



Body/Equipment Mounting Directives for Sprinter Model Series 906

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Mercedes-Benz

Amendments since the 28.04.2006 edition

6	Electrics/electronics	63
6.4.3	Lengthening of cables	68
6.6.2	Connecting and routing the wiring for the aerial (radio).	77
6.12	Tyre pressure monitoring system.	86
7	Modifications to the basic vehicle	91
7.3.1	Fuel system	117
7.6.4	Fitted shelving/installations	144
8	Body types	157
8.6	Bodies on chassis with low frame	169
8.6.1	General.	169
8.6.2	Low frame bodyshell	171
8.6.3	Threshold values for the body	172
8.6.4	Attachment of the body to the cab	173
8.6.5	Attachment to the low frame	174
8.6.6	Low frame electrics	175
8.6.7	Low frame drive train / chassis	178
8.6.8	Wheel clearance / wheel arch design.	179
8.6.9	Low frame fuel tank shield.	180
8.6.10	Low frame exhaust system	180
8.14	Motor caravans	189
8.15	Lifting work platform	191
	Index	241

1	Introduction	6	4	Technical threshold values for planning	40
1.1	The aim of these directives	6	4.1	Threshold values of the basic vehicle	40
1.2	Symbols	7	4.1.1	Steerability.	40
1.3	Vehicle safety.	8	4.1.2	Extreme permissible positions of centre of gravity	40
1.4	Operating safety.	9	4.1.3	Vehicle dimensions	40
2	General	10	4.1.4	Parts which must not be welded:.	41
2.1	Vehicle and model designation	10	4.1.5	Parts which must not be drilled:	41
2.2	Model overview	11	4.2	Chassis threshold values	42
2.3	Advice for body manufacturers	15	4.2.1	Permissible axle loads	42
2.3.1	Certificate of endorsement	15	4.2.2	Approved tyre sizes	42
2.3.2	Applying for a certificate of endorsement	16	4.2.3	Diameter of turning circle	43
2.3.3	Legal claims.	16	4.2.4	Modifications to the axles	43
2.4	Tender drawings, technical data, product information.	17	4.2.5	Modifications to the steering system.	43
2.4.1	Workshop Information System (WIS).	18	4.2.6	Modifications to the brake system	43
2.5	Product liability	19	4.2.7	Modifications to springs, spring mountings / shock absorbers	43
2.6	Warranty claims.	20	4.2.8	Wheel alignment	43
2.7	Mercedes star and logo	21	4.3	Bodyshell threshold values	44
2.8	Accident prevention	22	4.3.1	Modifications to the bodyshell.	44
2.9	Reprocessing components – recycling.	23	4.3.2	Threshold values of the vehicle frame	44
2.10	Quality system	24	4.3.3	Wheel arch lowering	44
3	Planning of bodies	25	4.3.4	Vehicle overhang	45
3.1	Selecting the chassis	25	4.3.5	Attachment points on the frame	45
3.2	Vehicle modifications.	26	4.3.6	Modifications to the wheelbase – non-specified body lengths	46
3.3	Dimensions and weights	27	4.3.7	Vehicle roof / roof load.	47
3.4	Vehicle type identification data	28	4.4	Threshold values of engine peripherals / drivetrain	48
3.5	Vehicle stability	29	4.4.1	Fuel system	48
3.6	Tyres	30	4.4.2	Modifications to the engine / drivetrain components.	48
3.7	Bolted and welded connections.	31	4.4.3	Engine cooling system	48
3.7.1	Bolted connections	31	4.5	Threshold values for the interior	49
3.7.2	Welded connections.	32	4.5.1	Modifications to airbags and belt tensioners	49
3.8	Noise insulation	35	4.5.2	Modifications to seats	49
3.9	Maintenance and repairs	36	4.6	Electrics / electronics threshold values	50
3.9.1	Storing the vehicle	37	4.6.1	Vehicle perimeter and side marker lamps	50
3.9.2	Battery maintenance and storage	38	4.6.2	Retrofitting electrical equipment	50
3.9.3	Work before handing over the modified vehicle	38	4.6.3	Mobile communications systems.	50
3.10	Optional equipment	39	4.6.4	CAN bus.	50
			4.6.5	Electronic Stability Program	50

4.7	Threshold values for additional equipment . . .	51	6.7.2	Central locking /rescue vehicle fittings	78
4.8	Threshold values for attachments	52	6.8	Windows and doors	80
4.9	Threshold values for the body	53	6.8.1	Power windows /window hinges	80
4.9.1	Threshold values of the mounting frame	53	6.8.2	Load compartment sliding door.	80
4.9.2	Attachment to the frame	55	6.8.3	Sliding sunroof.	80
<hr/>					
5	Damage prevention	56	6.8.4	Windscreen wipers.	80
5.1	Brake hoses/ cables and lines.	56	6.8.5	Exterior mirrors	81
5.2	Welding work	57	6.8.6	Windscreen heating/ rear window heating . .	81
5.3	Corrosion protection measures	58	6.9	Electronic Stability Program (ESP)	82
5.4	Painting work	60	6.10	Programmable special module (PSM)	83
5.5	Towing and tow-starting.	61	6.10.1	PSM functions	84
5.6	Storing and handing over the vehicle.	62	6.10.2	Mini-SPS	85
<hr/>					
6	Electrics/electronics	63	6.11	Signal acquisition and actuation module (SAM).	85
6.1	General information	63	6.12	Tyre pressure monitoring system	86
6.2	Electromagnetic compatibility (EMC).	64	6.13	Parktronic	87
6.3	Battery	65	6.14	Retarder fittings.	88
6.3.1	Retrofitting a battery isolating switch	65	6.15	Lifting platform fittings	89
6.3.2	Retrofitting an additional battery.	65	6.16	Wiring diagrams	90
6.3.3	Battery maintenance and storage	66	<hr/>		
6.4	Interfaces.	67	7	Modifications to the basic vehicle.	91
6.4.1	CAN bus and networking	67	7.1	Suspension	91
6.4.2	Electric wiring/ fuses.	68	7.1.1	General information on the suspension.	91
6.4.3	Lengthening of cables	68	7.1.2	Springs/ shock absorbers/ anti-roll bars. . . .	92
6.4.4	Additional power circuits	68	7.1.3	Brake system.	93
6.4.5	Control switches	69	7.1.4	Air suspension	94
6.4.6	Retrofitting electrical equipment	69	7.1.5	Wheels and tyres	95
6.4.7	Retrofitting an alternator	69	7.1.6	Spare wheel.	96
6.4.8	Power supply	71	7.2	Bodyshell /body.	97
6.4.9	Speed signal.	72	7.2.1	General information on the bodyshell/ body.	97
6.4.10	Earth bolts	72	7.2.2	Attachment to the frame	101
6.5	Lighting	74	7.2.3	Chassis frame material	102
6.5.1	Adjusting the headlamps	74	7.2.4	Overhang extension	103
6.5.2	Fitting additional lamps	74	7.2.5	Modifications to the wheelbase.	106
6.5.3	Tail lamps.	74	7.2.6	Modifications to the cab	109
6.5.4	Marker lamps.	75	7.2.7	Sidewall, windows, doors and flaps	111
6.5.5	Exterior lamps	75	7.2.8	Mudguards and wheel arches	112
6.5.6	Interior lamps.	76	7.2.9	End frame cross member.	113
6.5.7	Rain-light sensor	76	7.2.10	Windscreen support structure	114
6.6	Mobile communications systems.	77	7.2.11	Panel van /MPV roof	114
6.6.1	Equipment	77	7.3	Engine peripherals/ drivetrain	117
6.6.2	Connecting and routing the wiring for the aerial (radio).	77	7.3.1	Fuel system	117
6.7	Electronic ignition switch (EIS).	78	7.3.2	Exhaust system	118
6.7.1	General information	78	7.3.3	Engine cooling system	119
			7.3.4	Engine air intake	119

These directives provide body manufacturers with important technical information about the basic vehicle. This information must be observed for the production of attachments, bodies, equipment and modifications on vehicles manufactured by Mercedes-Benz.

Due to the large number of body manufacturers and body types, DaimlerChrysler AG cannot take into account all the possible modifications to the vehicle, e.g. performance, stability, load distribution, centre of gravity and handling characteristics, that may result from the design of attachments, bodies, equipment or modifications. For this reason, DaimlerChrysler AG can accept no liability for accidents or injuries sustained as a result of such modifications to your vehicles, in particular even if such modifications have a negative impact on the entire vehicle. Accordingly, DaimlerChrysler AG will only assume liability as manufacturer within the scope of the design and production work which it has performed itself. As manufacturer of the entire vehicle, the body manufacturer will undertake to ensure that the attachments, bodies, equipment or modifications that it produces are not defective in themselves, nor are they capable of causing defects to or hazards on the entire vehicle. If this obligation is violated in any way, the body manufacturer will assume full product liability. DaimlerChrysler AG uses the body/equipment mounting directive to instruct body manufacturers with regard to important aspects to be observed when mounting attachments and bodies.

These body/equipment mounting directives are primarily intended for the professional manufacturers of attachments, bodies, equipment or modifications for our vehicles. As a result, these body/equipment mounting directives assume that the body manufacturer has suitable background knowledge. If you intend to mount attachments, bodies and equipment on or carry out modifications on our vehicles, please be aware that certain types of work (e.g. welding work on load-bearing components) may only be carried out by qualified personnel. This will avoid the risk of injury and will attain the degree of quality required for the attachments, bodies, equipment and modifications.

1.1 The aim of these directives

These directives are divided into 10 interlinked sections to help you find the information you require more quickly:

1. Introduction
2. General
3. Planning of bodies
4. Technical threshold values for planning
5. Damage prevention
6. Electrics/electronics
7. Modifications to the basic vehicle
8. Body types
9. Calculations
10. Technical details

Appendix:

- Index

You will find further information and technical data in the tender drawings (▷ page 17).

The index in pdf format is linked to help you find the information you require quickly.

Make absolutely sure that you observe the threshold values selected in Section 4 as planning must be based on these values.

The sections entitled "Modifications to the basic vehicle" and "Construction of bodies" are the main source of technical information contained in these body/equipment mounting directives.



1.2 Symbols

The following symbols are used in these directives:

Warning



A warning draws your attention to possible risks of accident and injury to yourself and others.

Environmental note



An environmental note gives you tips on the protection of the environment.

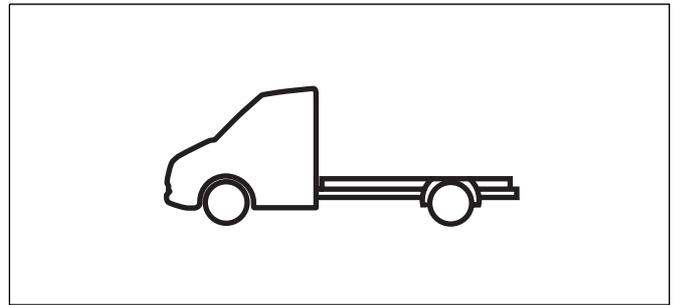


A note draws your attention to possible hazards to your vehicle.

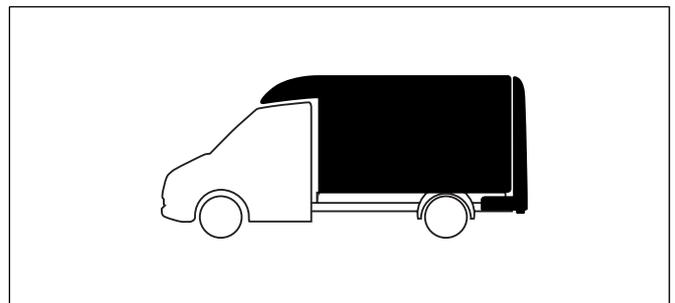


A tip contains advice or further information you may find useful.

- ▷ page This symbol indicates the page on which you will find further information on the subject.
- ▷▷ This continuation symbol indicates an interrupted sequence of actions that will be continued on the next page.



This symbol is used for information relating to the delivered basic vehicle (chassis, panel van and MPV).



Under this symbol, you will find information relating to the conversion or the mounting or attachment of the body by the body manufacturer.

1.3 Vehicle safety

Risk of accident



Before installing non-MB bodies or attaching, mounting, installing or modifying assemblies, please read the relevant section of the detailed Operating Instructions concerning installation work. You could otherwise fail to recognise dangers, which could result in injury to yourself or others.

Notes on vehicle safety

We recommend that you only use parts, assemblies, conversion parts and accessories that have been recommended by Mercedes-Benz for the type of vehicle concerned.

Any modifications to the vehicle that

- change the vehicle type approved in the general operating permit
- could endanger road users, or
- adversely affect exhaust emissions or noise levels

will invalidate the vehicle's general operating permit in many countries.

The use of parts, assemblies, conversion parts or accessories that have not been recommended may jeopardise the safety of the vehicle.



Make absolutely sure that you comply with national registration regulations as attachments, bodies, equipment on or modifications to the vehicle will change the vehicle type approved and may invalidate the general operating permit.



1.4 Operating safety

Risk of accident



Work incorrectly carried out on equipment and its software could prevent this equipment from working. Since the electronic systems are networked, this might also affect systems that have not been modified.

Malfunctions in the electronic systems could seriously jeopardise the operating safety of the vehicle.

Have work on or modifications to electronic components carried out at a qualified specialist workshop which has the necessary expertise and tools to carry out the work required.

Mercedes-Benz recommends that you use a Mercedes-Benz Service Centre for this purpose.

In particular, work relevant to safety or on safety-related systems must be carried out at a qualified specialist workshop.

Some of the safety systems only function when the engine is running. For this reason, do not switch off the engine when the vehicle is in motion.



2.1 Vehicle and model designation

2.1 Vehicle and model designation

These body / equipment mounting directives apply to the following vehicle types:

Version	Wheelbase [mm]	Model series by permissible gross vehicle weight		
		3,000 kg	3,500 kg	4,600 kg / 5,000 kg
Panel van	3,250	906.611	906.631	-
	3,665	906.613	906.633	906.653
	4,325	-	906.635	906.655
	4,325 ¹	-	906.637	906.657
MPV	3,250	906.711	906.731	-
	3,665	906.713	906.733	-
	4,325	-	906.735	-
Platform truck	3,250	906.111	906.131	-
	3,665	906.113	906.133	906.153
	4,325	-	906.135	906.155
Platform truck with crewcab	3,250	906.211	906.231	-
	3,665	906.213	906.233	906.253
	4,325	-	906.235	906.255

¹ Version with extended overhang

² 3.88 t version

Engine code	Engine	Output [kW / bhp]	Model designation by permissible gross vehicle weight			
			3,000 kg	3,500 kg	4,600 kg	5,000 kg
MC1	OM646 DE 22 LA	65 / 88	209 CDI	309 CDI	-	509 CDI
MC2	OM646 DE 22 LA	80 / 109	211 CDI	311 CDI	411 CDI	511 CDI
MC3	OM646 DE 22 LA	110 / 150	215 CDI	315 CDI	415 CDI	515 CDI
MC4	OM642 DE 30 LA	135 / 184	218 CDI	318 CDI	418 CDI	518 CDI
MC9	M272 E35	190 / 258	224	324	424	524
MR2	OM646 DE 22 LA	95 / 129	213 CDI	313 CDI	413 CDI	513 CDI

Body code	Roof version
D 03	High roof
D 05	Super-high roof

2.2 Model overview

3.0 t	
<p>906.611 MC1 / MC2 / MC3 / MC4</p>	<p>906.613 MC1 / MC2 / MC3 / MC4 / MC9</p>
<p>906.611 MC1 / MC2 / MC3 / MC4</p>	<p>906.613 MC1 / MC2 / MC3 / MC4 / MC9</p>
<p>906.711 MC1 / MC2 / MC3 / MC4</p>	<p>906.713 MC1 / MC2 / MC3 / MC4 / MC9</p>
<p>906.711 MC1 / MC2 / MC3 / MC4</p>	<p>906.713 MC1 / MC2 / MC3 / MC4 / MC9</p>
<p>906.111 MC1 / MC2 / MC3 / MC4</p>	<p>906.113 MC1 / MC2 / MC3 / MC4 / MC9</p>
<p>906.211 MC1 / MC2 / MC3 / MC4</p>	<p>906.213 MC1 / MC2 / MC3 / MC4 / MC9</p>

See tender drawings for dimensional data for "H" (▷ page 17).

Explanations of model series and engine codes are contained in the table (▷ page 10)

3.5 t				
<p>906.631 MC1 / MC2 / MC3 / MC4</p>	<p>906.633 MC1 / MC2 / MC3 / MC4 / MC9</p>			
<p>906.631 MC1 / MC2 / MC3 / MC4</p>	<p>906.633 MC1 / MC2 / MC3 / MC4 / MC9</p>	<p>906.635 MC1 / MC2 / MC3 / MC4</p>	<p>906.637 MC1 / MC2 / MC3 / MC4 / MC9</p>	
		<p>906.633 MC1 / MC2 / MC3 / MC4 / MC9</p>	<p>906.635 MC1 / MC2 / MC3 / MC4 / MC9</p>	<p>906.637 MC1 / MC2 / MC3 / MC4 / MC9</p>
<p>906.731 MC2 / MC3</p>	<p>906.733 MC2 / MC3 / MC9</p>			
<p>906.731 MC2 / MC3</p>	<p>906.733 MC2 / MC3 / MC9</p>	<p>906.735 MC2 / MC3 / MC9</p>		
<p>906.131 MC1 / MC2 / MC3 / MC4</p>	<p>906.133 MC1 / MC2 / MC3 / MC4 / MC9</p>	<p>906.135 MC1 / MC2 / MC3 / MC4 / MC9</p>		

See tender drawings for dimensional data for "H" (▷ page 17).

Explanations of model series and engine codes are contained in the table (▷ page 10)

3.5 t		
906.231 MC1 / MC2 / MC3 / MC4	906.233 MC1 / MC2 / MC3 / MC4 / MC9	906.235 MC1 / MC2 / MC3 / MC4 / MC9

See tender drawings for dimensional data for "H" (▷ page 17).

Explanations of model series and engine codes are contained in the table (▷ page 10)

5.0 t (4.6 t)		
<p>906.653 MC1 / MC2 / MC3 / MC4 / MC9</p>		
<p>906.653 MC1 / MC2 / MC3 / MC4 / MC9</p>	<p>906.655 MC1 / MC2 / MC3 / MC4 / MC9</p>	<p>906.657 MC1 / MC2 / MC3 / MC4 / MC9</p>
<p>906.653 MC1 / MC2 / MC3 / MC4 / MC9</p>	<p>906.655 MC1 / MC2 / MC3 / MC4 / MC9</p>	<p>906.657 MC1 / MC2 / MC3 / MC4 / MC9</p>
<p>906.153 MC1 / MC2 / MC3 / MC4 / MC9</p>	<p>906.155 MC1 / MC2 / MC3 / MC4 / MC9</p>	
<p>906.253 MC1 / MC2 / MC3 / MC4 / MC9</p>	<p>906.255 MC1 / MC2 / MC3 / MC4 / MC9</p>	

See tender drawings for dimensional data for "H" (▷ page 17).

Explanations of model series and engine codes are contained in the table (▷ page 10)

2.3 Advice for body manufacturers

Technical advice on body compatibility

Herr Leipner and his team will be pleased to advise body manufacturers and issue certificates of endorsement.

They can be contacted on:

Telephone:	+49 (0) 711 175 8438
	+49 (0) 711 175 0810
Fax:	+49 (0) 711 173 2323
E-mail:	ABH-Management_ Entwicklung_ MB-Vans@daimlerchrysler.com
Postal address:	DaimlerChrysler AG
	HPC A413 (internal postcode)
	Abteilung ET / 3M, D-70546 Stuttgart, Germany

Body manufacturer information and certification

Contact **Herr Pflüger** and his team if you have any questions relating to sales, suggestions regarding existing products and launches, the ABH portal or the Qualified Partner List.

They can be contacted on:

Telephone:	+49 (0) 711 173 9369
	+49 (0) 711 173 9365
Fax:	+49 (0) 711 175 8933
Postal address:	DaimlerChrysler AG
	HPC A446 (internal postcode)
	Abteilung VT / P3, D-70546 Stuttgart, Germany

2.3 Advice for body manufacturers

Technical advice on the basic vehicle

Contact **Herr Binus** and his team at the order processing office of the Düsseldorf factory if you have any questions relating to the configuration and equipment of the basic vehicle.

Telephone:	+49 (0) 211 953 3570
	+49 (0) 211 953 2881
Fax:	+49 (0) 211 953 3565
Postal address:	DaimlerChrysler AG
	Werk Düsseldorf
	Abteilung LOG / AZ-T D-40467 Düsseldorf, Germany

Technical advice outside Germany

Contact the body manufacturer organiser at DaimlerChrysler AG in your country for technical advice on modifications.

2.3.1 Certificate of endorsement

DaimlerChrysler AG does not issue any body / equipment approvals for non-MB bodies. These directives only supply important information and technical specifications to body manufacturers explaining how to handle the product. For this reason, DaimlerChrysler AG recommends that all work on the basic vehicle and body be carried out in compliance with the Mercedes-Benz body / equipment mounting directives.

DaimlerChrysler AG advises against attachments, bodies, equipment and modifications which:

- are not produced in accordance with Mercedes-Benz body / equipment mounting directives
- exceed the permitted maximum gross vehicle weight
- exceed the permissible axle loads



DaimlerChrysler AG issues certificates of endorsement voluntarily based on the following criteria:

DaimlerChrysler AG's assessment shall be based solely on the documents submitted (by the company carrying out the modifications). The assessment and the endorsement shall only cover the expressly defined scopes and their basic compatibility with the designated chassis and its connection points or, in the case of chassis modifications, the basic feasibility of the design for the designated chassis. The certificate of endorsement shall not refer to the overall design of the body, its functions or its intended field of operation. The endorsement shall only apply if design, production and assembly are performed by the company carrying out the modifications in accordance with the state of the art and in compliance with the valid body / equipment mounting directives of DaimlerChrysler AG – unless deviations have been endorsed in these directives. Nevertheless, the certificate of endorsement shall not release the company carrying out the modifications from his product liability or his obligation to perform his own calculations, tests and trials on the entire vehicle in order to ensure that the entire vehicle produced by the company meets the required specifications for operating and road safety and handling characteristics. Accordingly, it shall be the sole duty and responsibility of the body manufacturer to ensure the compatibility of his attachments, bodies, equipment and modifications with the basic vehicle and to guarantee the operating and road safety of the vehicle.



National laws, guidelines and registration regulations must be complied with.

2.3.2 Applying for a certificate of endorsement

In individual cases, the body drawings may be submitted to the department responsible before the start of work. The drawings shall contain the following information:

2.3 Advice for body manufacturers

- All deviations from Mercedes-Benz body / equipment mounting directives.
- Complete data on dimensions, weights and centre of gravity (weight certificates).
- How the body is attached to the chassis.
- The vehicle's conditions of use, e.g.:
 - on poor roads
 - in very dusty conditions
 - at high altitude
 - at extremely high or low ambient temperatures
- Certificates (e mark, seat tensile strength test, etc.)

Submitting the required documentation in full will make queries on our part unnecessary and will speed up the approval procedure.

2.3.3 Legal claims

- No legal claim can be made as to the issue of a certificate of endorsement.
- DaimlerChrysler AG reserves the right to refuse the issue of a certificate of endorsement due to ongoing technical development and the knowledge gained from it, even if a similar endorsement was issued in the past.
- The certificate of endorsement may be restricted to individual vehicles.
- The retroactive granting of a body approval for vehicles already completed or delivered can be refused.

The body manufacturer alone shall be responsible for:

- the functionality and compatibility with the basic vehicle of his attachments, bodies, equipment or modifications
- operating and road safety
- for all attachments, bodies, equipment or modifications and fitted parts



2.4 Tender drawings, technical data, product information

2.4 Tender drawings, technical data, product information

The original design data is available on DVD-R if a basis for designs, calculations, etc., is required. The data is available in the following formats:

- CATIA V4
- CATIA V5
- Step AP 214 CC2

The original design data can be ordered from the technical advice team (▷ page 15).

You can obtain tender drawings and technical data from the Mercedes-Benz body/equipment manufacturer information portal at:

<http://abh-infoportal.mercedes-benz.com>

The Mercedes-Benz body manufacturer information portal is a modern communications system for exchanging tender drawings, technical data and product information for all Mercedes-Benz commercial vehicles.

Make sure that your work is always based on the latest version of the body/equipment mounting directives to be found in the Mercedes-Benz body manufacturer information portal.

The Mercedes-Benz body manufacturer portal is the traditional technical data supply of the Mercedes-Benz body/equipment manufacturer system (MBAS) in a user-friendly web-based format – the MBAS-Web. In this portal, additional information is available to you on different levels:

- Updated news reports (under "News")
- Your personalised information in the ABH profiles (under "Partnership")

This makes the Mercedes-Benz body manufacturer portal the central communications platform between Mercedes-Benz commercial vehicles and yourselves as our partners in the body manufacturing industry. You are thus optimally equipped to provide your customers with quick, low-cost and comprehensive advice and feasibility studies, to plan and determine the final vehicle design, to compile quotations and to prepare designs.

2.4 Tender drawings, technical data, product information

In the body manufacturer information portal, we offer:

- Tender drawings and sketches of individual views in dxf and pdf formats
- Technical data sheets
- Body / equipment mounting directives
- Body / equipment manufacturer information
- Information about power take-offs

The data can be downloaded in a few minutes via ISDN or modem.

For further information about the ABH portal, call +49 (0) 711 173 3322.

2.4.1 Workshop Information System (WIS)

An additional source of information available to you is the Workshop Information System (WIS).

For example, the WIS contains:

- Basic data (dimensions, tightening torques)
- Function descriptions
- Circuit diagrams
- Workshop manuals
- Maintenance data sheets

You can obtain information about the WIS from any DaimlerChrysler branch or call:

Telephone:	+49 (0) 711 178 3170
Fax:	+49 (0) 711 174 0082
Postal address:	DaimlerChrysler AG
	HPC R800 (internal postcode)
	Abteilung GSP / TIM, D-70546 Stuttgart, Germany

2.5 Product liability

Product liability (under civil law) means the liability of a manufacturer for any consequential damage arising to the user of the product or a third party if the product does not possess the degree of operating safety or reliability which can reasonably be expected by the injured party.

With regard to product liability, attention is drawn to the following points:

Every manufacturer shall be liable for the product that he has manufactured. Accordingly, DaimlerChrysler AG will only assume liability as manufacturer within the scope of the design and production work which it has performed itself.

DaimlerChrysler AG shall not therefore accept any liability for damage resulting from defects in retrofitted products produced by third-party manufacturers.

The body manufacturer alone shall bear sole responsibility, e.g. for:

- the operating and road safety of the body
- the operating and road safety of parts and modifications
- testing and maintaining the operating and handling safety of the vehicle after the body / equipment is mounted (the body and / or equipment must not have a negative effect on the driving, braking or steering characteristics of the vehicle)
- influences of parts on or modifications to the chassis
- consequential damage resulting from the attachment, equipment or modification
- consequential damage resulting from retrofitted electrical and electronic systems
- maintaining the operational reliability and freedom of movement of all moving parts of the chassis after the body / equipment is mounted (e.g. axles, springs, propeller shafts, steering, transmission linkage, etc.) even in the case of diagonal torsion between the chassis and the bodies

Work or modifications performed to the chassis or body must be entered in the "Confirmations by the body manufacturers" section of the Maintenance Booklet.



2.6 Warranty claims

Warranty claims can only be made within the framework of the contract of sale between purchaser and seller.

This means that each seller warrants the items supplied by him to the purchaser.

In the following cases in particular, DaimlerChrysler AG will assume no liability:

- if the vehicle used does not correspond to the equipment version for the country in question and area of operation
- if damage was caused either by the body itself or by the manner in which it is mounted

2.7 Mercedes star and logo

The Mercedes star and MB logo are trademarks of DaimlerChrysler AG.

The Mercedes star and MB logo may not be removed or attached to another point without approval.

Mercedes-Benz stars and MB logos supplied separately must be attached at the points specified by Mercedes-Benz.

Points of attachment at the rear of the vehicle

The Mercedes-Benz logo shall be affixed at the bottom left-hand side of the rear end of the vehicle.

The Sprinter logo shall be affixed at the bottom right-hand side of the rear end of the vehicle.

Overall appearance of the entire vehicle

DaimlerChrysler reserves the right to demand the removal of the DaimlerChrysler AG trademark if the vehicle fails to comply with the image and the quality standards required by Mercedes-Benz.

Third-party trademarks

- may not be affixed next to Mercedes-Benz trademarks
- may not be affixed at any other points on the vehicle without the approval of the DaimlerChrysler AG department responsible (▷ page 15)



2.8 Accident prevention

The body and attached or installed equipment must comply with all applicable laws and regulations, and with health and safety and accident prevention regulations, safety regulations and information sheets issued by accident insurers.

All technical means shall be used to avoid operating conditions that may be unsafe or liable to cause an accident.

In Germany, information for commercial carriers is available from the Berufsgenossenschaft für Fahrzeughaltungen (German Trade Association of Vehicle Owners):

Telephone:	+49 (0) 40 39 80 - 0
Fax:	+49 (0) 40 39 80-19 99
E-mail:	info@bgf.de
Homepage:	www.bgf.de
Postal address:	Berufsgenossenschaft für Fahrzeughaltungen, Fachausschuss "Verkehr" Sachgebiet "Fahrzeuge" Ottenser Hauptstraße 54 D-22765 Hamburg, Germany

National laws, guidelines and registration regulations must be complied with.

The body manufacturer shall be responsible for compliance with these laws and regulations.



2.9 Reprocessing components – recycling

2.9 Reprocessing components – recycling

Environmental note



When planning bodies or equipment, the following principles for environmentally compatible design and material selection shall be taken into account, in particular with regard to EU Directive 2000 / 53 / EC.

Body manufacturers shall ensure that attachments and bodies (or conversions) comply with current environmental legislation and applicable regulations, in particular EU Directive 2000 / 53 / EC concerning end-of-life vehicles and EU Directive 2003 / 11 / EC concerning restrictions on the bringing into circulation and use of certain dangerous substances and dangerous preparations.

The installation documentation for the conversions shall be kept by the vehicle owner and, if the vehicle is to be scrapped, handed over to the dismantling company concerned at the time of vehicle handover. This is intended to ensure that even converted vehicles are processed in an environmentally responsible manner.

Materials with risk potential, such as halogen additives, heavy metals, asbestos, CFCs and CHCs, are to be avoided.

- It is preferable to use materials which permit recycling and closed material cycles.
- Materials and production processes that generate only low quantities of waste during production must be selected in such a way that this waste can be easily recycled.
- Plastics are to be used only where they provide advantages in terms of cost, function or weight.
- In the case of plastics, and composite materials in particular, only compatible substances within one material family are to be used.
- For components which are relevant to recycling, the number of different types of plastics used must be kept to a minimum.

- It must be assessed whether a component can be made from recycled material or with recycled elements.
- It must be ensured that components can be dismantled easily for recycling, e.g. by snap connections, pre-weakened points, easy accessibility, or by using standard tools.
- It must be ensured that service products can be removed simply and in an environmentally responsible manner by means of drain plugs, etc.
- Wherever possible, components should not be painted or coated; pigmented plastic parts are to be used instead.
- Components in areas at risk from accidents must be designed in such a way that they are damage-tolerant, repairable and easy to replace.
- All plastic parts are to be marked in accordance with VDA code of practice 260, e.g. "PP – GF30R".



2.10 Quality system

World-wide competition, increased quality standards demanded by the customer from the transporter as a whole, national and international product liability laws, new organisational forms and rising cost pressures make efficient quality assurance systems a necessity in all sectors of the automotive industry.

In order to comply with these requirements, a working group within the Association of German Automobile Manufacturers (VDA) has produced a "Guide to quality assurance for the manufacturers of trailers, bodies and containers". It was published in VDA Volume 8 and is based on the ISO 9000 ff. standards.

For the reasons quoted above, we urgently advise body manufacturers to set up a quality management system with the following minimum requirements:

- To devise, set up and monitor a quality assurance system within the company concerned
- To set out responsibilities in an organisational chart
- To appoint a manager responsible for quality
- To ensure that the instructions for processes, work and inspections are up-to-date and available in all departments and at all workplaces
- To ensure that the employees involved are adequately qualified





When planning bodies, in addition to a user-friendly and maintenance-friendly design, the careful choice of materials and, in consequence, the associated corrosion protection measures (▷ page 58) are of great importance.

3.1 Selecting the chassis

In order to ensure safe operation of the vehicle, it is essential to choose the chassis carefully in accordance with the intended use.

Planning should therefore consider the following items in particular and adapt them to the intended use:

- Wheelbase
- Engine / transmission
- Axle reduction ratio
- Maximum permissible gross vehicle weight
- Position of the centre of gravity



Before carrying out any work on the body or modification work, the delivered vehicle must be submitted to a check to verify whether it fulfils the necessary requirements.

For more information on the chassis and body variants on offer, see the "Model overview" section (▷ page 11) or contact the department responsible (▷ page 15).



On the Mercedes-Benz homepage, you can assemble your vehicle in the Configurator and view the available items of optional equipment:

www.mercedes-benz.de



3.2 Vehicle modifications

Before starting work on the body, the body manufacturer must check whether:

- the vehicle is suitable for the planned body
- the chassis model and equipment are suitable for the operating conditions intended for the body

You can plan bodies by requesting the department responsible to send you tender drawings, product information and technical data or you can retrieve this information from the communications system (▷ page 17).

Furthermore, you must note the optional equipment that is fitted by the factory (▷ page 39).

As supplied ex works, all vehicles comply with EC Directives and national regulations (except for some vehicles for non-European countries).

The vehicles must still comply with EC Directives and national regulations after modifications have been carried out.



Adequate clearances must be maintained in order to ensure the function and operational safety of assemblies.

Risk of accident



Do not carry out any modifications to the steering or brake system. Any modifications to the steering and the brake system may result in these systems malfunctioning and ultimately failing. The driver could lose control of the vehicle and cause an accident.



On no account should modifications be made to the noise encapsulation.

Vehicle approval

The body manufacturer must inform the officially recognised approval authority or inspector of any modifications to the chassis.



National laws, guidelines and registration regulations must be complied with.



3.3 Dimensions and weights

On no account should modifications be made to the vehicle width, vehicle height or vehicle length if they exceed the threshold values specified in the current version of the body/equipment mounting directives.

For all dimension and weight specifications, please refer to the tender drawings and technical data in the Mercedes-Benz body manufacturer portal (▷ page 17) and to the Technical Threshold Values (▷ page 40). They are based on a vehicle that is fitted with standard equipment. Items of optional equipment are not taken into consideration.

Weight tolerances of up to +5% in production must be taken into consideration (in accordance with DIN 70020 in Germany).

The permissible axle loads and the maximum permissible gross vehicle weight must not be exceeded. Information about axle loads and the maximum permissible gross vehicle weight is contained in the "Technical advice on the basic vehicle" section (▷ page 15).

Risk of accident



The vehicle tyre load-bearing capacity must not be exceeded by overloading the vehicle beyond its specified gross vehicle weight. The tyres could otherwise overheat and suffer damage. The driver could lose control of the vehicle and cause an accident.

The braking distance may increase considerably when the vehicle is overloaded.

You will find information regarding permissible weights on the vehicle type identification plates on the vehicle itself (▷ page 28) and in the "Technical details" section (▷ page 199).

Risk of accident



Make sure that you do not exceed the permissible axle loads. Doing so would prevent the ESP system from functioning correctly on vehicles which are equipped with this feature. The driver could lose control of the vehicle and cause an accident.

Information about changes in weight is available from your contact at Mercedes-Benz (▷ page 15).



All bodies must comply with the individual axle loads and the permissible gross vehicle weight.

The permitted number of vehicle occupants and a sufficient margin for the payload must also be taken into account.

Take the weight of optional equipment into consideration when making calculations.

National regulations and guidelines must be observed.



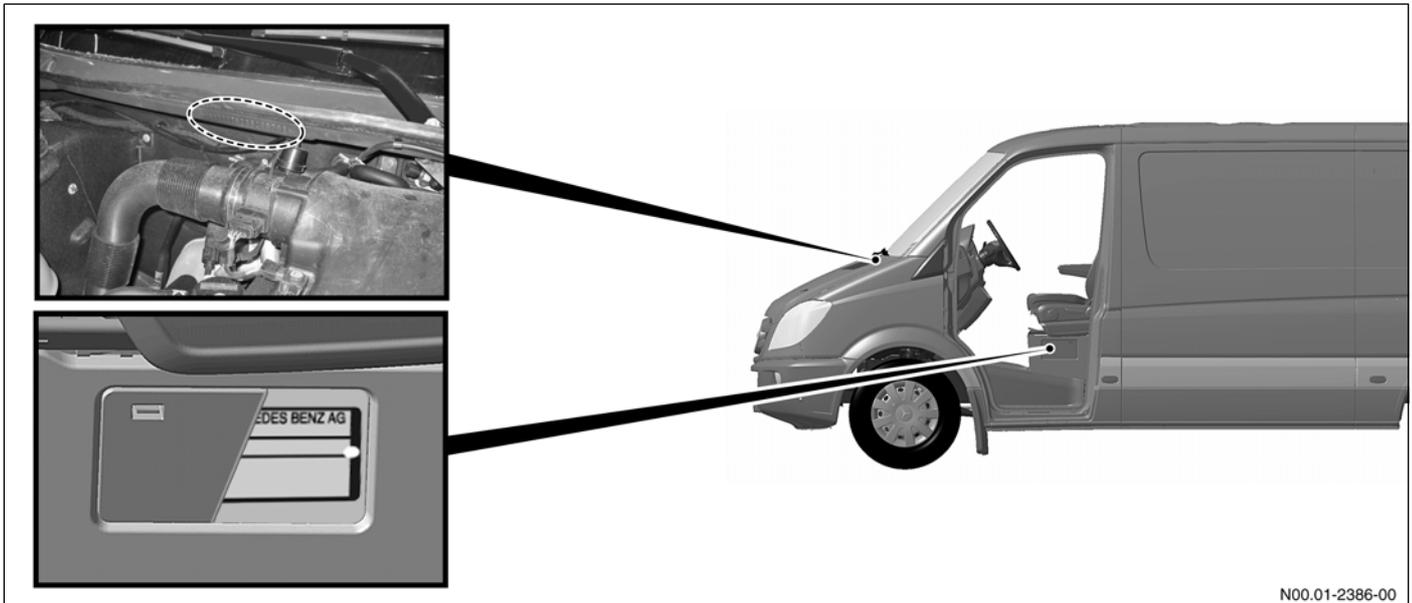
3.4 Vehicle type identification data

3.4 Vehicle type identification data

The vehicle identification number (VIN) and the vehicle identification plate may neither be changed nor fitted to a different point on the vehicle.

The vehicle identification number is on the waist rail in the engine compartment.

The type plate with the vehicle identification number and details of permissible weights is on the base of the driver's seat.

**Location of vehicle type identification data**

3.5 Vehicle stability

For approval of the vehicle with body / equipment mounted, a calculation of the height of the centre of gravity of the laden vehicle must be submitted in accordance with EC Brakes Directive 71 / 320 / EEC.

You will find the permissible heights for the centre of gravity in the "Technical threshold values for planning" section (▷ page 40).

DaimlerChrysler AG will make no statements concerning:

- driving characteristics
- braking characteristics
- steering characteristics, and
- behaviour during ESP intervention

of bodies for payloads with an unfavourably located centre of gravity (e.g. rear, high and side loads) as attachments, bodies, equipment and modifications will have a considerable impact on the above characteristics. Only the body manufacturer is in a position to make an assessment.

Risk of accident



If an attachment, the body, mounted equipment or modifications cause an extreme displacement of the centre of gravity on a vehicle equipped with ESP, it may be necessary to deactivate ESP. You can obtain more information from the department responsible (▷ page 15).

If ESP has been deactivated, the driver will then have to adapt his style of driving accordingly (reducing cornering speed, avoiding sudden steering wheel movements, etc.). When driving dynamics become critical the vehicle behaves like a vehicle without ESP. The permissible axle loads, gross vehicle weights and centre of gravity locations must be complied with.

Neither in kerb condition nor with equipment installed nor with modifications having been carried out may the permissible wheel, axle, or gross vehicle weights ever be exceeded.

Risk of accident



Make sure that you do not exceed the permissible axle loads. Doing so would prevent the ESP system from functioning correctly on vehicles which are equipped with this feature. The driver could lose control of the vehicle and cause an accident.

Further information regarding permissible weights is contained on the vehicle type identification plates on the vehicle itself (▷ page 28).



3.6 Tyres

The body manufacturer must ensure that:

- there is always sufficient space between the tyre and the mudguard or wheel arch, even if snow or anti-skid chains are fitted and the suspension is fully compressed (also allowing for axle twist) and that the relevant data in the tender drawings (▷ see page 112) are observed
- only permissible tyre sizes are used (see vehicle documents) (▷ page 42)

Risk of accident



Exceeding the specified tyre load-bearing capacity or the permissible maximum tyre speed can lead to tyre damage or tyre failure. You could lose control of the vehicle, cause an accident and injure yourself and other people.

For this reason, only fit tyres of a type and size approved for your vehicle and observe the tyre load-bearing capacity required for your vehicle and the tyre speed index.

In particular, comply with national regulations concerning the approval of tyres. These regulations may define a specific type of tyre for your vehicle or may forbid the use of certain tyre types which are approved in other countries.

If you have other wheels fitted:

- the brakes or components of the suspension system could be damaged
- wheel and tyre clearance can no longer be guaranteed
- the wheel brakes or components of the suspension system may no longer function correctly



For more information (▷ see page 17) and (▷ see page 42).

3.7 Bolted and welded connections

3.7 Bolted and welded connections

3.7.1 Bolted connections

If it is necessary to replace standard bolts with longer bolts, use only bolts:

- of the same diameter
- of the same strength grade
- of the same type
- with the same thread pitch

Risk of accident

Do not modify 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 could lose control of the vehicle and cause an accident.

Parts must be refitted in accordance with Mercedes-Benz after-sales service instructions and using suitable standard parts. We recommend the use of genuine Mercedes-Benz parts.

- VDI guideline 2862 must be applied to all installation work.
- 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.
- No design modification is possible if bolts are tightened to the required torque and angle by Mercedes-Benz.
- The settling behaviour of bolted connections must be observed.



Information about Mercedes-Benz after-sales instructions is available from any Mercedes-Benz Service Centre.

Additional tensioned parts must be of equal or greater strength than the preceding tensioned assembly.

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

We recommend the use of standard Mercedes-Benz parts.



3.7 Bolted and welded connections

3.7.2 Welded connections

General

In order to maintain the high standard of welding demanded by Mercedes-Benz, the work must only be carried out by appropriately qualified welders.

The following is recommended in order to achieve high-quality welds:

- clean the area to be welded thoroughly
- make several short welding beads rather than one long bead
- make symmetrical beads to limit shrinkage
- avoid more than three welds at any one point
- avoid welding in strain-hardened zones
- spot welds or step welds should be offset



The battery must be disconnected before all welding operations. Airbags, seat belts, the airbag control unit and airbag sensors must be protected from welding splashes or removed if necessary.



Parts of the floor or the roof are laser-welded.
The panelling of the sidewall is laser-soldered with the roof edge panelling.

Choice of welding method

The mechanical properties of weld seams depend on selecting the adequate welding method and on the geometry of the elements to be joined.

If overlapping sheets are to be welded, the choice of welding method will depend on whether only one or both sides of the workpiece is / are accessible.

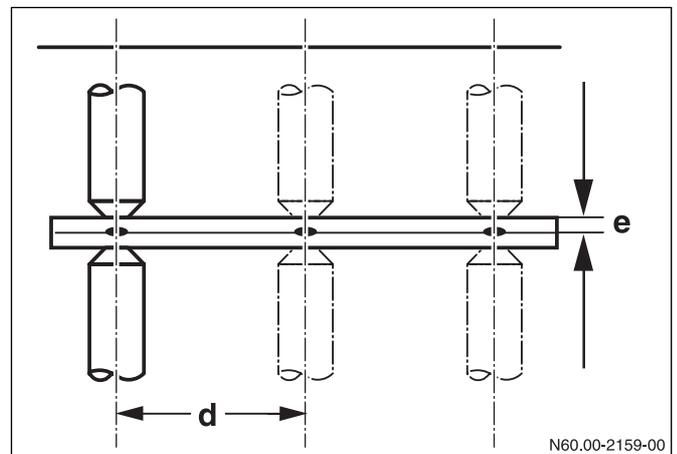
Accessible sides	1	Gas-shielded plug welding
	2	Resistance spot welding

Resistance spot welding

Resistance spot welding is used for welding overlapping parts which are accessible from both sides. Spot welding of more than two sheet layers must be avoided.

Distance between spot welds:

To avoid shunt effects, the specified distances between the spot welds must be maintained ($d = 10e + 10 \text{ mm}$).



Ratio of sheet thickness to distance between spot welds

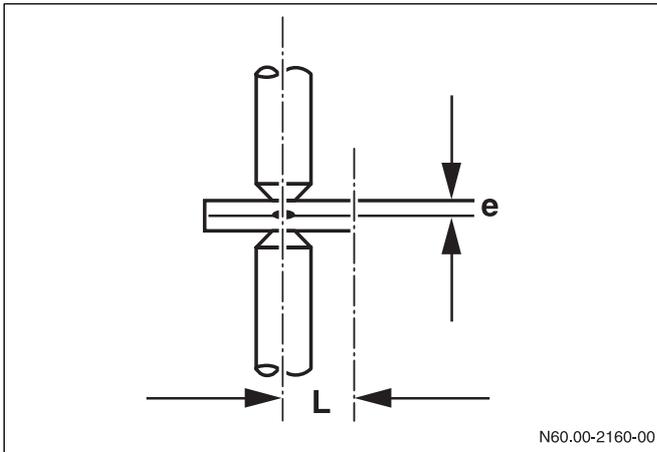
- d Distance between spot welds
- e Sheet thickness



3.7 Bolted and welded connections

Distance from sheet edge:

To avoid melting core damage, the specified distances to the sheet edge must be maintained ($L = 3e + 2$ mm).



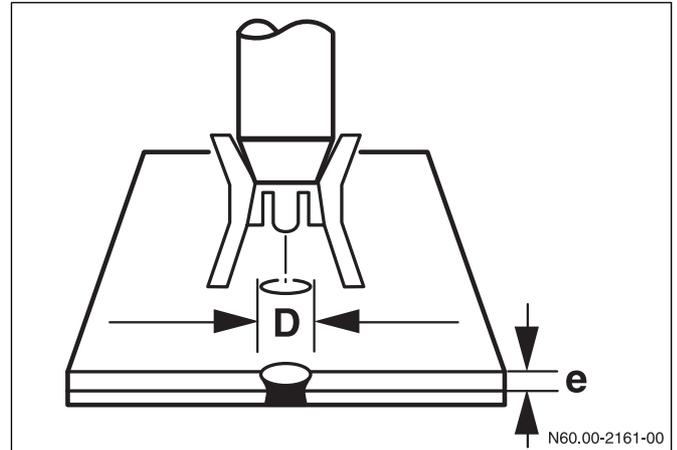
Ratio of sheet thickness to distance from the edge

- e Sheet thickness
- L Distance from sheet edge

Gas-shielded plug welding

If overlapping sheets can only be welded from one side, use either inert gas plug welding or tack welding.

If the joint is produced by stamping or drilling followed by plug welding, the drilled area must be deburred before welding.

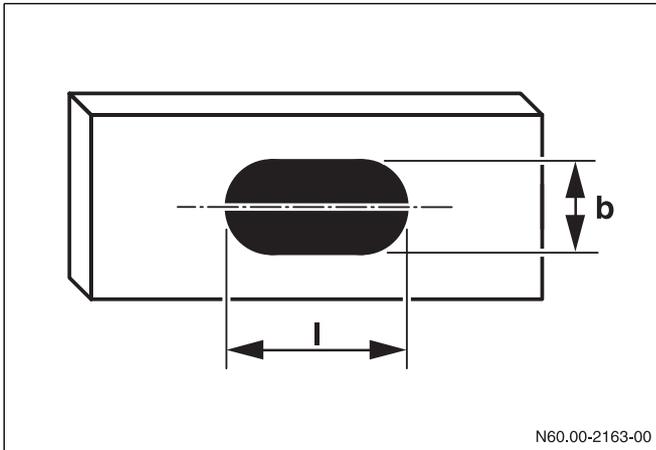


Ratio of sheet thickness to plug hole diameter

D = plug hole diameter [mm]	4.5	5	5.5	6	6.5	7
e = sheet thickness [mm]	0.6	0.7	1	1.25	1.5	2

3.7 Bolted and welded connections

Mechanical quality can be additionally improved by the use of slotted holes ($l = 2 \times b$).

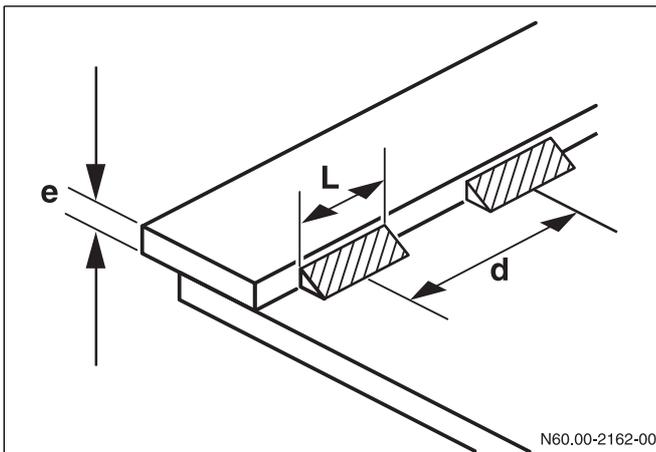


Ratio of width to length of slotted holes

- b Width of slotted hole
- l Length of slotted hole

Tack welding

If sheet thickness is > 2 mm, overlapping sheets can also be joined by tack welding ($30 \text{ mm} < L < 40 \times e$; $d > 2 L$).



Ratio of sheet thickness to distance between spot welds

- d Distance between tack weld centres
- e Sheet thickness
- L Length of tack weld

Do not perform welding work on:

- Assemblies such as the engine, transmission, axles, etc.
- Chassis, except on chassis frame extensions



More information is contained in the "Threshold values for planning" (▷ page 53) and "Damage prevention" (▷ page 56) sections, the "Bodyshell" (▷ page 97) section and the Mercedes-Benz Workshop Information System (WIS).

Anti-corrosion protection after welding

On completion of all welding work on the vehicle, you must comply with the specified corrosion protection measures (▷ page 58).



When carrying out welding work, note the instructions specified by Mercedes-Benz in the "Damage prevention" (▷ page 57) and "Modifications to the basic vehicle" sections (▷ page 97).

3.8 Noise insulation

If modifications are carried out on any parts whose operation produces noise, e.g.

- engine
- exhaust system
- air intake system
- tyres, etc.

sound level measurements must be made.

National regulations and guidelines must be observed.

In Germany, the EC Directive 70 / 157 / EEC or Section 49.3 StVZO (geräuscharm) (Section 49.3 of the German Road Traffic Licensing Regulations (low-noise vehicles)) must be observed.

- Noise-insulating parts fitted as standard must not be removed or modified.
- The level of interior noise must not be adversely affected.



All modifications to the vehicle must comply with vehicle sound levels as defined in EC Directive 70 / 157 / EEC.



To prevent modifications from changing the vehicle's sound levels, it must be ensured that interior sound levels are reduced when planning bodies (▷ page 133).



3.9 Maintenance and repairs

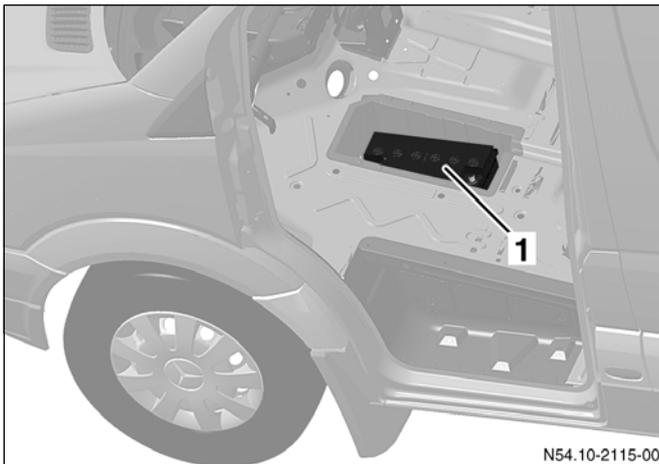
3.9 Maintenance and repairs

Maintenance and repair of the vehicle must not be hindered by the body. The Operating Instructions must be observed.

- Maintenance points and assemblies must remain easily accessible.
- Stowage boxes must be fitted with maintenance flaps or removable rear panels.
- The battery compartment must be sufficiently ventilated, with provision for air to enter and exit.
- Check the condition and capacity of batteries and service them in accordance with the manufacturer's specifications (▷ page 38).

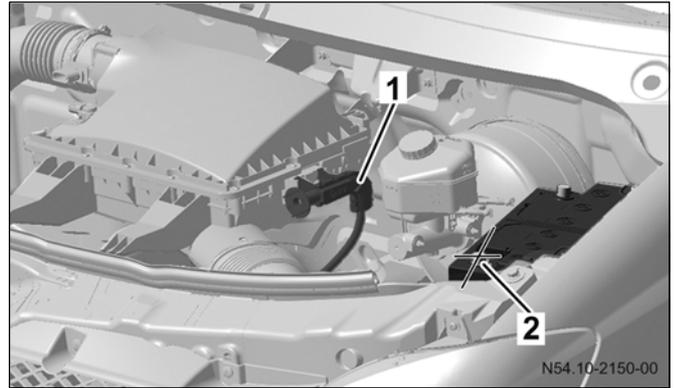


Leaving the vehicle parked up for long periods of time can lead to battery damage. This can be avoided by disconnecting the battery and storing it in an appropriate manner (▷ page 38).



Installation location of the main battery

- 1 Main battery



Installation location of the jump-starting connection

- 1 Jump-starting connection
- 2 Positive terminal, auxiliary battery – not suitable for jump-starting

The jump-starting connection or the main battery must be used if you intend to use an external power source to start the vehicle.



The auxiliary battery in the engine compartment must not be used for connection to an external power supply as this could result in damage to the vehicle (▷ page 65).

The cost of any additional work made necessary by the body and which has to be carried out during warranty, maintenance or repair work will not be carried by DaimlerChrysler AG.



3.9 Maintenance and repairs

The following must be observed by the body manufacturer before delivery of the vehicle:

- Check the headlamp setting or have this checked at a qualified specialist workshop. We recommend a Mercedes-Benz Service Centre.
- Retighten the wheel nuts to the specified torque.
- DaimlerChrysler AG recommends adapting the scopes of maintenance work on the body to each individual body using the relevant Mercedes-Benz service systems. This applies both to the scope and type of service work, and for determining the service due dates for servicing intervals based on time elapsed and distance covered.

The body manufacturer must provide the vehicle with operating instructions and maintenance instructions for the body and any additional equipment installed. These instructions must be in the language of the country in which the vehicle is to be used.

3.9.1 Storing the vehicle

Storage in an enclosed space:

- Clean the entire vehicle
- Check the oil and coolant levels
- Inflate the tyres to 0.5 bar above the specified tyre pressures
- Release the handbrake and chock the wheels
- Disconnect the battery and grease battery lugs and terminals

Storing the vehicle in the open (< 1 month):

- Carry out the same procedure as for storing in an enclosed space
- Close all air inlets and set the heating system to "Off"

Storing the vehicle in the open (> 1 month):

- Carry out the same procedure as for storing in an enclosed space
- Fold the windscreen wipers away from the windscreen
- Close all air inlets and set the heating system to "Off"
- Remove the battery and store it in accordance with the manufacturer's specifications (▷ page 38)



3.9 Maintenance and repairs

**Maintenance work on the stored vehicle
(in storage for > 1 month)**

- Check the oil level once a month
- Check the coolant once a month
- Check the tyre pressures once a month

Removing the vehicle from storage

- Check the fluid levels in the vehicle
- Adjust the tyre pressures to the manufacturer's specifications
- Check the battery charge and install the battery
- Clean the entire vehicle

3.9.2 Battery maintenance and storage

To avoid damage to the battery, disconnect the battery if the vehicle is to be parked up for a period longer than 1 week.

If the vehicle is parked up for periods of longer than 1 month, remove the battery and store it in a dry place at temperatures of between 0 °C to 30 °C.

Store the battery in an upright position.

The battery charge must be kept above 12.55 V at all times.

If the voltage drops below 12.55 V but not below 12.1V, the battery must be recharged.



If the battery voltage drops below 12.1 V, the battery is damaged and it will have to be replaced.

3.9.3 Work before handing over the modified vehicle

The manufacturer must confirm the work and modifications carried out by making an entry in the Maintenance Booklet.

Checking the entire vehicle

Check the vehicle for perfect condition. Damage must be repaired where necessary.

Checking the brake system

The brake fluid must be renewed every two years.

If it is not known how long a vehicle equipped with a hydraulic brake system has been in storage, the brake fluid must be renewed.

Check electrical and hydraulic lines for all types of damage and replace if necessary.

Checking the battery

Check, and correct if necessary, the battery charge before handing over the vehicle.

Checking the tyres

Before handing over the vehicle, check that the tyres are inflated to the specified pressure and check the tyres for damage. Damaged tyres must be replaced.

Checking wheel alignment

We recommend that the wheel alignment be checked if modifications have been made by a body repair workshop. More detailed information is contained in the Mercedes-Benz Workshop Information System (WIS).



3.10 Optional equipment

We recommend using equipment available as option codes to adapt the body to the vehicle optimally.

Information about all optional equipment available as a code is available from your Mercedes-Benz Service Centre or from body manufacturer advisors (▷ page 15).



On the Mercedes-Benz homepage, you can assemble your vehicle in the Configurator and view the available items of optional equipment:

www.mercedes-benz.de

Optional equipment (e.g. reinforced springs, frame reinforcement, auxiliary tanks, anti-roll bars, etc.) or retrofitted equipment increases the unladen weight of the vehicle.

The actual vehicle weight and axle loads must be determined by weighing before mounting.

Not all optional equipment can be installed in any vehicle without problems. This applies particularly to retrofitting.

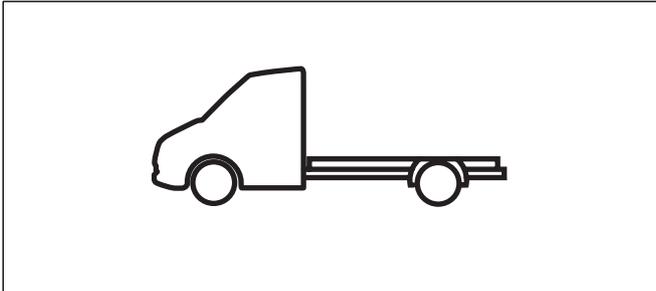


4.1 Threshold values of the basic vehicle

4.1 Threshold values of the basic vehicle



This section contains the basic vehicle technical threshold values which are important for planning work. In addition, you will find more information in the other sections of the current version of the body/equipment mounting directives.



