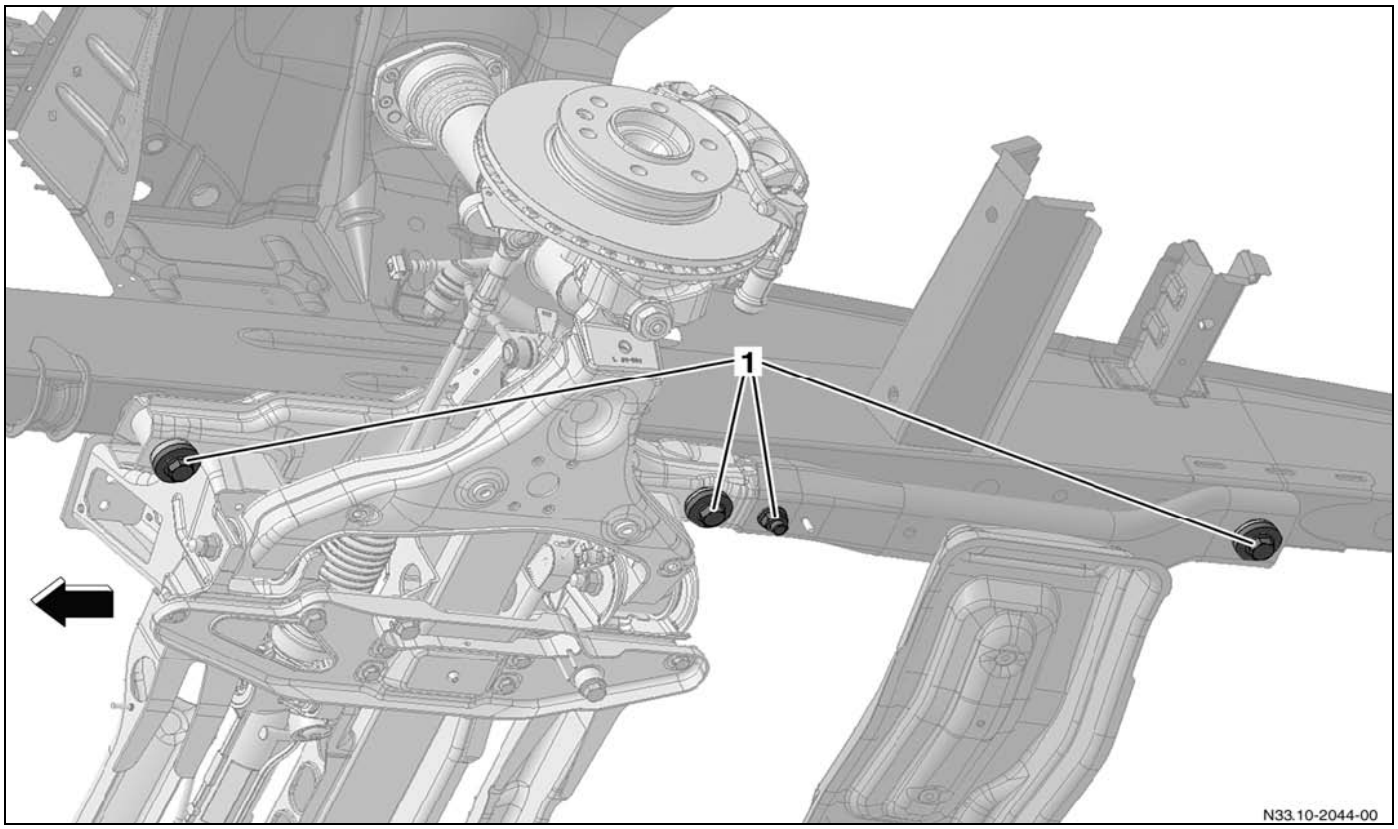
7. Modifications to the basic vehicle

7.1.1. General information on the suspension

Additional attachment parts are not permitted to be secured to the bolting points on the front axle.



Front axle

1 Bolting points on the front axle

This is especially valid for:

- Front transverse link: Do not modify wheel position values
- Do not modify or use the front axle to mount additional equipment or make other modifications.

Arrow Front of vehicle

- Rigid rear axle: do not modify rear axle.
- Brakes: do not modify the brake system
- Do not modify: equipment, sensors, line routing for ESP/ABS.

Warning

Modifications to components of the suspension system can result in impaired and unstable vehicle handling characteristics. The driver may lose control of the vehicle and cause an accident that may cause serious injury or death. For this reason, no modifications whatsoever may be made to components of the suspension system.

Warning

Do not change any bolted connections that are relevant to safety, e.g. that are required for wheel alignment, steering or braking functions. They may otherwise no longer function correctly. The driver may lose control of the vehicle and cause an accident that may cause serious injury or death. Parts must be refitted in accordance with MB after sales service instructions and using suitable standard parts. We recommend the use of genuine MB SPRINTER parts.

- It is strictly prohibited to shorten the length of the free clamping bolt, change to the reduced shaft or use bolts with a shorter thread.
- The settling behavior of bolted connections must be observed.

Information is available from any authorized SPRINTER Service Center. Additional tensioned parts must be of equal or greater strength than the preceding tensioned assembly.

The use of MB tightening torques assumes coefficients of friction for the bolts in the tolerance range of [=0.08…0.14].

We recommend the use of standard MB SPRINTER parts.

7.1.2. Springs/shock absorbers/anti-roll bars

Modifications to springs, shock absorbers and anti-roll bars can only be made in the combinations specified by Daimler AG on the front and rear axle.

You can obtain more information from SPRINTER ENGINEERING
(→ chapter 2.7).

We recommend the use of genuine MB SPRINTER springs

- Do not damage the surface or corrosion protection of the spring leaves during installation work
- Before carrying out welding work, springs must be covered to protect them against welding spatter.
- Do not touch springs with welding electrodes or welding tongs.

On no account should springs and shock absorbers be used if they do not correspond to the characteristics of standard parts or parts obtainable as optional equipment. We recommend the use of standard MB SPRINTER parts.

Warning

On no account should springs and shock absorbers be used if they do not correspond to the characteristics of standard parts or parts obtainable as optional equipment. Otherwise, this system may no longer work correctly and could ultimately fail. The driver may lose control of the vehicle and cause an accident that may cause serious injury or death. Refer also to the optional equipment Information (→ chapter 3.9).

7.1.3. Brake system

Warning

Work carried out incorrectly on the brake hoses, lines and cables may impair their function. This may lead to the failure of components or parts relevant to safety, the driver may lose control of the vehicle and cause an accident that may cause serious injury or death.
Have work on brake shoes, lines and cables only carried out by an authorized SPRINTER dealer.

Routing lines

Warning

A sufficient distance must be maintained between brake lines and heat sources, sharp-edged or moving parts. Otherwise, the brake system function could be impaired or the brake system could suffer total failure as a result of bubbles forming in the brake fluid or from chafing points in the brake lines the driver may lose control of the vehicle and cause an accident that may cause serious injury or death.

Routing lines along the brake hoses
- No other lines may be attached to the brake hoses.

Brake cable for the parking brake
- Do not modify the length of the brake cable.

Disc brakes
- Do not impair cooling by attaching spoilers below the bumper, additional hub caps or brake disc covers, etc.

Warning

Do not modify air inflow and air outflow of the brake system. Any modifications may result in these systems not functioning correctly and ultimately failing. The driver may lose control of the vehicle and cause an accident that may cause serious injury or death.
Brake system overheating will not only impair braking ability, it can also cause tire damage. For this reason, make sure that there is a sufficient supply of cooling air at all times.

Warning

Do not modify brake system components e.g. discs, calipers, sensors, etc. Any modifications to brake components may result in these systems not functioning correctly and ultimately failing. The driver may lose control of the vehicle and cause an accident that may cause serious injury or death.

7.1.4. Wheels and tires

Warning

Only fit tires of a type and size approved for your vehicle and observe the tire load-bearing capacity required for your vehicle and the tire speed index. In particular, comply with FMVSS/CMVSS regulations concerning the approval of tires. These regulations may define a specific type of tire for your vehicle.
If you have other wheels fitted:

- The brakes or components of the suspension system could be damaged
- Wheel and tire clearance can be no longer be guaranteed
- The brakes or components of the suspension system can no longer function correctly

The driver may lose control of the vehicle and cause an accident that may cause serious injury or death.

Gross vehicle Weight [lbs]	Wheel	Tire size	Load Index
8,550	6.5Jx16	245/75R16	120/116
9,990	5.5Jx16	215/85R16	115/112
11,030	5.5Jx16	215/85R16	115/112

The body builder must ensure the following:

- There must be sufficient space between the tire and the mudguard or wheel arch even with snow chains fitted and the suspension completely compressed (allowing for axle twist). The relevant data (→ chapter 7.2.6) must be observed.
- It is only permissible to fit approved tire sizes see the vehicle documents, 2D drawings website (→ chapter 1) or the above table.
- It is only permissible to fit approved wheels with the correct dimension & load rating document.

You can obtain more information about tires and wheels from any authorized SPRINTER dealer or in the “Optional equipment” section (→ chapter 3.9).

7.1.5. Spare wheel

The SPRINTER is equipped with a spare wheel. When mounting a spare wheel, observe the following:

- Fit under the frame, on the side of the frame or on the body in accordance with the chassis drawing.
- Observe legal requirements
- It must be easily accessible and easy to handle
- It must be double – secured against detachment.

7.2. Body shell / Body

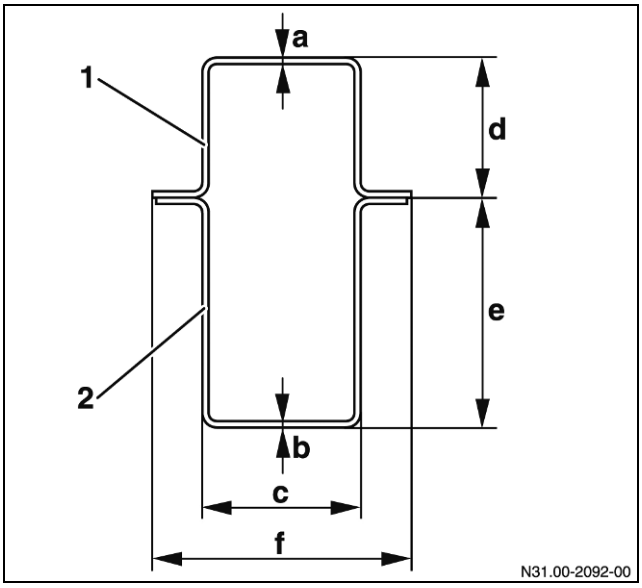
7.2.1. General information on the body shell/body

Modifications to the body must not have a negative effect on the function or strength of vehicle equipment or controls or on the strength of structural parts. In the case of vehicle conversions and mounting bodies, do not make modifications that affect the function or clearance of movement of chassis parts (e.g. during maintenance and inspection work) or accessibility to these parts.

Observe the following:

- The TPMS (Tire Pressure Management System) may malfunction if modifications are made in the direct proximately of the aerials and wheels.
- Do not modify the cross member structure from the front of the cross member through to the rear of the B-pillar.
- Do not modify the rear door opening or to the roof area.
- The clearance for the fuel filler neck, fuel tank and fuel lines must be maintained.
- Avoid sharp-edged corners.
- Do not drill holes in or perform welding work on the A-pillar or B-pillar.
- Do not cut in the C or D-pillar (rear door opening), including the associated roof arch.
- Do not exceed the maximum permissible axle loads.
- Trailer connections must be checked for correct operation.
- If a trailer hitch is installed, the necessary reinforcements must be present.
- Holes on the longitudinal frame member are the result of the production process and are not suitable for securing attachments, bodies, equipment and conversions as there is otherwise a risk of damage to the frame.

Section dimension of longitudinal frame members. (mm)



Dimensions of the upper chord and lower chord

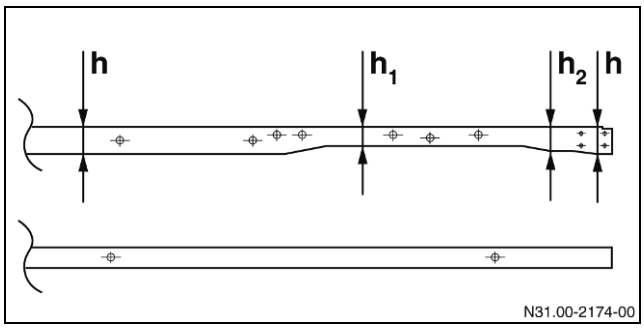
1 Upper chord
2 Lower chord

Model	a	b	c	d	e	f
3500 Chassis Cab	3	3	70	80	120 100[1]	126
2500 Cargo Van		1.5	70	-	120 85[1]	93
3500 Cargo Van		3	70	-	120 100[1]	118

Dimensions in [mm]

[1] In the area of the rear axle

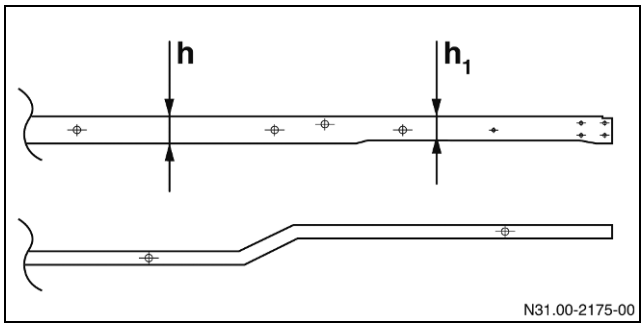
8,550 Longitudinal frame member



Dimensions of the lower chord of the longitudinal frame member

h	120 mm
h1	85 mm
h2	110mm

9,990 & 11,030 longitudinal frame member



Dimensions of the lower chord of the longitudinal frame member

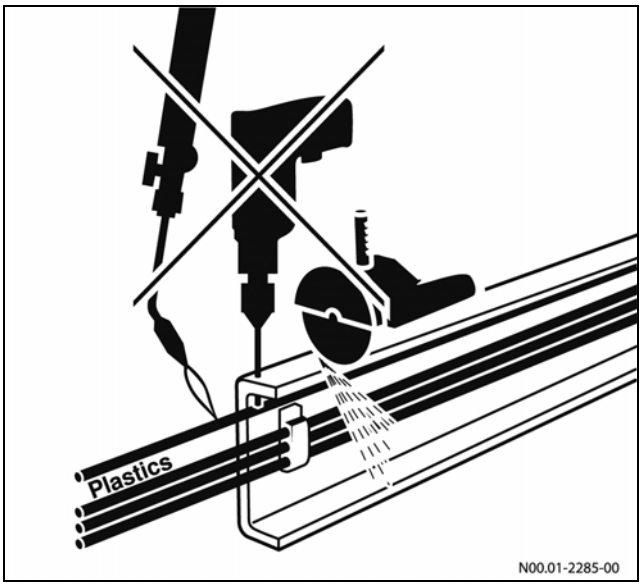
h	120 mm
h1	100 mm

Welding work on the body shell

Welding work may only be performed by skilled personnel.

You will find further information about welding operations in the “Planning of bodies” (→ chapter 3), “Damage prevention” (→ chapter 5) and “Body shell“ (→ chapter 7.2) sections and in the SPRINTER Repair Manual.

Do not weld upper and lower chords of the chassis frame. Plug welding is only permissible in the vertical webs of the longitudinal frame member, contingent upon approval from SPRINTER ENGINEERING. Do not perform any welding work in bends.



Warning

Unauthorized drilling or welding work carried out in the area of deployment of the airbags could cause them to function incorrectly, e.g. they could be triggered unpredictably while the vehicle is in motion or they might fail completely and in case of an accident may cause serious injury or death.
For this reason, do not weld or drill near air bags.

Drilling work on the frame

Existing holes in the longitudinal frame member result from the production process and may only be used if approved by SPRINTER ENGINEERING (→ chapter 2.7).

On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (→ chapter 5.3).

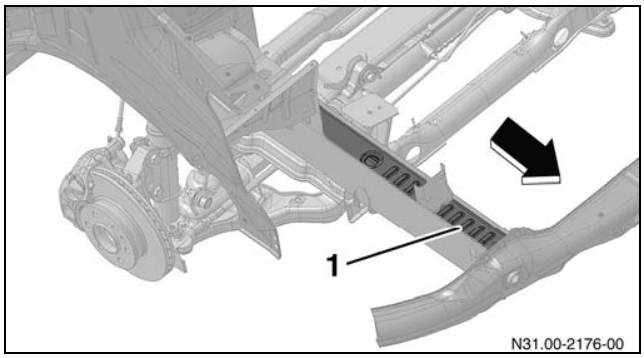
Do not drill holes:

- On the upper and lower chords of the frame (except if drill holes are at the rear end of the frame)
- In areas with a load-bearing function for the rear axle or parts fastened to the frame
- At load application points (e.g. spring supports, brackets, etc.)

7.2.2. Attachment to the frame

Attachment to the front frame section

On no account should assemblies, bars, etc. be secured near the frame fore-structure or the front axle as this may interfere with the necessary structure for passive safety.



Structure for passive safety

1 crumple zone on the sub-frame
Arrow Front of vehicle

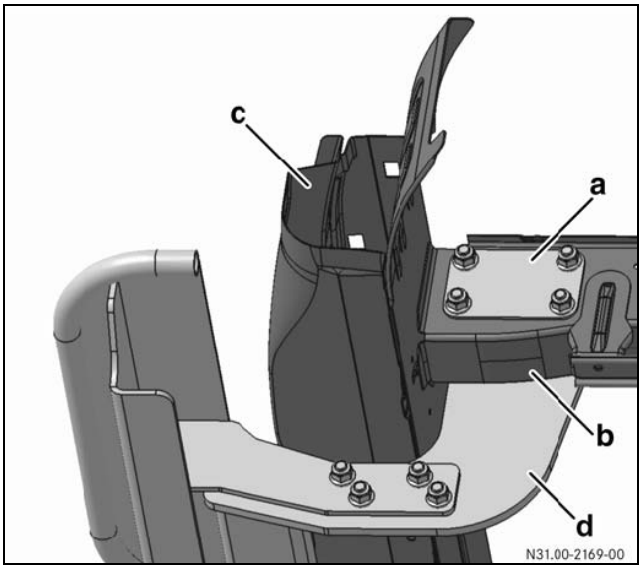
Warning

If attachments are mounted on the front frame section, the function of the forward impact structure and the airbag units may be impaired and in case of an accident and may cause serious injury or death.
For the aforementioned reasons, do not install assemblies & bars to the front structure of the SPRINTER.

The modifications must not hinder possible repair work on the standard vehicle.

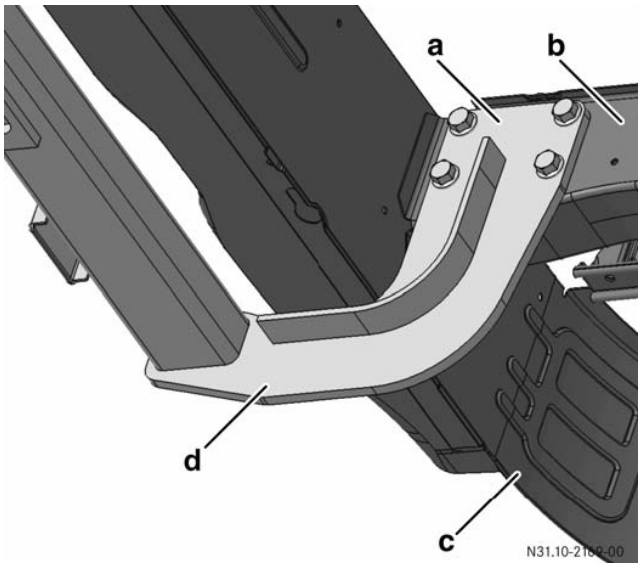
Attachment to the rear frame section

The attachment of additional equipment or bodies to the rear frame section must be equal to the attachment of the trailer hitch available as optional equipment. For the application of greater forces and moments, an additional support on the end frame cross member is required.



