Service Training

Commercial Vehicles

Self-study Programme 369

The Crafter 2006

The Crafter

- Professional
- Multi-functional
- Comfortable
- Safe

S369_002

The LT2, which has enjoyed great success for a number of years, is to be succeeded by the new light transporter named the Crafter.

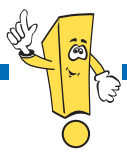
As an entirely new development from Volkswagen and DaimlerChrysler, the vehicle concept will be implemented for both DaimlerChrysler and for Volkswagen Commercial Vehicles. Above all, brand-specific adaptations can be found in the design.

Besides its technical features and multi-functionality, the Crafter is characterised by its modern exterior and interior design. The results achieved in the field of active and passive safety deserve particular emphasis.

Separate self-study programmes are available on the following topics:

- SSP 370 The Crafter - Electrical System
- SSP 371 The 2.5l TDI Engines in the Crafter
- SSP 372 TheShiftmatic Gearbox 0B81

NEW



Important Note

The self-study programme shows the design and function of new developments. The contents will not be updated.

For current testing, adjustment and repair instructions, refer to the relevant service literature.

Contents







In brief

The history of the light transporter

Volkswagen's first light transporter – the LT1 – was developed entirely in-house within the Group. It was presented to the specialist world for the first time in 1975.

1975

S369_046

What is called the one-box-design of the first Volkswagen light transporter is striking.

The driver is seated above the front axle, the engine is installed between the driver and front passenger, and the rear axle is used to drive the vehicle.

The LT1 was built with two wheelbases and two roof heights. Vehicle variants included the minibus with up to 14 seats, the pure panel van and a dropside vehicle or a chassis. The dropside vehicle and chassis were available with both a single cab and a double cab. Both petrol and diesel engines were installed.

1996

The second generation of light transporter – the LT2 – was jointly developed by Mercedes-Benz (Sprinter) and Volkswagen, and was launched in 1996. Both manufacturers' vehicles are almost identical in design terms. In comparison with the predecessor model, they were characterised by a sloping front with a conventional bonnet.

The LT2 was manufactured with three wheelbases and two roof heights.

Once again, both petrol and diesel engines were installed. The diesel engines which were fitted were generally turbo diesel engines.

S369_047

2006

S369_048

The third generation of the light transporter is also a joint development between DaimlerChrysler and Volkswagen. From 2006 onwards, Volkswagen's new light transporter will be launched under the name Crafter. Both manufacturers' vehicles are almost identical in design terms. Adaptations have primarily been carried out on the Crafter's front end. This has enabled a differentiation in the vehicle's appearance which corresponds to Volkswagen Commercial Vehicles' current design style.

The Crafter will be manufactured with three wheelbases, 4 vehicle lengths, 6 platform lengths and three different heights. The weight classes are sub-divided into three basic weight classes and an extended weight class.

Vehicle variants will include the crew bus with up to 9 seats, the panel van and a dropside vehicle or the chassis. The dropside vehicle and chassis will be built with both a single cab and a double cab.

The vehicle will be fitted with a Volkswagen turbo diesel engine with common rail fuel injection in 4 power outputs ranging from 65 kW to 120 kW.

In brief

Technical highlights in the Crafter

The Crafter has been developed to meet users' highest standards of quality and functionality. It is also characterised by its modern and striking design.

As a panel van, it is able to cope with all of the tasks of an enclosed load transporter. This variant will, in turn, form the vast part of the production range.

As a crew bus, it meets the broad demands of passenger transportation.

Extended model range in comparison with the predecessor model

S369_011

Comfortable radio/navigation and CD equipment options

Extensive storage compartment and securing option system

Large payload and load compartment, particularly favourable loading conditions in 4.6 t vehicles with super-single tyres (5.0 t variant with lower load rating)

High level of active occupant protection with driver and front passenger airbag, side and curtain airbags in the front and 3-point seat belts on all seats

Extensive heating and climate control equipment variants, supplementary heating systems

Diverse convenience component equipment such as, e.g. hill start assist, Park Distance Control, tyre pressure monitor, digital tachograph, light and rain sensor, heated windscreen

S369_038

Sliding door dimensions for particularly easy loading

The Crafter will also be built as a dropside vehicle, with both a single and a double cab.
The manufacturing range also includes a chassis variant, onto which optional bodies can be mounted according to the customer's wishes.

Engine range – turbo diesel engines with common rail fuel injection technology – with practical output levels

Diesel particulate filter as standard

S369_039

Passive occupant protection thanks to crashoptimised body and running gear

Double cab now with rear doors on both sides for the 2nd row of seats, double cab now also with short wheelbase of 3250 mm

Joystick gearshift in the dash panel

S369_012

6-speed manual gearbox for all engines, Shiftmatic gearbox (optional) for 80 kW and 100 kW

Load-dependent, 3rd generation electronic stabilisation programme, Bosch ESP 8.1, fitted as standard

New 16" running gear, independent wheel suspension with glass fibre-reinforced plastic leaf springs at the front, rigid rear axle with steel leaf springs

Technical data

Crafter – crew bus, panel van

S369_023

S369_024

S369_025

Crew bus and panel van dimensions

Gross vehicle weight	3000 - 5000 kg
Roof load	Max. 300 kg
Trailed load	Max. 3500 kg
Length	5244 - 7340 mm
Width	1993 mm
Height[1)]	2415 - 3045 mm
Front overhang length	1000 mm
Rear overhang length	990 - 2015 mm

Height of load sill[1)]	665 - 765 mm
Load compartment volume	7.5 - 17 m^3
Load compartment length	2600 - 4700 mm
Load compartment width	Max. 1780 mm
Load compartment height	1650 - 2140 mm
Wheelbase	3250 - 4325 mm
Track width at front	1708 - 1732 mm
Track width at rear	1521 - 1738 mm

1) Unladen
2) The crew bus and panel van values apply to unspecified items.
The Crafter is also available in the chassis version with single cab/double cab.

Technical data

Crafter – dropside vehicle with single/double cab, chassis with single/double cab

S369_026

S369_125

Dimensions for dropside vehicle with single/double cab, chassis with single cab[2)]

	Chassis with single cab or double cab	Dropside vehicle with single cab	Dropside vehicle with double cab
Length	5304 - 6846 mm	5328 - 6928 mm	5558 - 7038 mm
Width	1993 mm	2090 - 2190 mm	
Height	2340 - 2425 mm	2340 - 2425 mm	
Rear overhang length	1050 - 1517 mm	1074 - 1599 mm	1304 - 1709 mm
Interior load length	-	2840 - 4300 mm	2120 - 3600 mm
Interior load width	-	2030 - 2130 mm	
Height of load sill[1)]	-	960 - 1070 mm	

The Crafter model range

Weight (t)	Wheelbase (mm)	Crew bus - flat roof	Crew bus - high roof	Panel van - flat roof	Panel van - high roof
3,0	3250				
	3665				
3,5	3250				
	3665				
	4325				
	4325L				
4,6*/5,0	3665				
	4325				
	4325L				

* 4.6 t variant for use with super-single tyres

Panel van - super-high roof	Chassis with single cab	Chassis with double cab	Dropside vehicle with single cab	Dropside vehicle with double cab
				
				
				
				
				
				
				
				
				

Body

Body-in-white

Like the predecessor model, the Crafter is also designed as a panel van and crew bus with a unitised, all-steel body as an integral construction. The body forms a common support system together with the vehicle frame.

The Crafter's body has been optimised in terms of the following focal points:

- Strength and stiffness
- Crash behaviour
- Comfort
- Weight

Strength and stiffness

A stable body shell makes an important contribution towards stability and therefore also a vehicle's driving safety. The Crafter's body shell stiffness has therefore been increased. Important measures for achieving this include:

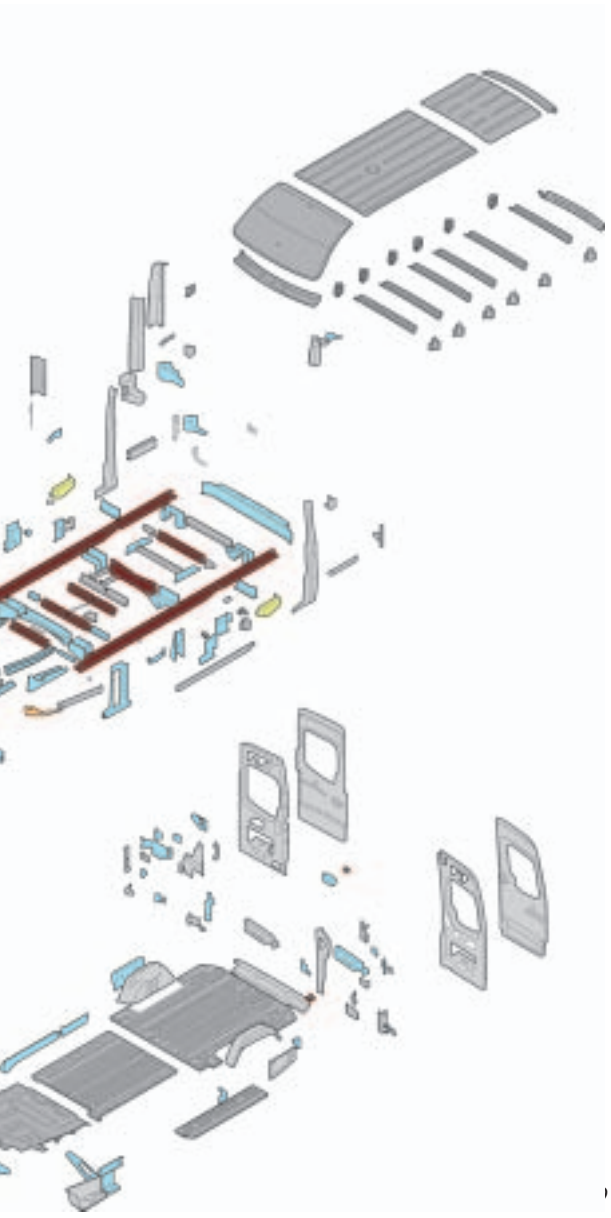
- Computer-based optimisation of the body-in-white
- Continuous B-, C- and D-pillars with enclosed profile
- Increased rear portal stiffness
- Welding the lower side wall section to the side wall at the top and the sub-structure at the bottom
- Additional roof frames and roof members form a system which is extremely resistant to bending.

Besides the geometrical design of the vehicle components, high priority was also given to the choice of relevant materials/material grades during these optimisations.

Depending on stress levels, steels of different stiffnesses are used for the body components.

The figure shows the crew bus/panel van body-in-white.

Due to design reasons, certain of the dropside vehicle body shell versions' body components are designed differently, whilst others have been adapted. In addition, bake-hardening steels*** are not used in the dropside vehicles.



- Soft deep-drawing steels
- High-strength ZE steels*
- High-strength IF steels**
- High-strength, cold-rolled steels
- Bake-hardening steels***
- Others

* ZE ... Symbol for electrolytically galvanised

** IF ... Symbol for **I**nterstitial **F**ree
IF steels have no interstitially (on intermediate lattice spaces) dissolved alloying constituents and can therefore be easily formed.
High-strength IF steels are based on a basic IF material. The higher strength is achieved via corresponding alloying.

*** Bake-hardening steels:
These are counted as higher- and high-strength steels. The bake-hardening effect leads to an increase in strength at paint stoving temperatures (150 - 200 °C).

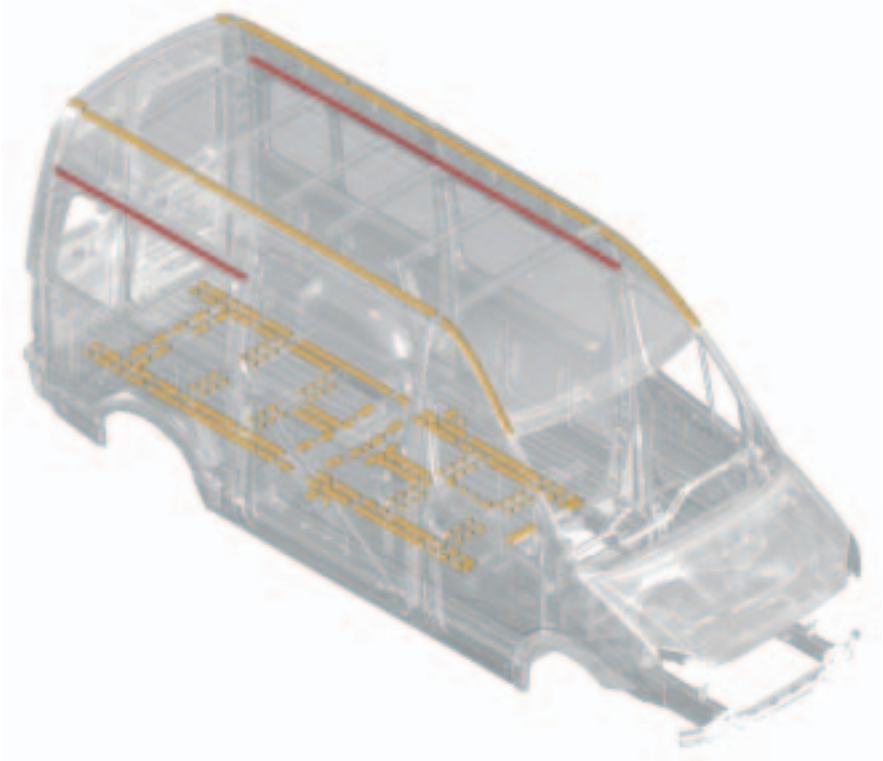
The joining techniques

Laser soldering and laser welding

Laser soldering and welding enable a number of the additional parts required for the spot welding process, such as e.g. gusset plates, to be omitted.

The main advantages are:

- Access to the weld seam on both sides is not necessary
- Higher process speed
- Lower thermal entrainment and therefore less weld warping and stress entrainment
- Omission of weld seam finishing
- Considerably tidier seams
- Continuous weld seams



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Laser welding

Laser soldering

Bonding

In modern bodies, bonded seams are increasingly being employed to joint parts which lie on each other.

If an adhesive is applied between two parts which are to be joined, an almost homogeneous material transition is created. Under the shearing forces which arise, relative movements between the two parts are therefore unable to occur within the bond.
The torsional stiffness which is achieved in this manner makes a major contribution towards overall body stiffness.

Depending on the purpose for which they are used, the bonding processes are sub-divided into:

- Strength bonding

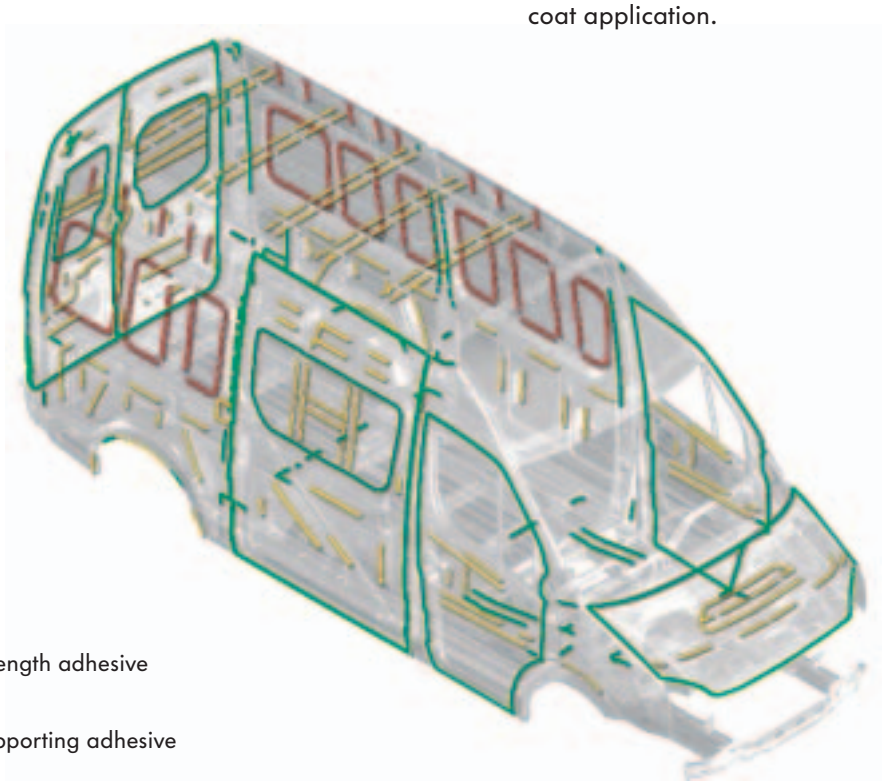
  In this case, sheet metal parts are firmly bonded together using adhesive.

- Support bonding

  In this case, adhesive is applied between sheet metal parts so that the two parts are supported on each other via the bond which arises. This contributes towards both stiffness and noise reduction thanks to the avoidance of resonances.