4.1.1 Steerability

- In all load states, the front axle load must represent at least the following proportion of the gross permissible vehicle weight:

M1 licensed	at least 30% of the gross vehicle weight
N1 to N3 licensed	at least 25% of the gross vehicle weight

- The permissible axle loads must be observed regardless of the load situation.

4.1.2 Extreme permissible positions of centre of gravity

y-axis:	The maximum wheel load (1 / 2 the axle load) of the laden vehicle may only be exceeded by 4%.
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Centre of gravity heights with ESP

Gross vehicle weight [t]	Centre of gravity heights, z-axis
3.0	1,300 mm
3.5	1,300 mm
5.0	1,300 mm
If $Z_{SP} > 1,300$ mm, ESP must be downgraded.	

4.1.3 Vehicle dimensions

Vehicle width

(in accordance with Section 42 Para. 3 of StVZO (German Road Traffic Licensing Regulations))
not including additional headlamps

Standard headlamps	$\leq 2,502$ mm
Xenon headlamps	$\leq 2,216$ mm

Vehicle height

(in accordance with Section 42 Para. 3 of StVZO (German Road Traffic Licensing Regulations))

4,000 mm

Vehicle length

(in accordance with Section 42 Para. 3 of StVZO (German Road Traffic Licensing Regulations))



4.1 Threshold values of the basic vehicle

4.1.4 Parts which must not be welded:

- In the A- and B-pillars
- Top and bottom chord of the frame
- Radii
- In the vicinity of the airbags
- Plug welding is only permissible in the vertical webs of the longitudinal frame member.

You will find more information in the "Damage prevention" (▷ page 57) and "Planning of bodies" (▷ page 31) sections.

4.1.5 Parts which must not be drilled:

- In the A- and B-pillars
- In the top or bottom chord of the longitudinal frame member
- At load application points (e.g. spring supports)
- At front-axle or rear-axle supporting points
- In the vicinity of the airbags



Holes in the longitudinal frame member are the result of the production process and are not suitable for all attachments, bodies, equipment and conversions. On no account may holes resulting from the production process be used, as this could damage the frame.

More information is contained in the "Planning of bodies" section (▷ page 31).



4.2 Chassis threshold values

4.2.1 Permissible axle loads

Refer to the "General" section (▷ page 10).

Risk of accident



Make sure that you do not exceed the permissible axle loads. Doing so would prevent the ESP system from functioning correctly on vehicles which are equipped with this feature. The driver could lose control of the vehicle and cause an accident. In addition, overloading could damage the suspension system and load-bearing parts.

Information about axle loads and the maximum permissible gross vehicle weight is contained in the "Technical advice on the basic vehicle" section (▷ page 15).

On vehicles with "harder anti-roll for chassis with motor caravan body" (Code CE6) the following minimum rear axle loads must be maintained in all driving conditions:

Gross vehicle weight	Minimum rear axle load
3.5 t	1,200 kg
3.88 t	1,850 kg
5 t	2,250 kg

4.2.2 Approved tyre sizes

Gross vehicle weight [t]	Equipment		Tyre size	Weight and speed index
3.0			205 / 75 R16 C	110 / 108R
3.5			235 / 65 R16 C	115 / 113R
	2		235 / 60 R17 C	117 / 115R
	3		225 / 75 R16 C	116 / 114R
3.88			235 / 65 R16 C	121N (116R)
4.6			195 / 75 R16 C	107 / 105R
	1	FA	235 / 65 R16 C	115 / 113R
		RA	285 / 65 R16 C	128N (116R)
	2			205 / 75 R16 C
5.0			195 / 75 R16 C	107 / 105R
	2			205 / 75 R16 C

¹ With Supersingle optional equipment, Code RH9

² Optional equipment

³ All-wheel drive and SW code Z12

4.2 Chassis threshold values

4.2.3 Diameter of turning circle

Refer to:

- Section 32d StVZO (German Road Traffic Licensing Regulations)
- European Union: 97 / 27 / EC
- European Union: 96 / 53 / EC

Wheelbase [mm]	Diameter of turning circle [m]
3250	12.3
3665	13.5
4325	15.6

4.2.4 Modifications to the axles

No modifications whatsoever may be made to the suspension or the axles (▷ page 91).

4.2.5 Modifications to the steering system

On no account may any modifications be made to the steering system (▷ page 91).

4.2.6 Modifications to the brake system

On no account may any modifications be made to the brake system.

On no account may any modifications be made to disc brake air inflow and air outflow (▷ page 93).

Wheel chocks are specified for vehicles with a permissible gross vehicle weight >4t according to Section 4.1 Para.14 StVZO (German Road Traffic Licensing Regulations).

4.2.7 Modifications to springs, spring mountings / shock absorbers

Modifications to springs and shock absorbers can only be made if they are matched at the front and rear. The combination determined at the factory must be used.

You can obtain more information and, if necessary, request the certificates of endorsement from the department responsible (▷ page 15).

On no account should springs or 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 Mercedes-Benz parts.

On no account should modifications be made to the spring mountings (▷ page 91).

4.2.8 Wheel alignment

No modifications whatsoever may be made to wheel alignment settings (▷ page 91).

4.3 Bodyshell threshold values

4.3 Bodyshell threshold values

4.3.1 Modifications to the bodyshell

Refer to the "Modifications to the basic vehicle" section (▷ page 97).

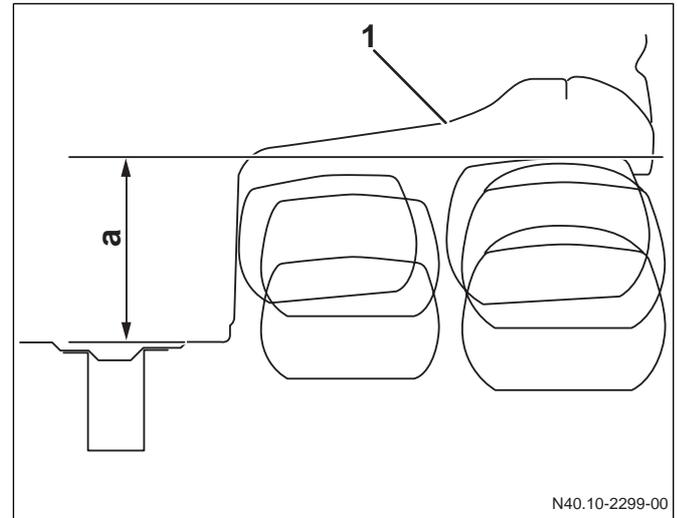
- No modifications whatsoever may be made to the cross-member structure from the front of the vehicle back to, and including, the B-pillar.
- On no account should modifications be made to the rear door opening including the roof area (▷ page 111).
- In the event of modifications to the load-bearing structure, the total equivalent rigidity of the structure fitted by the body manufacturer must at least equate to that of the standard vehicle.
- Clearances for fuel filler necks, fuel tank lines and fuel lines must be maintained.
- It is not permissible to drill holes in or perform welding work on the A-pillar or B-pillar.
- If modifications are made to the sidewall of the panel van or the MPV, the rigidity of the modified body must be equal to that of the basic vehicle.
- If bodies are mounted on basic vehicle cabs, a fuel level sensor shield may be necessary depending on the body type. Refer to the "Fuel system" section (▷ page 117).

4.3.2 Threshold values of the vehicle frame

If modifications are made to the wheelbase or the frame is extended, the material of the extension element must have the same quality and dimensions as the standard chassis frame (▷ page 157).

Vehicle name	Model designation	Material
Sprinter	906	H240 LA or S235 JRG

4.3.3 Wheel arch lowering



Maximum wheel arch lowering

- 1 Contour of standard panel van wheel arch
- a Maximum possible extent of lowering



The minimum required wheel clearance is measured from the floor in the panel van or the flange between the upper and lower chord of the longitudinal frame member on chassis vehicles.

Permissible gross vehicle weight [t]	Tyres	Dimension a [mm]
3.5 (longitudinal frame member, straight)	205/65R16	270
	235/65 R16	265
4.6 – 5 (longitudinal frame member, tapered)	285/65 R16	265
	2 x 195/75R16	225
	2 x 205/75R16	235

More information is contained in the "Modifications to the basic vehicle" section (▷ page 112).

4.3.4 Vehicle overhang

The maximum vehicle overhang without exceeding the permissible axle loads and centres of gravity is:

Maximum overhang lengths	
Wheelbase I [mm]	Overhang length [mm]
3,250	1,650
3,665	1,850
4,325	2,200



Extensions to overhang lengths may make it necessary to reduce the maximum permissible trailer load or noseweight. In such cases, we recommend that you consult the department responsible (▷ page 15).

4.3.5 Attachment points on the frame

Attachment to the frame must be carried out as described in the "Attachment to the frame" section (▷ page 101).

4.3.6 Modifications to the wheelbase – non-specified body lengths

- On no account should modifications be made to the wheelbase by moving the position of the rear axle.
- Modifications to the frame must be carried out as described in the "Bodyshell" section (▷ page 97).

Recommended cutting points on the frame

Wheelbase [mm]	Permissible gross vehicle weight [t]	A _V [mm]	A _H [mm]
3,665	3.5 / 3.88	2,285	1,305
4,325	3.5 / 3.88	2,285	1,305
3,665	4.6 / 5.0	2,205	1,420
4,325	4.6 / 5.0	2,205	1,420

Values refer to a chassis with cab

A_V...Distance to centre of front axle A_H...Distance to centre of rear axle

- Avoid frame cuts in the area of frame inserts.
- The offset between the cutting point on the mounting frame and the cutting point must be >100 mm.
- If modifications to the wheelbase have been carried out, they must never cause the exhaust tailpipe to be directed at any vehicle components (e.g. tyres).
- More information is contained in the "Modifications to the basic vehicle" section (▷ page 107).

4.3.7 Vehicle roof/roof load

Maximum roof loads			
Panel van [kg]	High roof panel van [kg]	Extra-high roof panel van [kg]	Cab, crewcab [kg]
LH1	LH2	LH3	[kg]
300	150	0	100

Roof arches or supporting parts may not be removed or damaged without being replaced.

The connection between the roof arch and the sidewall must be of sufficient bending strength (▷ page 115).

Wheelbase [mm]	Quantity required
3,250	≥ 4 roof arches
3,665	≥ 5 roof arches
4,325	≥ 6 roof arches

Roof arches	Position
1	to the rear of the front doors (B-pillar)
2	at the centre of the load compartment sliding door (between the B- and C-pillars)
3	in the centre of the vehicle behind the load compartment sliding door (C-pillar)
4-6	between the C-pillar and the rear end of the vehicle (rear pillar)

Roof height [mm]	Moment of inertia I_x per roof arch [mm ⁴]
≤ 250	≥ 40,000
≤ 400	≥ 65,000
≤ 550	≥ 86,000

4.4 Threshold values of engine peripherals / drivetrain

4.4 Threshold values of engine peripherals / drivetrain

4.4.1 Fuel system

- On no account should modifications be made to the fuel system (▷ page 117).

4.4.2 Modifications to the engine / drivetrain components

- On no account may any modifications be made to the engine air intake.
- Modifications to propeller shaft lengths may only be carried out by a company qualified in propeller shaft engineering.
- It is not possible to retrofit any engine speed regulation equipment, other than that which is available as an optional extra.
- On no account should modifications be made to the exhaust system, especially in the vicinity of exhaust gas aftertreatment components (diesel particle filter, catalytic converter, Lambda probe, etc.).

4.4.3 Engine cooling system

On no account should modifications be made to the cooling system (radiator, radiator grille, air ducts, etc.) (▷ page 119).

The complete cross-section of the cooling air intake surfaces must remain unobstructed. This means:

- at least 11 dm² for the front grille (radiator and condenser)
- at least 7 dm² for the opening in the bumper (charge-air cooler flow)

4.5 Threshold values for the interior

4.5.1 Modifications to airbags and belt tensioners

Risk of injury



On no account may any modifications be made to the airbag system or the belt tensioner system.

Modifications to or work incorrectly carried out on a restraint system (seat belt and seat belt anchorages, belt tensioner or airbag) or its wiring could cause the restraint systems to stop functioning correctly. This means, for example, that airbags or belt tensioners may be activated inadvertently or may fail in the event of an accident even though the rate of deceleration exceeds the deployment threshold.

- On no account should modifications be made to airbag components or in the vicinity of airbag components and sensors.
- On no account should modifications be made to the roof lining or its attachment if the vehicle is equipped with windowbags.
- The vehicle interior must be designed in such a way that airbags can fully deploy without impediment (▷ page 125).
- On no account should modifications be made around the airbag control unit (▷ page 125).

More information is contained in the "Modifications to the basic vehicle" section (▷ page 125).

4.5 Threshold values for the interior

4.5.2 Modifications to seats

Risk of accident



It is not permitted to modify the seats or mount seats on the wheel arches. In the event of an accident, the seats could become detached from their anchorages.

More information is contained in the "Modifications to the basic vehicle" (▷ page 132) and "Modifications to the interior" sections (▷ page 165).

If a rear bench seat with two- or three-point seat belts deviates from the standard seat design, it must comply with the requirements of EC Directives 76 / 115 / EEC and 74 / 408 / EEC.



4.6 Electrics / electronics threshold values

4.6 Electrics / electronics threshold values

Refer to the "Electrics / electronics" section (▷ page 63).

4.6.1 Vehicle perimeter and side marker lamps

Vehicle perimeter lamps are required by law on all vehicles with total widths of over 2.10 m in accordance with Section 51b, Para. 2, of the StVZO (German Road Traffic Licensing Regulations).

Side marker lamps are required on all vehicles with a length of over 6 m as specified by EC Directive 76 / 756 / EEC.

4.6.2 Retrofitting electrical equipment

All equipment fitted must be tested in accordance with EC Directive 94 / 54 / EEC and must bear the e mark.



Comfort may be impaired in individual cases.

4.6.3 Mobile communications systems

- The maximum transmission output must not be exceeded.

Waveband	Maximum transmission output [W]
Short wave < 50 MHz	100
4 m band	20
2 m band	50
70 cm band	35
25 cm band	10

4.6.4 CAN bus

On no account should modifications be made to the CAN bus or the components connected to it.

The programmable special module (Code ED5) can be used to access individual types of data available on the CAN bus (▷ see page 83).

4.6.5 Electronic Stability Program



The location, position and mounting of the ESP yaw rate sensor must not be modified.

On no account should modifications be made to wiring or ESP components.

On no account should modifications be made to the wheelbase.



4.7 Threshold values for additional equipment

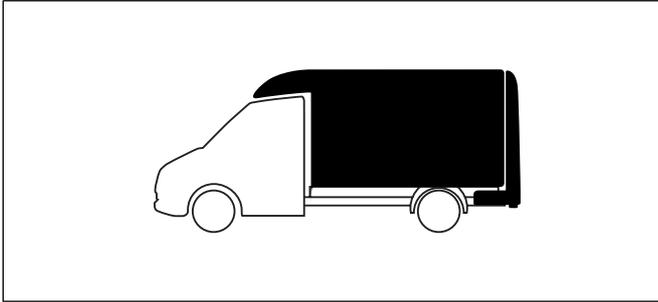
If auxiliary equipment (e.g. additional air-conditioning compressors, pumps, etc.) is retrofitted, the following must be observed:

- The operation of vehicle components must not be adversely affected.
- The freedom of movement of vehicle parts must be guaranteed in all driving situations.

4.8 Threshold values for attachments

- Under EC Directive 89 / 297 / EEC, all vehicles weighing over 3.5 t are required to be equipped with side underride guards.
- Under Section 32b of the StVZO (German Road Traffic Licensing Regulations), vehicles are required to be equipped with an underride guard if:
 - the distance between the rear of the vehicle and the rear axle is more than 1,000 mm
 - the ground clearance of the chassis as well as the main body parts exceeds 700 mm for the unladen vehicle across the entire width.
- The maximum permissible lifting load of a lifting platform is 500 kg on a fully enclosed model and 750 kg on chassis. Mounting in accordance with the "Lifting platform" section (▷ page 149) is imperative.

4.9 Threshold values for the body



Refer to the "Construction of bodies" section (▷ page 157).



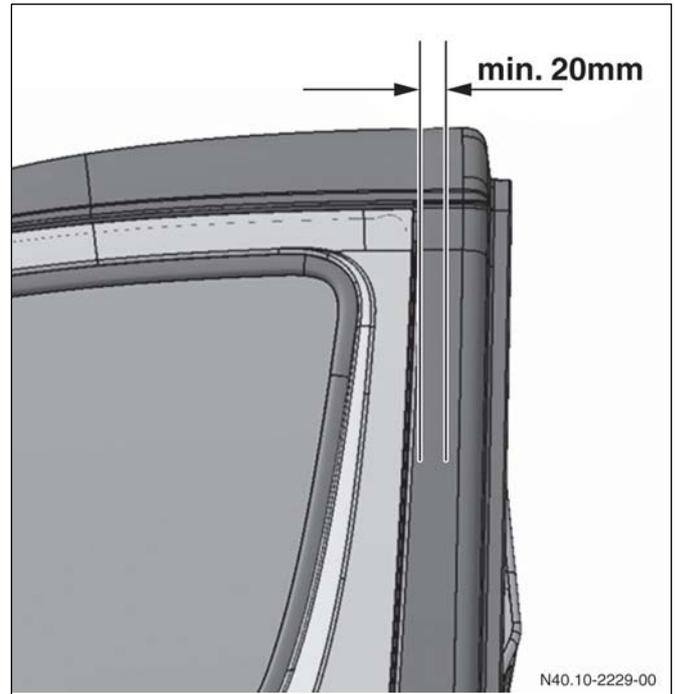
The standard fuel filler cap must not be removed or covered with any "blocking" parts (▷ page 189).



The minimum distance between the cab and a separate body must be > 50 mm.



The minimum distance between the rear edge of the door and an integrated body must be > 20 mm. Otherwise, the rear edge of the door may come into contact with the body in the event of an accident, and in extreme cases the door may be jammed.



Minimum distance between rear edge of door and integrated body

4.9.1 Threshold values of the mounting frame

Required moment of resistance¹ of mounting frame:

Up to maximum standard wheelbase	30 cm ³
Over maximum standard wheelbase	> 34.5 cm ³

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

For further information about mounting frames for tip-pers (▷ see page 184).



Material quality of specified mounting frame made of steel

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

More information is contained in the "Construction of bodies" section (▷ page 157).

4.9.2 Attachment to the frame

- The body must be secured to the basic vehicle by means of body support brackets fitted at the factory or by means of additional body support brackets (▷ page 160).
- The body support brackets must be secured using two bolts for each body support bracket.

5.1 Brake hoses / cables and lines



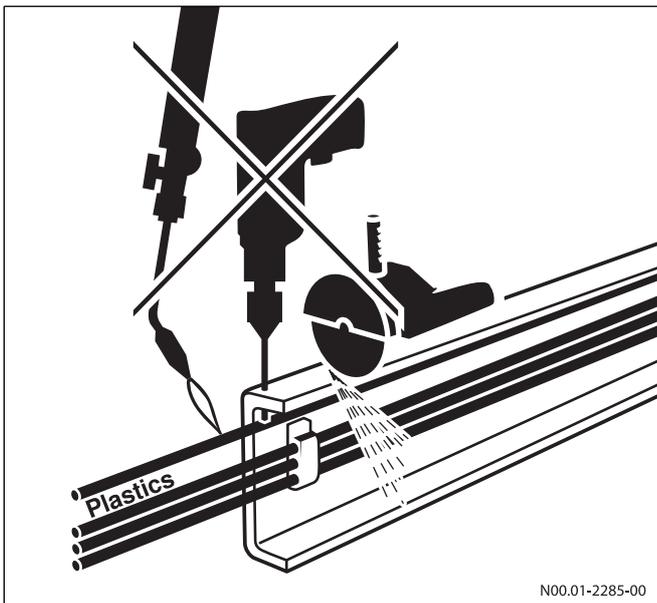
Any work carried out on the vehicle must comply with accident prevention regulations.



Comply with all national regulations and laws.

5.1 Brake hoses / cables and lines

Cover plastic lines and brake hoses before carrying out any welding, drilling and grinding work or before working with cutting discs. If necessary, the plastic lines and brake hoses should be removed.



Test each of the systems for pressure loss and leaks after installing compressed-air lines and hydraulic lines.

No other lines may be attached to brake hoses.

Lines must be protected from heat by means of insulation.

Warning



Work carried out incorrectly on the brake hoses or cables may impair their function. This may lead to the failure of components or parts relevant to safety.



5.2 Welding work

Warning

Welding work that is not performed correctly could lead to failure of components relevant to safety. It would then not be possible to rule out the risk of an accident. For this reason, the following safety precautions must always be observed during any work involving welding:

Warning

Welding in the vicinity of the restraint systems (airbag and belts) can cause these systems to no longer function correctly. Welding is therefore not permitted in the vicinity of the restraint systems.

- Welding work on the chassis may only be carried out by trained personnel.
- Welding work is not permitted on assemblies such as the engine, transmission, axles, etc.
- Disconnect the positive and negative terminals from the battery and cover them.
- Connect the welding-unit earth terminal directly to the part to be welded. Do not connect the earth clamp to assemblies such as the engine, transmission or axles.
- Do not touch electronic component housings (e.g. control modules) and electric lines with the welding electrode or the earth contact clamp of the welding unit.
- Before welding operations in the vicinity of the seat belts, airbag sensors or the airbag control unit, these components must be removed for the duration of the work. You will find important information about handling, transporting and storing airbag units in the "Interior" section (▷ page 124).

- Before welding, cover springs and air bellows to protect them from welding spatter. Do not touch springs with welding electrodes or welding tongs.
- Cover the fuel tank and fuel system (lines, etc.) before carrying out welding work.
- Use only completely dry lime basic jacket electrodes (2.5 mm diameter).
- The maximum current may be 40 A per mm of electrode diameter.
- Weld only with electrodes connected to the positive pole of a direct current source. Always weld from bottom to top.
- MIG welding is permissible.
- Only use welding wires with a thickness of between 1 and 1.2 mm.
- The yield point and tensile strength of the welding material must be at least equal to that of the material to be welded.
- Plug welding is only permissible in the vertical webs of the longitudinal frame member.
- Welds must be ground down and reinforced with angular profiles to prevent notching from welding penetration.
- Avoid welds in bends.
- There must be at least 15 mm between the weld and the outer edges.



You will find further information about welding operations in the "Planning of bodies" (▷ page 31), "Modifications to the basic vehicle" (▷ page 91) and the "Bodyshell" (▷ page 97) sections and in the Mercedes-Benz Workshop Information System (WIS).



5.3 Corrosion protection measures

Surface and anti-corrosion protection measures must be carried out on the areas affected after modifications and installation work have been performed on the vehicle.



Only protective agents tested and approved by DaimlerChrysler AG may be used for any anti-corrosion protection measures performed.

Planning measures

Anti-corrosion protection measures should be included in the planning and design stages by selecting suitable materials and designing components accordingly.

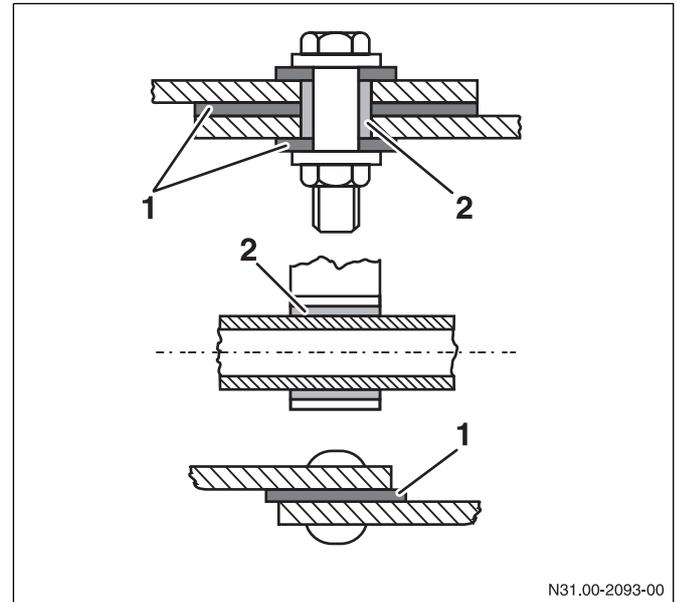


A conductive connection occurs if two different metals are brought into contact with each other through an electrolyte (e.g. air humidity). This causes electrochemical corrosion and the less noble of the two metals is damaged. The further apart the two metals are in the electrochemical potential series, the more intense electrochemical corrosion becomes.

For this reason, electrochemical corrosion must be prevented by insulation or by treating the components accordingly, or it can be minimised by selecting suitable materials.

5.3 Corrosion protection measures

Preventing contact corrosion by means of electrical insulation



N31.00-2093-00

Preventing contact corrosion

- 1 Insulating washer
- 2 Insulating sleeve

Contact corrosion can be prevented by using electrical insulation such as washers, sleeves or bushings.

Avoid welding work on inaccessible cavities.



5.3 Corrosion protection measures

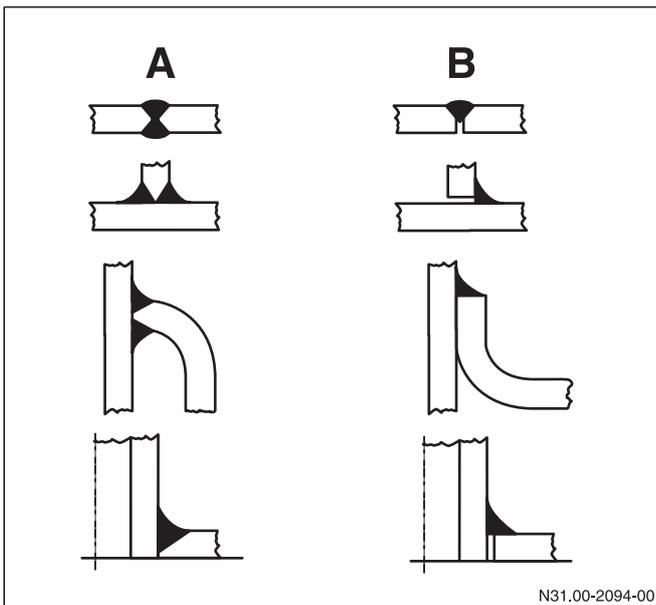
Component design measures

Corrosion can be prevented by design measures, in particular the design of joints between different materials or the same kind of materials:

There is a risk of dirt or humidity accumulating in corners, edges, beads and folds.

Design measures for counteracting corrosion can be implemented using inclined surfaces and drains, and by avoiding gaps in the joints between components.

Gaps inherent in the design of welded connections and how to avoid them



N31.00-2094-00

Examples of types of welded connections

A = correct
(through-welded)

B = incorrect
(gap)

Coating measures

The vehicle can be protected by applying protective coatings (e.g. galvanisation, painting or zinc coating applied by flame) (▷ page 60).

After all work on the vehicle:

- Remove drilling chips.
- Deburr sharp edges.
- Remove any burned paintwork and thoroughly prepare surfaces for painting.
- Prime and paint all unprotected parts.
- Preserve cavities with wax preservative.
- Carry out corrosion protection measures on the underbody and frame parts.

5.4 Painting work

Paintwork damaged by the body manufacturer must be repaired by the body manufacturer.

Observe the following points:

- DaimlerChrysler AG quality standards for initial painting and paintwork repairs must be adhered to.
- Only painting materials tested and approved by DaimlerChrysler AG may be used for any paintwork which may be necessary.
- The body manufacturer must observe the coat thickness for each individual coat as specified by the factory.
- Paint compatibility must be guaranteed when re-painting.



You can obtain information on the paint materials and coat thicknesses used at the factory and Mercedes-Benz paint numbers from any Mercedes-Benz Service Centre.

Mask the following areas before painting:

- Sealing surfaces
- Windows
- Contact areas between wheels and wheel hubs
- Contact areas for wheel nuts
- Vents on transmission, axles, etc.
- Disc brakes
- Door locks
- Door retainers in the rear door hinges
- Contact surfaces on the guide rails for the sliding doors
- Door retainers and opening limiters in the centre guide rails
- Moving parts of the sliding door carriage
- Airbags and seat belts
- Parktronic sensors (▷ see page 87)



To dry the paint, a temperature of 80 °C must not be exceeded because high temperatures can cause damage to the control units and other components.



5.5 Towing and tow-starting

Warning



Before towing or tow-starting, please make sure that you read the "Towing" section in the detailed Operating Instructions. You could otherwise fail to recognise dangers, which could result in injury to yourself or others.



Failure to observe the instructions in the Operating Instructions can result in damage to the vehicle.

5.6 Storing and handing over the vehicle

Storing

To prevent any damage while vehicles are in storage, we recommend that they be serviced and stored in accordance with the manufacturer's specifications (▷ page 36).

Handing over

To prevent damage to the vehicle or to repair any existing damage, we recommend that the vehicle be subjected to a full function check and a complete visual inspection before it is handed over (▷ page 38).

6.1 General information

Risk of accident

Work incorrectly carried out on equipment and its software could prevent this equipment from working correctly. Since the electronic systems are networked, this might also affect systems that have not been modified.

Malfunctions in the electronic systems could seriously jeopardise the operating safety of the vehicle.

Have work on or modifications to electronic components carried out at a qualified specialist workshop which has the necessary expertise and tools to carry out the work required.

Mercedes-Benz recommends that you use a Mercedes-Benz Service Centre for this purpose.

In particular, work on systems relevant to safety must be carried out at a qualified specialist workshop.

Some of the safety systems only function when the engine is running. For this reason, do not switch off the engine when the vehicle is in motion.

- Electrical and electronic components must fulfil the test requirements of ISO 16750.
- Observe the directives on (▷ page 65) when installing additional batteries.
- Cables routed in the vicinity of exhaust systems must be insulated against high temperatures (▷ page 93).
- Cables must be routed in such a way that there are no chafing points (▷ page 93).
- The batteries must be disconnected if the vehicle is not in use for extended periods (more than 20 days). The batteries must have sufficient charge when the vehicle is put into operation again (▷ page 38).
- Observe the Operating Instructions.



You can obtain more information from the department responsible (▷ page 15).



A positive total charge balance must be ensured when additional electrical consumers are installed (▷ page 69).

Do not release or remove the battery terminals when the engine is running.

Rapid-charge the batteries only after disconnecting them from the vehicle's electrical system. Both the positive and negative terminals must be disconnected.



6.2 Electromagnetic compatibility (EMC)

6.2 Electromagnetic compatibility (EMC)

Electromagnetic compatibility describes the ability of an electrical system to act neutrally in the vicinity of other systems when operating at full function. It does not interfere with any of the active systems in the vicinity, nor does it suffer any interference.

Electrical interference occurs in the vehicle electrical circuits because of the various consumers. At Mercedes-Benz, electronic components installed at the factory are checked for their electromagnetic compatibility in the vehicle. If subsequent modifications are made, this may cause discomfort in some cases (e.g. radio noise).

When retrofitting electric or electronic systems, they must be tested for electromagnetic compatibility and this must be documented.

The equipment must possess type approval in accordance with EU Directive 72 / 245 / EEC (as currently amended) and must bear the e mark.

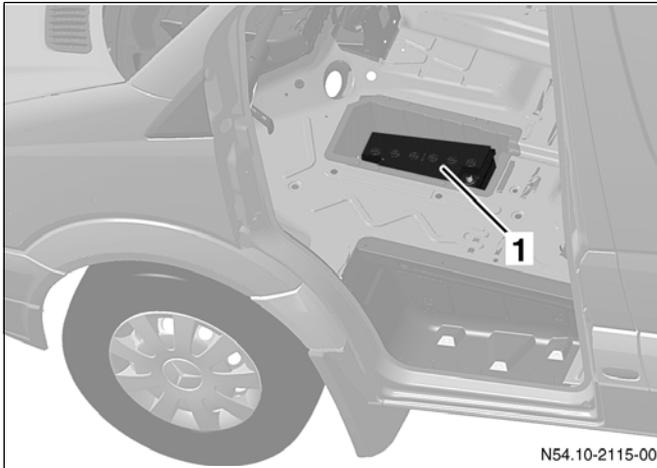
The following standards provide information on this:

- DIN 40839
- DIN 57879, Part 3
- VDE 0879, Part 3
- DC 10613 (EMC vehicle requirements)
- DC 10614 (EMC component requirements)
- EU Directive 72 / 245 / EEC as currently amended



6.3 Battery

The main battery is located in the floor on the left-hand side, to the front of the driver's seat.



Location of the main battery

- 1 Main battery

A moderate current draw requires the use of the reinforced battery (Code EE8, E28 or ED4). An auxiliary battery must be used for a high current draw.

6.3.1 Retrofitting a battery isolating switch

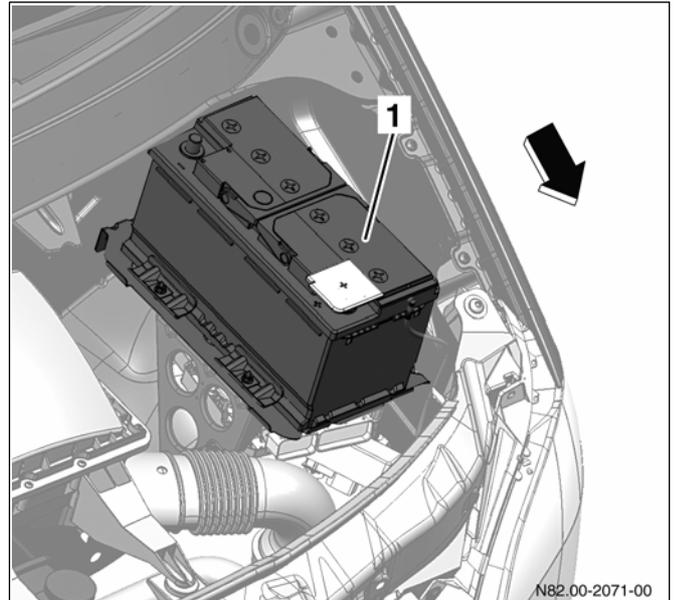
You can obtain more information about optional equipment from your Mercedes-Benz Service Centre, the department responsible (▷ page 15) or in the "Optional equipment" section (▷ page 39).

6.3.2 Retrofitting an additional battery



Capacities >100 Ah must not be connected directly to the vehicle's electrical system because this could cause damage to the basic vehicle.

We recommend the use of lead-antimony batteries fitted in the location provided in the engine compartment.



Location of the auxiliary battery

- 1 Auxiliary battery
Arrow Front of vehicle

If the auxiliary battery is located in the passenger compartment, battery gases must be vented to the outside via a central vent hose.

The auxiliary battery must only be fitted in conjunction with a cut-off relay and fuses suitable for the charge current.

The auxiliary battery may only be used to power auxiliary consumers such as the auxiliary heating, loading aids or electrical equipment in motor caravans (fridge, etc.).

If the vehicle is already equipped with an auxiliary battery, it is not permitted to connect any more auxiliary batteries in parallel.



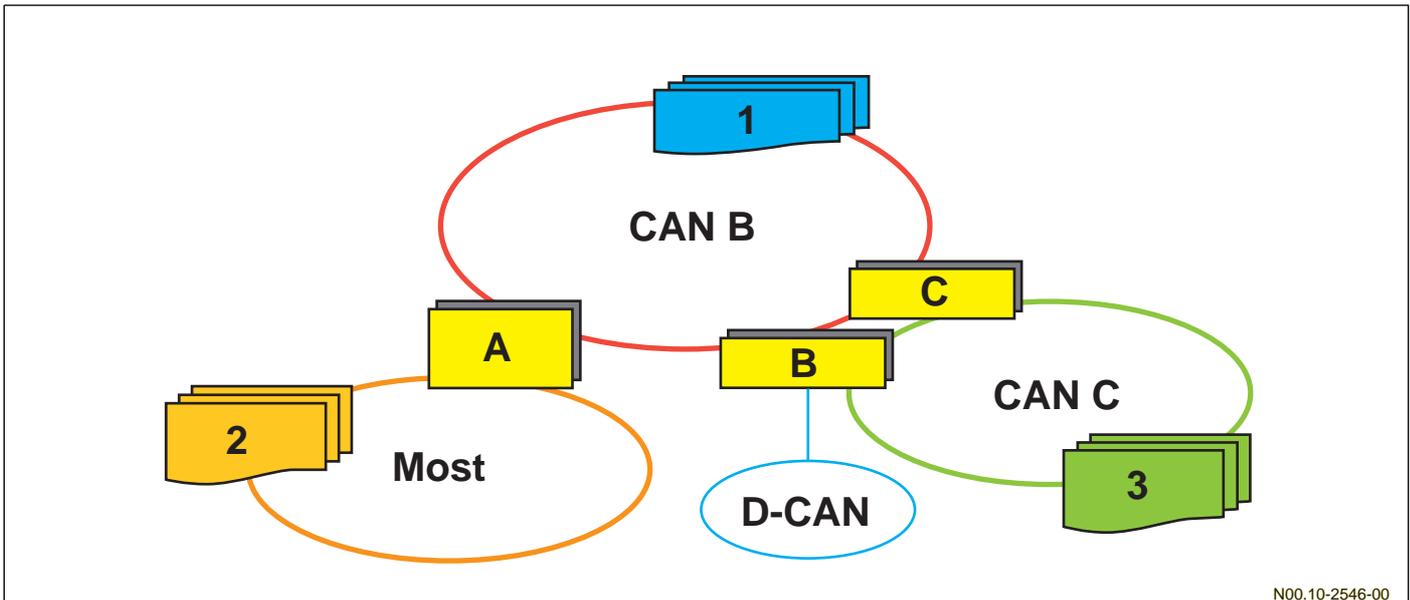
6.3.3 Battery maintenance and storage

Batteries must be checked regularly for voltage loss (self-discharge) even when removed. Only the electrolyte level check is not required with low-maintenance batteries.

You will find information on battery maintenance and storage in the "Planning of bodies" section (▷ page 38).

6.4 Interfaces

6.4.1 CAN bus and networking



1	2	3
I-CAN = interior CAN (CAN B, 83.333 kBit/s)	MOST = optical bus	M-CAN = engine CAN (CAN C, 500 kBit/s) D-CAN = diagnostics CAN (500 kBit/s)
Tyre pressure monitor ₁	CD changer ₁	Brake system
Electronic restraint system	Telephone ₁	Jacket tube module
Overhead control panel ₁		Electronic selector lever module ₁
Signal acquisition and actuation module		Transmission control unit ₁
Door control unit		Engine control unit
Electric sliding door, left/right ₁		Sensor cluster Ax/ Ay/wz
Fuel-fired heater booster ₁		Diagnostics interface
Keyless Entry ₁		Tachograph ₁
Upper control panel		Reduction control unit ₁
Trailer control unit ₁		Automatic headlamp range control ₁
Parktronic ₁		
Programmable special module ₁		
Air-conditioning control ₁		
PTC heater booster ₁		
Auxiliary heating, water ₁		

- ₁ Optional equipment
- A Headunit / radio, interface between I-CAN and MOST
- B Electronic ignition switch, interface between I-CAN and M-CAN
- C Instrument cluster, interface between I-CAN and M-CAN

Risk of accident

As all consumers are networked and internally monitored, no modifications should be made to the CAN bus (e.g. breaking, extending or tapping). Any modifications to the length, cross-section or resistance of the wiring harness can lead to failure of safety-relevant components or to impaired comfort.

Internal and external vehicle diagnosis can be carried out by means of the OBD diagnostic socket (SAE 1962). All control units are capable of self-diagnosis and have an internal malfunction memory.

Communication with the relevant control unit can be established using the STAR DIAGNOSIS tester and the software developed for this unit.



You can obtain more information from a Mercedes-Benz Service Centre.

6.4.2 Electric wiring/fuses

If the routing has to be altered, avoid routing across sharp edges and through narrow cavities or near moving components.

Only lead-free PVC-sheathed cables with an insulation limit temperature of ≥ 105 °C may be used. Connections must be made professionally and water-tight.

The line must be dimensioned in accordance with the current intensity drawn and protected with fuses.

The following table applies to cables with an insulating limit temperature of ≥ 105 °C

Max. permanent current [A]	Fuse rating [A]	Conductor cross-section [mm ²]
0 – 4.9	5 ¹	0.5
5 – 9.9	10 ¹	1
10 – 18	20 ¹	2.5
19 – 28	30 ¹	4
29 – 35	40 ²	6
36 – 48	50 ²	10
49 – 69	70 ²	16
70 – 98	100	25
99 – 123	125	35
124 – 148	150	50

¹ Shape C; DIN 72581 blade connector

² Shape E; DIN 72581 blade connector

6.4.3 Lengthening of cables

If cables are lengthened (e.g. in connection with a wheel-base extension), cables of the same or a greater cross-section must be used. We recommend the use of cables that conform with DIN 72551 or ISO 6722-3. The protective effect of fuses must not be impaired.

All connections must be made professionally and water-tight in accordance with IP 69k (resistant to high-pressure cleaning).

Cables to the ABS sensors on the rear axle may be lengthened by no more than 2.7 m. The cables to each sensor must be twisted with a loop length of 40 ... 58 mm.

6.4.4 Additional power circuits

If additional power circuits are installed, they must be protected against the main power circuit by fuses of adequate rating.

The dimensions of the wiring used must be adequate for the load and the wiring must be protected against the effects of tear, impact and heat.



6.4.5 Control switches

Depending on the vehicle's equipment, up to eight switch positions are available in total for additional special-purpose bodies and equipment. Code L72 includes a "non-MB body electrics" switch.

6.4.6 Retrofitting electrical equipment

Please observe the following if auxiliary electrical consumers are retrofitted:

- Alternators with LIN technology approved by DaimlerChrysler AG must be used for high current draw requirements.
- Do not connect additional alternators to the on-board network.
- Do not connect additional consumers to fuses already assigned.
- Do not connect additional wires (e.g. with insulation piercing devices) to existing wires.
- Provide consumers with adequate protection by means of additional fuses.

All equipment fitted must be tested in accordance with EU Directive 72 / 245 / EEC and must bear the e mark.

Additional electrical consumers must be connected by means of the terminal strip for auxiliary consumers (Code EK 1) available from the factory as described in the "Power supply interfaces" section (▷ page 71).



If the vehicle's electrics / electronics are modified or additional equipment is installed incorrectly, this may impair operating safety, cause damage to the vehicle's electrics or the complete vehicle, and invalidate the vehicle's warranty / operating permit.

6.4.7 Retrofitting an alternator

If additional electrical consumers are retrofitted, the increased power requirement can be met by fitting higher-rated alternators.

The following alternators are available as optional equipment (option codes) from the factory:

Code	U [V]	I [A]
	14.3	90
M 39	14.3	150
M 49	14.3	180
M 46	14.3	220

If additional equipment is fitted, factory-fitted power take-offs must be used (▷ page 136).

For retrofitting alternators, we recommend N62 versions available from the factory as optional equipment.

The following points must be observed if you intend to have other alternators retrofitted:

- On no account should the installation of an alternator impair vehicle parts or their function.
- The battery must have sufficient capacity and the alternator (▷ page 69) must generate sufficient power.
- The alternator circuit must be provided with additional fuse protection (▷ page 68).
- The additional pulley, Code N63, is available from the factory as optional equipment for driving air-conditioning compressors.
- Electrical lines must be routed correctly (▷ page 68).
- There must be no impairment of the accessibility or easy maintenance of installed equipment.
- There must be no impairment of the required engine air supply and cooling (▷ page 119).



- The guidelines of the equipment manufacturer for compatibility with the basic vehicle must be observed.
- The operating instructions and the maintenance manual for the additional equipment must be supplied on handing over the vehicle.

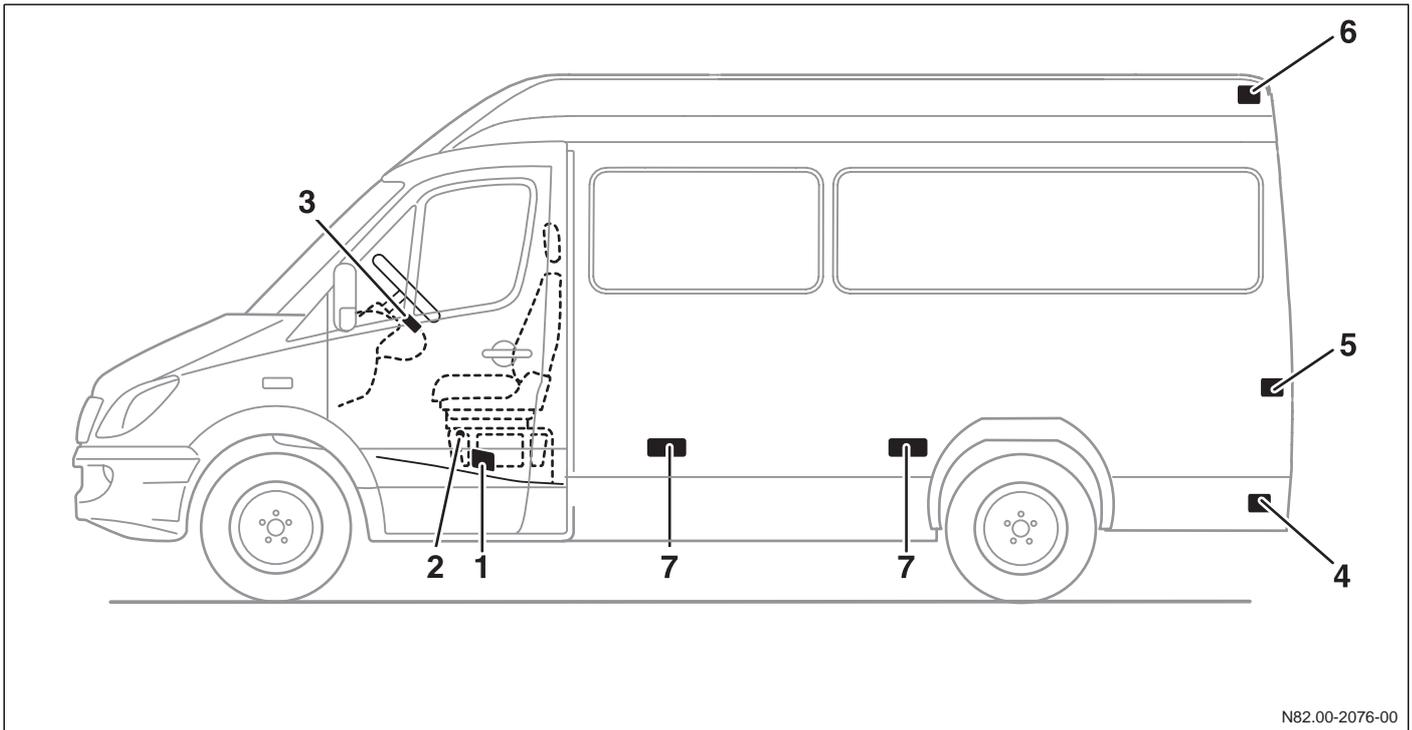
6.4.8 Power supply

Additional electrical consumers must be connected using an auxiliary electrical consumer terminal strip available from the factory (Code EK1). The terminal strip is installed inside the driver's seat base (at the front, on the right-hand side of the vehicle) and has three terminals:

1st terminal D+	12 V/10 A
2nd terminal 30	12 V/25 A
3rd terminal 15	12 V/15 A

You can obtain more information about optional equipment from your Mercedes-Benz Service Centre, the department responsible (▷ page 15) or in the "Optional equipment" section (▷ page 39).

The electrical interfaces available as optional equipment on the vehicle are depicted in the illustration below:



N82.00-2076-00

	Code	Description
1	EK1	Terminal strip for the electrical connection on the driver's seat base
2	E46	12 V socket in the cab (maximum rating: 15 A); position: driver's seat base
3	L72	Electrics for body interior lighting, 3-pin junction in the left-hand seat base, switch on the dashboard

	Code	Description
4	E57	Electrics for trailer power socket
5	L76	Extended tail lamps wiring harness (2 m)
6	L77	Additional electrical equipment for turn signal lamps
7	LB2	Provision for side marker lamps

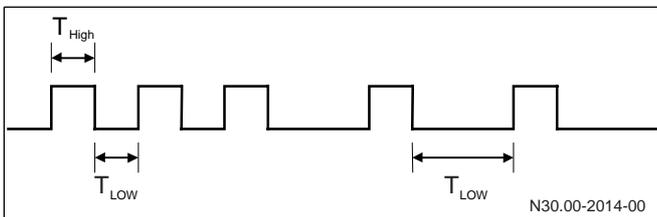
6.4.9 Speed signal

The "Highline" and "Lowline" instrument clusters output an electronic speed signal at pin 9 of the instrument cluster connector.

The speed signal (positive to earth) acts as a distance and speed signal for external electronics, e.g. taximeters or speed-dependent volume controllers. The signal is protected against short-circuit to earth and battery voltage and is not monitored.

The signal is output at 4 pulses per metre. The pulse width is 4 ms.

At 112.5 km/h, the pulse duration is the same as the pulse pause. This 1:1 ratio is maintained for higher speeds. This means that, at higher speeds, the pulse length and the pause length become shorter at the same time.



Ratio of pulse duration / pulse pause

Speed signal ($I_{\max} = 20 \text{ mA}$):

$$T_{\text{High}} U_a \geq 8 \text{ V}$$

$$T_{\text{Low}} U_a \leq 1 \text{ V}$$

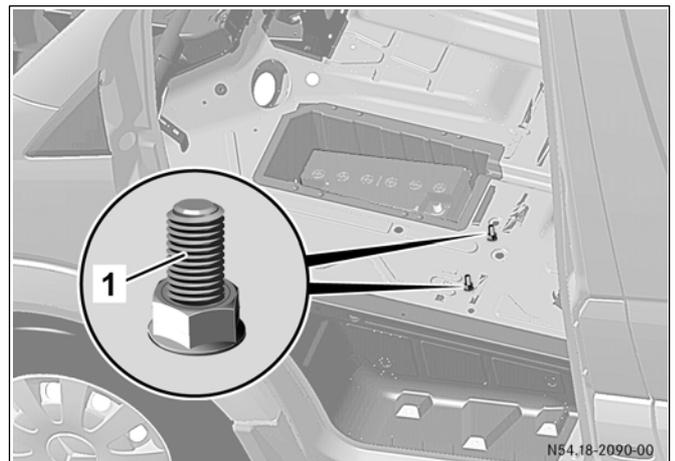
6.4.10 Earth bolts

The earth bolts provided by DaimlerChrysler AG for retrofitting electrical attachments or installations must be used to ensure the optimum earth connection with the basic vehicle.

There are two M6 earth bolts in the seat base of the co-driver's seat; there is a further M6 earth bolt on the underside of the vehicle on the cross member to the front of the rear axle.

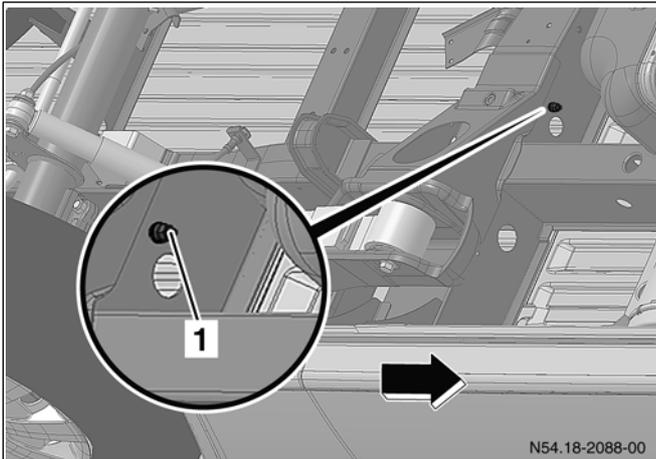
- No more than 4 cable shoes may be screwed onto one earth bolt.
- The nuts must be tightened to a torque of 6 Nm.
- The use of any other earth bolts may lead to malfunctions in safety systems.
- On low frames, the frame beyond the B-pillar to the rear must no longer be used as an earth return.
- The earth bolts of the safety systems must not be used for bodies.

For other requirements, please consult the department responsible (▷ page 15).



Cab earth connection, co-driver's seat bodyshell

- 1 Earth bolt connection



Frame earth connection (3.5 t to the front of the rear axle)

1 Earth bolt connection

Arrow Front of vehicle

6.5 Lighting

6.5.1 Adjusting the headlamps

National regulations shall apply.

The headlamp basic setting must be observed (see vehicle identification plate).

Only check the headlamp setting with the vehicle unladen (ready to drive – full tank and with one driver or 75 kg load).

- Park the vehicle on a level, horizontal surface.
- Align the headlamp beam adjuster and the vehicle at right angles to each other.
- Correct the tyre pressures (refer to the tyre pressure table).
- Move the headlamp range control to the basic setting "0".
- Switch on the headlamps.
- Check each headlamp separately; when doing so, cover the other headlamp and lights.

The light-dark boundary of the dipped-beam headlamp at a distance of 10 m can be calculated from the height of the headlamp (centre of headlamp to ground) minus the specified headlamp basic setting.

Bi-xenon headlamp basic setting

The basic setting on vehicles with bi-xenon headlamps must be adjusted by a Mercedes-Benz Service Centre using STAR DIAGNOSIS.

Headlamp basic setting:

1% = 10 cm, 1.5% = 15 cm, 2% = 20 cm

etc.

Risk of injury



There is a risk of fatal injuries from the high voltage in the xenon headlamps. Do not touch any components under high voltage. On no account may persons with electronic implants (e.g. pacemakers) carry out any work on xenon headlamps.

6.5.2 Fitting additional lamps

National regulations shall apply.

If moving vehicle parts cover lighting equipment by more than 50% during operation, the vehicle must be safeguarded accordingly.

An appropriate note must be attached at a point where it can easily be seen by the driver of the vehicle.

6.5.3 Tail lamps

National regulations apply to all lamp and turn signal units.

The following optional equipment is available from the factory as option codes to carry out retrofitted modifications to the vehicle tail lamps.

Code	Optional equipment designation	Description / function
L90	Omission of tail lamps	Possible to retrofit other lamps and turn signal units; the connections and wiring harnesses are retained.
L76	Tail lamp wiring harness lengthened	The lengthened tail lamp wiring (approx. 2 m) acts as provision for retrofitting tail lamps in a different location.

Code	Optional equipment designation	Description/function
L77	Additional electrical equipment for turn signal lamps	On chassis with cab and crewcab, the additional wiring at the vehicle rear end is provided for additional turn signal lamps on the body.

6.5.4 Marker lamps

Side marker lamps

To increase passive safety, all complete vehicles with a total length of over six metres must be equipped with side marker lamps in compliance with EU Directive 76/756/EEC.

Chassis with cab and crewcab can be equipped at the factory with the optional equipment "Provision for side marker lamps" (Code LB2).

Vehicle perimeter lamps / front perimeter lamps

Perimeter lamps increase passive safety and are required by law on vehicles with a width of over 2.10 m. They may be attached on vehicles from a width of 1.80 m. (Section 51 b, Para 2, StVZO (German Road Traffic Licensing Regulations)).

The "Perimeter lamps" option is available from the factory (Code L07).

6.5.5 Exterior lamps



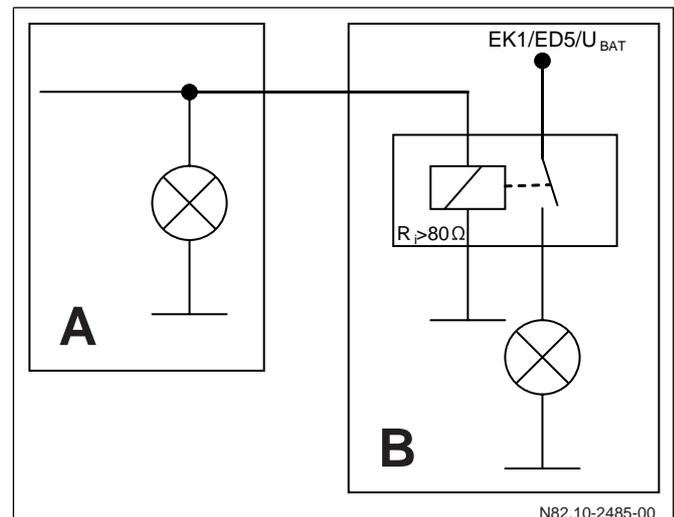
In order to ensure that the standard bulb failure monitor functions correctly, only bulbs of the same type and same output rating as standard bulbs (▷ see page 236) may be installed.

Lamp monitoring

The signal acquisition and actuation module (SAM) monitors all outputs for open load (wire break) and short circuit. If a lamp is not connected or is overloaded, a fault entry is stored in the memory of the SAM control unit. The vehicle owner or the driver must be informed. It is recommended that an entry be made in the Service Booklet. The fault entry must be addressed during a service if read using STAR DIAGNOSIS.

Additional lamps

Additional lamps must be connected via the PSM or a separate cubic relay. A standard cubic relay ($R_i > 80 \text{ Ohms}$) can optionally be connected in parallel with the exterior lamps (with the exception of the third brake lamp, turn signals, licence plate illumination, side markers and perimeter lamps). This will not have any negative effect on lamp monitoring.



Connection of an additional lamp

- A Scope of the basic vehicle
- B Scope of the body manufacturer





A warning buzzer can be optionally connected in parallel with the reversing lamps. The current rating of the warning buzzer must be no more than 300 mA. We recommend the use of a warning buzzer with piezo technology.



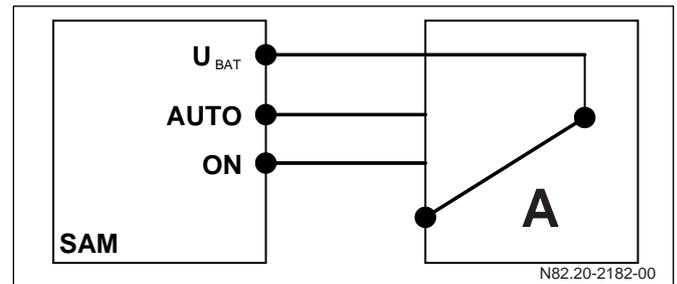
The third brake lamp is an LED with a rating of approximately 1.8 W and cannot be replaced by a filament bulb.

6.5.6 Interior lamps

All interior lamps can be replaced by other body-manufacturer-specific lamps. The interior lamps are operated via read-back switches networked by the SAM (signal acquisition and actuation module).

The system is only monitored for short circuits maximum load 80 W. The lights are dimmed as standard. Dimming must be deactivated in the SAM if fluorescent lighting or load relief relays are used. This is achieved by means of the "Working lamps" option (Code L63).

The read-back switch must always be connected to the SAM, otherwise the interior lamps cannot function.