Outside view

a Attachment of mounting plate to the longitudinal frame member
b Lower chord of the longitudinal frame member
c End frame cross member
d Mounting plate for the trailer hitch



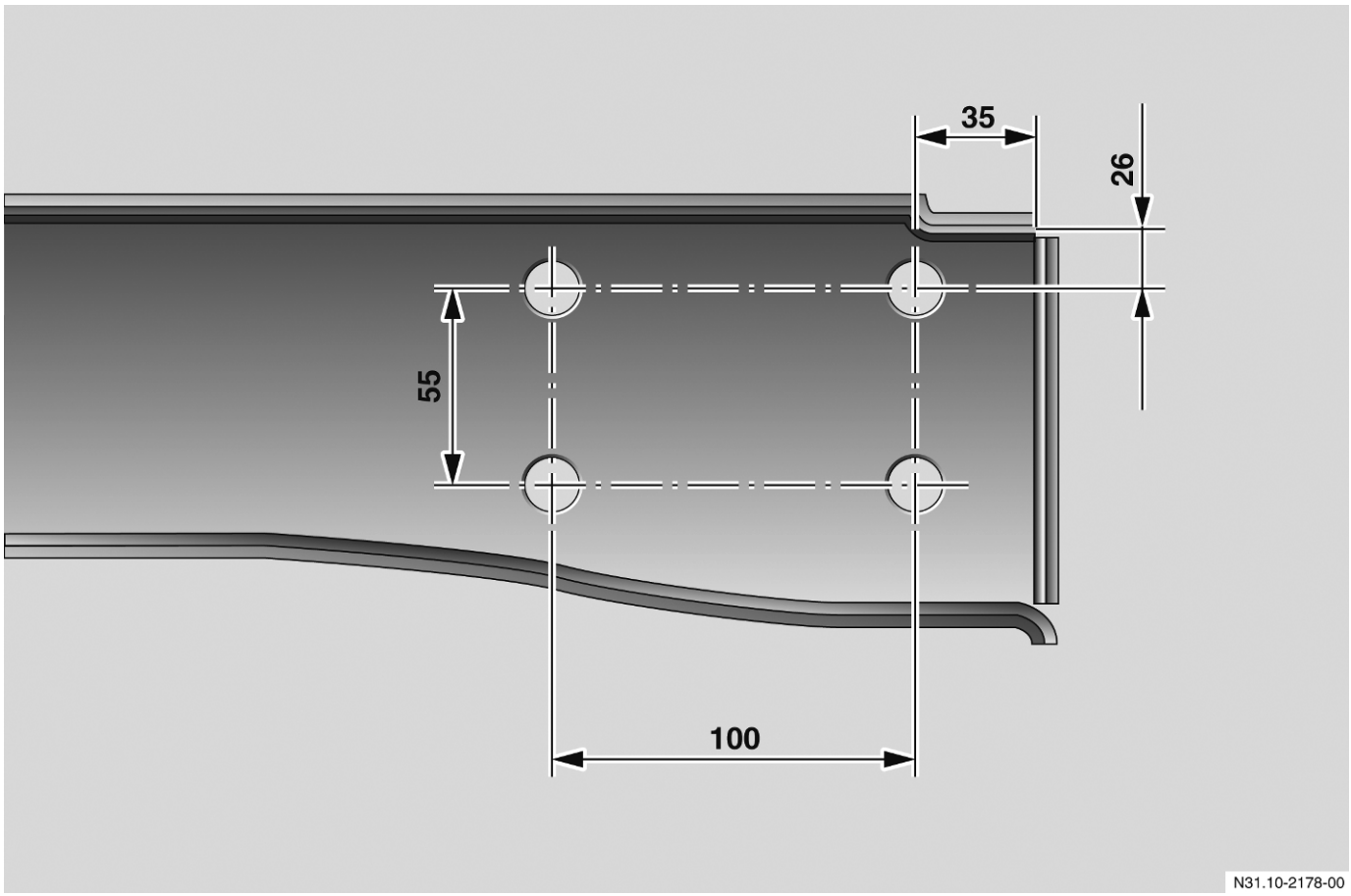
Inside view

a Attachment of mounting plate to the longitudinal frame member
b Lower chord of the longitudinal frame member
c End frame cross member
d Mounting plate for the trailer hitch

Attachments by means of body support brackets

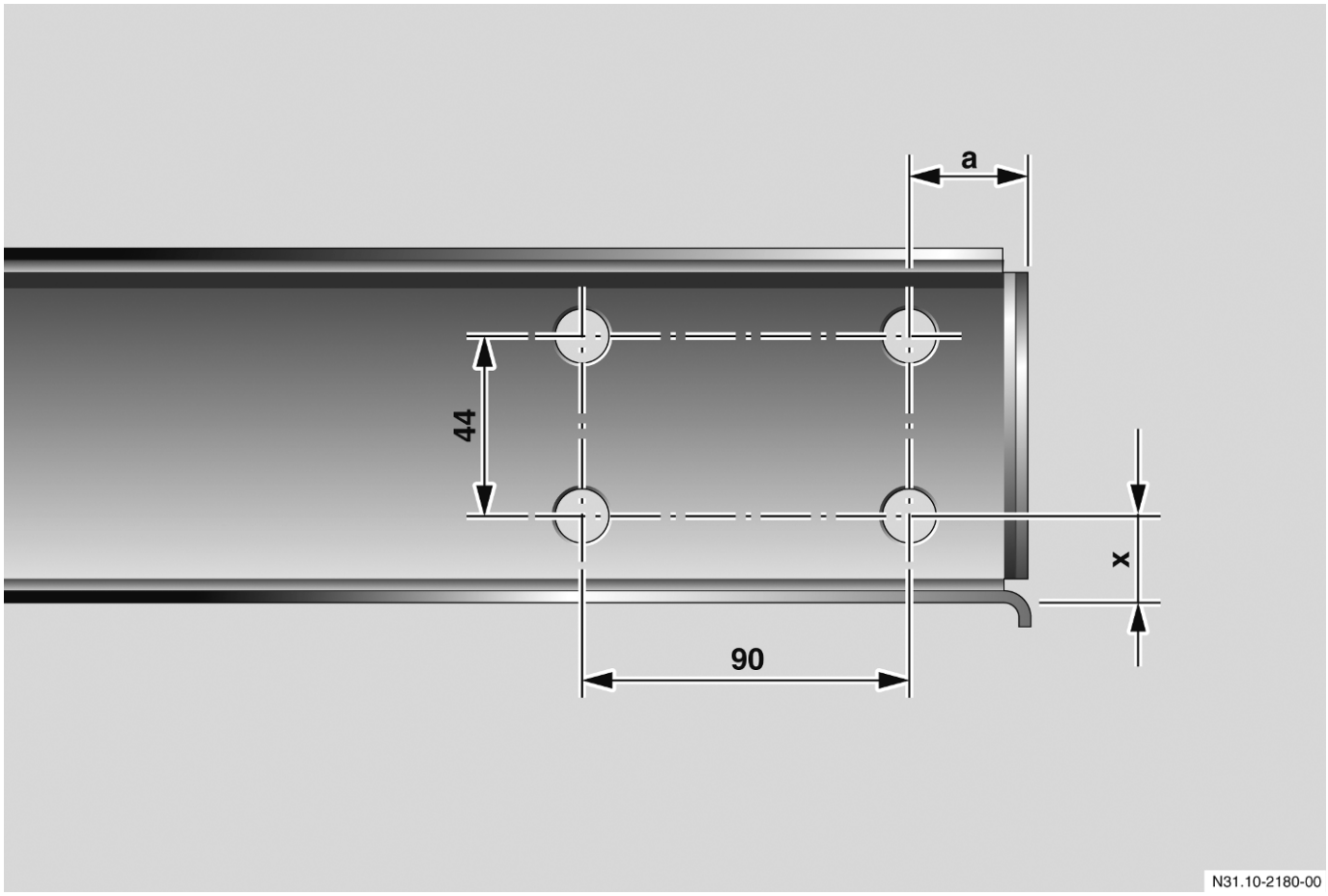
The body support brackets fitted at the factory must be used for attaching bodies to the vehicle frame. More information is contained in the “Attachment to the frame” section (→ chapter 7.2.2).

2500 and 3500 SPRINTER Cargo and Passenger Vans



Vehicle type	Wheelbase	Dim a	Dim x	Overhang
2500 and 3500 cargo and passenger vans	144 in	-	-	1150 mm / 45.3 in
	170 in	-	-	1250 mm / 49.2 in

3500 Chassis Cab



Vehicle type	Wheelbase	Dim a	Dim x	Overhang
3500 Chassis Cab	144 in	27 mm / 1.1 in	34 mm / 1.3 in	1250 mm / 49.2 in
	170 in	27 mm / 1.1 in	34 mm / 1.3 in	1350 mm / 53.2 in

7.2.3. Chassis frame material

If the frame is extended, the material of the extension element must have the same quality and dimensions as the standard chassis frame.

Material quality:	
Material	Tensile Strength (N/mm^2) Yield Strength (N/mm^2)
H240LA (DIN EN 10268-1.0480)	350-450 260-340
S235JRG2 (DIN EN 10025-1.0038)	340-510 >235

7.2.4. Overhang extension

Modifications to the vehicle overhang are possible for the Chassis Cab and must always take the permissible axle loads and the minimum front axle load into account. On vehicles with a closed body (Cargo van or Passenger van), an overhang extension is not allowed.

- An additional cross member must be fitted if the frame extension exceeds 350mm [13.8in].
- Any additional frame cross members must have the same functionality as standard cross members.
- If the frame overhang is extended, the permissible trailer load specified in the vehicle registration document must be checked and, if necessary, be reduced or even omitted.
- The frame overhang must be reinforced accordingly.
- Make sure that you do not exceed the permissible axle loads.
- Ensure that you maintain the position of the center of gravity within the permissible limits.
- The minimum front axle load must be complied under in all load conditions.

You can obtain more information from SPRINTER ENGINEERING
(→ chapter 2.7).

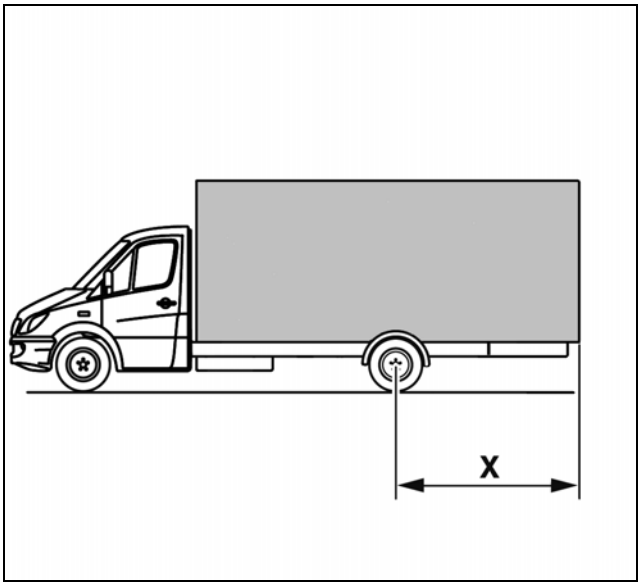
Maximum overhang lengths

If you stay within the limits of the following overhang lengths and the maximum rear axle load, the original trailer load still applies and ESP operation is not affected.

Wheelbase l (in)	Max. overhang length x(mm) [in]
144	1850 [72]
170	2200 [85]

The vehicle overhang length is part of the total overhang referring to the rear axle, including the frame overhang extension and the body and attachments.

For information on the section dimensions of the longitudinal frame member see (→ chapter 7.2.1).

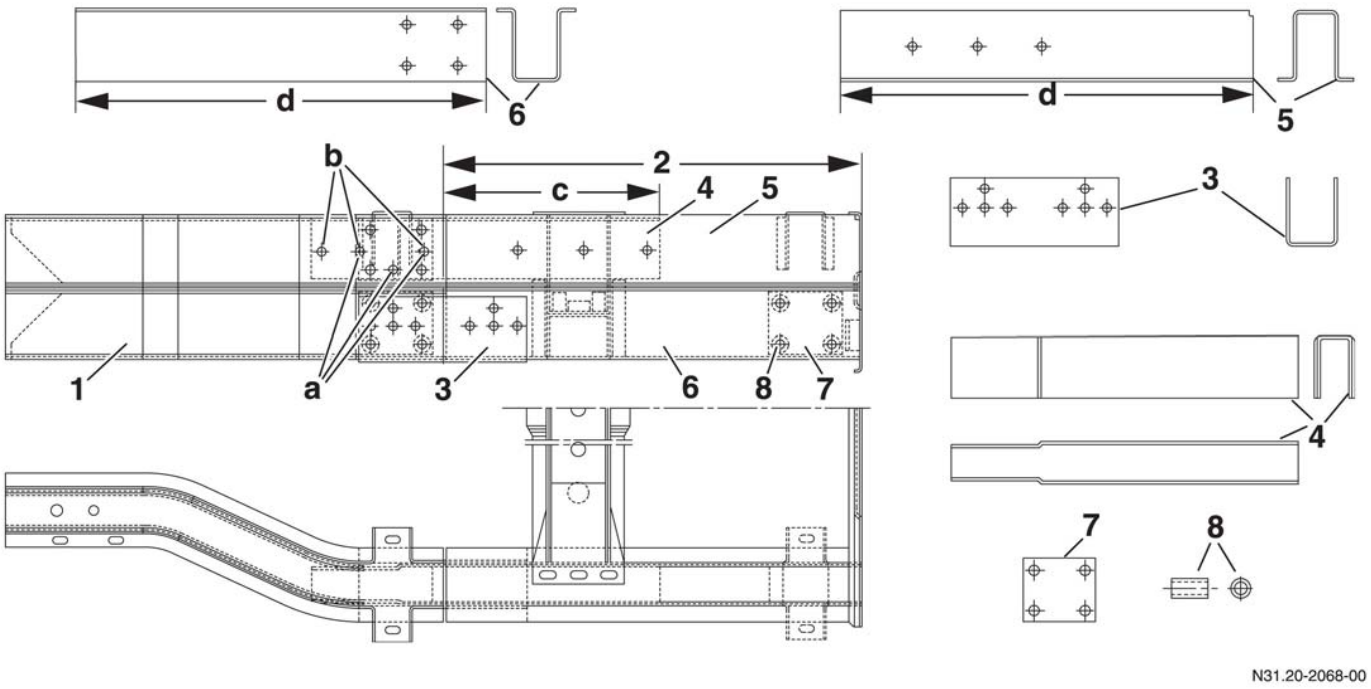


Maximum overhang lengths

X Maximum vehicle overhang

The illustration above depicts the implementation of a frame extension for an overhang extension. On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (→ chapter 5.3).

3500 SPRINTER Chassis Cab 11,030 GVWR frame extension with overhang extension



Frame extension with overhang extension

1 Longitudinal chassis frame member
2 Frame extension
3 Outer reinforcement
4 Internal reinforcement (wall thickness on 3500: 3mm)
5 Body mounting frame extension
6 Chassis frame extension (wall thickness on 3500: 3mm)
7 Reinforcement plate minimum 2 mm
8 Spacer bush, tube 24x4 M steel or ST 35 NBK
a Bore holes, 3665mm [144 in] wheelbase
b Bore holes, 4325mm [170 in] wheelbase
c 350mm (3665mm [144 in] wheelbase)
300mm (4325mm [170 in] wheelbase)
d Dimension defined by body builder

Comply with all applicable FMVSS / CMVSS guidelines and regulations

On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (→ chapter 5.3).

Modifications to the cab roof

Warning

On no account should any subsequent modifications be made to the roof or the roof skin between the A-pillar and the B-pillar of the vehicle is equipped with window bags. Otherwise, the window bag may no longer be able to work correctly (e.g. window bag deployment is delayed or incomplete) which may lead in case of an accident to serious injury or death.

The “electric sliding sunroof”, (Option D27), is available from the factory as optional equipment (→ chapter 7.5).

The roof load-bearing capacity is limited.

Roof arches or supporting parts may not be removed or modified.

You will find information on over cab attachments and wind deflectors in the “Attachments” section (→ chapter 7.6).

Observe the permissible center of gravity and the permissible axle loads must be maintained.

Modifying the cab rear panel

If it is necessary to cut through the cab rear panel, it is possible to do this in connection with a continuous surrounding frame. The equivalent rigidly of the frame must be at least equal to the original rigidity. Partitions may be totally or partially removed. Refer also to the “Modifications to closed Cargo vans” section
(→ chapter 8.4).

Warning

Do not modify the roof lining or the roof skin between the A-pillar and the B-pillar if the vehicle is equipped with window bags. Otherwise, the window bag may no longer be able to work correctly (e.g. window bag deployment is delayed or incomplete) which may lead in case of an accident to serious injury or death.

7.2.5. Side wall, windows, doors and flaps

Sidewall

Body structure or reinforcement conversions which alter the sidewall structure of the Cargo Van or the Passenger Van need written approval from SPRINTER ENGINEERING. The body builder must meet all applicable FMVSS / CMVSS and warranty responsibility for those modifications. Do not modify the roof frame or structural components.

Upon completion of all work on the vehicle, body builders must comply with the specified corrosion protection measures (→chapter 5.3).

Retrofitting Windows

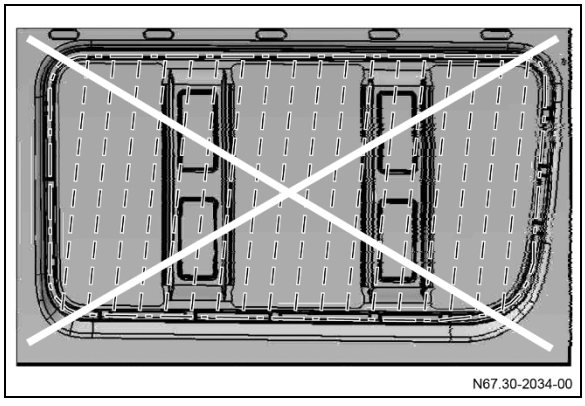
You must ensure the following when retrofitting side wall windows on Cargo vans:

- Use only approved glass manufacturer
- Use the interior structure as guidance.
- Do not cut into the interior structure.
- Use at least a 50mm (2'') radius in the corners

Alternatively you can order option "Window Opening Without Glass" (Option PF3 fleet only).

When installing windows in existing openings, ensure that the windows are installed with a stable frame. If modifications need to be carried out to the supporting structure of the basic vehicle (pillars, reinforcements, attachment of roof arches) in order to retrofit windows (panorama glazing), the rigidity of the modified body must be equal to that of the basic vehicle.

More information about modifications to the sidewall can be found in the "fitting shelving/installations" section.



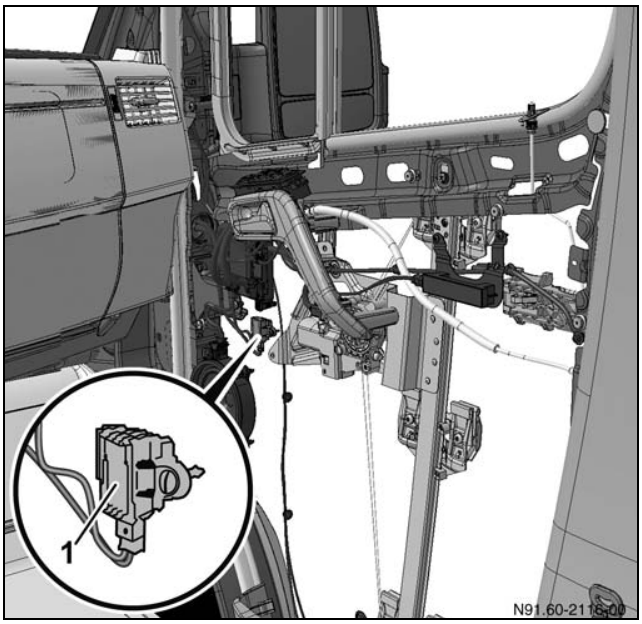
Doors and flaps

Body structure or reinforcement conversions to the supporting structure of the basic vehicle (frame cross members, pillars, reinforcements, attachment of roof arches) in order to retrofit doors, requires prior written approval from SPRINTER ENGINEERING.

The body builder must comply with all applicable FMVSS / CMVSS and warranty responsibility for those modifications. The rigidity of the modified body must be equal to that of the basic vehicle.

The trigger sensor of the occupant protection systems is located in the door body on vehicles with window or thorax bag.

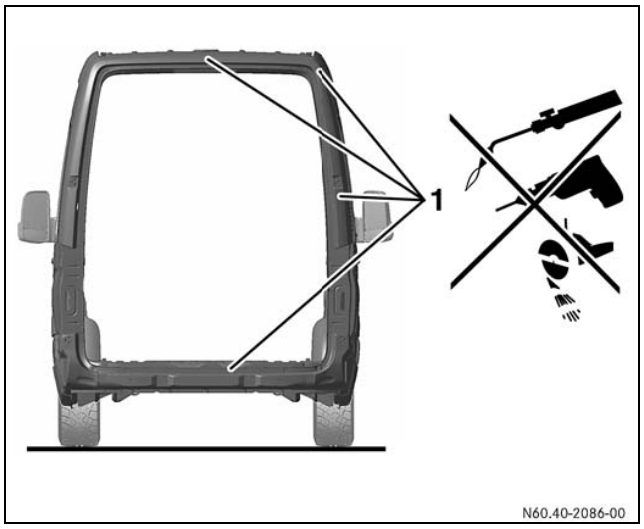
Do not modify the door body (see illustration).



Door, showing sensor system

1 Pressure sensor (trigger sensor of the occupant protection systems)

Do not modify the rear door opening including the roof area.



Rear door opening and roof area

1 Do not modify the above mentioned areas

- Seats in the passenger compartment or cabin must be directly accessible from the outside by a door or from the cab.
- It must be possible to open locked doors quickly and easily from the inside.
- The doors must open wide enough and the door entrances must be shaped in such a way as to enable persons to get in and out of the vehicle safely and comfortably.
- The maximum permitted height of the bottom step above the road surface is 400mm [15.75 in].
- Fittings must allow sufficient clearance to the interior door handles regardless of door position (trap guard).
- Do not modify the central locking system or the immediate area around the door or in the area of the pillars or cross members.

Upon completion of all work on the vehicle, body builder must comply with the specified corrosion protection measures (→ chapter 5.3).

7.2.6. End frame cross member

If special-purpose bodies are mounted, the end panel cross member can be ordered as an option. (Option Q18).

Upon completion of all work on the vehicle, body builder must comply with the specified corrosion protection measures (→ chapter 5.3).

Comply with all applicable FMVSS/CMVSS guidelines and regulations.

7.2.7. Roof structure

Warning

Do not modify the roof lining or the roof skin between the A-pillar and the B-pillar if the vehicle is equipped with window bags and thorax bags. Otherwise, the window bag and thorax bag deployment may be delayed or incomplete, in case of an accident it may lead to serious injury or death. The roof load-bearing capacity is limited (see table).

