, self-supporting and bolted through the vehicle floor; install suitable reinforcements in the underbody.
- It is not recommended to drill through the floor panel together with load compartment floor covers made of plastic.
- For alternative securing through the floor with longitudinal members, see the section “Frame and body fasteners” in this manual; see figure in [chapter 5.14.2 “Frame drilling and tube reinforcement”](#).
- Make sure that the body is completely sealed after cutting and drilling to prevent vapours, water, salt, dust and the like from entering the vehicle. Use sealing and finishing materials approved by Volkswagen, as well as corrosion protection for the underbody.
- To minimise the load on the top of the body wall, additional roof cross members must be used.
- If inner panelling is planned for the load area, the through-bolts of the shelf system must be screwed into the body through the trim and with a spreader plate.
- Load-bearing elements must not be secured only to the trim.
- To improve the crash behaviour, the shelf system should be designed with diagonally running reinforcements.
- The standard Volkswagen partition option should be used for the best possible protection of the driver and the front passenger.
- To ensure even load distribution in the vehicle, shelf systems should be installed on both sides of the load compartment.

Further information

See: [5.13 Corrosion protection measures](#)

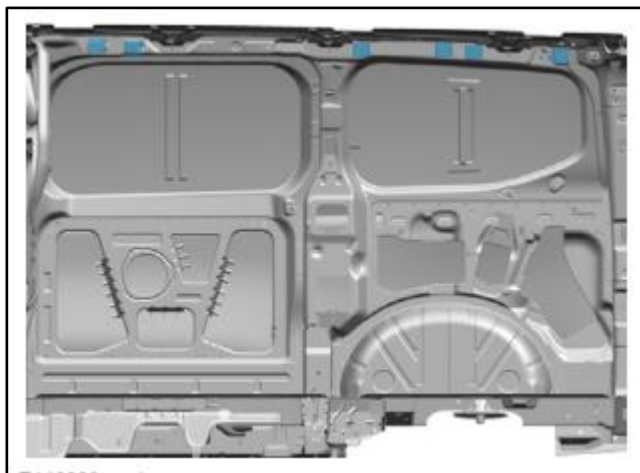
For more information on protection / no-drilling zones

See: [4.2 Instructions for cable installation and routing](#)

See: [5.1 Body](#)

See: [5.6 Body openings](#)

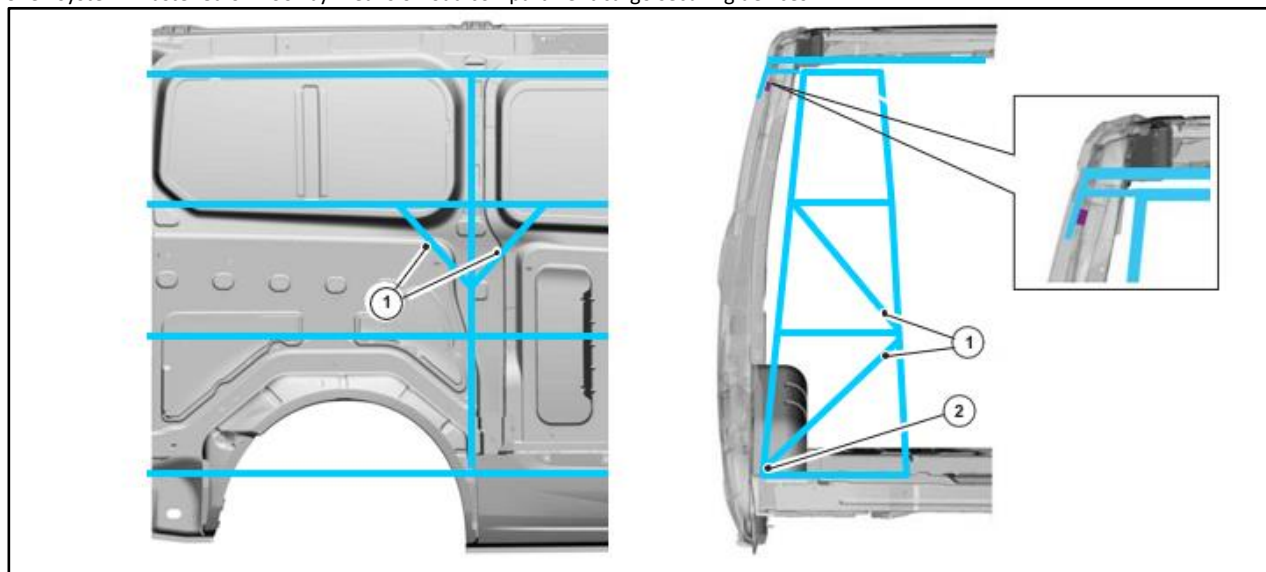
### Recommended position for cargo securing



To construct a glass support, build an inner frame on the outside of the body and screw the glass support to the inner frame through the body – see next figure.

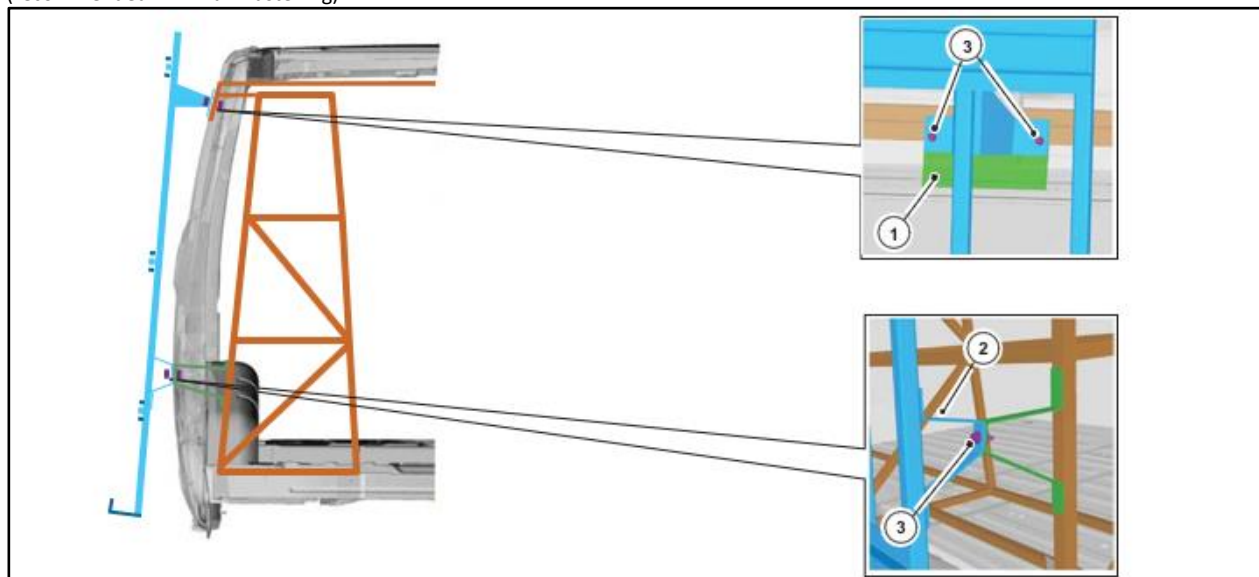
#### Design proposal for a non-Volkswagen shelf system (left side shown)

Shelf system – fastened on floor by means of load compartment cargo securing devices



#### Transport devices for glass on the outside of the Transporter panel van

Transport devices for glass on the outside of the Transporter panel van – bolted connection with inner frame through the body (recommended minimum fastening)



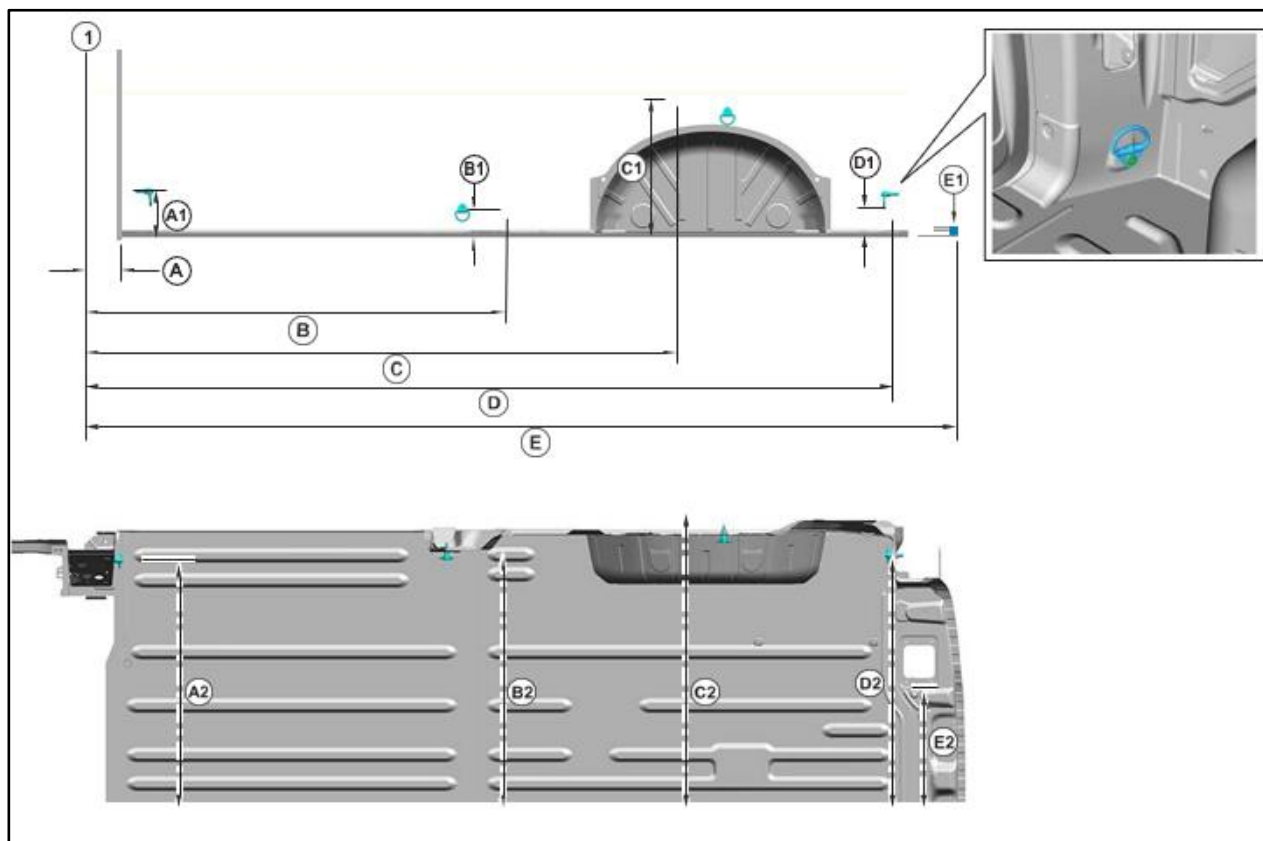
Element	Description
1	Rigid, self-supporting frame of the shelf system
2	Fastening on the floor

## 5.4 Load compartment

### 5.4.1 Load compartment cargo securing devices

All vehicles are equipped with load compartment cargo securing devices. These D-eyelets are shown in the following figure. Depending on the basic vehicle, not all positions are present in all vehicles.

For additional mounting positions, see: [5.3 Shelf systems](#)



Dimensions for cargo securing devices

Dimensions (mm)	L1	L2
<b>Distance from B-pillar (1)</b>		
A	78	
B	1177	
C	1716	2083
D	2374	2611
E	2515	2882
<b>Vertically from floor panel</b>		
A1	137	
B1	61	
C1	395	
D1	75	
E1	2	

Dimensions (mm)	L1	L2
From the centre line of the vehicle		
A2	733	
B2	817	
C2	882	
D2	791	
E2	450	

1=2,933 mm wheelbase, L2=3,300 mm wheelbase

## 5.5 Interior partitions

### 5.5.1 Partition(s) – driver and passenger protection for Transporter panel van, Caravelle and window van

#### Warning note

In the event of “no partition” (PR number 3CA) or the removal of the partition, the Converter MUST ensure that the B-pillar is covered, including the seat belt and the roll-up device. This is to ensure that the correct operation of the seat belt is not impaired.

#### Practical note

Partitions perform an important function and are required by law in some regions.