- Support bonding after top coat application

  In panel vans – without windows – a supporting adhesive is applied as a stiffening measure between the outer and inner skin following top coat application.



S369_096

Strength adhesive

Supporting adhesive

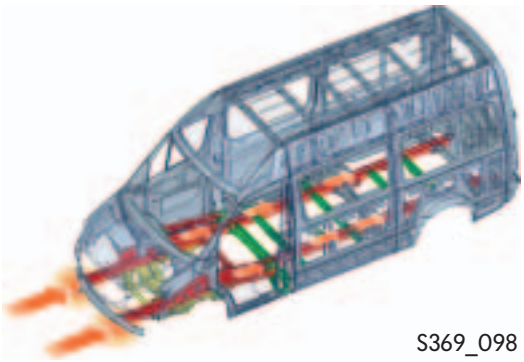
Supporting adhesive after top coat application

Crash-safe body design

One important development goal was to retain the essential features of a transporter, such as e.g. load volume, whilst simultaneously developing a stable passenger compartment for the front and rear passengers.

Co-ordinated force induction paths and energy-absorbing deformation zones were created, particularly for frontal impacts.

Force induction via the longitudinal members



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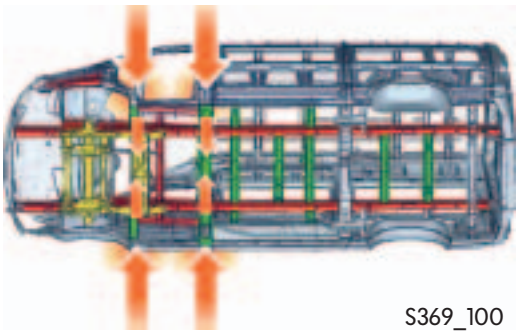
Force induction paths have also been provided for side impacts.

Force induction via the cross members



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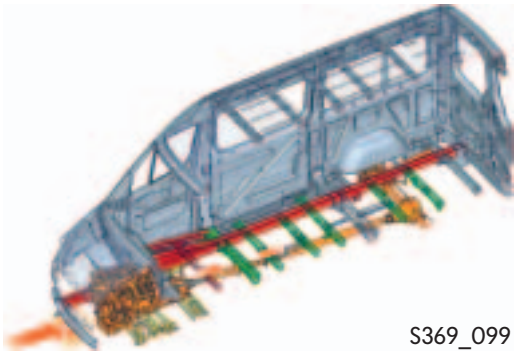
The drive train is an additional force induction path.

Force induction via the drive train



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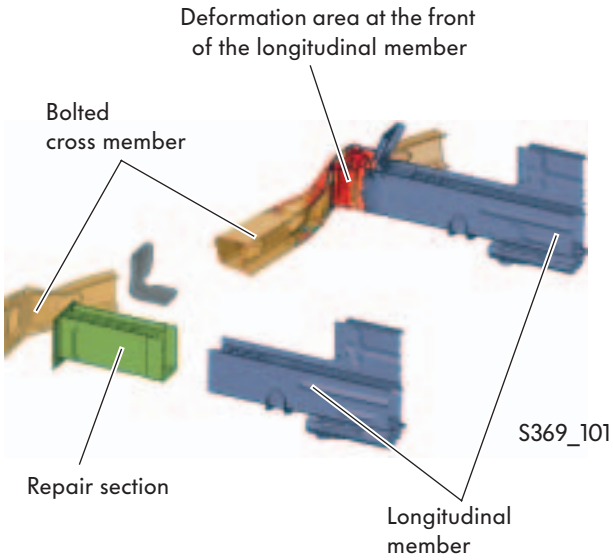
Front deformation zones

At the front, the two longitudinal members are joined together via a bolted steel cross member.

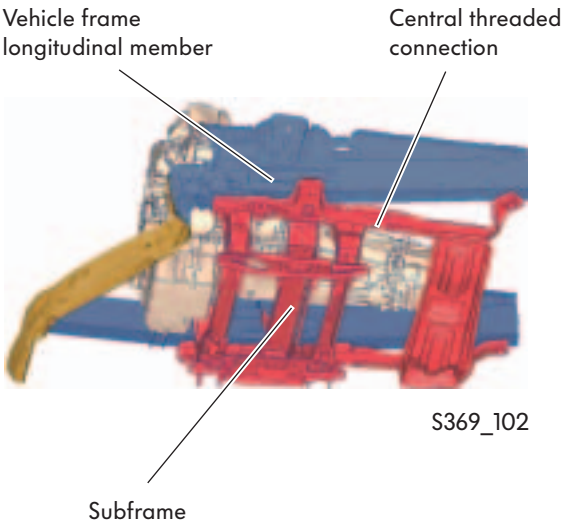
In the event of a frontal crash, this cross member primarily absorbs the force of the impact. The force is then guided into the longitudinal members and leads to deformation in the front area of one or both longitudinal members depending on the severity of the crash. The front area of the longitudinal members deforms even if the impact force is low. The rear area of the longitudinal members remains undamaged.

In the event of repairs, the exposed, front ends of the members also enable the separation of a defined area and replacement with a pre-manufactured repair section.



The detachable front axle

The front axle is designed as a so-called "detachable" front axle.
If a specific force level is attained in the event of a frontal crash, the subframe's central threaded connection, which is linked to the front axle, is disconnected and additional deformation zones in the frame longitudinal member are "released".



The seats

The first row of seats is comprised of the driver's seat as an individual seat and a front passenger seat, which is available as either an individual seat or a double seat bench.

S369_049

The seats are fitted with 3-point seat belts with ball bearing-type seat belt tensioners (centre seat without belt tension limiter).

The double seat bench may have a folding storage compartment in the centre seat's backrest.

S369_050

It also offers additional stowage space beneath the folding seat cushions.

S369_051

Double seat benches are fitted in the 1st and 2nd row of seats in the crew bus passenger compartment. The third row of seats is comprised of a triple seat bench.

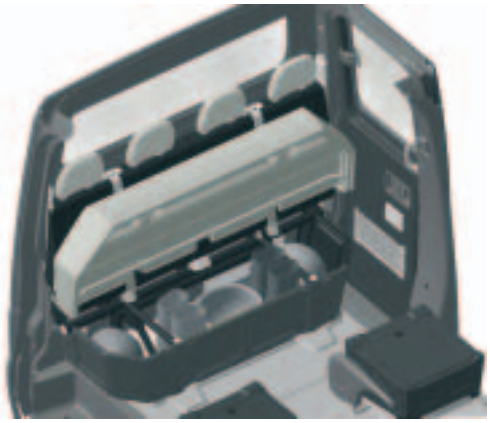
All seats are fitted with integral 3-point seat belts (without seat belt tensioners).

The left-hand seat in the 1st and 2nd row can be optionally fitted with the Isofix system.

S369_052

The second row of seats in the double cab is a quadruple seat bench. The entire seat cushion can be folded up, and the stowage space beneath it can be used to accommodate various utensils.

All seats are fitted with 3-point seat belts (without seat belt tensioners); these are integral in the case of the centre seats.



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Occupant protection

The Crafter is equipped with an extensive occupant protection system.

In the event of lateral impact, the Crafter's occupants are exposed to a lower risk of injury, thanks to their raised seating position, than passenger car occupants. In comparison with the predecessor, this has been further improved via the specific development of a stable floor structure in the Crafter.

Based on a stable passenger compartment which is able to withstand high loads, the available airbag and restraint systems additionally enhance occupant safety.

The airbag system

The Crafter is equipped with a driver airbag as standard.

The following are optionally available:

- Front passenger airbag
- Side airbag (in the seat) for the driver and front passenger – for the front passenger only if an individual seat is fitted
- Curtain airbag for the driver and front passenger – for the front passenger only if an individual seat is fitted

The seat belt system

The Crafter is equipped with 3-point seat belts as standard.

Seat belt system in the front seats

The driver and front passenger seats are fitted with seat belts with pyrotechnical belt tensioners. In conjunction with airbags, the seat belts are combined with belt tension limiters.

S369_087

S369_137

Seat belt system in the passenger compartment

The seats in the passenger compartment are fitted with integral seat belts.

S369_138

Engines

Engine/gearbox combinations

Engines	Mechanical 6-speed manual gearbox 0B7 330 Nm	Mechanical 6-speed manual gearbox 0B7 350 Nm	Shiftmatic gearbox 0B81
 2.5l/65 kW R5 TDI engine (BJJ)			
 2.5l/80 kW R5 TDI engine (BJK)			
 2.5l/100 kW R5 TDI engine (BJL)			
 2.5l/120 kW R5 TDI engine (BJM)			

The 2.5l TDI engines with common rail fuel injection technology

A new generation of 5-cylinder diesel engines has been developed for the Crafter.
This new engine generation's basic geometrical dimensions are based on the 2.5l 5-cylinder TDI engine with distributor-type injection pump, which proved its worth in the LT2.

S369_134

A multitude of engine components have been re-engineered to meet the increased output, acoustics, emissions, consumption and extended service interval requirements. Switching the engine to common rail fuel injection technology is a particularly important factor in this regard.

The engine is available in four output stages, from 65 kW to 120 kW. All engine variants are designed around a standardised, basic engine.

Depending on the output level, these have been adapted in terms of both mechanical system and engine management.

Equipped with a catalytically coated diesel particulate filter, all engine variants meet the EURO4/EU4 emissions standard. Engines which meet the EURO3/EU3 emissions standard are not fitted with a diesel particulate filter.

Detailed information on this engine generation is available in self-study programme 371 "The 2.5l TDI Engines in the Crafter".

Technical data

Technical features

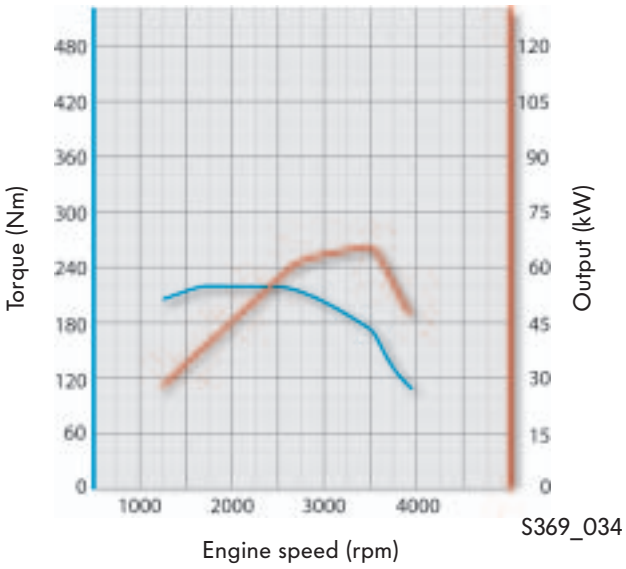
- Common rail fuel injection system with piezo injectors
- Catalytically coated diesel particulate filter
- Electric intake manifold flap
- Electric exhaust gas recirculation valve
- Variable exhaust gas recirculation cooler
- Adjustable turbocharger
- Vertical oil filter module
- Cyclonic oil separator
- Oil level sender for extended service interval

S369_019

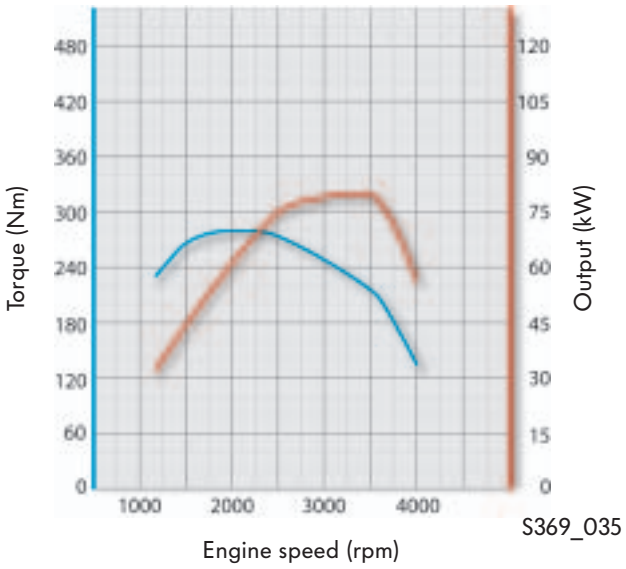
Engine code	BJJ	BJK	BJL	BJM
Type	5-cylinder in-line engine			
Displacement	2461 cm^3			
Bore	81.0			
Stroke	95.5			
Valves per cylinder	2			
Compression ratio	16.8 : 1			
Maximum output	65 kW at 3500 rpm	80 kW at 3500 rpm	100 kW at 3500 rpm	120 kW at 3500 rpm
Maximum torque	220 Nm at 2000 rpm	280 Nm at 2000 rpm	300 Nm at 2000 rpm	350 Nm at 2000 rpm
Engine management	EDC 16 C			
Fuel	Diesel, at least 51 CN			
Exhaust gas treatment	Exhaust gas recirculation with exhaust gas cooling; catalytically coated diesel particulate filter			
Emissions standard	EU4/EURO4	EU4/EURO4/ EURO3/EU3 (without diesel particulate filter and exhaust gas cooling)	EU4/EURO4	EU4/EURO4 EURO3 (without diesel particulate filter)

Torque and output graphs

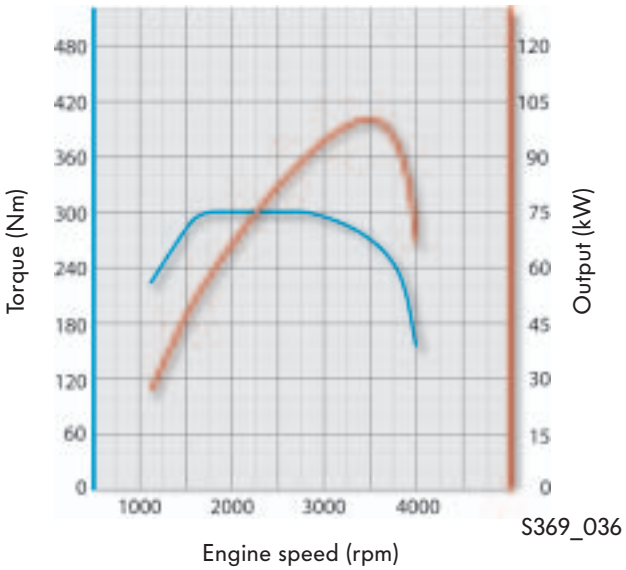
The 2.5l 65 kW TDI engine (BJJ)



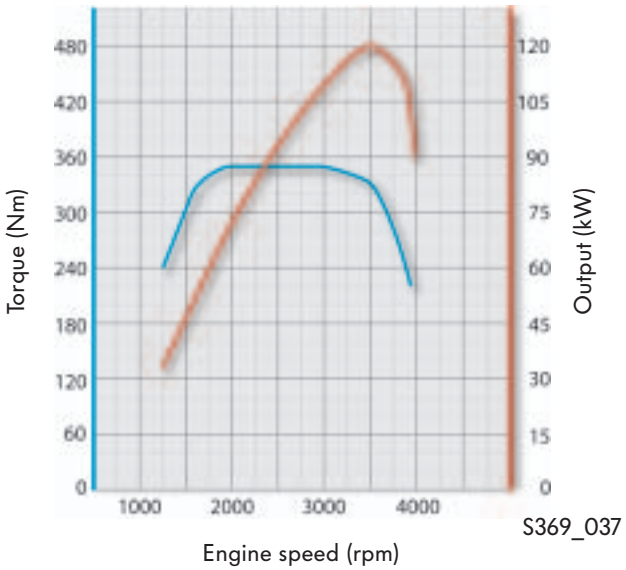
The 2.5l 80 kW TDI engine (BJK)



The 2.5l 100 kW TDI engine (BJL)



The 2.5l 120 kW TDI engine (BJM)



The 6-speed manual gearbox 0B7

The manual gearbox is vailable in two versions

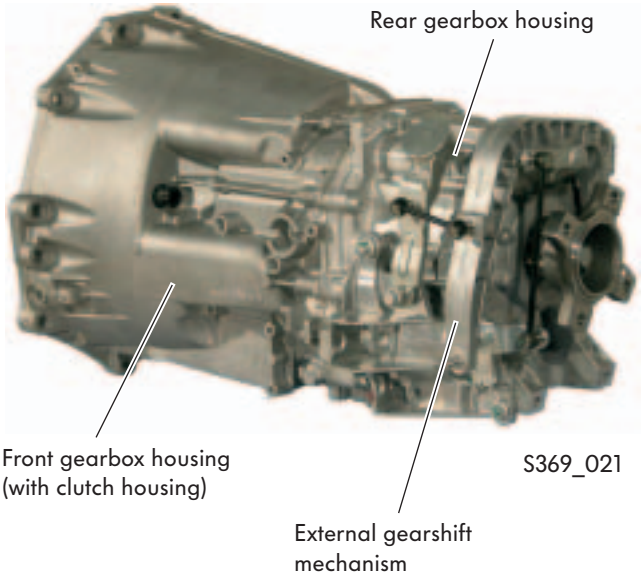
- 0B7 – for maximum torque of 330 Nm and
- 0B7 – for maximum torque of 350 Nm

The two gearbox versions have a modular structure and are primarily fitted with the same components.