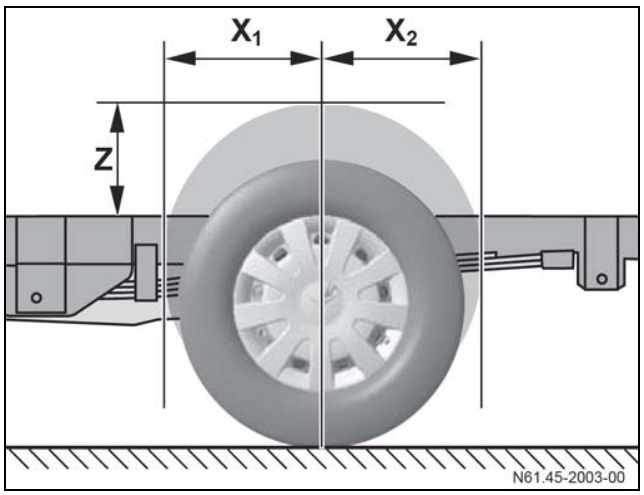
Do not remove or modify roof bows or roof structure.

Maximum roof loads	
Low Roof Cargo Van kg / [lbs]	High Roof Cargo Van kg / [lbs]
300 / [660]	150 / [330]

Do not exceed the vehicle's maximum center of gravity limits.

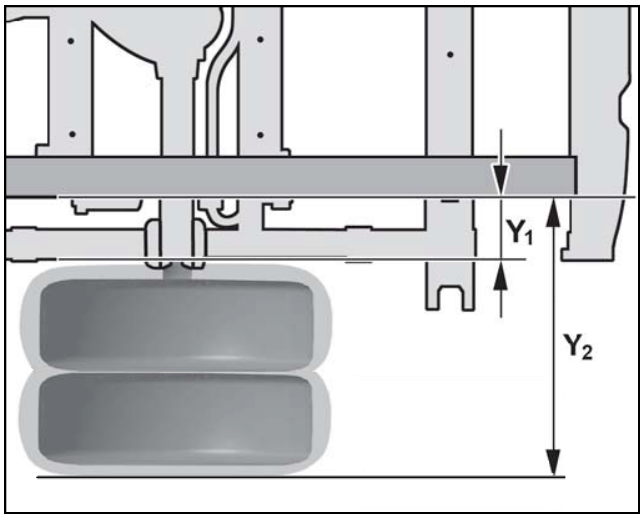
7.2.8. Tire Clearance Chassis-Cab

Ensure that there is sufficient space between the tire and the mudguard or wheel wells with snow chains fitted and the suspension completely compressed (allowing for axle twist).



Tire clearance (side view)

X_1 clearance from center of rear axle forward
X_2 clearance from center of rear axle backward
Z dimension from top of frame



Tire clearance (top view)

Y1 clearance from frame to inner tire
Y2 clearance from frame to outside of outer tire

The minimum required wheel clearance is measured from the closest body member to the upper and lower chord of the longitudinal frame member on Chassis Cab vehicles including snow chain clearance on outer tire.

Rear Axle Chassis Cab 215/85 R16	Dimensions mm [in]	Dimension for snow chain mm [in]
X_1	425 [16.75]	425 [16.75]
X_2	425 [16.75]	425 [16.75]
Y_1	110 [4.3]	110 [4.3]
Y_2	640 [25.2]	640 [25.2]
Z	127 [5]	159 [6.25]

7.2.9. Wheel well Cargo-Van

Warning

Do not modify the wheel wells on Cargo and Passenger vans.

Warning

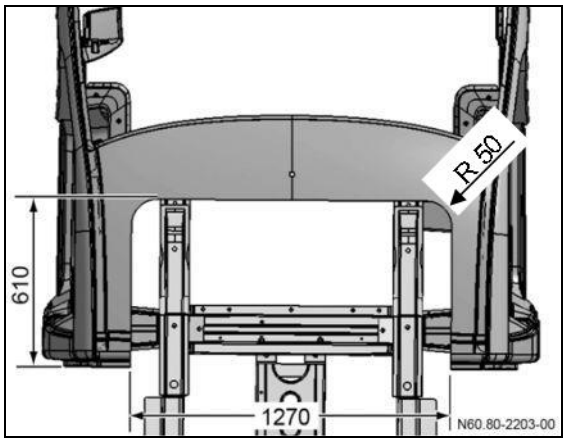
Do not install seats on the wheel wells. Otherwise, the vehicle could be damaged as a result (e.g. wheel wells and tires).

Upon completion of all work on the vehicle, body builder must comply with the specified corrosion protection measures (→ chapter 5.3).

Modifications to the width of the wheel wells are not permitted.

7.2.10. Cutting the cab roof and b-pillar roof arch

For partially integrated bodies, e.g. motor caravans or integral box bodies, the cab roof including B-pillar roof bow can be cut out in the indicated area (see illustration) where necessary.



Permissible Roof Cut

width	610 mm [24 in]
length	1270 mm [50 in]
radius	50 mm [2 in]

Note:
When cutting the B-pillar roof bow, it is essential to ensure equivalent rigidity in one of the ways listed below.

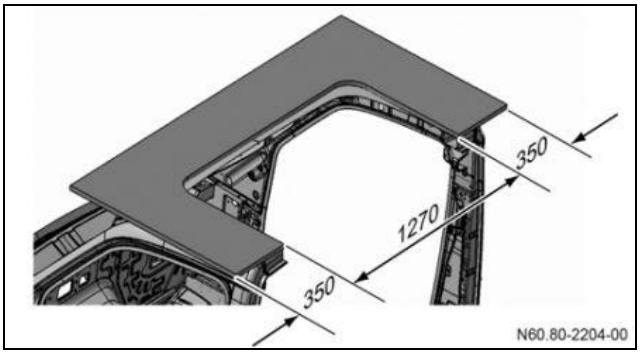
For alternative methods of ensuring equivalent rigidity developed by the body manufacturer, a detailed evaluation by Sprinter Engineering & Compliance Support Team (SPRINTER ENGINEERING) is required; including but not
limited to durability tests or FEA.

Equivalent rigidity when cutting B-pillar roof bow

Variant 1: Sandwich construction / wooden board

When the B-pillar roof bow is cut, the equivalent rigidity requirements can be met by means of a wooden board or sandwich construction bonded to the basic vehicle over its entire surface (e.g. with Sikafkex 221). The arched bow contour must be adapted to form a non-positive fit with the sandwich construction or wooden board by means of an auxiliary construction.

Required bending resistance of sandwich construction / wooden board	
y-axis	$EI_2 = 7 \times 10^8$ N / mm^2 [1.01×10^{11} lb / in^2]
z-axis	$EI_1 = 2 \times 10^{11}$ N / mm^2 [2.90×10^{13} lb / in^2]



Simulating structure (sandwich construction / wooden board) bonded to cut roof structure over entire surface

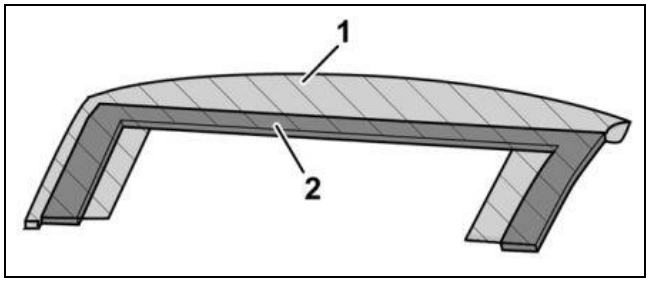
width 1	350 mm [13 13/16 in]
width 2	1270 mm [50 in]

Material characteristics	
Sandwich construction	Wooden board
Structure: 2.0 mm [1/8 in] GRP 26.0 mm [1 1/16 in] foam 2.0 mm [1/8 in] GRP	Structure: 20.0 mm [13/16 in] wood
E_{GRP} = 12,000 N / mm^2 [1.74×10^6 lb / in^2] E_{Foam} = 80 N / mm^2 [11,590 lb / in^2]	E_{Wood} = 3,000 N / mm^2 [434,656 lb / in^2]

Variant 2: Welded structure under cab roof

When the B-pillar roof bow is cut, the equivalent rigidity requirements can be met by means of a welded structure installed in the basic vehicle under the cab roof.

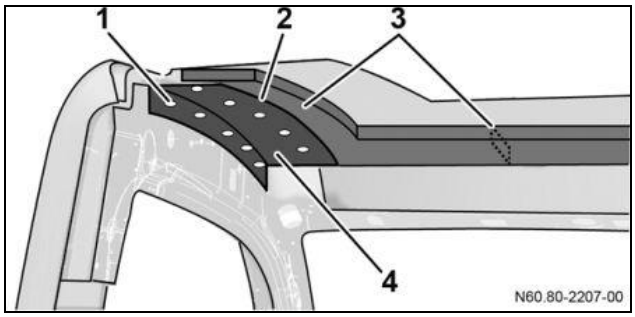
Required bending resistance of welded structure	
y-axis	EI_2 = 8.35 x 10^9 N / mm^2 [1.21 x 10^{12} lb / in^2]
z-axis	EI_1 = 2.36 x 10^{11} N / mm^2 [3.42 x 10^{13} lb / in^2]



Welded structure

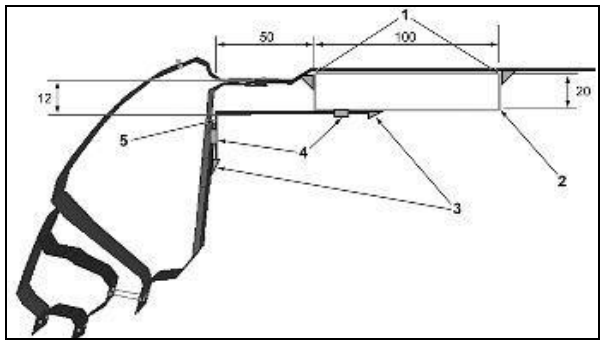
1 Roof paneling
2 Rectangular profile

Material characteristics of auxiliary frame
Material: at least DC0 1 or S235JRG2
Height = 20 mm [13/16 in]
Width = 100 mm [3 15/16 in]
Wall thickness = 1.5 mm [1/16 in]
E = 210,000 N / mm^2 [3.04 x 10^7 lb / in^2]



Welded structure

1 Plug welding
2 Overlap seam
3 Rectangular profile
4 End plate



Cross section of welded structure

height 1	12 mm [1/2 in]
height 2	50 mm [2 in]
width 1	100 mm [3 15/16 in]
width 2	20 mm [13/16 in]

1 Fillet weld
2 Rectangular profile (2mm [1/8 in] wall thickness)
3 Overlap seam
4 Plug welding
5 End plate

7.3. Engine peripherals/drive train

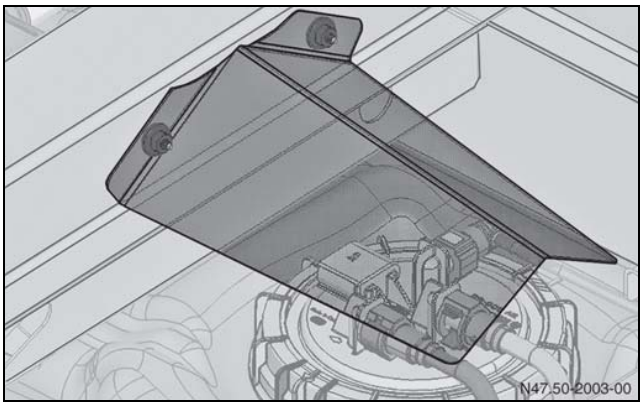
Maintenance and repair of the vehicle must not be hindered by the body.

7.3.1. Fuel system

Do not modify the fuel system

- The installation of heat conducting components, or of components that restrict the installation space, is not permitted.
- Do not modify the fuel pump, fuel line length or fuel line routing. Modifications to these components could impair engine operation because these components are matched to each other.
- Modification and attachments (e.g. additional eyelets) are not permitted in the vicinity of the fuel filler neck.
- If bodies are mounted on a Chassis Cab, a fuel level sensor shield is necessary when the fuel level sensor is not protected by the body.

If bodies are mounted on a Chassis Cab, the fuel level sensor may have to be protected against any falling cargo, depending on the body type. Otherwise damage could occur, rendering the vehicle unserviceable.



Fuel level sensor shield

The following must be observed if auxiliary Diesel powered generators are retrofitted:

- No sharp edges permitted
- Fuel lines must be secured
- Exhaust fumes must not be directed into the vehicle interior

For connections supplying fuel to the auxiliary power generator, contact SPRINTER ENGINEERING.

A fuel tap is standard equipment on Diesel engines. A small ‘pig tail’ is routed to the right side of the fuel tank. This fuel tap will prevent the fuel tank from running empty.

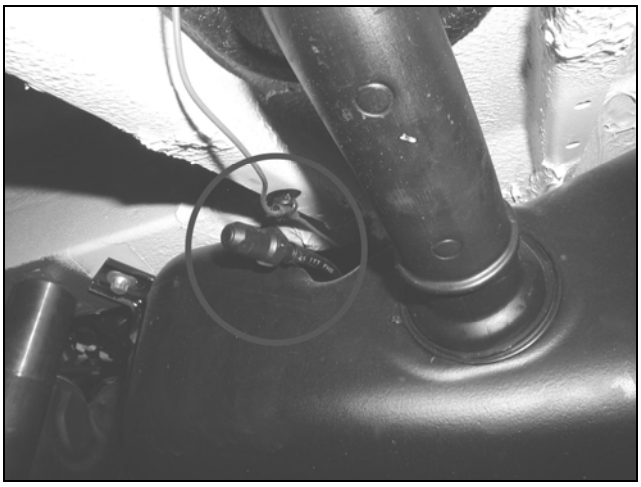
KL1 Auxiliary Diesel Fuel Tap (standard)

The fuel gauge sensor is fitted with an additional fuel connection to facilitate retrofitting of a fuel-powered auxiliary heater and/or generator. The fuel tank can be consumed down to approx.5 gal.

The picture shows a cap which can be removed. The connector piece is ø 7.89 mm. Aftermarket quick connects have to be compatible with SAEJ2044 specified tube end forms.

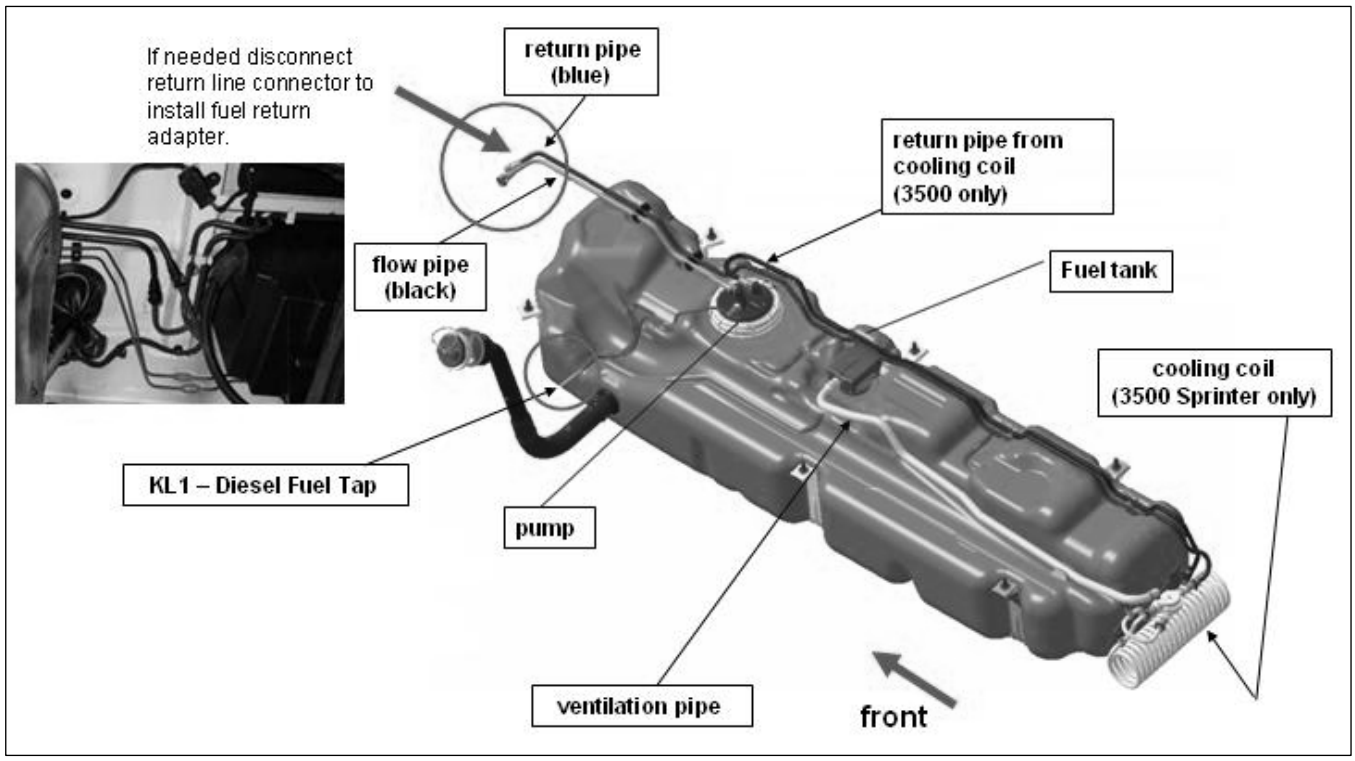
For Quick Connector information, contact:
Cooper-Standard Automotive Fluid Systems
2110 Executive Hills Court
Auburn Hills, MI 48326 USA

Phone: 001-248-836-9400
Fax: 001-248-863-9116
www.cooperstandard.com

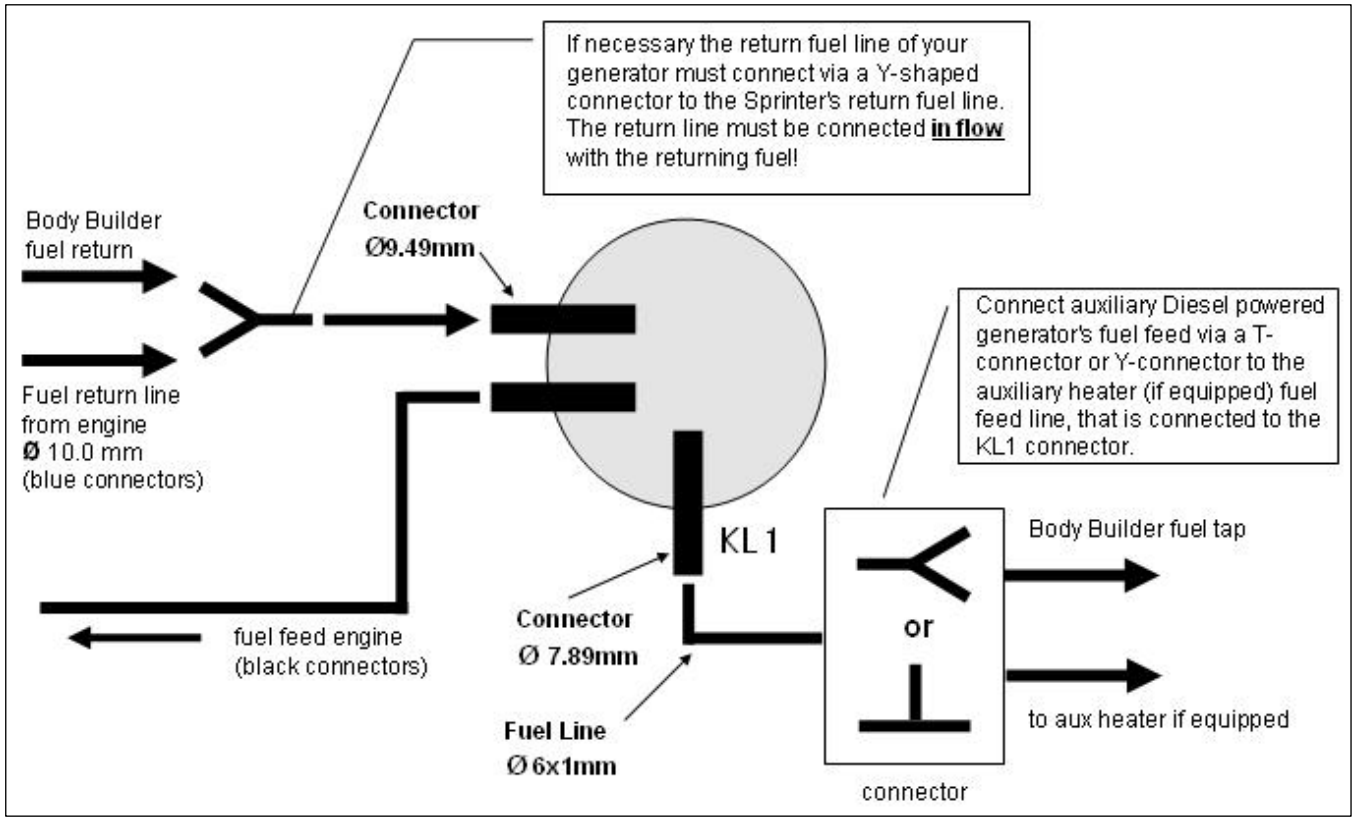


View from underneath without a fuel fired heater

Top view showing a fuel pump unit on a chassis cab



Diesel Fuel System 26.4 gal / 100 L



Fuel Tap Schematics

7.3.2. SCR system and DEF Tank location

In order to meet the strict 2010 EPA / CARB emission standards for Diesel powered engines, model year 2010 Mercedes-Benz & Freightliner Sprinters will require the use of a SCR (Selective Catalytic Reduction) system. The SCR system is an exhaust after treatment that significantly reduces (over 80%) NOx (Nitrogen Oxide).

Aside of sophisticated electronic controllers and sensors the SCR system requires a catalytic converter and a non-fuel reducing agent called DEF (Diesel Exhaust Fluid).

DEF is a mixture of Urea (33%) and water (67%). DEF is a non flammable, non-toxic, colorless, odorless water-soluble liquid.

DEF is stored in the vehicle in the DEF tank which features the SCR pump, temperature control, level sensors, etc.