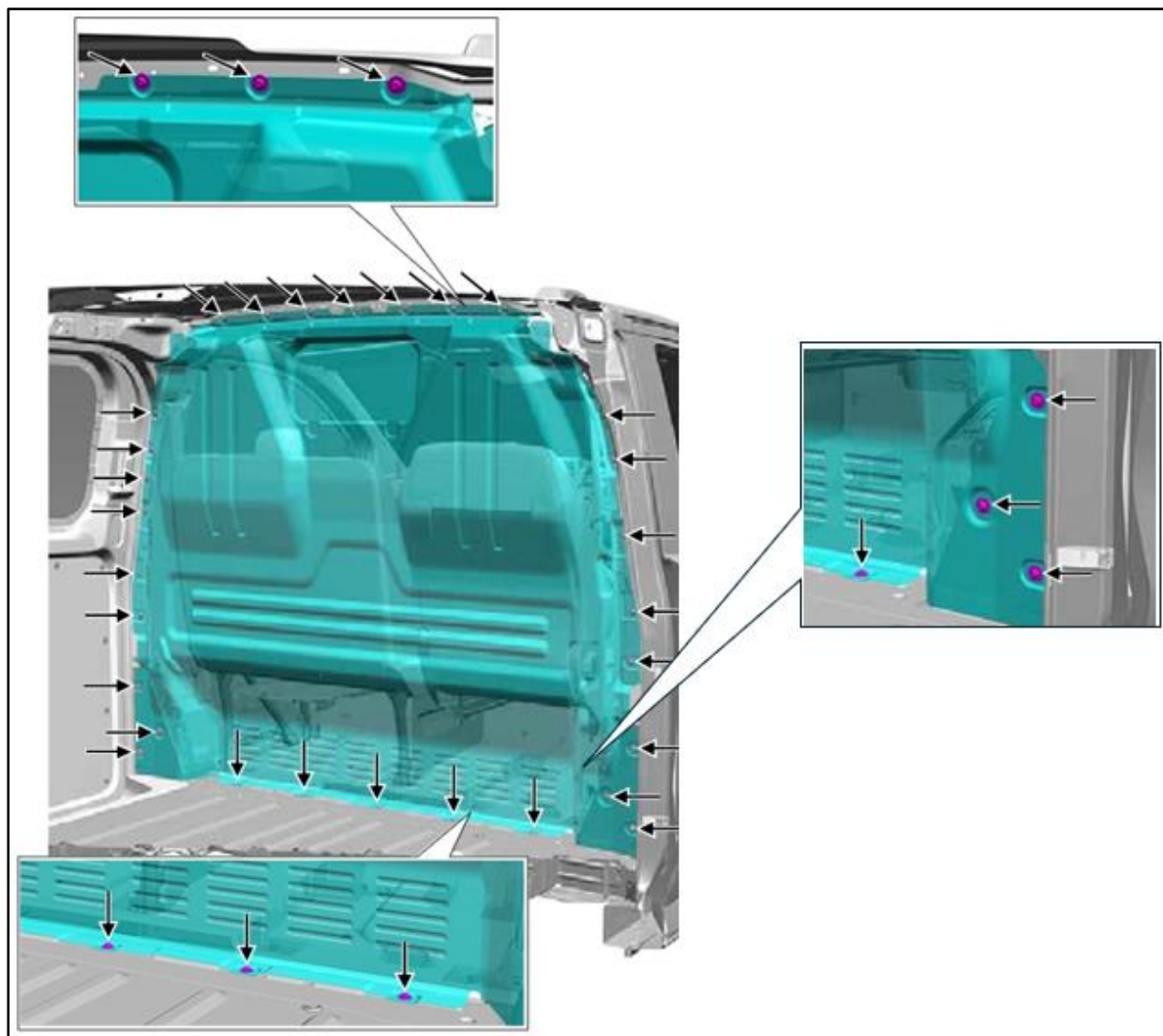
The Converter is liable for the compliance with local legal requirements relating to partitions and window protection grilles. Furthermore, the Converter is liable for compliance with the legal requirements on load limitation for partitions that do not originate from Volkswagen.

Volkswagen standard partitions allow a small amount of play between the partition and the body to compensate for natural body deformations and allow air circulation between the cab and the load compartment in the rear by means of the blower.

Air circulation and body deformation must also be taken into account when using an alternative partition. It is not recommended to shorten the seat adjustment distance on the driver and front passenger seats.

The following figures show the standard mounting points for the partition on the B-pillar. These are standard welding nuts for M6. They can be used to fasten retrofitted Volkswagen partitions.

## Roof height H1 – mounting points for partition



### 5.5.2 Partitions: motion sensors for anti-theft alarm

#### Practical note

The motion sensors for the anti-theft alarm (CSM\*) in the Transporter panel van and Caravelle versions have two CSMs (motion sensors), a primary CSM at the front and a secondary CSM at the rear. The CSMs must not be moved from the centre line of the vehicle.

The mounting bracket of the CSMs must not be changed during the conversion.

Insides or floors made of metal should be avoided due to the higher risk of false alarms.

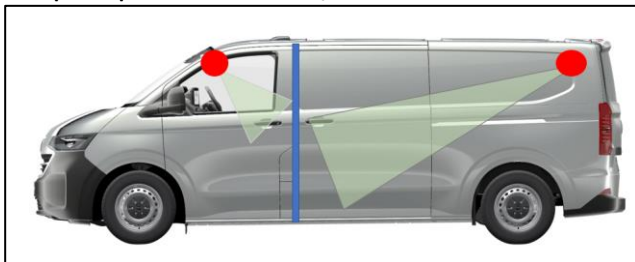
#### Practical note

Free lines of sight must be maintained between the CSMs.

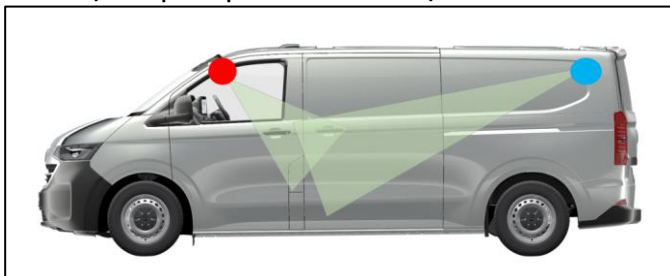
Thatcham accreditation is only valid for an original vehicle. When the vehicle is converted, a new accreditation from Thatcham may be required. The volumetric alarm remains operational, but it cannot be guaranteed to comply with Thatcham standards. It is the responsibility of the converter to validate the fully converted vehicle directly with Thatcham.

\* CSM – Combined Sensor Module Interior Motion Detect & Tilt Sensor

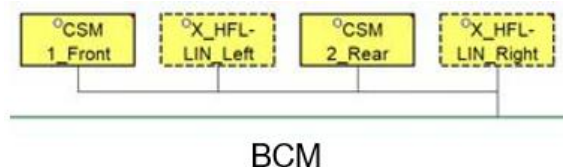
#### Transporter panel van: front CSM / rear CSM



#### Caravelle / Transporter panel van: front CSM / rear CSM



The front and rear CSMs are connected via a common LIN line. The front CSM is configured by the onboard supply control unit.



There are 2 main positions for the CSM to cover the front and back sides with 7 different CSM modules, 4 different CSM brackets (+3 CSM positions in OHC (Over Head Console) and D-pillar). There are seven different calibrations for CSMs (front: five, rear: two)

#### Transporter panel van without partition

Typically used for the conversion of police vehicles and as a prison transport vehicle. These have primary/secondary CSMs and no partition. These require additional calibrations (from Caravelle to Panel Van Plus (double cab)) and configurations (onboard supply control unit and rear CSM deactivation information). For resold vehicles a calibration may be required to restore the factory settings. The calibrations are interchangeable between the CSM modules.

For further information please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

	CSM Strategy	Calibration	Partition
Plant	Primary/secondary	Caravelle	No partition
Police	Primary/secondary	Panel Van Plus (double cab)	Partition
Camper	Primary/secondary	Caravelle	No partition

#### Partition restrictions for camper

If a closed part is installed, this impacts the motion detectors. It is not possible to detect movements in the rear of the vehicle, and the opening of the tailgate is not detected.

To minimise these effects, a minimum distance of 30 cm is recommended.

#### Example of a gap in the partition





## 5.6 Body openings

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

### 5.6.1 Security, anti-theft system and catch

### Practical note

To avoid security problems with the catch, it is recommended that you discuss this with your local Volkswagen Commercial Vehicles Partner before starting the conversion.

### Information

Do not change the locking system and do not damage the protective shields in the area of the lock and latch.

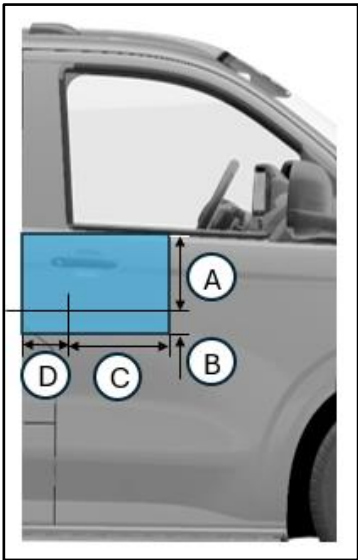
When removing and reinstalling the door seals, be sure to use the same seals as this is critical for closing the door. Any modification of the sealing flanges or surfaces must be discussed with your local Volkswagen Commercial Vehicles Partner. This also includes ventilation to adjust the door lock effort if a significant change to the lock is required.

The onboard supply control unit (BCM) has been specially designed to control the Transporter panel van closing and locking mechanism, for which specific time periods are defined for the unlocking and locking. An additional central locking function should be connected to the use of additional Transporter panel van locking mechanisms. Additional latches can be operated by the parallel connection of additional relays to existing relays.

See: [4.21 Handles, locks, locking elements and access systems](#)

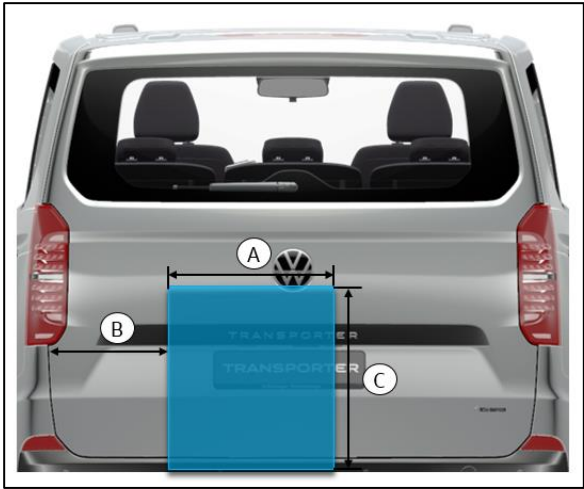
The following figures show the zones in which there should be no drilling.

No-drilling area – driver and front passenger doors



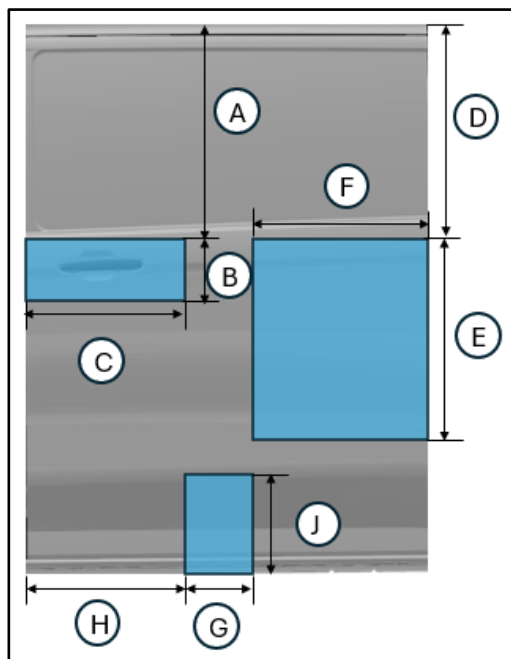
Element	Description
A	275 mm
B	50 mm
C	365 mm
D	155 mm

No-drilling zone – tailgate



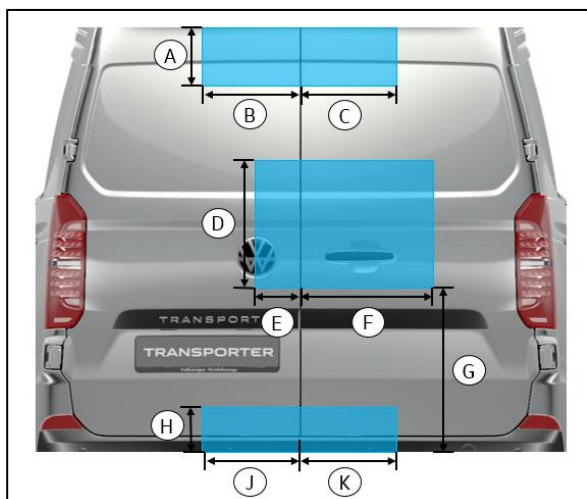
Element	Description
A	470 mm
B	550 mm
C	550 mm

## No-drilling area — sliding doors at the sides



Element	Description
A	630 mm
B	220 mm
C	500 mm
D	620 mm
E	620 mm
F	600 mm
G	150 mm
H	505 mm
J	200 mm

## No-drilling zone – rear loading doors



Element	Description
A	130 mm
B	250 mm
C	250 mm
D	430 mm
E	150 mm
F	420 mm
G	570 mm
H	150 mm
J	260 mm
K	260 mm

## 5.7 Interior equipment

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

### 5.7.1 Load compartment interior lighting

When installing interior trim, never damage the closing and locking system, locks, hinges, latches or door catch (electric cables, unlocking mechanism).

When installing or removing door trim, never damage the water protection film (water protection film of the door access hole).

### Warning note

Plan for mounting points for other equipment elements, e.g. shelf systems, in order to allow for through-bolts. Mountings on the trim may not be sufficient for the normal operational safety of the vehicle.