The main components are:

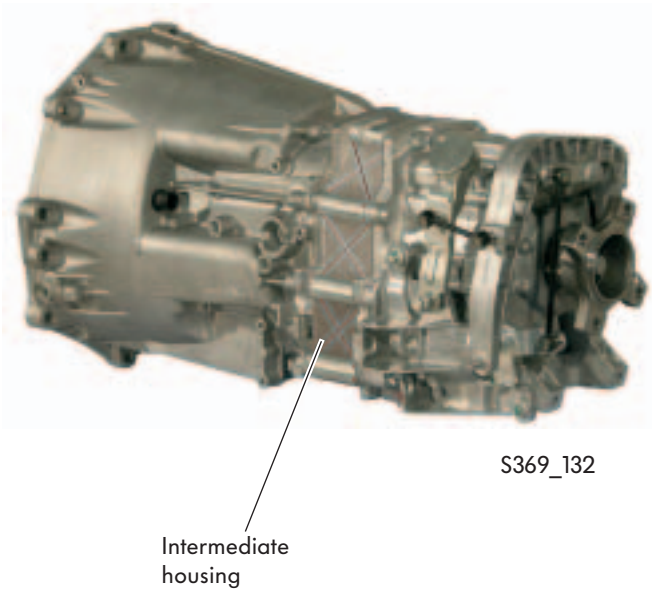
- Diecast aluminium clutch housing and gearbox housing
- Intermediate plate in the 0B7 – 350 Nm
- Internal gearbox components with the internal shift unit
- External gearshift mechanism

Manual gearbox 0B7 – 330 Nm



In the 350 Nm version of 6-speed manual gearbox 0B7, an intermediate housing with an integrated, additional mounting for the shafts is installed between the front and rear gearbox housing due to the higher, maximum torque of 350 Nm which has to be transmitted.

Manual gearbox 0B7 -350 Nm



Internal structure

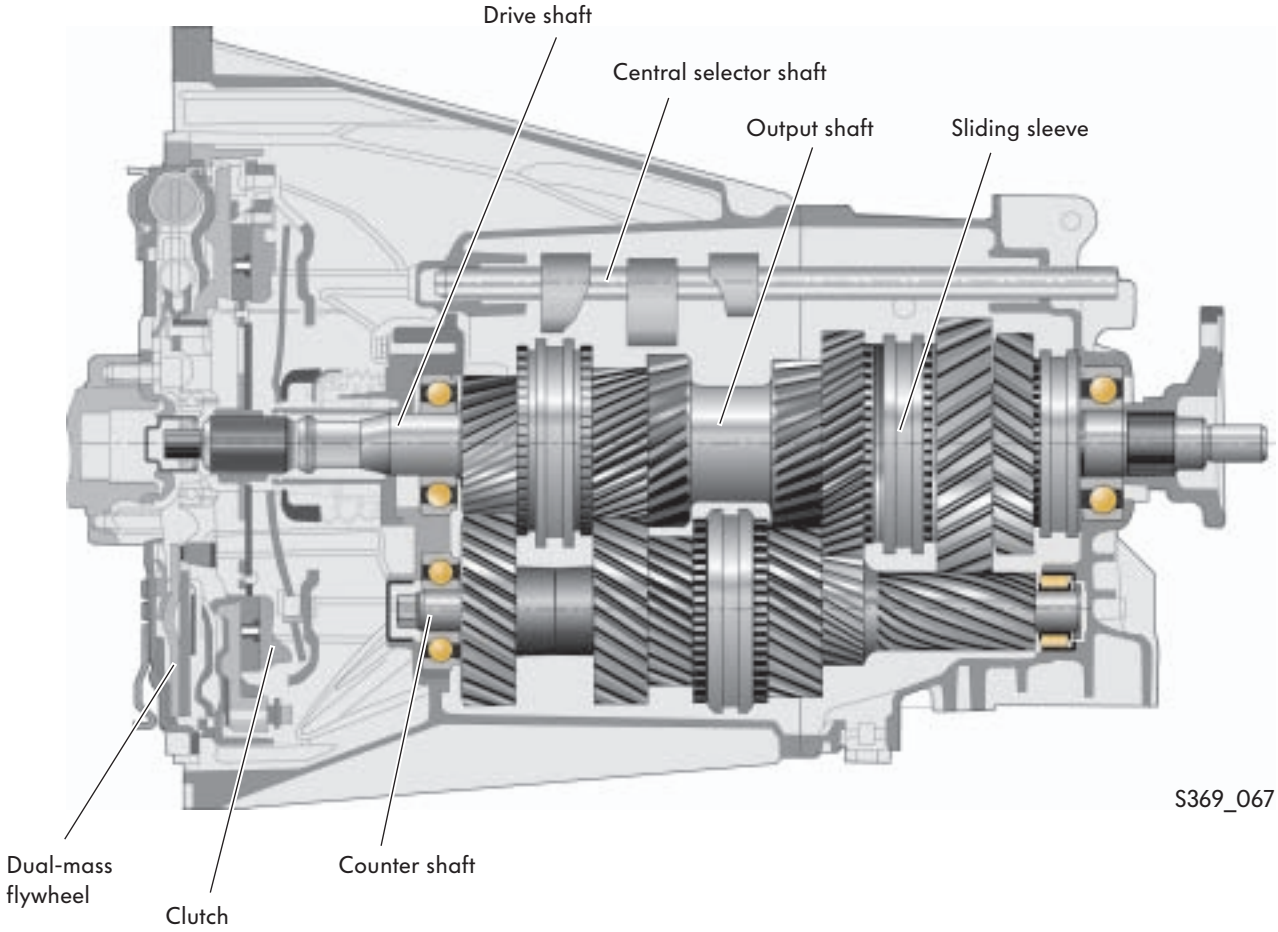
3 shafts are installed in the manual gearbox:

- Drive shaft
- Output shaft
- Counter shaft

The output shaft is axially mounted in the drive shaft.

Shifting is carried out via the central selector shaft, which takes up the external gearshift mechanism's movements and transfers these to the relevant sliding sleeves via a shift unit (module with selector forks).

For the sake of simplification and better clarity, the selector forks driven by the central selector shaft are not shown.



The figure shows manual gearbox 0B7 – 330 Nm (without intermediate plate).

Transmission

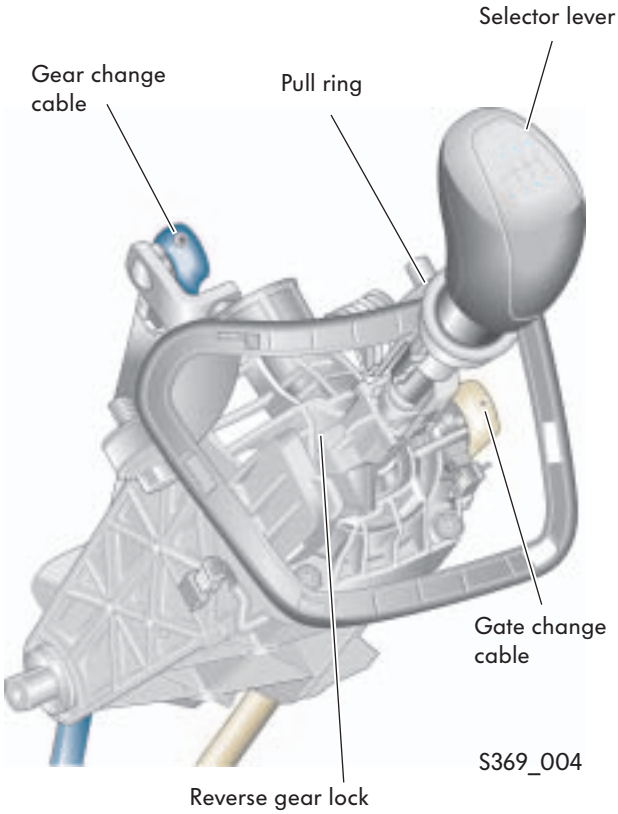
The gear change mechanism

The gears are changed using a joystick gearshift.

The gear lever is ergonomically located in the dash panel's centre console.

S369_066

Via the gear knob on the selector lever, the selector movement for gate selection and the shift movement for gear engagement are forwarded to the selector housing, split and transmitted to the external gearshift mechanism on the gearbox via a gear change cable and a gate change cable.



S369_004

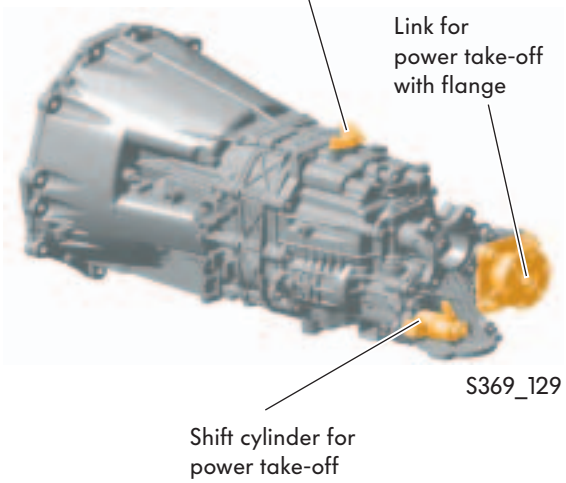
The power take-offs

The manual gearbox can be optionally equipped with power take-offs for driving additional, external devices:

- Hydraulic pump, e.g. for crane/tipper
- External generators
- Compressors (high-pressure cleaner)

The power is taken-off at the side of the gearbox from the counter shaft.

The power take-off is engaged and disengaged via a switch in the dash panel; the shift cylinder is actuated and the power take-off is engaged.



S369_129

The power take-off is available in two different variants:

- Power take-off with flange and
- Power take-off without flange

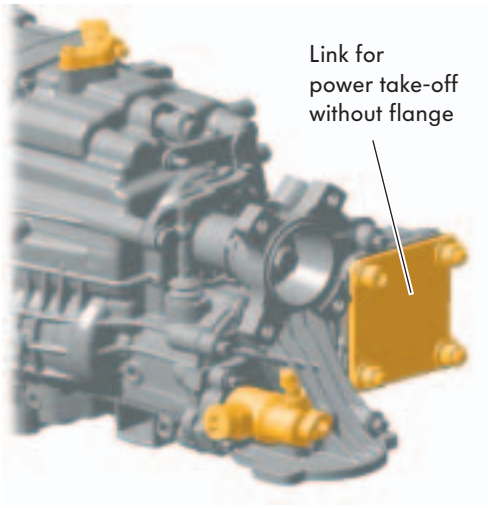
Both variants can be optionally equipped with or without a shift lock (gearbox lock).

Power take-off output:

The maximum, continuous output is
- 28 kW at 2780 rpm (engine speed) in the 330 Nm version
- 28 kW at 2713 rpm (engine speed) in the 350 Nm version

The maximum torque is
- 140 Nm at 1200 rpm (engine speed)

Version without flange



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The gearbox is equipped as standard without gears/gear drive for the power take-off – a power take-off cannot therefore be retrofitted.

The Shiftmatic gearbox 0B81

The Shiftmatic gearbox is an automated manual gearbox. Like the manual gearbox, it is operated using the joystick selector lever.

Shifting the gears with automatic clutch actuation is carried out via electronic actuation by the gearbox control unit.
Hydraulically operating components are actuated; these convert the gearbox control unit's signals into the relevant, mechanical gear change movement.

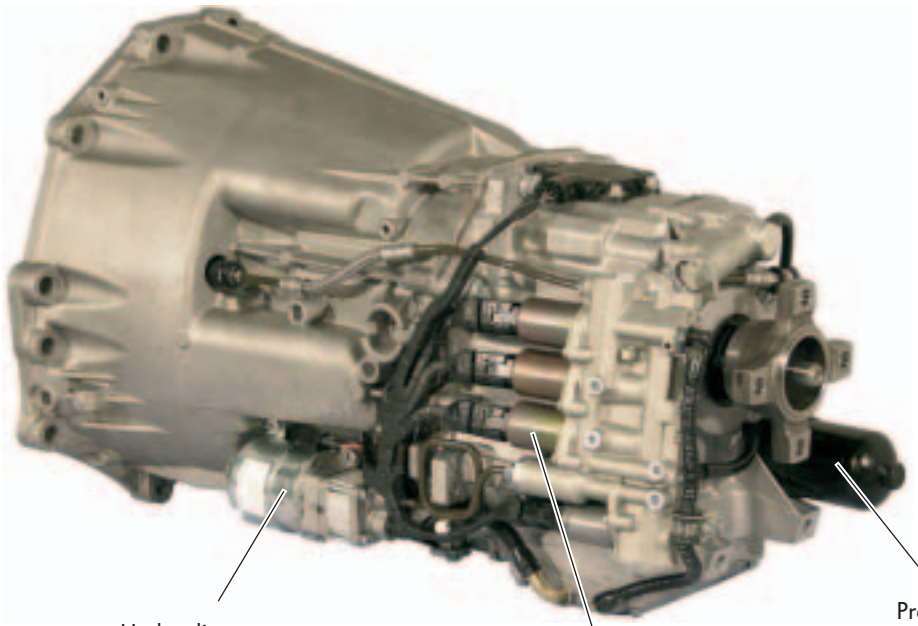
The clutch is controlled at the same time. A clutch pedal is not required and is therefore omitted.

The gears can be engaged in two different operating modes:

- Both in "automatic mode" and
- also in "manual mode"

Gear selection is carried out depending on the following main influencing variables:

- Engine speed
- Vehicle speed
- Selector lever position
- Operating mode



Detailed information on this gearbox can be found in self-study programme 372 "The Shiftmatic Gearbox 0B81".

Technical features

- Based on the 6-speed manual gearbox 0B7
- Automatic mode (A) or manual shifting via touch-shifting (+/–)
- The gearshift mode, the engaged gear and any operator error are displayed in the instrument cluster
- Changing gearshift modes during vehicle operation remains possible
- Designed for up to 330 Nm

Power take-offs are not possible in combination with the Shiftmatic gearbox.

Operating concept

Operation is carried out via the selector lever located in the instrument panel; this offers 3 stable and 3 touch-shift positions.

S369_065

Advantages of the Shiftmatic gearbox

- Added safety due to relieving strain on the driver
- Increased comfort thanks to smooth gear changes
- The vehicle is always operated in the optimal engine speed range (fuel consumption optimised in comparison with an automatic gearbox)
- Equipped with hill start assist as standard
- Less wear versus manual gearboxes
- Mature technology

The Shiftmatic gearbox offers additional advantages in comparison with a fully-automatic gearbox:

- Payload advantage thanks to lower weight
- Less expensive

Safety functions

- Engine can only be started in selector lever position N (gearbox neutral position)
- When the vehicle is stationary, a gear can only be engaged with the pedal depressed
- Operator errors such as starting with a gear engaged are not carried out,
- Engagement of reverse gear during forwards travel or gear changes counter to permissible engine speeds are not possible
- Warning buzzer signal when the driver's door is open, the engine is running and the pedal is not actuated; after a further three seconds, the gearbox is automatically set to neutral
- If the handbrake is not applied and the foot brake is not actuated, an acoustic warning is sounded

These functions prevent unintentional vehicle movement after starting the engine!

Running gear

The running gear

In comparison with the predecessor model, the Crafter is equipped with 16" running gear with a larger track. The running gear has been further developed from the predecessor model, the LT2.

The front axle

The front axle is a spring strut with independent wheel suspension. The design familiar from the predecessor model has therefore been optimised.