DEF has a limited shelf life that is influenced by ambient temperature and humidity, as such DEF degradation as well as DEF level in the SCR tank are important factors to meet the emission standards.

- Due to chassis certification Sprinters under 10,000lbs GVWR cannot exceed the UVW and inertia weight of 7,400lbs
- Due to chassis certification Sprinters over 10,000lbs GVWR cannot exceed the inertia weight of 10,470lbs

See page 18 for label information.

Warning

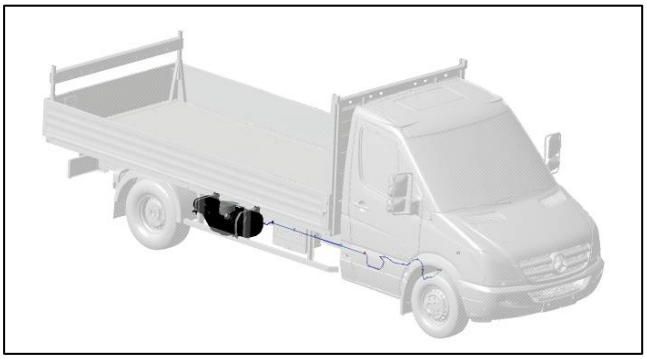
The SCR system is vital to comply with 2010 EPA / CARB emission certification. Do not modify or relocate individual components of the SCR system including but not limited to DEF tank, DEF lines etc.

If DEF comes into contact with painted surfaces or aluminum surfaces, rinse the affected areas immediately with plenty of water.

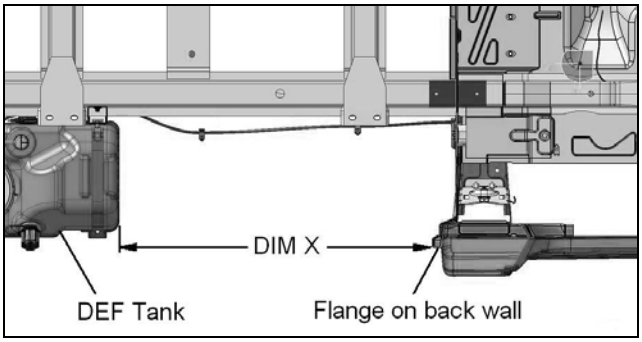
If DEF fluid is pumped out of the tank, do not reuse. Its purity is no longer guarantied and must be discarded.

Note:
For all additional information consult the Owners Manual.

Chassis Cab:
On Chassis Cabs the tank is located outside the frame and on the right hand side before the rear axle. The DEF filler neck is located directly on the tank.



DEF Tank Location

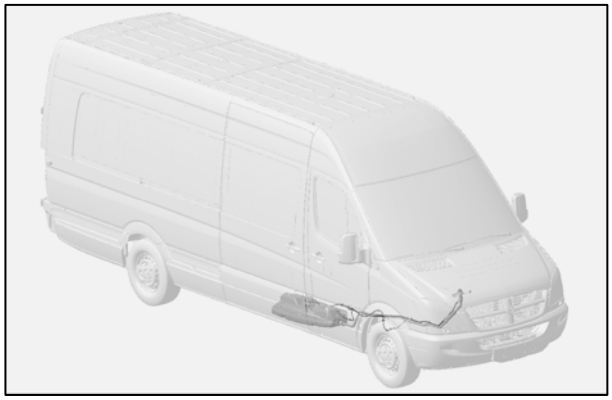


Top view DEF tank location (Chassis Cab)

Wheelbase (in) Chassis Cab	Clearance Dim X mm [in]
144	887 [35]
170	1547 [61]

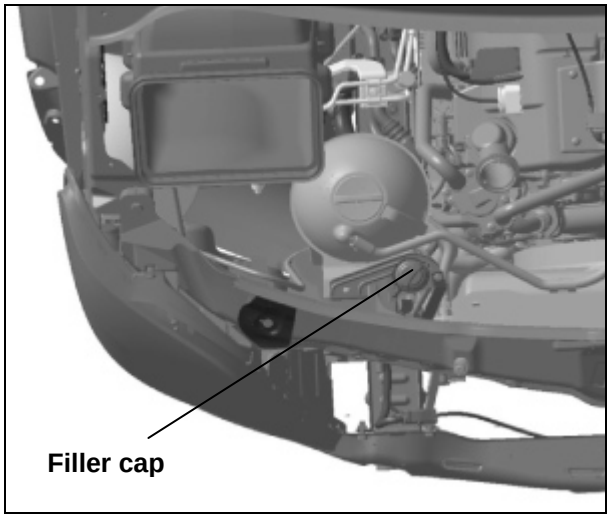
Weight increase: 155lbs

Cargo and Passenger Van:
On Cargo Vans and Passenger Vans the tank is located outside the frame and under the right hand side sliding door. The DEF filler neck is located inside the engine compartment.



DEF Tank location

Weight increase: 144lbs



Filler cap left side under hood

Option KP2

Small DEF Tank 12L Capacity

This smaller tank is located on the front RH side under the headlamp behind the front bumper. The filler neck is the same as the 2010 Sprinter Cargo and Passenger Vans. The tank is bolted to the front RH longitudinal and front cross member at three attachment points.

Filler neck in the engine compartment

Small DEF tank location

7.3.3. Exhaust system

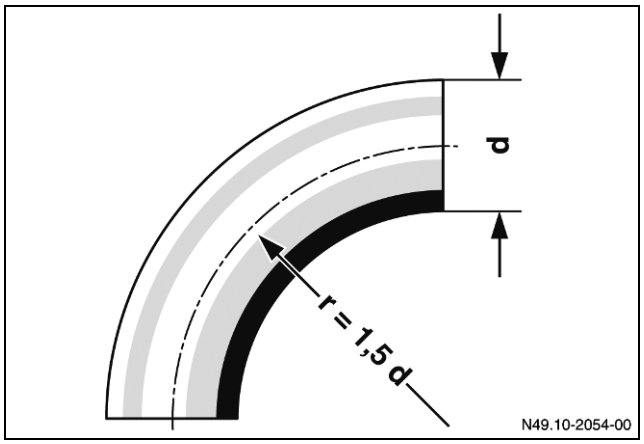
Do not modify exhaust system, except for the portion after the muffler. Comply with all applicable FMVSS/CMVSS guidelines and regulations.

Warning

Modifications to the exhaust system can only be made at 2 ft after the last muffler. Do not reduce the cross-sectional area of the exhaust pipe behind the muffler.

Under extreme loads, the temperature between the exhaust system (diesel particle filter, catalytic converter or main muffler) and the floor panel may rise above 80°C [180°F]. For this reason, heat shields or insulation must be fitted to the substructure to reduce heat radiation.

- Pipe bend, maximum 90°
- Avoid the use of additional pipe bends
- Bending radii >1.5 d



Example of a pipe bend design

Minimum distance to plastic lines, electrical cables and spare wheels:

- 200mm [8 in] for exhaust systems without shielding
- 80mm [3.5 in] with sheet metal shielding
- 40 mm [1.75 in] with sheet metal shielding and additional insulation

Upon completion of all work on the vehicle, body builder must comply with the specified corrosion protection measures (→ chapter 5.3).

Additional shielding is required

- Near control panels
- Near assemblies, attachments and equipment, unless they are made of heat-resistant material

Warning

Modifications to the exhaust system as far as the main muffler are not permitted. The lengths and routings, e.g. between the diesel particle filter and the main muffler, are optimized with regards to temperature characteristics. Modifications could lead to higher or extreme temperatures in the exhaust system and surrounding components (drive shafts, fuel tank, floor panel, etc.). The following exhaust system versions are available from the factory as optional equipment:

DPF (Diesel Particulate Filter) temperature during regeneration:

- Surface heat measured before DPF: 450-550 °C [842-1022 °F]
- Surface heat measured at DPF: 350 °C [662 °F]
- Surface heat measured after DPF: 350-500 °C [662-932 °F]

The regeneration cannot be triggered manually by the end user and is done automatically during normal operation.
If a manual regeneration is required please see an authorized Sprinter dealers.

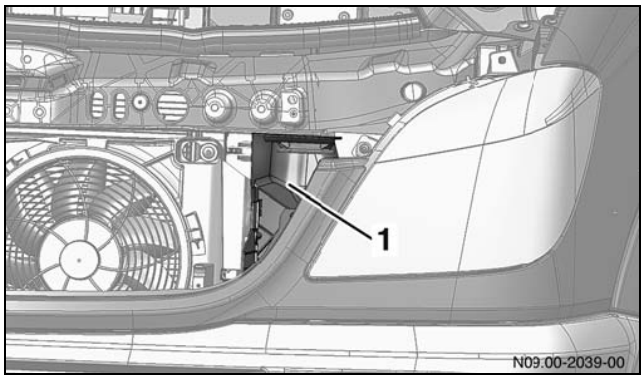
7.3.4. Engine cooling system

It is not permissible to modify the cooling system (radiator, radiator grille, air ducts, coolant circuit, etc.) because a sufficient flow of cooling air must be guaranteed. The complete cross-section of the cooling air intake surfaces must remain unobstructed. This means:

- at least 171 in^2 for the front grille (radiator and condenser)
- at least 109 in^2 for the opening in the bumper (charge air cooler flow)

Do not affix warning signs, labels or decorative objects in the area in front of the radiator. Provision for additional cooling equipment for assemblies shall be made for when the vehicle is stationary and if a high continuous output is demanded.

7.3.5. Engine air intake



Engine air intake opening

1 Area of engine air intake

Do not modify the area of engine air intake (See illustration).

The air cleaner is secured by two rubber mounted brackets in the front module.

The securing design of the air cleaner must be retained in the event of any modification to the front module.

Warm air

The intake of warm air will lead to a loss of engine power. A bulkhead between the intake point and the engine compartment is therefore essential. The intake temperature should not exceed the outside temperature by more than 10 °C [50 °F].

Water

- Water running down the body, spray water or water from washing the vehicle must not flow directly past the intake points.
- Make sure that water cannot reach the intake points through any fresh-air inlets.

The flow rate at the intake points must not be increased by modifications to the opening of the intake points.

Dust / dirt

- Increased dust intake will lead to shorter maintenance intervals for the air cleaner.

7.3.6. Clearance for assemblies

Adequate clearances must be maintained in order to ensure the function and operating safety of assemblies (particularly of electrical lines, brake lines and fuel lines).
The dimensional data in the 2D drawings must be observed.

The distance between the cab and the body must be at least 50mm [2 inches].

7.3.7. Engine speed regulation

The engine must run at a specific speed in order to drive auxiliary equipment (e.g. pumps, compressors, etc.).

The “constant engine speed” optional extra, option M53 and MT4 (variable), is available for diesel engines only. Further information can be obtained from SPRINTER ENGINEERING.

The speed is freely adjustable across a speed range from 900 to 3,800 rpm, independently of the load.

Constant engine is not suitable for driving a generator if a constant frequency is required, as in the 220-V electricity supply network.

Retrofit solutions for regulating the engine speed are only possible with the ‘Programmable Special Module’ (PSM) optional equipment (apart from those retrofit solutions available as optional equipment (OPTION M53).

7.4. Interior

7.4.1. General Information

The driver's and co-driver's airbag units, the window bags and thorax bags and the belt tensions are pyrotechnic components.

The purchase, transportation, storage, fitting, removal and disposal of potentially explosive substances may only be carried out by trained personnel and in accordance with the relevant safety regulations.

Modifications in the area of the dashboard and above the vehicle body waistline must comply with the head impact tests specified in CMVSS/FMVSS 201.

This applies in particular to the deployment areas of the airbags (wooden trim, additional fittings, mobile phone holders, bottle holders, etc.).

Paint or surface treatment is not permissible on the instrument panel, steering wheel impact absorber or air bag tear seams.

Warning

Do not paint or surface treatment on the instrument panel, steering wheel impact absorber or airbag tear seams. Otherwise, chemical reactions may occur on the treated surfaces. This could weaken or damage the materials, meaning that the restraint systems no longer operate properly.

See the illustrations of the airbag deployment areas for more information (→ chapter 7.4.2).

You will find information on RV conversions in the RV section (→ chapter 8.11).

The interior must be designated with soft edges and surfaces.

Fittings must be made of flame-resistant materials per FMVSS/CMVSS standards. Free access to the seats must be ensured. Avoid any protruding parts, edges or corners which could cause injury in the area of the seats.

Attachments with rigid connections to the front, side and rear of the vehicle at the height of possible accident zones could modify the characteristics of the vehicle's passive safety.

Warning

Do not modify airbag or the belt tensions system. Modifications to or work incorrectly carried out on a restraint system (seat belt and seat belt anchorages, belt tensions or airbag) or its wiring, could cause the restraint systems to stop functioning correctly, e.g. the airbags or belt tensions could be triggered inadvertently or could fail in accidents in which the deceleration force is sufficient to trigger the airbag and may lead to serious injury or death.

Warning

Reliable operation of the front airbag, window bag and thorax bag and belt tensions can no longer be guaranteed if modifications are made to the vehicle structure by the body builder, such as:

- Modifications to the seats and thus changes in the kinematics of the occupants in the event of an impact.
- Modifications to the frame front end
- Installation of parts in the vicinity of airbag inflation points or in airbag deployment areas
- Installation of non OEM seats
- Modifications to the A-pillar and B-pillar, the roof frame and its lining
- Modifications to the doors

This could otherwise result in serious injury or death.

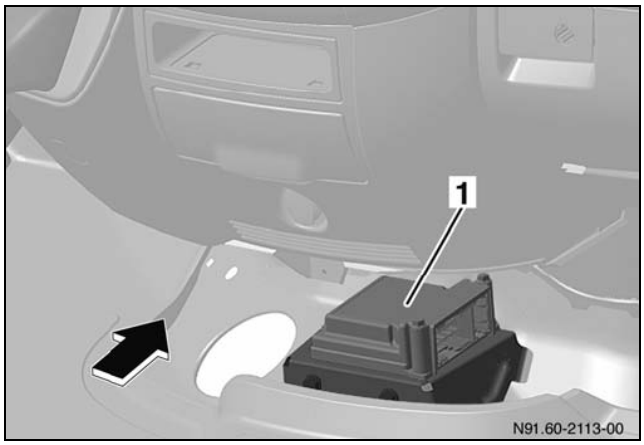
7.4.2. Safety equipment

Airbag control unit and sensors

Do not modify the installation location, installation position and attachment of occupant-safety airbag control units and satellite sensors by comparison with the standard vehicle on vehicles equipped with window bags and thorax bags. Never secure other vehicle components to the airbag control unit, the satellite sensors or the securing points.

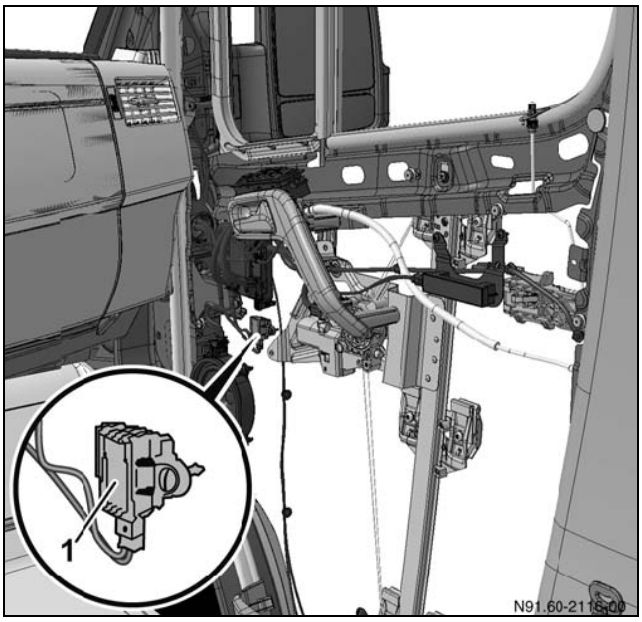
Warning

Never secure parts that create vibrations in the proximity of the airbag control unit or sensor installation locations and do not modify the floor structure in the proximity of the airbag control unit or the satellite sensors, otherwise operation of the front airbag, window bag ad thorax bag and belt tensions may be jeopardized and there is consequently a risk of serious injury or death. The airbag control unit is located on the transmission tunnel under the center console.

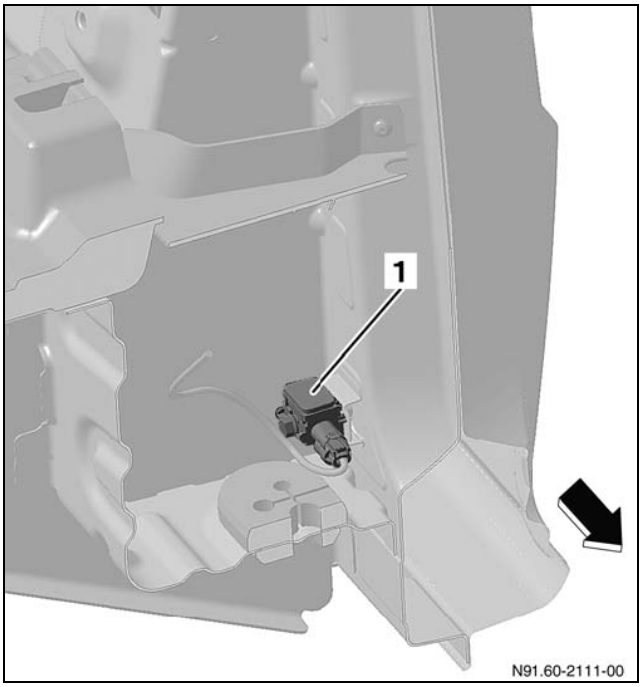


Location of airbag control unit
1 Airbag control unit
Arrow Front of vehicle

The satellite sensors are located towards the bottom of the B-pillar behind the entrance trim in the driver's and co-driver's doorway compartment. The additional pressure sensors for vehicles equipped with window bags and/or thorax bags are fitted inside the doors.



Front pressure sensor
1 Pressure sensor (trigger sensor of the occupant protection systems)



Sectional view of left-hand doorway area, B-pillar
1 Sensor (triggering sensor of the occupant protection systems)
Arrow Front of vehicle

Seat belts and belt pretensioner

Warning

Never damage or soil parts relevant to safety such as seat belts or belt anchorages and pretensioner when work is carried out on the vehicle. Otherwise, these restraint systems may no longer function properly and may not provide adequate protection in the event of an accident leading to serious injury or death.

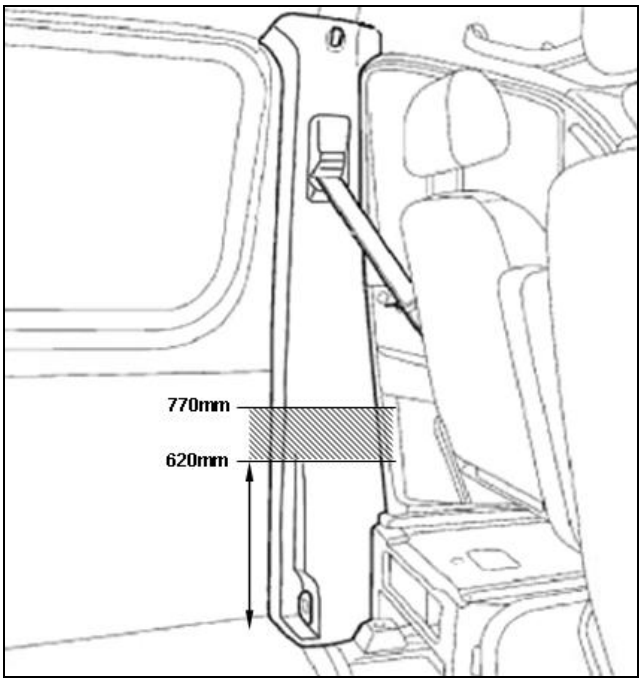
Use only the original seat belts otherwise the certification of the vehicle would be out of compliance. Seat belt anchorages must be tested in accordance with FMVSS/CMVSS standards.

All vehicles are equipped with pyrotechnic belt tensions in the retractors at the front seats. The retractors are located in the B-pillars. There is an additional retractor in the backrest of the bench seat on vehicles with two-seater co-driver's bench seat.

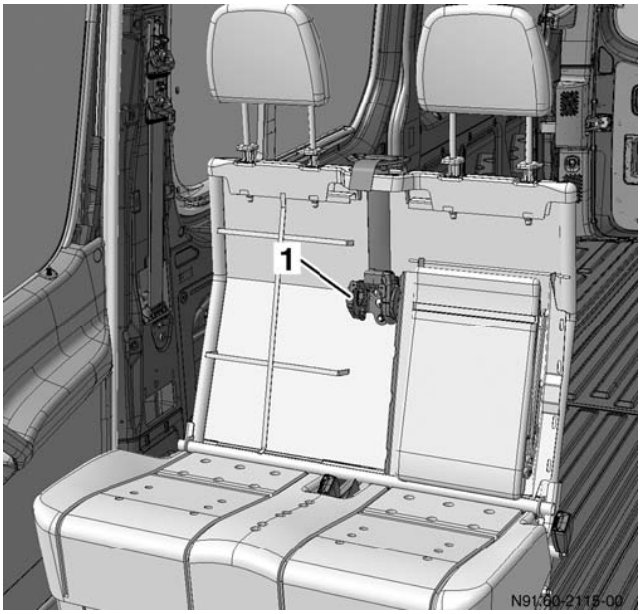
Retractor with pyrotechnic belt pretensioner
1 Connector

Warning

When installing aftermarket partition do not drill or attach any fasteners in the area around the seat belt retractor.



Location of seat belt retractor between 620-770mm [24.25 – 30.5 in] above floor.