Wooden panels in the load compartment must be treated with clear paint or other paint if they are exposed to high humidity.

The additional weight of trim on doors may require additional reinforcement of the door and pillar at the hinge and the stop.

### 5.7.2 Plywood panelling/cladding



#### Practical note

Before drilling in the vehicle, check the protection zones / no-drilling zones and the cable guide.

See: [4.2 Instructions for cable installation and routing](#)

See: [5.6 Body openings](#)

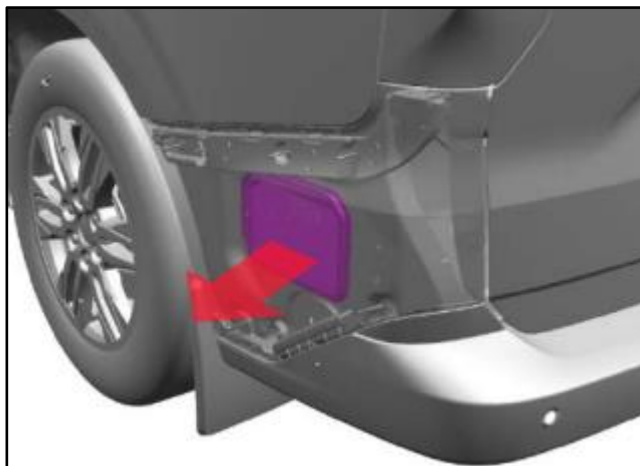
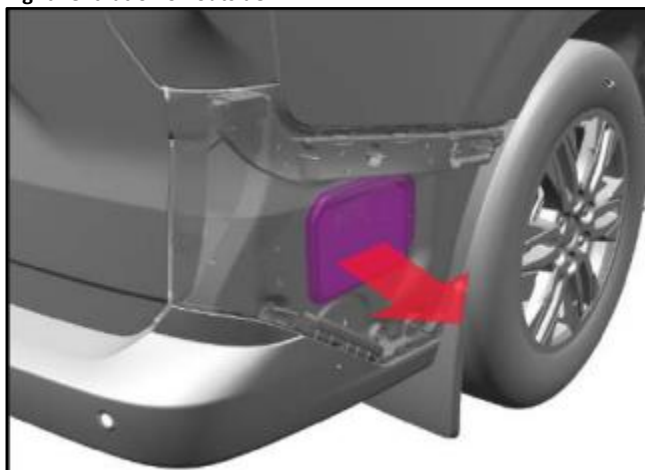
See: [5.1 Body](#)

- To have edges as smooth and free of chips as possible, the panels must be cut precisely by machine and not with a handsaw.
- The plates should be pre-drilled.
- Do not drill through the base plates; attach the plates to the existing load attachment points.
- It is recommended to install joint-free plywood floors.
- Use aluminium underbody cladding.
- The plywood must be water-resistant (WBP=water- and boiling-proof).
- A thickness of 9 mm is recommended for floors and 6 mm for side and door trim.

### 5.7.3 Side ventilation openings on the body

#### Warning note

The air flow inside the vehicle flows internally through openings in the D-pillar/body side trim, and then through air vents located in the lower part of the exterior of the body, as shown on the left and right sides (see figure below) of all vehicles. These cannot be covered or obstructed in any way.

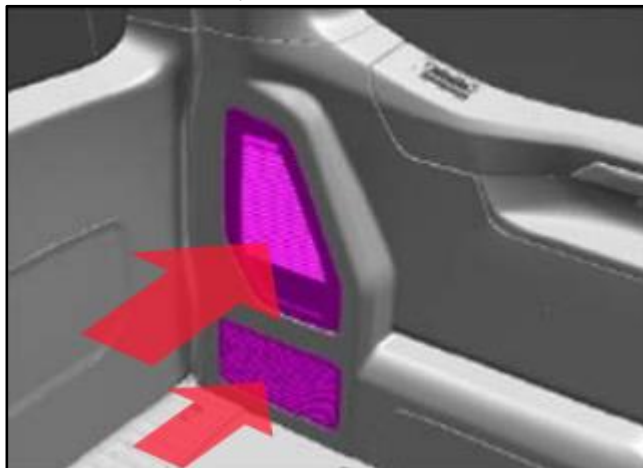
**Left ventilation on outside****Right ventilation on outside**

If the airflow is obstructed, there are problems with:

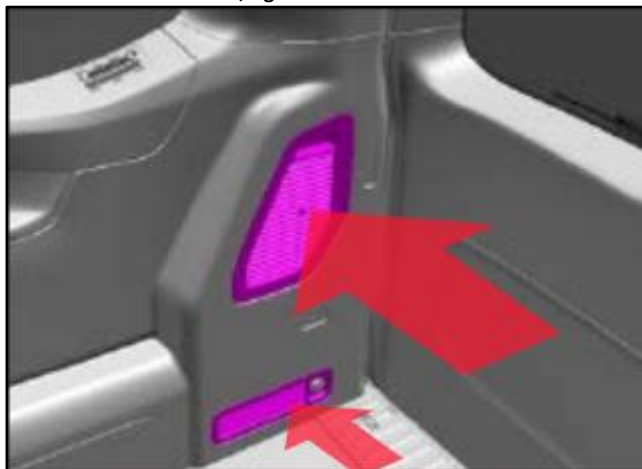
- Closing the doors
- Closing the tailgate / rear doors
- Air extraction
- Moisture extraction
- Removing fog from the windscreen while driving or when stationary
- Fan system (heating or cooling) of IP and rear HVAC systems

These ventilation openings must not be covered in any vehicle variant. If units are installed, e.g. cabinets for campers or inner trim for Transporters, an adequate air flow of AT LEAST 201 cm<sup>2</sup> must be enabled through the ventilation openings shown:

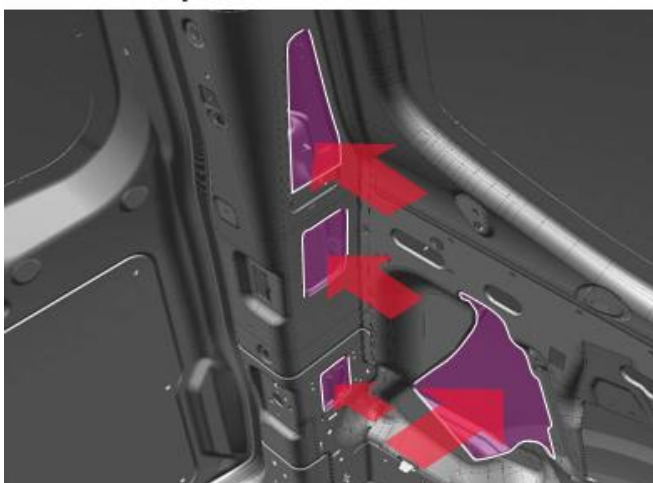
**Caravelle variant interior, left**



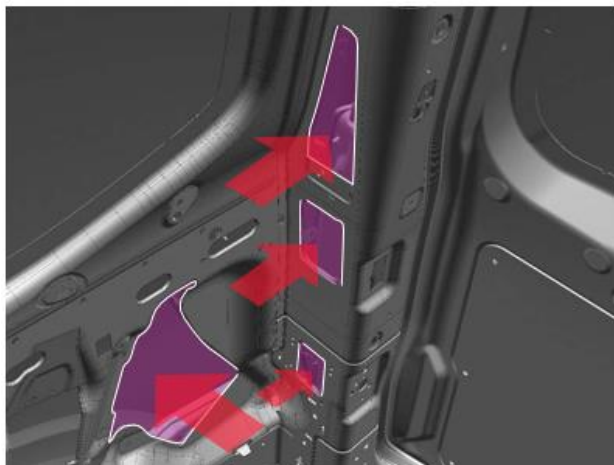
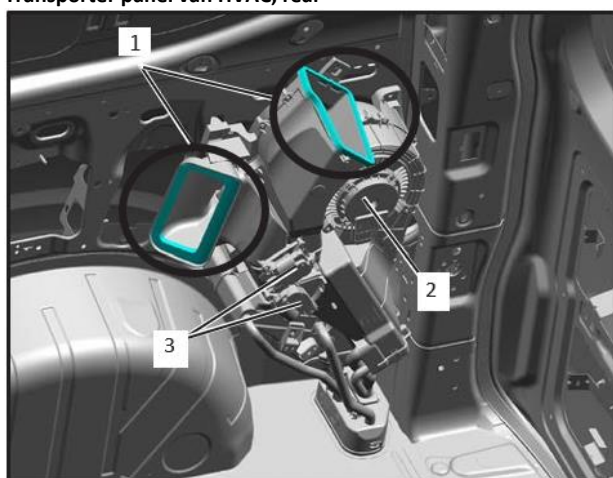
**Caravelle variant interior, right**



**Transporter panel van / camper, left D-pillar, inside**





**Transporter panel van / camper, right D-pillar, inside****Transporter panel van HVAC, rear**

1 – HVAC inlet/outlet (heating/air conditioning system)

2 – Blower

3 – Final control elements

Ensure sufficient air openings for the rear HVAC inlets and outlets shown in the figure “Transporter panel van HVAC rear”. Make sure there are sufficient distances to prevent damage to the blowers and the final control elements.

**5.7.4 Floor specification for campers (BEV/PHEV variants only)**

For applications with expected passenger occupancy, the modifications to the flooring material layer must have a thermal conductivity not higher than, and a specific heat not lower than, the sum of the three layers of steel, cotton and carpet listed below.

The conductivity and specific thermal values for the cotton insulation and the carpet are typical for automotive applications.

Material layers and thickness	Specific heat (J/kg K)	Conductivity (W/mK)
Top carpet 4.8 mm (16 oz.)	1465	0.294
Middle cotton 6.0 mm	1150	0.059
Bottom steel 1.5 mm	461	52

## 5.8 seats

### Information

When assembling the seat and seat belt, tighten the specified screws to the specified torque. For information on the tightening torques, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

### Warning note

Seats containing airbags must not be re-upholstered.

### 5.8.1 Transporter panel van

#### Warning note

Do not install seats in the rear loading area of the Transporter panel van.

### 5.8.2 Heated seats

#### Warning note

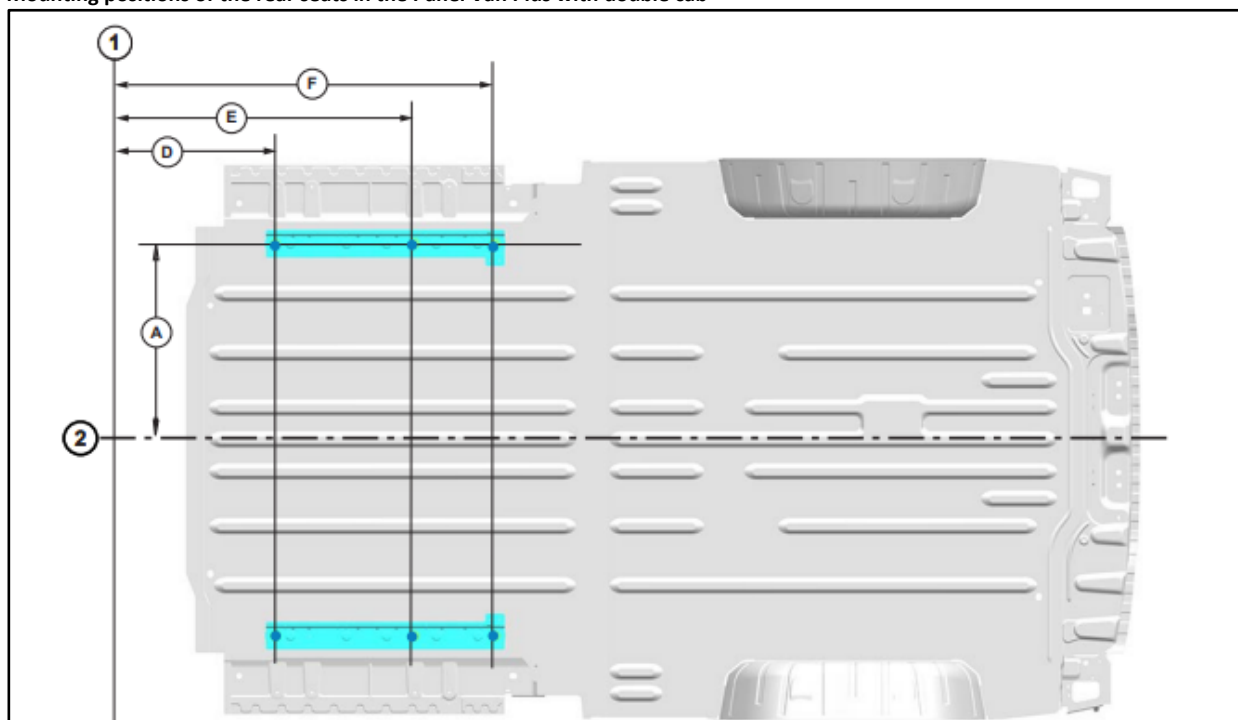
The electric wires for the Volkswagen seat heating must not be used for other purposes, e.g. for other electrical equipment.