Read-back switch switching principle

U_{BAT} Interior lighting power supply (+ 12 V)

AUTO Lighting controlled by SAM, e.g. when door opened

ON Interior lamp permanently lit

A Read-back switch (interior lighting)

6.5.7 Rain-light sensor

It is only permitted to fit the rain-light sensor (Code JA5) in conjunction with the standard / optional WSS variants provided. There is otherwise a risk of malfunction.

The overhead control panel (DBE) must also be fitted (contains the interface).



6.6 Mobile communications systems

6.6 Mobile communications systems

If mobile communication systems (e.g. telephone, CB radio) are retrofitted (▷ page 50), the following requirements must be fulfilled in order to avoid malfunctions developing on the vehicle at a later stage:

- All electronic equipment fitted requires type approval in accordance with EU Directive 72 / 245 / EEC and must bear the e mark.
- The ring-shaped MOST network uses a fibre-optic cable as a data carrier for transferring audio and control signals. This system supports the synchronous transfer of data at high baud rates, is insensitive to electromagnetic interference (EMC), does not itself cause electromagnetic interference and can transfer both audio and control data simultaneously. The system is available with the ignition OFF and is activated by a separate wake-up line.



The fibre-optic cable must not be kinked. The minimum bending radius is 25 mm.

6.6.1 Equipment

- The maximum transmission output must not be exceeded.

Waveband	Maximum transmission output [W]
Short wave < 50 MHz	100
4 m band	20
2 m band	50
70 cm band	35
25 cm band	10

- The mobile communications systems and brackets must not be positioned in the deployment area of the airbags (▷ page 128).

- The equipment must be permanently installed. Mobile devices may only be operated inside the cab if they are connected to an exterior aerial which has been installed in such a manner that it is reflection-free.
- The transmitter unit must be installed as far away from the vehicle's electronic system as possible.
- The equipment must be protected from humidity and severe mechanical vibrations; the permissible operating temperature must be observed.

6.6.2 Connecting and routing the wiring for the aerial (radio)

- Comply with manufacturer's notes and installation instructions.
- An aerial can be installed anywhere on the vehicle roof. The maximum transmission output must not be exceeded.
- The connection should be made directly to terminal 30 via an additional fuse. Disconnect the unit from the electrical system before jump-starting.
- The wiring routes must be kept as short as possible. The wires must be twisted and screened (coaxial cable). Chafing points must be avoided.
- Ensure that the system has a good earth connection to the body (aerial and equipment).
- The aerial and connecting cables between the transmitter, receiver and operating panel must be routed separately from the vehicle wiring harness in the vicinity of the body earth.
- Route the aerial cable in such a way that it is not kinked or pinched.
- Comply with regulations on the transport of hazardous goods (GGVS: German Law on the Road Transport of Hazardous Goods), and ADR (European Agreement concerning the International Carriage of Dangerous Goods by Road).



6.7 Electronic ignition switch (EIS)

6.7 Electronic ignition switch (EIS)

6.7.1 General information

- The processes involved in the access authorisation for the central locking (ZV) are verified and controlled by the signal acquisition and actuation module (SAM) and the door control unit (TF).
- When the key is inserted, infrared communication with the remote control key is achieved by inductive energy transmission.
- When the remote control values are transmitted to the drive authorisation system III (FBS III), the electronic steering lock (ELV) and the engine control unit are released.
- When the remote control key is removed, the ELV is locked if the last recorded speed signal was ≤ 3 km/h and the key is withdrawn by at least 4 mm. If the last speed signal received was ≥ 3 km/h, locking does not occur until the door locking switch reports the driver's door open for longer than 1 second.
- The remote control key activates the individual terminals (15, 15R) depending on the position in the ignition lock to which it is turned.
- The remote control key is mechanically locked when turned.
- If key identification is unsuccessful (invalid key), the lifting solenoid in the electronic ignition switch prevents the remote control key from turning.
- If key identification is successful, the memory functions are assigned.
- The electronic ignition switch acts as an interface (gateway) between the interior CAN (CAN B) and the engine compartment CAN (CAN C) for data exchange between the two bus systems.
- The diagnostics CAN acts as a central diagnostics interface with all control units with diagnostics capability.
- An HF receiver is integrated.

- Where control units are networked, the electronic ignition switch sends global information such as the model series and the country variant to the CAN-B and CAN-C control units (global variant coding) on the network.

6.7.2 Central locking / rescue vehicle fittings

To guarantee faultless operation, it is only permitted to use central locking elements supplied by Mercedes-Benz. If these cannot be used, please consult the department responsible (▷ page 15) for further information.

By means of EZS variant coding, the doors can be programmed to be present or not present.

Activating automatic locking using STAR DIAGNOSIS

- Speed (adjustable, default 15 km/h)
- Ignition ON
- Automatic locking when last open door is closed (post function)

Deactivating automatic unlocking using STAR DIAGNOSIS

On emergency vehicles it is possible to deactivate automatic central unlocking. This is a function that can be set by means of variant coding in the EIS using STAR DIAGNOSIS. You can obtain further information from the department responsible (▷ page 15).

Rescue vehicle fittings

The settings required for rescue vehicles, e.g. passive circuits for rear-door and sliding-door actuators, can be carried out using STAR DIAGNOSIS using the following settings:

- Right-hand sliding door "not present"
- Left-hand sliding door "not present"
- Rear door "not present"
- Common enable for control circuits 1 and 2
- Co-driver's door "not present"



Keyless entry

Key localisation and recognition is supported by five or six LF aerials and one HF aerial. Operation of these aerials must not be impaired by modifications to the body.

Installation location of the HF aerial

- Driver's door B-pillar, belt sash guide level

Installation location of the LF aerials

- One or two aerials in the load compartment roof for load compartment monitoring, position may differ depending on the body
- Two aerials in the driver's / co-driver's door for cab monitoring
- Two aerials in the sliding door or sidewall for monitoring the outside of the vehicle



Operation of the LF aerials is affected by changes in the amount of metal in their vicinity (within an approximate radius of 30 cm).



6.8 Windows and doors

6.8.1 Power windows / window hinges

The gearing ratio for heavier windows must be adjusted to ensure that the motor draws the same electrical power.

The time required to open / close the windows must not exceed 10 seconds. The motor is thermally protected, i.e. the availability of the power window function may be restricted after long operating periods.

The power windows and the window hinges can only be controlled using the door control panel. The switches are voltage coded and must only be replaced with equivalent genuine parts.

6.8.2 Load compartment sliding door

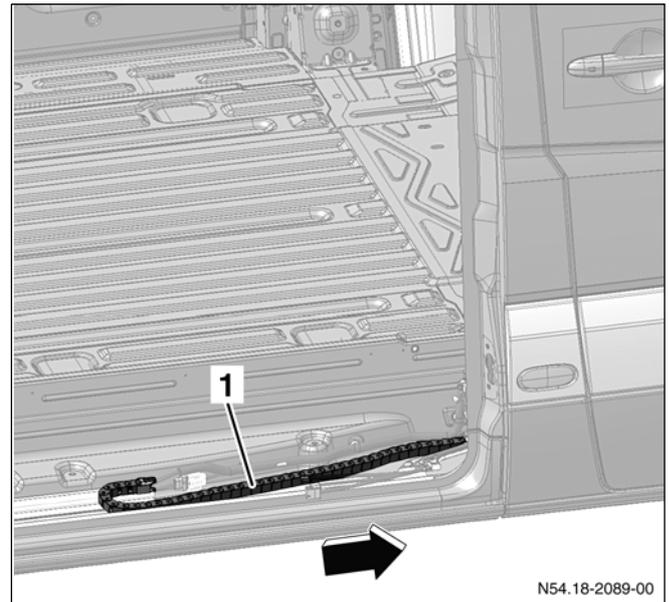
The electrical components of the load compartment sliding door of the Sprinter – model series 906 are connected to the on-board electrical system via a fixed electrical connection in the form of a cable track (drag chain), located under the step for the load compartment sliding door.

The cable track must be taken into consideration in the event of any modifications around the doorway. The cable track can be used for the requirements of the body manufacturer following consultation with the department responsible (▷ page 15).

The system for the electric load compartment sliding door has been designed for a maximum door weight of 65 kg. On no account should modifications be made to the door kinematics or the locks, rails, carriages, closing aids and trap guard strips.



Correct operation of the integrated trap guard (trap guard strip and path / time monitoring) must be ensured in the event of any modifications in this area, e.g. the window installation.



Load compartment sliding door with energy chain

- 1 Cable track (drag chain)
Arrow Front of vehicle

6.8.3 Sliding sunroof

A Mercedes-Benz sliding sunroof can only be fitted in conjunction with an overhead control panel (DBE). The length of the wiring harness between the sliding sunroof motor and the DBE must not be more than 6 m.

6.8.4 Windscreen wipers

We recommend the use of genuine Mercedes-Benz wiper motors.

If necessary, a second wiper motor can be connected via a load relief relay ($R_i > 80 \text{ Ohms}$).

The wiper motor must be connected to the signal acquisition and actuation module (SAM) by means of a read-back line. If only one wiper motor is connected, the SAM stores a fault in the malfunction memory.



6.8.5 Exterior mirrors

The output of the mirror heater (12 V / 20 W) is monitored by the door control unit. The mirror heating is deactivated if a fault entry is stored.

The door control unit must be modified if different mirrors without a heater or with a different heater are used.

The mirror adjustment is load switched and can be routed if required.

6.8.6 Windscreen heating / rear window heating

The original heaters can be replaced with heaters with the same power rating:

- Windscreen heating $P = 942 \text{ W} \pm 15\%$ at 13 V
- Rear window heating $P = 2 \times 151 \text{ W} \pm 15 \text{ W}$ at 13.5 V

If higher heat outputs are required, the relays, lines and fuses must be modified accordingly.



6.9 Electronic Stability Program (ESP)

6.9 Electronic Stability Program (ESP)

ESP is a dynamic vehicle control system which controls both dynamic directional and transverse forces acting on the vehicle.

Greater driving stability is provided by ESP with an extended sensor system that constantly compares the current actual vehicle direction with the desired direction of movement.

ESP improves vehicle stability in all driving situations, e.g. when accelerating, braking and freewheeling, when driving in a straight line and cornering.

Together with the signals of other sensors, a processor monitors that the direction specified by the driver is maintained.

If the vehicle deviates from the correct path (oversteering or understeering), the system produces a stabilising counteraction by applying the brakes on individual wheels.

Risk of accident

On no account may any of the following modifications be made to vehicles equipped with ESP:

- Modifications to the permissible gross vehicle weight
- Modifications to the wheelbase
- Modifications to the sensors (steering angle sensor, yaw rate sensor, wheel rotational speed sensor)
- Changes to the vibration characteristics at the installation location of the yaw rate sensor by modifications to the body
- Changes to the position of components
- Modifications to the suspension
- Modifications to wheels and tyres
- Modifications to the engine
- Modifications to the steering system
- Modifications to the brake system
- Conversion to a semitrailer tractor vehicle

Modifications to vehicles with ESP may cause this system to stop functioning correctly and may lead to system shutdowns and incorrect control interventions. The driver could lose control of the vehicle and cause an accident.



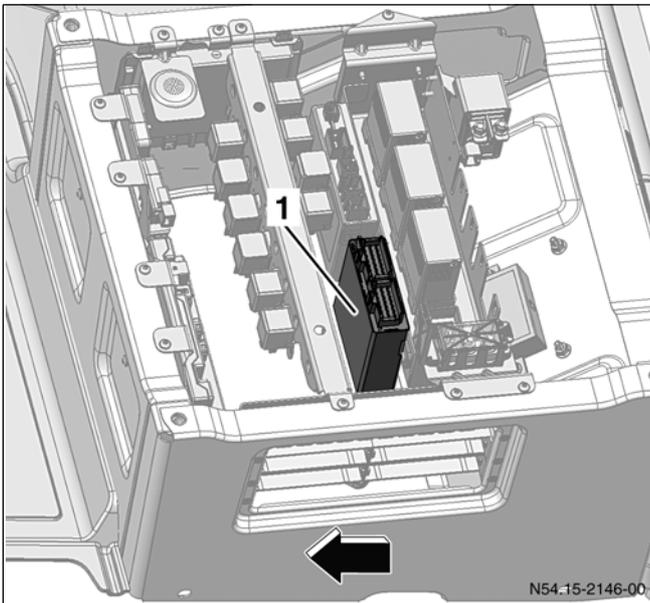
6.10 Programmable special module (PSM)

6.10 Programmable special module (PSM)

The term "networking" refers to the interaction between different control units. These individual components are not linked by means of analogue connections but digitally by means of several networks:

- Two high-speed Controller Area Networks (HS CAN and engine CAN)
- One diagnostics CAN
- One low speed CAN (interior CAN)
- One digital, optical bus (MOST)

All subscribing control units can read the messages sent on the CAN bus and are programmed to support the CAN language, or CAN protocol. The PSM was developed to give body manufacturers access to individual types of CAN bus data. The PSM is available under Code ED5.



Location of the PSM

- 1 PSM with cable connector in driver's seat cushion
- Arrow Front of vehicle

The PSM is able to read the messages of the various bus data and then, for example, translate them into switching signals at the outputs provided ("high" or "low") or

PWM signals (pulse width modulation) or forward them to a specific body manufacturer CAN (conforming to ISO11992-3). The electronics installed by the body manufacturer then have access to the necessary signals.

The PSM provides a clearly defined, diagnostics-compatible and EMC-tested interface between the vehicle and the body.

Customer-specific requirements may be special inputs, such as an external engine start and stop, or special outputs, such as pulse pause modulated engine speed or CAN-bus-compatible control units in bodies or trailers.



The cabling on the vehicle must not be tampered with, as this would lead to fault messages from the other control units on the CAN bus.

The PSM is connected to the vehicle network via the LS-CAN bus and therefore has access to all messages sent by the linked control units (e.g. idle contact active, parking brake active, speed C3, engine speed). In contrast, individual signals can be monitored or generated at analogue and digital inputs and outputs.

Example:

- The engine control unit sends the engine speed in a message, which can be read by the PSM. The PSM converts the engine speed information into a PPM signal and makes this available at an output.
- In the opposite direction, the PSM can convert the position of a hand throttle into an HS CAN message and thus request the desired engine speed of the engine.

6.10 Programmable special module (PSM)

The parameters of the PSM are programmed using STAR DIAGNOSIS. Information about this can be obtained from your Mercedes-Benz Service centre or the relevant department:

Name:	August Schlagbauer
Dept.:	GSP / TIM
Tele-phone:	+49 (0)711-17-83170
Fax:	+49 (0)711-17-40082
E-mail:	August.Schlagbauer@DaimlerChrysler.com



When writing a standard coding (retarder for example), all previous parameters are deleted. We recommend backing up data beforehand.

For more information about the PSM (▷ see page 235).

6.10.1 PSM functions

To read in data from the ICAN:

- Vehicle status
 - ▶ Terminal 15
 - ▶ Terminal 61
 - ▶ Secure from the outside, ...
- Light status
 - ▶ LDS and LSS requirements (e.g. main-beam headlamps, turn signals, dipped-beam headlamps, front foglamps, ...)
 - ▶ Hazard warning lamps OBF
- Window status
 - ▶ Windscreen and rear window wipers
 - ▶ Windscreen heating and rear window heating
- Central locking
 - ▶ Doors open / closed, unlocked / locked

- Engine CAN information
 - ▶ Wheel rotation speed
 - ▶ Road speed
 - ▶ Engine speed, ...
 - ▶ Cruise control operation
 - ▶ Brakes applied, ...
 - ▶ Transmission
 - ▶ Clutch information
 - ▶ Steering angle, ...
 - ▶ Tachograph information in accordance with the FMS-Standard
- Equipment attributes
 - ▶ Door installation
 - ▶ Sliding sunroof
 - ▶ Transmission, ...

Output on ICAN

- Light control
 - ▶ Parking lamps
 - ▶ Side lamps
 - ▶ Turn signals
 - ▶ Main-beam headlamps, ...
- Alarm functions
 - ▶ Alarm-triggered flashing of main-beam headlamps
 - ▶ Front foglamps
 - ▶ Warning flashers
 - ▶ Horn
- Sliding sunroof
 - ▶ Opening and closing of the sliding sunroof at the rear
- Central locking function
 - ▶ Lock / unlock front, load compartment and entire vehicle



6.10 Programmable special module (PSM)

- Windscreen and rear window
 - ▶ Windscreen wipers and rear window wiper
 - ▶ Windscreen heating and rear window heating
- Miscellaneous functions
 - ▶ Control buzzer (in the MPV) and interior lighting
 - ▶ Charging active
 - ▶ Retarder operation
- Warning signals
 - ▶ PSM defective
 - ▶ Undervoltage

6.10.2 Mini-SPS

The mini-SPS (mini memory-programmable control unit) is a module with freely programmable and freely interconnectable function blocks for creating any signal links that may be required:

- 16 AND / NAND / OR / EXOR / NOR / EXNOR
- 8 RS and D flip-flops
- 4 retriggerable / non-retriggerable timer stages
- 4 hysteresis links with adjustable thresholds
- 4 threshold value switches with 3 stages
- 4 counters

These body / equipment mounting directives cannot describe in full the wide variety of capabilities of the PSM.



You can obtain more information from the department responsible (▷ page 15).

6.11 Signal acquisition and actuation module (SAM)

The power circuit on the Sprinter – model series 906 comprises the signal acquisition and actuation module (SAM) in conjunction with a fuse and relay block (SRB). This power circuit supplies the systems and control units with power, depending on the function sequence. Requirements are sent to the SAM either on the CAN or via directly read switches and sensors. The fuses on the fuse and relay blocks also provide protection for individual components.

You will find information about other functions in the "Technical details" section (▷ page 235).



6.12 Tyre pressure monitoring system

6.12 Tyre pressure monitoring system

Risk of accident

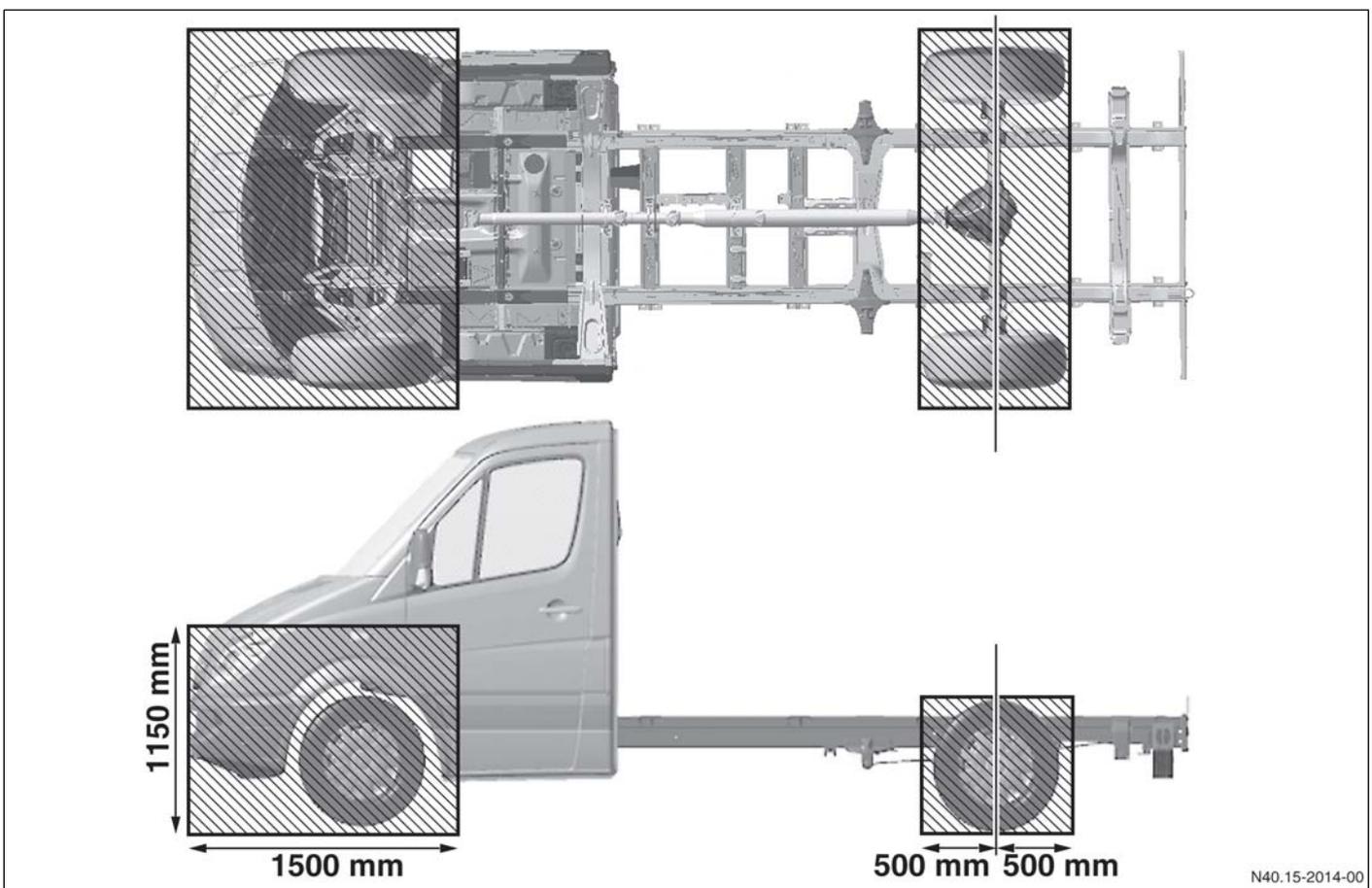
Do not carry out any modifications in the grey-shaded area of the vehicle substructure (see illustration). Otherwise, the function of the tyre pressure monitoring system may be compromised by the effects of reflections. This might result in the driver being unaware of any tyre pressure loss, and he could cause an accident. Furthermore, the vehicle may no longer meet licensing requirements.

The antenna position for the front axle is in the front of the engine compartment on the right-hand longitudinal member near the jack take-up bracket and behind the right-hand headlamp on the inside of the A-pillar.

The antenna position for the rear axle is to the rear on the underbody between the wheels (panel van and MPV) or on the left-hand longitudinal member near the axle (cab and crewcab). On low frame vehicles, the antennas are below the axle support.



You can obtain more information about the tyre pressure monitoring system from the department responsible (▷ page 15).



Restricted areas for tyre pressure monitoring system



6.13 Parktronic

- If approved attachments are retrofitted, it is necessary to have Parktronic coded with the appropriate parameter record by Mercedes-Benz.
- After-market painting of the bumper is not permitted with the Parktronic ultrasonic sensors fitted. The coat of paint impairs the emission and reception of the ultrasonic signals.



Sensors which are already painted must not be repainted or touched up.

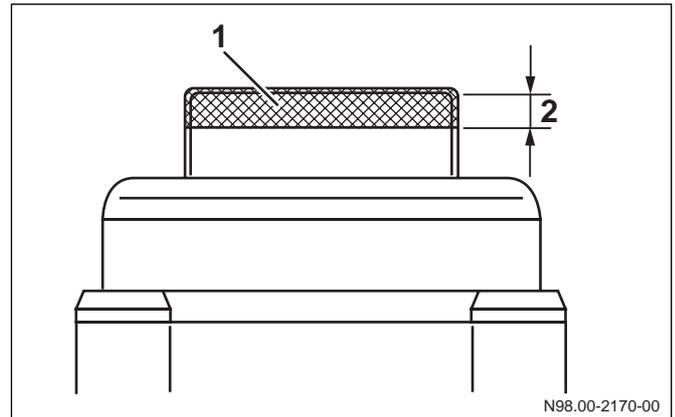
In order to ensure that they function correctly throughout their operating life, sensors must be painted before being installed.

Unpainted sensors and sensors painted in a range of colours are available from Mercedes-Benz.

The maximum thickness the paint coat on the cover may have without impairing sensor operation is 120 µm. This also includes repeated painting applications and the coat of cathodic dip paint (KTL coat). The KTL coat thickness is between 12 µm and 25 µm.

It is therefore necessary to make spot checks of the paint coat thickness to ensure faultless operation of the sensors.

It is essential that not only the cover itself but also the cylindrical edge of the sensor cover be coated with paint evenly all the way round and covering at least 2 mm.



Area of cylindrical edge of the sensor cover to be painted

- 1 Area to be painted
- 2 Maximum coat thickness 120 µm



The coat of paint may not be ground off mechanically, as this could damage the chromate layer or the cathodic dip paint layer or the sensor covering.



If the surface has been cathodically electroprimed, the paint must not be removed by chemical means as this could damage the cataphoretic electroprimer layer. A new layer cannot be applied afterwards. Nor is it permitted to touch up damaged areas chemically or mechanically.



Attachment parts fitted in the detection range of the sensors may impair operation of the Parktronic system (e.g. trailer coupling, overhangs of bodies, wheel carriers, steps, brush guards).



6.14 Retarder fittings

Risk of accident

The retarder acts as an additional brake directly on the rear wheels. To prevent the rear wheels from locking up when braking, the ESP must switch the retarder off if it begins to lock up. For this purpose, the retarder must be connected up to the vehicle network via the PSM.

The factory setting for the ESP code is "Retarder not present". Both ESP and PSM must be appropriately re-coded after installing the retarder.

The "retarder fittings" optional equipment (Code BR9) is designed to be compatible with the Telma CE35 retarder. The scope of the optional equipment comprises the wiring for the selector lever, switches and indicator lamps and the high-load power supply to the control box (maximum rating: 100A). The PSM program will be passively coded once the fittings for the Telma retarder have been installed in the vehicle.

The service switch and hand switch are read in by the programmable special module (PSM). The PSM forwards the signals to the junction under the vehicle to enable communication with the retarder control unit.

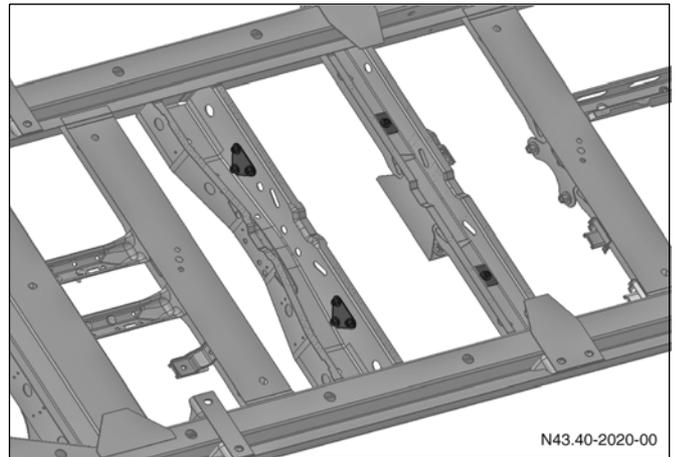
The indicator lamp is controlled directly by the retarder.

The power supply of the retarder is via a connection on the underbody (terminal 30).

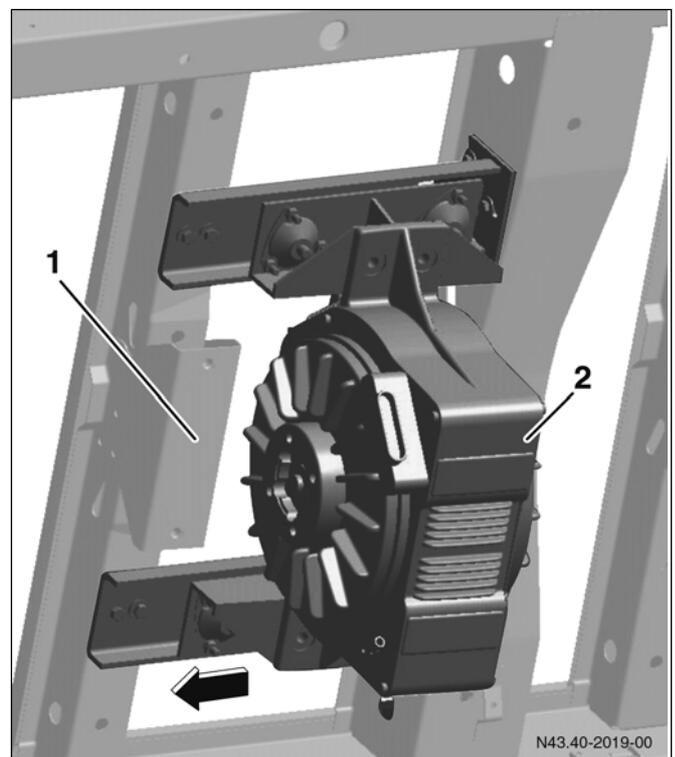
The body manufacturer is responsible for the remaining wiring under the vehicle that is still required (from the control unit to the retarder) and for the positioning of components.

The retarder manufacturer is responsible for providing the installation description and the wiring between the control box and the retarder, for example.

You will find notes on the mechanical connection in the "Retarder" section (▷ page 122).



Fastening points for retarder fittings



Retarder installation using TELMA as an example

- 1 Suspension of the propshaft intermediate bearing
- 2 Retarder
- Arrow Front of vehicle



6.15 Lifting platform fittings

The "Lifting platform fittings" optional equipment package (Code EV3) includes among other things the following (in accordance with VDHH requirements):

- Control current fittings
- On / off switch in the cab, which closes or opens the control current circuit of the lifting platform
- Main current fittings
- 25 mm² earth line, secured to the vehicle frame, with a blue 1-pin ITT Cannon main current connector on the lifting platform end
- 35 mm² positive line, with a 10 mm cable shoe on the battery end for connecting the main current fuse directly to the positive terminal, with a red 1-pin ITT Cannon high current connector on the lifting platform end
- Both lines overhang the end of the right longitudinal member by 1000 mm. The free line lengths are tied back in the left longitudinal member.



An alternator and a battery with higher capacity as well as an auxiliary battery must be fitted if an electrohydraulic lifting platform is fitted.



Before the lifting platform is used for the first time, the body manufacturer must insert a fuse in the appropriate location in the driver's seat base.

For notes on the mechanical connection, see the "Attachments to the rear frame section" (▷ page 101) and the "Lifting platform" (▷ see page 149) sections.



6.16 Wiring diagrams

Wiring diagrams can be made available to body manufacturers. Enquiries should be addressed to:

E-mail:

Service.Information@DaimlerChrysler.com

Fax:

+49 (0) 711 178 3417



This symbol is used for information relating to the delivered basic vehicle (chassis, panel van and MPV).

7.1 Suspension

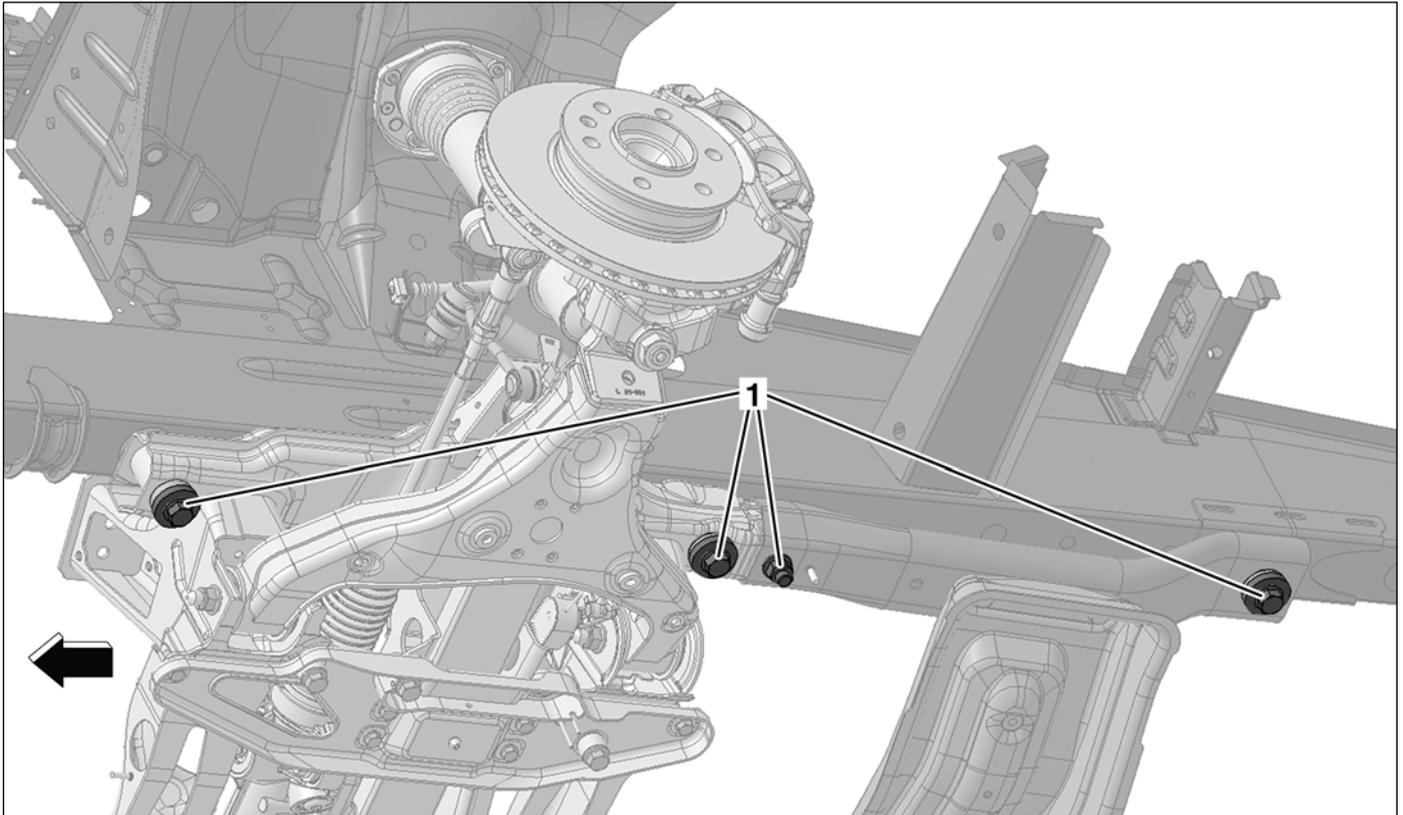
7.1.1 General information on the suspension

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

Risk of accident



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



Front axle

1 Bolting points on the front axle

Arrow Front of vehicle

This is especially valid for:

- Front transverse link: on no account should wheel position values be modified.
- It is not permitted to modify or use the front axle to mount additional equipment or make other modifications.
- Rigid rear axle: on no account should modifications be made.
- Brakes: on no account should modifications be made.



- Equipment, sensors, line routing for ESP / ABS: on no account should modifications be made.
- When installing the front axle new bolts must always be used. All bolts and threaded joints must be tightened in accordance with Mercedes-Benz tightening specifications. Information is available from your Mercedes-Benz Service Centre.

Risk of accident



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 could lose control of the vehicle and cause an accident.

Parts must be refitted in accordance with Mercedes-Benz after-sales service instructions and using suitable standard parts. We recommend the use of genuine Mercedes-Benz parts.

- VDI guideline 2862 must be observed for all assembly operations, particularly the section relating to bolted connections with particular relevance to safety.
- 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 behaviour of bolted connections must be observed.



Information is available from any Mercedes-Benz Service Centre.

Additional tensioned parts must be of equal or greater strength than the preceding tensioned assembly.

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

We recommend the use of standard Mercedes-Benz 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 DaimlerChrysler on the front and rear axle. In this case a certificate of endorsement is not required. For any further modifications the front and the rear axles must be adapted to each other.

You can obtain more information and, if necessary, request the certificates of endorsement from the department responsible (▷ page 15).

- We recommend the use of genuine Mercedes-Benz 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 or 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 Mercedes-Benz parts.

Risk of accident



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, if the vehicle is fitted with ESP, this system may no longer work correctly and could ultimately fail. The driver could lose control of the vehicle and cause an accident.



Refer also to the optional equipment available as a code (▷ page 39).





7.1.3 Brake system

Risk of accident



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. Have work on brake hoses, lines and cables only carried out by an authorised specialist workshop.

After completion of the work, check that the brake system is working correctly. We recommend that the brake system be inspected and approved by a technical inspection centre.

If the routing has to be altered, avoid routing across sharp edges and through narrow cavities or near moving components.

Hydraulic brake system

- Hydraulic brake lines are to be completely replaced by approved 4.75 mm x 0.7 or 6 mm x 0.7 mm rolled laminated tube.
- The bending radius must be > 17.5 mm.
- Lines must only be shaped in a bending machine. The cross-section must not be reduced.
- Fit nuts (part no. 000 997 66 34) on line ends and make the flange (F DIN 74234).
- The inside of the lines must be cleaned before installation.
- The use of plastic lines in hydraulic systems is not permissible.
- The brake fluid must be renewed every two years.
- If it is not known how long a vehicle equipped with a hydraulic brake system has been in storage, the brake fluid must be renewed.
- For routing between two components which move in relation to each other, a flexible line (hose, Stahlflex, etc.) must be used.

Routing lines

Risk of accident



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.

- We recommend the use of genuine Mercedes-Benz brake line brackets for the attachment of the brake lines.
- The maximum permissible distance between brackets is 500 mm.

Routing lines along the brake hoses

No other lines may be attached to brake hoses.

Brake cable for the parking brake / modifying the length of the brake cable

If a new brake cable is required for the parking brake, the new length of the control cable must be determined and a new suitable control cable must be procured.

The brake cable retainers are moment-optimised; no modification is permitted.

The department responsible will be happy to answer any questions relating to the standard brake cable (▷ page 15).





Disc brakes

Cooling must not be impaired by attaching spoilers below the bumper, additional hub caps or brake disc covers, etc.

Risk of accident



On no account should modifications be made to the air inflow and air outflow of the brake system. Any modifications to the steering and the brake system may result in these systems malfunctioning and ultimately failing. The driver could lose control of the vehicle and cause an accident.

Brake system overheating will not only impair braking ability, it can also cause tyre damage.

For this reason, make sure that there is a sufficient supply of cooling air at all times.

Risk of accident



On no account should modifications be made to brake components (e.g. callipers, discs, etc.) or sensors. Any modifications to brake components may result in these systems not functioning correctly and ultimately failing. The driver could lose control of the vehicle and cause an accident.

Auxiliary brakes / retarders

Retrofitting auxiliary brakes requires a certificate of endorsement from the department responsible.

You will find further information in the "Auxiliary brakes / retarders" section (▷ page 141) and in the description of the electrical interface in the "Retarder fittings" section (▷ page 88).

Fittings are available as optional equipment for the installation of a retarder (Code BR9). The department responsible will provide information about the scope of the optional equipment (▷ page 15).

7.1.4 Air suspension

You can obtain information on retrofitting air suspension from the department responsible (▷ page 15).

Risk of accident



On no account should springs or shock absorbers be used if they do not correspond to the characteristics of standard parts, components with an endorsement certificate or parts obtainable as optional equipment. This applies in particular to the retrofitting of air suspension to the front axle. Otherwise, if the vehicle is fitted with ESP, this system may no longer work correctly and could ultimately fail. The driver could lose control of the vehicle and cause an accident.

Risk of accident



If attachments are fitted to the front part of the frame, this modified crash structure may cause the airbag units to function incorrectly. This applies in particular to the retrofitting of air suspension to the front axle. For this reason, air suspension must not be retrofitted to the front axle.





7.1.5 Wheels and tyres

Risk of accident

Only fit tyres of a type and size approved for your vehicle and observe the tyre load-bearing capacity required for your vehicle and the tyre speed index.

In particular, comply with national regulations concerning the approval of tyres. These regulations may define a specific type of tyre for your vehicle or may forbid the use of certain tyre types which are approved in other countries.

If you have other wheels fitted:

- the brakes or components of the suspension system could be damaged
- wheel and tyre clearance can no longer be guaranteed
- the wheel brakes or components of the suspension system may no longer function correctly

The body manufacturer must ensure the following:

- There must be sufficient space between the tyre and the mudguard or wheel arch even with snow or anti-skid chains fitted and the suspension completely compressed (allowing for axle twist). The relevant data (▷ see page 113) must be observed.
- It is only permissible to fit approved tyre sizes (see the vehicle documents, tender drawings (▷ page 17) or the following table).
- It is only permissible to fit approved wheels (▷ page 17).



You can obtain more information about tyres and wheels from any Mercedes-Benz Service Centre or in the "Optional equipment" section (▷ page 39).

Gross vehicle weight [t]	Equipment		Tyre size	Weight and speed index
3.0			205 / 75 R16 C	110 / 108R
3.5			235 / 65 R16 C	115 / 113R
	2		235 / 60 R17 C	117 / 115R
	3		225 / 75 R16 C	116 / 114R
3.88			235 / 65 R16 C	121N (116R)
4.6			195 / 75 R16 C	107 / 105R
	1	FA	235 / 65 R16 C	115 / 113R
		RA	285 / 65 R16 C	128N (116R)
	2		205 / 75 R16 C	110 / 108R
5.0			195 / 75 R16 C	107 / 105R
	2		205 / 75 R16 C	110 / 108R

¹ With Supersingle optional equipment

² Optional equipment

³ All-wheel drive





7.1.6 Spare wheel

The SPRINTER – model series 906 is equipped with the TIREFIT kit as standard. The country-specific equipment or optional equipment may include a spare wheel.

When mounting a spare wheel, observe the following:

- Fit it 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 Bodyshell/body

7.2.1 General information on the bodyshell/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 load-bearing parts.

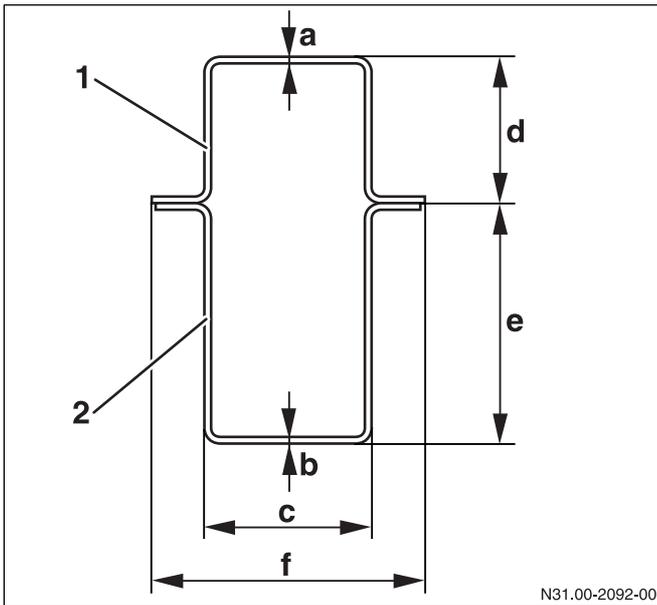
In the case of vehicle conversions and mounting bodies, it is not permissible to make modifications that affect the function or freedom of movement of chassis parts (e.g. during maintenance and inspection work) or accessibility to these parts.

Observe the following:

- ESP must be deactivated in the event of modifications to the wheelbase of vehicles with ESP.
 - The TPMS (Tyre Pressure Management System) may malfunction if modifications are made in the direct proximity of the aerials and wheels (▷ see page 86).
 - On no account should modifications be made to the cross member structure from the front of the cross member through to the rear of the B-pillar.
 - On no account should modifications be made to the rear door opening or to the roof area.
 - The clearance for the fuel filler neck, fuel tank and fuel lines must be maintained (▷ page 117).
 - Avoid sharp-edged corners.
 - Brackets (plug welds) must be used to attach additional equipment to the longitudinal and cross members. These require a certificate of endorsement.
 - It is not permissible to drill holes in or perform welding work on the A-pillar or B-pillar.
 - It is not permissible to make cuts in the C or D-pillar (rear door opening), including the associated roof arch.
 - The maximum permissible axle loads must not be exceeded.
 - Trailer connections must be checked for correct operation.
- If a trailer coupling is installed, the necessary reinforcements must be present (▷ page 151).
 - 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.
 - If bodies are mounted on basic vehicle cabs, a fuel level sensor shield may be necessary depending on the body type. Refer to the "Fuel system" section (▷ page 117).



Section dimensions of longitudinal frame members



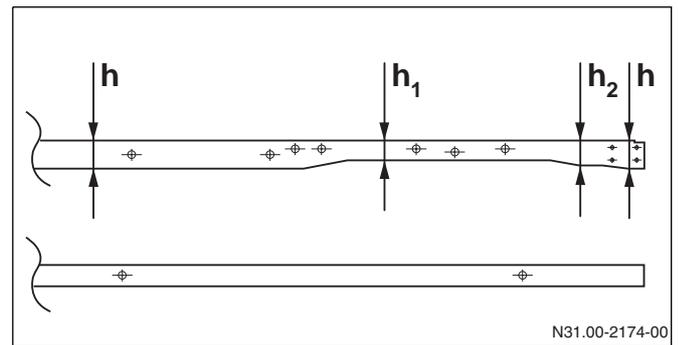
Dimensions of the upper chord and lower chord

- 1 Upper chord
- 2 Lower chord

Permissible gross vehicle weight [t]	a	b	c	d	e	f
3.5 Open model series	2	2	70	61	119 84 ¹	118
5 Open model series	3	3	70	80	120 100 ¹	126
3.5 Panel van / MPV		1.5	70	-	120 85 ¹	93
5 Panel van / MPV		3	70	-	120 100 ¹	118

¹ In the area of the rear axle

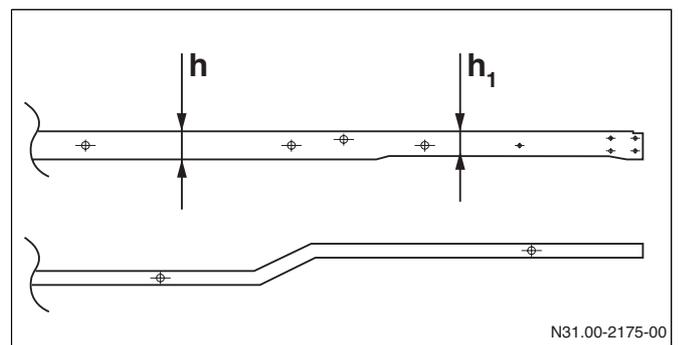
3.5t longitudinal frame member



Dimensions of the lower chord of the longitudinal frame member

h	120 mm
h1	85 mm
h2	110 mm

5 t longitudinal frame member



Dimensions of the lower chord of the longitudinal frame member

h	120 mm
h1	100 mm



Welding work on the bodyshell

Welding work may only be performed by skilled personnel.



You will find further information about welding operations in the "Planning of bodies" (▷ page 31), "Damage prevention" (▷ page 57) and "Bodyshell" (▷ page 97) sections and in the Mercedes-Benz Workshop Information System (WIS).

The only permissible welding work on the chassis frame is that which is required in order to modify the wheelbase or to extend the overhang (▷ page 106).

On no account should welding work be carried out on the upper and lower chords of the chassis frame.

Plug welding is only permissible in the vertical webs of the longitudinal frame member.

Do not perform any welding work in bends.

Risk of accident



Impermissible 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) (▷ page 128). For this reason, welding work must not be performed near airbags.

In Germany, the handling, transportation and storage of airbag units is subject to the law on explosive substances (Gesetz über explosionsgefährliche Stoffe).

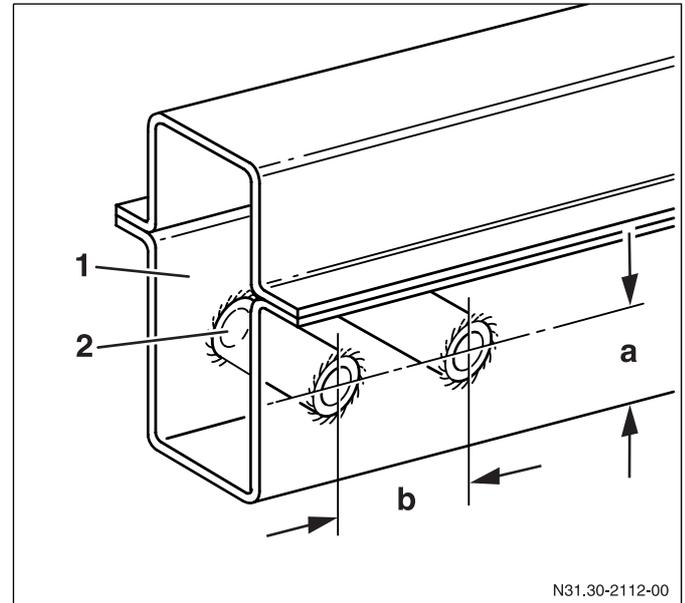
Drilling work on the frame



Existing holes in the longitudinal frame member result from the production process and may only be used if approved by a certificate of endorsement from the department responsible (▷ page 15).

Drilling in the longitudinal member web is only possible if:

- spacer bushes are welded to the longitudinal members (see illustration)
- distance **a** is at least 20% of the frame height
- the distance between drill holes **b** is at least 50 mm



Drilling work on the longitudinal frame members

- 1 Chassis frame
- 2 Spacer bushes
- a at least 20% of the frame height
- b at least 50 mm

After drilling, deburr and countersink all holes, remove chips from the frame and treat the holes with body cavity sealing.

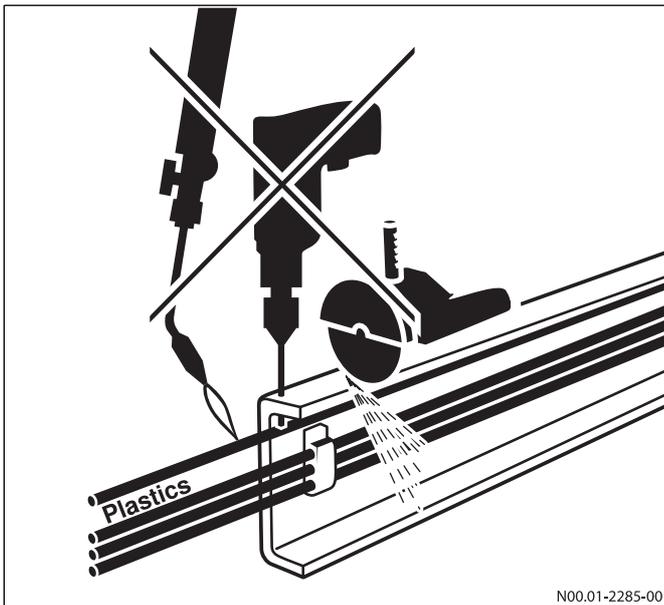




On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (▷ page 58).

Parts which must not be drilled:

- 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.)



Risk of accident



Impermissible drilling in the vicinity of the airbags could cause the airbags on the standard vehicle to function incorrectly (▷ page 128). For this reason, drilling work must not be performed near airbags.

In Germany, the handling, transportation and storage of airbag units is subject to the law on explosive substances (Gesetz über explosionsgefährliche Stoffe).

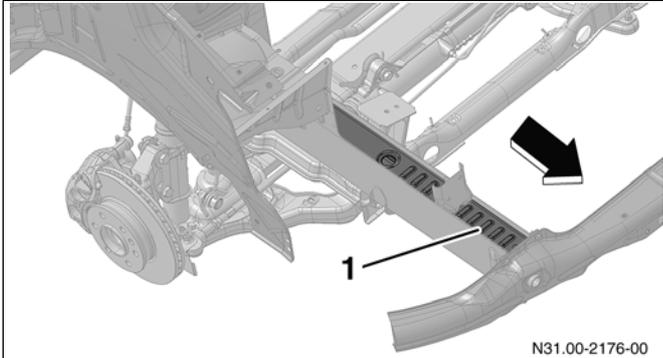




7.2.2 Attachment to the frame

Attachment to the front frame section

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



Structure for passive safety

- 1 Crumple zone on the subframe
- Arrow Front of vehicle

Risk of accident



If attachments are mounted on the front frame section, the function of the forward impact structure and the airbag units may be impaired.

If the impact structure is modified, the airbag units may have to be deactivated. Attachments are therefore only permitted to be mounted on the front section of the frame after consultation with the department responsible.

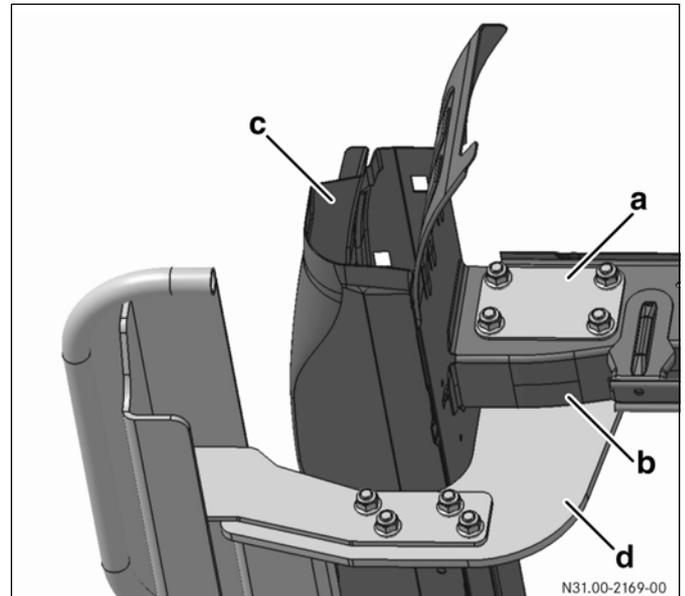


The modifications must not hinder possible repair work on the standard vehicle.

Attachment to the rear frame section

The attachment of additional equipment or bodies to the rear frame section must be analogous to the attachment of the trailer coupling available as optional equipment.

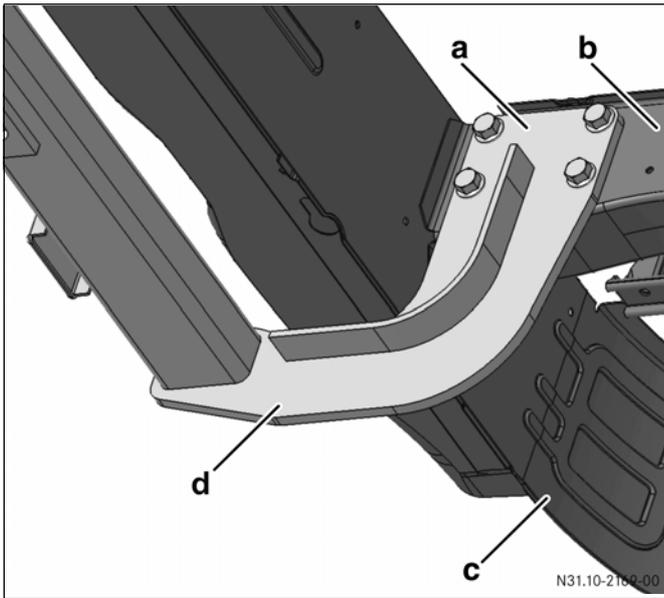
For the application of greater forces and moments, an additional support on the end frame cross member is required.



Exterior 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 coupling





Interior 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 coupling

A certificate of endorsement is required from the department responsible (▷ page 15).

You will find further information about hole patterns for the various trailer coupling variants in the "Technical details" section (▷ page 238).

Attachment 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 (▷ page 160).

7.2.3 Chassis frame material

If modifications are made to the wheelbase or the frame is extended, the material of the extension element must have the same quality and dimensions as the standard chassis frame.

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 and must always take the permissible axle loads and the minimum front axle load into account.

On vehicles with a closed body (MPV or panel van), an overhang extension is only permitted after consultation with the department responsible.

- An additional cross member must be fitted if the frame extension exceeds 350 mm.
- 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 centre of gravity within the permissible limits.
- The minimum front axle load must be complied with in all load states (▷ see page 40).

You can obtain more information from the department responsible (▷ page 15).

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 [mm]	Overhang length x [mm]
3,250	1,650
3,665	1,850
4,325	2,200

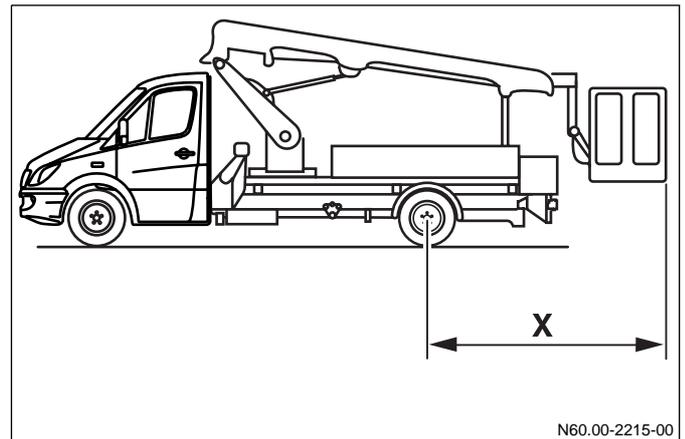
On vehicles with a low frame, note the maximum overhang lengths listed in the "Low frame bodyshell" section (▷ page 171).



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 page 98).



Maximum overhang lengths (using a lifting work platform as illustration)

x Vehicle overhang

If the underride guard needs to be repositioned due to the overhang extension, the attachment must be the same as that of the original vehicle (▷ page 154).

The illustration above depicts the implementation of a frame extension for an overhang extension.

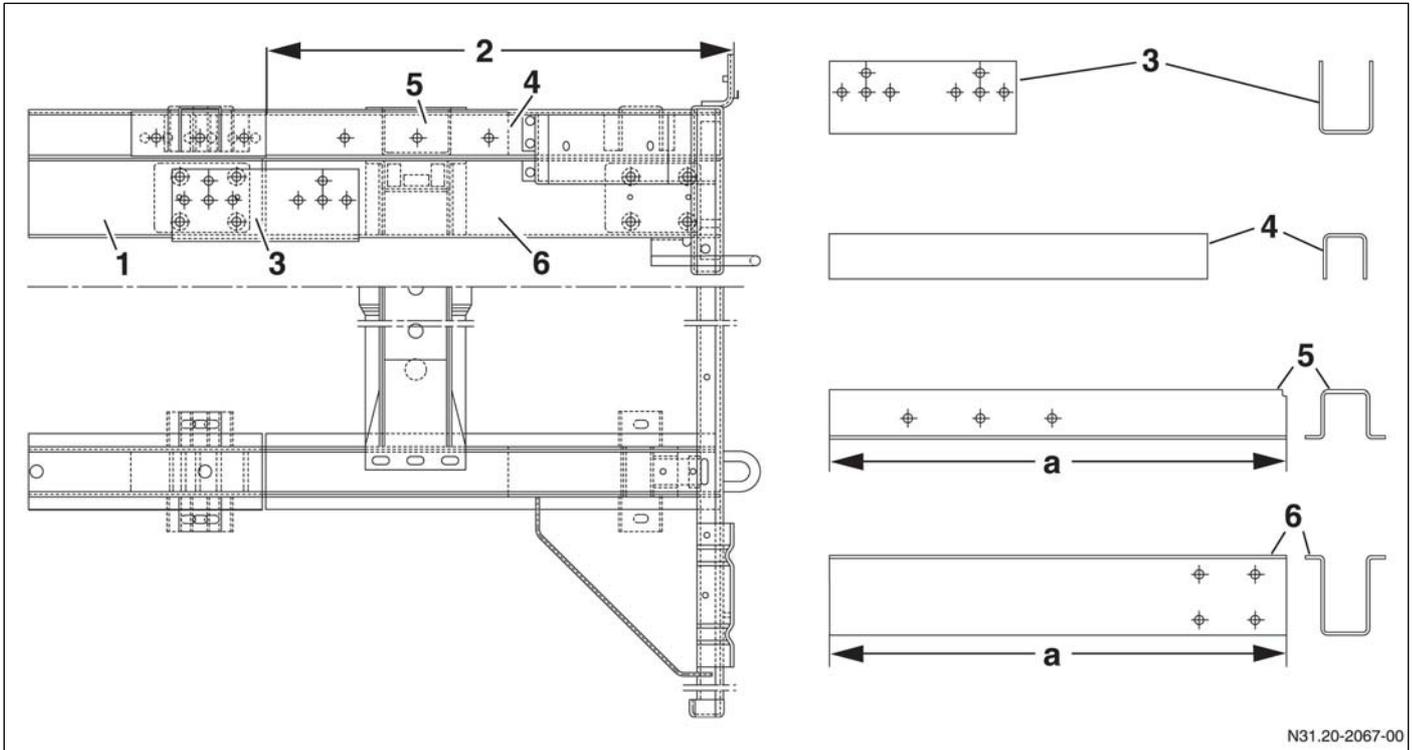




3.0 t and 3.5 t vehicles



On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (▷ page 58).