Co-driver's bench seat with retractors
1 Retractor

The legal requirements detailed in this section relate to current legislation. The relevant FMVSS/CMVSS legislation must be observed.

Warning

Never retrofit or replace front bench seats with individual seats. Otherwise, the restraint systems may no longer function properly and may not provide adequate protection in the event of an accident leading to serious injury or death.

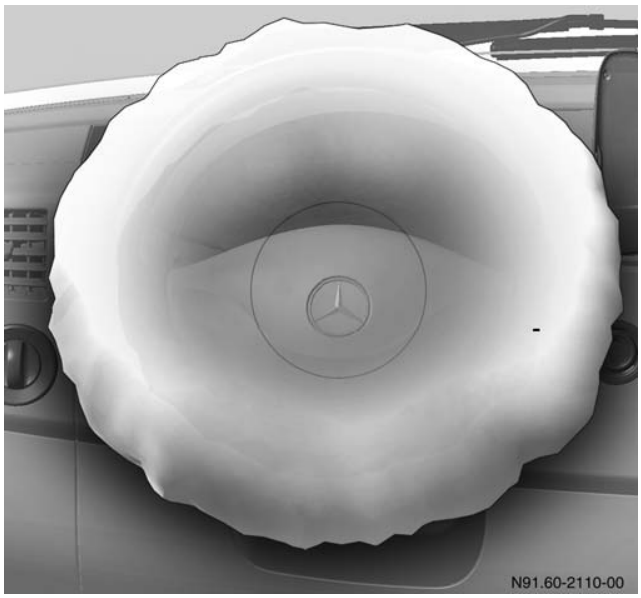
Front airbag

All airbag units are labeled “Airbag”

- The driver’s airbag unit is identified by the “Airbag” inscription on the steering wheel cover.
- The vehicle is equipped with a co-driver’s airbag. This unit is also identified by the “Airbag” inscription.
- If the vehicle is equipped with window bags, they are identified by the “Airbag” inscription on the cover
- If the vehicle is equipped with thorax bags, these are identified by the “SRS Airbag” inscription on the backrest.

Another identification feature is the red “SRS” indicator lamp in the instrument cluster.

The following illustrations show the location and deployment areas of the driver’s and co-driver’s airbags as well as that of window bag and thorax bag. The deployment areas shown are greater than the actual volume of the airbag because space is required for airbag rebound as it deploys.

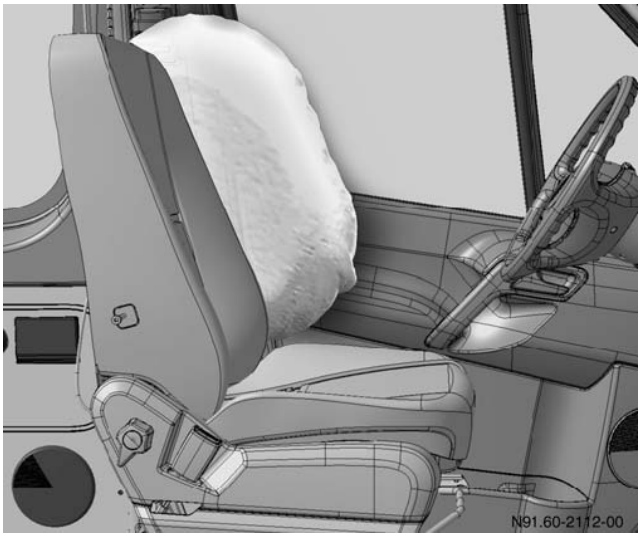


Deployment area of driver’s airbag

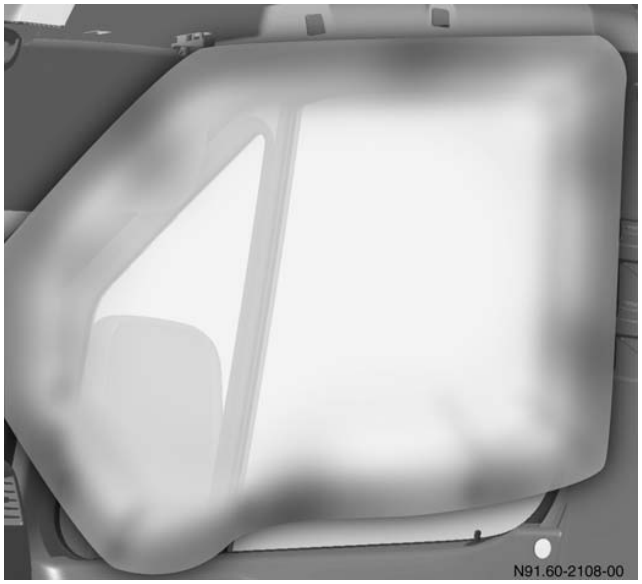
Deployment area of co-driver’s airbag

Side-impact airbags

Do not modify the B-pillar, door bodies, trim and seat upholstery.



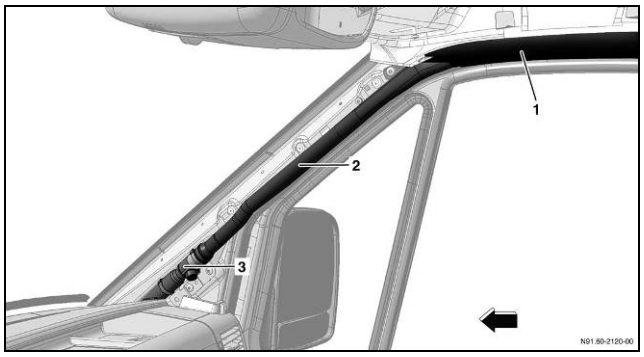
Deployment area of left-hand side thorax bag



Deployment area of right-hand window bag

Warning

Work on the A-pillar may cause damage to the window bag, which could cause the window bag to no longer function properly.



Window bag installation location

1 Cover
2 Window bag in protective sleeve
3 Gas generator in window bag
Arrow Front of vehicle

Working with airbag and belt pretensioner units

Warning

Removed airbag units must always be stored in such a way that the upholstered side faces upwards. If the upholstered side faces downwards, the airbag unit will be catapulted through the air if it is triggered accidentally and may lead to serious injury or death. The airbag units fitted to the SPRINTER include the driver's and co-driver's airbags as well as the optional window bag and thorax bag.

- Work involving removed airbag and belt pretensioner units, and testing and installation work, may only be carried out by trained personnel.
- The airbag and belt pretensioner units and the airbag control unit must be fitted without delay and immediately on removal from storage. The vehicle battery must have been disconnected, the negative pole or negative terminal covered and the test coupling/connection disconnected.
- If work is interrupted, the air bag and belt pretensioner units must be locked away again.
- The airbag and belt pretensioner units may not be treated with grease, cleaning agents or other similar products.
- The airbag and belt pretensioner units may not be exposed to temperatures above 100°C [212°F] even for a short period of time.

Airbags, belt pretensioner units, the sensors and control units, must be replaced if they are dropped from a height of more than 0.5 m [20 inches]. Airbag and belt pretensioner units may only be subjected to electrical tests using the specified testers when the airbag and pretensioner units have been fitted. We recommend that tests be carried out at an authorized SPRINTER Service Center.

Disconnect the main battery by disconnecting the negative terminal covered and the test coupling / connection disconnected before the airbag and belt pretensioner unit are removed.

Transporting and storing airbag units and belt pretensioner units

Internal transport should always be carried out using the spare parts packaging and utilizing the vehicle luggage compartment or load compartment.

Never transport airbag in the passenger compartment. The airbag units fitted to the SPRINTER include the driver's and co-driver's airbags as well as the optional window bag and thorax bag.

Warning

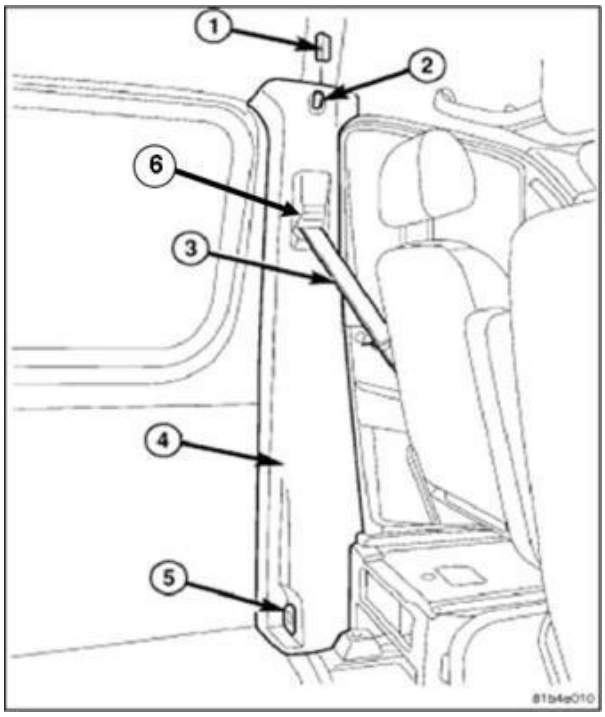
Airbag and belt pretensioner units must be disposed of by personnel who have undergone special training for this task. Accident prevention regulations must be observed otherwise it may lead to serious injury or death.

You will find information on retrofitting seats in the "Implementation of bodies" section.

Warning

On no account may seats be mounted on the wheel wells. Otherwise, in an accident the seats may become loose and may lead to serious injury or death.

7.4.3. B-Pillar cover removal & reinstallation



1. Trim coat hook
2. Coat hook
3. Seat belt
4. Trim B-pillar
5. Cargo tie down
6. Seat belt height adjustment mechanism

Removal of B-Pillar Cover

1. Pull coat hook trim 1 upwards and remove coat hook 2.
2. Remove the cargo tie down 5 or cover.
3. Remove the seat belt 3 from the seat (if needed).
4. Remove the assist handle covers and remove the screws (optional equipment). Remove the assist handle from the passenger side B-pillar.
5. Pull the trim 4 on the B-pillar out of clip connections starting at top and remove downward.
6. Remove the seat belt 3 from the trim 4 (if needed).

Reinstallation of B-Pillar Cover

1. Pull the seat belt through the B-pillar cover.

2. IMPORTANT: Slide adjustment part of B-pillar cover to top position before reinstallation. Insure that the seat belt height adjustment fits correctly into guide. Make sure that the door rubber seals are seated correctly.

Correct Alignment of B-Pillar Cover

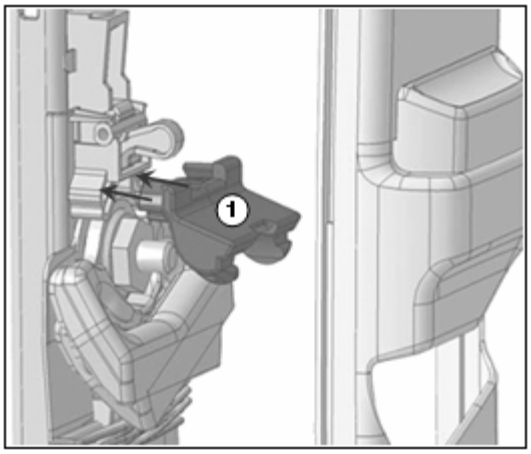
3. Install the trim onto B-pillar and seat clips starting from bottom moving upwards. Install the seat belt to the seat. Install the cargo tie down or cover. Torque cargo tie down with 18 Nm [13.3 ft-lbs]. Install the coat hook and seat trim fully. Bolt the end fitting to seat. Torque belt end with 37 Nm [27.3 ft-lbs].
4. Check seat belt and its height adjustment for proper functionality otherwise check step 2 again.

Note:
If entire seat was removed torque seat bolts (4x) with 37 Nm [27.3 ft-lbs].

Dampening Device on Height Adjustment (Partition Wall Only)

Sprinter Cargo Vans with partition walls (D50, D51, D53, D62 and D64) come with a 1 dampening device (left and right side) on top of the height adjustment mechanism. Make sure dampening device is fitted properly into height adjustment before reassembly.

Note:
Dampening devices are not used on Sprinter Chassis Cab and Passenger Vans.



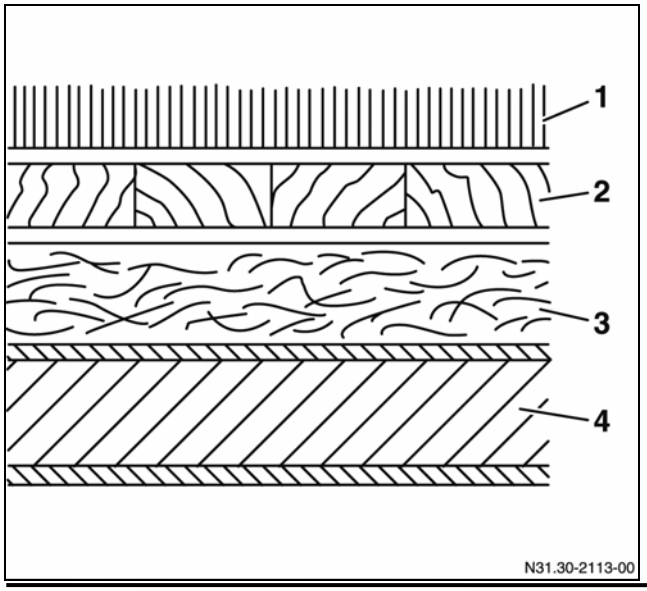
Dampening Device B-Pillar Cover Interior Exterior

7.4.4. Reducing noise in the vehicle interior

To reduce the noise level in the vehicle interior, flame retardant noise insulating materials may be installed.

Floor area

A structure as shown in the illustration is recommended for insulation and soundproofing. An additional covering with heavy-duty insulating foil may be provided in the area of the wheel wells. Insulating foils, e.g. bituminous felt, have limited temperature resistance. They should therefore not be installed in the immediate vicinity of the engine or exhaust system.



1 Carpet (bonded underside)
2 Wooden floor (12mm - .5in plywood)
3 Heavy-duty insulation material (8 to 10kg/m^2 / 1.6 to 2lbs/ft^2)
4 Supporting construction

Roof and side panels

Rock wool, glass wool, fibrous web or soft, open pore PE or PU – based foam are effective insulation materials. The inside must be covered with a sound-transmitting material (perforated card, plastic, fabric cover).

Warning

Do not modify the roof lining or the roof skin between the A-pillar and the B-pillar if the vehicle is equipped with window bags. Otherwise, the window bag may no longer work correctly (e.g. window bag deployment is delayed or incomplete). In case of an accident it may lead to severe injury or death.

Seals

Openings, gaps and slots between the engine compartment, the underside of the vehicle, the front bulkhead and the vehicle interior must be carefully sealed with anti-corrosion protection or a permanently elastic material following treatment. Air vents must not be fitted in the immediate vicinity of sources of noise or exhaust fumes.

In addition, manufacturers or suppliers of sound proofing materials should be consulted.

They will be able to provide you with suggestions on how to design optimum noise insulation for your particular body.

7.4.5. Ventilation

The passenger compartment and the driver's seat must have adequate ventilation with provision for air to enter and exit.

The windscreen and side window demisting function must remain operational, especially if the driver's area forms part of the passenger compartment or if the layout and design of the interior does not correspond to that of the standard equipment.

New vehicles can be supplied from the factory with the optional equipment "Controlled air conditioning/in addition in rear compartment" under options H08.

When retrofitting assemblies, please refer to the "additional Equipment" section (→ chapter 7.5).

7.5. Additional equipment

If additional equipment is fitted, factory-fitted power take-offs must be used.

7.5.1. Retrofitting an air-conditioning system

All electrical equipment fitted must be tested in accordance with FMVSS/CMVSS standards.

When retrofitting air-conditioning systems, we recommended the “Rear-compartment air-conditioning system” option H08 which can be obtained from the factory as optional equipment.

The requirements of the equipment manufacturer must be observed if you intend to retrofit any other air-conditioning system. The following points must be observed to ensure compatibility with the basic vehicle:

- Do not tie in the OEM A/C system
- On no account should the installation of an air-conditioning system impair vehicle parts or their function.
- The battery must have sufficient capacity and the alternator must generate sufficient power.
- Additional fuse protections for the air-conditioning power circuit
- Air-conditioning compressors must be attached using the equipment carrier provided.
- The additional equipment for driving air-conditioning compressors is available from the factory as optional equipment under Option N63 (maximum output 8kW).
  Ensure that wires and electrical lines (→ chapter 7.3.5) are routed correctly.
- There should be no impairment of the accessibility or easy maintenance of installed equipment.
- The operating instructions and the maintenance manual for the additional equipment must be supplied on handing over the vehicle.
  There should be no impairment of the required engine air supply and cooling (→ chapter 7.3.3)

7.5.2. Auxiliary heating

The floor of the vehicle must be air-tight if exhaust gases are routed out under the vehicle. Openings in the vehicle floor provided for control elements must be sealed with rubber sleeves. The following auxiliary heating system is available from the factory as optional equipment:

Description	Option
auxiliary heater front	H12
auxiliary heater rear	H13

More information is contained in the Special Equipment Book from your authorized SPRINTER dealer.

7.5.3. Power take-offs

General

Engine power take-off at front of engine only.

Power take-off versions available from the factory. These power take-offs can be obtained from the factory as optional equipment.

The following codes are available for power take-offs:

Code N62	Additional alternator
Code N63	Refrigerant compressor

These power take-offs can be obtained from the factory as optional equipment.

The maximum power output is:

Code N62	8.5 kW (11.4 hp)
Code N63	8.0 kW (10.7 hp)

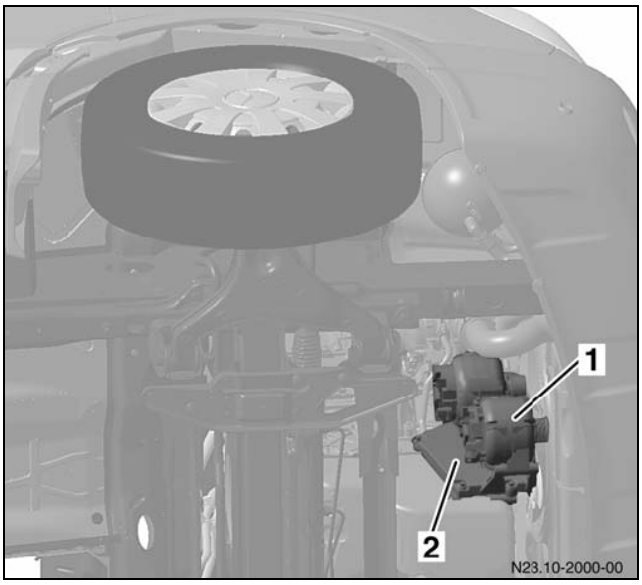
The additional pulley is located in the second belt plane (belt width 12.7mm, effective diameter 128.2mm).

Code N62	Poly-V-belt pulley, 50 mm external diameter, 6 grooves
Code N63	Poly-V-belt pulley, 120 mm external diameter, 6 grooves.

We recommend using the following genuine DG SPRINTER belts

For option:	MB part #
Code N62	A001 993 47 96
Code N63	A001 993 37 96

Additional equipment can be mounted on an equipment carrier fixed to the engine.



Additional equipment on engine-resident equipment carriers

1 Additional equipment
2 Equipment carrier

Maximum weight of additional equipment

Code N62	7.3 kg (16.1 lbs)
Code N63	6.5 kg (14.3 lbs)

7.6. Attachments

Make sure that you adhere to the permissible axle loads in all cases.

Attachments must not impair the function of vehicle parts.

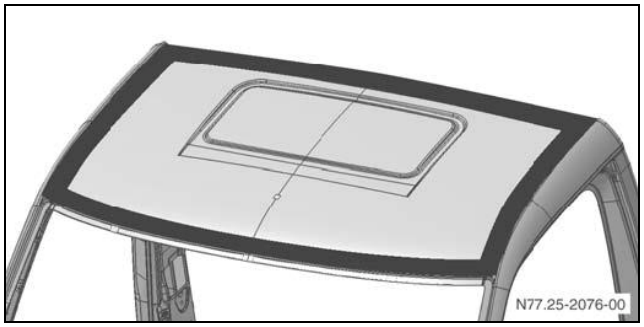
Comply with all applicable FMVSS/CMVSS requirements. Do not attach a winch to the front section of the frame.

Winches behind the cab

If winches are attached behind the cab, they must be mounted on a mounting frame of sufficient size and strength.

7.6.1. Wind deflectors

Wind deflectors may only be fitted onto the cab roof by applying high-strength adhesive to the whole area around the lateral roof frame, the front roof frame and the first roof arch (level with the B-pillar). The load applied by air resistance and contact pressure must be taken into consideration. The deflectors must only be fitted in such a way that the basic vehicle is not damaged.



Adhesive for fitting wind deflectors should be applied in the area shown

No further holes should be drilled in the cab roof for fixing additional attachments.

If other roof attachments are fitted, please consult with SPRINTER ENGINEERING.

7.6.2. Attachment above cab

- The permissible center of gravity location and the front axle load must be observed (→ chapter 4).
- The attachment to the roof must be designed as described in the “Bodyshell” section (panel van roof) (→ chapter 7.2).

7.6.3. Roof racks

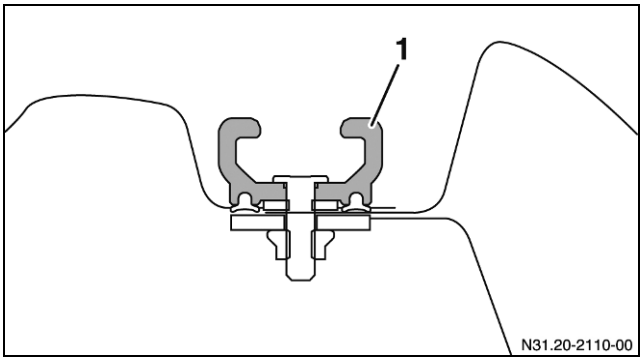
SPRINTER – Cargo vans and Passenger vans:

- Make sure that the load is distributed evenly across the entire roof area
- We recommend the use of an anti-roll bar at the front axle
- Support feet must be spaced at regular intervals. 110 lbs per pair of feet and strut is recommended as a basic rule.
- With shorter roof racks, the load must be reduced proportionally.