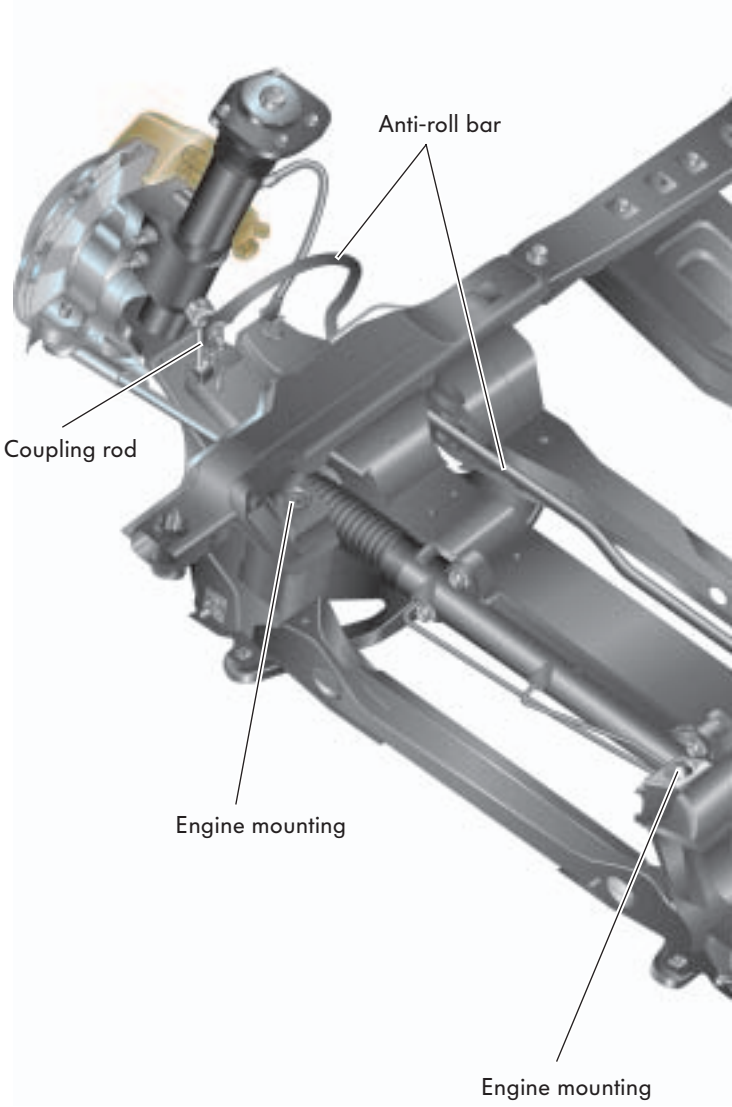
Technical features

- Acoustic decoupling of the front axle from the vehicle body
- Crash-optimised
- Suspension with GFP transverse leaf springs, enabling lower weight and increased stabilisation capacity
- Standard anti-roll bar
- Slightly understeering to neutral handling behaviour
- Assembly mountings in the form of two engine mountings and one gearbox mounting

The subframe is the front axle module's supporting element. It is comprised of a weightsaving sheet steel construction with 3 cross members, which are designed as a multi-shelled, welded construction.

Its primary functions are:

- Absorbing the wheel control forces via the wishbones
- Supporting the weight of the engine and the engine's torque in the engine mounting brackets
- The steering box is mounted, and the gearbox cross member is secured, to the subframe
- Dissipation of energy in the event of a crash via specific detachment of the subframe's central threaded connection with the body



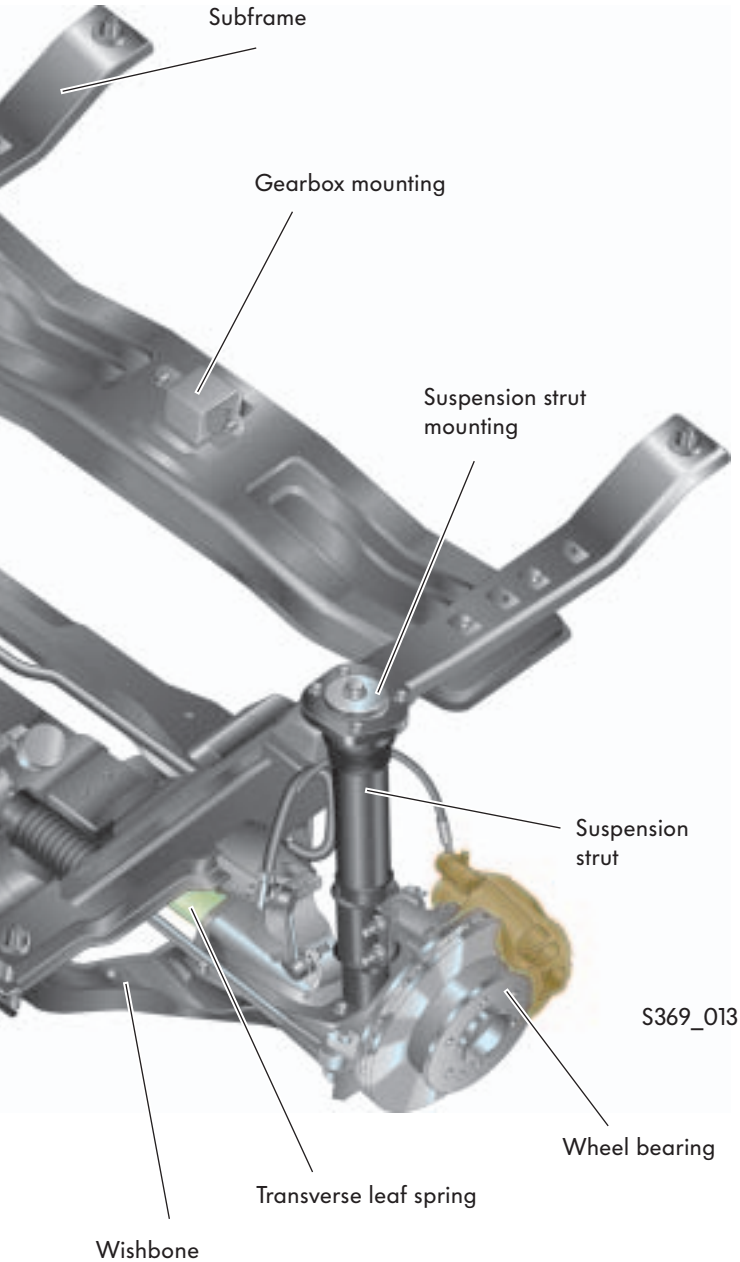
GFP = **G**lass **F**ibre-reinforced **P**lastic

The transverse leaf springs

The transverse leaf springs are manufactured from glass fibre-reinforced plastic (GFP). This has enabled the weight of the transverse leaf springs to be significantly reduced in comparison with a steel version and has essentially increased the stabilisation capacity.

Advantages of GFP springs:

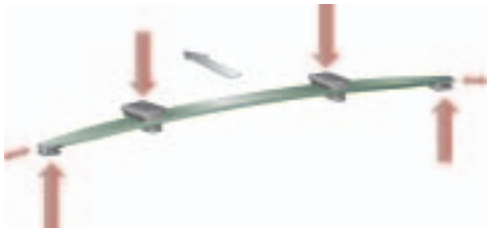
- Low weight plus high strength at the same time
- Very high corrosion resistance
- Impact- and shock-resistant
- Long service life



S369_013

The leaf spring suspension concept

The suspension concept has been optimised in comparison with the predecessor model.



S369_093

Previously, the leaf springs were guided via all 4 mountings.
In the case of the new solution in the Crafter, the leaf springs are now guided primarily via the two centrally located mountings.

This contributes towards decoupling the suspension and axle guidance characteristics.

Running gear

The rear axle

The rear axle has been further devloped from the predecessor model, the LT2. It is a rigid rear axle, which is guided on longitudinal leaf springs.

Corresponding design adaptations have taken place in the Crafter due to the extended payload variants.

The most important technical data are:

- The suspension concept has been optimised. The panel van and crew bus are fitted with larger bonded rubber bushes at the front, in order to improve acoustic decoupling.

- The front spring eye and the spring inclination have been co-ordinated to achieve understeering rear axle kinematics with reduced roll steer. This contributes extensively towards improved handling behaviour, e.g. when changing lanes.

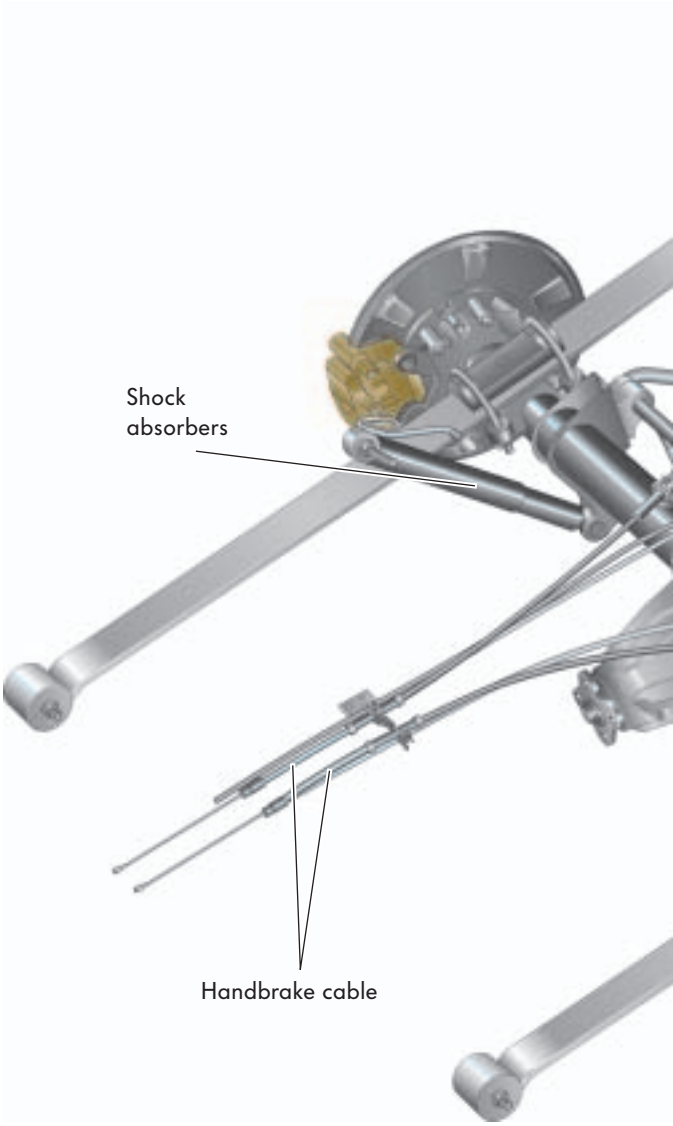
- The shock absorbers are located further outwards, thereby enabling considerably better roll damping.

- The Crafter with a payload of 5.0 t is equipped with an anti-roll bar (diameter 28 mm) as standard. The 3.5 t payload version can be optionally equipped with an anti-roll bar (diameter 17 mm).

  Heavy-duty versions are additionally available:

  21 mm diameter for the 3.5 t version
  34 mm diameter for the 5.0 t version

- Optimisation of the rear axle encompasses both weight and noise reduction measures.



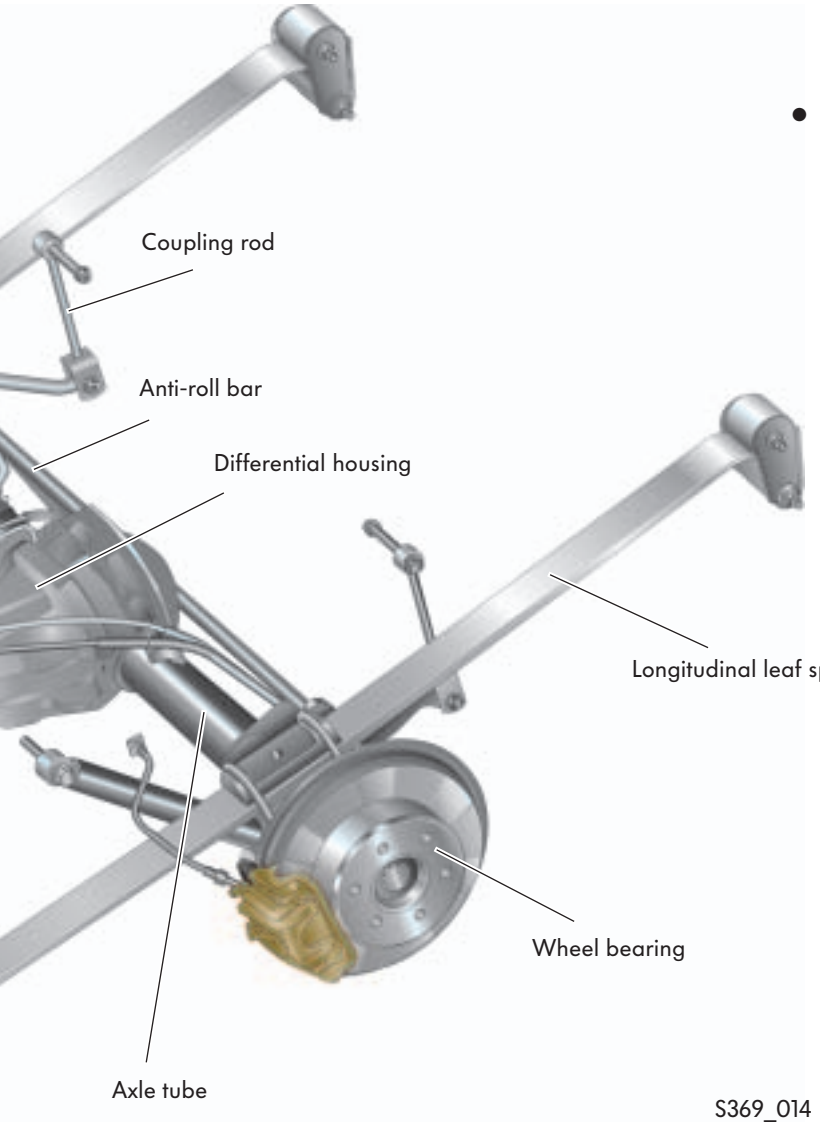
- Depending on payload, 1- to 3-layer leaf springs are fitted:

  1-layer – for the panel van and vehicles with 3.0 – 3.5 t

  2-layer – for the crew bus with 3.5 t

  3-layer – for vehicles with 4.6 and 5.0 t

- The rear axle differential housing is manufactured from grey cast iron.
  The axle tubes are manufactured from sheet steel and are pressed into the differential housing.



S369_014

The handbrake system

The handbrake system operates with dual-servo brakes, in which drum brakes are integrated into the rear disc brakes.

The drum brakes are actuated via the handbrake lever and the brake cables. The front cable leads to the cable adjuster, from which the two brake cables then lead to the drum brakes.

The handbrake actuation mechanism is secured to the driver's seat bracket. It is optionally available as a folding handbrake actuation mechanism.

Function:

When the handbrake is actuated, the handbrake lever can be pressed back down to its lower resting position from the upper position without pressing the locking knob. This is necessary if a swivel seat (camper) is installed, for example.

To release the handbrake, the handbrake cable has to be raised again and then pushed down with the locking knob pressed in.

Dual-servo brakes

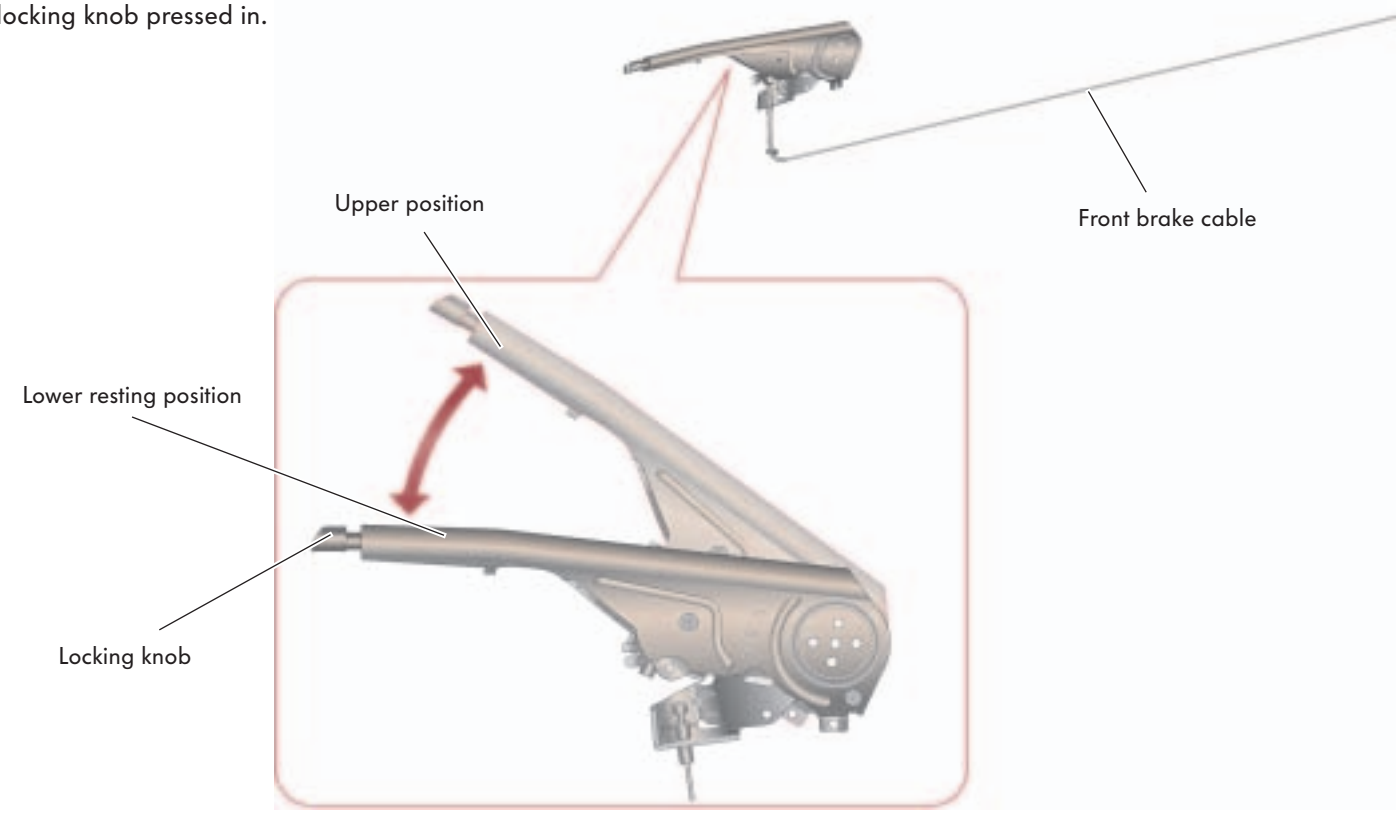
Different dual-servo brakes are fitted depending on payload:

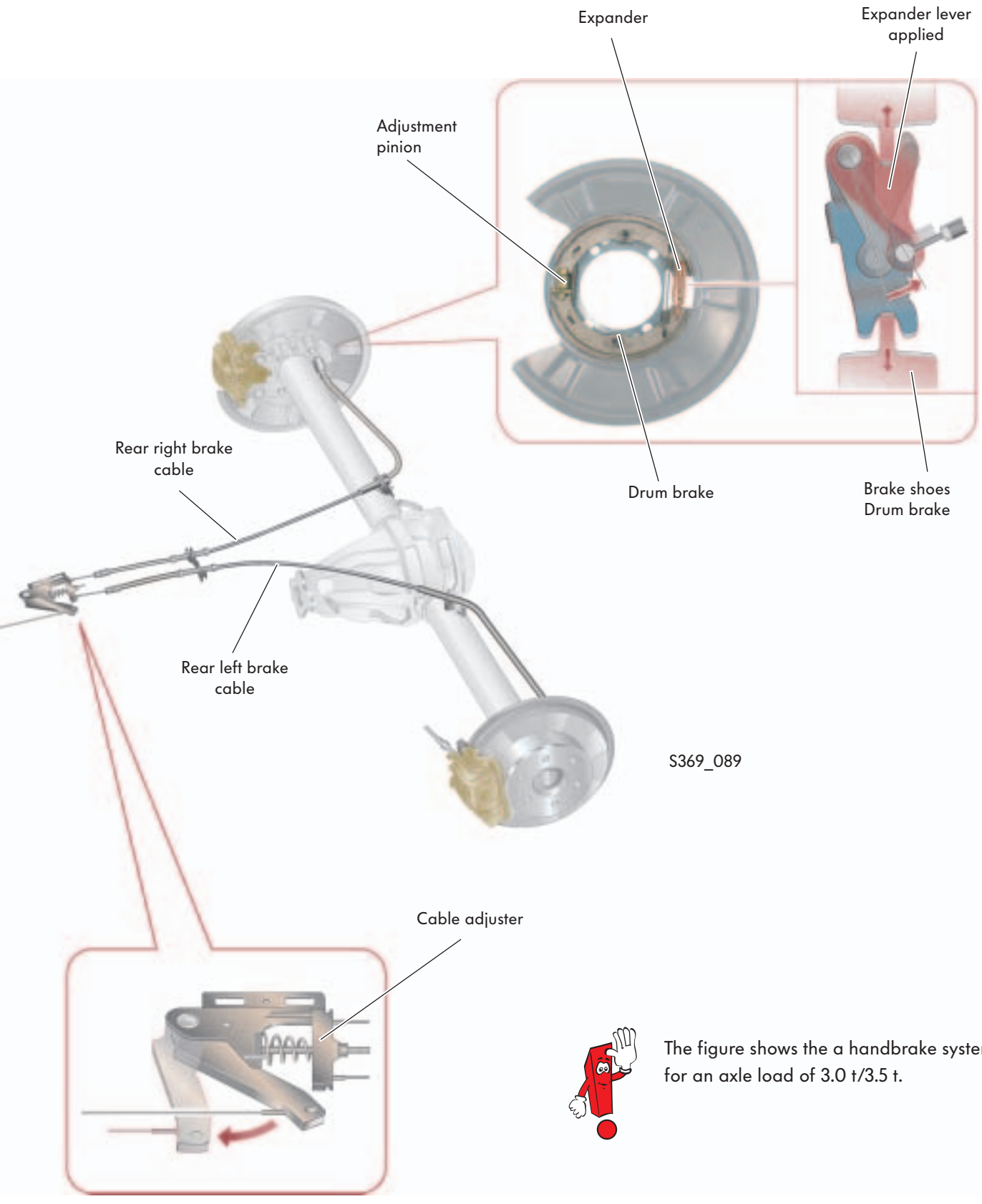
- For 3.0 t and 3.5 t = diameter 180 mm x 25 mm
- For 5.0 t and 4.6 t = diameter 172 mm x 42 mm

The expander, which is mounted between the brake shoes, pushes both brake shoes apart on application of the handbrake.

The expander's floating mounting enables both drums to lock in the direction of travel regardless of the direction of drum rotation. This is why this is also referred to as the dual-servo principle.

An adjustment pinion serves to adjust the brake shoes.





The figure shows the a handbrake system for an axle load of 3.0 t/3.5 t.

The steering

The Crafter is fitted with a rack and pinion power-assisted steering system, which operates according to hydraulic principles. It offers the level of comfort found in passenger cars.

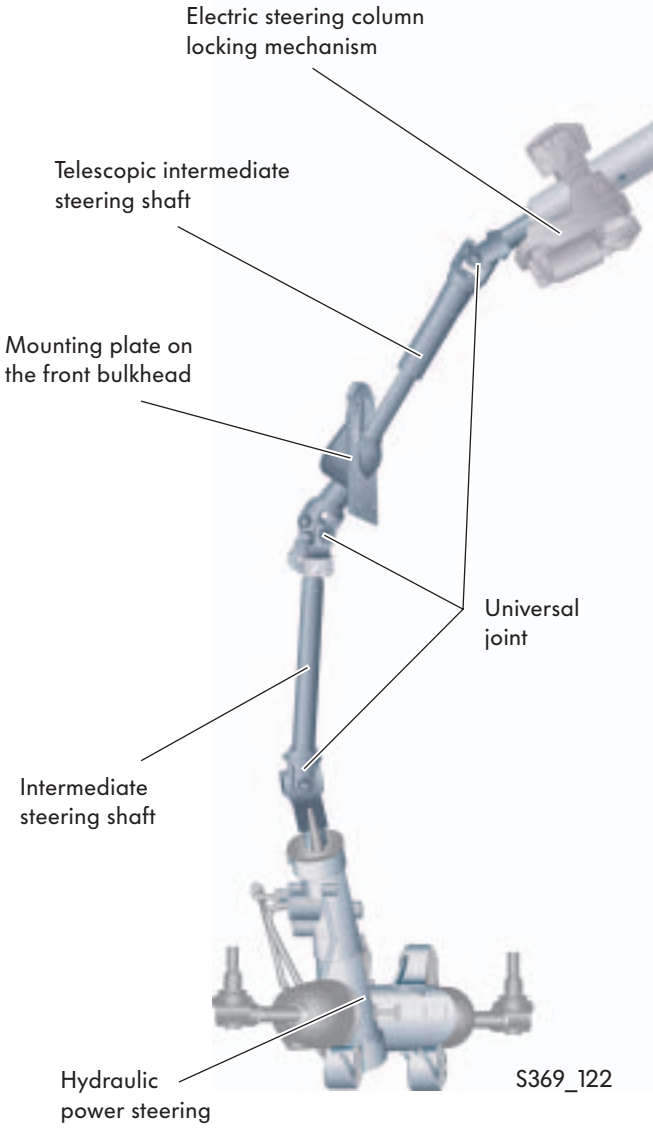
The steering column

The steering column is designed to significantly reduce the consequences of an accident. Universal joints and telescopic intermediate steering shafts are employed to achieve this.

In addition to the simple version of the steering column without adjustment option, a version offering longitudinal and inclination adjustment is also available.

In the adjustable steering column, an additional telescopic section is installed in the upper column tube.

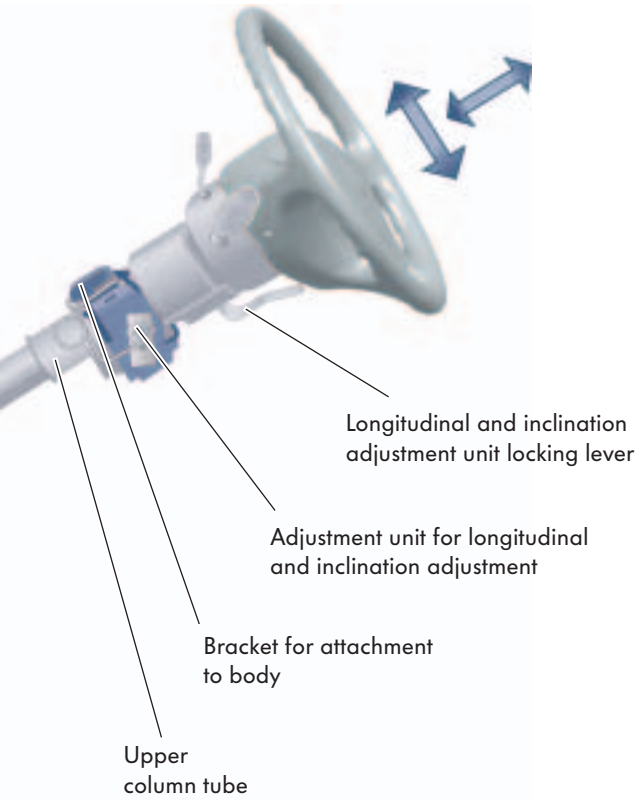
Steering wheel locking (previously with a mechanical steering lock) is carried out via an electric steering column locking mechanism which is actuated directly by the electromechanical ignition lock.

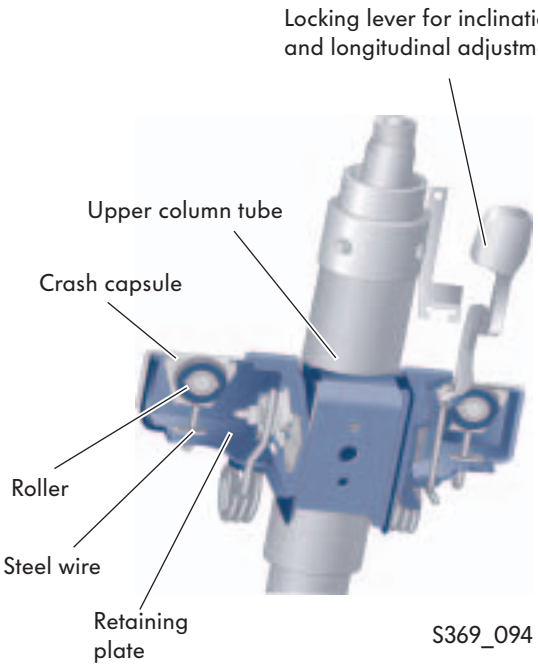


The figure shows an adjustable steering column. In the non-adjustable steering column, only the adjustment unit and the upper column tube are missing.

Steering column adjustment

To optimally adjust it as the driver wishes, the steering column can be optionally equipped with an inclination and longitudinal adjustment facility. Its inclination can be adjusted by 4° mm, whilst longitudinal adjustment of 40 mm is possible. The locking lever can be used to release or lock the clamping mechanism for inclination or longitudinal adjustment.





Non-adjustable steering column

This is equipped with 3 universal joints and a telescopic intermediate steering shaft is installed in the lower area between the two universal joints. The telescoping sections are pushed into each other from the steering box side.

Adjustable steering column

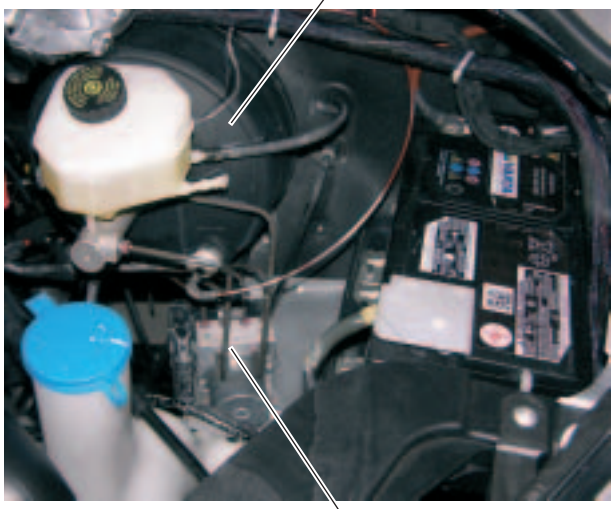
In this case, a second telescopic section is installed in the upper column tube. This is activated by the driver's falling into the airbag.
Energy is constantly absorbed over the course of this telescopic section's travel, as a steel wire is unreeled from a roller on each side of the steering column. The roller is mounted on a "crash capsule", which is firmly anchored to the dash panel cross member, counter to which the upper column tube, including the retaining plate, moves downwards, thereby unreeling the wire.

The brake system

The Crafter's brake system is designed as a dual-circuit system with diagonal division.

The technical features of the brake system are:

- 10" tandem brake servo
- Anti-lock Brake System (ABS), Traction Control System (TCS) and Electronic Stabilisation Programme (ESP) as standard
- Brake pad wear indicator on the front and rear axle
- Active wheel speed sensors
- Hydraulic brake assist system
- Electronic brake pressure distribution instead of automatic, load-dependent brake pressure regulator
- Hill start assist (optional)
- Handbrake integrated into the rear disc brake as a drum brake

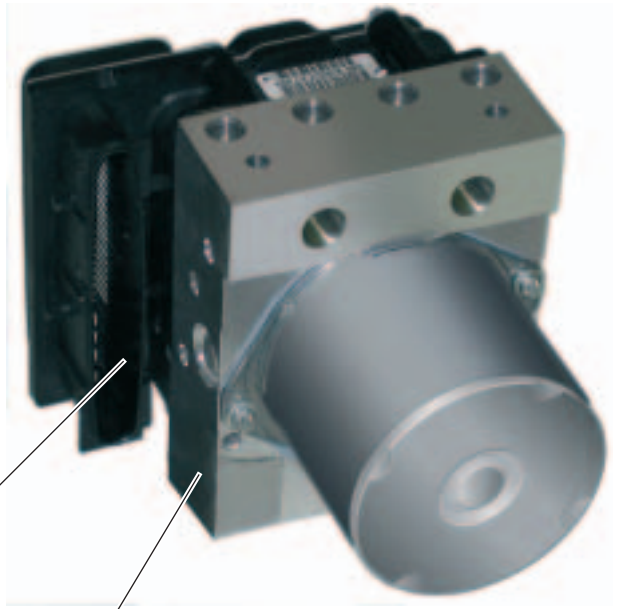


S369_044

ESP system

A Bosch version 8.1 ESP system, the most recent generation, is fitted.
This system takes the relevant vehicle load into consideration (evaluating its acceleration behaviour), determines the centre of gravity and responds accordingly in terms of its control characteristics.

ESP unit



S369_040

Front brakes

The Crafter's front axle is fitted with a 16" floating caliper disc brake system with ventilated brake discs. The dimensions are Ø 300 mm x 28 mm.

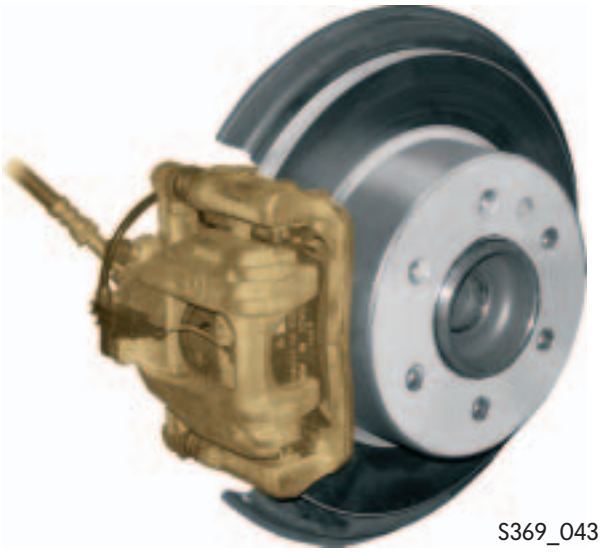
S369_042

Rear brakes

Two different brake system versions are installed on the rear axle.

- Vehicles with a gross vehicle weight of 3.0 t and 3.5 t are equipped with a 16" floating caliper disc brake system with solid brake discs.
  The brake disc dimensions are Ø 298 mm x 16 mm.