N31.20-2067-00

Frame extension with overhang extension

- 1 Longitudinal chassis frame member
- 2 Frame extension
- 3 Outer reinforcement
- 4 Inner reinforcement
- 5 Body support extension
(wall thickness on 3.5 t: 2 mm)
- 6 Chassis frame extension
(wall thickness on 3.5 t: 2 mm)
- a Dimension defined by body manufacturer

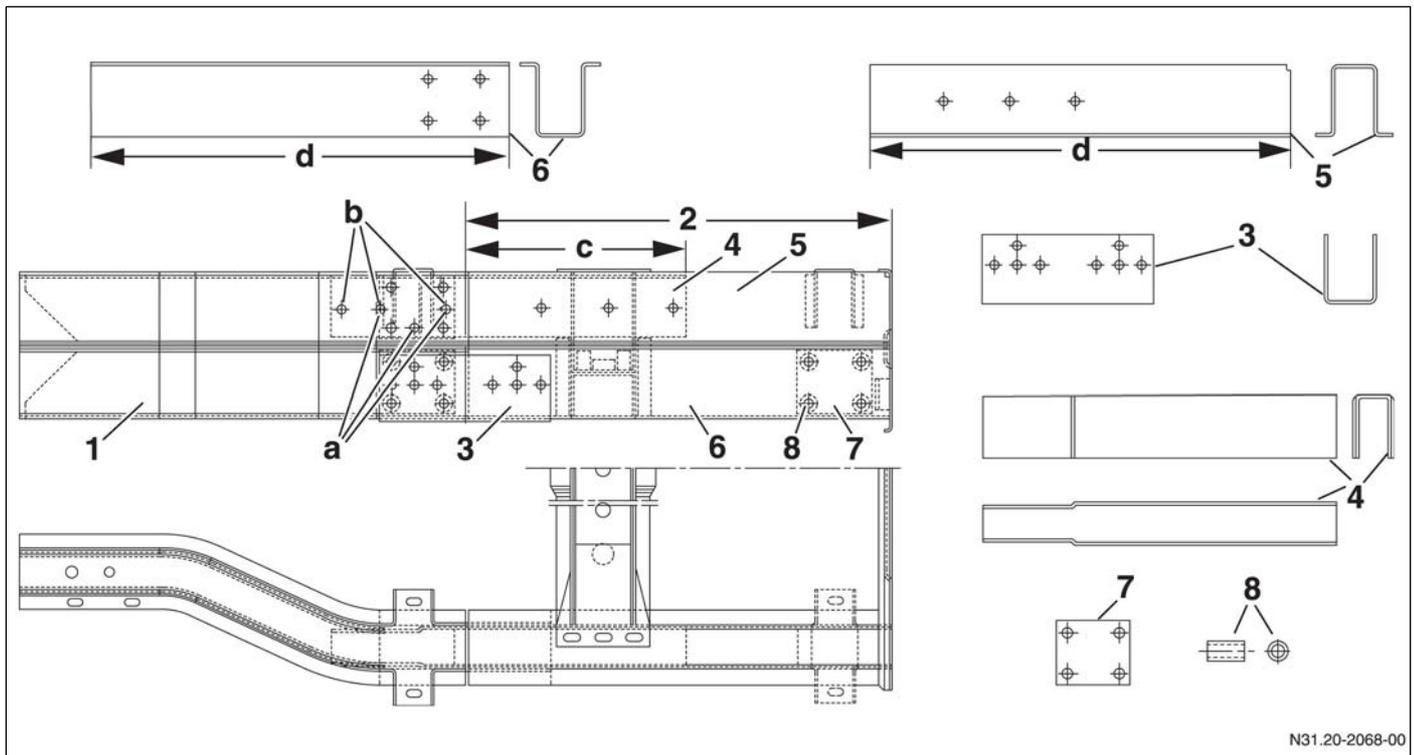


Comply with all national guidelines and regulations.





4.6 t and 5.0 t vehicles



N31.20-2068-00

Frame extension with overhang extension

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



Comply with all national guidelines and regulations.





7.2.5 Modifications to the wheelbase

A chassis with the next shorter standard wheelbase must be used if the wheelbase is to be extended.

An additional frame cross member must be fitted if the frame extension exceeds 350 mm.

Any additional frame cross members must have the same functionality as standard cross members. The drive shaft clearance must be taken into consideration.

Risk of accident



On no account should modifications be made to the wheelbase on vehicles equipped with the Electronic Stability Program (ESP).

Modifying the wheelbase on vehicles with ESP may cause the system to no longer work correctly and the system could ultimately fail. The driver could lose control of the vehicle and cause an accident (▷ page 82).



On no account should modifications be made to the wheelbase by moving the position of the rear axle.

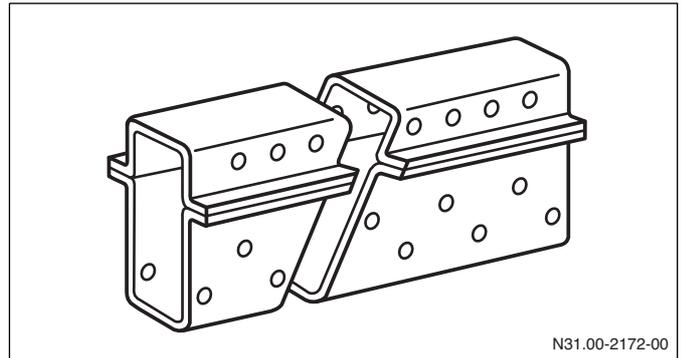
- Before cutting frame longitudinal members, the chassis must be in a perfectly horizontal position.
- Support the frame. Use the next shorter wheelbase available on which to carry out wheelbase extensions (example: if a wheelbase of 4,600 mm is required, select standard wheelbase 4,325 mm).

Take account of changes to the chassis weight and turning circle.

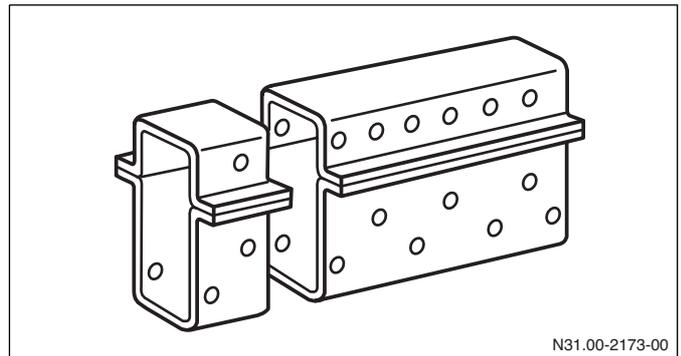
Position the cutting points so that the cut does not pass through any existing holes in the longitudinal frame member.

Also observe the "Lengthening of cables" (▷ page 68), "Brake system" (▷ page 93) and "Propeller shaft" (▷ page 120) sections.

Cuts in the frame



"Diagonal" frame cut



"Straight" frame cut

On no account should the frame be cut at the following points:

- load application points (e.g. spring supports)
- axle guide, axle suspension
- areas of sectional change (frame drop, frame taper)



Cuts through bore holes are not permitted.





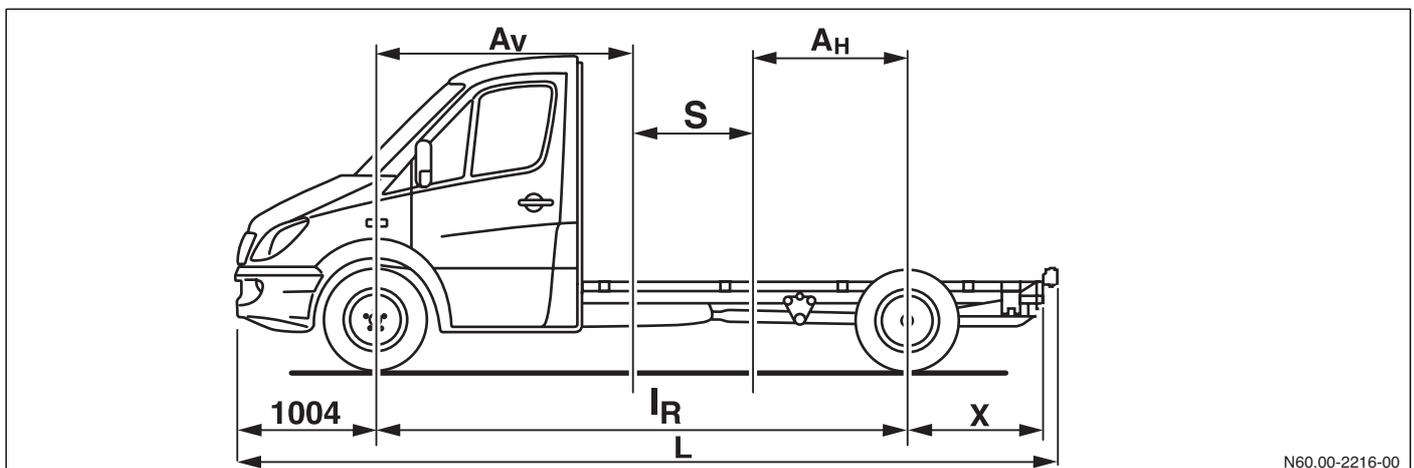
Recommended cutting areas on the frame

Avoid making cuts in the area of frame inserts when extending the wheelbase. We recommend the areas specified for the particular wheelbases (see table, see illustration).

Wheelbase [mm]	Permissible gross vehicle weight [t]	A_V [mm]	A_H [mm]
3,665	3.5 / 3.88	2,285	1,305
4,325	3.5 / 3.88	2,285	1,305
3,665	4.6 / 5.0	2,205	1,420
4,325	4.6 / 5.0	2,205	1,420

Values refer to a chassis with cab

A_V ...Distance to centre of front axle A_H ...Distance to centre of rear axle



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Cutting area on the frame

L Total vehicle length

l_R Wheelbase length

X Standard vehicle overhang

S Recommended cutting area

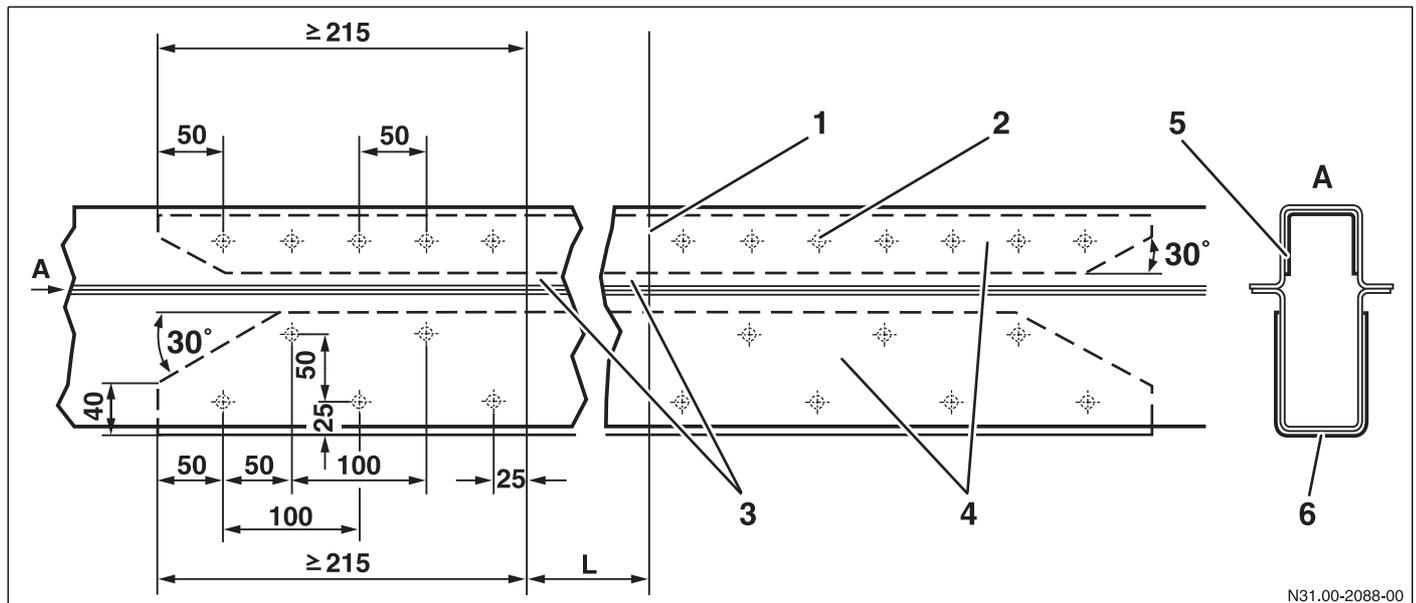
A_H Distance from rear axle to cutting area

A_V Distance from front axle to cutting area

**Reinforcement in areas of cuts in the frame**

If the vehicle frame is extended, the cutting areas must be reinforced by frame inserts. The specified overlap and the material properties of the frame inserts must be observed.

Wheelbase extensions must be carried out as follows:

**Specification of frame inserts**

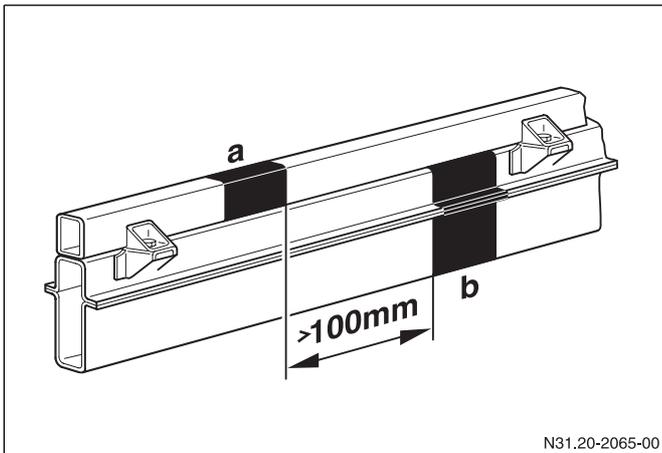
- 1 Weld kerfs all round
- 2 Plug weld, plug hole diameter 12 mm
- 3 Material grade of hat profile used must be the same as the standard vehicle
- 4 Inserts, material min. ST 12.03, material thickness 2 to 3 mm
- 5 Insert, upper chord (inside)
- 6 Insert, lower chord (outside)
- L Wheelbase extension

With wheelbase modifications, make sure that the end of the exhaust pipe is not directed at a tyre.

After wheelbase modifications, the chassis must be reinforced by a continuous mounting frame (▷ page 157).



If the mounting frame is also lengthened when extending the overhang, the welds must be positioned at least 100 mm apart (see illustration).



Extending the overhang on frames with mounting frame

- a Mounting frame extension element
- b Frame extension

Risk of accident



On no account should modifications be made to the wheelbase on vehicles equipped with the Electronic Stability Program (ESP).

Modifying the wheelbase on vehicles with ESP may cause the system to no longer work correctly and the system could ultimately fail. The driver could lose control of the vehicle and cause an accident (▷ page 82).

On no account may modified wheelbases exceed the longest standard wheelbase or be shorter than the shortest standard wheelbase.



If the vehicle wheelbase is modified, the length of the propeller shafts must be adapted to the vehicle. The extension must be carried out by a company qualified in propeller shaft engineering.

On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (▷ page 58).

Certificate of endorsement for wheelbase modifications

You can obtain more information on wheelbase modifications and, if necessary, request the certificates of endorsement from the department responsible (▷ page 15).

Please send two drawings of the conversion or body and the following information together with the request:

- Position of cut
- Reinforcement measure
- Propeller shaft train
- Conditions of use

7.2.6 Modifications to the cab

All modifications to the cab must be approved by a certificate of endorsement issued by the department responsible (▷ page 15). Rigidly installed equipment or conversions must satisfy the requirements of legislation relating to head impact as specified in ECE-R21 and FMVSS 201.

Risk of accident



Modifications to the cab must not impair the function of any components relevant to safety (e.g. airbag units, sensors, pedals, gear lever, lines or others). This may lead to the failure of components or parts relevant to safety.





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 be covered with panelling parts, and "blocking" parts must never be mounted on the B-pillar.

The strength and rigidity of the cab structure must not be impaired.

The intake of air into the engine must not be hindered.

Modifications to the cab will cause a change in the centre of gravity. The permissible centre of gravity limits and axle loads must be maintained.



On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (▷ page 58).

Modifications to the cab roof

Risk of accident



On no account should any subsequent modifications be made to the roof lining or the roof skin between the A-pillar and the B-pillar if the vehicle is equipped with windowbags. Otherwise, the windowbag may no longer be able to work correctly (e.g. windowbag deployment is delayed or incomplete).

Modifications to the cab roof (e.g. lowering the roof height) may only be undertaken after consulting the department responsible (▷ page 15).

The "electric sliding sunroof", Code D27, is available from the factory as optional equipment (▷ page 39).

Plastic roofs are suitable for the installation of roof hatches only to a limited extent.

The roof load-bearing capacity is limited (▷ page 47).



Roof arches or supporting parts may not be removed or modified without being replaced.



You will find information on over-cab attachments and wind deflectors in the "Attachments" section (▷ page 142).

Observe the permissible centre 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 rigidity 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 panel vans" section (▷ page 166).

Risk of accident



On no account should any subsequent modifications be made to the roof lining or the roof skin between the A-pillar and the B-pillar if the vehicle is equipped with windowbags. Otherwise, the windowbag may no longer be able to work correctly (e.g. windowbag deployment is delayed or incomplete).





7.2.7 Sidewall, windows, doors and flaps

Sidewall

If modifications are made to the sidewall of the panel van or the MPV, the rigidity of the modified body must be equal to that of the basic vehicle.

The roof frame must be retained and its function may not be impaired in any way.

A certificate of endorsement is required from the department responsible (▷ page 15).



On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (▷ page 58).

Windows

Windows must be inserted with a stable frame. The frame must then be joined by a non-positive attachment to other body elements.

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.

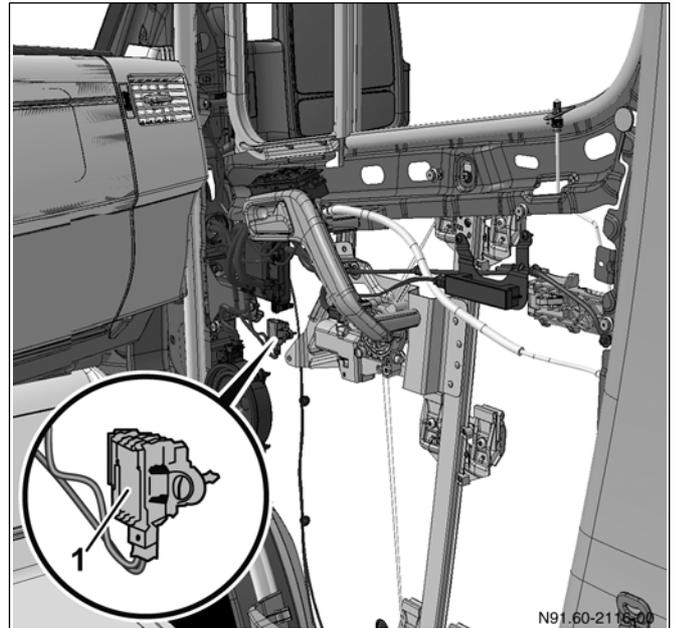


More information about modifications to the sidewall can be found in the "Fitted shelving / installations" section (▷ page 144).

Doors and flaps

If modifications need to be carried out to the supporting structure of the basic vehicle (frame cross members, pillars, reinforcements, attachment of roof arches) in order to retrofit doors, 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. On no account should modifications be made to the door body (see illustration).

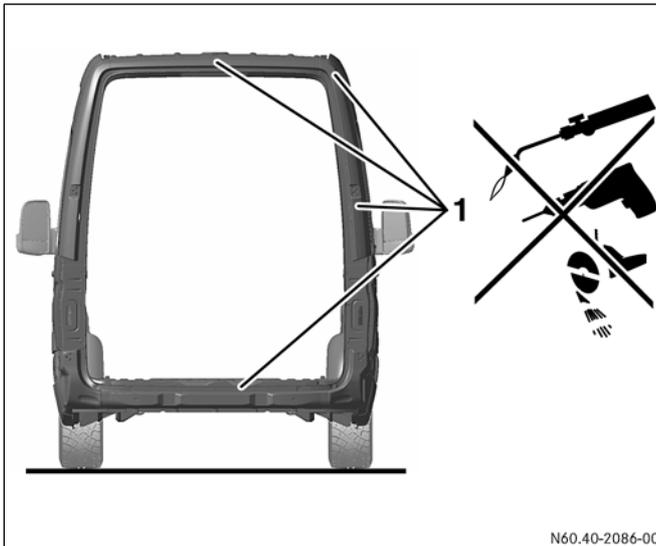


Door, showing sensor system

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



Any modifications to the rear door opening including the roof area are only permitted in exceptional cases and require a certificate of endorsement from the department responsible (▷ page 15).



Rear door opening and roof area

- 1 Areas in which modifications are not permitted (certificate of endorsement required)
- 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 400 mm.
 - Fittings must allow sufficient clearance to the interior door handles regardless of door position (trap guard).
 - On no account should modifications be made to the central locking system or to the immediate area around the door or in the area of the pillars or cross members.



On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (▷ page 58).

7.2.8 Mudguards and wheel arches

Ensure that there is sufficient space between the tyre and the mudguard or wheel arch even with snow or anti-skid chains fitted and the suspension completely compressed (allowing for axle twist). Comply with the dimensional data in the tender drawings.

Lowering the wheel arches

If the wheel arches are to be lowered, a certificate of endorsement must first be issued by the department responsible.

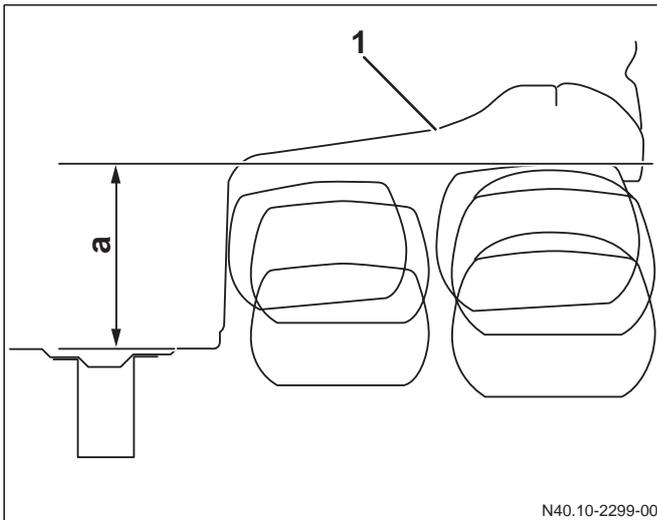
Wheel arch lowering is possible provided the following prerequisites are fulfilled:

- No components or sharp edges (e.g. folded seams or edges) must not protrude into the wheel housing.
- The maximum permitted lowering dimension may not be exceeded by any component in the wheel arch.
- The unrestricted use of snow chains is no longer possible: An appropriate entry is required in the vehicle documents with the wording "Only restricted use of snow chains possible".





Maximum wheel arch lowering



Maximum wheel arch lowering

- 1 Contour of standard panel van wheel arch
- a Maximum possible extent of lowering



The minimum required wheel clearance is measured from the floor in the panel van or the flange between the upper and lower chord of the longitudinal frame member on chassis vehicles.

Permissible gross vehicle weight [t]	Tyres	Dimension a [mm]
3.5 (longitudinal frame member, straight)	235 / 65 R16	265
	205 / 65R16	270
4.6 - 5 (longitudinal frame member, tapered)	285 / 65 R16	265
	2 x 205 / 75R16	235
	2 x 195 / 75R16	225



You can obtain more information from the department responsible (▷ page 15).

Risk of accident



On no account may seats be mounted on the wheel arches. This also applies for lowered wheel arches. Otherwise, the vehicle could be damaged as a result (e.g. wheel arches and tyres).



On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (▷ page 58).



Reduction in the width of the wheel arches are not permitted.

7.2.9 End frame cross member

If special-purpose bodies are mounted, the end panel cross member acting as an underride guard may be omitted at the factory (Code Q72) (▷ page 39).

You will find more information on the underride guard in the "Attachments" section (▷ page 154).



On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (▷ page 58).

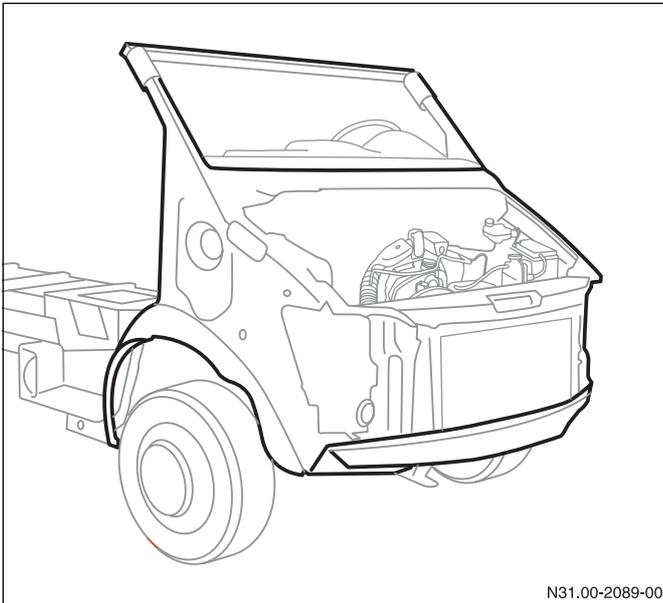
Comply with all national guidelines and regulations.





7.2.10 Windscreen support structure

The windscreen support structure (chassis platform) offers body manufacturers a base for producing fully integrated bodies (e.g. motor caravans) or special-purpose bodies. It is available from the factory under Code F50/platform (▷ page 39).



Windscreen support structure chassis

The directives relating to the modification of windscreen support structure chassis in the "Bodies on chassis with frame front end / windscreen support structure" section (▷ page 167) must be observed.



On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (▷ page 58).

7.2.11 Panel van /MPV roof

If modifications are made to the roof structure of panel vans /MPVs, the following points must be observed:

- Fit an anti-roll bar to the front axle to reduce the tendency to roll.
- If the roof skin and roof arches are removed and if no continuous sectional frame is possible, additional roof arches must be fitted. The overall design must be retained, and sufficient rigidity of the modified parts must be guaranteed.



The rigidity of the new roof structure must be equal to that of the original standard roof.

On no account should modifications be made to the rear door opening including the roof area.

On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (▷ page 58).

Attachment to the roof

Securing elements similar to roof racks are possible for retrofitting attachments (▷ page 143).

Attachments to the roof skin require a certificate of endorsement from the department responsible (▷ page 15) (except for rotating beacons and working-area lamps).

Attachments to roof arches require a certificate of endorsement from the department responsible.





Risk of accident



On no account should any subsequent modifications be made to the roof lining or the roof skin between the A-pillar and the B-pillar if the vehicle is equipped with windowbags. Otherwise, the windowbag may no longer be able to work correctly (e.g. windowbag deployment is delayed or incomplete).

Increasing the height of the roof

The height of the roof may only be increased in conjunction with integrated arches and reinforcement frames.

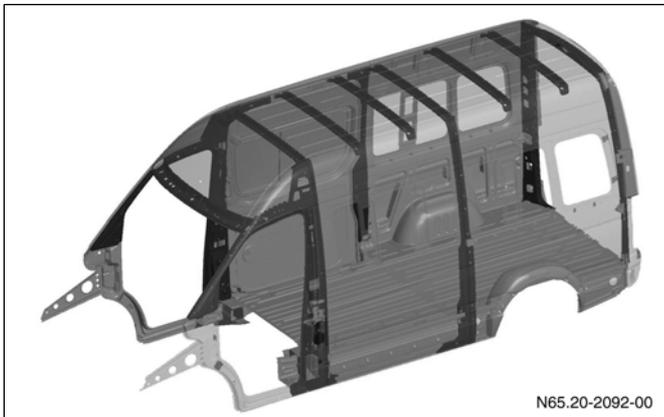


The rigidity of the new roof structure must be equal to that of the original standard roof.

Number of roof arches

Wheelbase	Quantity required
3,250 mm	≥ 4 roof arches
3,665 mm	≥ 5 roof arches
4,325 mm	≥ 6 roof arches

Location of roof arches



Panel van roof arches



The arches must be secured to the side panels in such a way that a non-positive connection is guaranteed (bend-resistant connection of arch and roof frame).

The roof arches must be reinforced in the event of any increase in the height of the roof.

The minimum moment of inertia required I_x per roof arch can be seen in the table below:

Roof height [mm]	Moment of inertia I_x per roof arch [mm ⁴]
250	≥ 40,000
400	≥ 65,000
550	≥ 86,000

A minimum required moment of inertia of $L_x = 33,000 \text{ mm}^4$ must be maintained if the roof height is either reduced or not modified.

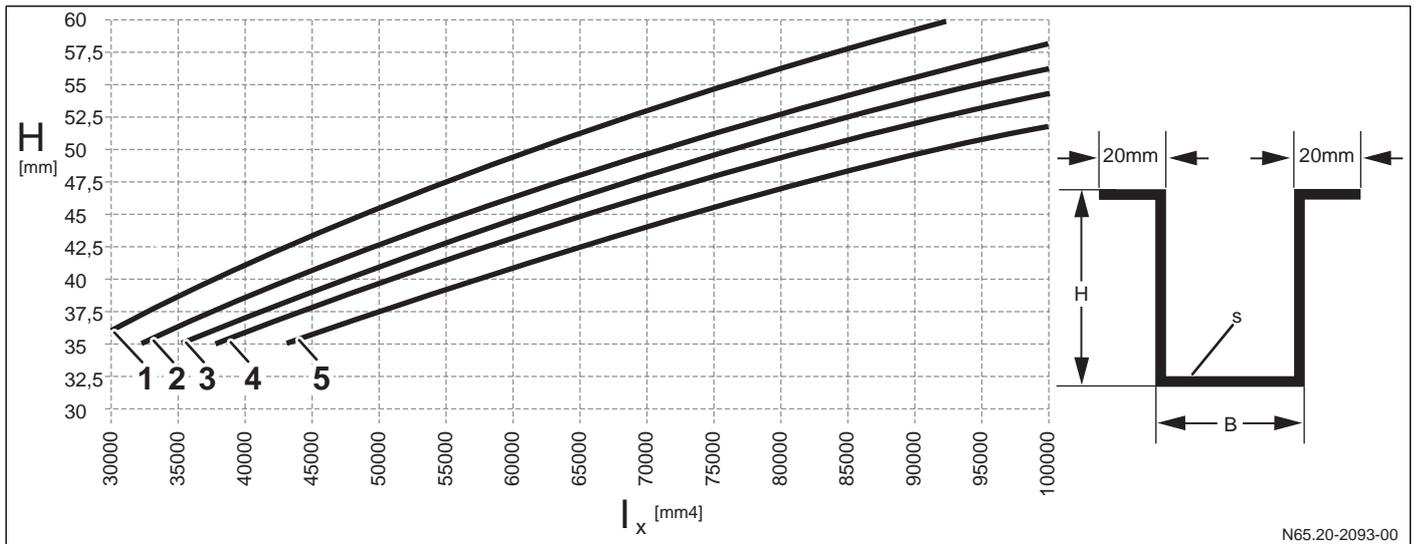
The maximum roof load of the high panel roof is 150 kg if the load is evenly distributed over the entire roof surface (▷ page 143).

Risk of accident



The maximum permissible height for the centre of gravity must not be exceeded. Otherwise, if the vehicle is fitted with ESP, this system may no longer work correctly and could ultimately fail. The driver could lose control of the vehicle and cause an accident (▷ page 82).





Required moments of inertia for roof arches with 20 mm flange with the roof skin

- 1 B: 50 x s: 0.8
- 2 B: 40 x s: 1.0
- 3 B: 50 x s: 1.0
- 4 B: 60 x s: 1.0
- 5 B: 50 x s: 1.2

Retrofitting a raised roof

Risk of accident



On no account should any subsequent modifications be made to the roof lining or the roof skin between the A-pillar and the B-pillar if the vehicle is equipped with windowbags and thorax bags. Otherwise, the windowbag and thorax bag may no longer work correctly (e.g. windowbag and thorax bag deployment may be delayed or incomplete).

Plastic roofs are suitable for the installation of roof hatches only to a limited extent.

The roof load-bearing capacity is limited (see table).

If a raised roof is fitted, at least two-thirds of the original roof area must be retained.



Roof arches or supporting parts may not be removed or damaged without being replaced (▷ page 115).

Maximum roof loads

Panel van [kg]	High roof panel van [kg]	Extra-high roof panel van [kg]	Cab, crewcab [kg]
LH1	LH2	LH3	
300	150	0	100

The threshold value of the vehicle's maximum centre of gravity must not be exceeded.





7.3 Engine peripherals / drivetrain

7.3 Engine peripherals / drivetrain



Maintenance and repair of the vehicle must not be hindered by the body (▷ page 36).

7.3.1 Fuel system

Modifications to the fuel system may only be carried out with the approval of the department responsible (▷ page 15).



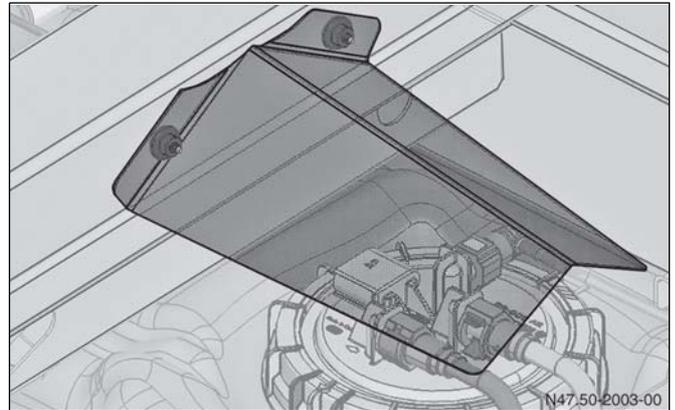
Non-approved modifications to the fuel system (fuel tank, lines, etc.) may lead to impaired performance and trigger engine emergency running mode.

The following must be observed for all work on the fuel system:

- The activated charcoal container is located on the rear end of the fuel tank on vehicles with petrol engine. On no account should modifications be made to the position or connection of the activated charcoal container.
- The installation of heat-conducting components, or of components that restrict the installation space, is not permitted.
- On no account should modifications be made to 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.
- Modifications and attachments (e.g. additional eyelets) are not permitted in the vicinity of the fuel filler neck.
- If bodies are mounted on basic vehicle cabs, a fuel level sensor shield is necessary when the fuel level sensor is not protected by the body. Vehicles with a platform are fitted at the factory with the fuel level sensor shield with part number A906 471 00 87. It is installed by means of the standard weld screws with two captive M6-8 nuts (MBN10104).



If bodies are mounted on basic vehicle cabs, 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 fuel-fired heater boosters are retrofitted:

- No sharp edges permitted
- The fuel tank must not be subjected to load in the event of an impact. Deflection plates must be fitted if necessary
- Fuel lines must be secured
- Exhaust fumes must not be directed into the vehicle interior

For connections supplying fuel to the auxiliary heating, the procedure for design approval must be observed.

Code KL1 is available as optional equipment.

Environmental note



Modifications carried out incorrectly to the fuel system may have a detrimental effect on the environment.





7.3 Engine peripherals / drivetrain

7.3.2 Exhaust system

If modifications are made to the exhaust system, we recommend the use of genuine Mercedes-Benz parts.

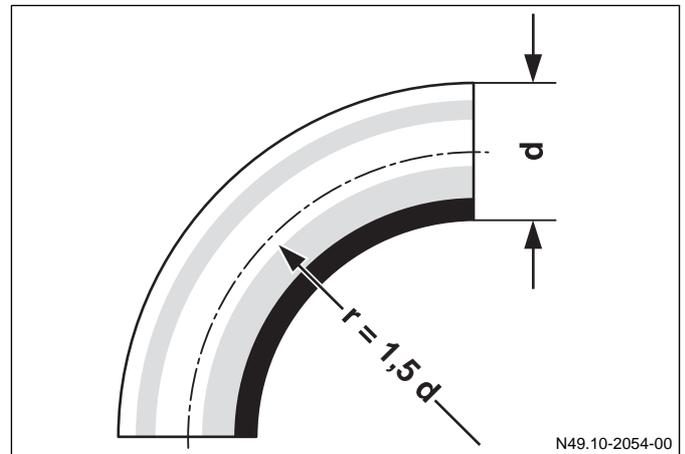
Comply with all national guidelines and regulations.

The length and installation position of the flexible metal hose between the exhaust manifold and the exhaust pipe must not be modified.

The free cross-section of the exhaust pipe behind the silencer must not be reduced.

Under extreme loads, the temperature between the exhaust system (diesel particle filter, catalytic converter or main silencer) and the floor panel may rise above 80 °C. For this reason, shields or insulation must be mounted on the substructure to reduce the effects of radiated heat; refer also to the "Low frame exhaust system" section (▷ page 180).

- 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:

- 200 mm for exhaust systems without shielding
- 80 mm with sheet metal shielding
- 40 mm with sheet metal shielding and additional insulation



7.3 Engine peripherals / drivetrain



On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (▷ page 58).

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 silencer are not permitted.

The lengths and routings, e.g. between the diesel particle filter and the main silencer, are optimised with regards to temperature characteristics. Modifications could lead to higher or extreme temperatures in the exhaust system and surrounding components (propeller shafts, fuel tank, floor panel, etc.).

The following exhaust system versions are available from the factory as optional equipment:

Code	Description
K 60	Exhaust, straight to the rear
K 63	Exhaust, to the side behind the rear axle
KA 3	Exhaust, to the side in front of the rear axle

You can obtain more information about optional equipment from your Mercedes-Benz Service Centre, the department responsible (▷ page 15) or in the "Optional equipment" section (▷ page 39).

7.3.3 Engine cooling system

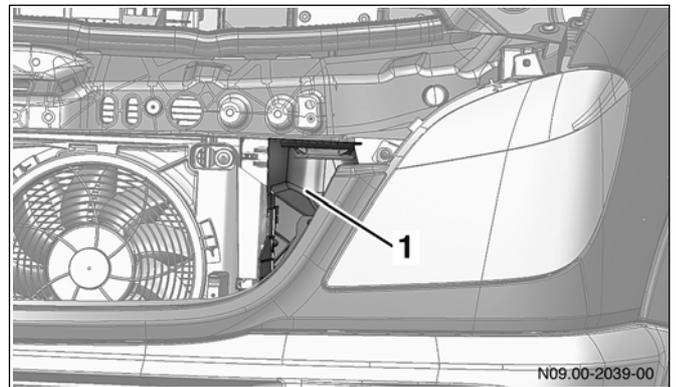
It is not permissible to modify the cooling system (radiator, radiator grille, air ducts, coolant circuit, etc.) because a sufficient flow of cooling air must be guaranteed. The complete cross-section of the cooling air intake surfaces must remain unobstructed. This means:

- at least 11 dm² for the front grille (radiator and condenser)
- at least 7 dm² 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.

7.3.4 Engine air intake



Engine air intake opening

- 1 Area of engine air intake



On no account should modifications be made in 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 filter must be retained in the event of any modification to the front module.





7.3 Engine peripherals / drivetrain

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.

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 filter.

7.3.5 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 tender drawings must be observed (▷ page 17).

The distance between the cab and the body must be at least 50 mm (▷ page 55).

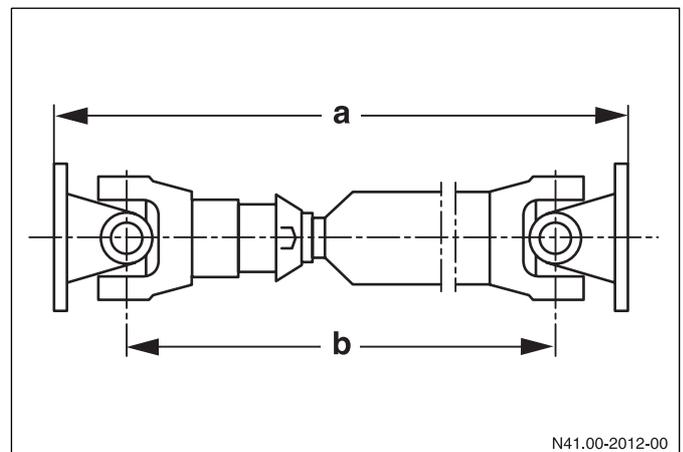
7.3.6 Propeller shafts

The correct design of the propeller shaft train prevents noise and the development of vibrations. We recommend the use of genuine Mercedes-Benz parts.



If the vehicle wheelbase is modified, the length of the propeller shafts must be adapted to the vehicle. The modifications must be carried out by a company qualified in propeller shaft engineering.

The propeller shaft intermediate bearings must be equally as rigid. They must also be designed in such a way that no vibrations are transmitted to the vehicle structure.



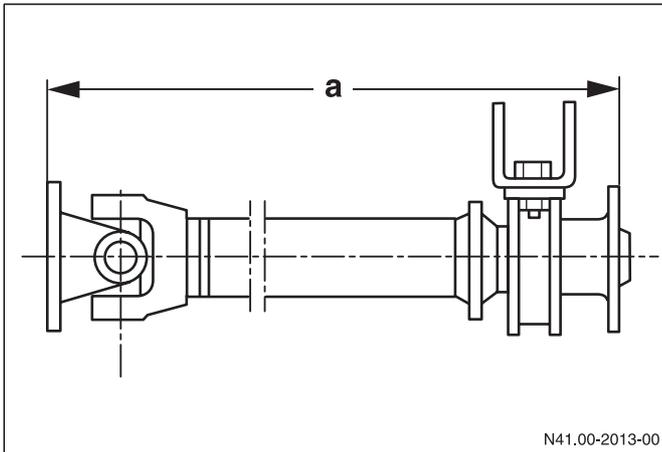
Propeller shaft

- a Operating length
- b Permissible shaft length





7.3 Engine peripherals / drivetrain



N41.00-2013-00

Intermediate shaft

a Operating length

If modifications are made to the wheelbase, the propeller shaft location and length must be the same as a comparable standard vehicle (same model and identical or similar wheelbase).

The diameter and wall thickness of the propeller shaft tube must be the same as for a standard propeller shaft.

The check straps fitted to the substructure are for passive safety and protect the fuel tank in the event of an impact. It is not permissible to modify the check straps.

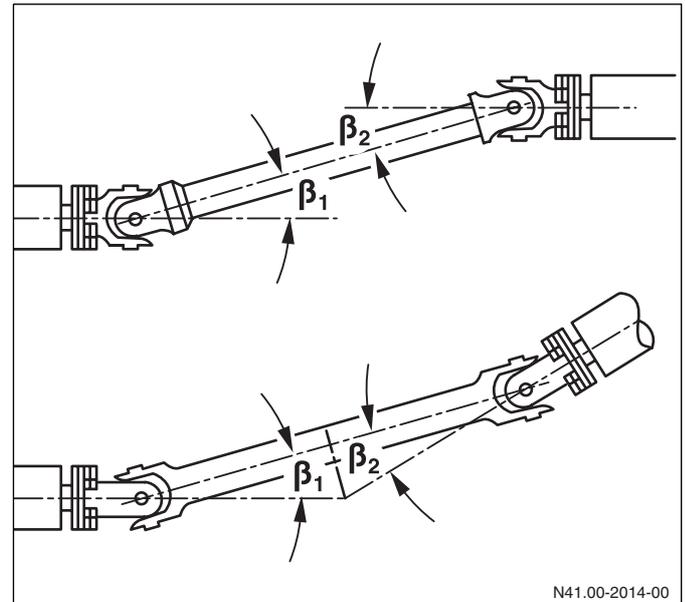
Angular offset

If necessary, fit several propeller shafts with intermediate bearings.

The angular offsets must be identical on both universal joints ($\beta_1 = \beta_2$). The angular offsets must not be greater than 6° or less than 1° .



Angular offsets greater than 6° and flange angle errors ($\beta_1 \neq \beta_2$) cause vibrations in the drivetrain. They shorten the service life of assemblies and may cause damage.



N41.00-2014-00

Types of angular offset



7.3 Engine peripherals / drivetrain

7.3.7 Retarder

The "Fittings for retrofitting a retarder" optional equipment (Code BR9) is available from the factory. This optional equipment comprises:

- the modified cross member structure in the sub-structure
- the wiring down to under the vehicle
- the wiring for the service switch, for an indicator lamp and for the hand switch in the cockpit

The service switch and hand switch are read in by the programmable special module (PSM). The PSM forwards the signals to the junction under the vehicle to enable communication with the retarder control unit.

The indicator lamp is controlled directly by the retarder.

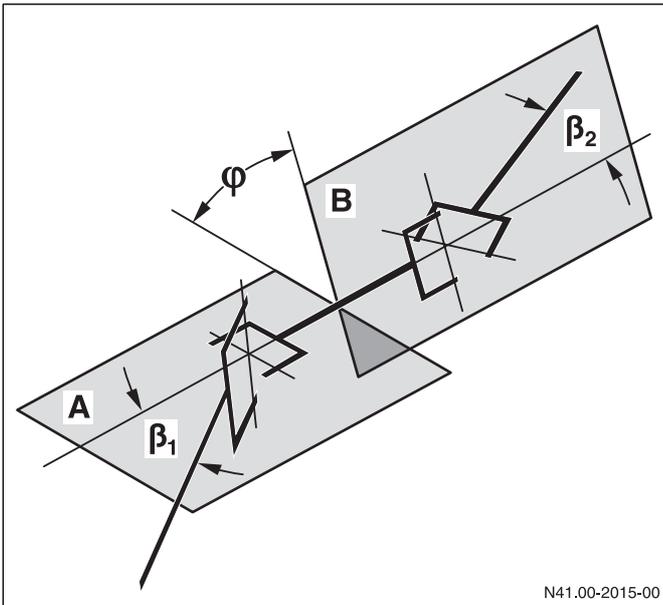
The power supply of the retarder is via a connection on the underbody (terminal 30).

The body manufacturer is responsible for the remaining wiring under the vehicle that is still required (from the control unit to the retarder) and for the positioning of components.

You will find notes on the electrical connection in the "Retarder fittings" section (▷ page 88).



If vehicles (with wheelbase 3,665 mm) are equipped with a retarder, the gearing unit for the handbrake must be relocated for reasons of space. You can obtain more information from the department responsible (▷ page 15).



$$\beta_1 = \beta_2$$

Angle in one plane (two-dimensional offset):

W- or Z-type offset

Angles in two planes (three-dimensional offset):

With three-dimensional offset, the input and output shafts intersect in different planes (combined W- and Z-offset).

In order to compensate for any irregularities, the inner joint fork must be offset.

Balance propeller shafts before installing them.

On no account should modifications exceed the threshold values.

DaimlerChrysler AG may issue a certificate of endorsement at their discretion for possible exceptions (▷ page 15). Drawings must then be submitted containing the planned propeller shaft modifications with precise dimensional data (shaft length and angular offset).





7.3.8 Engine speed regulation

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

The "constant engine speed" optional extra, Code M53 and MT4 (variable), is available for some engine combinations. Further advice can be obtained from the ordering offices at the factories (▷ page 15).

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

The speed can be increased by depressing the accelerator pedal.

Constant engine speed 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 (Code M53)). This optional equipment makes it possible to have the working engine speed regulation controlled externally (▷ page 83). There is otherwise a risk of malfunctions and the engine could enter emergency running mode.





7.4 Interior

7.4.1 General information

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

Handling, transportation and storage are subject to legislation concerning potentially explosive substances (for example, the "Gesetz über explosionsgefährliche Stoffe" in Germany) and must therefore be reported to the relevant trades inspectorate.

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 satisfy the criteria of the head impact tests specified in ECE R4 or FMVSS 201.

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

See the illustrations of the airbag deployment areas for more information (▷ page 128).

The permissible centre of gravity and maximum permissible axle loads must not be exceeded.

You will find information on motor caravan conversions in the "Motor caravan" section (▷ page 189).

For the conversion of vehicles in Germany, appropriate information sheets can be requested from the relevant technical inspection authorities for motor vehicles (e.g. TÜV, DEKRA).

The interior must be designed with soft edges and surfaces.

Fittings must be made of flame-resistant materials and be fitted securely.

Unimpeded access to the seats must be ensured. There must not be 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.

Risk of injury



On no account may any modifications be made to the airbag system or the belt tensioner system.

Modifications to or work incorrectly carried out on a restraint system (seat belt and seat belt anchorages, belt tensioner or airbag) or its wiring, could cause the restraint systems to stop functioning correctly, e.g. the airbags or belt tensioners could be triggered inadvertently or could fail in accidents in which the deceleration force is sufficient to trigger the airbag.

Risk of injury



Reliable operation of the front airbag, windowbag and thorax bag and belt tensioners can no longer be guaranteed if modifications are made to the vehicle structure by the body manufacturer, 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-MB seats
- modifications to the A-pillar and B-pillar, the roof frame and its lining
- modifications to the doors

This could otherwise result in personal injury.





7.4.2 Safety equipment

Airbag control unit and sensors

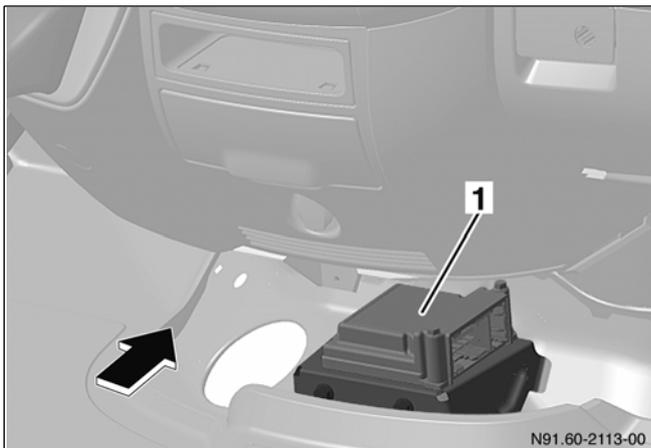
It is not permitted to modify the installation location, installation position and attachment of occupant-safety airbag control units and satellite sensors by comparison with the standard vehicle on vehicles equipped with windowbags and thorax bags. Other vehicle components must not be secured to the airbag control unit, the satellite sensors or the securing points.

Danger



Vehicle parts that create vibrations must not be secured in the proximity of the airbag control unit or sensor installation locations, nor may modifications be made to the floor structure in the proximity of the airbag control unit or the satellite sensors. Reliable operation of the front airbag, windowbag and thorax bag and belt tensioners is otherwise no longer guaranteed and there is consequently a risk of injury.

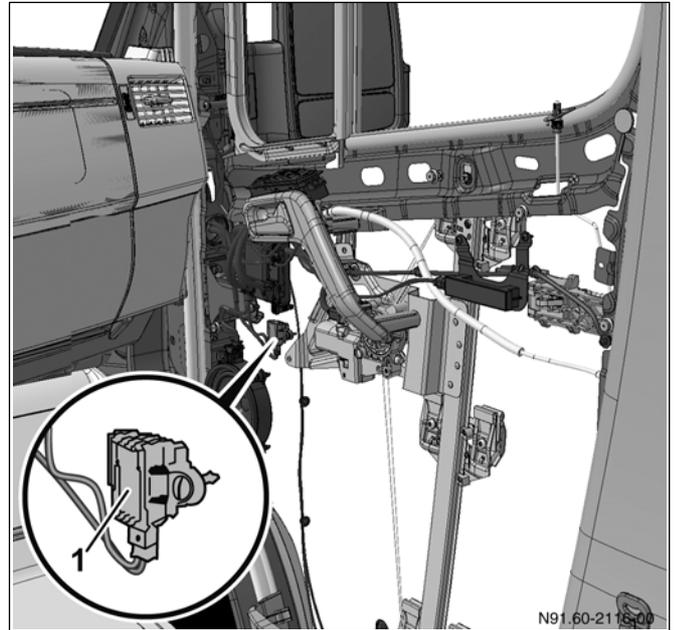
The airbag control unit is located on the transmission tunnel under the centre console.



Location of airbag control unit

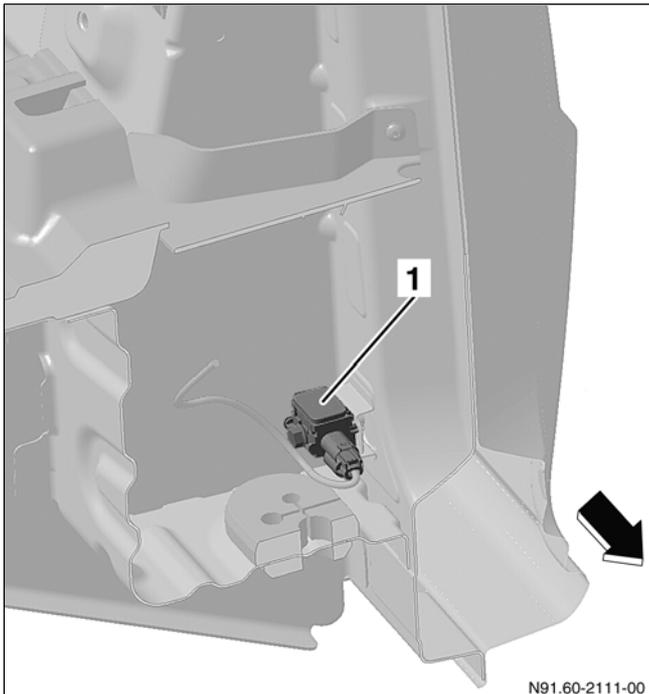
- 1 Airbag control unit
- Arrow Front of vehicle

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 windowbags 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 Satellite sensor (triggering sensor of the occupant protection systems)
- Arrow Front of vehicle

Seat belts and belt tensioners

Risk of injury



Parts relevant to safety such as seat belts or belt anchorages and tensioners must not be damaged or soiled 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.



Only the original seat belts may be fitted, otherwise the general operating permit of the vehicle would be invalidated.

Vehicles designed to travel at a maximum speed of over 25 km/h must be equipped with seat belts (see minimum seat belt requirements, EC Directive 77 / 541 / EEC).

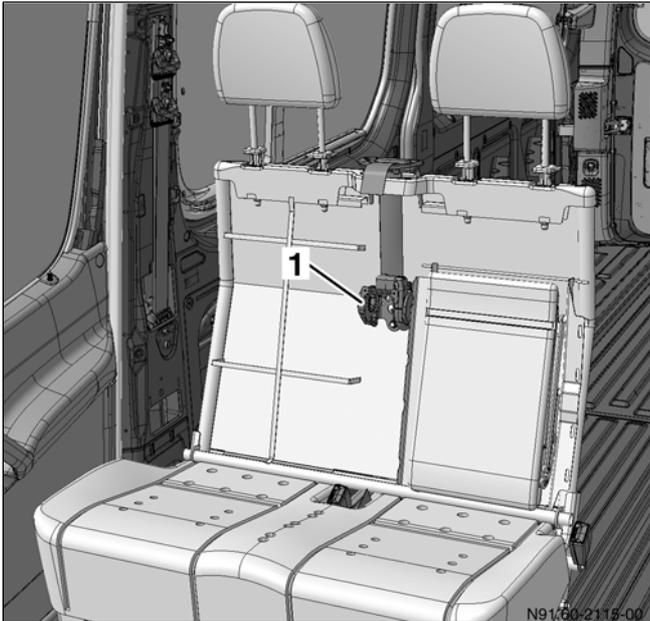
Seat belt anchorages must be tested in accordance with EC Directive 76 / 115 / EEC.

All vehicles are equipped with pyrotechnic belt tensioners 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 tensioner

- 1 Connector



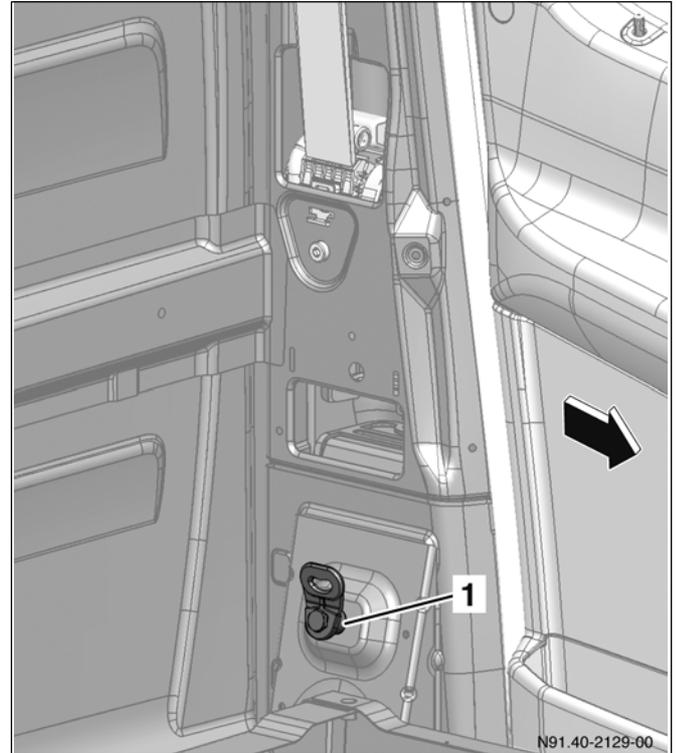
Co-driver's bench seat with retractors

- 1 Retractor



The legal requirements detailed in this section relate to current legislation in Germany. The relevant national legislation must be observed in all other countries.