It is not recommended to retrofit seat heating as this may result in airbag deployment or malfunction (incorrect configuration).

### 5.8.3 Mounting positions for rear seats

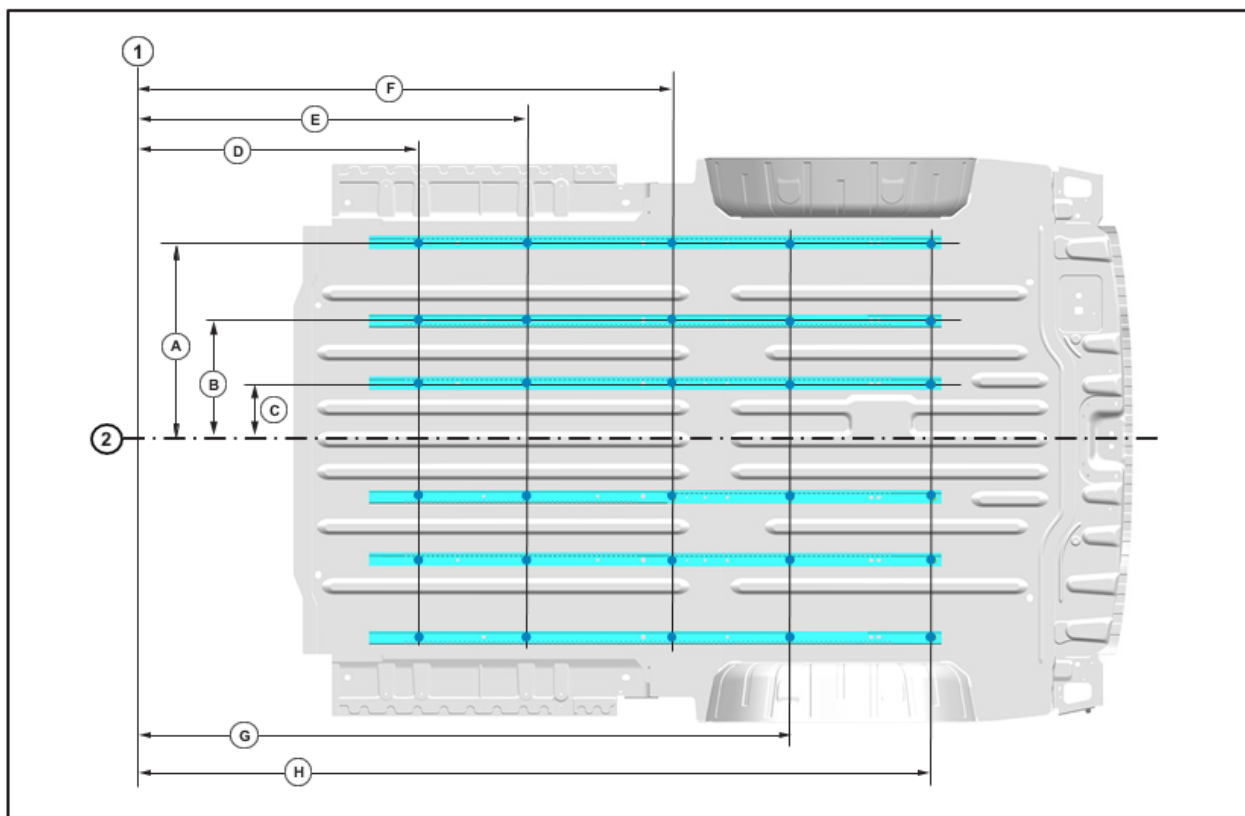
The following figures show the mounting positions of the second / second and third row seats in the floor. These positions are independent of the wheelbase. The fasteners are always present, but access to the fasteners depends on the floor panel. Access holes in the floor panel may be required to gain access to the fasteners.

## Mounting positions of the rear seats in the Panel Van Plus with double cab



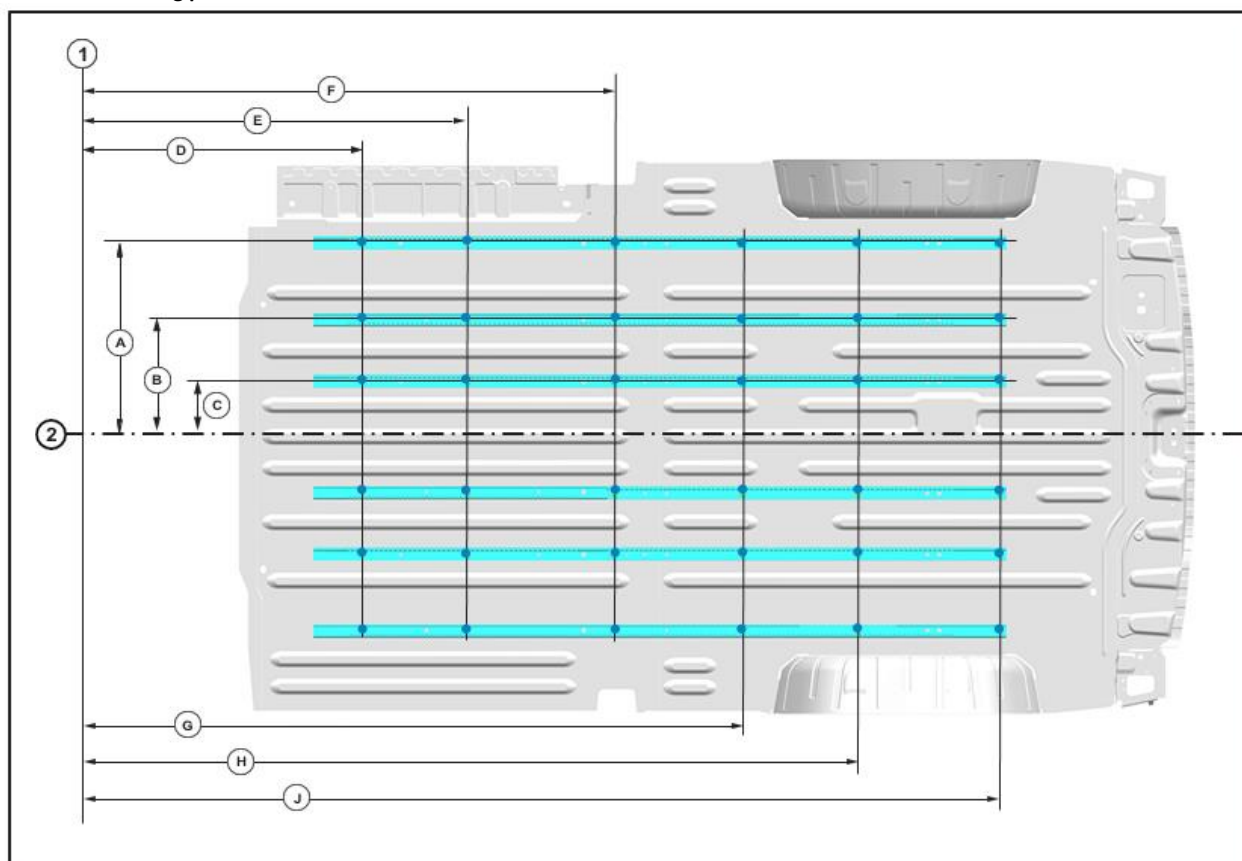
Element		Element	
1	Front axle line		
2	Centre line of the vehicle		
A	614	E	2133
D	1699	F	2384

## Rear seat mounting points L1



Element		Element	
1	Front axle line		
2	Centre line of the vehicle		
A	614	E	2134
B	374	F	2587
C	175	G	2949
D	1804	H	3387

## Rear seat mounting points L2



Element		Element	
1	Front axle line		
2	Centre line of the vehicle		
A	614	F	2587
B	374	G	2987
C	175	H	3349
D	1804	J	3787
E	2134		

## 5.9 Glass, frames and mechanisms

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 “Contact in Germany”](#) and [chapter 1.2.1.2 “International contact”](#)).

### 5.9.1 Heated windscreen and heated rear window

#### Warning note

No modifications should be made to the original system (controlled by onboard supply control unit (BCM) and multiplex architecture) and no power should be taken from connected lines and controllers.

These options are not suitable for a subsequent installation or a vehicle conversion.

### 5.9.2 Rear and side windows

When modifying windows, a window van or Caravelle is recommended as the original vehicle. However, if a Transporter panel van is being converted, the following must be considered:

- Cut the outer panel of the body side and the door to 1 mm from the inner plate flange
- Do not cut through metal joints and columns
- Use approved windows in accordance with the legal regulations
- After cutting through the outer panel, firmly connect the inner panel and the outer panel to each other

#### Warning note

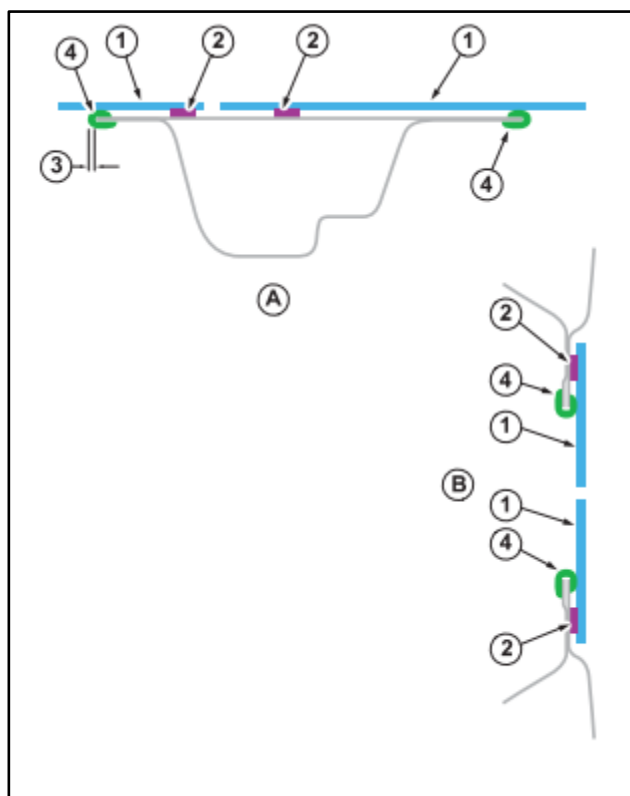
Installation of rear seats See: [5.8 Seats](#)

#### Typical side view of the panel van body for fitting windows



For wheelbase and vehicle overall height dimensions, see: [1.14 Assemblies and ergonomics](#)

## Lateral cut through a typical body side wall in the Transporter panel van for fitting windows



Element	Description
A	Horizontal cut through C-pillar
B	Vertical cut through side window (no side loading door)
1	Glass panes
2	Adhesive
3	Cut the outer plate flange around the entire circumference at a distance of 0 to 1.5 mm from the inner plate flange.
4	Window trim strip

Do not add any parts or create sharp edges in the deployment zone of the airbags.

## 5.10 Airbag – Safety Restraint System (SRS)

### 5.10.1 Airbags

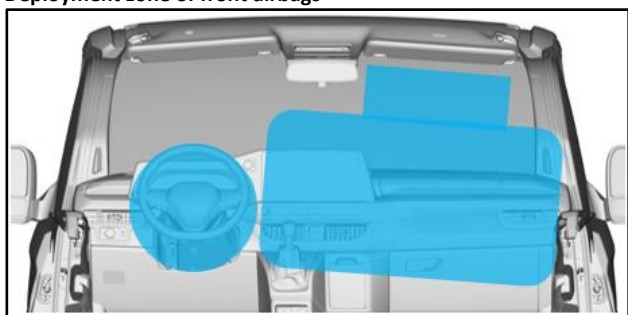
#### Deployment zone of front airbags

##### Warning note

Do not add any parts, sharp protrusions (e.g. screws), accessories or sharp edges to the deployment zone of the driver and front passenger airbags, as these may impair the deployment of the airbag.

Do not attach any stickers to the airbag covers as this could affect the deployment of the airbag.

#### Deployment zone of front airbags



#### Deployment zone of side and curtain airbags

##### Warning note

Do not add any parts, sharp protrusions (e.g. screws), accessories or sharp edges to the deployment zone of the driver and front passenger airbags, as these may impair the deployment of the side and curtain airbags.

Do not attach any stickers to the airbag covers as this could affect the deployment of the airbag.

##### Information

If conversions are planned in this area, it is recommended to order a basic vehicle without airbags.

All Caravelle vehicles are equipped with side and curtain airbags as standard.



**Side airbags (integrated in the seat):**

The side airbags in this vehicle have not been tested for use with rotating front seats. Do not specify side airbags for the original vehicle if you intend to install a front seat rotation mechanism or an armrest on the outsides of the seat; such devices may affect the operation or deployment of the side airbags. Check that any installed seat covers are designed for seats with side airbags.