- Vehicles with a gross vehicle weight of 4.6 t and 5.0 t are fitted with ventilated brake discs. The brake disc dimensions are Ø 303 mm x 28 mm.



S369_043

Running gear

Wheels and tyres

The Crafter has steel wheels. It can be equipped with the following dimensions:

Overview

Standard equipment:

Front axle	**3.0 t**	**3.5 t**	**Super-single 4.6 t**	**Twin tyres 5.0 t**
Tyre size	205/75R16C	235/65R16C	205/75R16C	195/75R16C
Wheel size	5.5Jx16 H2	6.5Jx16 H2	5.5Jx16 H2	5.5Jx16 H2
Rear axle				
Tyre size	205/75R16C	235/65R16C	285/65R16C	195/75R16C
Wheel size	5.5Jx16 H2	6.5Jx16 H2	8.5Jx16 H2	5.5Jx16 H2

Optional equipment:

Front axle	**3.0 t**	**3.5 t**	**Super-single 4.6 t**	**Twin tyres 5.0 t**
Tyre size	235/65R16C	-	-	205/75R16C
Wheel size	6.5Jx16 H2	-	-	5.5Jx16 H2
Rear axle				
Tyre size	235/75R16C	-	-	205/75R16C
Wheel size	6.5Jx16 H2	-	-	5.5Jx16 H2

Optional aluminium wheels are also available in addition to the steel wheels.

Super-single tyres

As an alternative to twin tyres, the Crafter may also be optionally equipped with new super-single tyres. This is an absolutely new feature in the transporter segment.

These tyres have a wider, balloon-like cross-section and are also accordingly reinforced.
The super-single tyres are fitted on panel vans with a gross vehicle weight of 4.6 t (as 5.0 t version "with lower load rating").

At high payloads, these tyres' narrower design offers significant advantages in comparison with the wider twin tyres.

The Crafter is fitted with tyres with the dimensions 285/65R16C.

Tyre load capacity and permissible vehicle speed

The tyre load capacity and permissible vehicle speed are revealed by the lettering "128N" on the tyre's flank.

This information means:

- 128 (load index) – means that the tyre has a maximum, permissible load capacity of 1800 kg
- N (speed index) – means a maximum, permissible vehicle speed of 140 km/h

S369_131

Advantages:

- The innovative all-weather profile guarantees safety, better handling and vehicle stability, lower fuel consumption, high mileage, traction and comfort plus low maintenance costs.
- Thanks to the installation space, which is narrower than that of twin tyres, additional load width, e.g. for loading pallets – transversely between the wheel housings – is acquired.
  On the whole, installation space conditions are therefore improved, e.g. including for bodies and adaptations.

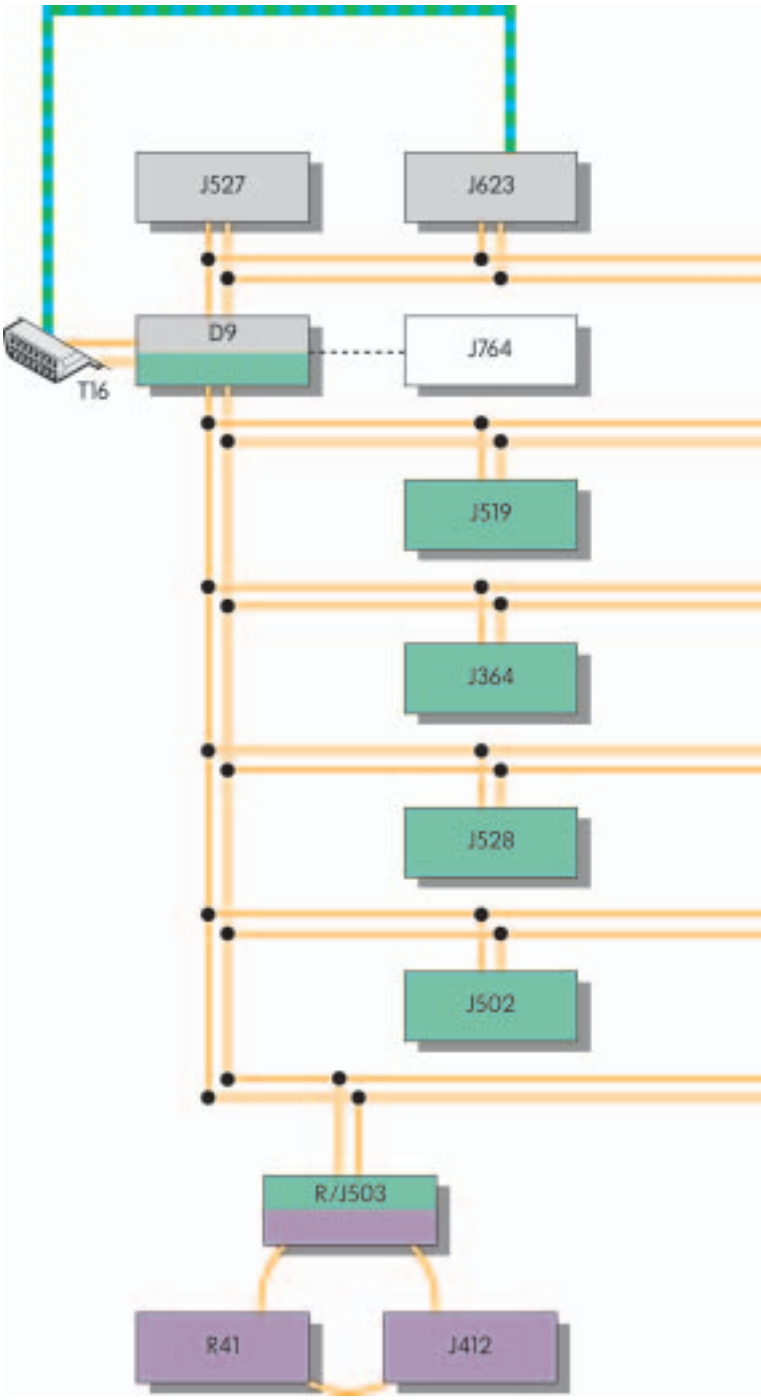
The data bus systems

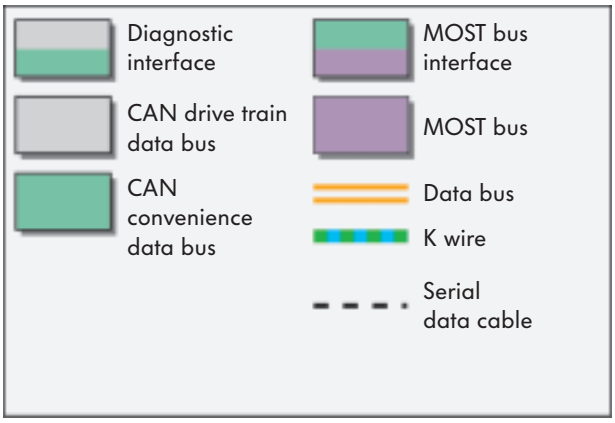
Data bus networking

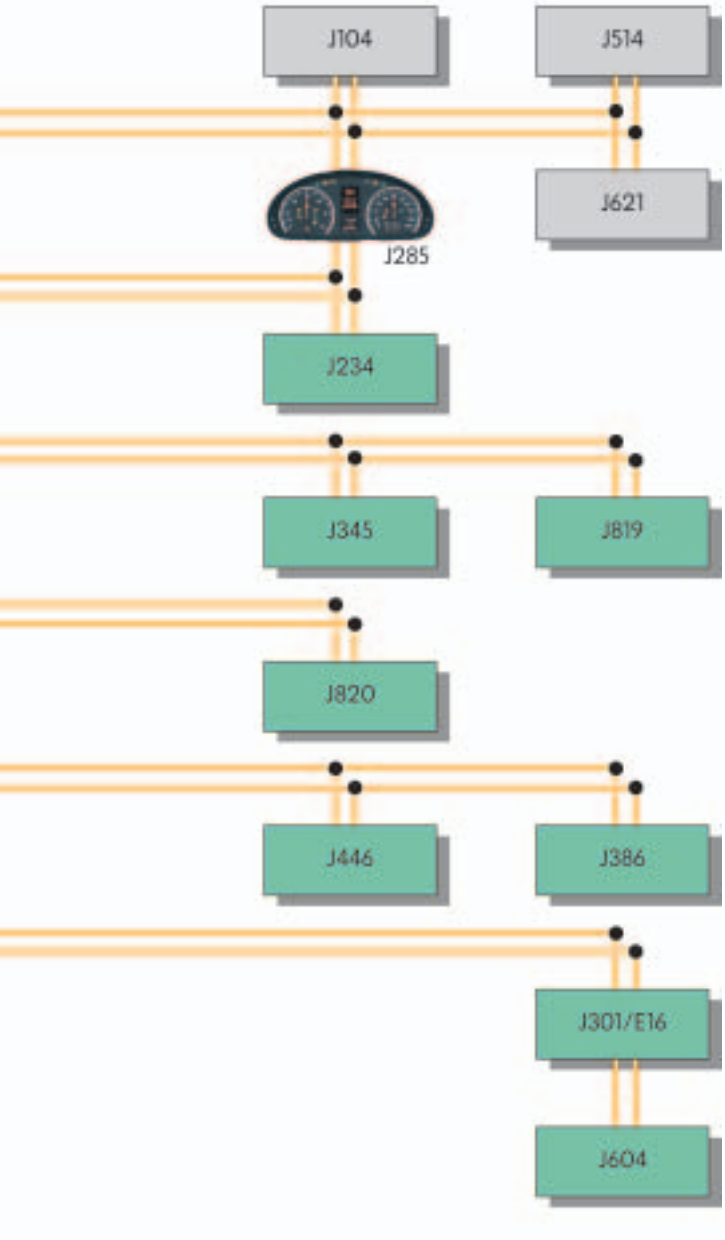
The Crafter's control units are networked via the CAN data bus and the MOST data bus.

Networking enables data to be exchanged between the individual control units.
Instead of using conventional (discrete) cable connections, the data are transmitted via the data buses in digital form as an electrical signal or as a light signal. This enables data to be made available to several control units.

The CAN data bus is sub-divided into three individual systems, the CAN drive train data bus, the CAN convenience data bus and the CAN diagnostic data bus.
All three bus systems are connected to each other via the electronic ignition lock D9, and are therefore able to exchange information.







S369_075

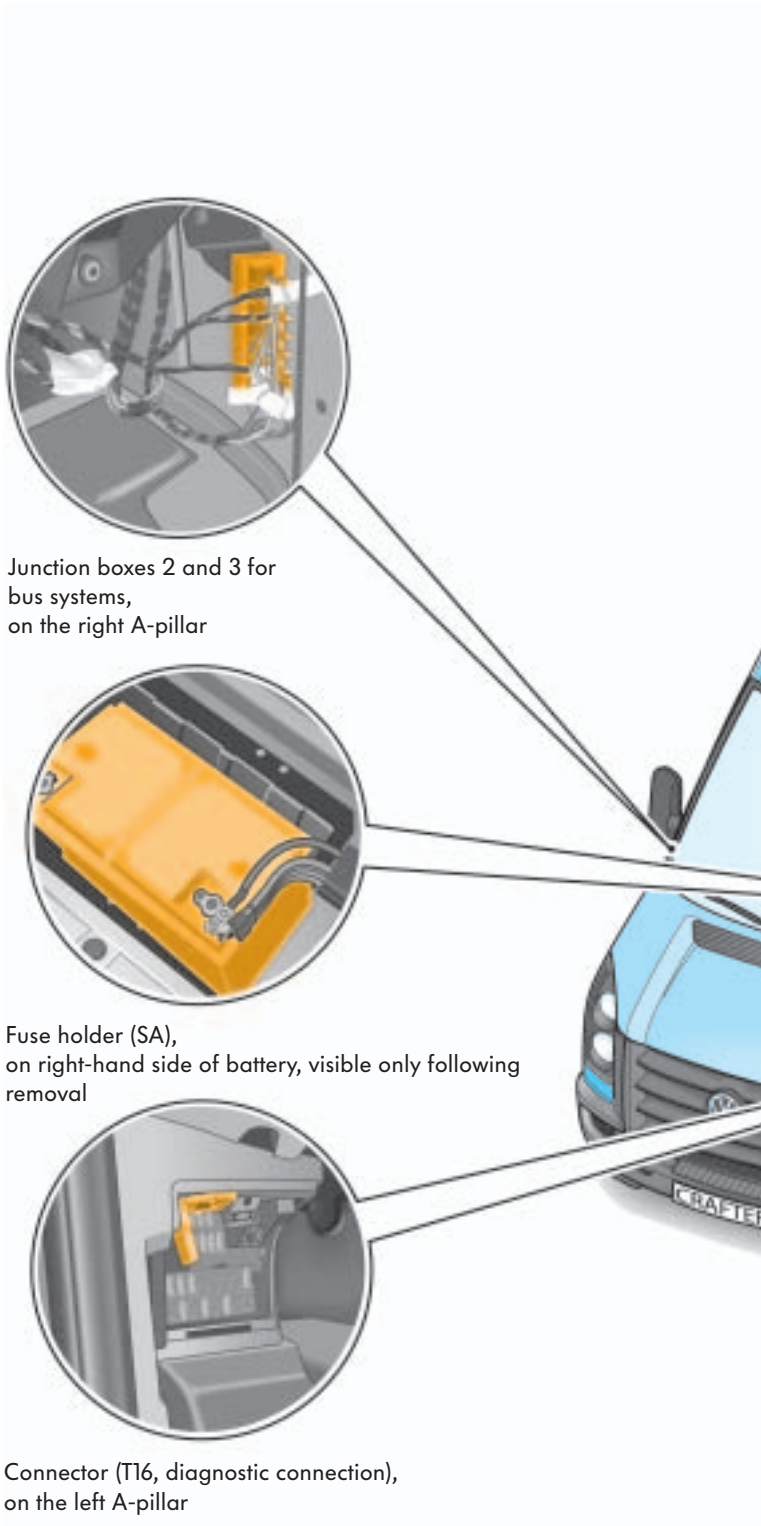
D9 Electronic ignition lock
E16 Heater/heat output switch
J104 ABS control unit
J234 Airbag control unit
J285 Control unit with display in dash panel insert
J301 Air conditioning system control unit
J345 Trailer detector control unit
J364 Auxiliary heater control unit
J386 Driver door control unit
J412 Mobile telephone operating electronics control unit
J446 Parking aid control unit
J502 Tyre pressure monitor control unit
J503 Control unit with display for radio and navigation
J514 Electronic manual gearbox control unit
J519 Onboard supply control unit
J527 Steering column electronics control unit
J528 Roof electronics control unit
J604 Auxiliary air heater control unit
J621 Tachograph control unit
J623 Engine control unit
J764 Electronic steering column lock control unit
J819 Control unit for middle of dash panel
J820 Control unit for programmable special functions
R Radio
R41 CD changer
T16 16-pin connector (diagnostic connection)

Further information can be found in self-study programme No. 370 "The Crafter – Electrical System".