There is also a securing point for a seat belt end locking fixture at the bottom of the B-pillar, which has been tested in accordance with 76 / 115 / EEC using a folding seat rigidly connected to the bodyshell.



Securing point for the seat belt end locking fixture in the B-pillar

- 1 Seat belt end locking fixture
Arrow Front of vehicle



Front airbag

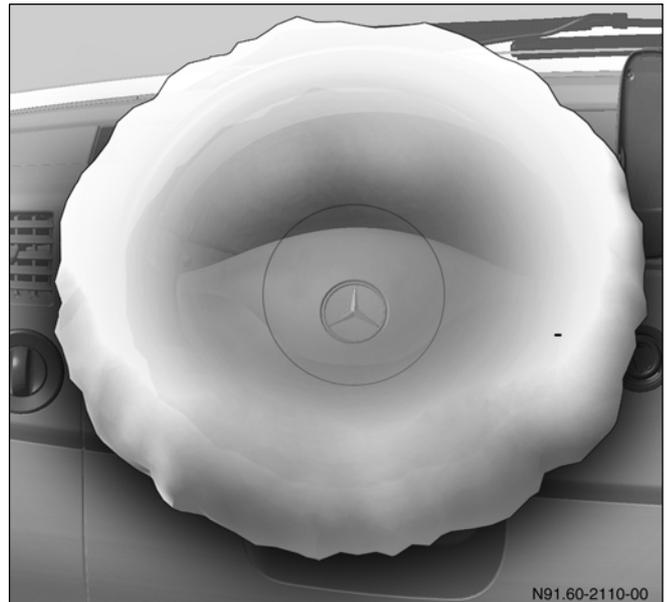
All airbag units are labelled "Airbag":

- The driver's airbag unit is identified by the "Airbag" inscription on the steering wheel boss.
- If 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 windowbags, 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 windowbag 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



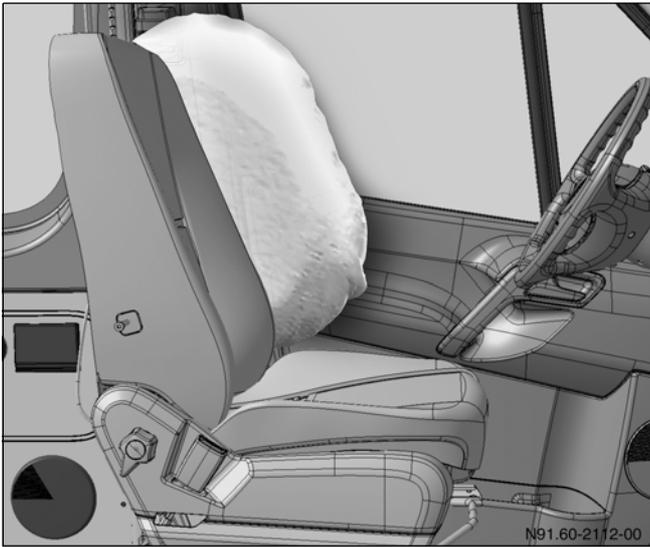
Deployment area of co-driver's airbag



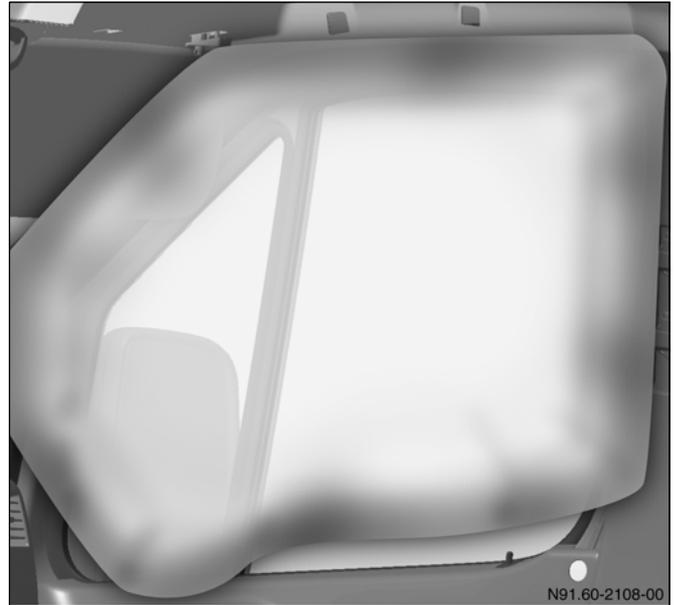


Side-impact airbags

On no account should modifications be made to the B-pillar, door bodies, trim and seat upholstery.



Deployment area of left-hand side thorax bag



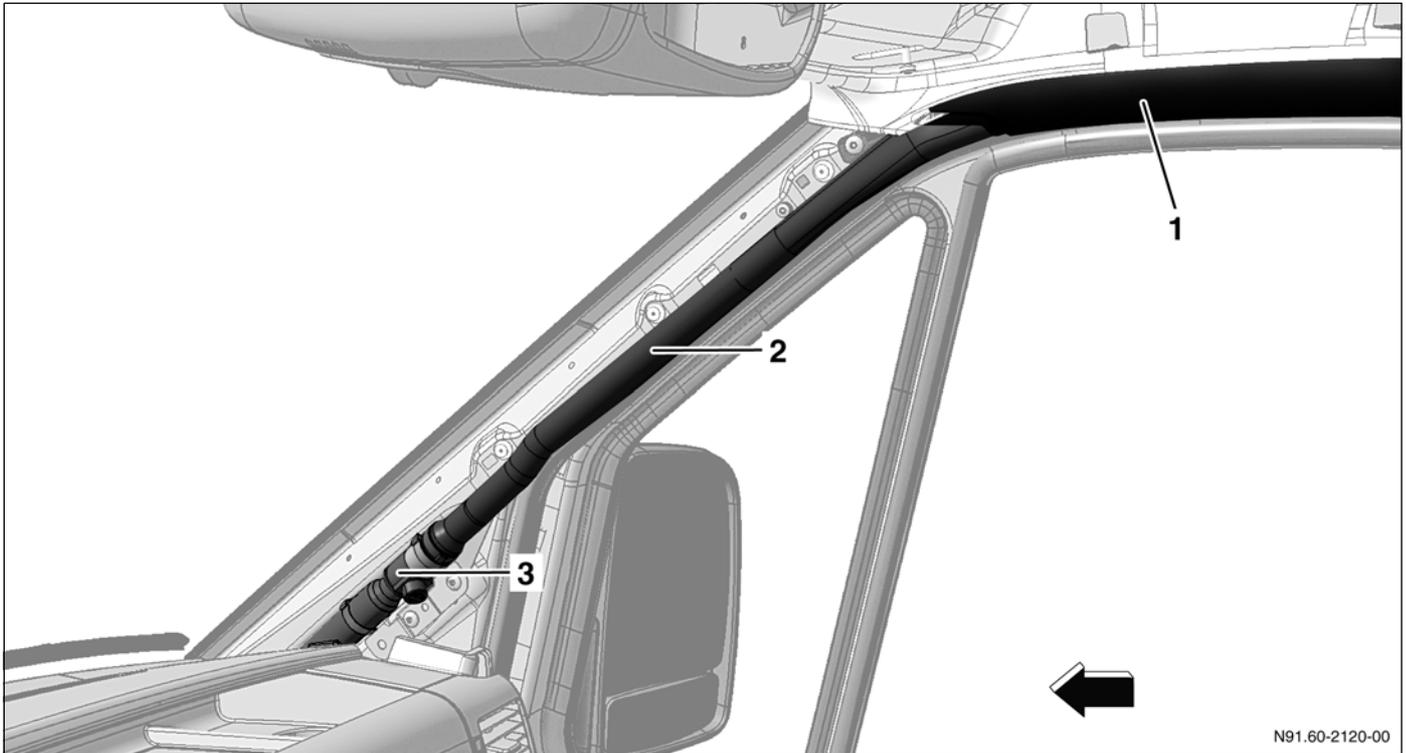
Deployment area of right-hand side windowbag



Warning



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



Windowbag installation location

- 1 Cover
 - 2 Windowbag in protective sleeve
 - 3 Gas generator in windowbag
- Arrow Front of vehicle



Working with airbag and belt tensioner units

Risk of injury



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.

The airbag units fitted to the SPRINTER – model series 906 include the driver's and co-driver's airbags as well as the windowbag and thorax bag.

- Work involving removed airbag and belt tensioner units, and testing and installation work, may only be carried out by skilled personnel.
- The airbag and belt tensioner 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 airbag and belt tensioner units must be locked away again.
- The airbag and belt tensioner units may not be treated with grease, cleaning agents or other similar products.
- The airbag and belt tensioner units may not be exposed to temperatures above 100 °C, even for a short period of time.

Airbag and belt tensioner units, and the sensors and control unit, must be replaced if they are dropped from a height of more than 0.5 m. Airbag and belt tensioner units may only be subjected to electrical tests using the specified testers when the airbag and tensioner units have been fitted. We recommend that tests be carried out at a Mercedes-Benz Service Centre.

The vehicle battery must be disconnected, the negative terminal covered and the test coupling/ connection disconnected before the airbag and belt tensioner unit are removed.

Transporting and storing airbag units and belt tensioner units

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



Transporting airbag units in the passenger compartment in any way is prohibited.

The airbag units fitted to the SPRINTER – model series 906 include the driver's and co-driver's airbags as well as the windowbag and thorax bag.

Airbag and belt tensioner units must be stored in accordance with the second ordinance of the German Explosives Law (Zweite Verordnung zum Sprengstoffgesetz) dated 17.04.86.

This ordinance allows small amounts of substances and materials to be stored in secure areas as specified in the Explosives Law without requiring special storage permission.

Class T1 pyrotechnic materials may only be stored in limited quantities on premises used for commercial purposes.





Annex 6 of the Appendix to the 2nd ordinance of the German Explosives Law specifies that the following maximum storage quantities are permissible without obtaining special approval from the relevant authority, where materials are stored on premises used for commercial purposes and certain conditions are fulfilled (e.g. steel cabinet).

- General storage space: 20 kg gross weight
- The gross mass of the component which has been approved in accordance with the act concerning explosives is used to calculate the actual stored mass.

The weights of the individual components are:

Driver's airbag	1.5 kg
Co-driver's airbag	3.3 kg
Windowbag	2.1 kg
Thorax bag	0.7 kg
Seat belt	1.3 kg

Disposing of airbag and belt tensioner units

The airbag units fitted to the Sprinter – model series 906 include the driver's and co-driver's airbags as well as the windowbag and thorax bag.

In Germany, airbag and belt tensioner units must be electrically detonated as specified in accident prevention regulations to render them unusable prior to disposal.

- If belt tensioners that have not been triggered require detonation for disposal purposes, place them in the footwell of a vehicle which has been sent for scrapping, and connect them directly using a 2-pin plug.
- If the upholstery pads on the airbag units have not been destroyed, the airbag units must be detonated using the 2-pin plug.

These safety measures are necessary because pyrotechnic materials could cause injury if activated incorrectly.

Risk of injury



Airbag and belt tensioner units must be disposed of by personnel who have undergone special training for this task. Accident prevention regulations must be observed.

Hazards arise from disposal using cutting torches, by smelting, or if primed parts are disposed of on open fires or smouldering fires on waste disposal sites.

In order to avoid any additional workload arising from these safety precautions, we recommend that you entrust the disposal of pyrotechnic components to an external waste disposal company who will implement all the necessary safety precautions (including 10 m safe distance, special detonator).

When the materials are handed over, the waste disposal company must sign a declaration containing the obligation to dispose of the pyrotechnic materials in accordance with accident prevention regulations. Agreements of this kind must ensure that it is not possible to extract pyrotechnic materials after disposal and to pass them on for repairs.

7.4.3 Standard seats

DaimlerChrysler AG will issue a certificate of endorsement at their discretion (▷ page 15) for modifications to the seat attachments (including seat bases) and seat belt anchorages or for the installation of seats other than those available from the factory.

Proof of the strength of the seats delivered from the factory is only valid if the seats are secured in original mountings (seat subframe, detents, seat base, etc.).

When seat belts and seats (including seat bases) are re-installed, the specified bolts must be tightened to the specified torque.





You will find information on retrofitting seats in the "Implementation of bodies" section (▷ page 165).

Risk of accident



On no account may seats be mounted on the wheel arches. Otherwise, the vehicle could be damaged as a result (e.g. wheel arches and tyres).

7.4.4 Reducing noise in the vehicle interior

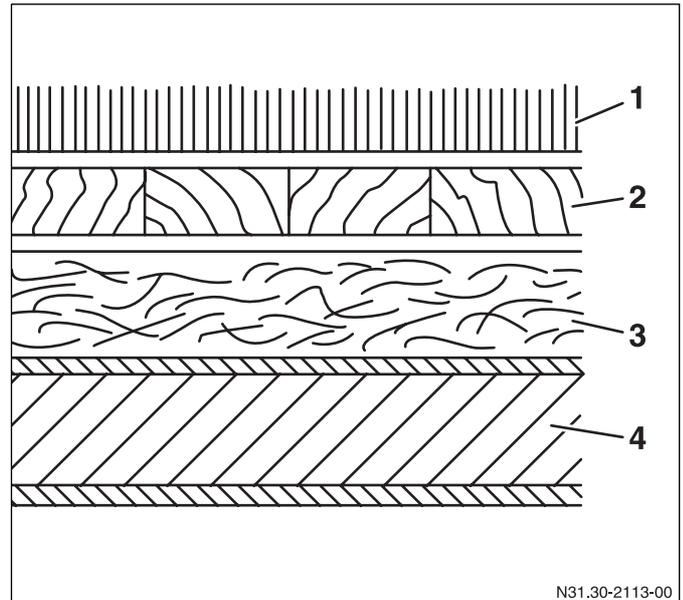
To reduce the noise level in the vehicle interior, flame-retardant noise-insulating materials may be installed.

Floor area

A structure as shown in the illustration is advisable for insulation and soundproofing. An additional covering with heavy-duty insulating foil may be provided in the area of the wheel arches.



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 (12 mm plywood)
- 3 Heavy-duty insulating foil (8 to 10 kg/m² surface-to-weight ratio)
- 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).

Risk of accident



On no account should any subsequent modifications be made to the roof lining or the roof skin between the A-pillar and the B-pillar if the vehicle is equipped with windowbags. Otherwise, the windowbag may no longer be able to work correctly (e.g. windowbag deployment is delayed or incomplete).





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 (▷ see page 58). Air vents must not be fitted in the immediate vicinity of sources of noise or exhaust fumes.

In addition, manufacturers or suppliers of soundproofing 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 Codes HH9 and HH7 (▷ page 39).

When retrofitting assemblies, please refer to the "Additional equipment" section (▷ page 135).



7.5 Additional equipment

7.5 Additional equipment

If additional equipment is fitted, factory-fitted power take-offs must be used (▷ page 136).

7.5.1 Retrofitting an air-conditioning system

All electrical equipment fitted must be tested in accordance with EC Directive 72 / 245 / EEC and must bear the e mark.

When retrofitting air-conditioning systems, we recommend the "Controlled air-conditioning system" Code HH9 or the "Rear-compartment air-conditioning system" Code HH7 which can be obtained from the factory as optional equipment.

The requirements of the equipment manufacturer concerned 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:

- 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 (▷ page 69) must generate sufficient power.
- Additional fuse protection for the air-conditioning power circuit (▷ page 68).
- Air-conditioning compressors must be attached using the equipment carrier provided (▷ page 139).
- The additional pulley for driving air-conditioning compressors is available from the factory as optional equipment under Code N63 (maximum output 7 kW) (▷ page 139).
- Ensure that wires (▷ page 56) and electrical lines (▷ page 68) 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 (▷ page 119).
- If compact systems are mounted on the cab roof (evaporator, condenser and blower), the permissible roof loads must not be exceeded (▷ page 116).
- Attachments to the roof require a certificate of endorsement from the department responsible (▷ page 15).





7.5 Additional equipment

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 systems are available from the factory as optional equipment:

Description	Code
Auxiliary warm-air heater	H11
Hot water auxiliary heater	H12
Auxiliary heat exchanger in the load compartment / chassis	H13

More information is contained in the "Optional equipment" section (▷ page 39).

7.5.3 Liquid-petroleum gas (LPG) system

National regulations and laws must be observed when retrofitting liquid-petroleum gas systems.

Comply with the manufacturer's installation instructions.

The body manufacturer is responsible for the proper functioning and maintenance of the systems fitted.

There should be no impairment of the functions of the basic vehicle when additional equipment is retrofitted.

7.5.4 Power take-offs

General

Power take-off versions available from the factory:

- Transmission-driven power take-off (OM 646, 642)
- Engine power take-off at the front (OM 646, 642)

The power take-off version and selection of the gear ratio are dependent on the power and speed of the PTO equipment to be driven.

Transmission-driven power take-offs may only be engaged and disengaged when the vehicle is stationary.

The maximum transferable torques for each of the power take-offs are guide values for shock-free and vibration-free operation.

These figures are based on a highly durable gearing design and a service life calculated in compliance with the German standard DIN 622. The additional mass forces of the driven PTO assemblies are not taken into account.

The ratio chosen should ensure that a minimum engine speed of 1,200 rpm at P = 28 kW or 1,500 rpm at P = 40 kW (in conjunction with transmission oil cooling) can be maintained. The power output should be within the range of the maximum engine torque.

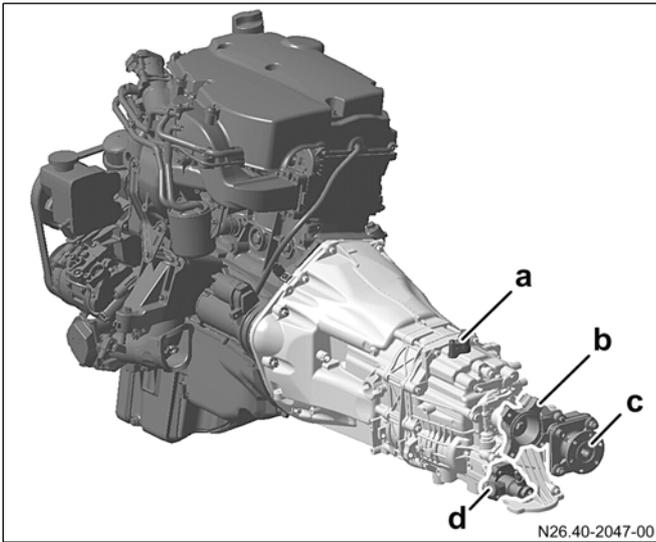
Exposed propeller shafts, fan impellers or pulleys must be covered.

No belts or chain drives may be fitted to the drive shaft or drive flange of a power take-off.



7.5 Additional equipment

Transmission-driven power take-off


Illustration showing transmission-driven power take-off

- a Neutral gate switch
- b Transmission shaft flange
- c PTO flange
- d Selector cylinder for PTO (activated by a switch on the dashboard)

The side-mounted PTO available for Mercedes-Benz manual transmissions is obtainable from the factory as optional equipment.

Code N05	without flange
Code N07	with flange

Technical data


The maximum dead weight of implements on directly flange-mounted power take-offs (Code N05) must not exceed 12 kg otherwise transmission damage can occur.

$$\eta_{NA} = 0.687 \times n_{\text{engine}} \text{ (NSG370)}$$

$$\eta_{NA} = 0.704 \times n_{\text{engine}} \text{ (NSG400)}$$

Max. continuous output NSG370	28 kW at 2,780 rpm (engine speed)
Max. continuous output NSG400	28 kW at 2,713 rpm (engine speed)
Max. torque	140 Nm at 1,200 rpm (engine speed)

The direction of rotation is clockwise when viewed in the direction of travel.

If transmission oil cooling is retrofitted

Max. continuous output NSG370	40 kW at 2,780 rpm (engine speed)
Max. continuous output NSG400	40 kW at 2,713 rpm (engine speed)
Max. torque	200 Nm at 1,500 rpm (engine speed)



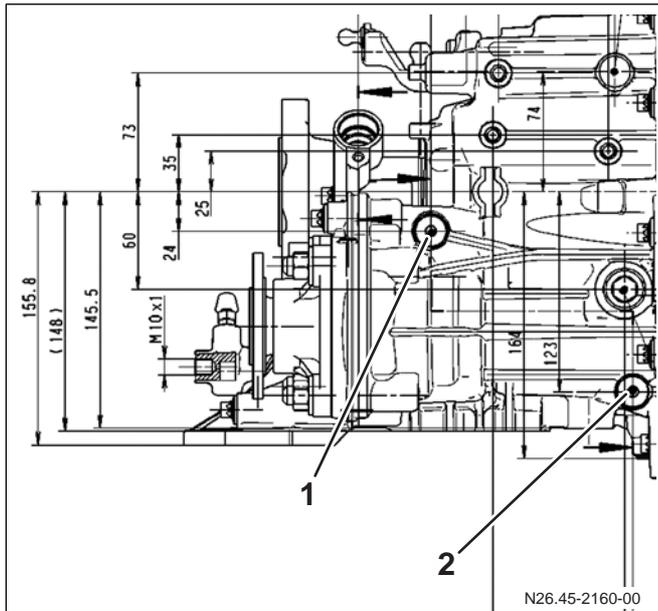
Avoid continuous excessive torque take-off since this can lead to transmission damage.

All transmissions with the NSG370 / 400 NA (Code N05 or N07) power take-off are provided with points for connecting up a separate oil cooler.





7.5 Additional equipment

**Position of the oil cooler connections**

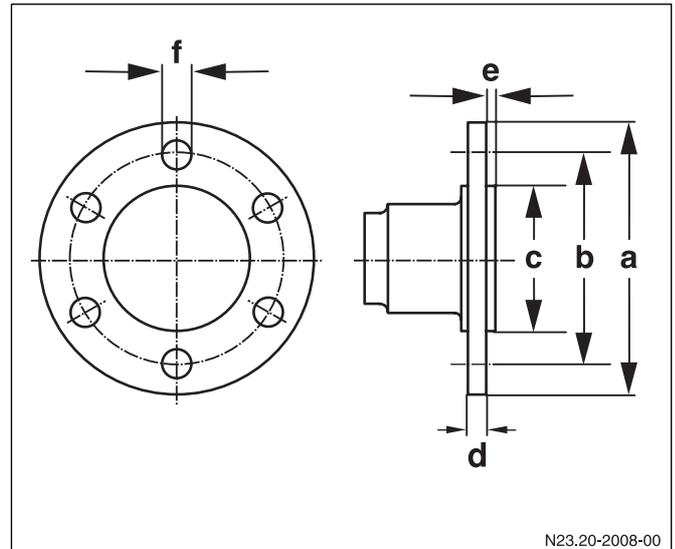
- 1 Optional oil cooler connection "in"
DIN 908-M14x1.5x12
- 2 Optional oil cooler connection "out"
DIN 908-M14x1.5x12

The "Provision for transmission oil cooling" option is available from the factory under Code GK4.

Under this option, a radiator with an integral oil cooler (New Automatic Transmission radiator) is installed. The routing lines between radiator and transmission as well as the oil pump required are not supplied and will need to be provided by the body manufacturer.

When connecting a transmission oil cooling system, the additional volume of oil in the oil cooler and oil pump lines must be taken into account so that the oil circuit remains constant. Top up with an appropriate amount of transmission oil, depending on the routing lines and the type of oil cooling system used.

More information is contained in the "Optional equipment" section (▷ page 39).

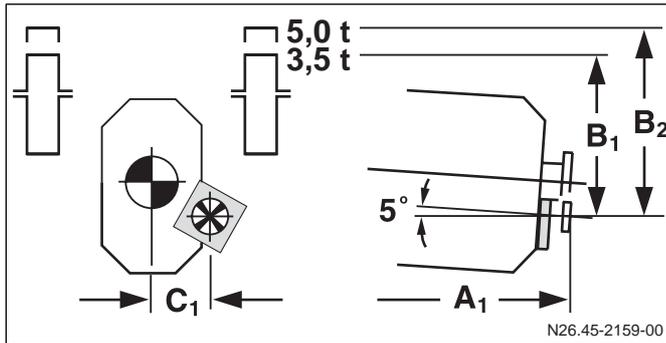
**Flange****Dimensions - coupling flange - power take-off**

Engine:	OM 646 / OM 642
a Ø	90
b Ø	74.5
c Ø	47 ^{e8}
d	6
e	2.1
f Ø	8 ^{A12}
Number of holes	6





7.5 Additional equipment



Power take-off dimensions

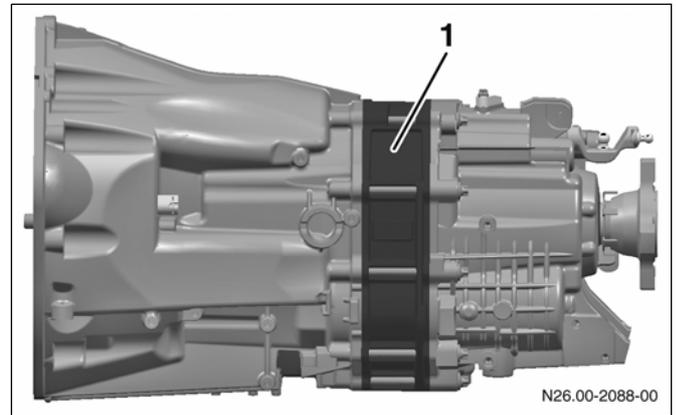
I	OM 646		OM 646 / OM 642	
II	NSG370-6		NSG400-6	
III	N07	N05	N07	N05
IV	0.687		0.704	
V	28 / 2780	28 / 2780	28 / 2713	28 / 2713
VI	140	140	140	140
VII	b	b	b	b
A ₁	585.9	538	692	645
B ₁	194.2	190.8	198.9	195.5
B ₂	214.2	210.8	213.9	215.5
C ₁	125.8	125.8	125.8	125.8

Key to PTO table:

- I Engine
- II Transmission
- III Power take-off designation (optional equipment code)
- IV Gear ratio i_{NA} ; PTO drive speed $n_{NA} = i_{NA} \times n_{engine}$
- V PTO continuous output in kW at engine speed (rpm)
- VI Maximum transferable torque at PTO in Nm
- VII Rotation direction viewed in direction of travel
 - a) anti-clockwise
 - b) clockwise
- A₁ Distance from rear edge of coupling flange to centre of front axle measured in mm
- B₁ / B₂ Distance from centre of coupling flange to upper edge of chassis in mm

C₁ Distance from centre of coupling flange to centre of transmission flange in mm

The transmission fluid temperature in continuous operation (over 30 minutes) must not exceed 120 °C. On the NA 2b, the maximum permissible weight moment at the transmission flange due to the intrinsic weight of a hydraulic pump is 15 Nm.



NSG400 transmission with intermediate flange for the OM 646

- 1 Intermediate flange



An additional intermediate flange is inserted on vehicles with OM 646 and NSG400; this alters the position of the coupling flange.

Engine power take-off at the front (OM 646 / 642)

Additional equipment (e.g. a refrigerant compressor or an extra alternator) can be driven by an additional pulley on the front of the crankshaft, see also the "Additional equipment" section (▷ page 135).

The following codes are available for power take-offs:

Code N62	Additional alternator
Code N63	Refrigerant compressor



7.5 Additional equipment

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

The maximum power output is 7 kW.

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

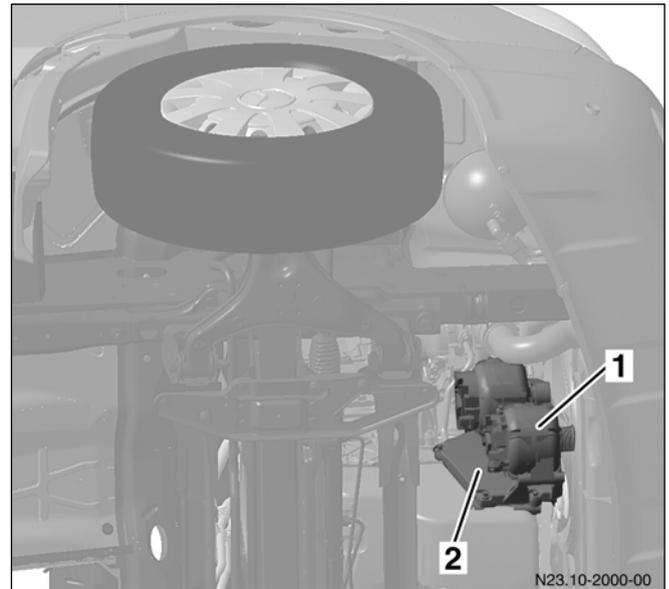
Diameters of the additional equipment pulleys

OM 642	
N62	Poly-V-belt pulley, 50 mm external diameter, 6 grooves
N63	Poly-V-belt pulley, 120 mm external diameter, 6 grooves
OM 646	
N62	Poly-V-belt pulley, 50 mm external diameter, 6 grooves
N63	V-belt pulley, AV13 section, 133 mm external diameter

We recommend using the following genuine Mercedes-Benz belts

OM 642	
N62	A001 993 47 96
N63	A001 993 37 96
OM 646	
N62	A001 993 17 96
N63	A001 993 17 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



Installing propeller shafts

If a propeller shaft is installed, the following must be observed:

- Installation guidelines of the propeller shaft manufacturer.
- If necessary, fit several propeller shafts with intermediate bearings.
- The flanging surfaces must be completely flat.
- The angular offsets must be identical on both universal joints ($\beta_1 = \beta_2$). They must not be greater than 6° or less than 1° .
- Balancing plates must not be removed.
- Make sure that the marks are aligned on the propeller shafts during installation.

For more information on the design of propeller shafts (▷ page 120).

7.5.5 Retrofitting an alternator

The existing power take-offs must be used when retrofitting an additional alternator.

You will find more information on additional alternators in the "Retrofitting an alternator" section (▷ page 69).

7.5.6 Auxiliary brakes / retarders



If you intend to retrofit a retarder, you can obtain instructions concerning retarder control on the Sprinter – model series 906 with ABS / ASR or ESP from the department responsible (▷ page 15).

The "retarder fittings" (Code BR9) optional equipment is available for retrofitting a retarder. For a description of the scope of electrical parts (▷ see page 88).





7.6 Attachments

A certificate of endorsement from the department responsible is required for attachments to the frame (▷ page 15).

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

Attachments must not impair the function of vehicle parts.

Comply with national legal requirements.

On no account should a winch be attached to the front section of the frame.

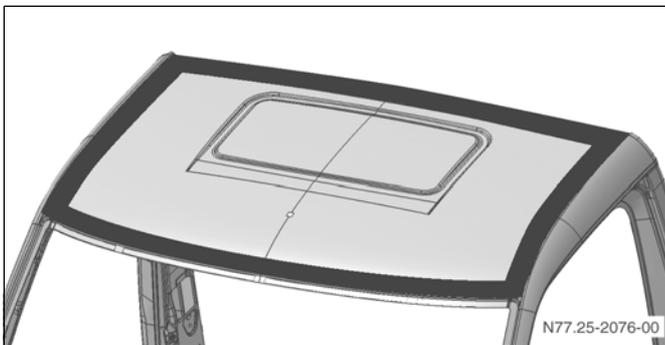
Winches behind the cab

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 of the 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 (e.g. air-conditioning system), a certificate of endorsement is required from the department responsible (▷ page 15).





7.6.2 Attachment above cab

- The permissible centre of gravity location and the front axle load must be observed (▷ page 40).
- The attachment to the roof must be designed as described in the "Bodyshell" section (panel van roof) (▷ page 114).
- If the conversion causes vibrations or noise, the mounting frame must be extended through the cab rear panel to underneath the seat bases and secured. You can request a design proposal from the department responsible (▷ page 15). With this design, an additional battery under Code E28 (accommodation in the co-driver's seat base) is not possible.

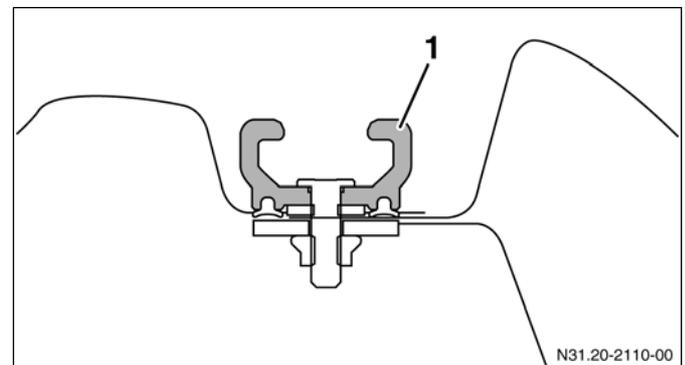
7.6.3 Roof racks

Sprinter – model series 906 panel vans and MPVs:

- 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. 50 kg per pair of feet and strut is recommended as a basic rule.
- With shorter roof racks, the load must be reduced proportionally.

Roof rack threshold values (laden)		
	Max. roof load [kg]	Minimum number of support feet pairs
Low roof	300	6
High roof	150	3
Cab	100	2
Crewcab	100	2

To make it possible to fit roof racks, the Sprinter – model series 906 can be equipped with C-rails (optional equipment Code D13).



Roof rack mounting

- 1 C-rail (roof rack)



7.6.4 Fitted shelving/installations

Fitted shelving must:

- be sufficiently 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.



On no account should attachments transfer forces only to the vehicle sidewalls. For a favourable force transfer, we recommend the use of load rails available as optional equipment or their entire contact area in the bodyshell:

- Code VC4 – on the roof frame
- Code V42 – on the waist rail



Load rails in the panel van

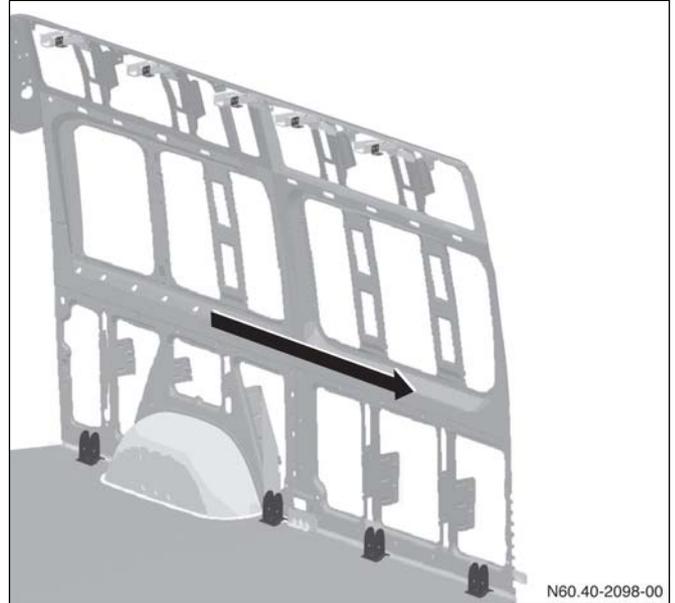
1 Load rails
 Arrow Front of vehicle



For further information about the sidewall (▷ see page 111).

Fittings for fitted shelving

Code ZE6 "Fittings for fitted shelving" is available from the factory to facilitate the retrofitting of shelves. The package includes angles attached to the roof arches and brackets mounted on the vehicle floor.



ZE6 package contents in shaded areas

Arrow Front of vehicle

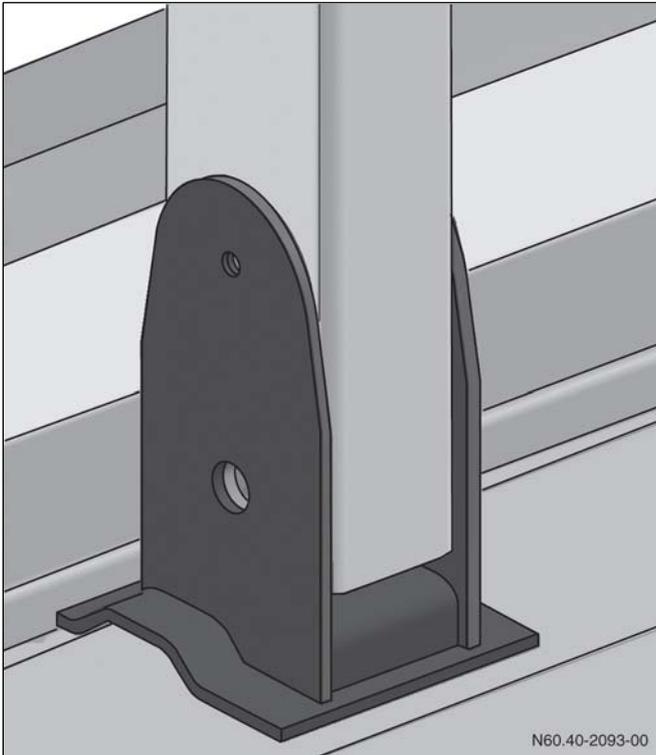
The following must be observed when using the shelf fittings:

- Shelves must not be wider than 450 mm.
- The max. load-bearing capacity is 80 kg/m.



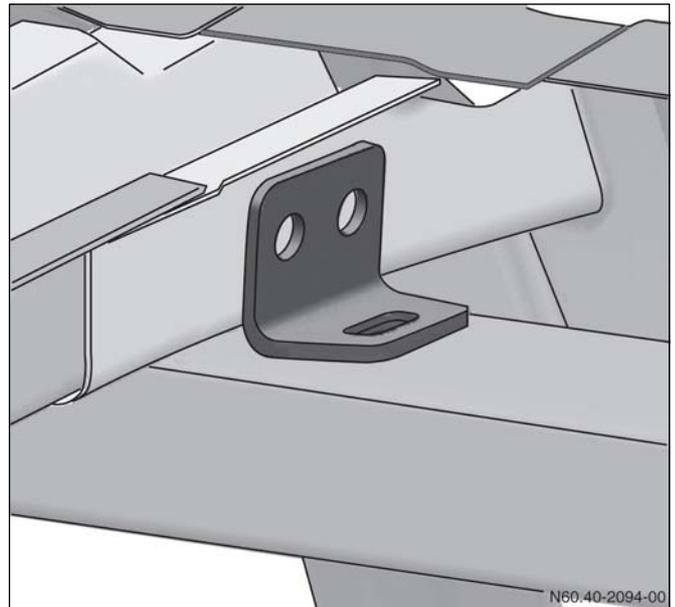


- The shelf supports must be made of steel (at least ST235JO according to DIN EN 1002) with a minimum cross-section of 60x40x3 (length x width x thickness).
- The shelf supports are bolted to the floor with the brackets.

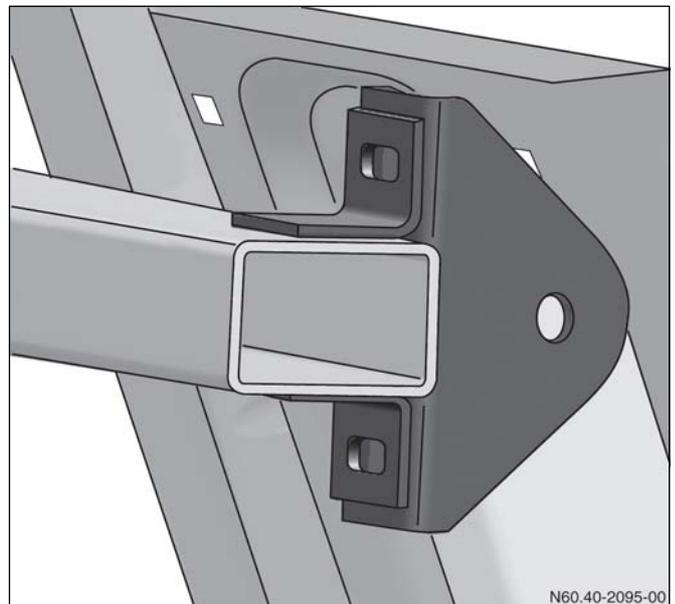


Bolting the brackets to the floor

- 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 1,200 mm², dimensions 60 mm X 20 mm).
- A tube with a rectangular profile measuring 60 mm x 40 mm x 3 mm is bolted onto the brackets on the roof arches. The shelf supports are bolted to this rectangular profile at the top.

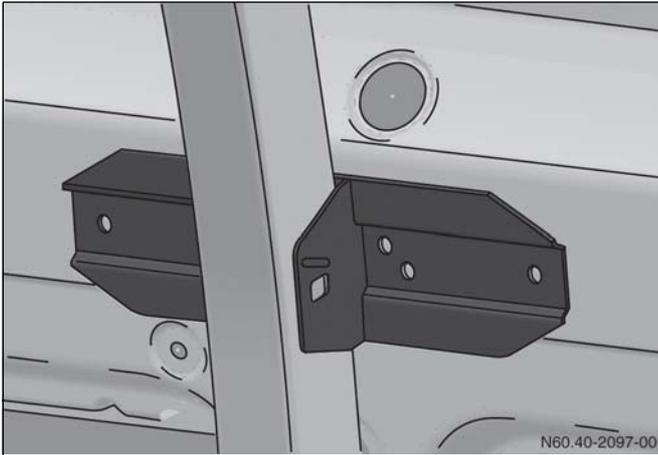


Bolting the longitudinal tube to the roof arch



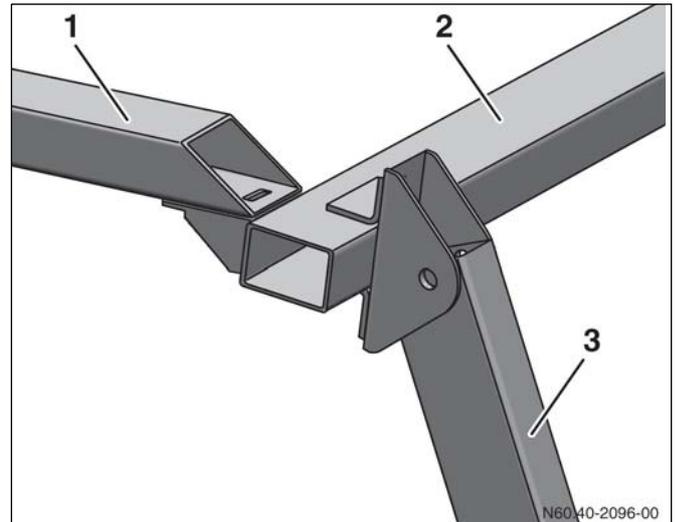
Connecting the longitudinal tube to the support

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



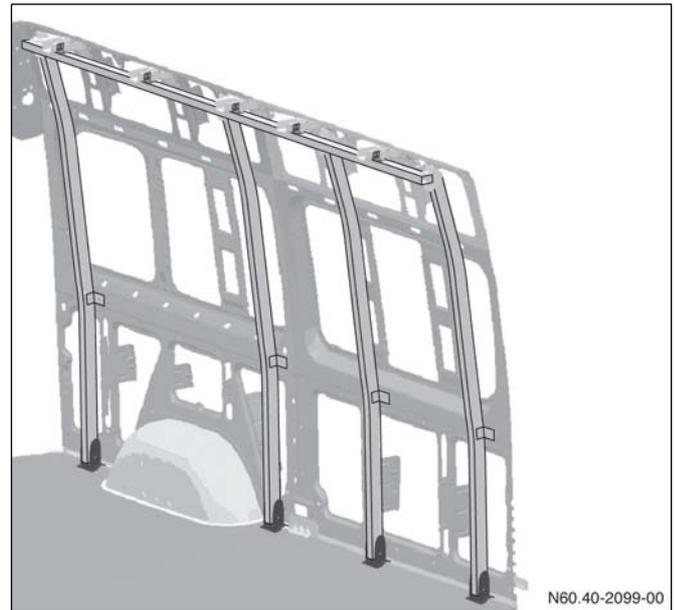
Suggestion for bracket on the waist rail

- In addition to fixing the shelf supports to the floor and to the roof arches, it is necessary to fix them to the waist rail by means of a bracket. If the connection is bonded, a minimum bonding surface area of 7,000 mm² is required. The minimum bending strength about the vertical axis must be greater than $E \times I > 3.6 \times 10^8 \text{ N mm}^2$.



Additional connection of the longitudinal tubes

- 1 Connecting rail
 - 2 Longitudinal tube
 - 3 Support
- If the first or last support is more than 300 mm away from the roof arch, the longitudinal tubes must be connected together.



Suggested shelf attachment with ZE6



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 acting on the frame (▷ page 157).

The permissible axle loads must be verified by calculating a weight balance.

The vehicle's stability must be ensured by the body manufacturer. The slewing range of the crane must be limited accordingly.

Loading cranes mounted on vehicles in Germany must comply with the German accident prevention regulations (UVV).

Comply with national 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 (▷ page 181) or tipper bodies (▷ page 184).



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.

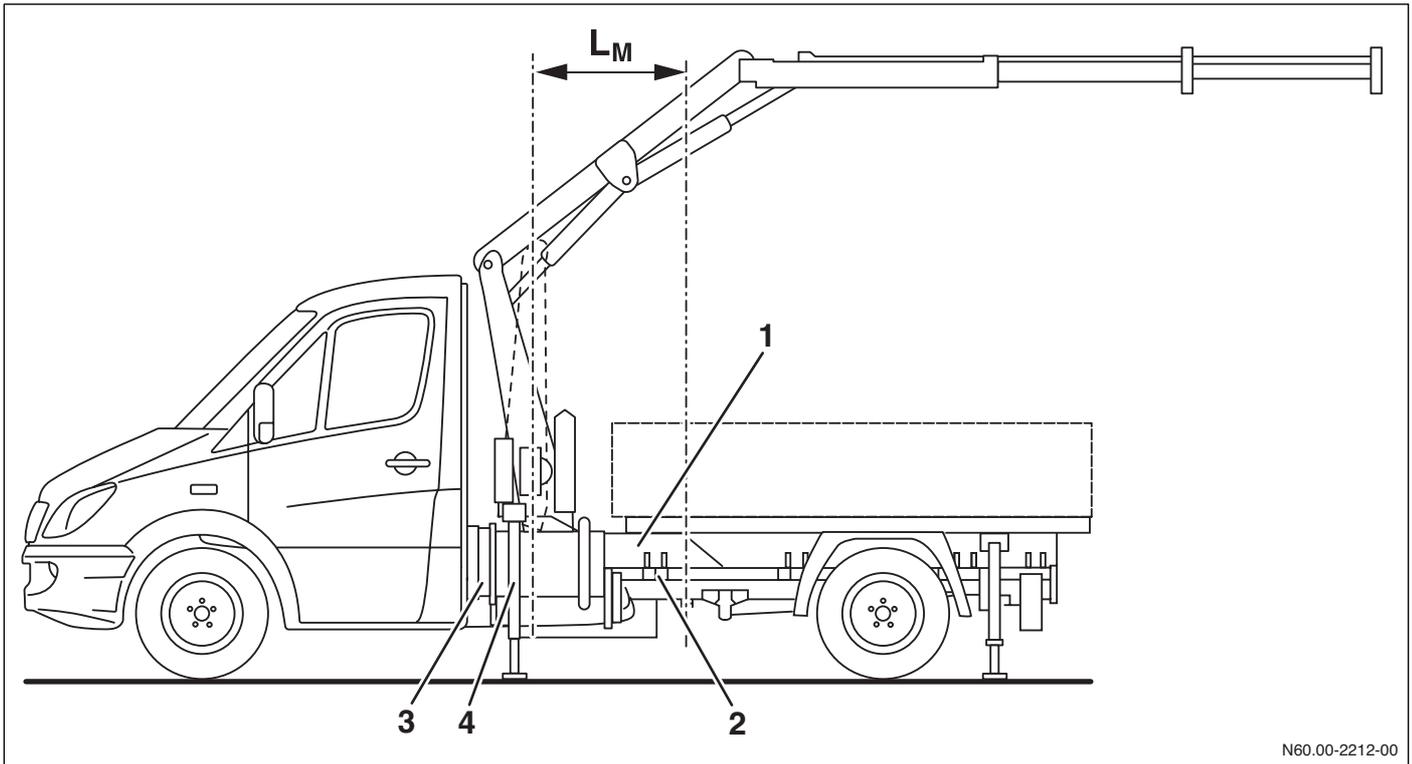
Loading cranes behind the cab

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 (W_x) for longitudinal mounting frame members: 45 cm³
- Section dimensions of mounting frame longitudinal members (▷ page 157).
- 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 colours, 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.
- If the crane load moments are exceeded, a certificate of endorsement is required from the department responsible. The crane mounting must be reinforced.
- 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 $L_M \geq 35\%$ of the wheelbase.
- This attachment requires a certificate of endorsement from the department responsible (▷ page 15).





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Loading crane

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



Loading crane mounted at end of frame

Risk of accident



The minimum front axle load (▷ see page 40) 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
- Moment of resistance (W_x) for longitudinal mounting frame members: 45 cm^3
- Section dimensions of mounting frame longitudinal members (▷ page 157).
- While the crane is in operation, vehicle stability must be ensured by extending outriggers.

7.6.6 Loading tailgate (lifting platform)

We recommend the "Lifting platform fittings" (Code EV3) optional equipment if you intend to retrofit a lifting platform to open models.

Please consult the department responsible if you intend to retrofit a lifting platform to enclosed models (▷ page 15).

If a lifting platform is being fitted, observe the following:



An alternator and a battery with higher capacity as well as an auxiliary battery must be fitted if an electrohydraulic lifting platform is fitted.

- Within the EU, lifting platforms must conform to EU EN 1756-1.
- Lifting platforms in Germany must comply with the German accident prevention regulations (UVV).
- The permissible rear axle load must not be exceeded.
- The minimum front axle load must be complied with in all load states (▷ see page 40).

- Vehicle stability must be ensured by the body manufacturer 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 (open model series).
- We recommend the use of only hydraulic supports.
- The legal requirements in various countries relating to "Underride guard" and "Lighting" must be observed when a lifting platform is mounted.
- Maximum load clearance 600 mm, relative to the standard rear portal / standard rear cross member.
- We recommend fitting an anti-roll bar to the front and rear axles.
- Cuts in the rear cross member are only permitted after consultation with the department responsible (▷ page 15).
- Vehicle stability when loading and unloading the vehicle must be ensured by the user.



The maximum lifting force must not be exceeded when the vehicle is unloaded.





Lifting platform attachment

The attachment of a lifting platform must be designed as described in the "Attachment to the rear frame section" section (▷ page 101).

Additional torque support must be provided by means of at least two bolted connections fitted with spacer bushes (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 panel van body.

If modifications are required to the underride guard due to the attachment of a lifting platform, the strength and bending strength of the underride guard must not be changed (▷ page 154).



The vehicle must not be raised using the outriggers, as this would damage the frame.

Model	Wheelbase [mm]	Maximum lifting force [kN]		Minimum dimension of mounting frame – longitudinal member [mm]
		Open model series	Enclosed model series	
209 CDI – 218 CDI	3,250	5	5	80 x 45 x 3
	3,665	5	5	80 x 45 x 3
309 CDI – 318 CDI	3,250	5	5	80 x 45 x 3
	3,665	5	5	80 x 45 x 3
	4,325	5	5	120 x 50 x 4
	3,665	7.5	5	120 x 50 x 4
	4,325	7.5	5	140 x 60 x 5
409 CDI – 418 CDI 509 CDI – 518 CDI	3,665	5	5	80 x 45 x 3
	4,325	5	5	120 x 50 x 4
	3,665	7.5	5	120 x 50 x 4
	4,325	7.5	5	140 x 60 x 5
	3,665	10	5	140 x 60 x 5
	4,325	10	5	160 x 60 x 5





7.6.7 Trailer coupling

- We recommend the use of trailer couplings that have been approved by Mercedes-Benz and attached to the special mounting points on the bodyshell (rear longitudinal member) (▷ page 238).
- Access to the spare wheel must be guaranteed if a trailer coupling with a non-detachable ball neck is fitted (especially with a fully laden vehicle).
- Fitting the trailer coupling must comply with national regulations. The relevant standard in Germany is DIN 74050.
- If there are any deviations from the German accident prevention regulations (UVV), a certificate of endorsement must be requested in Germany from the Berufsgenossenschaft für Fahrzeughaltung, 22757 Hamburg, Germany (tel. +49 (0)40-381091).
- Technically, there is no problem retrofitting a trailer coupling when the equipment available as optional equipment, Code E 57 – "Electrics for trailer power socket" (▷ page 154) is already fitted.



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



If you retrofit a towing device, a fuel tank shield will be needed for the following vehicles:

- 4-cylinder diesel engine on 4.6 t / 5 t vehicles
- 6-cylinder diesel engine
- 4-cylinder diesel engine on 3.5 t vehicles with low frame and underbody protection
- 4-cylinder diesel engine on 3.88 t vehicles with low frame
- 6-cylinder diesel engine on 3.88 t vehicles with low frame

Information is available from your Mercedes-Benz Service Centre.

Dimensioning the trailer coupling

The size of the trailer coupling is defined by the drawbar ratio.

$$D = g \times \frac{m_k \times m_a}{m_k + m_a} (\text{kN})$$

D = drawbar ratio

m_k = permissible gross vehicle weight of the tractor vehicle in t

m_a = permissible gross vehicle weight of the trailer in t

$g = 9.80665 \text{ m/s}^2$

In order to allow the trailer to be exchanged when used in international transport, the clearance between the centre of the trailer coupling and the end of the tractor vehicle must be no more than 300 mm (in Germany, according to the German standard DIN 74050).

Clearance dimensions, trailer coupling

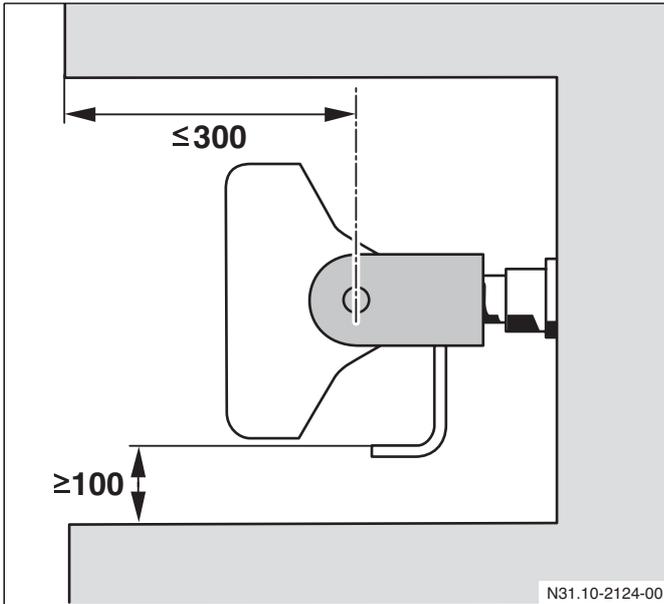
The national clearance dimensions must be taken into consideration: in the EU, as specified in EU 94 / 20 or ECE-R55.

The height of the trailer coupling above the ground must be between 300 mm and 450 mm when the vehicle is laden to the permissible gross vehicle weight.



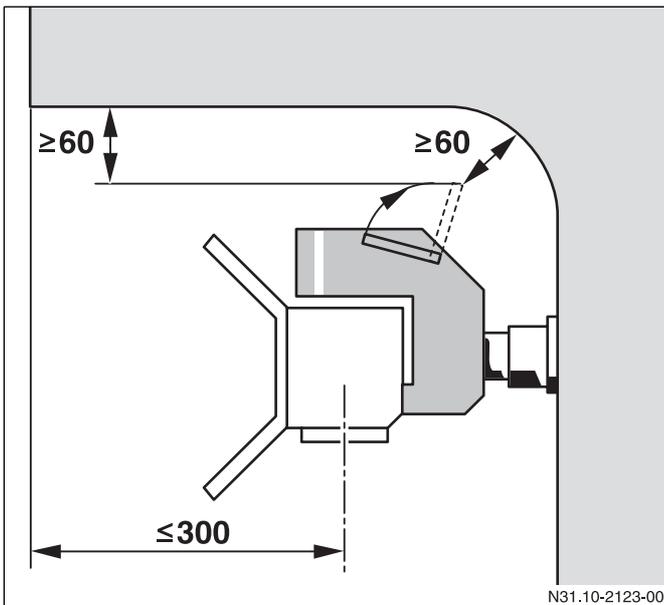


Open-jaw coupling



N31.10-2124-00

Open-jaw coupling, top view



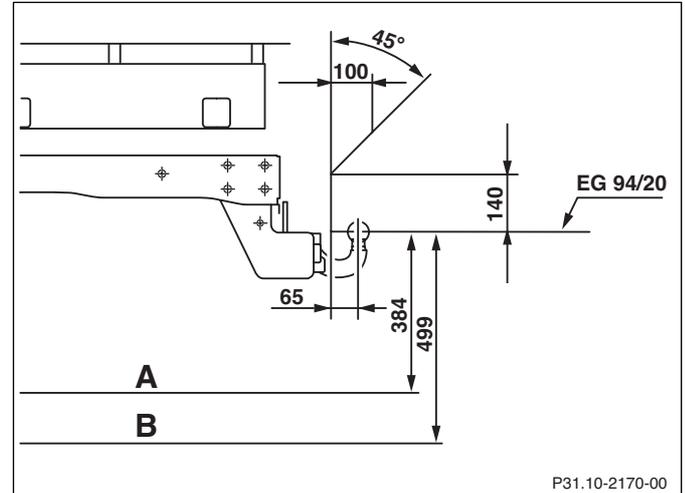
N31.10-2123-00

Open-jaw coupling, side view

The distance from the centre of the coupling pin of the trailer coupling to the end of the body must not be more than 300 mm. The specified clearances must be maintained.

The reliable operation of the coupling must not be impaired.
On no account should an open-jaw coupling be fitted to the front.

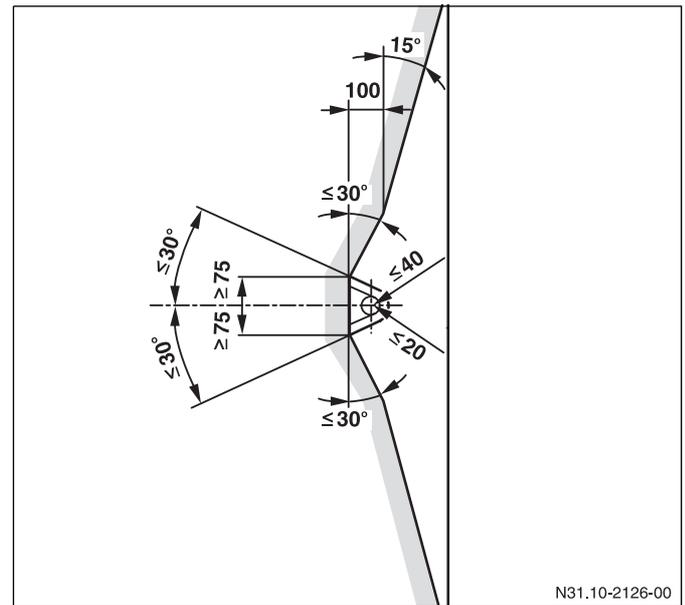
Ball coupling



P31.10-2170-00

Ball coupling, side view

- A Laden
- B Empty



N31.10-2126-00

Open-jaw coupling, top view



The specified clearances must be maintained.