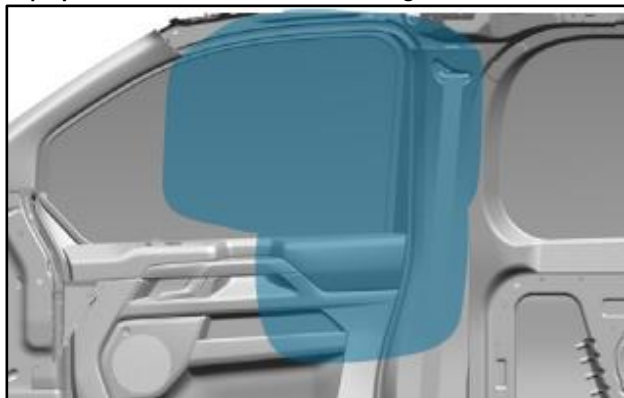
**Curtain airbags:**

Extensive conversions to the roof or the headliner can impair the deployment of the curtain airbags. If the roof or the headliner are being changed or replaced, do not specify basic vehicles with curtain airbags.

If access to the roof is required, e.g. to install exterior accessories, you absolutely must install the original headliner at existing mounting points.

**Information**

When deployed, the front curtain airbags protrude approximately 260 mm horizontally into the interior. Avoid attaching objects within this zone.

**Deployment zone of side and curtain airbags in the front****Deployment zone of window van curtain airbags**

The rear curtain airbag extends from the centre of the grab handle of the second row to the mounting of the third row seat belt and the top edge of the door trim.

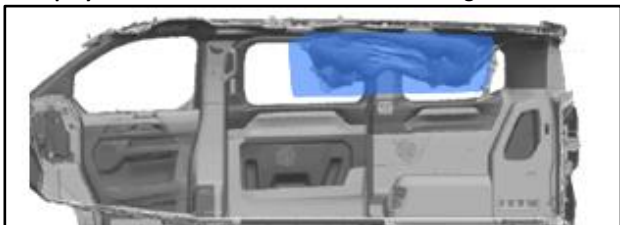
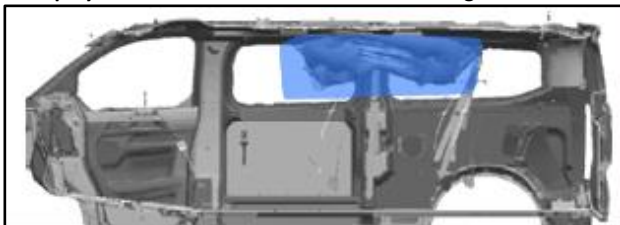
Do not install equipment on the B-, C- or D-pillar above the belt line. Do not install equipment above the belt line at a distance of 10 mm from the C-pillar, from the front edge of the B-pillar to the rear edge of the D-pillar.

Do not install equipment on the headliner that is less than 10 mm from the side edges. Do not install equipment on the headliner along the side rails.

All dimensions of the airbag and equipment mounting zones are approximate values due to the different airbag deployment characteristics, and they represent free deployment processes without occupants.

**Information**

During deployment, the window van curtain airbags protrude approximately 100 mm horizontally into the interior. Avoid attaching objects within this zone.

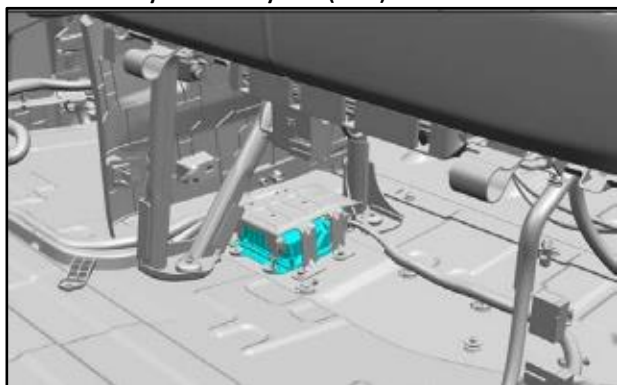
**L1 Deployment zone of window van curtain airbags****L2 Deployment zone of window van curtain airbags****Module – Safety Restraint System (RCM)**

The RCM is located under the front seat on the centre line of the vehicle; see figure below. Depending on the equipment, this is a driver's seat, a front passenger seat or a double seat.

**Warning note**

Modifications or reinforcements in the RCM area can affect the deployment mechanism of the side airbag and lead to uncontrolled deployment of the side airbag.

The RCM is protected by a cover to prevent damage. This protector should remain in its mounted position to ensure the protection of the RCM.

**Module – Safety Restraint System (RCM)****Front, rear and side sensors**

The airbag sensor for the front airbags is located behind the front grille, see figure “Front sensor”.

The sensors are located on the B-, C- and D-pillars of the vehicle, see the figures below.

The sensors for the side airbags are located in the front doors, see figure “Door sensors”.

**Warning note**

Modifications or reinforcements in the area of the sensors can affect the deployment mechanism of the side airbag and lead to its uncontrolled deployment.

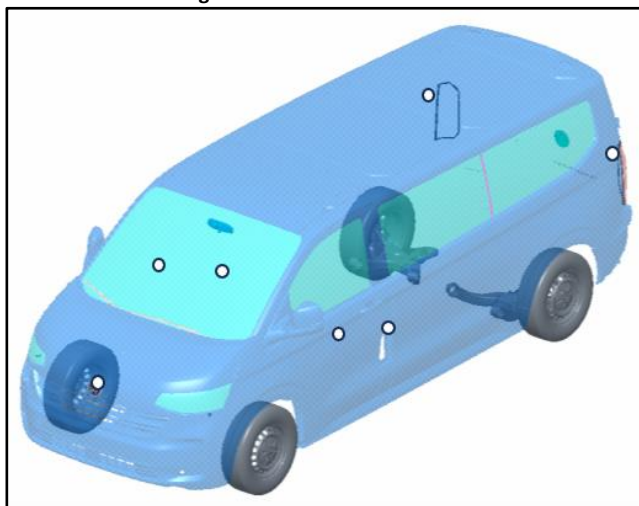
Drilling and grinding work in these areas is only permitted when the battery is disconnected.

**Warning note**

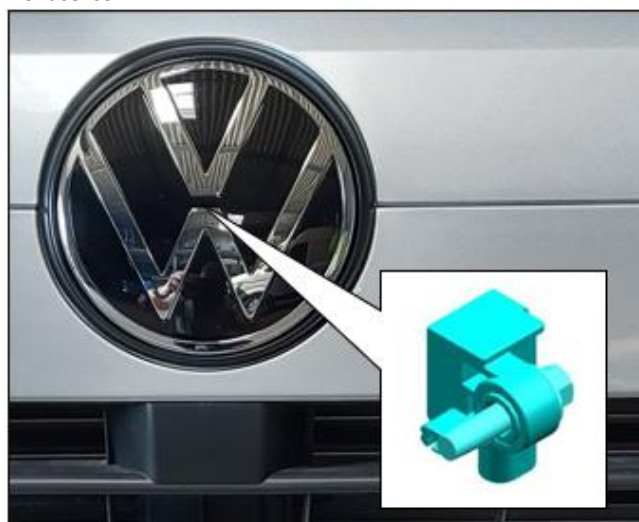
If the vehicle is equipped with side and curtain airbags, the following restrictions apply to the attachment of accessories to the doors: The accessories must not be in the deployment area of the airbags. In addition, any drilling in the door trim or the inner or outer panel must be sealed in order to maintain the integrity of the door cavity. Insufficient sealing of openings in door trim or sheet metal can impair the sensitivity of the restraint system.

If the battery is disconnected: See [4.5 Battery systems](#), section “Battery and monitoring sensor” for the reconnection of the battery.

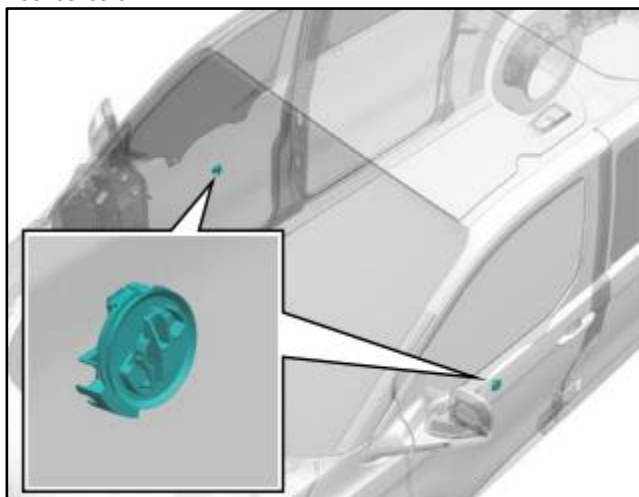
#### Location of the airbag sensors



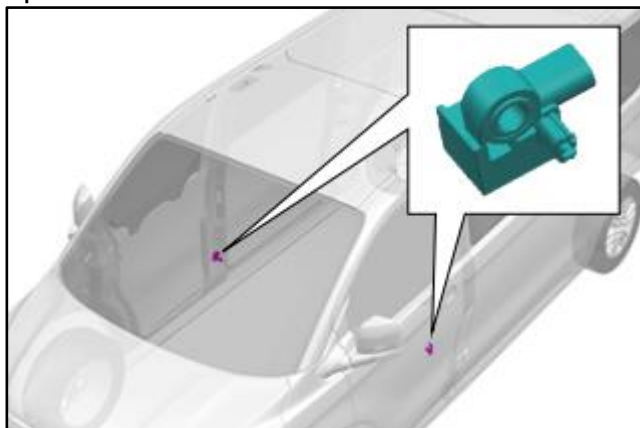
#### Front sensor



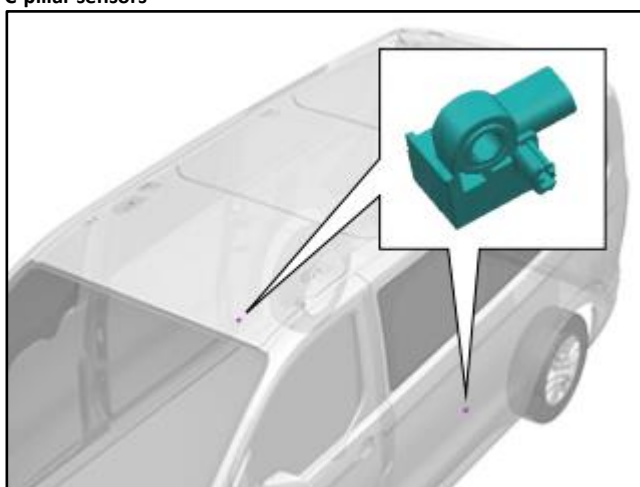
#### Door sensors



#### B-pillar sensors



#### C-pillar sensors



#### D-pillar sensors



## 5.11 Seat belt systems

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

### 5.11.1 Seat belts

#### Warning note

Follow the removal and installation procedures for the seat belt system to ensure proper operation of the restraint system.

The belt buckles must not be changed on the seats.

#### Warning note

In the event of "no partition" (PR number 3CA) or the removal of the partition, the Converter must ensure that the B-pillar is covered, including the seat belt and the roll-up device. This is to ensure that the correct operation of the seat belt is not impaired.

Avoid removing and refitting seat belts, belt buckles or other components of the seat belt system. However, if the system must be removed and refitted as part of a conversion, follow the guidelines in the Workshop Manual for removing and installing the seat belt system.

When removing the seat belt system, a forked bracket should be fitted to the belt 200 mm below the belt stop button. This prevents the entire belt from being pulled into the automatic belt retractor and locked.

When refitting, first attach the retractor to the body and carefully pull the strap out of the retractor to allow the D-loop to be inserted, then remove the forked bracket. If the automatic belt retractor blocks, allow the belt to run back a little to release the belt lock. Do not attempt to unblock the retractor by pulling the belt hard or by manual intervention in the locking mechanism.

### 5.11.2 No-drilling zone – B-pillar

#### Warning note

Do not drill in the assembly area of the right/left retractor unit.

Drilling is only permitted in the area marked in green.

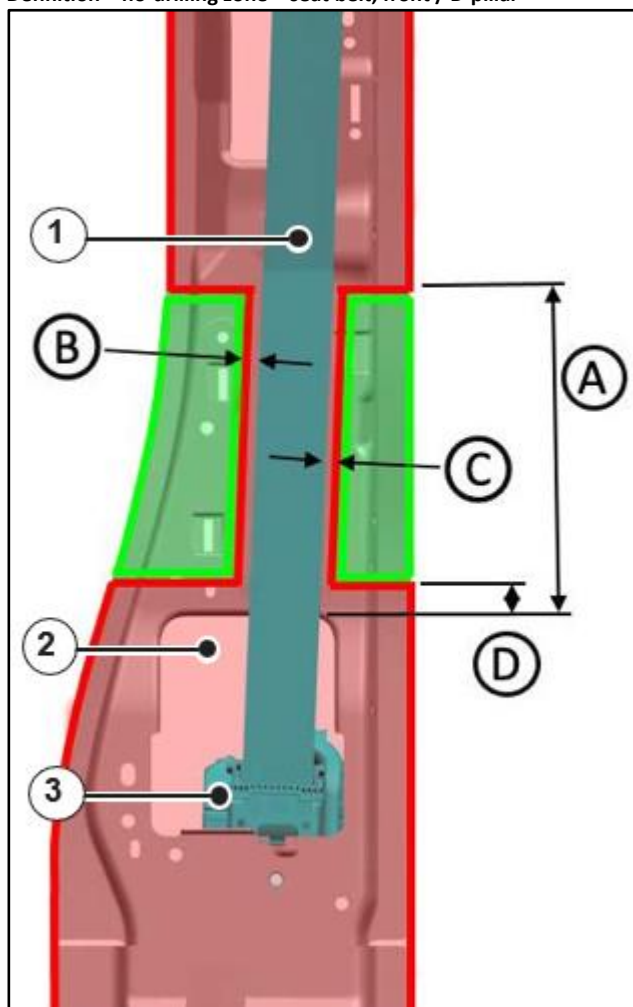
Damage to the retractor: if holes are drilled near or above the retractor and the anchorage of the belt tensioner, the mechanisms must be covered to prevent chips/debris from falling into the unit and causing functional problems.