Roof rack limiting values (laden)

Maximum roof loads	
Cargo Van kg / [lbs]	High Roof Cargo Van kg / [lbs]
300 / 660	150 / 330

To make it possible to fit roof racks, the SPRINTER must be equipped with C-rails (Option D13, for Cargo Vans only). C-rails can be retrofitted.



Roof rack mounting
1 C-rail (roof rack)

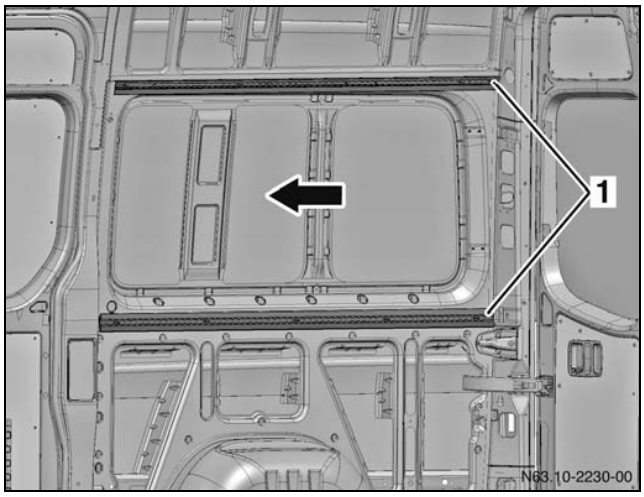
7.6.4. Fitted shelving/installations

Fitted shelving must:

- be sufficient strong and self-supporting
- rest on the cross and longitudinal members of the vehicle floor
- distribute forces evenly
- it is preferable to make attachments at the points of the load rails and lashing eyelets.

Do not transfer loads only to the vehicle side walls. For a favorable force transfer, we recommend the use of load rails available as optional equipment or their entire contact area in the body shell:

	Max rated tensile force
Code VC4 on roof frame	150 daN [33 lbf]
Code V42 on waist rail	250 daN [56 lbf]

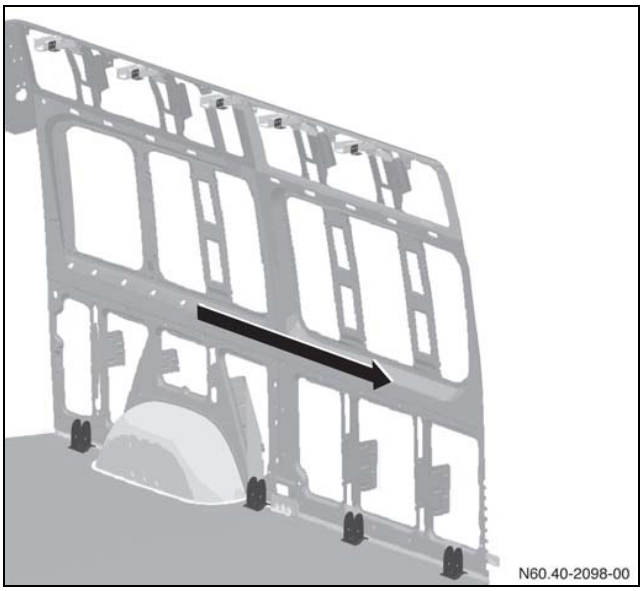


Load rails in the panel van
1 Load rails
Arrow Front of vehicle

For further information about the side wall
(→ chapter 7.2.5)

Fittings for fitted shelving

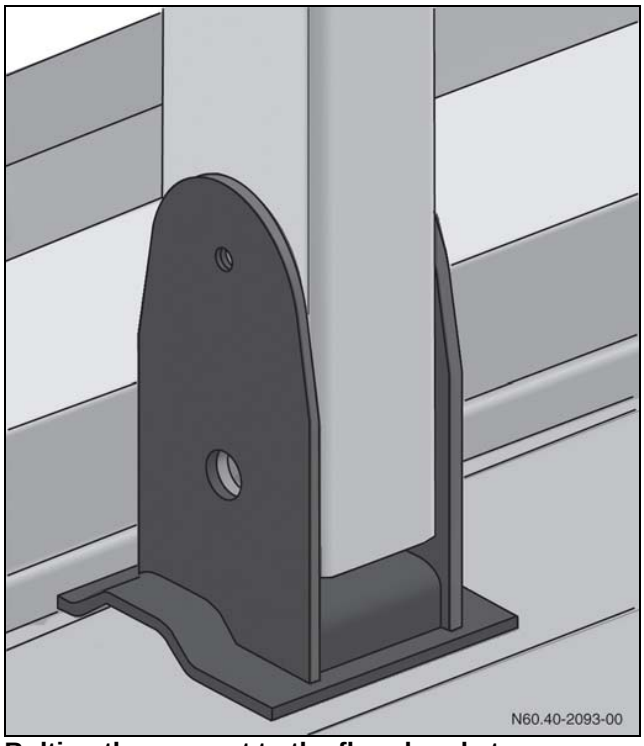
Code ZE6 “Shelving Prep” is available from the factory to facilitate the retrofitting of shelves. The package includes angles attached to the roof arches and body support brackets mounted on the floor.



ZE6 package contents in shaded areas
Arrow front of vehicle

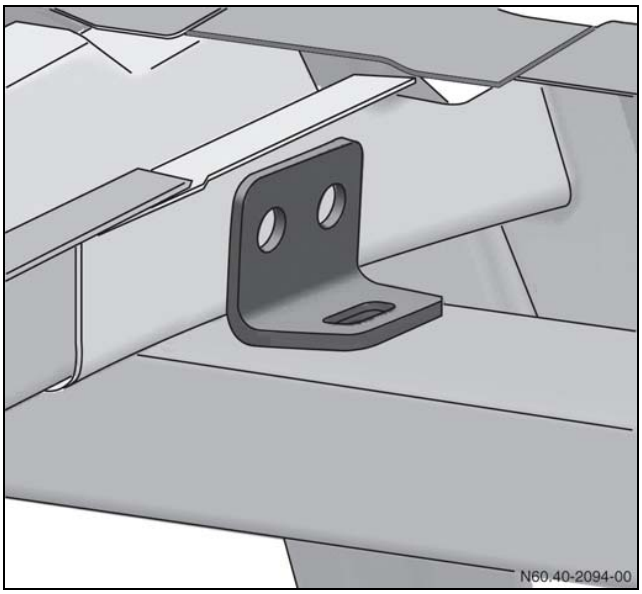
The following must be observed when using the shelf fittings:

- Shelves must not be wider than 450 mm [17.5inch]
- The max load-bearing capacity is 80 kg/m [50 lbs/ft]
- The shelf support must be made of steel with a minimum cross section of 60x40x3mm [2.25”x1.5”x1/8”] (length x width x thickness).
- The shelf supports are bolted to the floor bracket.

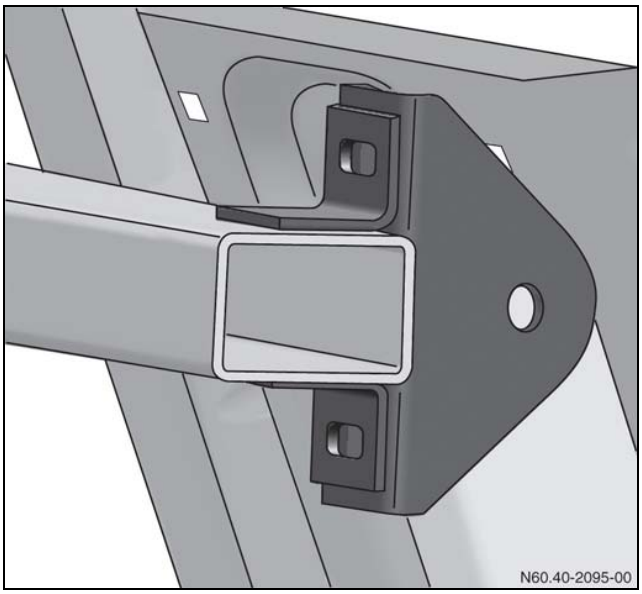


Bolting the support to the floor bracket

- To fix the wooden floor, 2 angles per support must be mounted at the bolt connection between the support and the bracket (contact surface per angle at least 1,200mm^2 [186 in^2], dimension 60mm x 20mm [2.5in x 0.8in])
- A steel tube with a rectangular profile measuring 60mm x 40mm x 3mm [2.25”x1.5”x1/8”] is bolted onto the brackets on the roof arches. The shelf supports are bolted to the rectangular profile at the top.

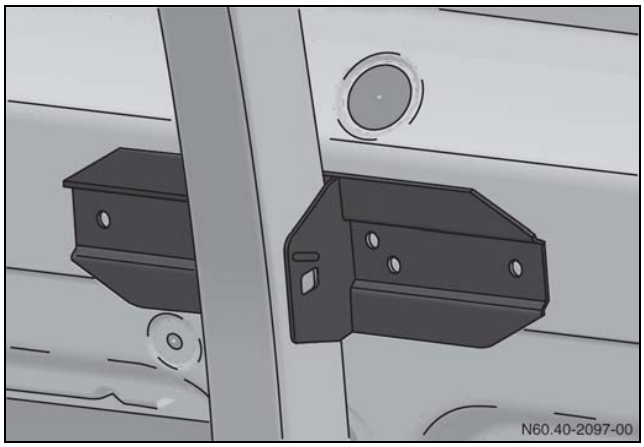


Bolting the longitudinal tube to the roof arch



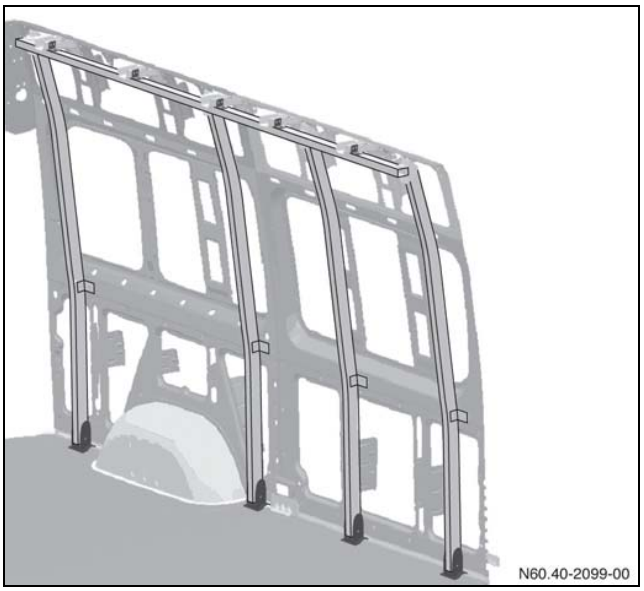
Connecting the longitudinal tube to the support

- The longitudinal tube must not be connected with the partition or the rear door.

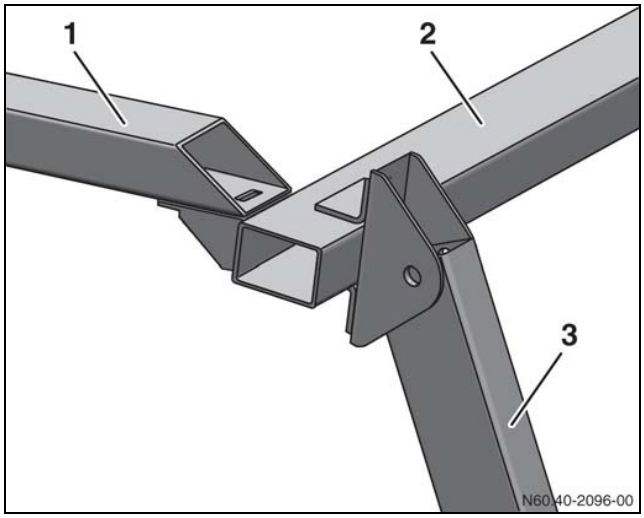


Suggestion for bracket on waist rail

In addition to fixing the self support to the floor and to the roof arches, it is necessary to fix them to the waist rail using a bracket. The connection must be made by bonding and riveting. A minimum bonding surface of 7,000 mm^2 [10.0 in^2] is required.



Suggested attachment with ZE6



Additional connecting of the longitudinal tubes

1 connecting rail
2 longitudinal tube
3 support

if the first or last support is more than 300mm [12 in] away from each roof arch, the longitudinal tubes must be connected together.

7.6.5. Loading cranes

The size of the crane must be selected in accordance with the chassis size.
Loading cranes must be secured on a mounting frame to relieve the load on the frame (→ chapter 8.1) The permissible axle loads must be verified by calculating a weight balance.
The vehicle's stability must be ensured by the body builder. The slewing range of the crane must be limited accordingly.
Loading cranes mounted on vehicles must comply with all applicable accident prevention regulations.

Comply with all legal requirements.

The mounting instructions of the crane manufacturer must be observed.

If additional platform or tipper bodies are mounted, the dimensions of the longitudinal mounting frame member must be taken from the table for platform bodies (→ chapter 8.5) or tipper bodies.

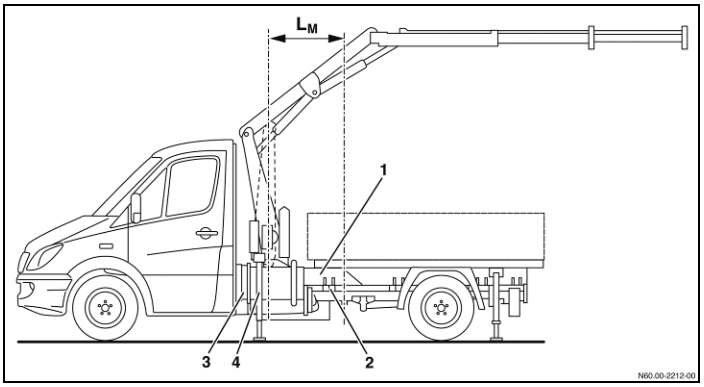
Outriggers must be provided for every loading crane. We recommend using hydraulic supports. The vehicle must not be raised using the outriggers, as this would damage the frame

Loading cranes behind the cab

Loading cranes and outriggers must not impair the function of other equipment.

Mounting frame

- Maximum crane load moment (kN x l) / 25 kNm
- Moment of resistance (Wx) for longitudinal mounting frame members: 45cm^3 / [2.75 in^3]
- Section dimensions of mounting frame longitudinal members (→ chapter 7.2).
- While the crane is in operation, vehicle stability must be ensured by extending outriggers.
- Outriggers extending beyond the vehicle when stationary must be made easily distinguishable by conspicuous colors, reflectors and warning lights.
- The platform length depends on the position and weight of the loading crane and must take into consideration the permissible axle loads.
- The vehicle may only be used on flat, paved roads.
- Due to the vehicle's load distribution, a frame extension may be required.
- If a stronger mounting frame is required than for the body when a loading crane is mounted behind the cab, the loading crane can be secured on a shorter mounting frame (see illustration below). The short chamfered mounting frame must have a length of L_M>35% of the wheel base.
- This attachment required approval from SPRINTER ENGINEERING.



Loading crane

1	Loading crane mounting frame
2	Body support brackets
3	Loading crane attachment
4	Outrigger
L_M	Length of loading crane mounting frame

Loading crane mounted at end of frame

Warning

The minimum front axle load (→ chapter 4) must be complied with in all load states. Otherwise, adequate driving stability is no longer guaranteed.

- Loading cranes must be secured to a mounting frame made of steel
- Maximum crane load moment (kN x l):25 kNm 18,439ftlbs
- Moment of resistance (W_x) for longitudinal mounting frame members: 45 cm^3 [2.75 in^3]
- Section dimensions of mounting frame longitudinal members (→ chapter 7.2).
- While the crane is in operation, vehicle stability must be ensured by using extending outriggers.

7.6.6. Loading tailgate (lifting platform)

Please consult SPRINTER ENGINEERING if you intend to retrofit a lifting platform to SPRINTER models. If a lifting platform is being fitted, observe the following:

An auxiliary battery (Option E28) must be fitted if an electro-hydraulic lifting platform is fitted. The deep discharge battery with higher capacity (Option ED4) is highly recommended.

- Lifting platforms must comply with all applicable legal requirements
- The permissible rear axle load must not be exceeded
- The minimum front axle load must be complied with in all load states.
- Vehicle stability must be ensured by the body builder in all operating states.
- Calculate the vehicle's load distribution. This calculation must take all special equipment into consideration.
- If necessary, shorten the body length and the rear chassis overhang accordingly (Chassis Cab series).
- We recommend the use of only hydraulic supports.
- Maximum load distance 600mm [24 inches] relative to the standard rear portal / standard rear cross member.
- Vehicle stability when loading and unloading the vehicle must be ensured by the user.
- The maximum lifting force must not be exceeded.

Lifting platform attachment

The attachment of a lifting platform must be desiged as described in the "Attachment to the rear frame section" (→ chapter 7.2.2).

Additional torque support must be provided by means of at least two bolted connections fitted with spacer bushings (e.g. on the mounting frame).

- Extend the mounting frame as far forwards as possible and attach it with a non-positive connection to the chassis frame.
- No mounting frame is required on vehicles with a standard Cargo van body.

If modifications are required to the under ride guard due to the attachment of a lifting platform, the strength and bending strength of the under ride guard must not be changed. The vehicle must not be raised using the outriggers, as this would damage the frame.

Model	Wheel base [in]	Maximum lifting force (kN)/[lbs]		Minimum dimension of mounting frame longitudinal member (mm)/[in]
		Chassis Cab	Cargo	
SPRINTER 2500 8550 GVWR	144	-	5 / [1124]	80x45x3 / [3.1 x 1.8 x 1/8]
	170	-	5 / [1124]	80x45x3 / [3.1 x 1.8 x 1/8]
	144	-	5 / [1124]	80x45x3 / [3.1 x 1.8 x 1/8]
	170	-	5 / [1124]	80x45x3 / [3.1x 1.8 x 1/8]
SPRINTER 3500 9990 & 11030 GVWR	144	10 / [2248]	5 / [1124]	120x50x4 / [4.75 x 2 x 5/32]
	170	10 / [2248]	5 / [1124]	120x50x4 / [4.75 x 2 x 5/32]

7.6.7. Trailer hitch

- We recommend the use of trailer hitches that have been approved by MB and attached to the special mounting points on the body shell (rear longitudinal member)
- Access to the spare wheel must be guaranteed if a trailer hitch with non-detachable ball neck is fitted (especially with a fully laden vehicle).
- Fitting the trailer hitch must comply with all applicable regulations.

Never attach a trailer hitch to the end cross member of the frame.

Information is available from your authorized SPRINTER dealer.

Clearance dimensions, trailer hitch

The height of the trailer hitch above the ground must be between 300mm [11.75 in] and 450mm [18 in] when the vehicle is laden to the permissible gross vehicle weight.

The reliable operation of the hitch must not be impaired.

Do not install an open-jaw hitch fitted to the front of the vehicle.

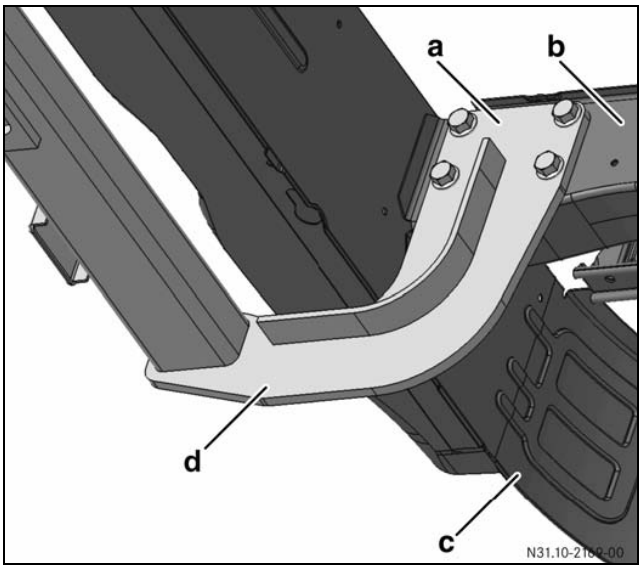
The specified clearances must be maintained.

Warning

If the towing vehicle is unladen, only an unladen trailer may be towed. If the trailer hitches have removable ball hitches, the operating instructions must be supplied in the vehicle and they must refer to the special features and operation of the hitch.

Attachment of the trailer hitch

Only secure trailer hitches and mounting plates to the special mounting points on the body shell (rear longitudinal member). In addition, Cargo vans require an additional attachment as support on the rear cross member of the vehicle frame.



Inside view

a Attachment of mounting plate to the longitudinal frame member
b Lower chord of the longitudinal frame member
c End frame cross member
d Mounting plate for the trailer hitch

If the frame needs extending, spacer bushings must be fitted to the frame to attach the mounting plate or the rear cross member. They may lead to a reduction in the towing weight or the tongue weight.

You will find whole patterns with dimensions for securing the trailer hitch in the “Technical details” section.