Risk of accident



If the tractor vehicle is unladen, only an unladen trailer may be towed.

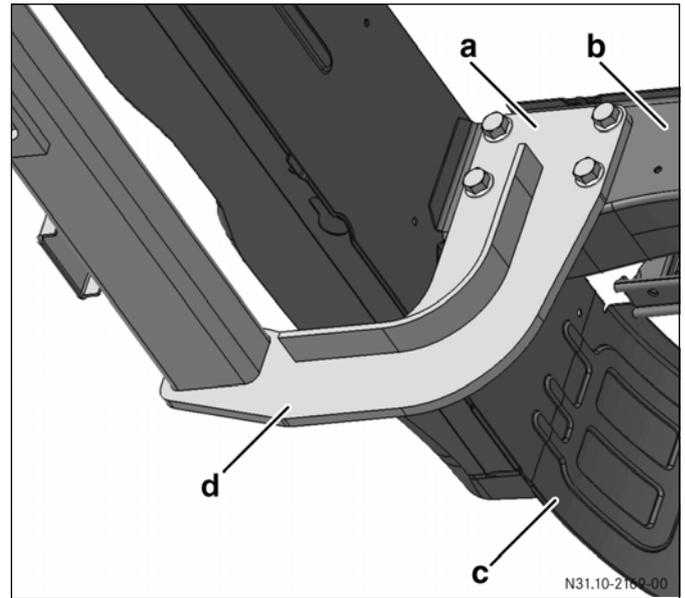


If trailer couplings have removable ball couplings, the operating instructions must be supplied in the vehicle and they must refer to the special features and operation of the coupling.

Attachment of the trailer coupling

Only secure trailer couplings and mounting plates to the special mounting points on the bodyshell (rear longitudinal member) (▷ page 101).

In addition, panel vans require an additional attachment as support on the rear cross member of the vehicle frame.



Interior 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 coupling

- On no account should any attachment be made to the underride guard.
- Any modifications to the underride guard must be clarified with the technical inspection authority responsible (TÜV). The strength or the bending strength must not be impaired.
- If the frame needs extending, spacer bushes must be fitted to the frame to attach the mounting plate or the rear cross member (▷ page 99). They may lead to a reduction in the towing weight or the nose-weight.

You will find hole patterns with dimensions for securing the trailer coupling in the "Technical details" section (▷ see page 238).





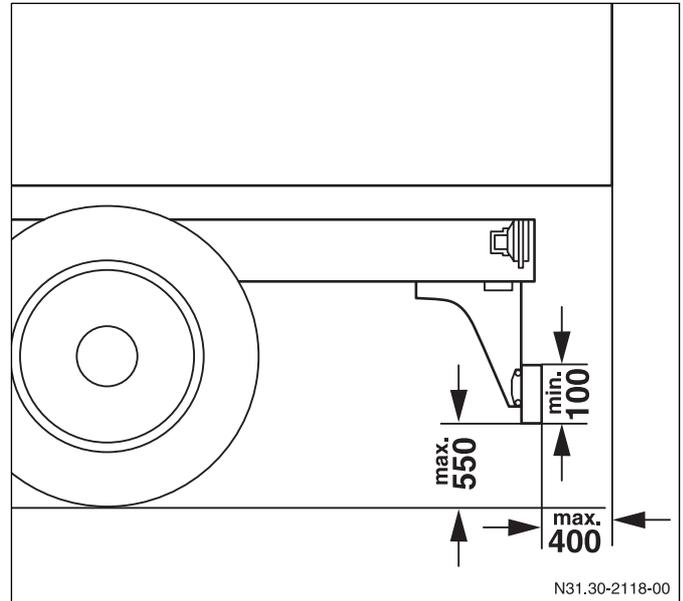
Depending on the model series, the following optional equipment is available as an option code from the factory to retrofit trailer couplings:

Code	Description
E 57	Electrics for trailer power socket (provides the power supply to the trailer including lighting control)
Q 10	Trailer coupling cross member (a special cross member with a retaining plate for mounting a trailer coupling is fitted to the vehicle rear) The design of the cross member is dependent on the vehicle's tonnage.
Q 20	Trailer coupling (Open-jaw coupling for towing trailers with drawbars) The design of the open-jaw coupling is dependent on the vehicle's tonnage.
Q 50	Trailer coupling, removable ball coupling (Removable ball coupling for towing trailers fitted with a ball coupling)
Q 22	Trailer coupling, rigid ball coupling (Rigid ball coupling with an increased height of 50 mm)
QA7	Trailer coupling for higher towing weights 3.5 t Attachment of a rigid ball coupling with a maximum permissible, braked towing weight of 3.5 t for the 5 t weight variant.
QA8	Trailer coupling for higher towing weights 2.8 t/3.0 t Attachment of a rigid ball coupling with a maximum permissible, braked towing weight of 2.8 t for the 3.5 t weight variant, and a maximum of 3.0 t for the 5 t weight variant. The permissible nose weight is 120 kg.

7.6.8 Underride guard

Rear underride guard

The rear underride guard fitted at the factory (except on panel vans and MPV) complies with EC Directive 70 / 221 / EEC.



Side view of the underride guard design

On no account should modifications be made to the underride guard.

If modifications are unavoidable, they must be clarified in advance with the technical inspection authority responsible (TÜV).

In Germany, an underride guard is required by law in accordance with Section 32b StVZO (German Road Traffic Licensing Regulations) if:

- the distance between the rear of the vehicle and the final rear axle is more than 1,000 mm
- the ground clearance of the chassis as well as the main body parts exceeds 700 mm for the unladen vehicle across the entire width.



Exceptions to this regulation are semitrailer tractor vehicles, machines and vehicles whose purpose cannot be fulfilled if an underride guard is fitted.

If an underride guard is required, it must comply with EC Directive 70 / 221 / EEC and its design drawings submitted by the body manufacturer.

The underride guard must be mounted as far back as possible.

Dimensions

- Maximum height of underride guard (unladen vehicle) above road surface: 550 mm.
- Width:
 - ▶ maximum = width of rear axle (outer tyre edge)
 - ▶ minimum = width of rear axle less 100 mm on each side. The decisive factor is the widest axle
- The cross member must have a section height of at least 100 mm.
- Edge radius at least 2.5 mm.

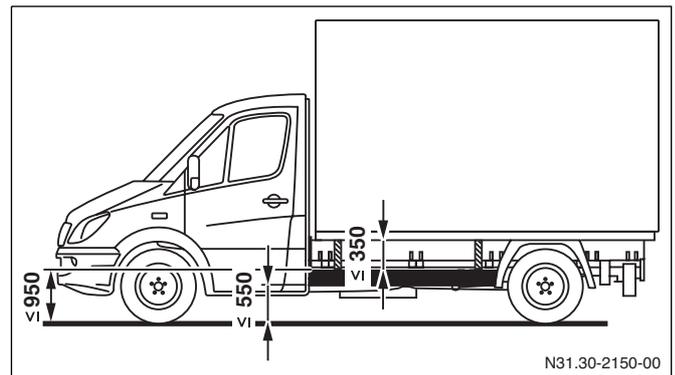
Modifications to the underride guard

If the underride 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 underride guard (e.g. due to the attachment of a lifting platform), the strength and bending strength of the underride guard must not be modified.

Any modifications to the underride guard must comply with national regulations and laws.

Side underride guards



Side underride guard design

According to EC Directive 89 / 297 / EEC a side underride guard is specified for vehicles with a permissible gross vehicle weight in excess of 3.5 t.

Exceptions to this regulation are semitrailer tractor vehicles, machines and special-purpose vehicles whose purpose cannot be fulfilled if side underride guards are fitted.

Components may be mounted in the side underride guards, e.g. battery box, air tank, fuel tank, lights, reflectors, spare wheel and tool box, provided that the specified clearances are maintained.

Brake, air and hydraulic lines and other parts may not be secured to side underride guards.

The function and accessibility of all equipment on the vehicle must not be impaired.

The side underride guards are secured to the platform at the factory (Code C57).

If side underride guards are retrofitted:

- The dimensions specified in the illustration may not be exceeded.
- The underride guards must extend continuously from the front to the rear wherever possible.



- Adjacent parts may overlap. The overlapping edge must point to the rear or downwards. The maximum permissible width of any gap between sections is 25 mm, provided the rear part does not protrude significantly beyond the front part.

The side underride guard may be made of a continuous flat surface. The outer surface must be smooth and generally flat. The guard parts must be rigid and permanently fixed. They must be made of metal or another suitable material. The distance between the outer surface of the underride guard and the outer edge of the vehicle must not be more than 120 mm. The edge radius must be at least 2.5 mm.



8.1 Mounting frame

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 (see self-supporting bodies and mounting frames acting as floor assemblies (▷ pages 163, 164).

Attachment to the frame must run along the frame using the body support brackets attached to the frame at the factory (▷ page 160) (except for the 904 model series).

8.1.1 Material quality

Required moment of resistance¹ of mounting frame:

Up to maximum standard wheelbase	30 cm ³
Over maximum standard wheelbase	> 34.5 cm 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 / ASTM J403 / J412 / J413 standards, the Japanese JIS G3445 standards or the UK BS 970 standards can be used.

Material	Tensile strength [N/mm ²]	Yield strength [Nmm ²]
H240LA (DIN EN 10268-1.0480)	350-450	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 that of steel mounting frames.
- If aluminium mounting frames are used, their strength must be at least as great as that of steel mounting frames. Observe the specifications of the aluminium 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.

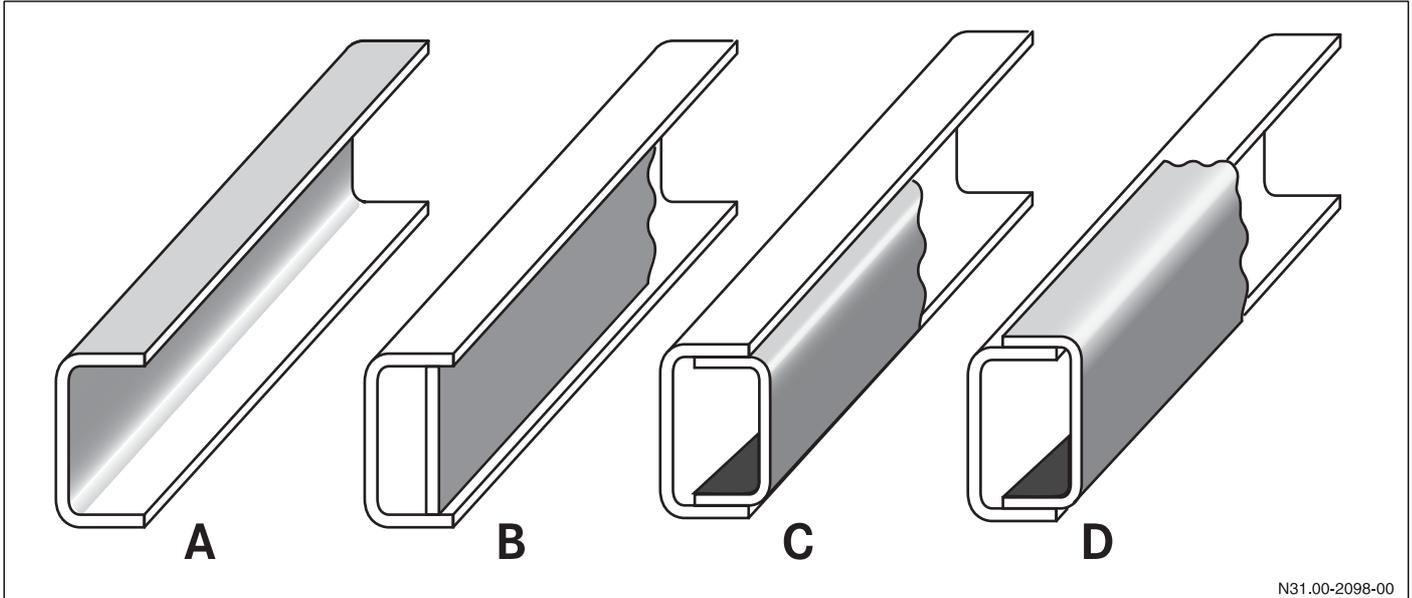
Place the vehicle on a flat, horizontal surface before mounting the body.



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.



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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 an offset frame (permissible gross vehicle weight ≥ 4.6 t), the longitudinal mounting frame members can run continuously in a straight line.



8.1 Mounting frame

8.1.3 Section dimensions / dimensioning

For the longitudinal members, use flanged U-sections or commercially available U-sections for vehicle construction (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 (▷ page 157).

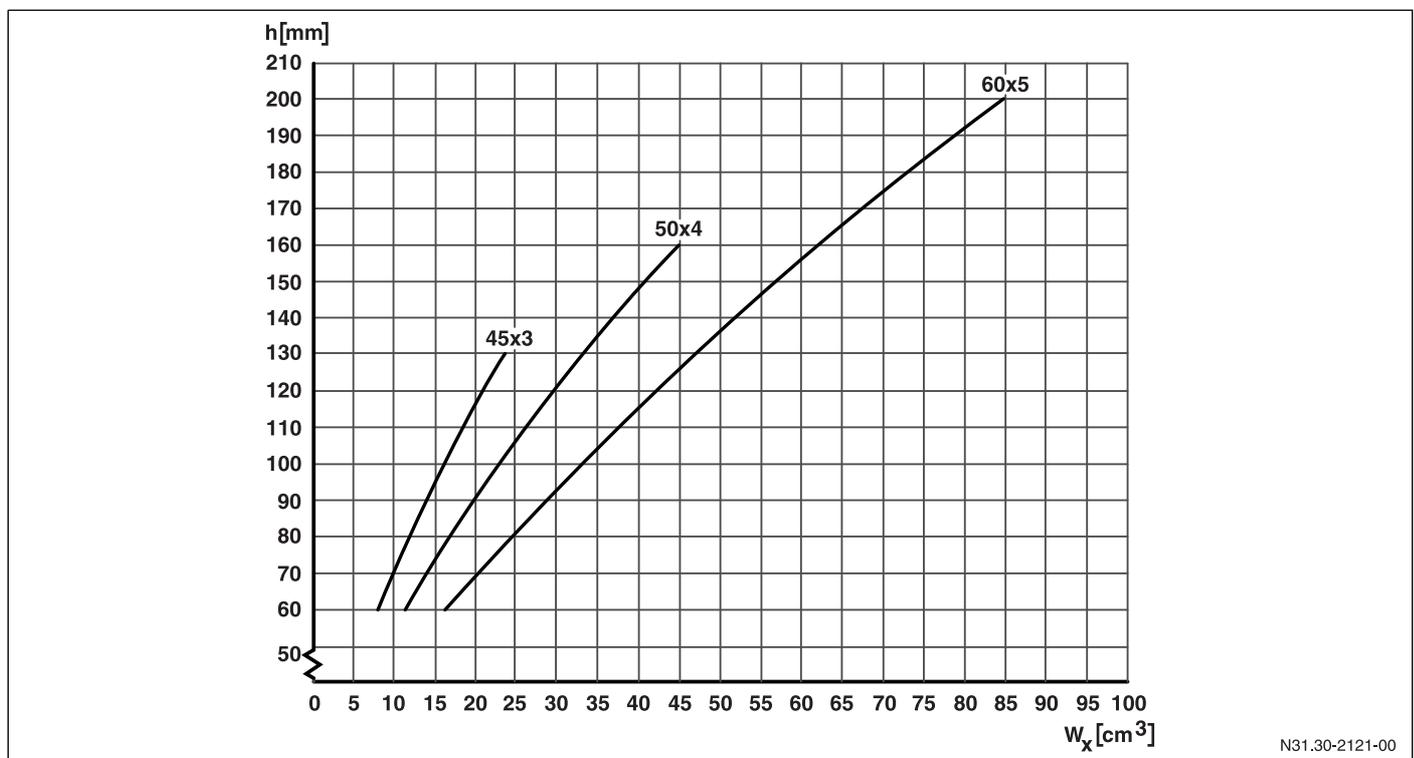
The specified moments of resistance and section dimensions refer to longitudinal frame members subjected to identical loads on both sides.

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 width.



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.



N31.30-2121-00

Longitudinal member dimensioning

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





8.1 Mounting frame

8.1.4 Attachment to the frame

The 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 and additional brackets may be fitted as required.

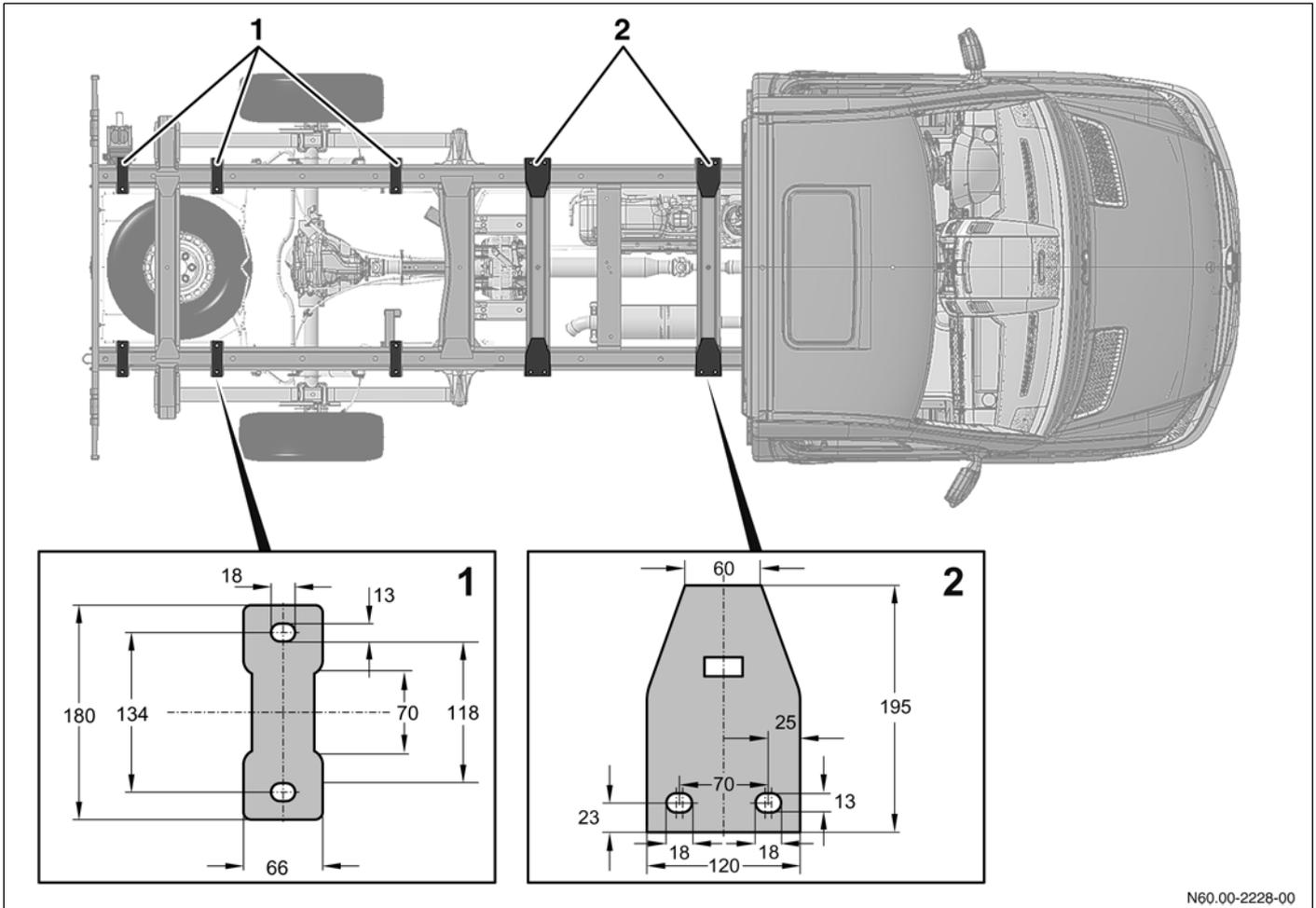


The minimum distance between the body and the cab must be >50 mm.

If prefabricated mounting frames are used, the production tolerances of the chassis frame width (maximum $+6 / -3$ mm) must be taken into consideration.



The positions for the body support brackets are indicated in the tender drawings depending on the model series (\triangleright page 17).



Types of fastening points on the frame





8.1 Mounting frame

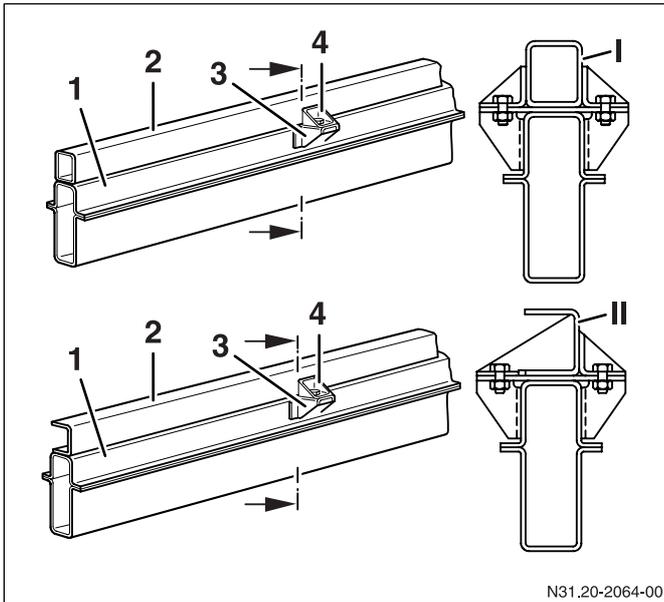
Additional body support brackets

If it is necessary to fit additional body support brackets, make sure that you comply with the welding directives (▷ page 57).

- Plug welding is only permissible in the vertical webs of the longitudinal frame member.
- Do not perform any welding work in bends.

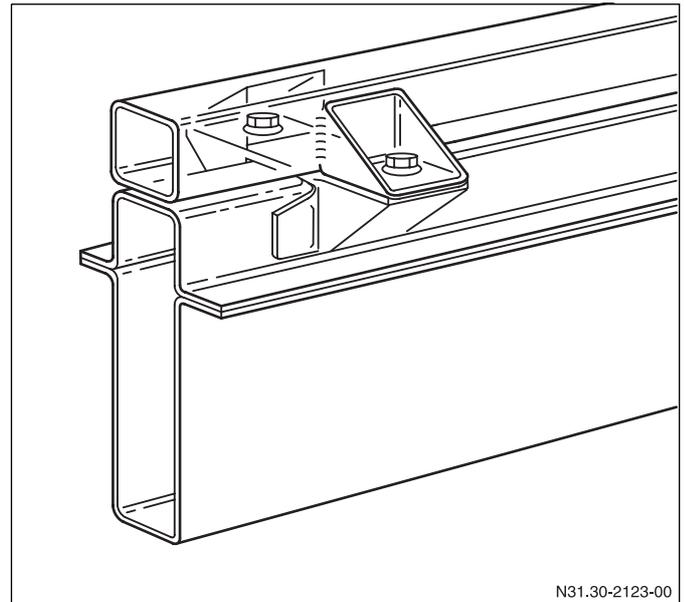
The body support brackets must be attached using two bolts for each body support bracket.

Attachment of the body support brackets

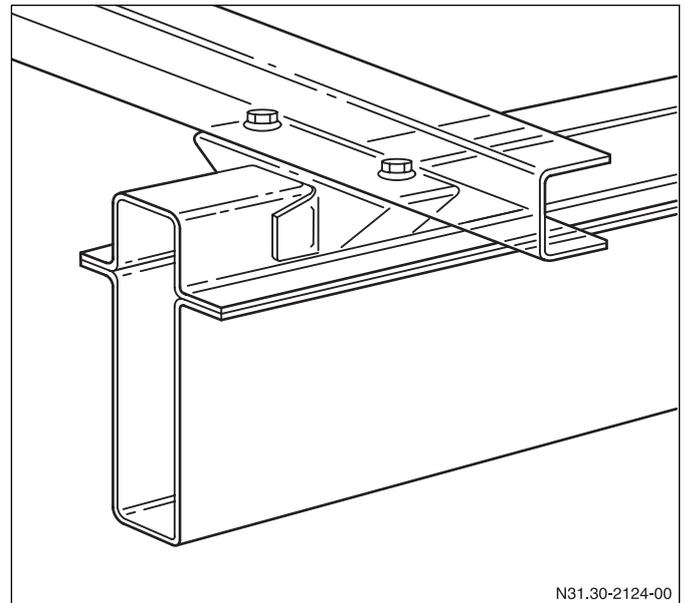


Example of a body bracket design

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



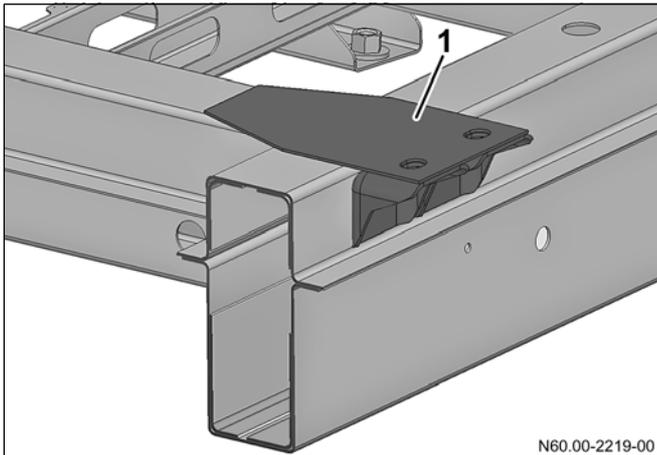
Attachment to a longitudinal member



Attachment to a cross member



8.1 Mounting frame



Body bracket with external bolted connection

1 Body bracket

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

Correct attachment is a decisive factor for:

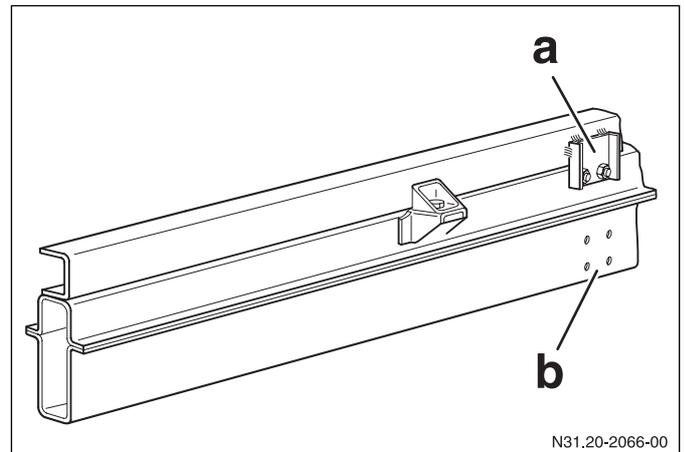
- vehicle handling and operating safety
- the service life of the chassis frame and the body

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.

The body can be secured to the sides of the upper chords on the longitudinal frame member. Spacer bushes welded to the frame must be used for reinforcement.

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



Dual support (rigid connection)

- a Rigid attachment at frame end
- b Standard holes at frame end

Elastic connection

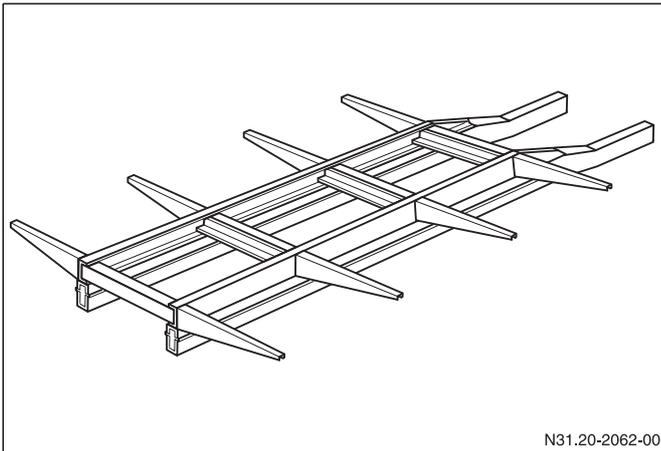
On rigid bodies (e.g. panel vans), flexible attachments must be provided behind the cab (e.g. by fitting cup springs or rubber mountings) at the first and second body brackets.



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.



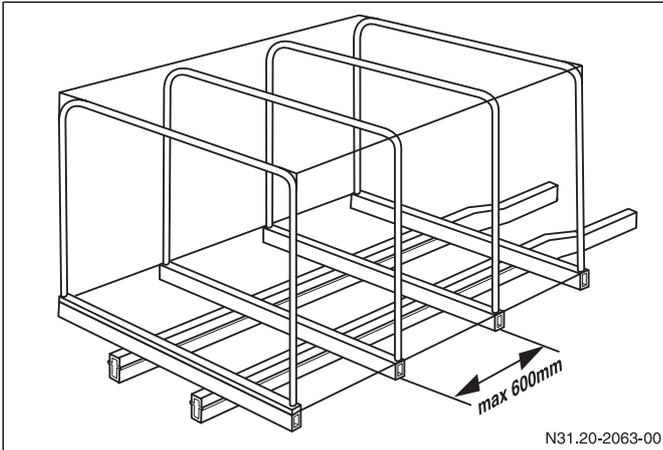
Example of a floor assembly



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



8.3 Modifications to the interior

8.3 Modifications to the interior

8.3.1 Retrofitting additional seats

DaimlerChrysler AG will issue a certificate of endorsement at their discretion (▷ page 15) for modifications to the seat attachments (including seat bases) and seat belt anchorages or for the installation of seats other than those available from the factory.

Proof of the strength of the seats delivered from the factory will only retain its validity if the seats are secured in their original mountings.

When retrofitting seats, it is absolutely essential to keep to the H-point. You can obtain up-to-date documentation from the department responsible (▷ page 15).

When re-installing seat belts, the specified bolts must be tightened to the original torque.

Risk of injury



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 occupants may be injured in the event of an accident.

Only the components of the series production supplier may be used for the installation of safety belts and seat belt buckles:

Postal address:	Autoliv B.V. & Co. KG Postfach 109 D-25333 Elmshorn
Telephone:	+49 (0)4121 - 797-0

All 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.

Passenger cabin / load compartment

On panel vans, the bodyshell floor assembly is available from the factory as optional equipment under Code V40 (MPV floor assembly) for retrofitting bench seats. The number of mounting options for the MPV floor assembly depends on the model series and the equipment and registration variants (the mounting shells for the bench seats are not included in the scope of delivery).

You can obtain more information on optional equipment Code V40 from your Mercedes-Benz Service Centre, the department responsible (▷ page 15) or in the "Optional equipment" section (▷ page 39).

If a rear bench seat with two- or three-point seat belts deviates from the standard seat design, it must comply with the requirements of EC Directives 76 / 115 / EEC and 74 / 408 / EEC.

Risk of injury



On no account may seats be mounted on the wheel arches. In the event of an accident, persons could be injured if the seats become detached from their anchorages, and this could result in further damage to the vehicle.





8.4 Modifications to closed panel vans

8.4 Modifications to closed panel vans

Floor assembly / side panels

On panel 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 (▷ page 109).

Partitions

Partitions in panel vans may be totally or partially removed.

The following partitions are available as optional equipment from the factory:

Code	Description
D50	Partition, continuous
D51	Partition, continuous with window
D53	Partition, continuous with a sliding window
D56	Continuous partition on C-pillar
D62	Provision for retrofitting partition
D64	Partition with sliding door
D93	Omission of partition

You can obtain more information about optional equipment from your Mercedes-Benz Service Centre, the department responsible (▷ page 15) or in the "Optional equipment" section (▷ page 39).

Vehicle roof

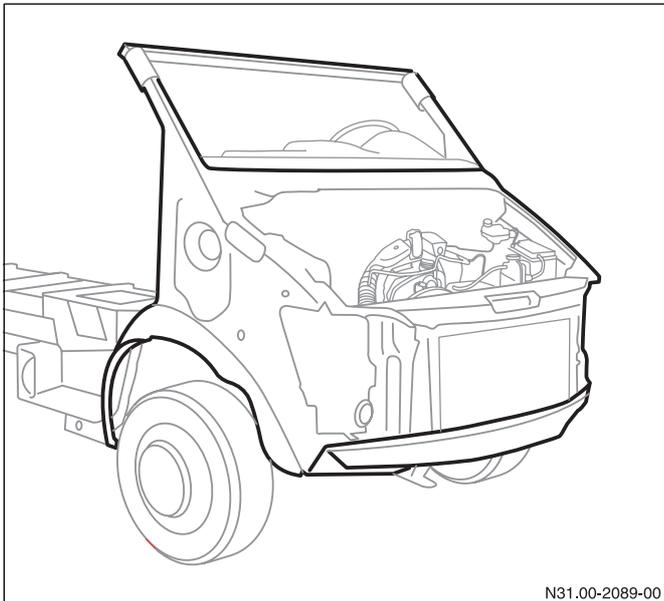
You will find more information about the roof in the "Panel van / MPV roof" section (▷ page 114).



8.5 Bodies on chassis with frame front end / windscreen support structure

8.5 Bodies on chassis with frame front end / windscreen support structure

The windscreen support structure offers body manufacturers a base for producing fully integrated bodies (e.g. motor caravans) or special-purpose bodies. It is available from the factory under Code F50 (▷ page 39).



Windscreen support structure

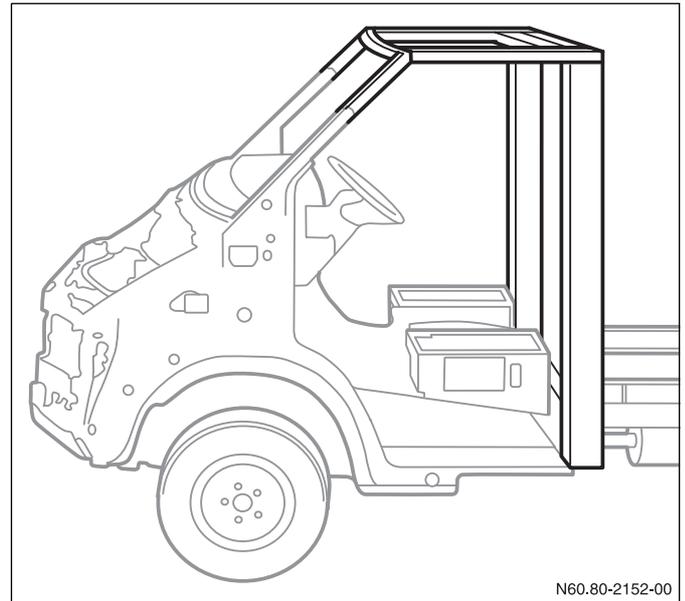
If bodies are mounted on windscreen support structure chassis, you must comply with national regulations and laws.

If bodies are mounted on windscreen support structure chassis, the cab structure must have the same rigidity as the standard vehicle.

The front body part must be designed as a self-supporting structure through to the B-pillar.

A new cell structure is recommended that is identical with the original structure, comprising the following:

- A-pillar
- B-pillar
- Roof cross members
- B-pillar substructure cross members



Example of a windscreen support structure with cell structure

The attachments between the cross members and the cab A- and B-pillars must be positively connected.

A separate, non-positive connection must be made between the headlamp frame and the inner part of the A-pillars – on no account should this connection be bonded.



8.5 Bodies on chassis with frame front end / windscreen support structure

On no account should a non-steel mudguard be connected by means of a common connection to the headlamp frame and the inside of the A-pillar.

The notes in the following sections must also be observed for bodies on windscreen support structure chassis:

- "Maintenance and repairs" (▷ page 36)
- "Engine cooling system" (▷ page 119)
- "Engine air intake" (▷ page 119)



We recommend that you obtain a certificate of endorsement from the department responsible for bodies mounted on windscreen support structure chassis.

On completion of all work on the vehicle, you must comply with the specified corrosion protection measures (▷ page 58).

Modifications to the engine flap

If modifications are made to the engine flap, make sure that the water separation feature for the air heating system integrated in the flap is not affected. If necessary, the water separation feature must be replaced by parts with the same function.



In order to ensure that the engine flap functions properly and operates safely, no modifications may be made to the standard engine flap mechanism (bonnet lock, hinges, buffers, catch hook, etc.).





8.6 Bodies on chassis with low frame

8.6 Bodies on chassis with low frame

8.6.1 General

A low frame (Code ZM1) that is 205 mm lower than the standard frame is available for vehicles with integral body and the appropriate chassis.



Please observe the body manufacturer information bulletins from the low frame manufacturer, Alois Kober GmbH.

Technical advice on low frame packages

Contact **Herr Kania** at Alois Kober GmbH if you have any questions or require drawings and technical data relating to the low frame.

Telephone:	+49 (0)8221-97470
Fax:	+49 (0)8221-97369
E-mail:	Bernhard.Kania@al-ko.de
Postal address:	Alois Kober GmbH
	lchenhauser Strasse 14
	D-89359 Kötz



Sprinter with low frame



8.6 Bodies on chassis with low frame

In the case of bodies with a low frame, please refer to all the other sections in these Body / Equipment Mounting Directives, in particular the "Motor caravans" section (▷ page 189).

For bodies with a low frame also note the following:

- On no account should modifications be made to the suspension.
- When retrofitting seats, it is absolutely essential to keep to the H-point. You can obtain up-to-date documentation from the department responsible (▷ page 15).
- On no account should modifications be made to bolted connections between the frame and the cab.
- On no account should modifications be made to bolted connections between the frame and the sub-frame.
- The minimum distance between the cab and a separate body must be complied with (▷ page 189).
- The minimum distance between the rear edge of the door and an integrated body must be complied with (▷ page 189).
- Make sure that you do not exceed the permissible axle loads.



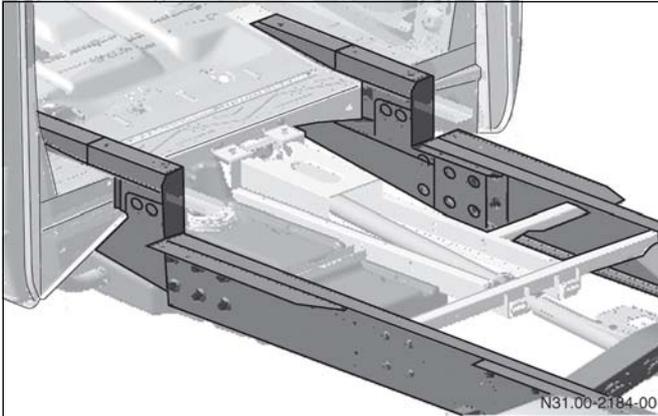
8.6 Bodies on chassis with low frame

8.6.2 Low frame bodyshell

On vehicles with a low frame the chassis behind the cab has its own frame. The contact person responsible at Alois Kober GmbH will be happy to answer any questions relating to the frame (▷ page 169).



On no account should modifications be made to the standard wheelbase on vehicles with a low frame.



Attachment of the low frame

Overhang extension

Wheelbase [mm]	Maximum vehicle overhang from wheel centre on rear axle [mm]
3,600	2160
3,850	2310
4,100	2460



The vehicle overhang length is part of the total overhang from the rear axle, including the frame overhang extension as well as the body and attachments.

Information on the different types of overhang can be obtained from ALKO (▷ page 169).





8.6.3 Threshold values for the body

Inherent rigidity of the body/floor

In order to transmit forces between the body and the chassis, the floor of the body must have a bending strength about the x-axis of $EI = 6 \times 10^9 \text{ Nmm}^2$ at a width of 2,000 mm.

Example: sandwich floor, $t = 36 \text{ mm}$, with 3 mm wooden supports above and below. In the area where the force is introduced, the floor of the body must be solid wood (e.g. areas near wheel arches, longitudinal members, body mounting brackets, etc.).

Inherent rigidity of the sidewall/body

In order to transmit forces between the body and the chassis, the sidewall of the body must be rigid.

Example: sandwich floor, $t = 30 \text{ mm}$, with 3 mm wooden supports inside and outside.

Modifications to the cab

Roof arches may not be modified and supporting parts may not be removed without being replaced. See the "Modifications to the cab" section (▷ page 109).

Bodies with modifications to roof arches or supporting parts on the cab require a certificate of endorsement from the department responsible, see (▷ page 15).



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 be covered with panelling parts, and "blocking" parts must never be mounted on the B-pillar.

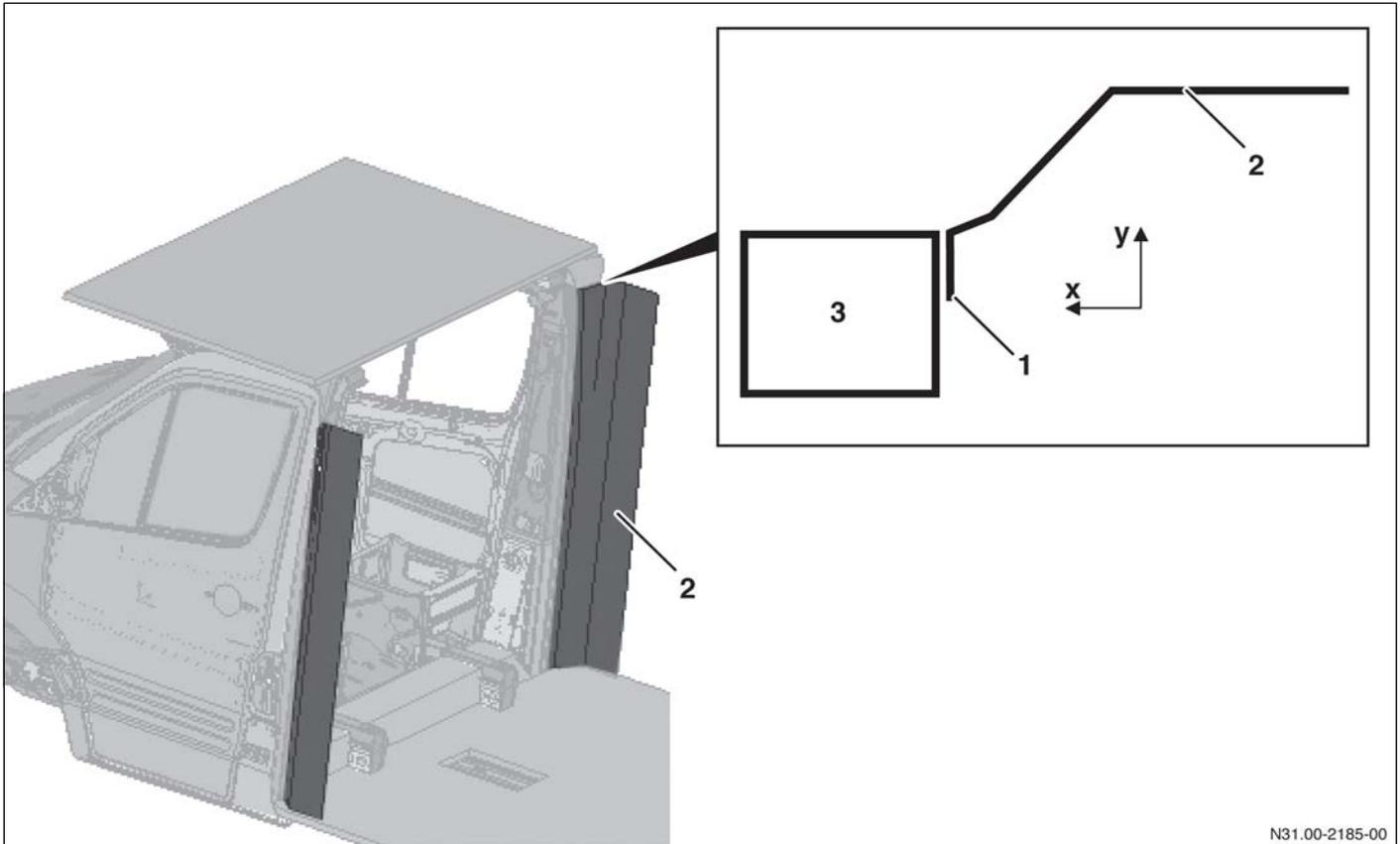




8.6 Bodies on chassis with low frame

8.6.4 Attachment of the body to the cab

The body sidewall must always be connected to the B-pillar. It must be assured that forces are transmitted between the body and the B-pillar. This can be done, for example, by attaching the body to the B-pillar via a stay plate of $t = 2 \text{ mm}$ angled at approx. $2 \times 45^\circ$. The stay plate must be bonded across its entire surface area.



Attachment of the body to the cab

- 1 Bonding flange
- 2 Body sidewall
- 3 B-pillar



8.6.5 Attachment to the low frame

The body is attached to the low frame by bonding. The floor must be bonded with longitudinal members along its entire length using a flexible adhesive (e.g. Sikaflex 221).

Trailer tow hitch

The maximum trailer load of 2 t must not be exceeded. Information on trailer couplings can be obtained from the contact person at ALKO.

See "Technical advice on low frame packages" (▷ page 169).



The permissible axle loads must be observed regardless of the vehicle's operating state.





8.6 Bodies on chassis with low frame

8.6.6 Low frame electrics

General

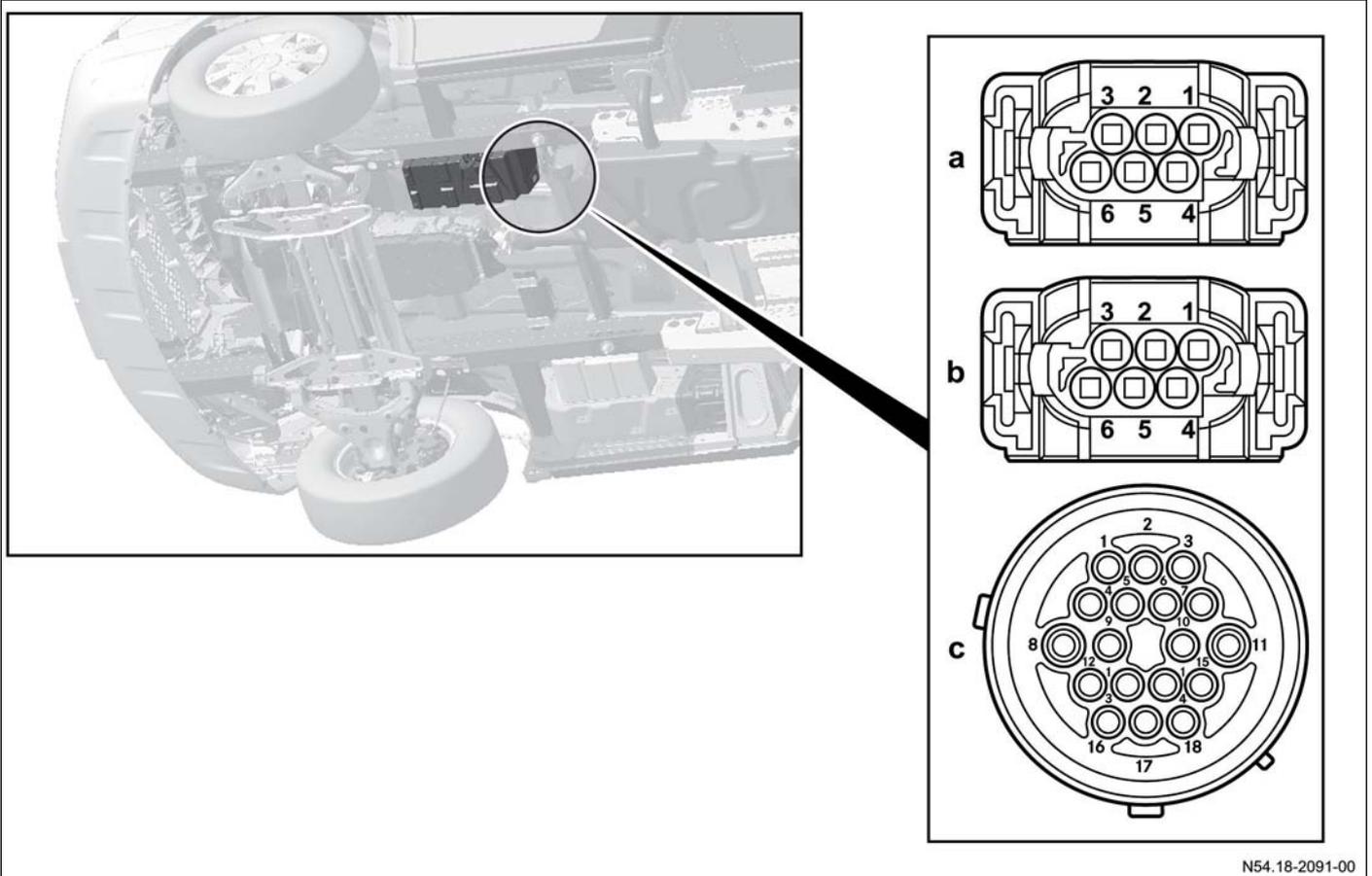


On low frame vehicles, the frame beyond the B-pillar to the rear must no longer be used as an earth return. An earth line to the rear lights and other consumers must be routed separately as far as the rear end of the vehicle.

See (▷ page 72)

Interfaces

An interface consisting of max. 3 connectors is provided on vehicles with a low frame. This is located in the underbody behind the battery well, and is only accessible from below. In addition to the connections for the rear lights, it also provides connections for side marker lamps and the electrics for the trailer power socket, depending on the vehicle's equipment.



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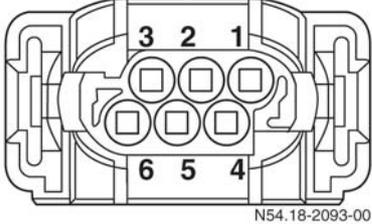
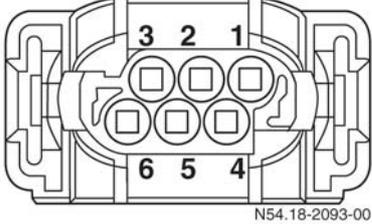
Position of low frame interface connector behind battery box





8.6 Bodies on chassis with low frame

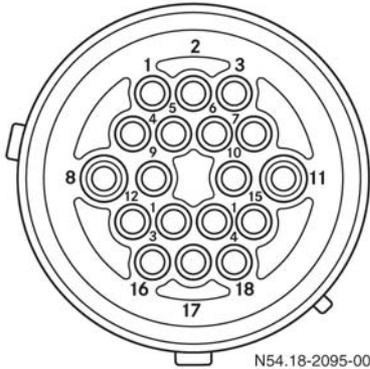
Connector assignment

	Part number	Colour	Pin assignment	Body manufacturer mating connector
a	A210 540 36 81	Black	Pin 1: Tail lamp Pin 2: Brake lamp Pin 3: Rear foglamp Pin 4: Perimeter lamps /side marker lamp in the rear light Pin 5: Turn signal lamp	A220 540 02 81
	 <small>N54.18-2093-00</small>			
b	A220 540 00 81	White	Pin 1: Perimeter lamps /side marker lamp in the rear light Pin 2: Brake lamp Pin 3: Tail lamp Pin 4: Reversing lamp, duplicate Pin 5: Turn signal lamp	A220 540 03 81
	 <small>N54.18-2093-00</small>			



8.6 Bodies on chassis with low frame

	Part number	Colour	Pin assignment	Body manufacturer mating connector
c	A203 545 24 28	Black	Pin 1: - Pin 2: - Pin 3: Side marker lamp, left, no. 1 Pin 4: Side marker lamp, left, no. 2 Pin 5: Side marker lamp, right, no. 1 Pin 6: Side marker lamp, right, no. 2 Pin 7: Side marker lamp, earth 1 Pin 8: Side marker lamp, earth 2 Pin 9: - Pin 10: Trailer power socket, reversing lamp Pin 11: Trailer power socket, terminal 30 Pin 12: Trailer power socket, turn signal lamp, left Pin 13: Trailer power socket, rear foglamp Pin 14: Trailer power socket, turn signal lamp, right Pin 15: Trailer power socket, tail lamp, right Pin 16: Trailer power socket, brake lamp Pin 17: Trailer power socket, tail lamp, left Pin 18: -	A220 540 03 81



Vehicles with cab, crewcab or low frame do not have a separate licence plate lamp. The licence plate is illuminated by a lamp lens integrated in the standard tail lamps. An additional lamp at pin 1 is not possible. If you intend to retrofit a separate licence plate lamp, please refer to the "Fitting additional lamps" section (▷ page 74).



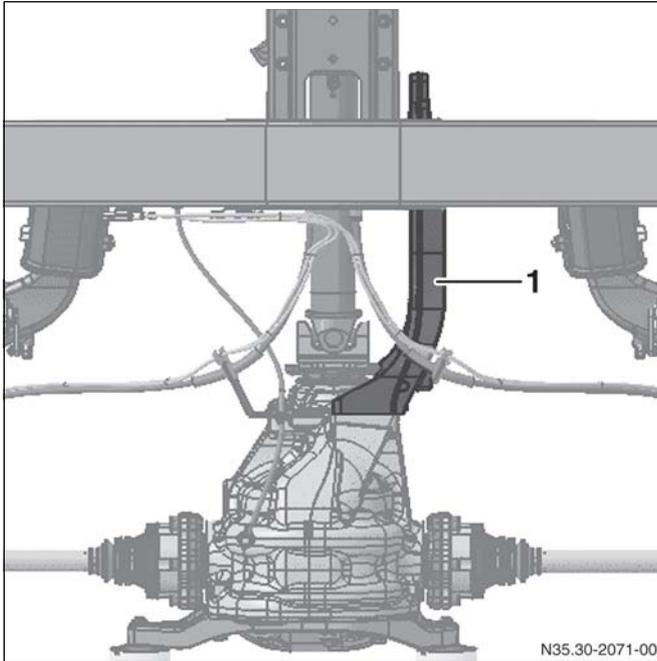


8.6 Bodies on chassis with low frame

8.6.7 Low frame drive train / chassis

General

Modifications to the transfer case torque multiplier are not permitted.



Torque multiplier

1 Torque multiplier

Propeller shaft clearance

With all attachments and bodies, a minimum clearance of 15mm from the body to the propeller shaft must be maintained. Refer also to section 7.3.6, "Propeller shaft".

Suspension



Modifications to chassis components, such as sub-frames, semi-trailing arms, axle housings and spring mountings, are not permitted.

In contrast to the basic vehicle, chassis with a low frame are equipped with semi-trailing arm rear suspension. Code CE2 rear air springs are available as optional equipment for low frame vehicles.



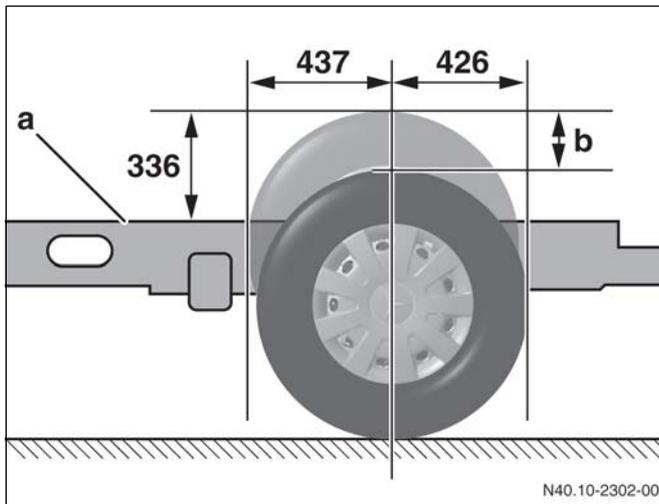
Suspension



8.6 Bodies on chassis with low frame

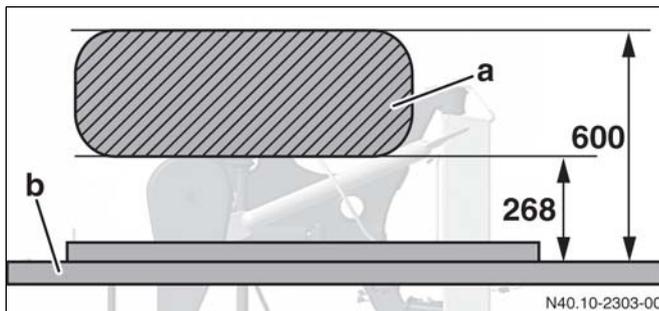
8.6.8 Wheel clearance / wheel arch design

In the case of bodies on vehicles with a low frame, sufficient distances must be maintained between the basic vehicle and the body, e.g. the wheel arches.



Minimum clearance to the body

- a Top frame edge
- b Spring travel



Minimum clearance to the frame

- a Necessary freedom of movement between wheel and body
- b Longitudinal frame member



8.6.9 Low frame fuel tank shield



If you retrofit a towing device, a fuel tank shield will be needed for the following vehicles:

- 4-cylinder diesel engine on 3.5 t vehicles with a low frame and underbody protection
- 4-cylinder diesel engine on 3.88 t vehicles with a low frame
- 6-cylinder diesel engine on 3.88 t vehicles with a low frame

Information is available from your Mercedes-Benz Service Centre.

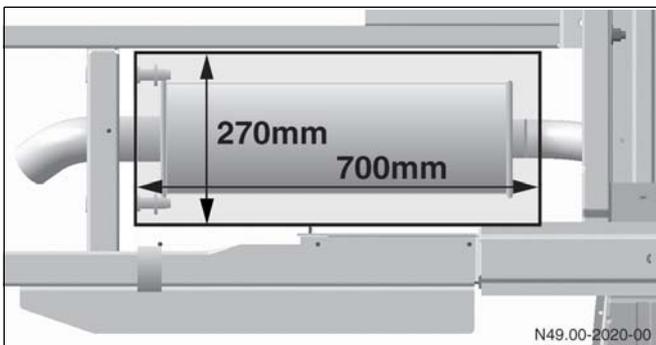
8.6.10 Low frame exhaust system

General

On no account should modifications be made to the exhaust system, especially in the vicinity of exhaust gas aftertreatment components (diesel particle filter, catalytic converter, Lambda probe, etc.). Refer also to the "Modifications to the basic vehicle" section (▷ page 118).

Heat shield

In vehicles with a low frame chassis it is necessary to install a suitable heat shield in the area of the main silencer in order to prevent heat from affecting the body.



Heat shield





8.7 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) (▷ page 157).

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.

Chassis with crewcab:

- If necessary, the rear frame overhang may have to be shortened to prevent the permissible rear axle load from being exceeded and to ensure that the minimum front axle load is maintained.
- Reflectors must be mounted on the body to comply with legal requirements (in Germany, Section 51a StVZO, German Road Traffic Licensing Regulations) (▷ page 74).

Version	Moment of resistance W_x for each longitudinal member in cm^3
3.5 t	17
4.6 t and 5 t	30

For the section dimensions of the longitudinal mounting frame member, see the graph on (▷ page 159).



Where 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.





8.8 Panel 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) (▷ page 157).

On rigid bodies (e.g. panel vans), flexible attachments must be provided behind the cab (e.g. by fitting cup springs or rubber mountings) at the first and second body brackets (▷ page 162).