#### Warning note

Damage to the belt:

- 1) The belt must not be cut, crushed or obstructed at any point (from the retractor to the area of the D-ring) by any additional fastening parts.
- 2) Avoid sharp edges near the belt; all edges must have a minimum radius of 0.5 mm.
- 3) Avoid retrofitting parts that could change the guiding of the belt to the occupant

## Definition – no-drilling zone – seat belt, front / B-pillar



Element	Description
1	Belt
2	Hole of the belt retractor
3	Retractor
A	230 mm (horizontal)
B	15 mm to the left of the belt (parallel to the belt)
C	15 mm to the right of the belt (parallel to the belt)
D	30 mm above the hole of the belt retractor (horizontal)



### 5.11.3 Seat belt warning system

The seat belt warning system is a legal requirement for all new vehicles. For front seats (including single and double passenger seats), there is a sensor in the belt buckle to detect the occupant's seat belt status, in addition to seat-occupied sensor mats in the seats. Only the belt buckle sensor is provided for the rear seats. If a vehicle is converted, these functions must be retained.

If factory-installed wired seats are permanently removed, the instrument cluster must be reconfigured with the Global Volkswagen Diagnostics and Repair System (ODIS).

#### Permanent deactivation/reactivation procedure

The deactivation/reactivation procedure deactivates / reactivates the acoustic signal for the front seats individually or for all rear seats together.

1. When the vehicle is stationary, insert the key in the ignition lock
  2. Carry out 4 fastening and unfastening procedures
- The sequence should begin and end with "unbuckled".
3. The flashing of the warning lamp for the seat belt warning confirms successful deactivation / reactivation

The procedure does not start, or is aborted, if one or more of the following conditions are fulfilled:

- The vehicle starts to move
- The status of another belt buckle changes
- 30 seconds have elapsed since the vehicle was switched on

#### Information

Any belt buckle can be used for the procedure.

Additional (non-factory installed) seats cannot be included in the seat belt warning system by means of this procedure.

#### Information

The converter must not provide the owner/operator with the procedure for deactivating the seat belt warning system via the manual or other easily accessible sources.

If the seat trim is replaced, the operation of the seat belt warning system must be tested successfully when developing the trim. The final seat assembly must be checked for proper operation after completion. For further information please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

5.11.4 Wireless seat belt warning system

Caravelle and window van only

The wireless seat belt warning system consists of a series of wireless transmitters in the seat and 4 aerials mounted on the body, as shown in the following figure. The transmitters in the rear seats must record their position by measuring the field strength of the aerials. The aerial power is calibrated for each body type.

The system does not measure the correct rear seat position for each rear seat if:

- Aerials are repositioned
- They are attached to different materials
- They are shielded from the seats by a conductive (metallic) material
- Magnets are closer than 70 mm to the aerials

Example of a system structure



Element	Description
Green	Wireless belt buckle controller
Orange	Buckle switch
Grey	Occupant detection switch
Blue	Wireless buckle sensor, mounted on the seat
Purple	Aerial*

\* 1x mounted on headliner, 2x side panel, 1x rear door

Information

For the installation and programming of additional Volkswagen rear seats that are equipped with a wireless belt buckle status sensor, the only method is to use a diagnostic service tool with the correct safety clearance. If necessary, Volkswagen Commercial Vehicles Partners have the necessary tools and the correct authorisation.

**Information**

For the installation of additional rear seats that are not from Volkswagen, or are from third-party manufacturers but are not equipped with a Volkswagen wireless belt buckle status sensor, a retrofitted seat belt warning system must be used to ensure compliance with ECE16 regulations for seat belt warning systems.

**Information**

A Caravelle or window van transmitter vehicle without factory-fitted rear seats is not supplied with wireless hardware or a seat belt warning system for the rear seat. If such a vehicle is equipped with rear seats, a retrofitted seat belt warning system must be used to ensure compliance with ECE16 regulations for seat belt warning systems.

For further information please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

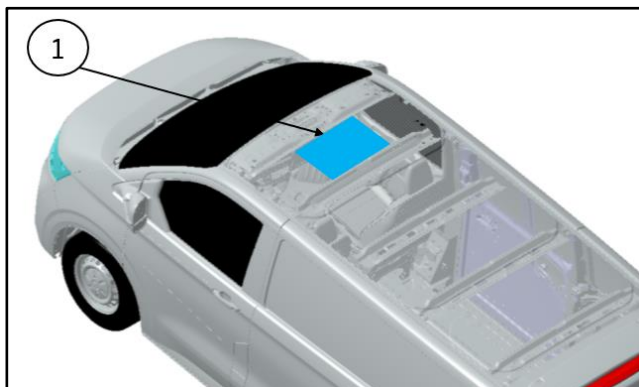
## 5.12 Roof

### 5.12.1 Roof ventilation

#### Warning note

When retrofitting a sliding sunroof or other roof-mounted equipment, avoid the installation positions of the aerials.

#### Subsequent installation of the sliding sunroof



Element	Description
1	Fit in roof panel (only for low roof)

**General information** – It is not recommended to cut roof traverses when installing openings; see figure. Fans must prevent direct ingress of water and dust. When it is switched off, smoke should not be able to enter through the system. The regulations for internal and external safety must be observed.

It is not recommended to shorten/modify/remove the B-pillar roof traverse. However, if this is absolutely necessary and cannot be avoided, the roof traverse must be replaced by a suitable construction with an equivalent structural strength and function as the original construction. All legal requirements must be complied with.

**Ventilation units** – The roof panel has a load capacity of 1 kg when not supported. Loads up to a maximum of 25 kg must be distributed between the roof arches over the full length of the roof carriers.

**Air-conditioning systems** – Units weighing more than 25 kg must be supported from the inside with cross members that direct the load onto the outer roof rails.

5.12.2 Roof carrier

Warning note

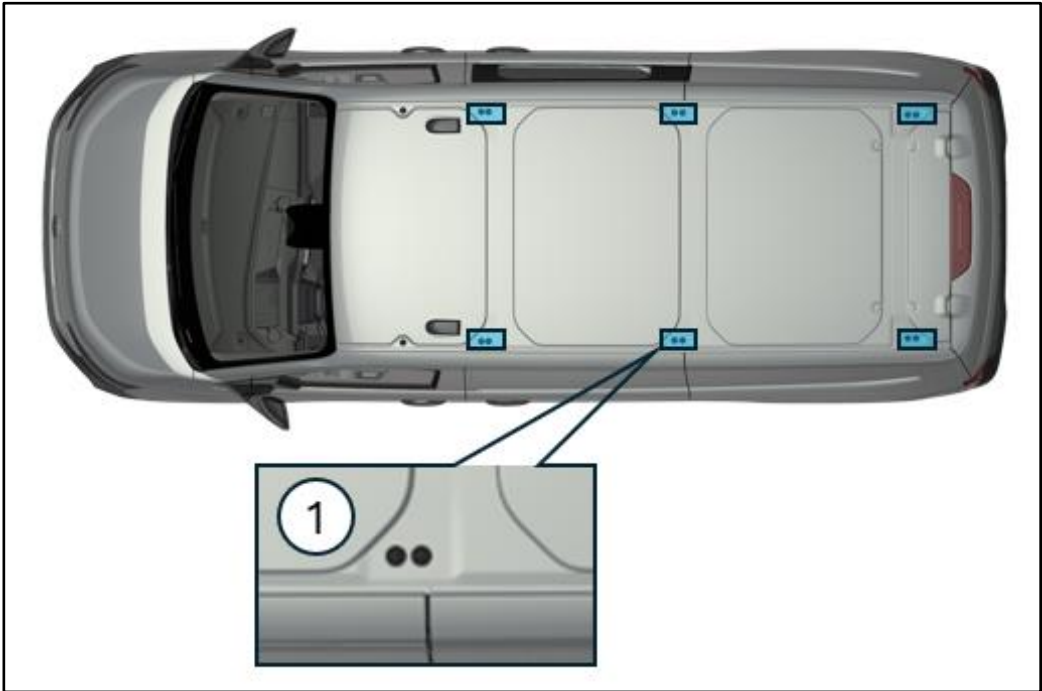
When installing a roof carrier or other accessories, the mounting points must be sealed to prevent water from entering the vehicle interior.

Information

The maximum roof load including roof carrier is specified in the user manual.

When installing a roof carrier, read and follow the manufacturer’s instructions.

Roof height H1



Element	Description
1	Mounting points for roof carriers, 3 per side. Location depends on wheelbase.

Information

For the maximum roof carrier length for vehicles with a roof height of H1, the fully open position of the tailgate must be taken into account.

All H1 variants of the Transporter panel van, Caravelle and window van can be equipped with roof carriers (see figure).

The following must be observed:

- The load must not exceed the weight values specified in the Owner's Manual.
- The load must be evenly distributed (the Converter must ensure that this limitation is noted in the Owner's Manual)
- The load on an individual bracket must not exceed 75 kg, even with the most unfavourable weight distribution
- The roof carrier must be secured with one or two M8 screws per mounting; see figure
- The front edge of the roof carrier should never protrude beyond the rear edge of the driver's door or beyond the B-pillar

### 5.12.3 Pop-up roof conversion

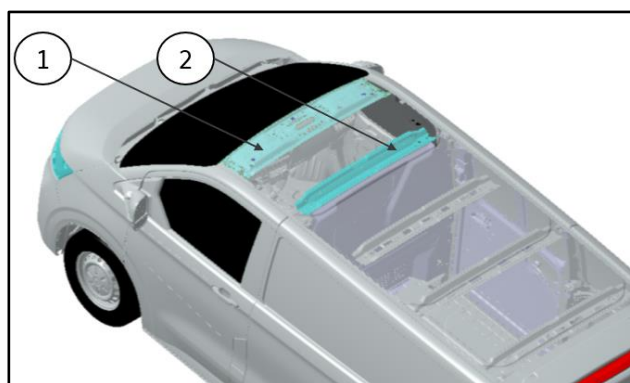
#### Warning note

When installing a pop-up roof, do not cut/change/remove the roof strip above the windscreen or the roof traverse above the B-pillars.

#### Information

The airbag exclusion limit is the rear side of the large roof console, as shown below. This is located 37 mm behind the roof strip above the windscreen.

#### Pop-up roof – installation



Element	Description
1	Top edge rail
2	B-pillar roof traverse

It is not recommended to shorten/modify/remove the B-pillar roof traverse – see figure. However, if this is absolutely necessary and cannot be avoided, the roof traverse must be replaced by a suitable construction with an equivalent structural strength and function as the original construction. All legal requirements must be complied with.

## 5.13 Corrosion protection measures

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

### 5.13.1 General information

Do not drill into closed body components to prevent corrosion due to chips.

However, if drilling is necessary, the following must be observed:

- After cutting or drilling, re-paint metal edges to protect against corrosion
- Do your best to remove all chips from the inside of the longitudinal member and treat it to prevent corrosion.
- Apply anti-corrosion agent to the inside and outside of the chassis frame

Welding:

See: [5.1.2 Welding](#)

### 5.13.2 Repair paint damage

Paint damage caused by cutting or machining the body panel must be repaired.

Make sure that all materials used comply with Volkswagen specifications and try to maintain the original condition as far as possible.

### 5.13.3 Underseal and materials

### Warning note

Surfaces of components such as brakes or catalytic converters must not be painted over or contaminated.

Make sure that all materials used comply with Volkswagen specifications and try to maintain the original condition as far as possible.

Some manufacturer-specific products will affect the original finish.

#### 5.13.4 Paint road wheels

##### Warning note

Do not paint the surfaces of the rims that come into contact with other wheels, the brake drum or disc, the hub and holes, or the surface under the wheel nuts.

Any further treatment in these areas may adversely affect the performance of the wheel hub and the safety of the vehicle. Cover the wheels during painting or paint repair work.

#### 5.13.5 Contact corrosion

When using materials with unequal electrochemical potential, ensure that the materials are insulated from each other to prevent contact corrosion.

Use suitable insulating materials. Where possible, use materials with a low electrochemical potential difference.



## 5.14 Frame and structure

### Information

For further information, please contact your national sales company or your local Volkswagen Commercial Vehicles Partner. If they are unable to help you, please contact Volkswagen Commercial Vehicles (see [chapter 1.2.1.1 "Contact in Germany"](#) and [chapter 1.2.1.2 "International contact"](#)).