Installation locations of the electrical components

Overview of installation locations

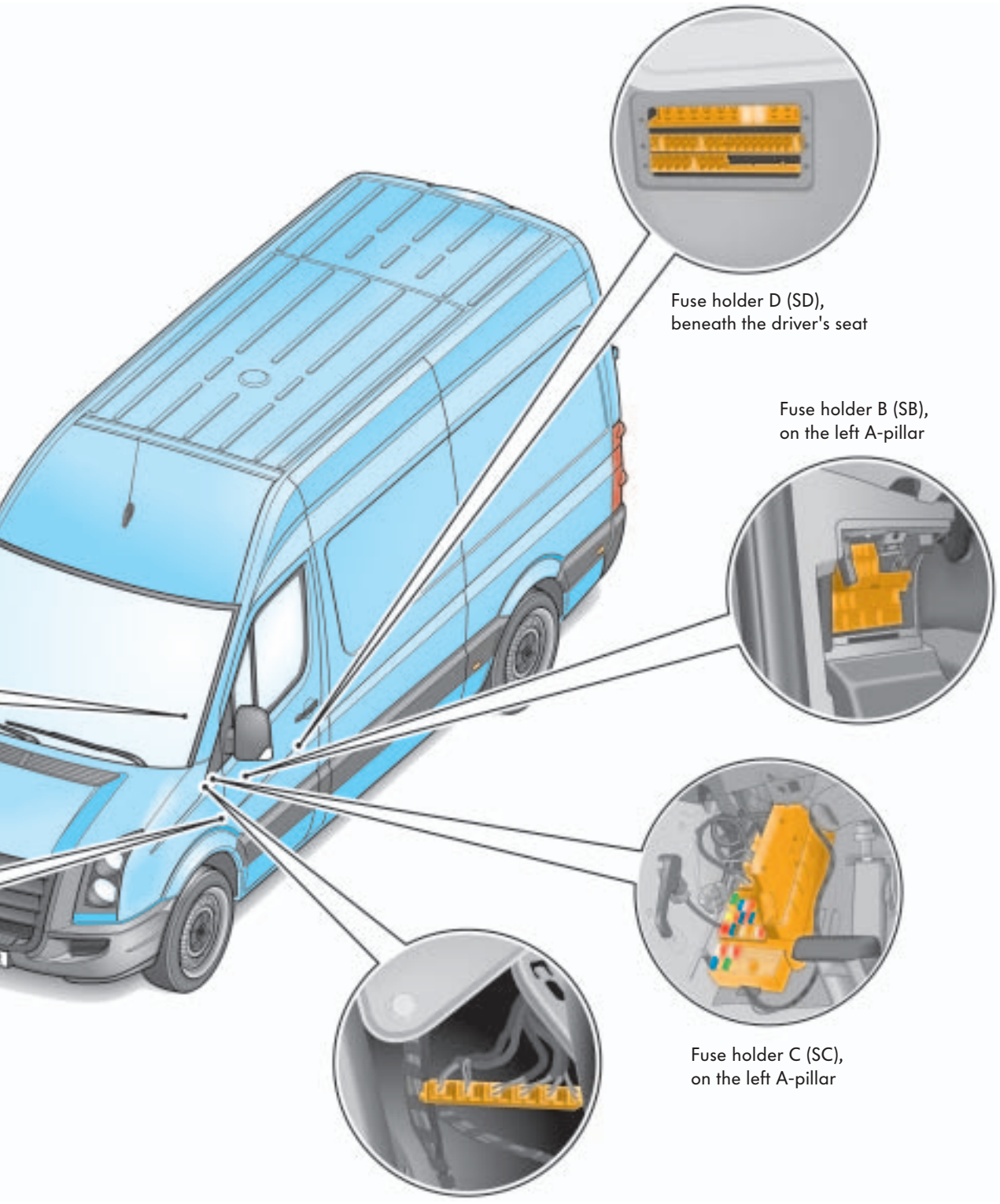
The vehicle electrical system has a decentralised structure; the fuse and relay installation locations are therefore in different locations throughout the vehicle.



Junction boxes 2 and 3 for bus systems, on the right A-pillar

Fuse holder (SA), on right-hand side of battery, visible only following removal

Connector (T16, diagnostic connection), on the left A-pillar


Fuse holder D (SD),
beneath the driver's seat
Fuse holder B (SB),
on the left A-pillar
Fuse holder C (SC),
on the left A-pillar
Junction box 1 for bus systems,
beneath the front left dash panel

S369_144

Electrical system

Radio systems

RCD 2001

Radio system RCD 2001 is equipped with an audio CD drive and a CD changer connection. The radio unit has a single FM and AM tuner and a TP/TA traffic radio function.

S369_029

RCD 4001

Radio system RCD 4001 is based on RCD 2001, but is additionally equipped with a MOST data bus interface via which a CD changer and a mobile telephone can be connected.

S369_030

RNS 4001

Radio/navigation system RNS 4001 is based on the RCD 4001, but its functions are extended by a navigation system with arrow depictions.

S369_031

RNS 5001

Radio/navigation system RNS 5001 is based on the RNS 4001, but offers map depiction instead of arrow-based navigation and has a DVD drive instead of a CD drive.

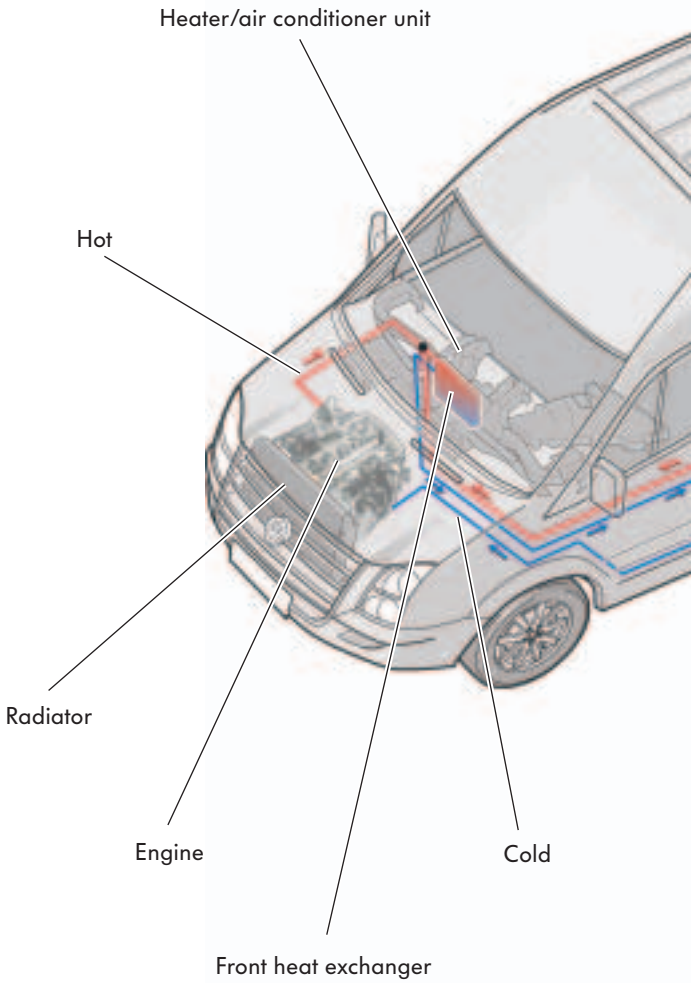
S369_032

Heating and air conditioning

Climate control

The Crafter can be fitted with a heating and ventilation system as basic equipment or the "Climatic" semi-automatic air conditioning system.

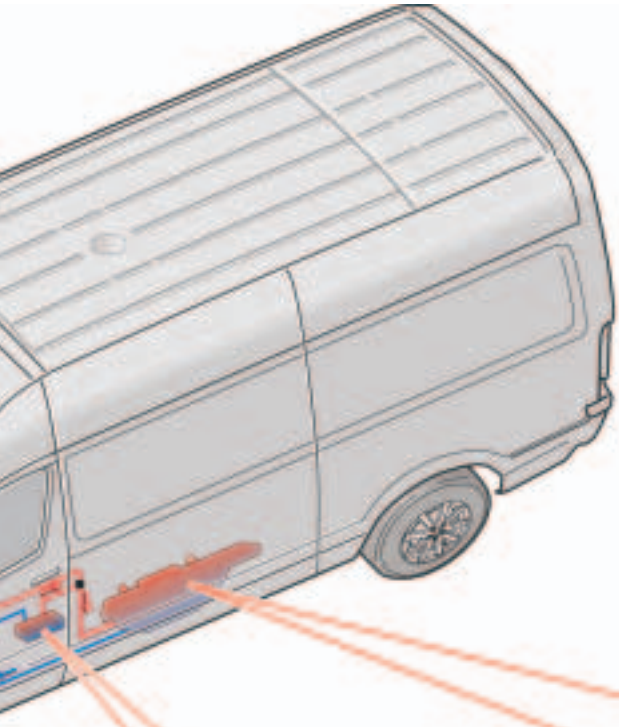
Optional extension of the "Climatic" system to control the climate in the rear passenger compartment is also possible.



Depending on the system which is fitted, the following equipment components may be installed:

- PTC pre-heater for faster heating
- Fuel-driven pre-heater, 5 kW and 10 kW, with timer switch and radio remote control
- Heat exchanger for the rear load/passenger compartment
- Extended air conditioning system with 2nd evaporator in the rear
- Residual heat function

The figure shows the standard equipment with heating and ventilation system and optional pre-heaters.



S369_082

Load/passenger compartment heat exchanger (with blower); the auxiliary hot air heater may also be installed at this point

Additional water heater/auxiliary heater - fueldriven

Heating and air conditioning

The heater and air conditioner unit

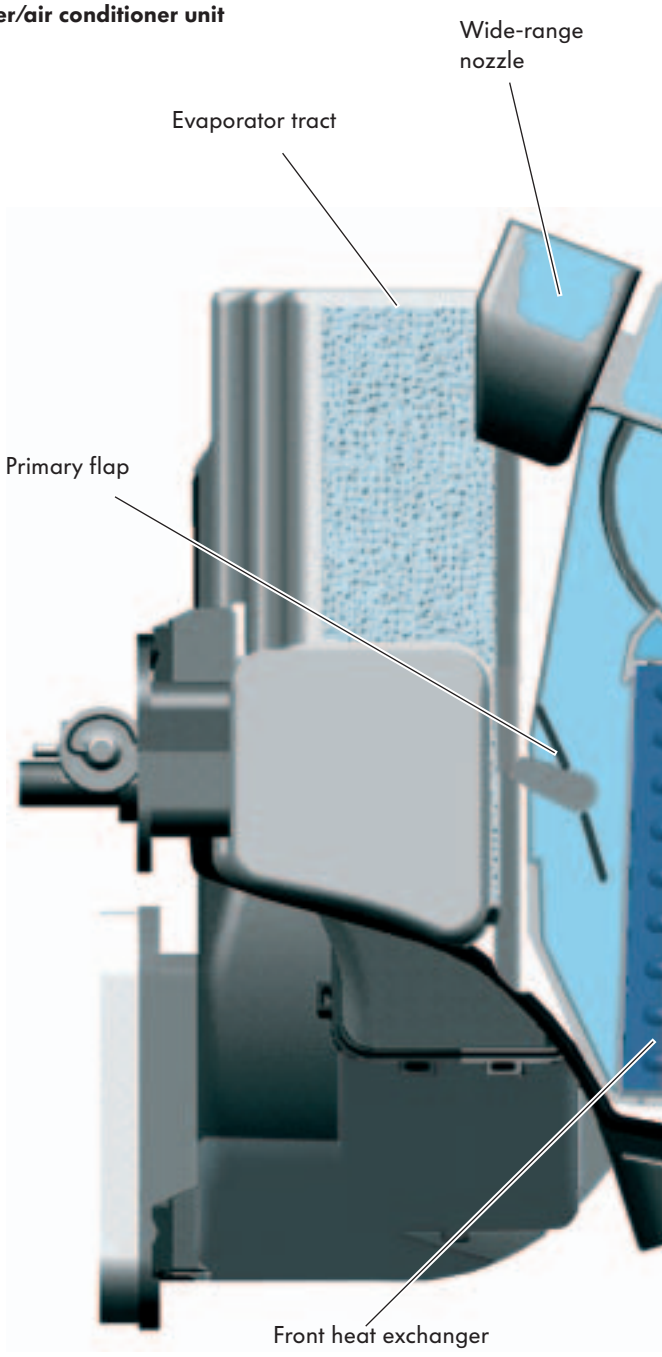
Heating and ventilation

The Crafter is fitted with a heating and ventilation system as basic equipment.

Technical features

- 4-stage blower, fresh air/recirculated air circuit, dust and pollen filter (in the engine compartment intake housing)
- Immediate heating response thanks to airside temperature regulation (previously on coolant-side)
- Electric pre-heater in front (PTC = Positive Temperature Coefficient) for fast heating directly after starting (as standard in the crew bus, special equipment in all other models)
- Hot air supply to the windscreen wiper parking position via a separate duct to prevent the wiper blades from freezing on
- Hot/cool air duct to the load/passenger compartment for even air distribution up to the 1st row of seats in the passenger compartment, without restricting the footwell (as standard in the crew bus, special equipment for panel van without partition wall and double cab)

Heater/air conditioner unit



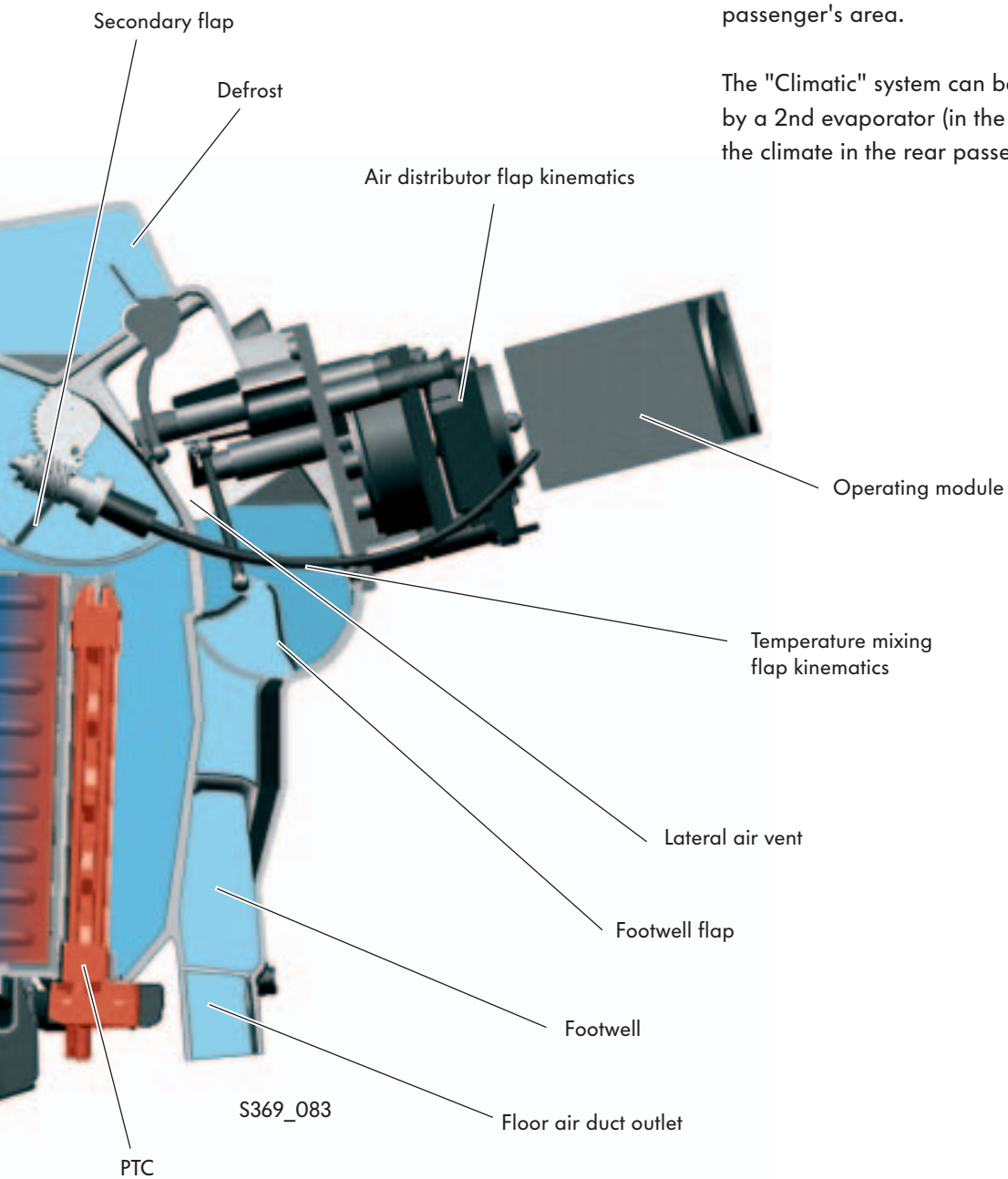
Air conditioning system

The Crafter can also be fitted with the "Climatic" semi-automatic air conditioning system.

The heating/ventilation system and the semi-automatic "Climatic" air conditioning system use the same heater/air conditioner unit.

"Climatic" controls the climate in the driver's and front passenger's area.

The "Climatic" system can be optionally extended by a 2nd evaporator (in the roof lining) to control the climate in the rear passenger compartment.