Version	Moment of resistance W_x for each longitudinal member in cm^3
3.5 t	30
4.6 t and 5 t	40



8.9 Refrigerated vehicles

Refer also to the following sections:

- "Retrofitting an air-conditioning system" (▷ page 135)
- "Power take-offs" (▷ page 136).
- "Attachment to the roof" (▷ page 114).
- "Retrofitting electrical equipment" (▷ page 69)

With panel vans, 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.



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





8.10 Tipper bodies

Vehicles with tipper bodies must comply with national regulations and laws.

On vehicles with automatic transmission, hydraulic assemblies cannot be driven by PTOs on the transmission side (▷ page 136).

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

Also observe the "Side underride guards" (▷ page 155) and "Underride guard" sections (▷ page 154).

Pivots

- The rear pivot on three-way and rear-end tipper 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 coupling.
- The front pivot must be provided with guide brackets so that the pivots can be guided when the tipper body is lowered.

Restraining facilities

- Comply with all national regulations and laws.
- Fit a support (folding support) to prevent the tipper body from lowering
- Secure operating devices against accidental operation
- Connect a "Tipper body" indicator lamp to provide a visual warning that the tipper 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.
- On three-way tipper bodies, the application point of the lifting press must be in front of the centre of gravity of the body and the payload.

Mounting frame

If chassis are provided with tipper 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" section (▷ page 160).
- Make sure that the steel longitudinal and cross members have the correct dimensions.
- Close off the rear area of the mounting frame towards the panel van and, if necessary, reinforce the mounting frame by installing a diagonal cross or by taking other appropriate measures.

Vehicles with tipper 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 the department responsible (▷ page 15).

Version	Moment of resistance W_x for each longitudinal member in cm^3
3.5 t	30
4.6 t and 5 t	40



8.11 Semitrailer tractors

8.11 Semitrailer tractors

Chassis may be converted into semitrailer tractor vehicles provided that this conversion complies with national regulations and laws.

The conversion of chassis into semitrailer tractor vehicles requires a certificate of endorsement from the department responsible.

The longitudinal frame members must be reinforced by an auxiliary frame or a semitrailer bracket.

The vehicle must be equipped with anti-roll bars on the front and rear axles.

Risk of accident

Vehicles equipped with ESP are not suitable for use as semitrailer tractor vehicles. Otherwise, if the vehicle is fitted with ESP, this system may no longer work correctly and could ultimately fail. The driver could lose control of the vehicle and cause an accident.

It is therefore imperative to select the optional equipment available under Code BW2, "Omission of ESP", if the vehicle will be used as a semitrailer tractor vehicle.

Recommended optional equipment (option codes) for conversion to semitrailer tractor vehicle

Code BW2: Omission of ESP

Code EE8: Heavy duty battery 12 V 100 Ah

Code E28: Additional battery 12 V 100 Ah

Code EK1: Terminal strip for auxiliary consumers

Code E57: Electrics for trailer power socket

We also recommend the use of additional anti-roll bars as optional equipment to optimise handling characteristics, depending on the type of semitrailer used. You can obtain information on recommended optional equipment from the department responsible (▷ page 15).

Mounting frame for semitrailer tractor vehicles

If the vehicle is used as a semitrailer tractor vehicle, a steel mounting frame made of rectangular tubes, 100 x 60 x 3 (or s = 4 mm) is required. The mounting frame must extend rearwards as far as the standard chassis end and, towards the front, as far as the first body support bracket behind the cab.

The mounting frame must be attached using the body support brackets fitted at the factory as described in the "Attachment to the frame" section (▷ page 160).

In addition, the attachment between the frame and the mounting frame must be rigid at the frame end. The attachment must be made to the upper chord of the longitudinal frame members on the 906.1, 906.2, 906.6 and 906.7 model series (▷ page 160).

An additional rigid attachment must be made at the front end of the longitudinal frame members.

Electrical connection for the semitrailer

All additional electrical consumers must be connected as described in the "Power supply interfaces" (▷ page 67) and "Retrofitting electrical equipment" sections (▷ page 69).

- Connecting lines must not scrape against body parts.
- The body manufacturer must ensure freedom of movement when cornering.
- Connecting lines must not get caught on the semitrailer or pull on the trailer power socket.
- When the tractor is driven without a semitrailer, the connecting lines must be secured correctly.





Brake system

The semitrailer brake system must be connected to the semitrailer tractor vehicle. On no account should over-run brakes be fitted.



The semitrailer brake circuit must be designed with a sufficient supply of energy in accordance with EC Directive 71 / 320 / EEC.

The semitrailer manufacturer and the body manufacturer are responsible for the correct functioning of the semitrailer brake.

Mounting plate and semitrailer coupling

The body manufacturer must ensure that the mounting plate and semitrailer coupling are adequately dimensioned.

Comply with all national regulations and laws (e.g. 9420EC, ECE-R55).

The mounting plate and the semitrailer coupling must be mounted in compliance with the manufacturer's specifications and mounting instructions.





8.12 Rescue vehicles

Vehicles with bodies for rescue or recovery equipment must be attached with mounting frames of adequate dimensions (▷ page 160).

In addition, the bodies must be fitted with two rigid connections on each longitudinal frame member (▷ page 162).

Bodies for rescue and recovery vehicles require a certificate of endorsement from the department responsible.

Refer to the "Winches" section for information on attaching winches (▷ page 142).

Also observe the "Side underride guards" (▷ page 155) and "Underride guard" sections (▷ page 154).



8.13 Torsional rigidity of body types

The bodies and mounting frames for torsionally rigid bodies (e.g. municipal vehicles, fire-brigade panel vans or street-cleaning vehicles) must be attached by means of flexible elements at the front of the frame (▷ page 162). 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 (▷ page 69).

A certificate of endorsement is required from the department responsible (▷ page 15).



8.14 Motor caravans

Prior to conversion into a motor caravan, please make sure that:

- legal requirements are observed (national road traffic type approval laws or the relevant EC directives)
- the minimum requirements for interior design and motor caravan equipment are fulfilled



For the conversion of vehicles in Germany, appropriate information sheets can be requested from the relevant technical inspection authorities for motor vehicles (e.g. TÜV, DEKRA).

- 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.
- The standard fuel filler cap must not be removed or covered with any "blocking" parts.



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 be covered with panelling parts, and "blocking" parts must never be mounted on the B-pillar.

Attachment to the frame

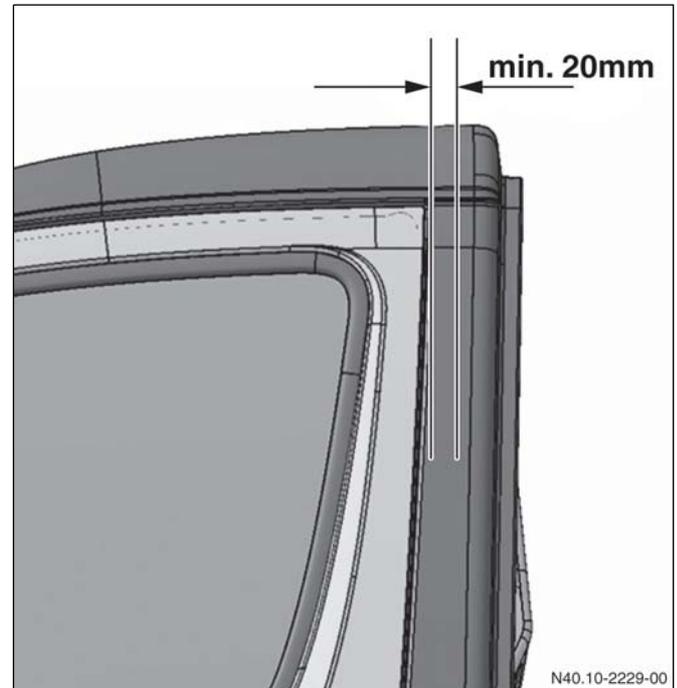


The minimum distance between the cab and a separate body must be > 50 mm.

- The body must be secured to the basic vehicle by means of body support brackets fitted at the factory or by means of additional body support brackets (\triangleright page 160).
- The body support brackets must be secured using two bolts for each body support bracket.



The minimum distance between the rear edge of the door and an integrated body must be > 20 mm. Otherwise, the rear edge of the door may come into contact with the body in the event of an accident, and in extreme cases the door may be jammed.



Minimum distance between rear edge of door and integrated body





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

- Dimensions and weights (▷ page 27).
- Instructions on modifications to the basic vehicle (▷ page 91).
- Electrics / electronics (▷ page 63)
- Mudguards and wheel arches (▷ page 112)
- Liquid-petroleum gas (LPG) (▷ page 136).
- Minimum rear axle loads (▷ page 42)

Modifications or conversions to standard vehicles (e.g. the installation of a raised roof) may invalidate the type approval. In Germany, modifications to the vehicle must therefore be inspected by the relevant technical authorities in accordance with Section 19, Paragraph 2 of the StVZO (German Road Traffic Licensing Regulations).

The vehicle registration documents must be presented. After the modifications have been entered, the vehicle registration documents must be submitted to the relevant registration office so that a new type approval can be issued.

Due to the higher centre of gravity, at least one anti-roll bar is required on the front axle (NCV3 model series 906).

We recommend fitting an additional anti-roll bar on the rear axle. This is available from the factory as optional equipment under Code CE6 (▷ page 39).

You will find more information on electrics and additional equipment in the "Electrics / electronics" (▷ page 63) and "Additional equipment" sections (▷ page 135).



8.15 Lifting work platform

General



Where 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.



Additional loads in or on the cab are not permissible when the platform is raised. Otherwise, there is a risk of damage to the frame.

If chassis are equipped with lifting work platforms, the following points must be observed due to high loads when in the raised state:

- Retrofitting of lifting work platforms requires a certificate of endorsement from the department responsible.
- To ensure the uniform loading of the chassis frame, the body must be attached to the chassis frame by means of a mounting frame
- All body support brackets must be attached to the mounting frame
- An additional, double body support bracket must be installed for each longitudinal frame member behind the cab (see example)
- The attachment of the first and additional brackets must be flexible connections of adequate size. See section 8.1 "Flexible connection"
- Additional loads in or on the cab are not permissible when the platform is raised (misuse)

- The introduction of force in the supports must be exactly halfway between the two standard double bracket pairs behind the cab on the mounting frame. In addition, the mounting frame must be sufficiently protected against torsion in the area of force introduction by means of a cross member.





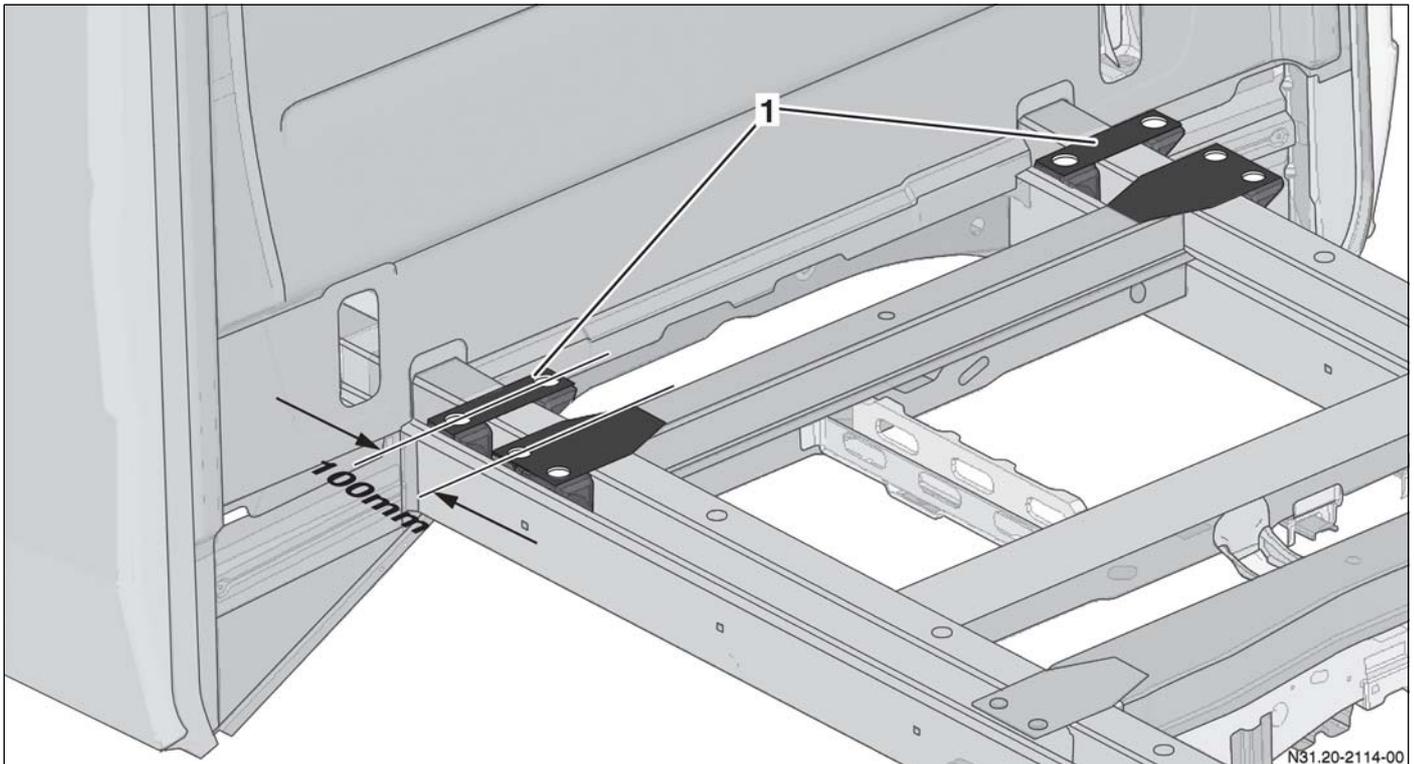
8.15 Lifting work platform

Required additional body support bracket

To ensure a uniform introduction of force in the chassis frame, one additional body support bracket is required for each longitudinal frame member in the area behind the cab.

The body support brackets must be of at least the same quality as the standard material H240LA and have a wall thickness of 3 mm.

The hole spacing of the additional body support bracket to the next adjacent hole in the existing body support bracket must measure 100 mm.



Body support brackets

1 Additional body support brackets

When installing additional body support brackets, we recommend the use of genuine Mercedes-Benz parts. Further details on the standard positions and dimensions of body support brackets can be found in the "Tender drawings" section (▷ page 17) and in the "Body types" section (▷ page 160).



8.15 Lifting work platform

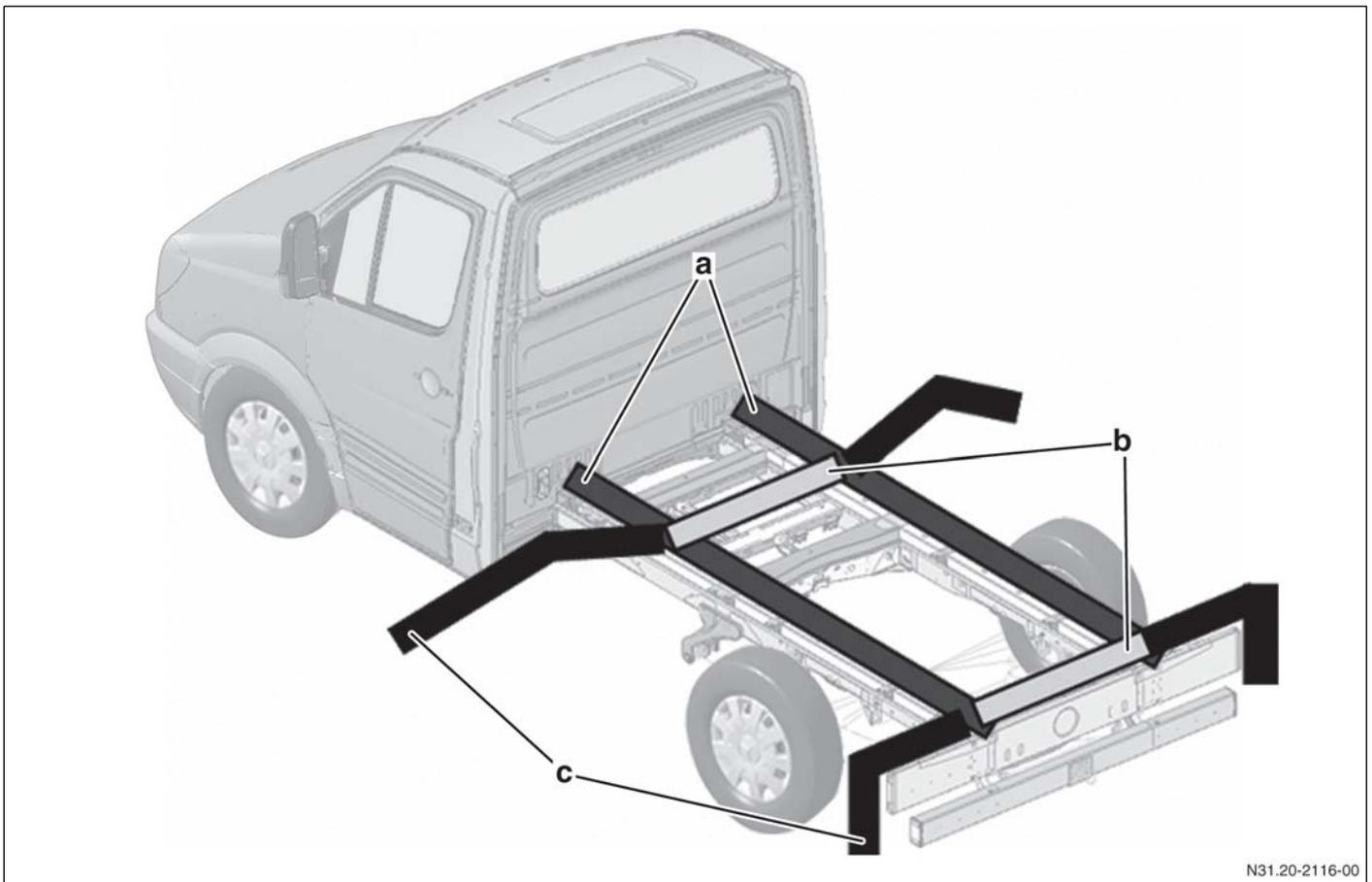
Mounting frame

The installation of lifting work platforms on a chassis requires a mounting frame of sufficient size.

Version	Moment of resistance W_x for each longitudinal member in cm^3
3.5 t	30
4.6 t and 5 t	40

The mounting frame must be attached in the same way to all body support brackets. The attachment of the mounting frame at the first and additional brackets must be with flexible connections of adequate size, see (▷ page 157).

The introduction of force in the mounting frame by the outriggers must be exactly halfway between the two as standard double bracket pairs behind the cab. In the area of the introduction of force in the mounting frame by the outriggers, a rigid cross member (front and rear) must be installed to protect the mounting frame against torsion.



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Attachment of mounting frame to body support brackets

a Area of additional brackets

b Required cross members for mounting frame in area of force introduction from outriggers

c Outriggers



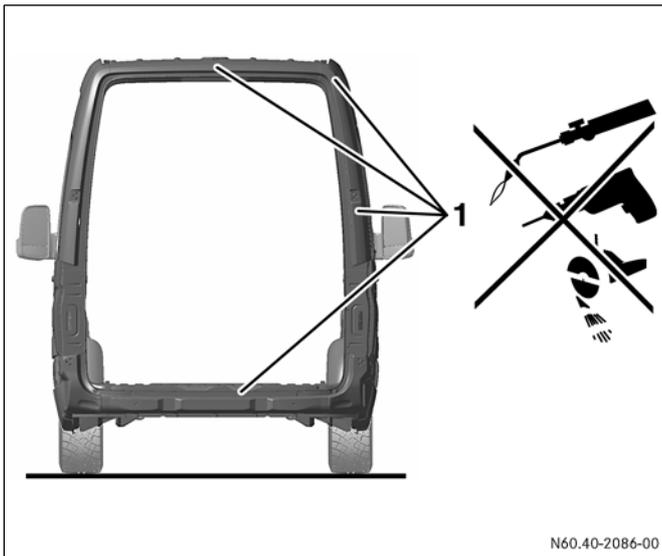
8.16 Increasing the height of the roof

8.16 Increasing the height of the roof

Refer to the directives in the "Panel van / MPV roof" section for after-market increases in the height of the roof (▷ page 115).



Any modifications to the rear door opening including the roof area are only permitted in exceptional cases and require a certificate of endorsement from the department responsible (▷ page 15).



Rear door opening and roof area

- 1 Areas in which modifications are not permitted (certificate of endorsement required)

9.1 Calculating the centre of gravity

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

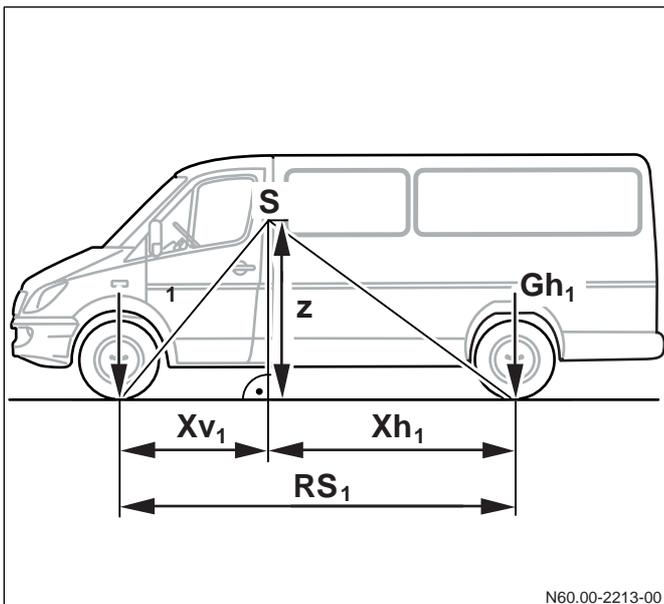


The determined centre of gravity must not exceed the specified threshold values (▷ page 40).

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

The axle loads must be weighed when the vehicle is horizontal (Gv_1 and Gh_1) and when one axle is raised by amount "a" (Gv_2 and Gh_2 ; we recommend $a = 500$ mm). The wheelbase RS_1 (3,250 mm, 3,665 mm or 4,325 mm) is defined by the vehicle model series (see Ordering) or must be measured using a rule.

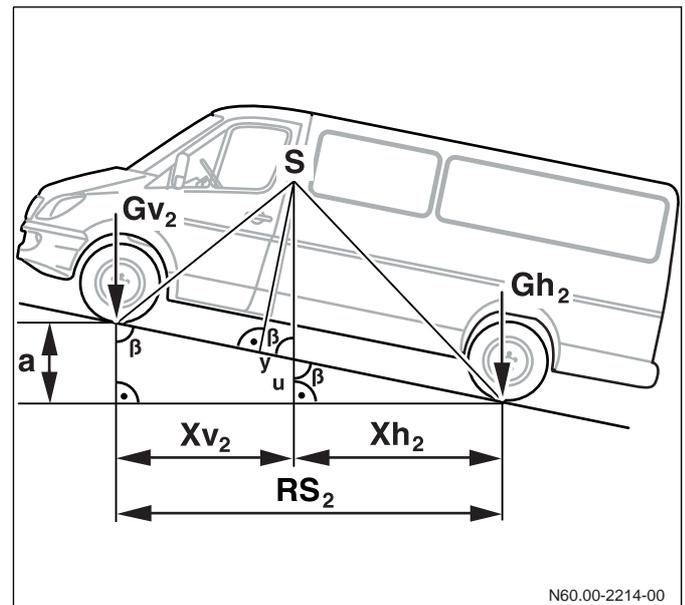
Measurement 1



Measurement with vehicle level

9.1 Calculating the centre of gravity

Measurement 2



Measurement with axle raised

x_{v1}, x_{v2} ... distance from centre to front axle, measurement 1 / 2

x_{h1}, x_{h2} ... distance from centre to rear axle, measurement 1 / 2

v = front axle

h = rear axle



9.1 Calculating the centre of gravity

The sum of all moments about a point is zero. Therefore:

$$Mh = 0$$

$$(Gv_1 + Gh_1) * xh_1 = Gv_1 * RS_1 \quad (1)$$

$$xh_1 = \frac{Gv_1 * RS_1}{Gv_1 + Gh_1} \quad (2)$$

The "new" wheelbase RS_2 after raising one axle is calculated as follows:

$$RS_2 = \sqrt{RS_1^2 - a^2} \quad (3)$$

xh_2 is calculated analogously to xh_1 :

$$xh_2 = \frac{Gv_2 * RS_2}{Gv_2 + Gh_2} \quad (4)$$

The height of the centre of gravity z is calculated from:

$$z = \tan\beta * y \quad (5)$$

The unknown angle β can be calculated from:

$$\cos\beta = \frac{a}{RS_1} \quad (6), \text{ therefore, the following results for } \beta:$$

$$\beta = \cos^{-1}\left(\frac{a}{RS_1}\right) \quad (7)$$

The required y is obtained from the equation:

$$y = xh_1 - \sqrt{u^2 + xh_2^2} \quad (8)$$

The values for xh_1 and xh_2 are already known from equations (2) and (4). The required u is calculated using:

$$\frac{a}{RS_2} = \frac{u}{xh_2} \quad (9) \text{ and results in the following equation:}$$

$$u = \frac{a * xh_2}{RS_2}$$

9.1 Calculating the centre of gravity

If equations (7) and (10) are used in equation (5) and are referred back to the given/measured values **a**, **RS₁**, **Gv₁**, **Gh₁**, **Gv₂** and **Gh₂**, the result for the height of the centre of gravity **z** is:

$$z = \tan \left[\cos^{-1} \left(\frac{a}{RS_1} \right) \right] * \left(\frac{Gv_1 * RS_1}{Gv_1 + Gh_1} - \frac{Gv_2 * RS_1}{Gv_2 + Gh_2} \right)$$

9.2 Position of semitrailer coupling

9.2 Position of semitrailer coupling

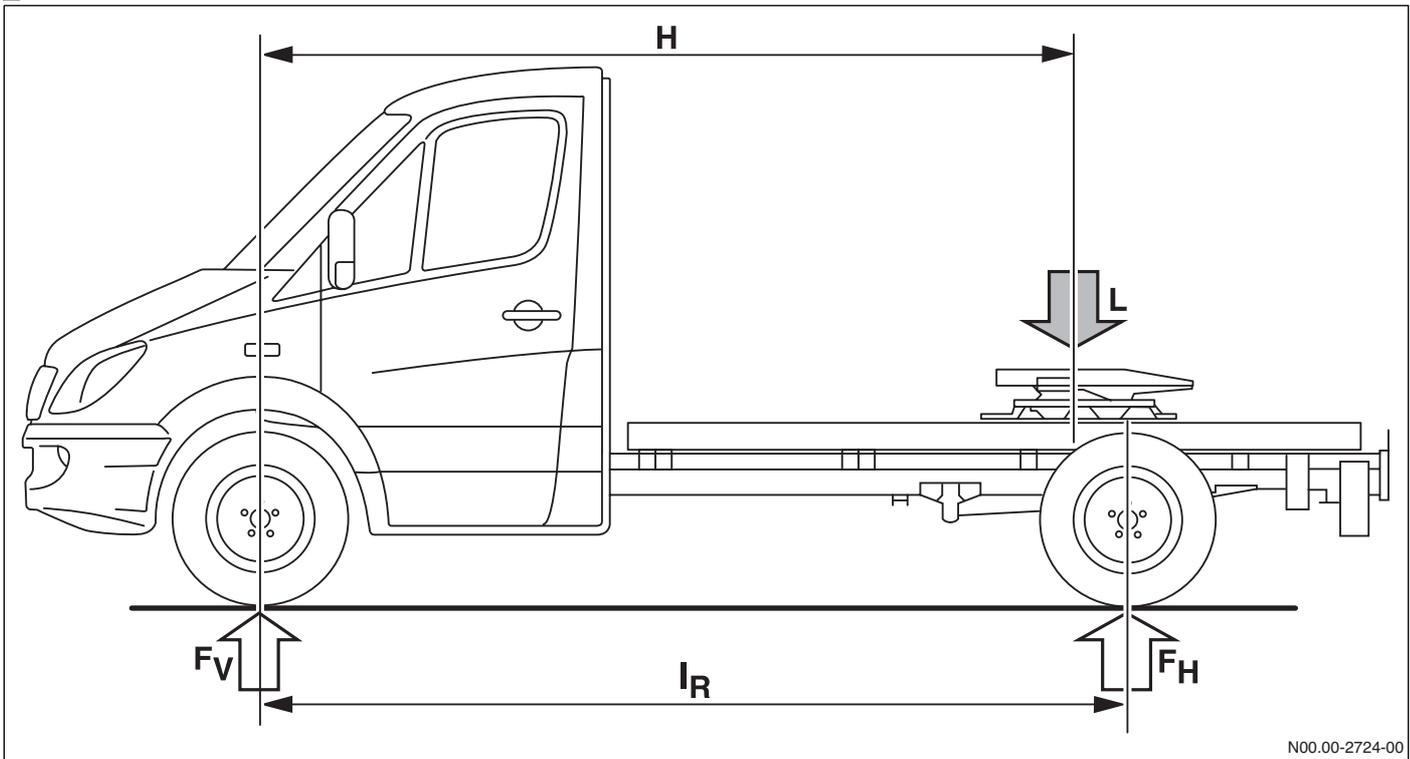
Drawbar ratio semitrailer coupling

Calculating the position of the semitrailer coupling

$$D = \frac{0,6 \cdot 9,81 \cdot Z \cdot A}{Z + A - L}$$



You will find more information about semitrailer tractor vehicles in the "Semitrailer tractors" section (▷ page 185).



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To avoid exceeding the maximum axle load, the position of the semitrailer coupling is calculated as follows:

$$H = \frac{F_{H^*} \cdot I_R}{L}$$

$$F_{H^*} = F_H - F_{HL}$$

$$L = Z + A - \frac{0,6 \cdot 9,81 \cdot Z \cdot A}{D}$$

- H distance between front axle and semitrailer coupling
- I_R wheelbase
- F_H maximum permissible rear axle load
- L maximum vertical load on coupling
- F_{H*} resulting maximum rear axle load
- F_{HL} rear axle load of unladen vehicle
- Z permissible gross weight of tractor vehicle
- A permissible gross weight of semitrailer
- D drawbar ratio of coupling

The permissible axle loads must be maintained at the front and rear axles.

10.1 Programmable special module (PSM)

10.1 Programmable special module (PSM)

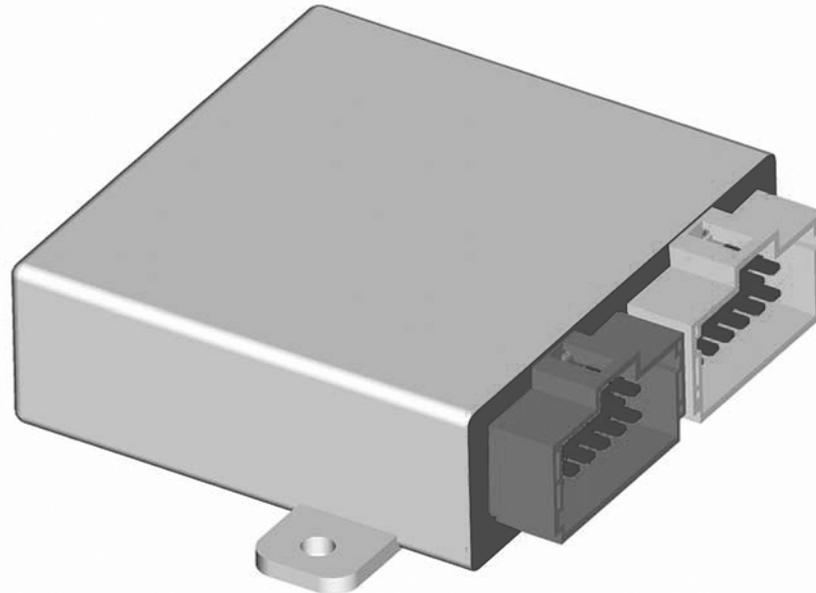
10.1.1 General

- The PSM (programmable special module) control unit is the interface between the vehicle and the body manufacturer. The PSM carries out functions specific to the body manufacturer (e.g. engine-speed control) that are not implemented in other control units. This means that the PSM converts information received in CAN messages to discrete outputs or forwards the information to the ABH CAN, for example. In the same way, the PSM is able to forward discrete inputs or information from the ABH CAN to the interior CAN. The information, the inputs, the method and the direction are programmed using StarDiagnosis®.



When writing a standard coding (retarder for example), all previous parameters are deleted. We recommend backing up data beforehand.

- The PSM has 10 inputs and 20 outputs, which can also be used as inputs. There is only one PSM fitted in any one vehicle. Complex bodies requiring more inputs/outputs should be connected to the PSM via the ABH CAN.



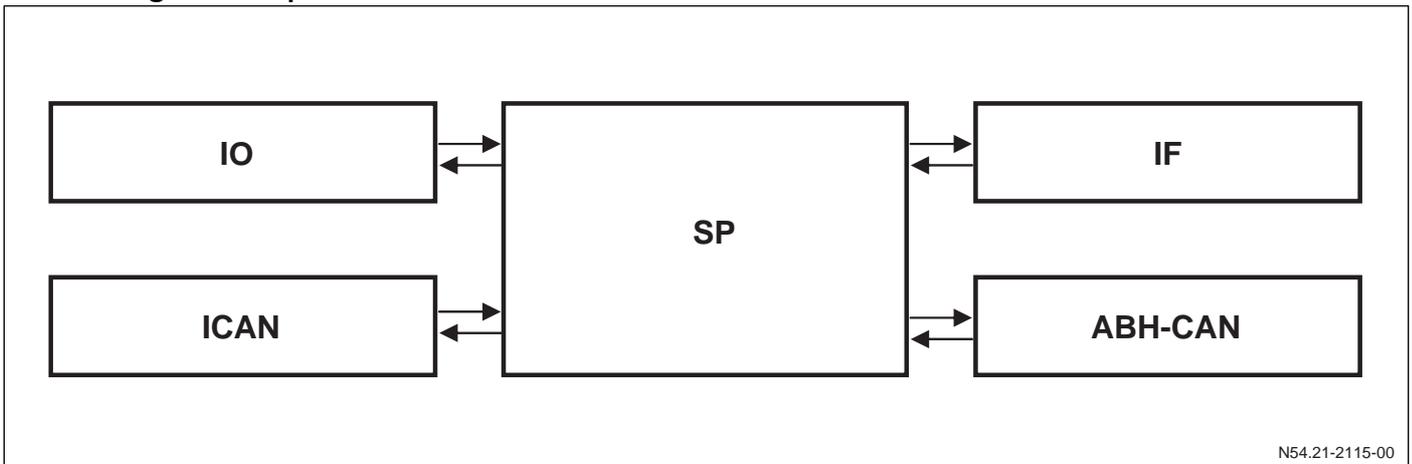
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10.1 Programmable special module (PSM)

10.1.2 Signal concept and interfaces

10.1.2.1 Signal concept

**Simplified signal flow in the PSM**

SP	Signal pool
IO	Digital inputs and outputs
ICAN	Interior CAN
IF	Internal functions
ABH-CAN	Body manufacturer CAN

The diagram shows the simplified signal flow in the control unit. The signals are fed into a signal pool in the PSM. A signal may be dependent on other signals, e.g. from terminal 15.

The **ICAN**, the discrete **inputs and outputs**, the **internal functional units** and the **body manufacturer CAN** currently act as sources or outputs. Which signal is assigned to which output is determined by parameter programming. It is possible to assign any signal from the signal pool to a particular output.

10.1 Programmable special module (PSM)

Each signal in the signal pool has a unique identifier in the form of a signal number.

Signal pool input

- Each signal has only one single source.

Signal pool output

- A signal can be used internally or for one, more than one, or even no outputs.

Use

- How the signals are used is determined by the programming of the individual functions.

Signal types

- Bit information
(e.g. terminal 15 signal ID 1018)
- 1-byte information
(e.g. vehicle speed signal ID 2014)
- 2-byte information
(e.g. engine speed signal ID 3001)
- Multibyte information as pointers
(e.g. VIN signal ID 4000)

Signal sources

- ICAN
- Diagnostics
- ABH CAN
- PSM after ICAN
- Discrete inputs
- AD converter
- Internal signals

Signal pool outputs (programmable)

- ICAN
- ABH CAN
- Discrete outputs
- Internal functional modules

Special signals, including

- inactive (0 x 1000)
- active (0 x 1001)
- deactivated (0 x 300B)

Signals (as at 17.01.2006)

- Quantity: 550, of which
 - ▶ Bit signals 444
 - ▶ 1-byte signals 52
 - ▶ 2-byte signals 41
 - ▶ Multibyte signals 3
 - ▶ PWM signals 10



10.1 Programmable special module (PSM)

10.1.2.2 Inputs

A total of 10 inputs are available:
3 high active, 3 low active and 4 analogue. The analogue inputs can also be used as digital inputs.

Inputs 1, 2 and 3 (high active)

- **Switch to terminal 30, terminal 15 (+12 V)**
- Internal pull-down resistor (with active control unit)
- Individually programmable wake-up capability
- Status stored in the signal pool

Inputs 4, 5 and 6 (low active)

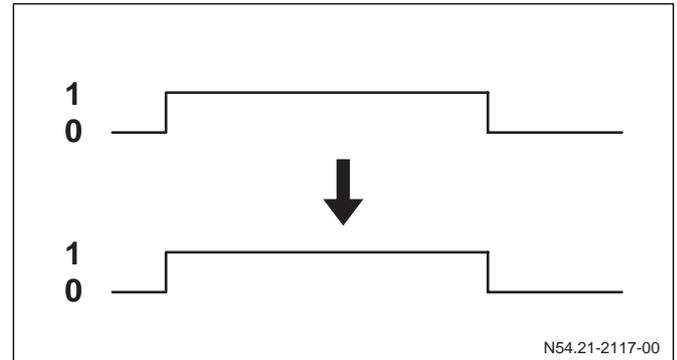
- **Switch to terminal 31, (earth)**
- Internal pull-up resistor individually programmable
- Individually programmable wake-up capability
- Status stored in the signal pool

Inputs 7, 8, 9 and 10 (analogue)

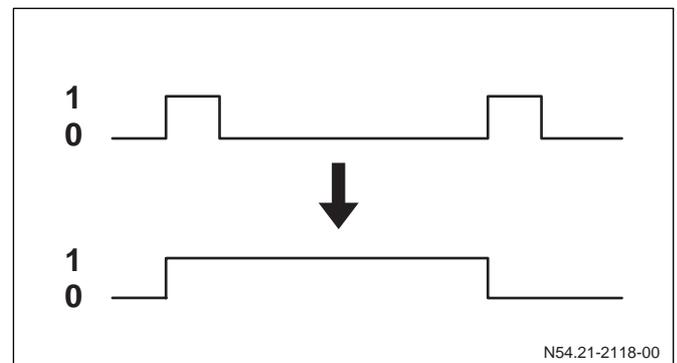
- **Switch to terminal 30, terminal 15 (+12 V)**
- **Switch to terminal 31, (earth)**
- Internal pull-up resistor (100 k or 1.2 k with active PSM)
- Commonly programmable wake-up capability for input 7 and 8
- Digital value and analogue value information (related to terminal 30) is stored in the signal pool

Parameter option, switch/button

- ▶ **Switch:** the status of the input is stored in the signal pool.



- ▶ **Button:** the signal in the signal pool is toggled with each 0 → 1 switch of the input.



10.1 Programmable special module (PSM)

10.1.2.3 Outputs

A total of 20 inputs are available: this includes terminal 30 (+12 Volt) and earth switch lead-out in the range between 0.5 A and 10 A. For more precise details of numbers and output (▷ see page 227).

General

- Short-circuit detection
- Status of the outputs is in the signal pool
- In the case of high-side outputs, the load is applied by the PSM using terminal 30 (+12 V), i.e. the earth must be connected to body earth or battery earth
- Parameter programming options
 - ▶ Dependence on vehicle status
 - ▶ Use as output or input

Outputs 1 and 2 (half bridge 5 A)

- Parameter programming options
 - ▶ Use as low-side or high-side
 - ▶ Open-load detection

Outputs 3, 4, 5 and 6 (high-side 10 A and 5 A)

- Parameter programming options
 - ▶ Internal pull-up
 - ▶ Wake-up capability
 - ▶ Open-load detection

Outputs 7 and 8 (high-side 5 A)

- Parameter programming options
 - ▶ Internal pull-up
 - ▶ Open-load detection

Outputs 9 and 10 (high-side 1 A)

- Parameter programming options
 - ▶ Used as PWM output. For reasons of electromagnetic compatibility, the output should not be subjected to a load of more than 100 mA during return to earth via the vehicle. The load current may be as much as 750 mA if there is a return to earth via a low-active output of the PSM. Otherwise, it will be necessary to implement suitable shielding measures and carry out an EMC approval measurement / check.
 - ▶ Open-load detection
 - ▶ Pull-down (output 9 only)

Outputs 11 and 12 (low-side 1 A)

- Parameter programming options
 - ▶ Open-load detection

Outputs 13 - 20 (high/low-side 0.5 A)**Global parameter programming options**

- PSM configuration
 - Global PSM run-on time (minutes) (after central locking locked by lock from outside)
 - Global PSM undervoltage thresholds (100 mV) and response times (100 ms) (only for discrete and SPS outputs. Functional, hardware undervoltage and overvoltage is not cancelled)
 - Power failure thresholds for outputs programmed with wake-up capability (for each of discrete outputs 3, 4, 5 and 6)

10.1 Programmable special module (PSM)

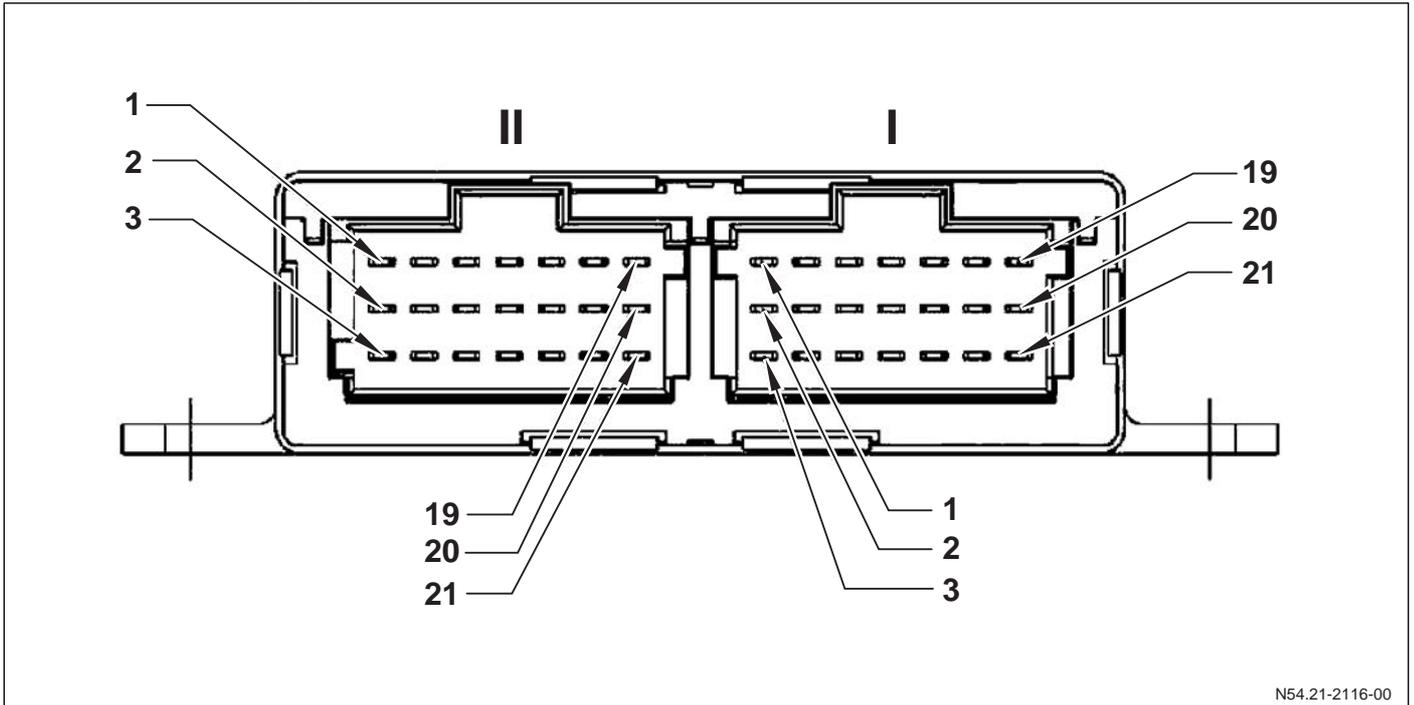
Programmable options of the outputs

- **Open-load detection**
This option can be used to configure an output in such a way that an open-load fault is stored if the load current falls below a threshold of approximately 5% of the nominal current.
This function is only supported by outputs A01 to A12.
- **Short-circuit monitoring**
This function is supported by all outputs and cannot be deactivated.
- **Wake-up capability and load detection**
Outputs A03, A04, A05 and A06 can be programmed to have a wake-up capability. With wake-up capability programmed, the output concerned is activated by a 1-0 edge and the PSM is woken if in sleep mode.
- **Input/output**
With this option, all outputs can also be used as discrete inputs. All high-side outputs become high-active inputs, all low-side outputs become low-active inputs. Half bridge outputs 1 and 2 remain high-active inputs at all times, regardless of their polarity.
- **PWM soft start**
If a PWM output is configured as a switch (no PWM signal but normal discrete output), it is possible to activate a soft start whereby an 80% PWM is initially output for approximately 150 ms at switch-on before the output is subjected to maximum load. This function makes it possible for bulbs to switch on reliably and more softly, for example.
- **PWM output**
Configures a PWM-compatible output as a switch (0) or PWM output (1).
- **High-side/low-side**
This option can be used to select the desired switching direction for half bridge outputs A01 and A02.
- **ICAN faults**
The output is only active if no CAN faults are present. If the option is not set, outputs can remain active despite the presence of a CAN fault.
- **Global PSM undervoltage**
The output is only active if no undervoltage has been detected (▷ see page 212).
- **Terminal 61**
The output is only active when terminal 61 ON.
- **Terminal 15**
The output is only active when terminal 15 ON.
- **Terminal 15R**
The output is only active when terminal 15R ON.
- **Terminal 15C**
The output is only active when terminal 15C ON.
- **Central locking unlocked**
The output is only active when the "Central locking unlocked" status is set.
"Central locking unlocked" is set when "Unlock from outside" is pressed or terminal 15C is active. "Central locking unlocked" is unset when terminal 15C is OFF and "Lock from outside" is pressed.
- **Run-on**
The output remains active until the PSM run-on time has elapsed (programmable).
 - ▶ Global run-on (▷ see page 213)
 - Parameter programming in PSM configuration
 - ▶ Stay-awake function (▷ see page 213)
 - Function enabled by parameter programming in PSM configuration
 - Stay awake is not the same as Wake ICAN.



10.1 Programmable special module (PSM)

10.1.2.5 Contacts and pin allocation



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- I Connector 1
- 1 Pin 1
- 2 Pin 2
- 3 Pin 3

- II Connector 2
- 19 Pin 19
- 20 Pin 20
- 21 Pin 21

10.1 Programmable special module (PSM)

*Pin assignment***Connector 1**

No.	Abbreviation	Use and alternative use
1		Not assigned / reserve
2	A18N005	Output 18 (negative / 0.5 A) or input, low-active
3	KL30.1	Terminal 30.1
4	A07P050	Output 7 (positive / 5 A) or input, high-active
5	A17N005	Output 17 (negative / 0.5 A) or input, low-active
6	KL30.1	Terminal 30.1
7	A08P050	Output 8 (positive / 5 A) or input, high-active
8	A09P010PWM	Output 9 (positive / 1 A, PWM-compatible) or input, high-active
9	A16P005	Output 16 (positive / 0.5 A) or input, high-active
10	A05P050W	Output 5 (positive / 5 A, wake-up capability) or input, high-active
11	A10P010PWM	Output 10 (positive / 1 A, PWM-compatible) or input, high-active
12	A15P005	Output 15 (positive / 0.5 A) or input, high-active
13	A06P050W	Output 6 (positive / 5 A, wake-up capability) or input, high-active
14	A11N010	Output 11 (negative / 1 A) or input, low-active
15	A14P005	Output 14 (positive / 0.5 A) or input, high-active
16	A03P100W	Output 3 (positive / 10 A, wake-up capability) or input, high-active
17	A12N010	Output 12 (negative / 1 A) or input, low-active
18	KL30.2	Terminal 30.2
19	A04P100W	Output 4 (positive / 10 A, wake-up capability) or input, high-active
20	A13P005	Output 13 (positive / 0.5 A) or input, high-active
21	KL30.2	Terminal 30.2

10.1 Programmable special module (PSM)

Connector 2

No.	Abbreviation	Designation and alternative use
1	E06N	Input 6 (low-active)
2	E04N	Input 4 (low-active)
3	KL31	Terminal 31
4	E01P	Input 1 (high-active)
5	E05N	Input 5 (low-active)
6	E02P	Input 2 (high-active)
7	E03P	Input 3 (high-active)
8	E07A	Input 7 (analogue)
9	ICAN-L	Interior CAN L
10	E09A	Input 9 (analogue)
11	E08A	Input 8 (analogue)
12	ICAN-H	Interior CAN-H
13	A01B050	Output 1 (H-bridge / 5 A)
14	E10A	Input 10 (analogue)
15	ACAN-L	Body manufacturer CAN L
16	A02B050	Output 2 (H-bridge / 5 A)
17	A20N005	Output 20 (negative / 0.5 A) or input, low-active
18	ACAN-H	Body manufacturer CAN H
19	A19N005	Output 19 (negative / 0.5 A) or input, low-active
20	RS485P	RS485, positive (non-inverting) input and output
21	RS485N	RS485, negative (inverting) input and output



10.1 Programmable special module (PSM)

10.1.3 Vehicle functions

10.1.3.1 Gateway function for vehicle information

This section describes the basic vehicle information that can be picked up using the PSM. You will find more detailed information in the list of signals (▷ see page 230).

- Vehicle status
 - ▶ e.g. terminal 15, terminal 61, lock from outside, etc.
- Light status
 - ▶ LDS and LSS requests (e.g. main-beam headlamps, turn signals, etc.)
 - ▶ Light status of SAM (main-beam headlamps, turn signals, dipped-beam headlamps, front foglamps, etc.)
 - ▶ Hazard warning lamps from OBF
- Window status
 - ▶ Windscreen and rear window wipers
 - ▶ Windscreen heating and rear window heating
- Central locking
 - ▶ Doors open / closed, unlocked / locked
- Engine CAN information
 - ▶ Wheel rotation speed, road speed, engine speed, etc.
 - ▶ Cruise control operation, brakes operated, etc.
 - ▶ Transmission, clutch information, steering angle, etc.
- Equipment attributes
 - ▶ Door installation, sliding sunroof, transmission, etc.
- Light control
 - ▶ Parking lamps, side lamps, etc.
 - ▶ Turn signals, main-beam headlamps, etc.
- Alarm functions

- ▶ Alarm-triggered flashing / flashing of main-beam headlamps, front foglamps, hazard warning lamps, horn

- Sliding sunroof
 - ▶ Opening and closing of the sliding sunroof at the rear
- Central locking functions
 - ▶ Lock / unlock front, load compartment and entire vehicle
- Windscreen and rear window
 - ▶ Windscreen wipers and rear window wiper
 - ▶ Windscreen heating and rear window heating
- Miscellaneous functions
 - ▶ Control buzzer (in the MPV) and interior lighting
 - ▶ Charging active
 - ▶ Retarder operation
- Warning signals
 - ▶ Undervoltage

10.1.3.2 Control of vehicle functions

Parameter programming options for vehicle functions

The following parameter programming options are available for specific ICAN functions:

- Alarm-triggered flashing

This option is used to define the priority and wake-up capability of alarm functions.
- Steering angle reset

This bit can be used with the turn signal outputs to activate the function whereby the turn signals are reset via the steering angle.
- Switch/button evaluation

With some I CAN functions, this can be used to program whether input signals should be evaluated as buttons or switches.



10.1 Programmable special module (PSM)

The following functions can be controlled using the PSM:

- Light functions
 - ▶ Left-hand parking lamps
 - ▶ Right-hand parking lamps
 - ▶ Automatic lights
 - ▶ Lights off
 - ▶ Side lamps
 - ▶ Dipped-beam headlamps
 - ▶ Front foglamps
 - ▶ Rear foglamp
 - ▶ Hazard warning lamps (w)
 - ▶ Headlamp flasher
 - ▶ Main-beam headlamps
 - ▶ Right-hand turn signals
 - ▶ Left-hand turn signals
 - ▶ Front interior lighting ON
 - ▶ Rear interior lighting ON
 - ▶ Horn
- Alarm functions
 - ▶ Front foglamps and main-beam headlamps synchronous
 - ▶ Hazard warning lamps
 - ▶ Main-beam headlamps
 - ▶ Interior lighting ON
 - ▶ Front foglamps
 - ▶ Horn
- Sliding sunroof
 - ▶ Close sliding sunroof automatically
 - ▶ Close sliding sunroof manually
 - ▶ Open sliding sunroof automatically
 - ▶ Open sliding sunroof manually
 - ▶ Lower sliding sunroof automatically
 - ▶ Lower sliding sunroof manually
 - ▶ Raise sliding sunroof automatically
 - ▶ Raise sliding sunroof manually
 - ▶ Close rear sliding sunroof automatically
 - ▶ Close rear sliding sunroof manually
 - ▶ Open rear sliding sunroof automatically
 - ▶ Open rear sliding sunroof manually
 - ▶ Lower rear sliding sunroof automatically
 - ▶ Lower rear sliding sunroof manually
 - ▶ Raise rear sliding sunroof automatically
 - ▶ Raise rear sliding sunroof manually
- Central locking
 - ▶ Lock entire vehicle
 - ▶ Unlock entire vehicle
 - ▶ Lock load compartment
 - ▶ Unlock load compartment
 - ▶ Lock front compartment
 - ▶ Unlock front compartment

10.1 Programmable special module (PSM)

- Wipe and heat windscreen / rear window
 - ▶ Front wipers, position III
 - ▶ Front wipers, position II
 - ▶ Front wipers, position I
 - ▶ Front wipers, wash
 - ▶ Front wipers, single wipe
 - ▶ Heat windscreen
 - ▶ Heat rear window
 - ▶ Rear window wiper, wash
 - ▶ Rear window wiper, intermittent
- Miscellaneous
 - ▶ Buzzer ON
 - ▶ Intermittent buzzer ON
 - ▶ Charging active
- Instrument cluster warning signals
 - ▶ Global PSM undervoltage
 - ▶ ADR indicator lamp ON
 - ▶ ADR defective indicator lamp ON



10.1 Programmable special module (PSM)

10.1.4 Internal functions

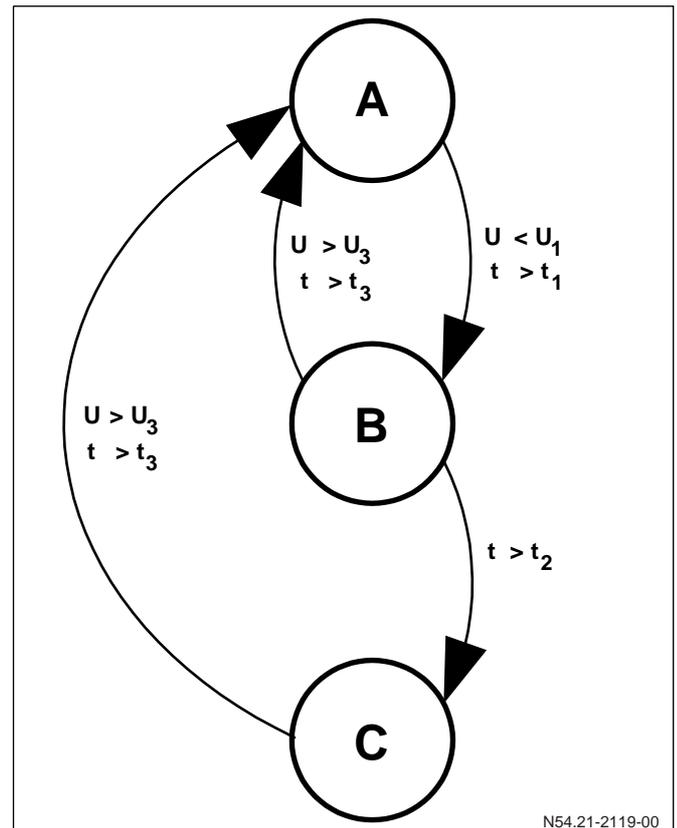
10.1.4.1 Programmable undervoltage detection

Using the programmable undervoltage detection function, it is possible to make control unit functions dependent on the on-board voltage. This undervoltage detection does not override the hardware undervoltage detection function in the control unit; rather, it should be considered as a configurable add-on.

In the evaluation of on-board voltage, undervoltage detection always uses greater of the two terminal 30 connections of the control unit. This means that the undervoltage detection function will still work even if one of the connections fails. In addition to the "Programmable options of the outputs" dependencies for discrete and SPS outputs, the ApplUSPG_global signal is also stored in the signal pool.

Three modes are defined for the global undervoltage: "Normal" mode (A), "Undervoltage detected" mode and "Undervoltage termination" mode. In "Undervoltage detected" mode, the PSM_USPG signal in the signal pool is simply set to "1". The functions/outputs programmed as being voltage-dependent are only deactivated in "Undervoltage termination" mode and not before. It is possible to program the voltage thresholds and the times for switching between the different modes. Of course, it is also possible to specify 0 seconds for these time parameters (e.g. the time between Undervoltage detected and Termination).

The adjacent status diagram shows the interrelationships that exist in the detection of global undervoltage and the different effects on the control unit:



- A Normal mode – All functions are carried out normally.
 - B "Undervoltage detected" mode - All functions are carried out normally, the PSM_USPG signal in the signal pool is set.
 - C "Undervoltage termination" – The USPGlobal signal is set, all functions that are coded to "dependent on global undervoltage" are terminated.
- U_1 PSM undervoltage: activation threshold
 - U_2 PSM undervoltage: deactivation threshold
 - t_1 PSM undervoltage: time for activation
 - t_2 PSM undervoltage: time for termination
 - t_3 PSM undervoltage: time for deactivation



10.1 Programmable special module (PSM)

10.1.4.2 Programmable run-on time

The parameter set of PSM variables contains the "Global PSM run-on time" variable. This is relevant to the configurable control unit run-on time, which is specified in minutes.

The run-on time elapses when the vehicle is locked by the remote control key. When the vehicle is unlocked, the run-on time is reset to the programmed value.