### 5.14.1 Mounting points and pipes

The holes on the frame are manufacturing-related. They are not for fastening additional components. If further fasteners are required on the chassis frame, please observe the recommendation in the following figure. This does not apply to areas where loads occur, such as fasteners on springs or shock absorbers.

### Information

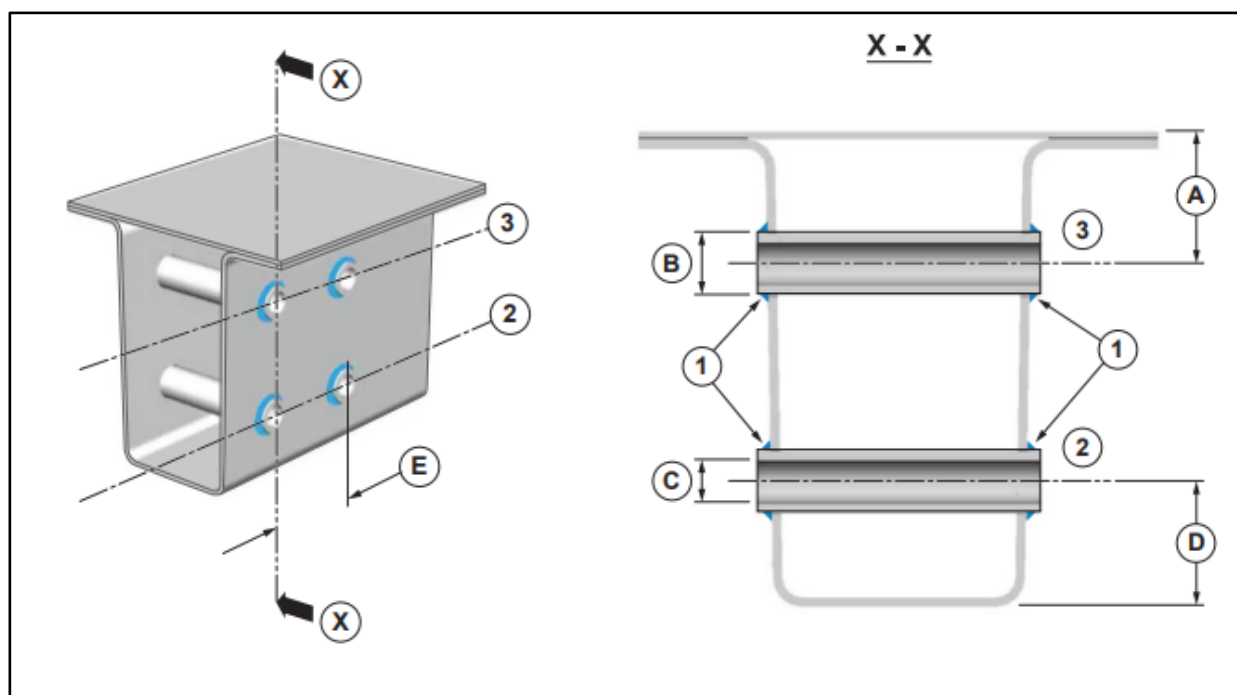
After drilling, deburr and counter-bore all holes and remove chips from the frame. Follow the corrosion protection measures.

See: [5.13 Corrosion protection measures](#)

### 5.14.2 Drilling on the frame and reinforcing tubes

The chassis frame can be drilled and reinforcing spacer tubes can be welded in, provided the following is observed:

- Follow all the details in the following figure
- Only drill or weld on the side walls of the chassis frame
- Locate and drill the holes precisely and use a drilling template to ensure the holes are perpendicular to the vertical centre line of the frame (consider the angle of the longitudinal member).
- Drill under dimension and expand the drill hole
- Do your best to remove all chips from the inside of the longitudinal member and treat it to prevent corrosion.
- Fully weld each tube end and grind it flat and at right angles, if possible in groups. Take into account the lifting angle of the longitudinal member
- Apply anti-corrosion agent to the inside and outside of the chassis frame
- See: [5.13 Corrosion protection measures](#)
- Holes should be arranged in groups of two either vertically at a distance of 30 to 35 mm from the top and/or bottom of the chassis frame, or horizontally at a minimum distance of 50 mm, 30 to 35 mm from the top and/or bottom of the chassis frame; see figure.
- Always use M10 bolts of property class 8.8 or higher
- Do not install tubes at medium chassis frame height, as this can impair the bulge resistance of the low-profile side walls
- Regardless of use, the maximum permissible bore hole diameter in the side panel of the chassis frame is 16.5 mm



Element	Description		Description
1	Complete holes – full diameter welding on each side	B	Diameter max. 16.5 mm
2	Centre line of the holes/tubes	C	Diameter 11 mm
3	Centre line of the holes/tubes	D	30 to 35 mm
A	30 to 35 mm	E	Min. 50 mm

Do not drill into closed body components to prevent corrosion due to chips.

See: [5.13 Corrosion protection measures](#)

Drilling and welding work on the frame and body must be carried out in accordance with the following guidelines.

See: [5.1.2 Welding](#)

#### 5.14.3 Water tank for campers

##### Information

It is recommended to attach a sticker or label next to the filler opening that indicates the correct fluid to be used, e.g. "Water only" for water tanks.

## 6 Homologation

### 6.1 Notes on the ISC parameters for conversions and modifications

Complete/incomplete vehicles that have been modified with add-ons/conversions after completion at the OEM plant and before initial registration must resubmit CO<sub>2</sub>/consumption values for the second stage.

These can be identified using the WLTP Conversion Calculator in accordance with the available homologations. Options for calculating weight and/or aerodynamic changes are available.

If individual values are not available for the respective conversion, it is possible to apply for homologation in consultation with the technical service and the regulatory authorities.

Below is a list of the ISC parameters that must be complied with for the following engine/gearbox versions in order to use the approval of the basic vehicle.

#### ICE (combustion engine) 81 kW

Drive/gearbox	Type approval	Actual weight of the final vehicle [kg]		Technically permissible gross weight of the final vehicle [kg]		Front surface [cm <sup>2</sup> ]		Rolling resistance of tyres [kg/ton]		Free radiator inflow area [cm <sup>2</sup> ]	
		from	to	from	to	from	to	from	to	from	to
81kW FM6 (BCFA)	M1_unvollständig	1825	3125	3100	3225	34000	47500	4.90	6.10	1652	2015
81kW_FM6 (BCFA)	N1_unvollständig	1825	3125	2575	3225	34000	47500	4.90	6.10	1652	2015

FM6 – Front-wheel drive/manual transmission/6-speed

**ICE (combustion engine) 110 kW**

Drive/gearbox	Type approval	Actual weight of the final vehicle [kg]		Technically permissible gross weight of the final vehicle [kg]		Front surface [cm²]		Rolling resistance of tyres [kg/ton]		Free radiator inflow area [cm²]	
		from	to	from	to	from	to	from	to	from	to
110kW_AA8 (BJAA)	M1_vollständig	1970	2596	3195	3300	34000	43000	4.90	6.10	1652	2015
110kW_AA8 (BJAA)	M1_unvollständig	1975	3125	3195	3300	34000	47500	4.90	6.10	1652	2015
110kW_AA8 (BJAA)	N1_vollständig	1970	2596	2800	3225	34000	43000	4.90	6.10	1652	2015
110kW_AA8 (BJAA)	N1_unvollständig	1975	3125	2795	3225	34000	47500	4.90	6.10	1652	2015
110kW_FM6 (BJFA)	M1_unvollständig	1825	3125	3100	3225	34000	47500	4.90	6.10	1652	2015
110kW_FM6 (BJFA)	N1_unvollständig	1825	3125	2575	3225	34000	47500	4.90	6.10	1652	2015
110kW_FA8 (BJFA)	M1_unvollständig	1875	3125	3165	3225	34000	47500	4.90	6.10	1652	2015
110kW_FA8 (BJFA)	N1_unvollständig	1875	3125	2600	3225	34000	47500	4.90	6.10	1652	2015

AA8 – Four-wheel drive/automatic gearbox/8-speed

FA8 – Front-wheel drive/automatic gearbox/8-speed

FM6 – Front-wheel drive/manual transmission/6-speed

**ICE (combustion engine) 125 kW**

Drive/gearbox	Type approval	Actual weight of the final vehicle [kg]		Technically permissible gross weight of the final vehicle [kg]		Front surface [cm²]		Rolling resistance of tyres [kg/ton]		Free radiator inflow area [cm²]	
		from	to	from	to	from	to	from	to	from	to
125kW_AA8 (BKAA)	M1_vollständig	1970	2596	3195	3300	34000	43000	4.90	6.10	1652	2015
125kW_AA8 (BKAA)	M1_unvollständig	1975	3125	3195	3300	34000	38000	4.90	6.10	1652	2015
125kW_AA8 (BKAA)	N1_vollständig	1970	2596	2800	3225	34000	43000	4.90	6.10	1652	2015
125kW_AA8 (BKAA)	N1_unvollständig	1975	3125	2800	3225	34000	47500	4.90	6.10	1652	2015
125kW_FA8 (BKFA)	M1_unvollständig	1875	3125	3150	3225	34000	38000	4.90	6.10	1652	2015
125kW_FA8 (BKFA)	N1_unvollständig	1875	3125	2600	3225	34000	47500	4.90	6.10	1652	2015

AA8 – Four-wheel drive/automatic gearbox/8-speed

FA8 – Front-wheel drive/automatic gearbox/8-speed

**BEV (battery electric vehicle)**

Drive/gearbox	Type approval	Actual weight of the final vehicle [kg]		Technically permissible gross weight of the final vehicle [kg]		Front surface [cm <sup>2</sup> ]		Rolling resistance of tyres [kg/ton]		Free radiator inflow area [cm <sup>2</sup> ]	
		from	to	from	to	from	to	from	to	from	to
100kW_HA1 (EJRA)	M1/N1_unvollständig	1890	3234	3160	3350	30000	47500	4.90	11.20	1652	2015
160kW_HA1 (EKRA)	M1/N1_unvollständig	1890	3234	3160	3350	30000	47500	4.90	11.20	1652	2015
210kW_HA1 (ELRA)	M1/N1_unvollständig	1890	3234	3160	3350	30000	47500	4.90	11.20	1652	2015

HA1 – rear-wheel drive/automatic gearbox/1-speed

**Information**

Calculation for conversions with weight changes and changes to the front surface are possible in the Customized Solution Portal (WLTP Conversion Calculator).

**Information**

For all vehicles/engine/gearbox versions for which no values can currently be generated using the WLTP calculation tool, please contact your responsible technical service and check whether individual approval or multi-stage type approval is possible.

## 7 List of changes

Changes to the Converter guidelines compared to the data status of September 2024.

Chapter no.	Chapter heading	Scope of change
1	General information	
1.1	Introduction	
1.1.1	Concept of this Owner's Manual	
1.1.2	Means of representation	
1.1.3	Vehicle safety	
1.1.4	Operational safety	
1.1.5	Note on copyright	
1.2	General information	
1.2.1	Product and vehicle information for Converter	
1.2.1.1	Contact in Germany	Links updated
1.2.1.2	International contact	
1.2.1.3	Electronic Repair and Workshop Information from Volkswagen AG (erWin*)	
1.2.1.4	Genuine Parts Online Ordering Portal*	
1.2.1.5	Online Owner's Manual	
1.2.1.6	European Type Approval (ETA) and EC Certificate of Conformity (CoC)	
1.2.1.7	Worldwide Harmonised Light Vehicles Test Procedure (WLTP)	
1.2.1.8	Notes on homologation of modifications and conversions	
1.2.1.9	Manufacturer's declaration	
1.2.2	Converter guidelines, consulting	
1.2.2.1	Letter of non-objection	
1.2.2.2	Application for the letter of non-objection	
1.2.2.3	Legal entitlements	
1.2.3	Warranty and product liability of the Converter	
1.2.4	Ensuring traceability	
1.2.5	Badges	
1.2.5.1	Positions on rear of the vehicle	
1.2.5.2	Appearance of whole vehicle	
1.2.5.3	Non-Volkswagen badge	
1.2.6	Recommendations for vehicle storage	
1.2.7	Compliance with environmental rules and regulations	
1.2.8	Recommendations for inspection, maintenance and repair	
1.2.9	Accident prevention	
1.2.10	Quality system	
1.3	Planning bodies	
1.3.1	Selecting the basic vehicle	Chapter updated
1.3.2	Vehicle modifications	
1.3.3	Vehicle acceptance	
1.4	Special equipment	
1.5	General product safety requirement	Chapter updated
1.5.1	Restraint system	
1.5.2	Drilling and welding	
1.5.3	Minimum requirements for the brake system	
1.5.4	Road safety	