Depending on the model series, the following optional equipment is available as an option from the factory to retrofit trailer hitches:

Chassis Cab

Option	Description
V08	Complete trailer tow group
E58	Complete trailer hitch wiring with 7 pin connector included at rear cross member

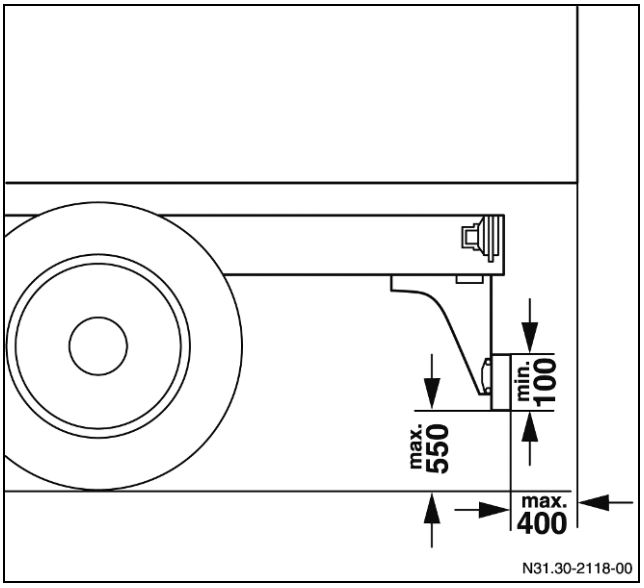
Cargo / Passenger Van

Option	Description
V08	Complete trailer tow group

Note:
Option V08 can not be ordered with rear step bumper W73.

7.6.8. Underride guard

If an under ride guard is required, it must comply with applicable legal requirements and its design drawings submitted by the body builder. The under ride guard must be mounted as far back as possible.



Side view Dimensions

- Maximum height of under ride guard (unladen vehicle) above road surface: 550mm [22 in]
- Width:
  - Maximum = width of rear axle (outer tire edge)
  - Minimum = width of rear axle less 100mm [4 in] on each side. The decisive factor is the widest axle
- The cross member must have a section height of at least 4 in.
- Edge radius at least 2.5mm [0.1 in].

Modification to the underride guard

If the under ride guard needs to be repositioned due to the overhang extension, the attachment must be the same as that of the original vehicle. If modifications are required to the under ride guard (e.g. due to the attachment of a lifting platform), the strength and bending strength of the under ride guard must not be modified. Any modifications to the under ride guard must comply with all applicable regulations.

8. Design of bodies

This section contains information concerning the body to be produced by the body manufacturer.

8.1. Mounting frame

All bodies require a mounting frame or a substructure that assumes the function of a mounting frame to ensure a reliable connection between the chassis and the body (except for self-supporting bodies and mounting frames acting as floor assemblies)

Attachment to the frame must run along the frame using the body support brackets attached to the frame at the factory (→ chapter 8.1.4).

Note:
All available body mounts and there attachment points must be used.

8.1.1. Material quality

Required moment of resistance[1] of mounting frame:	
Up to maximum standard Wheelbase	30 cm^3 / 1.8 in^3
Over maximum standard Wheelbase	> 34.5 cm^3 / 2.1 in^3

[1] Each individual mounting frame longitudinal member must have the moment of resistance specified here.

Material quality of specified mounting frame made of steel:

- Mounting frame with bracket mounting (non-positive) = H240LA or S235JRG2

- For H240LA or S235JRG2 steels complying with the DIN EN standard, analogous materials complying with the US SAE/ASTMJ403/J412/J413 standards.

Material quality of specified frame made of steel	
Material	Tensile Strength (N/mm^2) Yield Strength (N/mm^2)
H240LA (DIN EN 10268-1.0480)	350-45 260-340
S235JRG2 (DIN EN 10025-1.0038)	340-510 >235

- If high-strength steel is used for the mounting frames, their strength must be at least equivalent to steel mounting frames
- If aluminum mounting frames are used, their strength must be equivalent to steel mounting frames. Observe the specifications of the aluminum manufacturer.

8.1.2. Design

General
The mounting frame cross members must be located above the chassis frame cross members.

The mounting frame longitudinal members must extend as far towards the front of the vehicle as possible, to reinforce the point behind the cab which is critical with regard to bending stress, as well as to prevent vibration problems.

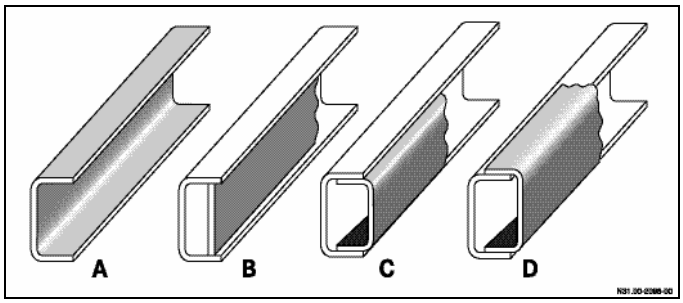
The body must have a torsion-free attachment to the body support brackets on the longitudinal frame member.

Place the vehicle on a flat, horizontal surface before mounting the body.

If very high longitudinal members are required or if the height of the frame needs to be small, the U-section can be designed as follows if the connections are non-positive:

- closed off like a box
- nested (inside overlapping U-section), or
- nested with an overlapping U-section

This increases the moment of resistance and torsional stability



Frame profile

A Open U-section
B Closed U-section
C Inside overlapping U-section
D Overlapping U-section

Mounting frame with offset frame

On vehicles with a pinched frame (permissible gross vehicle weight 11,030 lbs), the longitudinal mounting frame members can run continuously in a straight line.

8.1.3. Section dimensions / dimensioning

For the longitudinal members, use flanged U-sections or commercially available U-sections for vehicle design (not rolled steel sections). Box sections are also permitted as longitudinal member section.

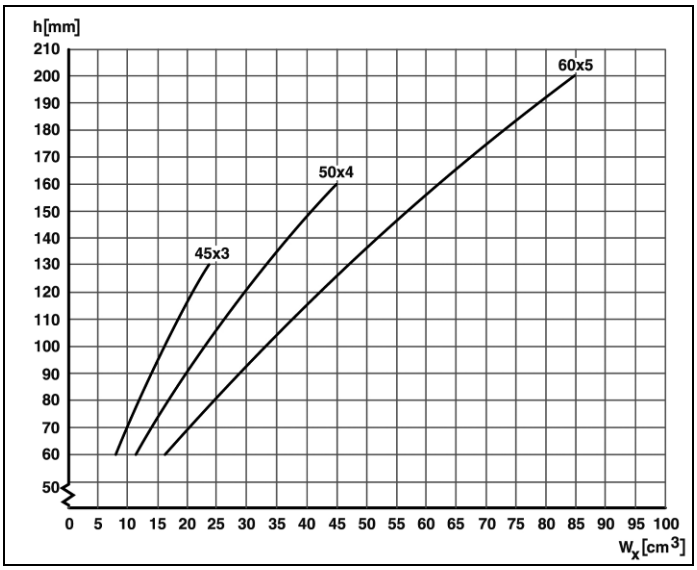
The dimensions of the longitudinal members are a function of the moment of resistance (W_x) required for the body and the chassis.

If more than one body is mounted on the same chassis (e.g. platform and lifting platform), the larger of the specified moments of resistance must be taken to determine the mounting frame.

The specified moments of resistance and section dimensions refer to longitudinal frame members subjected to identical loads on both sides.

Please refer to the table below for the section dimensions of mounting frame longitudinal members (open section).

The mounting frame and the chassis frame should have approximately the same flange with.



Longitudinal member dimensioning

h: Section height in mm
W_x: Moment of resistance in cm^3

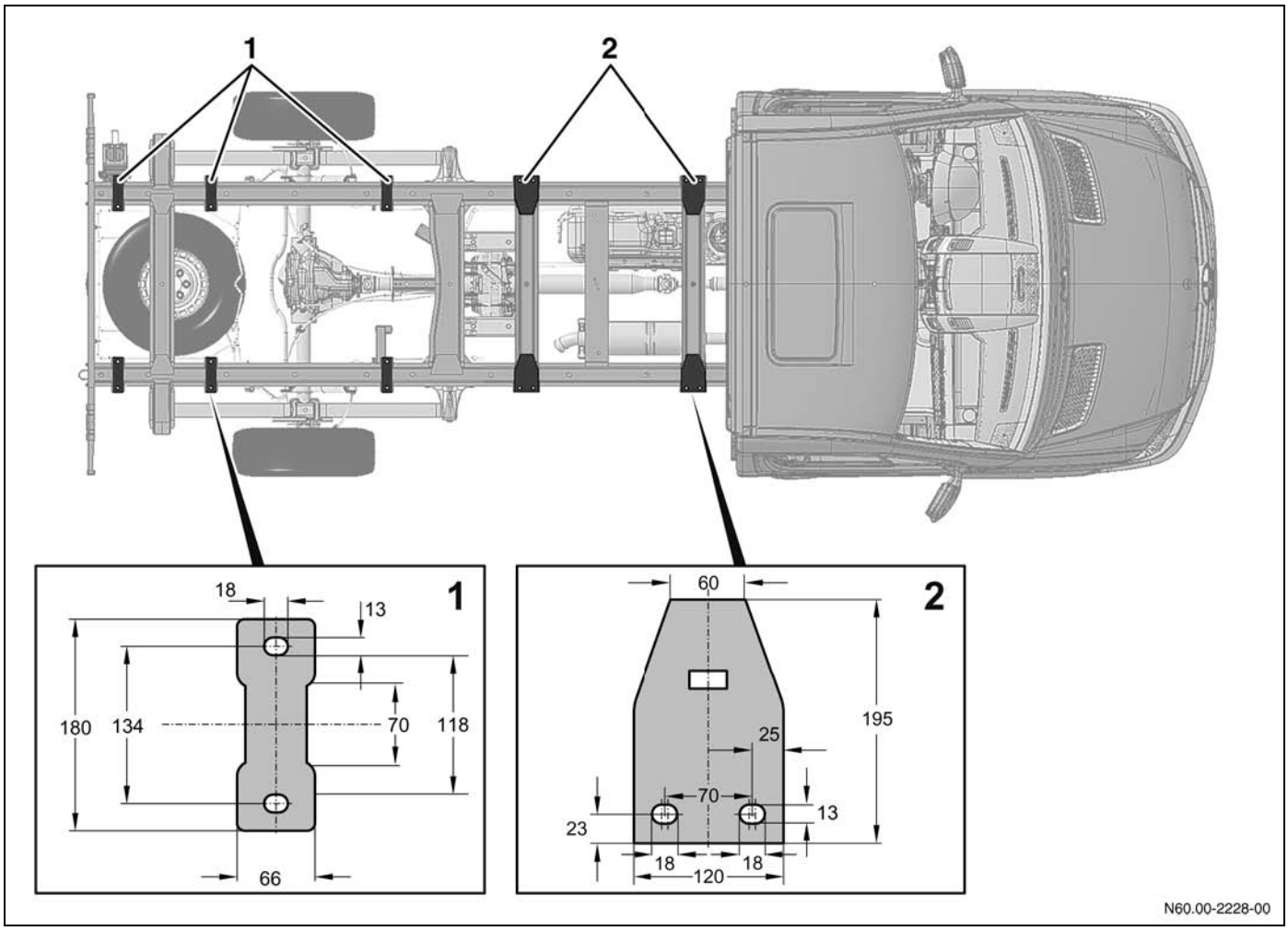
8.1.4. Attachment to the frame

All body support brackets fitted at the factory must be used for attaching bodies to the vehicle frame. The brackets are located on the longitudinal frame members.

The minimum distance between the body and the cab must be >50mm [2 inches]. Single rear wheel SPRINTER Chassis Cab are not available in the U.S or Canada and is for illustration purposes only.

If prefabricated mounting frames are used, the production tolerances of the chassis frame with (maximum +6/-3mm) [+0.24/-0.12 in] must be taken into consideration.

The positions for the body support brackets are indicated in the 2D drawings depending on the model series.



Types of frame fastening points (mm)

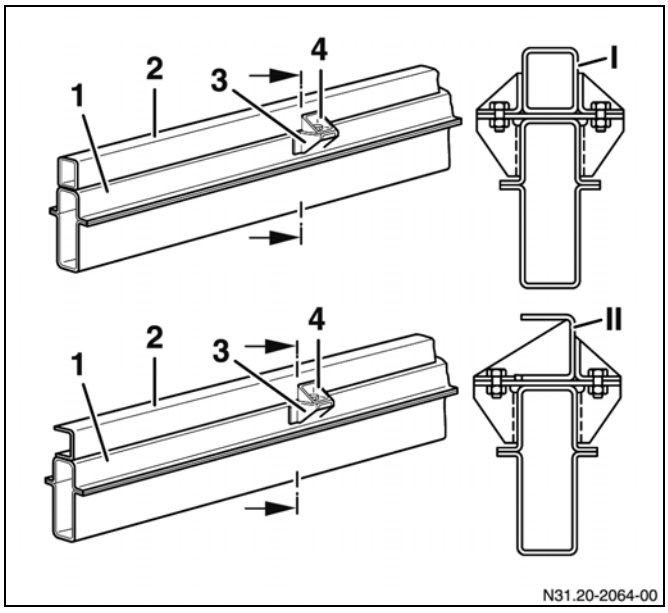
Note:
All available body mounts and there attachment points must be used.

Additional body support brackets

If it is necessary to fit additional body support brackets, contact SPRINTER ENGINEERING for directives
(→ chapter 2.7).

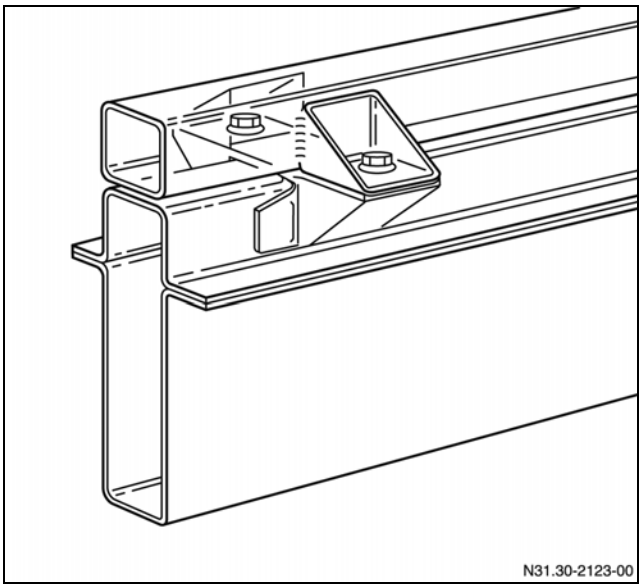
The body support brackets must be attached using two bolts for each body support bracket.

Attachment of the body support brackets

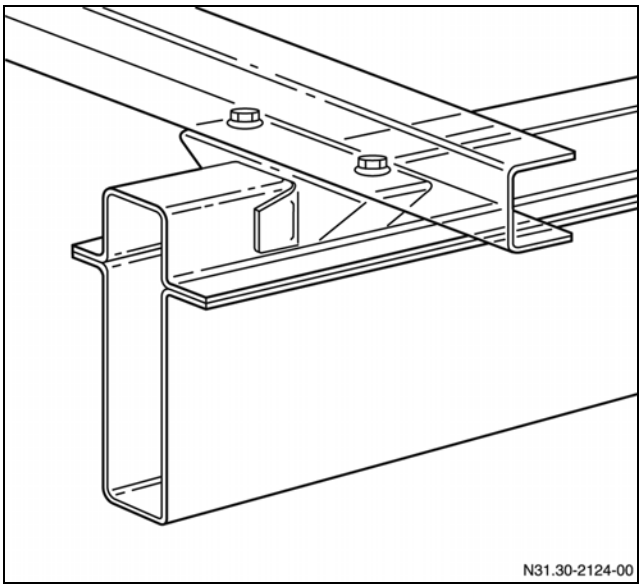


Example of a body bracket design

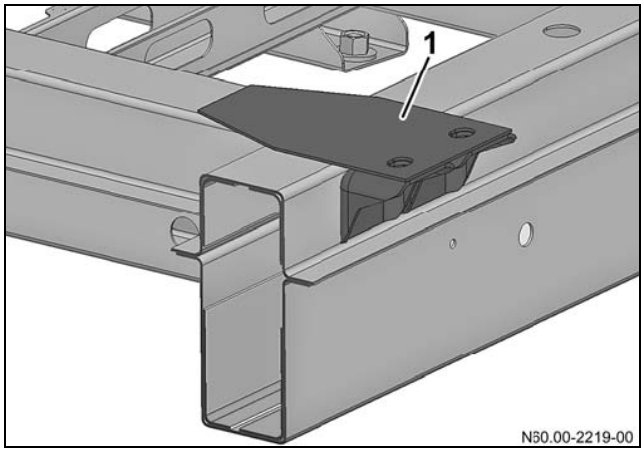
I Box section
II U-section
1 Chassis frame
2 Mounting frame
3 Standard mounting bracket
4 Bracket



Attachment to a longitudinal member



Attachment to a cross member



Body bracket with external bolted connection

1 Body bracket

Select the number of attachments to ensure sufficient transfer of all longitudinal and lateral forces.

Correct attachment is a decisive factor for:
- vehicle handling and operating safety
- the service life of the chassis frame and the body

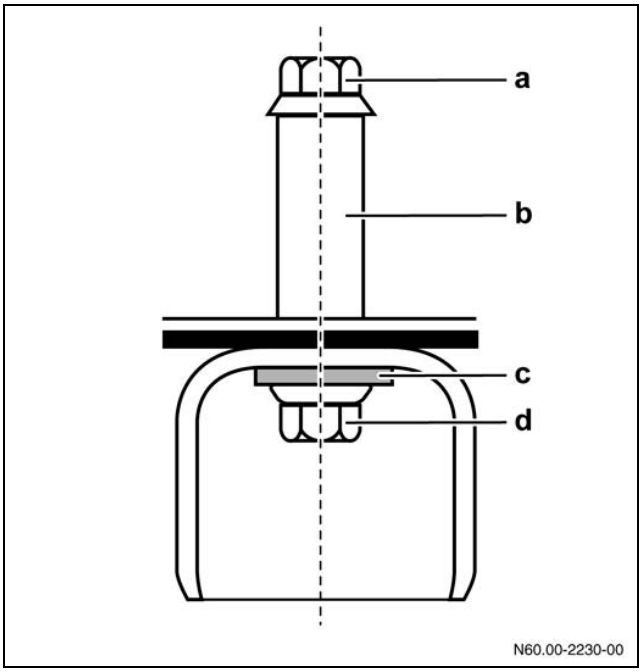
Rigid attachment

If the attachment is rigid, the mounting frame longitudinal member must be secured in both longitudinal and transverse directions. This will allow movement of the longitudinal mounting frame member only under specific conditions.

With rigid connections, a double support is required for each longitudinal frame member as depicted in the figure below.

Elastic connection

On rigid bodies (e.g. stiff cargo box, cargo box with cargo lift, refrigeration body etc.), bolted connections locked to prevent loosening and spacer sleeves must be provided at the first and second body brackets. The dimensions of the spacer sleeves must be adequate to ensure that they cannot deform.

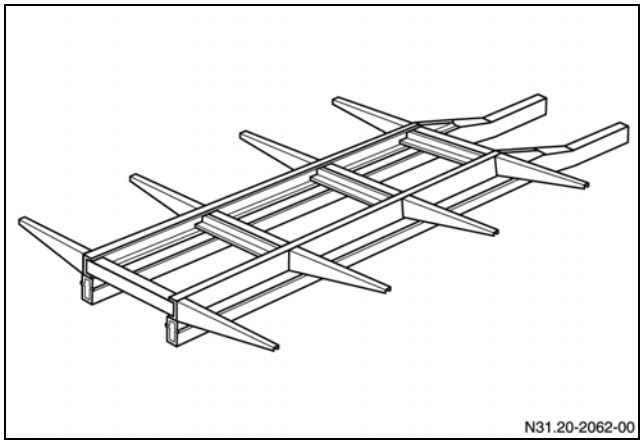


Suggested method for producing a bolted connection, locked to prevent loosing

a bolt with flange M12 x 90, strength Grade A
b spacer sleeve 22-13 x 50
c washer
d Nut with flange M12, strength Grade A

8.1.5. Mounting frame as floor assembly

A mounting frame with continuous longitudinal members is not required if the body floor assembly can assume the mounting frame function. The longitudinal members can also be integrated in the body. If the mounting frame longitudinal members are intersected by the cross members, the connection between the longitudinal and cross members must be rigid and resistant to torsion and bending.

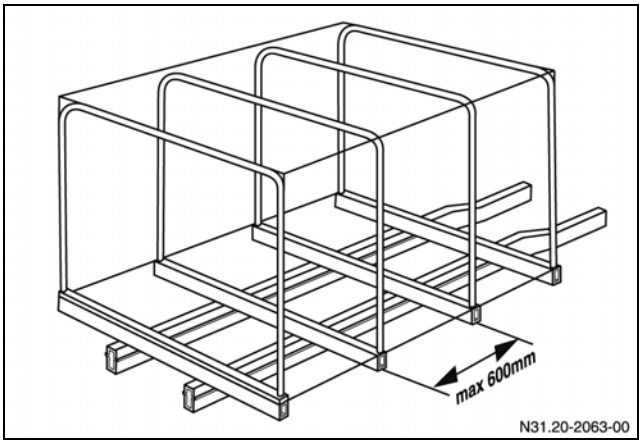


Example of a floor assembly

8.2. Self-supporting bodies

A mounting frame with continuous longitudinal members is not required if the body floor assembly can assume the mounting frame function.

Self-supporting bodies must have the same characteristics as the specified mounting frame. The body floor assembly must have the same rigidity and moment of resistance as a mounting frame.



Example of a body design

Spacing max 600mm [24inch]

8.3. Modifications to the interior

8.3.1. Retrofitting additional rear seats

When retrofitting rear seats, it is absolutely essential to keep to the H-point (hip point). You can obtain up-to-date documentation from SPRINTER ENGINEERING.

All applicable FMVSS/CMVSS regulations must be observed.