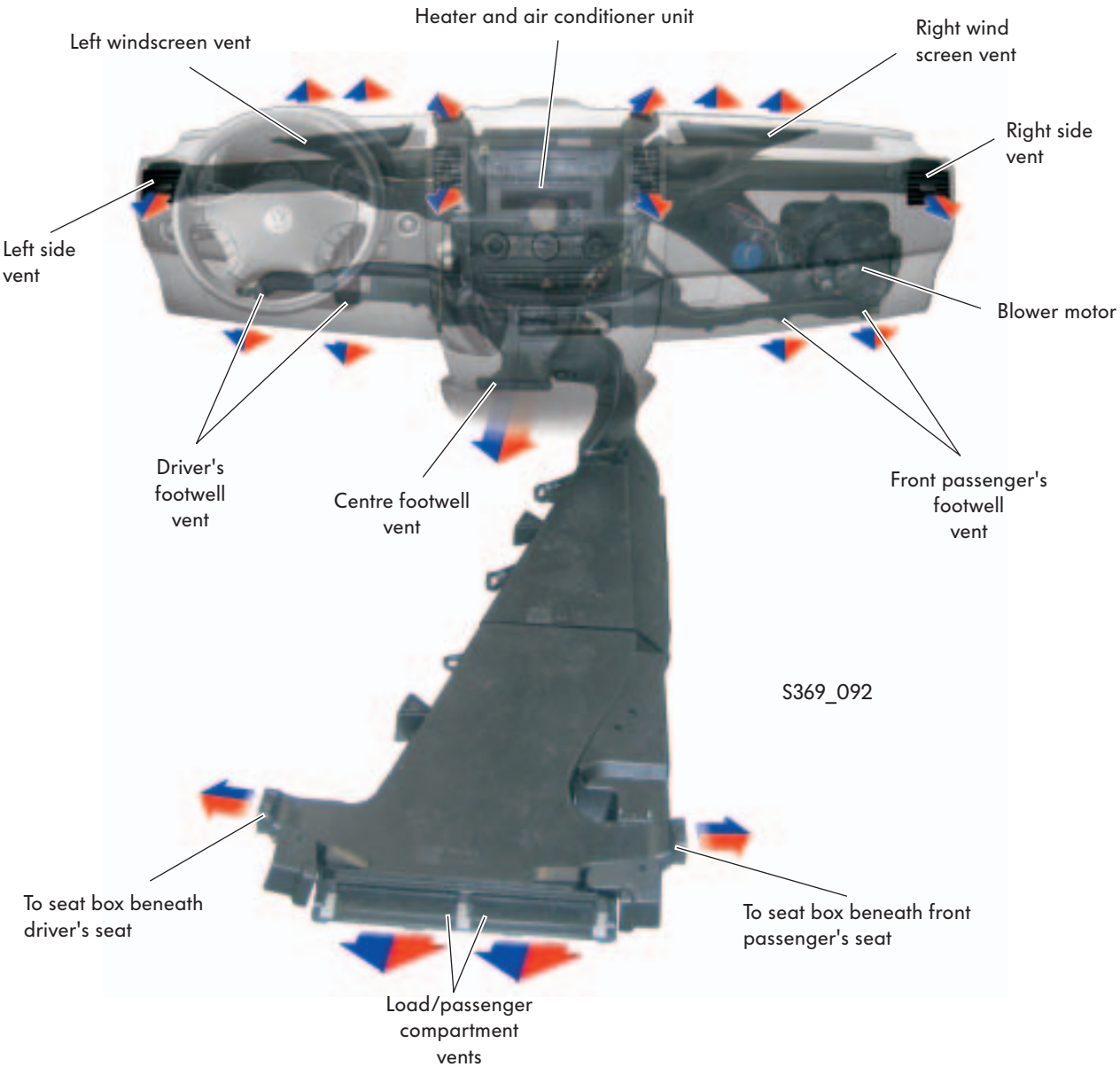


Heating and air conditioning

Front air distribution

The heating and air conditioning system distributes the heated air into both the driver's/front passenger's area and the rear load/passenger compartment.
A pleasant climate is thereby guaranteed, at least for the first row of seats in the passenger compartment.

- In the dash panel area, the air is guided to the driver and front passenger area via corresponding nozzles and louvres.
- Via the floor air duct, the air is routed on the left and right beneath the driver's and front passenger's seats and to the rear into the load/passenger compartment.



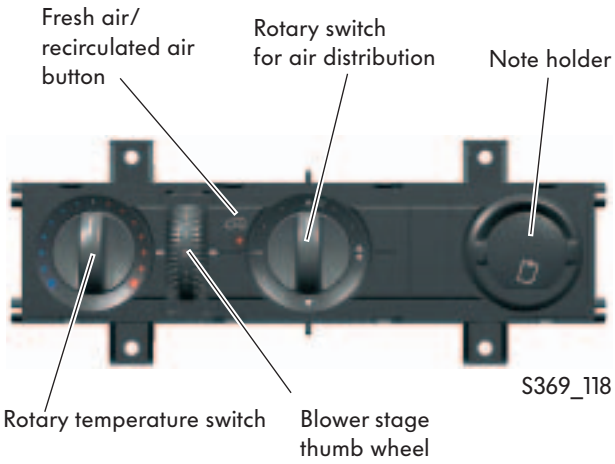
Manual heating

The heating and ventilation system ensures pleasant heating in the driver's/front passenger's area.
The floor air duct, which transports the heated air backwards from the heater unit, serves to heat the load/passenger compartment.

The temperature for the driver/front passenger area can be adjusted manually using the left-hand rotary switch.

Four different blower stages can be set:

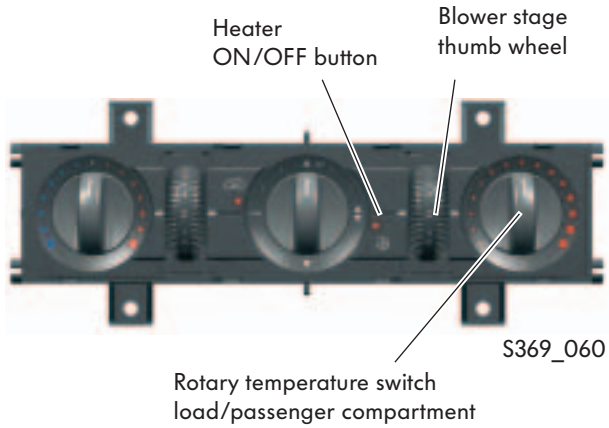
Operating/display unit – heating and ventilation – front (basic variant)



If the heating and ventilation system is equipped with an auxiliary heat exchanger for the load/passenger compartment, the temperature can be adjusted manually using the right rotary switch.

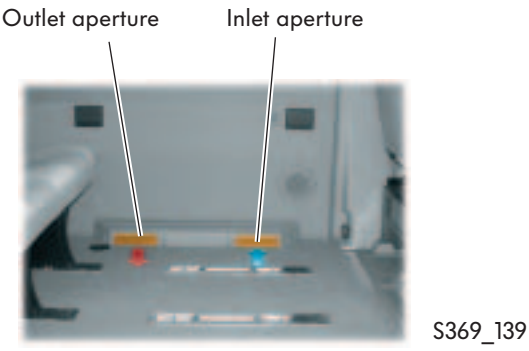
Three blower stages can be set:

Operating/display unit – heating and ventilation - rear with auxiliary heat exchanger for load/passenger compartment



Air distribution in the load/passenger compartment

The warm air is routed into the load/passenger compartment via an air duct and a corresponding outlet aperture from the load/passenger compartment heat exchanger. The air duct is also equipped with a corresponding inlet aperture for returning the cooled air to the heat exchanger.



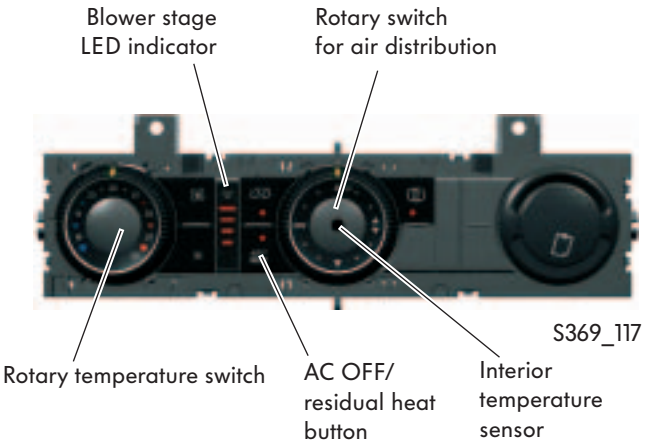
Heating and air conditioning

Climate control

"Climatic" controls the climate in the driver's and front passenger's area.

The nominal temperature can be manually adjusted using the rotary temperature switch.
The actual temperature is recorded by the interior temperature sensor and is used to automatically regulate the desired temperature.
Air distribution can be adjusted manually. Four blower stages can be set:

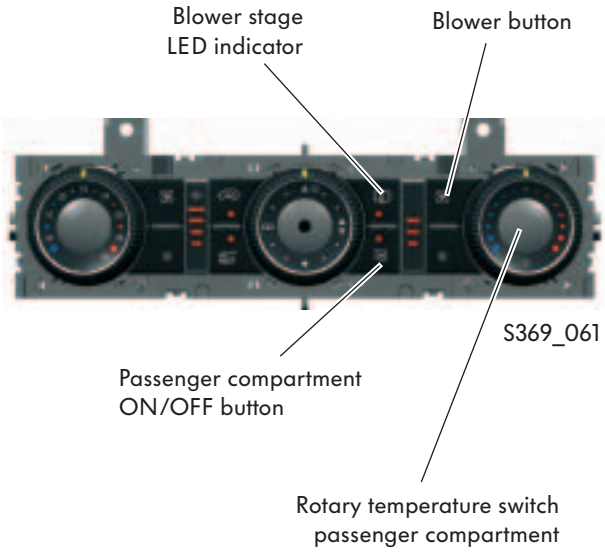
**Operating/display unit – "Climatic"
driver and front passenger area climate control - front**



The "Climatic" system can be optionally extended by a 2nd evaporator in the roof lining. This can be used to control the climate in the rear passenger compartment.
The refrigerant circuit for this 2nd evaporator is connected to the front circuit by a shut-off valve. The air is guided into the rear passenger compartment via a roof duct and corresponding vents.

When this equipment is fitted, the right-hand side of the "Climatic" operating module has a rotary temperature switch for the passenger compartment. This rotary switch is used to set the desired temperature for the passenger compartment.
Air distribution can be adjusted manually.
The evaporator blower can be set to 3 stages.

**Operating/display unit – extended by
passenger compartment climate control - rear**



The auxiliary coolant heater

The auxiliary coolant heater is operated using fuel via an auxiliary line from the fuel tank.

At least 16 litres of fuel must be available in the fuel tank (also see operating instructions) to enable proper heater operation.

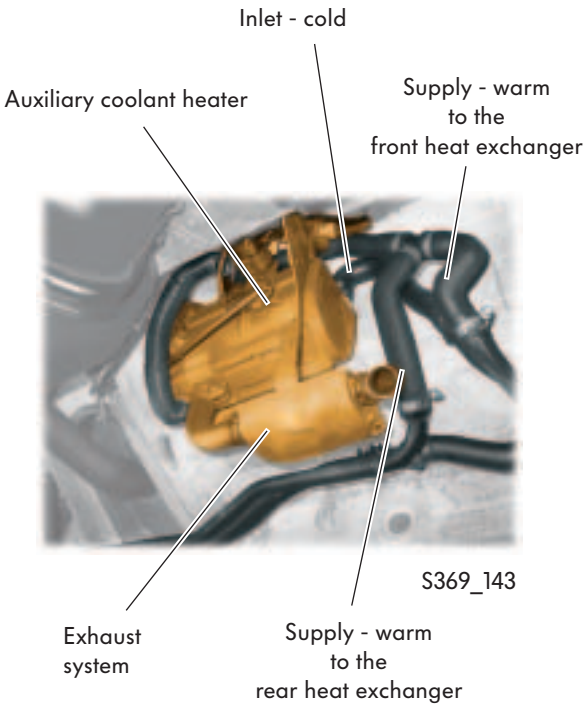
Depending on equipment, the heater can be operated as:

- A pre-heater or as
- An auxiliary heater (optional)

Besides heating the passenger compartment, the auxiliary coolant heater also helps the engine to reach its operating temperature faster.

When the heater is activated, is supplies heated water to both the front heat exchanger and the rear heat exchanger for the load/passenger compartment.

The auxiliary coolant heater can be operated both with the engine switched off, in auxiliary heating mode, and when the engine is running.
It is integrated into the CAN data bus.



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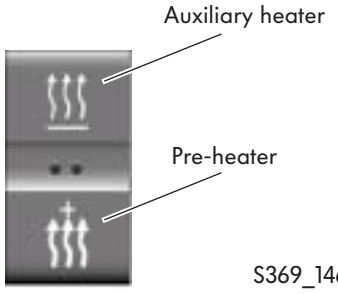
Regulation of the auxiliary coolant heater

Depending on equipment, the auxiliary coolant heater can be started using a button in the dash panel or via steering wheel buttons in combination with the display in the instrument cluster's diaplay unit.
Optional remote control is also possible.

If the engine is started during auxiliary heater operation, which is possible for up to max. 60 min., the auxiliary coolant heater switches to pre-heater mode and regulates itself independently via the coolant temperature.

Button



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Display


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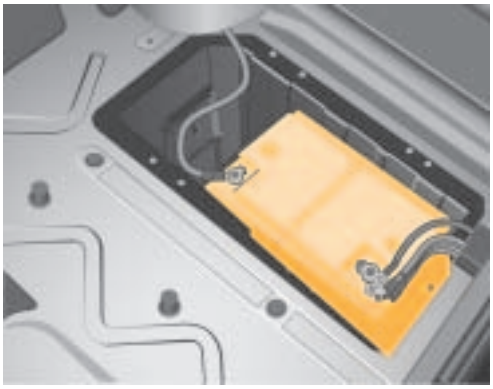
Batteries

The Crafter can be optionally equipped with a dual-battery vehicle electrical system; in this case, a starter and a vehicle electrical supply battery are installed.

Starter battery

The vehicle electrical system's standard 12 V vehicle voltage is supplied by the maintenance-free starter battery. The starter battery is installed in the covered battery recess in front of the driver's seat (left-hand drive vehicle) or the front passenger's seat (right-hand drive vehicle).
A vent pipe emerges into the open air from the recess.



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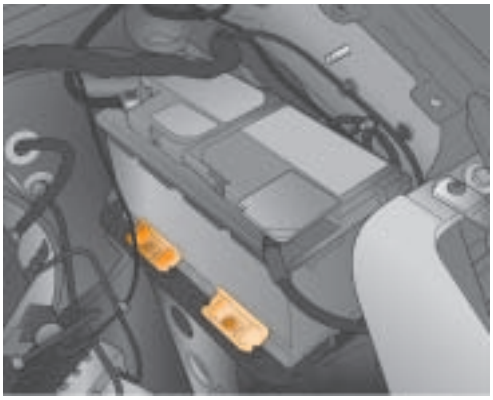
Vehicle electrical system battery

To supply high-current, body-side consumers, a second battery, located on the left of the engine compartment, is available in addition to the starter battery (left-hand drive vehicles only). This second battery is not intended as a starter battery.
By supplying the high-current consumers, it is instead intended
to protect the starter battery from discharge, thereby maintaining the vehicle's ability to start.



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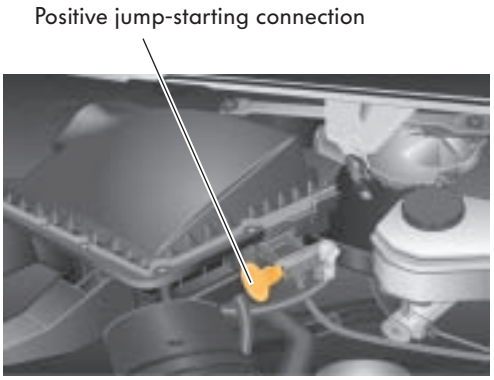
Jump-starting connections

The Crafter is equipped with a positive and a negative connection for jump-starting and for charging the battery.

Positive jump-starting connection

To connect a jump-starting cable or a battery charger, a connection point for the positive cable is located on the left-hand side of the air filter housing in the engine compartment.



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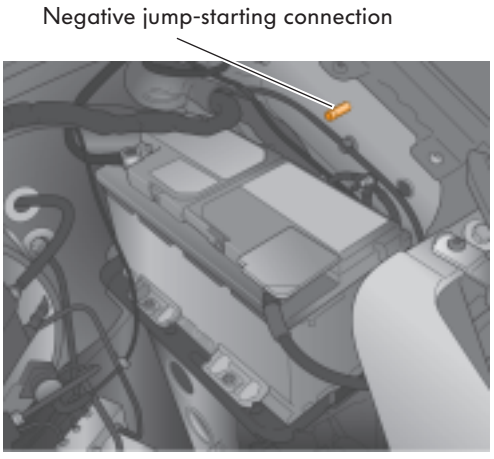
Negative jump-starting connection

To connect a jump-starting cable or a battery charger, a connection point for the negative cable is located on the left-hand wing in the engine compartment.



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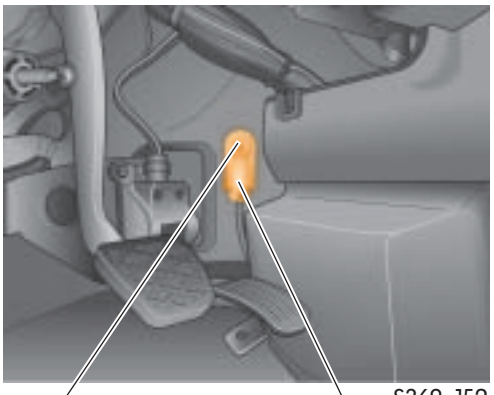
Negative main connection

The optional, main connection for the battery negative cable is located on the right next to the accelerator pedal.

The connection and the ground bolt can be separated by pulling the red actuation tab.
This enables the battery to be isolated from the vehicle electrical system if necessary or prescribed for repair work.



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