Chapter no.	Chapter heading	Scope of change
1.5.5	Acoustic vehicle alarm system (AVAS)	
1.5.6	High-voltage vehicle systems	
1.6	Conversion type	
1.6.1	Order codes	Chapter updated
1.6.2	Conversion type – reference tables	
1.7	Conversion – homologation	
1.8	Electromagnetic compatibility (EMC)	
1.8.1	Permitted aerial positions	Image updated
1.9	Guidelines for the working cycle of the vehicle	
1.9.1	Driving and operating characteristics of the vehicle	
1.10	Directive on end-of-life vehicles (ELV)	
1.11	Jacking up and lifting	
1.11.1	Lifting with a jack	
1.11.2	Lifting with a lifting platform	
1.12	Noise, vibrations, harshness (NVH)	
1.13	Vehicle transport aids and the storage of vehicles	Technical information and chapter updated
1.14	Assemblies and ergonomics	
1.14.1	General guidelines for assemblies	
1.14.2	Driver's operating area	
1.14.3	Driver's field of vision	
1.14.4	Effect of the conversion on parking aids	
1.14.5	Aids for getting in and out of the vehicle	
1.14.6	Skid plate at front, rear and sides	
1.14.7	Input values for calculation according to Worldwide Harmonized Light Vehicles Test Procedure (WLTP)	
1.14.8	Table of vehicle dimensions	
1.14.9	Dimensions for recommended main load areas	
1.14.10	Vehicles with roof-mounted equipment	Chapter updated
1.15	Hardware	Chapter updated
1.16	Load distribution	
1.16.1	Load distribution	
1.16.2	Centre of gravity position	
1.16.3	Test procedure for the height of the centre of gravity	Images updated
1.16.4	Calculation of the height of the centre of gravity	
1.16.5	Formulae	
1.17	Towing	
1.17.1	Ball coupling – requirements	
1.17.2	Models with ball couplings (for EU)	Chapter updated
2	Running gear	
2.1	Suspension system	
2.2	Front suspension	
2.2.1	Springs and spring suspension	
2.3	Rear suspension	
2.3.1	Springs and spring suspension	

Chapter no.	Chapter heading	Scope of change
2.4	Wheels and tyres	
2.4.1	Wheel clearance	
2.4.2	Tyre manufacturer	
2.4.3	Tyre pressure monitoring system	Chapter updated
2.4.4	Spare wheel	
2.4.5	Temporary repair kit	
2.4.6	Painting of wheels	
2.5	Brake system	
2.5.1	General information	
2.5.2	Kerb weight – data	
2.5.3	Brake hoses – general information	
2.5.4	Parking brake	Chapter updated
2.5.5	Hydraulic brake – front and rear brakes	
2.5.6	Anti-Lock Brake System – Electronic Stability Control	
3	Drive train	
3.1	Motor/electric drive	
3.1.1	Selection of motor/electric drive for conversions	
3.1.2	Motor/drive types	
3.2	Engine cooling	
3.2.1	Auxiliary heating systems	
3.2.2	Fuel-operated auxiliary heater	
3.2.3	Restrictions to the air flow	
3.3	Power take-off system	
3.3.1	Auxiliary drive units	
3.4	Automatic gearbox	
3.5	Clutch	
3.6	Manual gearbox	
3.7	Exhaust	
3.7.1	Extensions and optional exhaust systems	
3.7.2	Exhaust pipes and brackets	
3.7.3	Exhaust heat shields	
3.7.4	Diesel particulate filter (DPF)	
3.7.5	Manual initiation of regeneration (PR number 9HC)	
3.8	Fuel System	
3.9	High-voltage system and electrified drive train	
3.9.1	High-voltage system – health and safety information	
3.9.2	Overview of the high-voltage system	
3.9.3	De-energising the high-voltage system	
3.9.4	Cooling of the HV system	
3.9.5	High-voltage battery	
3.9.6	EV charging	
4	Electronics	
4.1	Overview of the electrical system	
4.1.1	Changes to electrical architecture and functions	Chapter updated
4.2	Instructions for cable installation and routing	
4.2.1	Information on wiring harnesses	



Chapter no.	Chapter heading	Scope of change
<a href="#">4.2.2</a>	General information on wiring and routing	Chapter updated
<a href="#">4.2.3</a>	Arrangement of the output pins	
<a href="#">4.2.4</a>	Unused connectors	
<a href="#">4.2.5</a>	Earth connection	
<a href="#">4.2.6</a>	Prevention of squeaking and rattling	
<a href="#">4.2.7</a>	Prevention of water ingress	
<a href="#">4.2.8</a>	Splicing of wiring harnesses	
<a href="#">4.2.9</a>	Wiring specification	
<a href="#">4.2.10</a>	Electromagnetic compatibility (EMC)	
<a href="#">4.2.11</a>	Cable routing through plates	
<a href="#">4.2.12</a>	Drill protection zones – HV cable	
<a href="#">4.2.13</a>	Drill protection zones – HV modules, LV cables and connectors	
<a href="#">4.2.14</a>	No-drilling zones – earth connection	
<a href="#">4.2.15</a>	No-drilling zones – chassis earth	Chapter updated
<a href="#">4.2.16</a>	No-drilling zones – load compartment	
<a href="#">4.2.17</a>	Wiring harness, electrics for ball coupling (PR number 1M5)	
<a href="#">4.2.18</a>	Electrical system for ball coupling	
<a href="#">4.2.19</a>	Ball coupling connectivity	
<a href="#">4.2.20</a>	Ball coupling connectivity (EU)	Chapter updated
<a href="#">4.2.21</a>	Ball coupling connectivity (Australia and New Zealand)	
<a href="#">4.3</a>	Communication network	
<a href="#">4.3.1</a>	CAN bus – system description and interface	Chapter updated
<a href="#">4.3.2</a>	Onboard supply control unit (BCM)	
<a href="#">4.4</a>	Charging system	
<a href="#">4.4.1</a>	General information	
<a href="#">4.4.2</a>	Layout of the battery charging system	
<a href="#">4.4.3</a>	Smart regenerative charging (SRC)	
<a href="#">4.4.4</a>	SRC override	
<a href="#">4.4.5</a>	Retrofit High Performance mode	
<a href="#">4.4.6</a>	Check function	
<a href="#">4.4.7</a>	Guidelines on charge balancing	
<a href="#">4.4.8</a>	Circuit diagrams	
<a href="#">4.4.9</a>	Alternator features	Chapter updated
<a href="#">4.5</a>	Battery systems	Chapter updated
<a href="#">4.5.1</a>	Recommendations for connectivity and power consumption	Chapter updated
<a href="#">4.5.2</a>	Supply and earth connections for high-voltage circuits	
<a href="#">4.5.3</a>	Guidelines for the conversion of vehicles	Chapter updated
<a href="#">4.5.4</a>	Battery options	Chapter updated
<a href="#">4.5.5</a>	Battery rules	Chapter updated
<a href="#">4.5.6</a>	Battery configurations	Chapter updated
<a href="#">4.5.7</a>	Batteries of other manufacturers installed by the Converter	Chapter updated
<a href="#">4.5.8</a>	Retrofitted +12-V power connections for loads over 200 A	Chapter updated
<a href="#">4.5.9</a>	Battery monitoring sensor (BMS)	
<a href="#">4.5.10</a>	Single and dual battery systems	Chapter updated
<a href="#">4.5.11</a>	Additional loads and charging systems	Chapter updated
<a href="#">4.6</a>	Battery protection	

Chapter no.	Chapter heading	Scope of change
4.6.1	Interior lights and 12-V sockets	
4.6.2	Standard battery monitoring (SBG) and load shedding	
4.6.3	Electrical power connections	
4.6.4	How SBG and load shedding work	
4.7	Interior climate control	
4.7.1	Front interior air conditioning system	
4.7.2	Rear interior air conditioning system	
4.8	Instrument cluster (IPC)	
4.9	Horn	
4.10	Engine management system	
4.10.1	Starting and starting with a warm engine	
4.10.2	Start/stop system	
4.10.3	Engine speed controller (PR number US2), system overview	Chapter updated
4.10.4	Diesel particulate filter (DPF) and idling speed control	
4.11	Tachograph	
4.11.1	Legal provisions	
4.11.2	Subsequent installation of tachograph and DSRC	
4.11.3	Calibration and subsequent installation of the tachograph	
4.12	Information and infotainment system	
4.12.1	Package overview for audio main units (AHU) – multimedia entertainment system (ICE)	
4.12.2	SYNC radio and SYNC radio with DAB	
4.12.3	Rear view camera system	Image updated
4.12.4	Additional loudspeakers	
4.13	Mobile phone	
4.14	Exterior lighting	
4.14.1	Reversing light	
4.14.2	Lights – front and rear fog lights	
4.14.3	Load of the lighting system	
4.14.4	Lights – warning lights / turn signals	
4.14.5	Electrically operated exterior mirrors	
4.14.6	Additional exterior lights	
4.15	Interior lighting	
4.15.1	Additional interior lights	Chapter updated
4.15.2	Additional lighting for the rear vehicle interior	
4.16	Emergency call systems	Image updated
4.16.1	Routing the GNSS/5G aerial	
4.17	Adaptive cruise control system	
4.18	Blind Spot Monitor (blind spot information system (BLIS))	
4.19	Camera on the windscreen	Image updated
4.20	Automatic wiper and headlight control for vehicles with large overhangs	Image updated
4.21	Handles, locks, locking elements and access systems	
4.21.1	Door – removal or modification	Chapter updated
4.21.2	Central locking	
4.21.3	Rear lid remote release / Tyre Pressure Monitoring System receiver (RKE/TPMS receiver)	
4.21.4	Aerials for keyless entry and keyless start (PEPS)	Image updated
4.22	Fuses	Chapter updated

Chapter no.	Chapter heading	Scope of change
<del>4.22.1</del>	<del>Fuses</del>	Chapter deleted
<del>4.22.2</del>	<del>Relay</del>	Chapter deleted
4.22.1	Wipers	Chapter no. changed
4.23	Connectors and connections	
4.23.1	General information	
4.23.2	External power supply point (CCP)	Chapter updated
4.23.3	Supply and earth connections for high-voltage circuits	
4.23.4	Vehicle interface connector – technical data for planning	
4.23.5	Intelligent interface for additional power tap incl. fuse (ISL) (PR number VH2/VH3)	Chapter updated
<del>4.23.6</del>	<del>Update and configuration of the SFB ISL software</del>	Chapter deleted
4.23.6	Functions of the battery monitoring – fuse box	Chapter updated Chapter no. changed
4.23.7	Additional vehicle signals/characteristics	Chapter no. changed
4.24	DC/AC converter (inverter) 230 V (PPOB)	
4.25	Earth connection	
4.25.1	Earth connections	Chapter updated
4.26	Acoustic vehicle alarm system (AVAS)	Chapter updated
5	Body and paintwork	
5.1	Body	
5.1.1	Body design – general information	
5.1.2	Welding	
5.1.3	Parts made of boron steel	
5.1.4	No-drilling zones on the vehicle floor: Transporter panel van with diesel engine	Images updated
5.1.5	No-drilling / no-welding zones on the vehicle floor – BEV/PHEV	Chapter updated
5.1.6	Transporter panel van – floor drilling – BEV/PHEV	Chapter updated
5.1.7	Integrity of the front section for cooling, crumple zone, aerodynamics and lighting	
5.2	Hydraulic lifting device	Image updated
5.3	Shelf systems	
5.4	Load compartment	
5.4.1	Load compartment cargo securing devices	
5.5	Interior partitions	
5.5.1	Partition(s) – driver and passenger protection for Transporter panel van, Caravelle and window van	Image updated
5.5.2	Partitions: motion sensors for anti-theft alarm	Chapter updated
5.6	Body openings	
5.6.1	Security, anti-theft system and catch	Images updated
5.7	Interior equipment	
5.7.1	Load compartment interior lighting	
5.7.2	Plywood panelling/cladding	
5.7.3	Side ventilation openings on the body	
5.7.4	Floor specification for campers (BEV/PHEV versions only)	Chapter updated
5.8	Seats	
5.8.1	Transporter panel van	
5.8.2	Heated seats	

Chapter no.	Chapter heading	Scope of change
5.8.3	Mounting positions for rear seats	
5.9	Glass, frames and mechanisms	
5.9.1	Heated windscreen and heated rear window	
5.9.2	Rear and side windows	
5.10	Airbag – Safety Restraint System (SRS)	
5.10.1	Airbags	Image updated
5.11	Seat belt systems	
5.11.1	Seat belts	
5.11.2	No-drilling zone – B-pillar	
5.11.3	Seat belt warning system	
5.11.4	Wireless seat belt warning system	Image updated
5.12	Roof	
5.12.1	Roof ventilation	Image updated
5.12.2	Roof carriers	Image updated
5.12.3	Pop-up roof conversion	Image updated
5.13	Corrosion protection measures	
5.13.1	General information	
5.13.2	Repair paint damage	
5.13.3	Underseal and materials	
5.13.4	Paint road wheels	
5.13.5	Contact corrosion	
5.14	Frame and structure	
5.14.1	Mounting points and tubes	
5.14.2	Frame drilling and tube reinforcement	
5.14.3	Water tank for campers	
6	Homologation	New chapter
6.1	Notes on the ISC parameters for conversions and modifications	New chapter
7	Lists of changes	Chapter no. changed and updated

# Converter guidelines

## The new Transporter

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<https://www.volkswagen-nutzfahrzeuge.de>

<https://www.customized-solution.com>

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