When re-installing seat belts, the specified bolts must be tighten to the original torque. 37NM / 27.3ftlbs

Warning

If seats other than those fitted at the factory are fitted in conjunction with seat belts available from the factory, only seat belt buckles that are compatible with the belt tongues of the factory-supplied seat belts may be used. Otherwise, the seat belt cannot engage in the seat belt buckle correctly and in the event of an accident occupants may suffer severe injury or death.

Only the components of MB may be used for the installation of safety belts and seat belt buckles.

All applicable regulations relevant to approval (e.g. seat belt buckle position) must be observed when fitting seat belts and seat belt buckles other than those available from the factory.

Warning

Never mount seats on the rear wheel wells. In the event of an accident, if the seats become detached from their anchorages may lead to severe injury or death.

8.4. Modifications to Cargo vans

Floor assembly/side panels

On Cargo vans, the body forms a self-supporting unit with the chassis frame. If body parts are modified or fitted, they must be welded if a bonded connection is not possible. For this reason, windows, roof hatches and vent openings must be mounted in a sturdy frame. The frame must then be joined by a non-positive attachment to other body elements.

Cab rear panel

If there is an opening in the cab rear panel, a sectional frame must be fitted in the opening. The remaining braces and pillars must be reinforced by additional gussets and connected to the sectional frame (e.g. by bonding). Refer also to the “Modifications to cab” section.

Partitions

Partitions in Cargo vans may be totally or partially removed. The following partitions are available as optional equipment from the factory:

Option	Description
D50	Partition, continuous
D51	Partition, continuous with window
D53	Partition, continuous with a sliding window
D62	Provision for retrofitting partition
D64	Partition with sliding door
D93	Omission of partition

You can obtain more information about optional equipment from your authorized SPRINTER dealer, SPRINTER ENGINEERING or in the “Optional equipment” section)
(→ chapter 3.9).

Vehicle roof

More information about the roof is contained in the “Cargo van / Passenger van roof” section.

8.5. Platform bodies

To ensure the uniform loading of the chassis frame, the body must be attached to the chassis frame by means of a mounting frame (U-section longitudinal members). If the standard platform is subjected to point loads (e.g. for the transportation of cable drums, coils, etc), the substructure and the platform floor must be reinforced to support the load. Before mounting the body:

- Weigh the chassis and define the body length.
- Reflectors and lights must be mounted on the body to comply with legal requirements per FMVSS/CMVSS regulations.

GVWR	Moment of resistance W_x for each longitudinal member in cm^3/[in^3]
11,030 lbs	30 / [1.83]

For the section dimensions of the longitudinal mounting frame member, see the section 8.1.3.

When bodies include attachments which move independently, ensure that there is adequate clearance between the attachments and the basic vehicle, otherwise they may collide with the basic vehicle, resulting in damage.

8.6. Cargo vans

To ensure the uniform loading of the chassis frame, the body must be attached to the chassis frame by means of a mounting frame (U-section longitudinal members).
On rigid bodies such as Cargo vans, the attachments behind the cab must be an elastic connection.

GVWR	Moment of resistance Wx for each longitudinal member in cm^3 / [in^3]
11,030 lbs	40 / 2.44

8.7. Refrigerated vehicles

Refer also to the following sections;

- "Retrofitting an air-conditioning system" (→ chapter 7.5.1)
- "Power take-offs" (→ chapter 7.5.3)
- "Attachment to the roof"
- "Retrofitting electrical equipment" (→ chapter 6.4.5)

On Cargo vans, easy access to the components of the door mechanism (e.g. guide rails and hinges) must be ensured so as not to hinder possible repair work.

On Cargo vans, the insulation increases the weight of the doors and therefore the load on the hinges, carriages and locking systems.

8.8. Dump bodies

Vehicles and dump bodies must comply with all applicable regulations and laws.

Make sure that you do not exceed the permissible axle loads.

Pivots

- The rear pivot on three-way and rear-end dump bodies must be positioned as close to the rear axle as possible.
- When the side gates or tailgate are folded down, they must not strike against the frame end, the light fittings or the trailer hitch.
- The front pivot must be provided with guide brackets so that the pivots can be guided when the dump body is lowered.

Restraining facilities

- Comply with all applicable laws and regulations
- Fit a support (folding support) to prevent the dump body from lowering
- Secure operating devices against accidental operation
- Connect a "dump body" indicator lamp to provide a visual warning that the dump body has not folded back completely (in driving position)

Lifting press

- The press carrier is attached to cross members in the mounting frame.
- The cross members of the mounting frame and the chassis must be placed on top of each other as far as possible forward.
- On three-way dump bodies, the application point of the lifting press must be in front of the center of gravity of the body and the payload.

Mounting frame

If chassis are provided with dump bodies, the mounting frame must have the correct dimensions to support the high loads to which the vehicle will be subjected.

Observe the following points:

- Attach the mounting frame to the body support brackets as described in the “Attachment to the frame” (→ chapter 7.2.2).
- Make sure that the steel longitudinal and cross members have the correct dimensions.
- Close off the rear area of the mounting frame towards the Cargo van and, if necessary, reinforce the mounting frame by installing a diagonal cross or by taking other appropriate measures.

Vehicles with dump bodies can only be used under normal operating conditions. If the vehicle is to be used in heavy-duty operating conditions, we recommend that you contact SPRINTER ENGINEERING (→ chapter 2.7).

GVWR	Moment of resistance Wx for each ongitudinal member in cm^3/[in^3]
11,030 lbs	40 / [2.44]

8.9. Rescue vehicles

Vehicles with bodies for rescue or recovery equipment must be attached with mounting frames of adequate dimensions. In addition, the bodies must be fitted with two rigid connections on each longitudinal frame member.

Refer to the “Winches” section for information on attaching winches.

Also observe the “Side under ride guards”

8.10. Torsional rigidity of body types

The bodies and mounting frames for torsionally rigid bodies (e.g. municipal vehicles, fire-brigade Cargo vans or street-cleaning vehicles) must be attached by means of elastic elements at the front of the frame. The body support brackets fitted at the factory must be used.

If required, the mounting frame must be additionally reinforced at the rear by fitting a diagonal cross.

Refer also to the “Retrofitting electrical equipment” section (→ chapter 4.6.2).

8.11. RV Conversion

Prior to conversion in an RV, please ensure the following important requirements:

- All applicable legal requirements are observed
- All applicable requirements for interior design and RV equipment are fulfilled
- Easy access to the components of the door mechanism (e.g. guide rails and hinges) must be retained so as not to hinder possible repair work.

Particular attention must be paid to the following sections of the body / equipment mounting directives:

- Dimensions and weights (→ chapter 4)
- Instructions on modifications to the basic vehicle
- Electrics/electronics (→ chapter 6)
- Mudguards and wheel wells (→ chapter 7.2.6)

Modifications of conversions to standard vehicles (e.g. the installation of a raised roof) may invalidate the certificate and warranty. Prior to converting a SPRINTER into an RV consult with SPRINTER ENGINEERING (→ chapter 2.7).

Never exceed the center of gravity limits.

We recommend fitting and additional anti-roll bar on the rear axle. This is available from the factory as optional equipment under Option V50. (→ chapter 3.9).

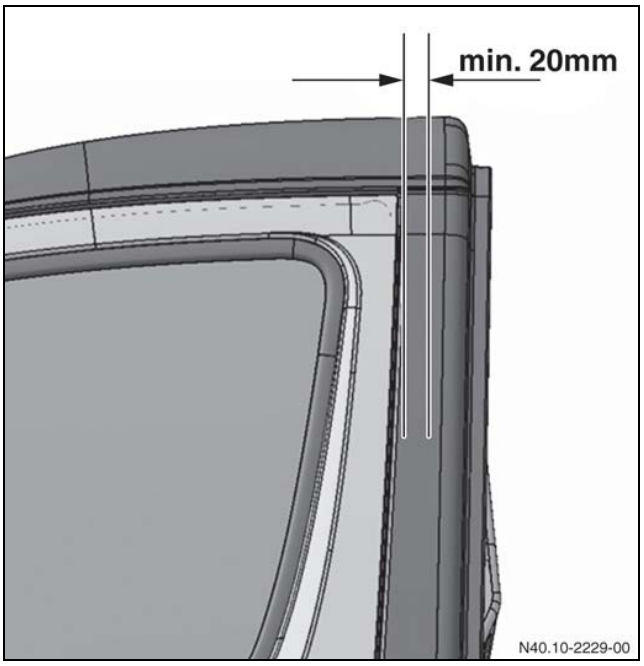
More information on electrics and additional equipment is contained in the “electrics/electronics” (→ chapter 6) and “Additional equipment” sections (→ chapter 7.5).

Warning

If the fuel filler cap is removed or parts are attached to the fuel filler cap, blocking may occur in the event of an accident. Because of this, the protrusion space in the B-pillar may no longer function correctly. On no account should the cap and B-pillar be covered with aftermarket paneling.

Attachment to the frame

- The body must be secured by using support brackets (→ chapter 8.12)



Minimum distance between rear door and integrated body

8.12. Integrated Bodies

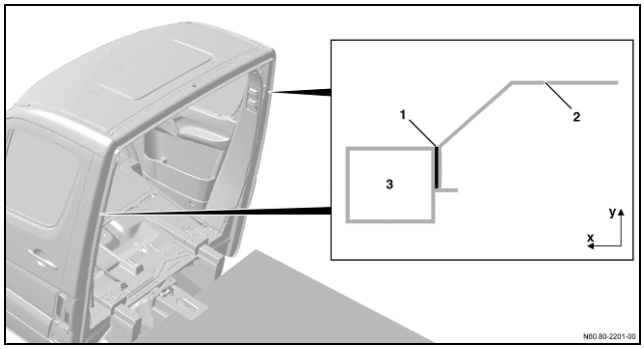
A non-positive connection between cab and body is required on vehicles with integrated bodies, e.g. RV's, integrated box bodies etc.

Attachment of cab rear panel to B-pillar (z-axis)

The body side wall must always be connected to the B-pillar. The connection between body and cab must be non-positive.
It must be assured that forces are transmitted between the body and B-pillar. This can be achieved by e.g.:

Variant 1

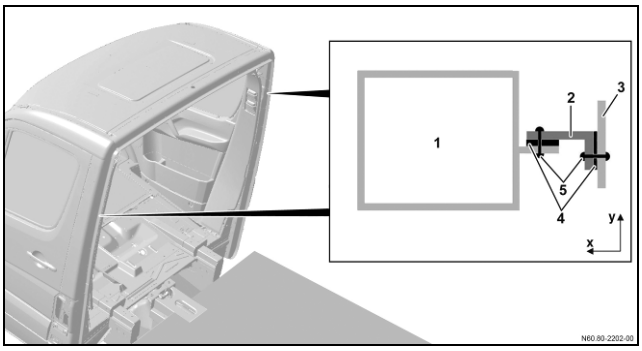
Attachment of body to B-pillar by means of a plate with t=2mm [3/32 in] angled at approx. 2x45º. The plate must be bonded across the entire surface area.



Variant 1: Attachment of body to B-pillar with plate. Picture shows passenger side.
1 Bonding flange
2 Plate / Bracket
3 B-pillar

Variant 2

Attaching the body to the welding flanges of B-pillar with angle pieces.



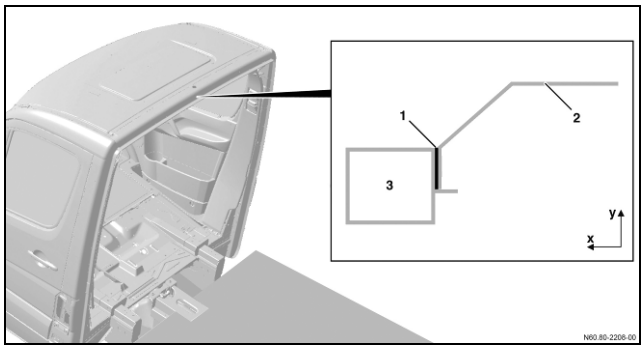
Variant 2: Attachment of body to B-pillar welding flanges with angle pieces.
Picture shows passenger side.
1 B-pillar
2 Angle piece
3 Front wall of upfitter body
4 Bonding flange
5 Rivet

Attachment of cab rear panel to roof bow (B-pillar) (y-axis)

In addition to the connection between body sidewalls and vehicle, it is necessary to form a non-positive connection between body and vehicle in the area of the B-pillar roof bow on vehicle with integrated bodies.
This can be achieved by e.g.

Variant 1

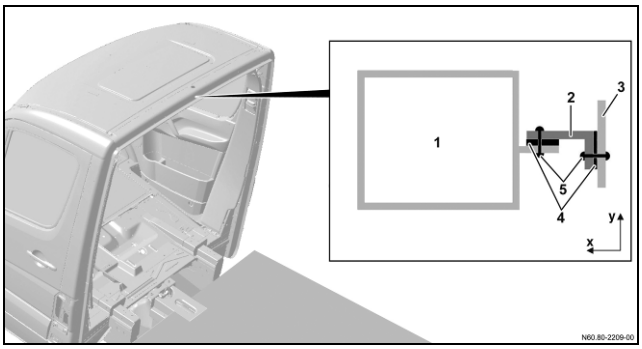
Attachment of body to B-pillar roof bow by means of a plate with t=2mm [3/32 inch] angled at approx. 2x45º. The plate must be bonded across its entire surface area.



Variant 1: Attachment of body to B-pillar with plate.
1 Bonding flange
2 Plate / Bracket
3 Roof bow (B-pillar)

Variant 2

Attaching the body to weld flange on roof bow with angle pieces

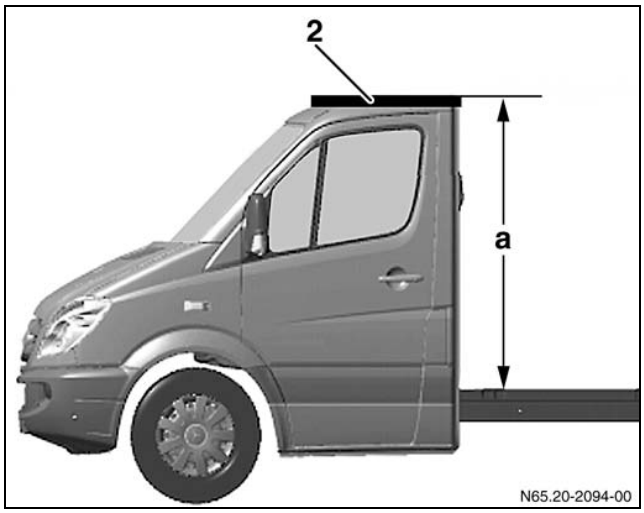


Variant 2: Attachment of body to roof bow welding flanges via angle pieces.
1 B-pillar
2 Angle piece
3 Front wall of upfitter body
4 Bonding flange
5 Rivet

8.13. Bodies on chassis with lowered roof

Code FA1 “Lowered Roof” is available for partially integrated and alcove bodies on vehicles with Code F28 “Platform with doors.” Code FA1 compromises the following changes from the standard version:

- The height of the roofs is reduced by approx. 70mm.
- The vehicle is cut in the area of the roof / door portal, reinforced by means of bodyshell modifications and the painted in the area of the bodyshell modifications.
- The standard-equipment sun visors and grab handles are mounted in the same position at modified attachment points.
- The headliner can be attached at the previous attachment points, but must be trimmed and adjusted to fit the interior at the front and sides by the body manufacturer.
- The vehicle is fitted with a temporary roof arch for transportation.
- Before the body is erected it is necessary for the body builder manufacturer to install the auxiliary roof frame supplied at the attachment points provided in order to ensure adequate equivalent rigidity. This provides a lowered attachment plane for bodies.



Location of auxiliary roof frame

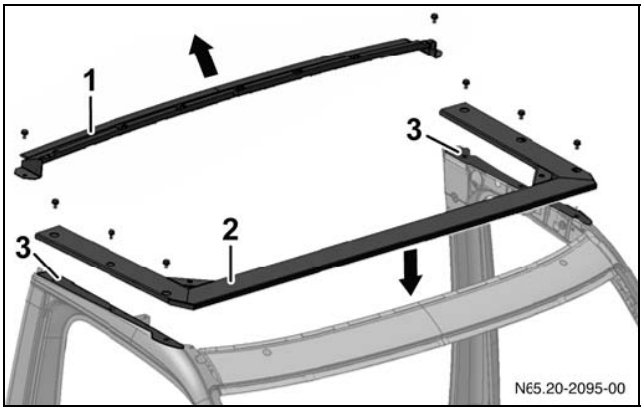
2 Auxiliary roof frame

a Distance between top edge of longitudinal frame member and top edge of auxiliary roof frame:

3500 lbs.	a = 1,536 mm

8.13.1. Mounting the auxiliary roof frame

The temporary roof arch (1) must be detached before mounting the auxiliary roof frame (2).
The auxiliary roof frame (2) must then be mounted at the points provided using six M10 x 20 10.9 hexalobular bolts (tightening torque 40 Nm +/-2 Nm).



Mounting of auxiliary roof frame

1 Transport roof arch
2 Auxiliary roof frame
3 Cutting area with reinforcements (bodyshell modifications)

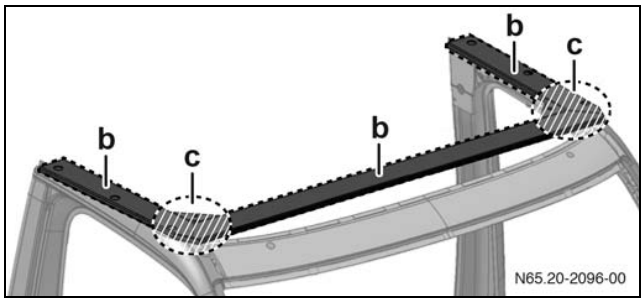
8.13.2. Mounting the body on the auxiliary roof frame

The body can be attached to the auxiliary roof frame by

- Bolts
- Rivets
- Adhesive bonding
- Welding

Warning

Holes must not be drilled in the corners of the auxiliary roof frame.
The auxiliary roof frame must not be cut.
The introduction of force to the auxiliary roof frame must occur by way of an area load (line load). Point loads must not be introduced into the auxiliary roof frame.
The load on the auxiliary roof frame while driving must not exceed 100 kg. When the vehicle is stationary, a load of 200 kg is permissible.



Attachment areas for auxiliary roof frame on vehicles with lowered roof.

b Attachment area

c No drilling allowed

Also observe 5.3 “Corrosion protection measures”. The department responsible will be happy to answer any questions.

9. Calculating the center of gravity

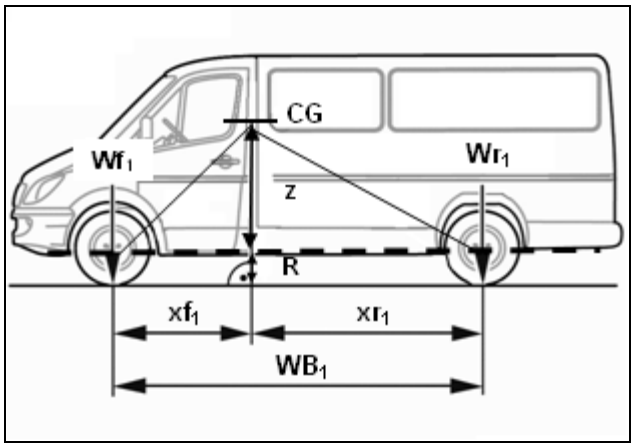
After installation or modification of the equipment, vehicles must be weighed on a scale in two different positions with a secured load appropriate to the area of vehicle applications.

The determined center of gravity must not exceed the specified limiting values (→ chapter 4).

Before the measurement is taken, the tires must be **inflated** to maximum pressure and the vehicle suspension at the front and rear axle must be **locked**.

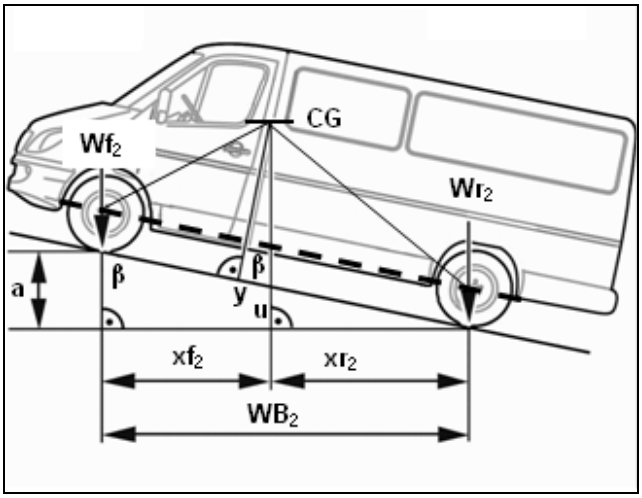
The axle loads must be weighed when the vehicle is horizontal (Wf_1 and Wr_1) and when one axle is raised by amount "a" (WF_2 and Wr_2); we recommend a = 500mm [20 in]. The wheelbase WB_1 (144.3 in or 170.3in) is defined by the vehicle model series (see ordering) or must be measured.

Measurement 1



Measurement with vehicle level

Measurement 2



Measurement with axle raised

Definitions:

CG	=	Center of Gravity
Wf	=	weight front
Wr	=	weight rear
W	=	total vehicle weight
WB	=	wheelbase
xf	=	distance from center to front axle
xr	=	distance from center to rear axle
z	=	Center of Gravity height
R	=	static radius height of front and rear wheels

$$z = R + \tan\left[\cos^{-1}\left(\frac{a}{WB_1}\right)\right] \cdot \left(\frac{Wf_1 \cdot WB_1}{W} - \frac{Wf_2 \cdot WB_1}{W}\right)$$

Formula center of gravity