The control unit can enter SLEEP mode at the end of the programmed run-on time provided it is not kept awake by other conditions, e.g. individual discrete outputs are active.

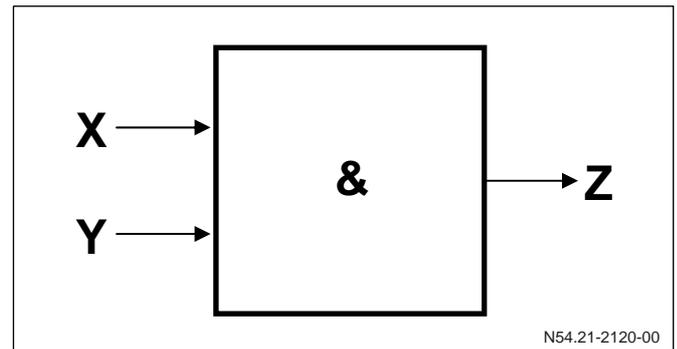
All functions of the control unit remain operable during the run-on time unless they require information from the ICAN.

10.1.4.3 Programmable PSM-internal stay-awake function

By applying this function or programming its parameters, this function module can be used to keep the PSM awake. In this way, it is possible to prevent the PSM from entering sleep mode even after the internal conditions necessary for this have been fulfilled. This capability is important for functions that require the PSM to remain continuously active and that require more time than is afforded by the normal PSM run-on time. If used incorrectly, the PSM may not enter sleep mode, which would lead to increased off-load current.

To enable the function, it is necessary to set the "PSM stay-awake active" parameter in the parameter set of PSM variables to 01.

The function can then be activated by any bit signal from the signal pool (e.g. SPS output, discrete input, etc.).



- X Function coded as active
- Y Any bit signal
- Z PSM_Intern_Wachhalten (PSM-internal stay-awake signal)

10.1 Programmable special module (PSM)

10.1.5 Engine functions

The PSM makes it possible to influence the engine control unit externally. To this end, a number of programmable function modules have been implemented to ensure correct operation of the engine control unit.

Engine-speed control function

The engine-speed control function makes it possible to control the actual speed of the engine.

A number of fixed engine speeds can be defined on the one hand, while the engine speed can be freely adjusted by button on the other

Power take-off function

The power take-off function controls the engagement of the power take-off on vehicles with this equipment. Various conditions are queried with the aim of preventing damage to the transmission.

Speed limiter function

The speed limiter function can be used to activate a programmable limit speed.

Engine remote start/stop function

With the engine remote start/stop function, it is possible to stop and restart the engine via the PSM.

Engine run-on function

This function is not available in the SPRINTER model series 906 due to the presence of the FBS3 drive authorisation system. If the engine is required to continue running with the vehicle locked, leave the electronic ignition key in the ignition lock and lock the vehicle using a mechanical key.

10.1.5.1 Engine-speed control (ADR) function

Using discrete inputs or ABH CAN signals, the PSM is able to activate output information on engine speed, torque and road speed limit values. This function requires that the following conditions be fulfilled:

- Terminal 15 active
- ADR not active

When these conditions are fulfilled, the output of limit values can be activated by means of the discrete or ABH CAN outputs.

Engine-speed control gives the body manufacturer the capability to manipulate the engine speed. This is possible in the following ways:

- Selection of a fixed engine speed
- Analogue specification of engine speed by means of a hand throttle
- Connection of a two-stage button for increasing/reducing the engine speed
- Use of the cruise control lever to increase/reduce/resume the engine speed
- Use of the ABH CAN to specify the engine speed directly
- Use of the ABH CAN to increase/reduce/resume the engine speed

ADR prevents the engine speed from jumping and ensures that it cannot go below/exceed the programmed minimum and maximum speeds. In the event of a fault, an attempt is made to regulate to the lowest possible engine speeds (idling speed) or to fully activate ADR.

ADR requires that the following input conditions be fulfilled before the function can be enabled internally:

- ADR module activated (parameter)
- Output of engine speed permitted (parameter)
- Terminal 15 active + normal voltage
- Transmission in neutral position (output)
- Engine idling (output)



10.1 Programmable special module (PSM)

- Handbrake applied (output)
- Brakes applied (output)
- Road speed not too high (parameter)
- Clutch pedal operated (output)
- Any ICAN signal active (output + parameter)
- Function enablement delay elapsed (parameter)

When these conditions are fulfilled, internal function enablement can be activated by means of the ADR request discrete or ABH outputs. Some of these conditions can be deactivated by parameter programming.

Any ICAN signal

- Any signal from the signal pool
- Can process either a bit signal or an analogue value
- Processing type is configurable

If internal ADR function enablement has been activated, the engine speed specification of the PSM can be output and modified. The methods for modifying the engine speed are listed below in order of their priority (fixed engine speed, hand throttle, increase / reduce / resume).

Fixed engine speed specification

Three different fixed engine speeds can be output at the outputs (discrete or ABH CAN). A run-on time of up to 25.5 seconds can be assigned to each fixed engine speed. If one of the fixed engine speeds is selected, the current engine speed is ramped up to this value. If none of the fixed engine speeds are selected, the engine speed is ramped up to the ADR lower engine speed limit if none of the other engine speed changes are active.

Hand throttle

The hand throttle can be controlled using either an analogue input (input 7 or 8) of the PSM or using the ABH CAN (output hand-throttle-ABH-Value). In either case, the engine speed is held between the programmed limits (minimum / maximum) of the hand throttle. When the hand throttle is activated, the engine speed is initially increased to the set engine speed by ramping. Once this speed is reached, any engine speed changes that are input at the hand throttle are forwarded directly.

Pulse and ramp mode

This operating mode has lowest priority and can therefore only be used if none of the fixed engine speeds are selected and the hand throttle is not active.

The input sources are either the cruise control lever, discrete inputs at the PSM or signals from the body manufacturer CAN (ABH CAN). The functions are "increase rpm", "reduce rpm" and "resume rpm".

The engine speed changes have two operating modes: step mode and ramp mode. In step mode, the engine speed is increased or reduced by the programmed increment with each new actuation of an input. Keeping the input in a state of actuation activates ramp mode. A ramp with the programmed gradient is then output and ends once an engine speed limit is reached or actuation of the input stops.



10.1 Programmable special module (PSM)

► Pulse and ramp mode – resume

The resumption of the engine speed functions in a similar way to cruise control: On actuation of this input, the engine speed is adjusted to a previously stored value. This is carried out by ramping.

The engine speed is stored each time an input is actuated to increase / reduce the engine speed. If ADR is now deactivated and reactivated, the current engine speed is adopted as the new starting value. Operating the resume function then adjusts the speed to the original engine speed. The same procedure also applies to the activation / deactivation of the hand throttle or a fixed engine speed

Troubleshooting the parameter programming of ADR

Whenever the ADR request is set, an event (DTC: 950D, Fehlende Bedingung ADR (unfulfilled ADR condition)) will be stored in the malfunction memory if one or more of the activation conditions have not yet been fulfilled.

The unfulfilled conditions are coded in the context data of this event:

10.1.5.2 Power take-off function

The power take-off function module makes it possible for the operator to engage and disengage engine-driven equipment at the main transmission as required. The PSM controls a solenoid valve, which then triggers the hydraulic actuation of the power take-off.

For the solenoid to be controlled, the power take-off requires that the following input conditions be fulfilled:

- PTO module activated (parameter)
- Control of solenoid valve permitted (parameter)
- Terminal 15 active + normal voltage
- Transmission in neutral position (output)
- Engine idling (output)
- Handbrake applied (output)
- Road speed not too high (parameter)

- Engine speed not too high (parameter)
- Clutch pedal operated (output)
- Any ICAN signal active (output + parameter)

Troubleshooting the parameter programming of the PTO

When these conditions are fulfilled, control of the solenoid valve can be activated by means of the PTO request discrete or ABH outputs. Some of these conditions can be deactivated by parameter programming.

"Last input condition" parameter programming option

If this flag is set, the solenoid valve cannot be controlled until all conditions have been fulfilled, and only then once the PTO request has been set.

If the flag is not set, an unfulfilled condition of the PTO can be overridden by unsetting / setting the power take-off request. This action causes a fault entry to be generated (DTC: 9401, PTO condition overridden), and the condition that was overridden is coded into the context variables of the fault entry.

10.1.5.3 Remote engine start function

For the engine start signal to be output, the engine starting function requires that the following input conditions be fulfilled:

- Engine start module activated (parameter)
- Output of engine start signal permitted (parameter)
- Terminal 15 active
- Engine not running
- Transmission in neutral position (output)
- Clutch depressed (output)
- Handbrake applied (output)
- Handbrake applied, discrete (output)
- Engine starter inhibitor not active, discrete (output)
- Engine starter inhibitor not active, ABH CAN (output)
- Power take-off not active (output)



10.1 Programmable special module (PSM)

When these conditions are fulfilled, output of the engine start signal can be activated by means of the engine start discrete or ABH outputs. Some of these conditions can be deactivated by parameter programming.

The engine start signal is withdrawn if the PSM detects that the engine is running. After a timeout (up to 6 seconds), the engine start signal is cancelled and a fault entry is generated. The engine start can then be re-activated once the request is withdrawn.

10.1.5.4 Remote engine stop function

For the engine stop signal to be output, the engine stop function requires that the following input conditions be fulfilled:

- Engine stop module activated (parameter)
- Output of engine stop signal permitted (parameter)
- Terminal 15 active and engine running (LL_STBL signal)

When these conditions are fulfilled, output of the engine stop signal can be activated by means of the engine stop discrete or ABH outputs.

The engine stop signal is withdrawn if the PSM detects that the engine is not running.

After a timeout (up to 6 seconds), the engine stop signal is cancelled and a fault entry is generated. The engine start can then be reactivated once the request is withdrawn.



10.1 Programmable special module (PSM)

10.1.6 SPS function

The PSM for the Sprinter model series 906 features SPS functions. These functions are designed to enable customers to create simple logical links between signals in the signal pool of the PSM.

The parameters of the SPS functions are programmable, which means that the customer is free to select the origin of the functions' input signals. The parameters are programmed using STAR DIAGNOSIS.

In addition, some blocks also support the configuration of further parameters such as thresholds and times.

The following logical blocks are available:

- 16 AND/OR/EXOR/NOR/NAND/EXNOR links
- 8 RS and D flip-flops
- 4 retriggerable/non-retriggerable timer stages
- 4 threshold value switches with 4 stages
- 4 hysteresis links with adjustable hysteresis thresholds
- 4 counter blocks

10.1.6.1 Activation of SPS groups

Using the module activation SPS parameter set, it is possible to activate or inhibit the processing of each of the 4 groups independently of the other groups.

10.1.6.2 Programmable options of the SPS outputs

The dependencies that can be set for each SPS output are summarised in the overview under "Programmable options of the outputs".

With outputs deactivated by the vehicle's operating state, note that the output is then assigned the value 0. Even outputs that are able to process a byte or a word signal will then receive the value 0.

In the case of the "Evaluate inverted signal" option, it should be noted that even byte and word signals are "inverted". With these signals, a 1 from the value 0 and a 0 from any value not equal to 0 is forwarded to the downstream evaluation unit. For this reason, caution is required when using this option for byte and word signals. The outputs for threshold value switches and hysteresis blocks do not have this parameter programming option as there is no point in "inverting" the input value here in the way described.

10.1.6.3 Description of the SPS blocks

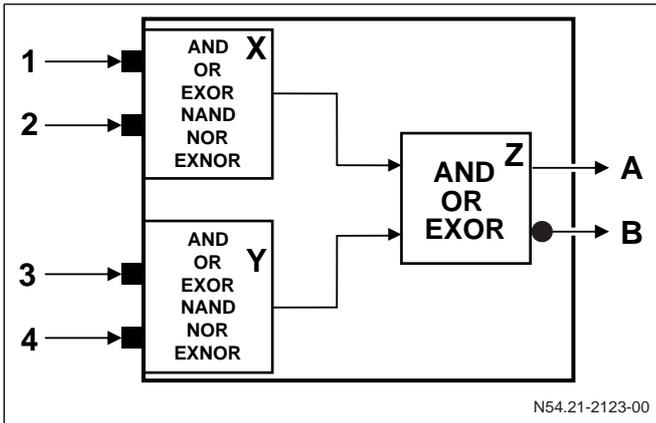
Block with logical links

A logical block has four digital inputs and two digital outputs, the second output always being the inversion of the first.

In these blocks, three 2-way gates are combined into a single system (see illustration). These two-way gates can perform different logic functions independently of each other. In this way, it is possible to effectively realise logical links that, for the most part, consist only of 2-way gates without having to use the entire logical block each time. At the same time, however, it remains possible to reproduce even 3-way and 4-way gates using only one logical block. This procedure spares resources and shortens the cycle time of the SPS system because the number of blocks linked in series can be reduced.



10.1 Programmable special module (PSM)

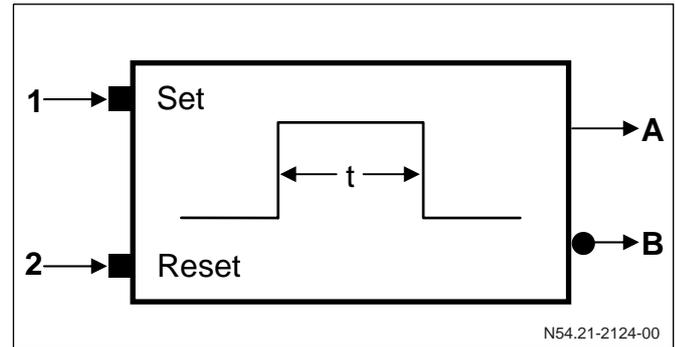


1 - 4 Inputs 1 to 4
 A, B Outputs A and B
 X, Y, Z Logical blocks X, Y and Z

The output of the logical block is written to the signal pool. In addition, the inversion of the output is calculated at the same time and also stored in the signal pool.

Timer block

The timer block has one digital trigger input and two digital outputs, the second output always being the inversion of the first. When triggered, the block remains active for a programmable period. It is possible to program whether or not the timer block should be retriggerable and whether the input signal should undergo edge or state-triggered evaluation. The reset input resets the timer each time.



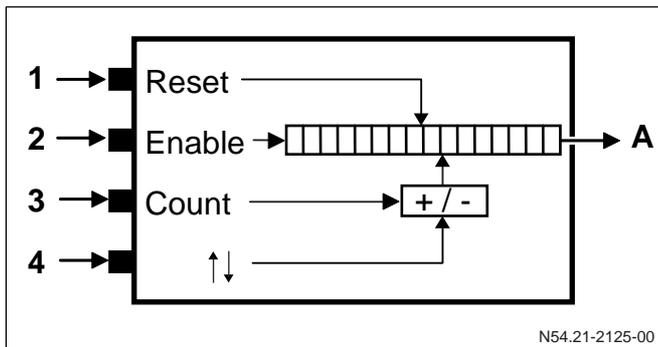
1 Set input
 2 Reset input
 A Output
 B Inverted output
 X, Y, Z Logical blocks X, Y and Z
 t Time t

The output of the timer block is written to the signal pool. In addition, the inversion of the output is calculated at the same time and also stored in the signal pool.

10.1 Programmable special module (PSM)

Counter block

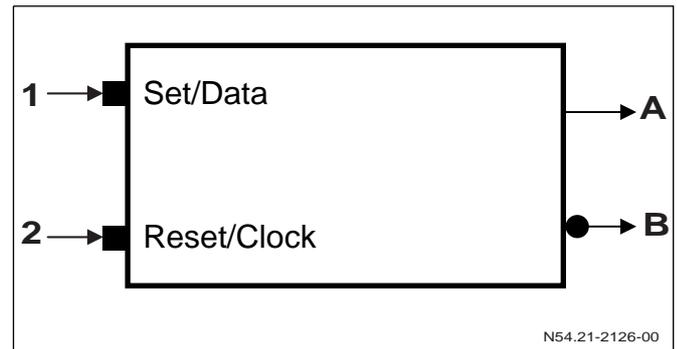
The counter block is an element for counting edge transitions. It has one reset input, one enable input, one direction input and the counter input to which the signal to be monitored can be applied. The internal counter register has a value range of 0 ... 65535 (16-bit). If the reset input is activated, the content of this register is reset to the current reset value (e.g. 00000). If the counter status rises to 65535, the counter overruns to 00000 at the time of the next edge at the clock input. The enable input enables or disables evaluation of the counter input. The direction input determines the counting direction: The counter counts up if a 0 is present at this input and counts down in the presence of a 1. Only positive edges are evaluated.



- 1 Reset input
- 2 Enable input
- 3 Counter input
- 4 Count direction input
- A Output with current count value

Flip-flop block

The flip-flop block has one digital input (reset / clock), one analogue input (set / data), one analogue output (A) and one digital output (B), where the digital output is always the logical inversion of the analogue output. The flip-flop can be configured either as a D flip-flop with data input and clock input or as an RS flip-flop with set and reset input. With a D flip-flop configuration, the analogue set / data input can be used as a means of storing and outputting even analogue signals with a value range of 0 ... 65535 in the flip-flop block. Conversely, the RS flip-flop works on a purely digital basis.



- 1 Set input with RS flip-flop / data input with D flip-flop
- 2 Reset input with RS flip-flop / clock input with D flip-flop
- A Output
- B Inverted output (when D flip-flop = 0 as soon as output A > 0)

The output of the flip-flops is written to the signal pool. In addition, the inversion of the output is calculated at the same time and also stored in the signal pool.

Apart from programming input and output parameters, it is also possible to influence the evaluation of the flip-flop inputs through a second parameter programming option. If the RS flip-flop parameter is set, it is possible to select a state-triggered or edge-triggered evaluation of input signals. On the other hand, with the D flip-flop parameter set, it is possible to trigger a latch by means of a positive or negative edge at the clock input.

10.1 Programmable special module (PSM)

Threshold value switch

The threshold value switch has three digital outputs and one analogue input, which can process a signal in the range 0...65535. The input value is compared with up to four threshold values and then set to the appropriate output.

To ensure that this block functions correctly, the programmed values for the thresholds must fulfil the following condition:

Threshold A < threshold B < threshold C < threshold D

Non-compliance with this rule for programming thresholds results in non-defined behaviour of the threshold value switch.



10.1 Programmable special module (PSM)

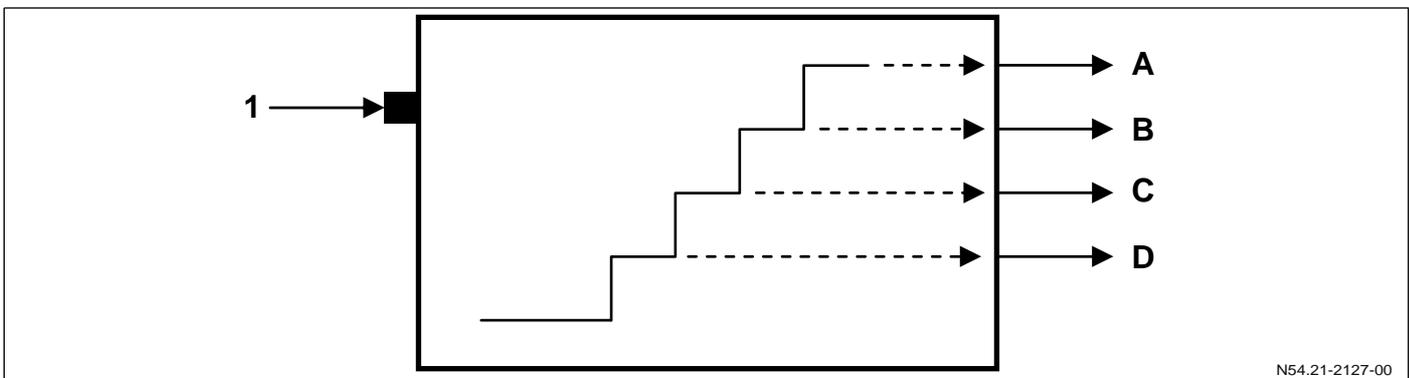
The operating mode of the threshold value switch (curve point or bar graph) can be determined via a parameter. The following tables show the differences between the two modes of operation:

Curve point mode of operation

Input	Output A	Output B	Output C	Output D
Input \leq threshold A	0	0	0	0
Threshold A < input \leq threshold B	1	0	0	0
Threshold B < input \leq threshold C	0	1	0	0
Threshold C < input \leq threshold D	0	0	1	0
Threshold D < input	0	0	0	1

Bar graph mode of operation

Input	Output A	Output B	Output C	Output D
Input \leq threshold A	0	0	0	0
Threshold A < input \leq threshold B	1	0	0	0
Threshold B < input \leq threshold C	1	1	0	0
Threshold C < input \leq threshold D	1	1	1	0
Threshold D < input	1	1	1	1



N54.21-2127-00

- 1 Data input
- A Output threshold A
- B Output threshold B

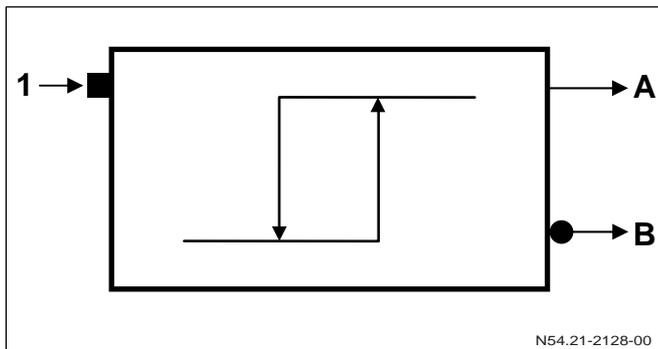
- C Output threshold C
- D Output threshold D

10.1 Programmable special module (PSM)

The thresholds can be programmed within a range of 0 ... 65535. Each block has two of these parameters. If a threshold is set to 65535 (FFFF), this threshold is evaluated as inactive and the associated output is never set. The mode of operation is specified in the SPS_SS_CFG byte.

Hysteresis block

The hysteresis block has one analogue input, which is able to process a signal in the 0 ... 65535 value range, and two digital outputs, the second output always being the inversion of the first. This block can be used to convert an analogue signal to a digital signal by means of a Schmitt trigger. The switching thresholds for the hysteresis can be set by parameter programming.



- 1 Data input
- A Output
- B Inverted output

The thresholds can be programmed within a range of 0 ... 65535. Each block has two of these parameters. If one or two thresholds are set to 65535 (FFFF), the hysteresis block concerned is evaluated as inactive and the associated output is never set. Similarly, the block is evaluated as inactive if the upper threshold is programmed to a value below the lower threshold.

The output of the hysteresis block is written to the signal pool. In addition, the inversion of the output is calculated at the same time and also stored in the signal pool.

10.1.6.4 Quantity of individual blocks

The table shows the quantity of SPS blocks available. The quantity available of each type of block was selected so as to make it possible for the retarder logic described in the Specifications to be realised with sufficient reserves.

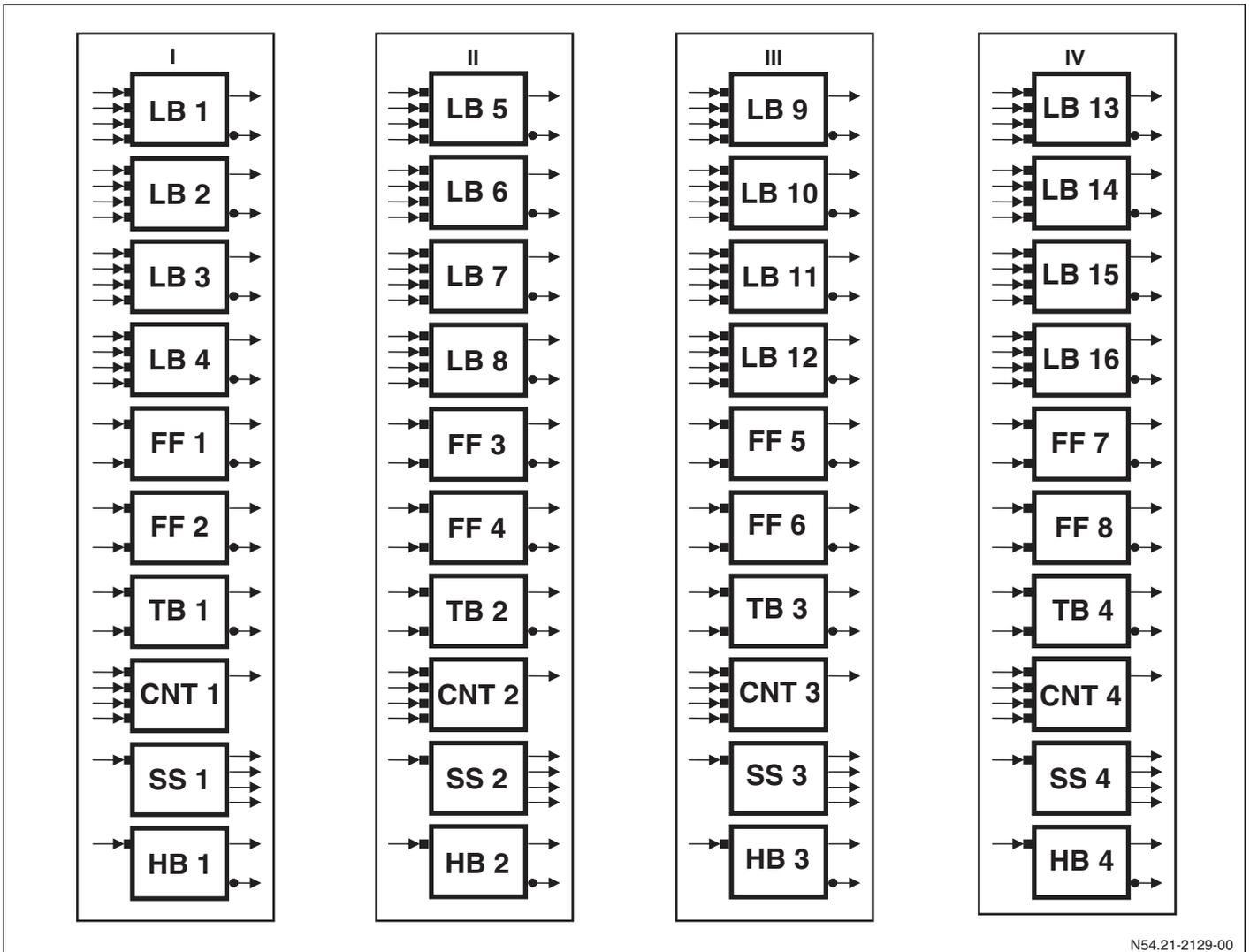
Block name	Quantity
Logical block	16
Timer block	4
Counter block	4
Flip-flop block	8
Threshold value switch	4
Hysteresis block	4

10.1.6.5 Internal processing and structure

The SPS blocks are divided into 4 groups to simplify the internal processing of the SPS blocks and to reduce the cycle time of the system. Each of these groups contains 4 logical blocks (LB), 1 timer block (TB), 2 flip-flops (FF), 1 threshold value switch (SS) and 1 hysteresis block (HB).

10.1 Programmable special module (PSM)

The overall layout is constructed as follows:



N54.21-2129-00

- I-IV Logic group 1-4
- LB X Logical block X
- FF X Flip-flop block X
- TB X Timer block X
- CNT X Counter block X
- SS X Threshold value block X
- HB X Hysteresis block X

10.1 Programmable special module (PSM)

10.1.7 ABH CAN

A second CAN bus is present at the PSM: the body manufacturer CAN (ABH CAN).

- Highspeed CAN Class C
- Extended CAN identifier (29-bit)
 - ▶ Baud rate togglable between 250 kbit/s and 125 kbit/s
 - ▶ Signal format: Intel (LSB first)
 - ▶ All bus contents can be separated by parameter programming and activated independently:
 - FMS (send direction only)
 - ISO11992-2 and 3 (abridged)
 - Freely assignable messages (J1939)

Data content – see also the documentation for the ABH CAN.

10.1.7.1 FMS

The Fleet Management System (FMS) is only concerned with messages to be sent by the PSM. These contents are vehicle information (road speed, engine values, driver information, etc.).

ABH-CAN Body manufacturer CAN

FMS ABH CAN information for the Fleet Management System

A Fleet Management System of the body manufacturer

10.1.7.2 ISO11992-2/

This standard is concerned with messages sent and received. The sent messages contain similar information to that of the FMS, supplemented by some engine information. The signals received by the PSM are stored in the signal pool and are available for use, e.g. by ADR.

10.1.7.3 Freely assignable messages

- 4 messages in the send direction (GPM_1H, GPM_1I, GPM_1J, GPM_1K)
- 4 messages in the receive direction (GPM_2H, GPM_2I, GPM_2J, GPM_2K)
- Sent signals are assigned from the signal pool (outputs)
- Received signals are stored in the signal pool for further use
- Message composition:
 - 8 bit signals
 - 2 byte signals
 - 2 2-byte signals
- Cycle time of the sent messages:
 - 2x at 100 ms, 1x 500 ms and 1x 1,000 ms

10.1 Programmable special module (PSM)

10.1.8 Details of discrete inputs

10.1.8.1 Positive active inputs

Designation	Abbreviation	Signal identifier	Switching threshold typically at 25 °C	Switching threshold min. / max. values	
				On	Off
Input 1 (high-active)	E01P	SignalID_InPortEPos1	6.5 V	> 7.7 V	< 3.9 V
Input 2 (high-active)	E02P	SignalID_InPortEPos2	6.5 V	> 7.7 V	< 3.9 V
Input 3 (high-active)	E03P	SignalID_InPortEPos3	6.5 V	> 7.7 V	< 3.9 V

10.1.8.2 Earth active inputs

Designation	Abbreviation	Signal identifier	Switching threshold typically at 25 °C	Switching threshold min. / max. values	
				On	Off
Input 4 (low-active)	E04N	SignalID_InPortEMin1	6.1 V	< 3.7 V	> 7.3 V
Input 5 (low-active)	E05N	SignalID_InPortEMin2	6.1 V	< 3.7 V	> 7.3 V
Input 6 (low-active)	E06N	SignalID_InPortEMin3	6.1 V	< 3.7 V	> 7.3 V

10.1.8.3 Analogue inputs

The analogue input values are normalised with the unit's supply voltage by means of an algorithm. A threshold value evaluation is then carried out. The value is below the threshold value if a switch is active (low-active). The signal is then assigned the logical status Active.

Designation	Abbreviation	Signal identifier	Switching threshold typically at 25 °C
Input 7 (analogue, low-active)	E07A	SignalID_InPortEAna0	20% Uterminal30
Input 8 (analogue, low-active)	E08A	SignalID_InPortEAna1	20% Uterminal30
Input 9 (analogue, low-active)	E09A	SignalID_InPortEAna2	20% Uterminal30
Input 10 (analogue, low-active)	E10A	SignalID_InPortEAna3	20% Uterminal30

10.1 Programmable special module (PSM)

10.1.9 Details of discrete outputs

With discrete outputs, the high-sides, low-sides and the outputs offer enhanced functions. All outputs can also be used as inputs. The high-sides can then be programmed to act as positive active inputs and the low sides as earth active inputs.

10.1.9.1 High-side outputs

The high-side outputs can be assigned signals from the signal pool. It is the status that is output in the case of bit signals, whereas the output is activated in the case of byte, int and PWM signals, provided the signal value does not equal 0.

Description	Fixed conditions	Optional conditions	Nominal load and load type	Type of overload threshold
Output 3 (positive / 10 A, wake-up capability, connection: terminal 30.1)	High-side, short-circuit detection active	Wake-up capability Output / input Open-load detection	10 A ohmic	15 A
Output 4 (positive / 10 A, wake-up capability, connection: terminal 30.2)	High-side, short-circuit detection active	Wake-up capability Output / input Open-load detection	10 A ohmic	15 A
Output 5 (positive / 5 A, wake-up capability, connection: terminal 30.1)	High-side, short-circuit detection active	Wake-up capability Output / input Open-load detection	5 A ohmic	7.5 A
Output 6 (positive / 5 A, wake-up capability, connection: terminal 30.2)	High-side, short-circuit detection active	Wake-up capability Output / input Open-load detection	5 A ohmic	7.5 A
Output 7 (positive / 5 A connection: terminal 30.1)	High-side, short-circuit detection active	Output / input Open-load detection	5 A ohmic	7.5 A
Output 8 (positive / 5 A connection: terminal 30.2)	High-side, short-circuit detection active	Output / input Open-load detection	5 A ohmic	7.5 A



10.1 Programmable special module (PSM)

Description	Fixed conditions	Optional conditions	Nominal load and load type	Type of overload threshold
Output 13 (positive / 0.5 A connection: terminal 30.1)	High-side, output, short-circuit detection active	Output / input	0.5 A ohmic	1.5 A
Output 14 (positive / 0.5 A connection: terminal 30.1)	High-side, short-circuit detection active	Output / input	0.5 A ohmic	1.5 A
Output 15 (positive / 0.5 A connection: terminal 30.2)	High-side, short-circuit detection active	Output / input	0.5 A ohmic	1.5 A
Output 16 (positive / 0.5 A connection: terminal 30.2)	High-side, short-circuit detection active	Output / input	0.5 A ohmic	1.5 A

10.1.9.2 Low-side outputs

The low-side outputs can be assigned signals from the signal pool.

Description	Fixed conditions	Optional conditions	Load and type of load	Type of overload threshold
Output 11 (negative / 1 A)	Low-side, short-circuit detection active	Output / input Open-load detection	1 A ohmic	1.5 A
Output 12 (negative / 1 A)	Low-side, short-circuit detection active	Output / input Open-load detection	1 A ohmic	1.5 A
Output 17 (negative / 0.5 A)	Low-side, short-circuit detection active	Output / input	0.5 A ohmic	1.5 A
Output 18 (negative / 0.5 A)	Low-side, short-circuit detection active	Output / input	0.5 A ohmic	1.5 A
Output 19 (negative / 0.5 A)	Low-side, short-circuit detection active	Output / input	0.5 A ohmic	1.5 A
Output 20 (negative / 0.5 A)	Low-side, short-circuit detection active	Output / input	0.5 A ohmic	1.5 A

10.1 Programmable special module (PSM)

10.1.9.3 Outputs with enhanced functions

Description	Fixed conditions	Optional conditions	Load and type of load	Type of overload threshold
Output 1 (H-bridge / 5 A) connection: terminal 30.1	Short-circuit detection active	Low or high-side active Output / input Open-load detection	5 A ohmic	6 A
Output 2 (H-bridge / 5 A) connection: terminal 30.2	Short-circuit detection active	Low or high-side active Output / input Open-load detection	5 A ohmic	6 A
Output 9 (positive / 1 A, PWM-compatible connection: terminal 30.2)	High-side, short-circuit detection active	PWM or discrete output When discrete: With / without soft start With / without pull-down Output / input Open-load detection	1 A ohmic PWM: 100 mA (500 mA)	2 A
Output 10 (positive / 1 A, PWM-compatible connection: terminal 30.2)	High-side, short-circuit detection active	PWM or discrete output When discrete: With / without soft start Output / input Open-load detection	1 A ohmic PWM: 100 mA (500 mA)	2 A

Outputs 1 and 2 can be selected to act as high-active or low-active. Active means that the respective connection to GND or terminal 30 is switched to output. Inactive means that there is no connection. It is not possible to use the other connection when an inactive status is set.

Outputs 9 and 10 can be configured to output either a PWM signal or a digital signal (discrete output).



10.1 Programmable special module (PSM)

10.1.10 List of signals available in the PSM

Category	Signal description	Signal ID
Equipment attributes	Vehicle Identification Number	0x4000
Vehicle status	Ignition key inserted	0x1016
Vehicle status	Ignition ON in "Radio" position	0x1017
Vehicle status	Ignition ON	0x1018
Vehicle status	Ignition ON and starter inoperative	0x1019
Vehicle status	Starter request by ignition key	0x101A
Vehicle status	Battery voltage - measured value from electronic ignition lock (EIS), 50 - 180 = 5 - 18 V	0x200B
Vehicle status	Engine running	0x1053
Vehicle status	Emergency lights ON	0x1054
Vehicle status	Handbrake applied	0x1055
Vehicle status	Outside temperature, 0 - 250 = -40 - 85 °C	0x200D
Vehicle status	Interior temperature, 0 - 232 = 0 - 58 °C	0x2012
Vehicle status	Instrument lighting, 0 - 100 = 0 - 100%	0x2013
Vehicle status	Vehicle speed normalisation: 0 - 254 = 0 - 254 km/h	0x2014
Vehicle status	Fuel level, 0 - 100 = 100 l	0x2015
Vehicle status	Display backlighting, 0 - 100 = 0 - 100%	0x2016
Vehicle status	Displayed outside temperature, 0 - 250 = -40 - 85 °C	0x2017
Vehicle status	Current kilometre reading	0x4001
Vehicle status	Current time in seconds from 0:00, 0 - 43,199 = 86,398 s	0x3008
Vehicle status	"Increase speed" operated at cruise control selector lever	0x10F3
Vehicle status	"Reduce speed" operated at cruise control selector lever	0x10F4
Vehicle status	"Resume" operated at cruise control selector lever	0x10F5
Vehicle status	Front interior lighting ON	0x1182
Vehicle status	Rear interior lighting ON	0x1183
Vehicle status	Programmed PSM undervoltage detected	0x11B9
Vehicle status	"Off" operated at cruise control selector lever	0x11BA
Vehicle status	Cruise control ON	0x11BB
Vehicle status	"Variable speed limiter" operated at cruise control selector lever	0x11BC
Vehicle status	Cruise control selector lever implausible	0x11BD
Vehicle status	Bonnet open	0x11C8

10.1 Programmable special module (PSM)

Category	Signal description	Signal ID
Vehicle status	Kilometre reading, 0 – 62500 = 0 – 1000000 km	0x3032
Vehicle status	Steering wheel button: next display	0x11CD
Vehicle status	Steering wheel button: previous display	0x11CE
Vehicle status	Steering wheel button: reserve	0x11CF
Vehicle status	Steering wheel button: reserve	0x11D0
Vehicle status	Steering wheel button: "+" button	0x11D1
Vehicle status	Steering wheel button: "-" button	0x11D2
Vehicle status	Steering wheel button: telephone send	0x11D3
Vehicle status	Steering wheel button: telephone end	0x11D4
Vehicle status	Raise vehicle level at rear	0x11D5
Vehicle status	Lower vehicle level at rear	0x11D6
Vehicle status	Switch on rear-compartment lighting from DBE	0x11D7
Vehicle status	Front interior lighting switched on from DBE	0x11D8
Vehicle status	ATA primed	0x11E1
Vehicle status	Vehicle level at rear	0x2047
Information from the engine CAN	Front left wheel pulse counter	0x2000
Information from the engine CAN	Front right wheel pulse counter	0x2001
Information from the engine CAN	Engine speed, in rpm	0x3001
Information from the engine CAN	Engine temperature, 0 – 254 = -40 – +214 °C	0x2002
Information from the engine CAN	Steering angle direction	0x101F
Information from the engine CAN	Steering angle 0 – 1440 = 0 – 720 °	0x3003
Information from the engine CAN	Engine running stable	0x1033
Information from the engine CAN	Transmission selector lever position, automatic transmission only	0x2008
Information from the engine CAN	Reverse gear engaged	0x1034
Information from the engine CAN	Accelerator pedal value, 0 – 100 = 0 – 100%	0x2027
Information from the engine CAN	Clutch depressed, only if switch fitted	0x10F1
Information from the engine CAN	Gear lever in neutral, only if switch fitted	0x10F2
Information from the engine CAN	Engine regulated to idling speed	0x113D
Information from the engine CAN	Automatic transmission in position P	0x113E
Information from the engine CAN	Automatic transmission in position D	0x113F
Information from the engine CAN	Current fuel consumption of the vehicle, 0 – 65534 = 0 – 14,200 µl / 250 ms	0x301B



10.1 Programmable special module (PSM)

Category	Signal description	Signal ID
Information from the engine CAN	Clutch partly depressed	0x11C4
Information from the engine CAN	Set braking torque	0x3030
Information from the engine CAN	Retarder OFF request from EIS	0x11C5
Information from the engine CAN	Retarder defective message from ABS	0x11C6
Indicator and warning displays	Minimum fuel level display	0x1232
Light control module and horn	Brake lamps ON	0x2007
Light control module and horn	Brake lamps suppression active	0x1032
Light control module and horn	Left turn signal operated at steering column switch	0x1041
Light control module and horn	Right turn signal operated at steering column switch	0x1042
Light control module and horn	Main-beam headlamps operated at steering column switch	0x1043
Light control module and horn	Headlamp flasher operated at steering column switch	0x1044
Light control module and horn	Horn operated	0x1045
Light control module and horn	Main-beam headlamps switched on	0x104C
Light control module and horn	Horn switched on	0x104D
Light control module and horn	Left-hand parking lamps switched on	0x104E
Light control module and horn	Right-hand parking lamps switched on	0x104F
Light control module and horn	Side lamps switched on	0x1050
Light control module and horn	Dipped-beam headlamps switched on	0x1051
Light control module and horn	Rear foglamp switched on	0x1052
Light control module and horn	Rotary light switch in "Left-hand parking lamps" position	0x1056
Light control module and horn	Rotary light switch in "Right-hand parking lamps" position	0x1057
Light control module and horn	Rotary light switch in "Auto" position	0x1058
Light control module and horn	Rotary light switch in "Off" position	0x1059
Light control module and horn	Rotary light switch in "Side lamps" position	0x105A
Light control module and horn	Rotary light switch in "Dipped-beam headlamps" position	0x105B
Light control module and horn	Rotary light switch in "Front foglamps on" position	0x105C
Light control module and horn	Rotary light switch in "Rear foglamp on" position	0x105D
Light control module and horn	Active for duration of turn signal ON phase when hazard warning lamps active	0x1067
Light control module and horn	Active for duration of turn signal ON phase when hazard warning lamps or only the left-hand turn signal active	0x1068
Light control module and horn	Active for duration of turn signal ON phase when hazard warning lamps or only the right-hand turn signal active	0x1069

10.1 Programmable special module (PSM)

Category	Signal description	Signal ID
Light control module and horn	ON duration of turn signal control, 0 – 250 = 0 – 2.5 s	0x200F
Light control module and horn	Hazard warning lamps switched on at OBF	0x106B
Light control module and horn	Light sensor defective	0x106E
Light control module and horn	"Night" light sensor signal	0x106F
Light control module and horn	Daytime driving lights	0x107C
Light control module and horn	Brake lamps status	0x107F
PWM functions	Wheel rotation speed for PWM output	0x3000
PWM functions	Engine speed for PWM output	0x3002
PWM functions	Instrument lighting setpoint value for PWM output	0x3006
PWM functions	Road speed for PWM output	0x3007
PWM functions	Outside temperature for PWM output	0x3009
PWM functions	Interior temperature for PWM output	0x300A
PWM functions	Display dimming setpoint value for PWM output	0x301A
Windscreen / rear window wash / wipe	Single wipe operated at steering column switch	0x1046
Windscreen / rear window wash / wipe	Wash operated at steering column switch	0x1047
Windscreen / rear window wash / wipe	Intermittent wipe operated at steering column switch	0x1048
Windscreen / rear window wash / wipe	Wiper speed 1 operated at steering column switch	0x1049
Windscreen / rear window wash / wipe	Wiper speed 2 operated at steering column switch	0x104A
Windscreen / rear window wash / wipe	Rear window heating ON	0x1063
Windscreen / rear window wash / wipe	Rear window heating switched on at OBF	0x106A
Windscreen / rear window wash / wipe	Rear wash / wipe switched on at OBF	0x106C
Windscreen / rear window wash / wipe	Intermittent rear window wiping switched on at OBF	0x106D
Windscreen / rear window wash / wipe	Rear window heating defective, interruption	0x1184
Windscreen / rear window wash / wipe	Windscreen heating ON	0x120F

10.1 Programmable special module (PSM)

Category	Signal description	Signal ID
Windscreen / rear window wash / wipe	PSM - switch on windscreen heating	0x1210
Sliding sunroof	Raise sliding sunroof manually from DBE	0x11D9
Sliding sunroof	Raise sliding sunroof automatically from DBE	0x11DA
Sliding sunroof	Lower sliding sunroof manually from DBE	0x11DB
Sliding sunroof	Lower sliding sunroof automatically from DBE	0x11DC
Sliding sunroof	Open sliding sunroof manually from DBE	0x11DD
Sliding sunroof	Open sliding sunroof automatically from DBE	0x11DE
Sliding sunroof	Close sliding sunroof manually from DBE	0x11DF
Sliding sunroof	Close sliding sunroof automatically from DBE	0x11E0
Miscellaneous CAN signals	Anti-theft alarm system active	0x1070
Miscellaneous CAN signals	Air-conditioning compressor switched on	0x107B
Miscellaneous CAN signals	Motion detected by motion detector	0x1181
Central locking and doors	Front left door open	0x105E
Central locking and doors	Front right door open	0x105F
Central locking and doors	Left sliding door open	0x1060
Central locking and doors	Right sliding door open	0x1061
Central locking and doors	Left sliding door unlocked	0x1064
Central locking and doors	Right sliding door unlocked	0x1065
Central locking and doors	Unlock front right door	0x1079
Central locking and doors	Unlock front left door	0x107A
Central locking and doors	This signal is set if the load compartment is unlocked.	0x1080
Central locking and doors	This signal is set if the front compartment is unlocked.	0x1081
Central locking and doors	This signal is set if the front compartment and load compartment are unlocked.	0x1082
Central locking and doors	Unlock from outside using remote control key	0x1083
Central locking and doors	Lock from outside using remote control key	0x1084
Central locking and doors	This signal is set if the load compartment is locked.	0x1085
Central locking and doors	This signal is set if the front compartment is locked.	0x1086
Central locking and doors	This signal is set if the front compartment and load compartment are locked.	0x1087
Central locking and doors	Central locking child-proof locks active	0x1180



10.2 Signal acquisition and actuation module (SAM)

10.2 Signal acquisition and actuation module (SAM)

Function	Equipment		SAM _{Min}	SAM _{Low}	SAM _{Med}	SAM _{High}
	Standard	Optional equipment				
Exterior lighting control with bulb monitoring	X		X	X	X	X
Third brake lamp		X		X	X	X
Front foglamps		X			X	X
Turn signal control	X		X	X	X	X
Interior lighting control	X		X	X	X	X
Comfort interior lighting						X
Windscreen wipe / wash	X		X	X	X	X
Rear window wipe / wash		X			X	X
Windscreen heating		X				X
Rear window heating		X			X	X
Central locking: sliding door, rear door		X		X	X	X
Central locking: second sliding door		X			X	X
Rotary light switch read-in	X		X	X	X	X
Read-in of sensor signals (including washer fluid level, coolant level, brake fluid level, fuel level sensor, outside temperature, brake lining wear) and switches	X		X	X	X	X
Electric hinged windows		X				X
Headlamp cleaning system		X			X	X
Auxiliary flasher module		X			X	X
Alarm function		X	X	X	X	X
ATA function		X			X	X
Xenon headlamps with cornering lamps		X				X
Co-driver's door central locking	X		X	X	X	X
Co-driver's door power window	X		X	X	X	X
Motion detector		X			X	X

Not all functions are supported by all control unit variants. Depending on the equipment, only "minimal" variants of the SAM or TSG are fitted, for example. In such cases, the control unit concerned must be retrofitted if necessary.

10.3 Exterior lighting bulb ratings

10.3 Exterior lighting bulb ratings

PIN	Function	Model	Load [W]	Remarks
FL_L	Left-hand main-beam headlamp	H7	55	Vehicles with xenon lamps: left-hand cornering lamp
FL_R	Right-hand main-beam headlamp	H7	55	Vehicles with xenon lamps: right-hand cornering lamp
NSW_L	Left-hand front foglamp	H7	55	Front foglamp in the main headlamp unit
NSW_L	Left-hand front foglamp	H11	55	Front foglamp in the bumper
NSW_R	Right-hand front foglamp	H7	55	Front foglamp in the main headlamp unit
NSW_R	Right-hand front foglamp	H11	55	Front foglamp in the bumper
ABL_L	Left-hand dipped-beam headlamp	H7	55	With left-hand xenon bulb
ABL_R	Right-hand dipped-beam headlamp	H7	55	With right-hand xenon bulb
	Shadow mask			Only with xenon
STL_L	Left-hand side lamp	W5W	5	
STL_R	Right-hand side lamp	W5W	5	
SL_L	Left-hand tail lamp	R21 /5W	5	On panel van and MPV
		R21 /5W	2 x 5	Two lamps in parallel on cab, crewcab, open model series
SL_R	Right-hand tail lamp	R21 /5W	5	On panel van and MPV
		R21 /5W	2 x 5	Two lamps in parallel on cab, crewcab, open model series
BR_L	Left-hand brake lamp	P21	21	Also rear left turn signal function with SAE in conjunction with cab, crewcab, open model series
BR_R	Right-hand brake lamp	P21	21	Also rear right turn signal function with SAE in conjunction with cab, crewcab, open model series
BR_3	Third brake lamp	LED	Approx. 1.8	LED lamp
NSL	Rear foglamp	P21	21	
KZB	Licence plate lamp	C5W	2 x 5	Two lamps in parallel on panel van and MPV
	Rear perimeter lamp	R21 /5W	2 x 5	Two lamps in parallel on chassis
RFL	Reversing lamp	P21	2 x 21	Two lamps in parallel, optional buzzer in parallel
BL_L	Left-hand turn signal	PY21	Front 21	ROW except SAE
		HPV16	Side 16	
		PY21	Rear 21	
BL_R	Right-hand turn signal	PY21	Front 21	ROW except SAE
		HPV16	Side 16	
		PY21	Rear 21	
BL_L	Left-hand turn signal	PY21	Front 21	ROW all-wheel drive
		PY21	Side 21	
		PY21	Rear 21	



10.3 Exterior lighting bulb ratings

PIN	Function	Model	Load [W]	Remarks
BL_R	Right-hand turn signal	PY21	Front 21	ROW all-wheel drive
		PY21	Side 21	
		PY21	Rear 21	
BL_L	Left-hand turn signal	3457NAK	Front 28.6	Only on SAE
		HPV16	Side 16	
		PY21	Rear 21	
BL_R	Right-hand turn signal	3457NAK	Front 28.6	Only on SAE
		HPV16	Side 16	
		PY21	Rear 21	
URL	Front perimeter lamps	W5W	2 x 5	Two lamps in parallel
SM_L	Side marker lamp, left	W3W	2 x 3	Two lamps in parallel
SM_R	Side marker lamp, right	W3W	2 x 3	Two lamps in parallel
TSG_L	Left-hand entry lamp	W5W	5	
TSG_R	Right-hand entry lamp	W5W	5	



Information on connectors / mating connectors on the basic vehicle can be obtained from the department responsible (▷ page 15) or found in the Workshop Information System (WIS) (▷ page 18).

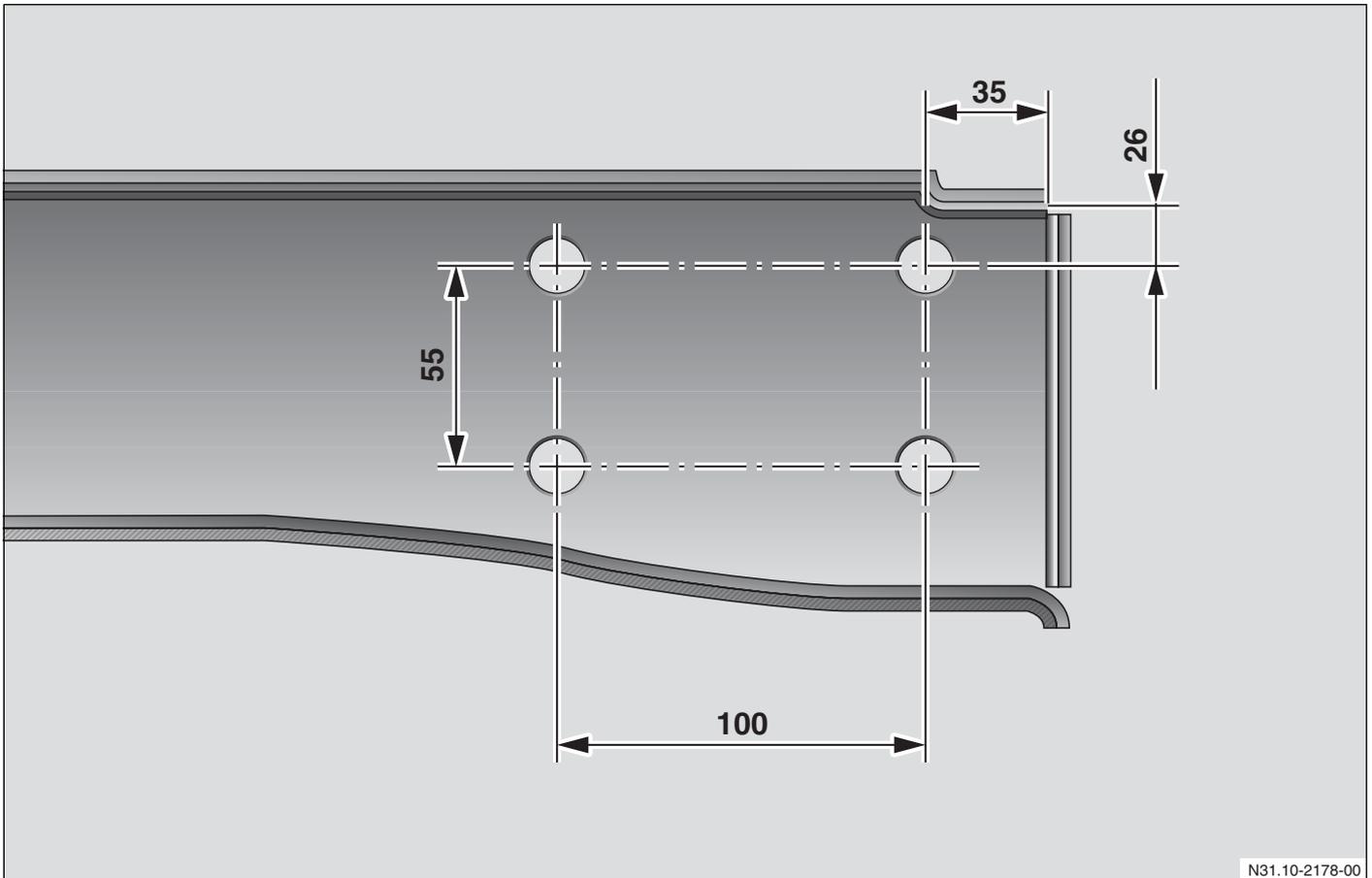


10.4 Trailer coupling hole patterns

10.4 Trailer coupling hole patterns

When fitting a trailer coupling, it is not necessary to reinforce its bolting points.

Installation dimensions, version 1

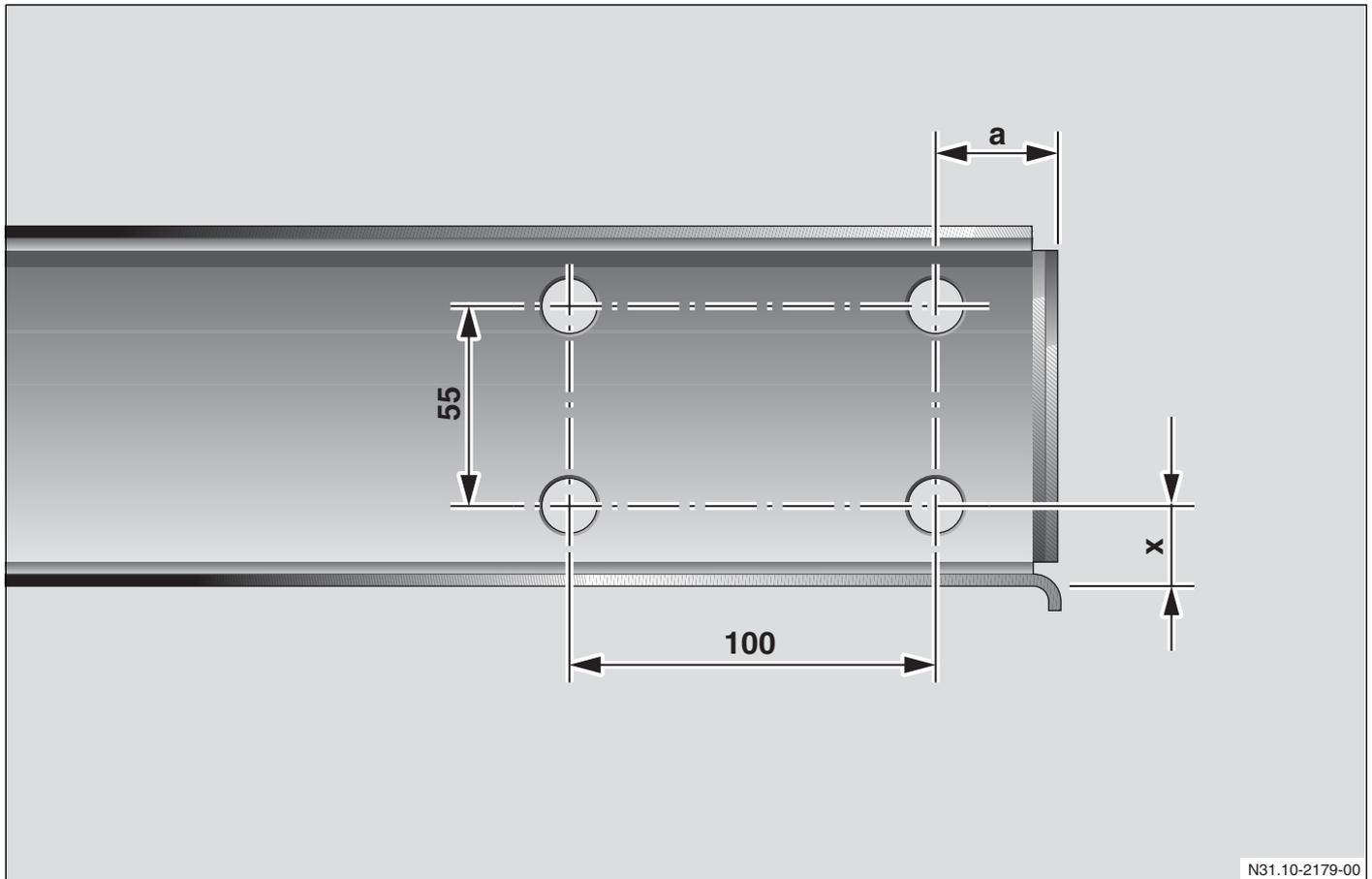


N31.10-2178-00

Vehicle type	Wheelbase	Dimension a	Dimension x	Overhang
Panel van /MPV 3.0 t to 5.0 t	3,250 mm			950 mm
	3,665 mm			1,150 mm
	4,325 mm			1,250 mm

10.4 Trailer coupling hole patterns

Installation dimensions, version 2

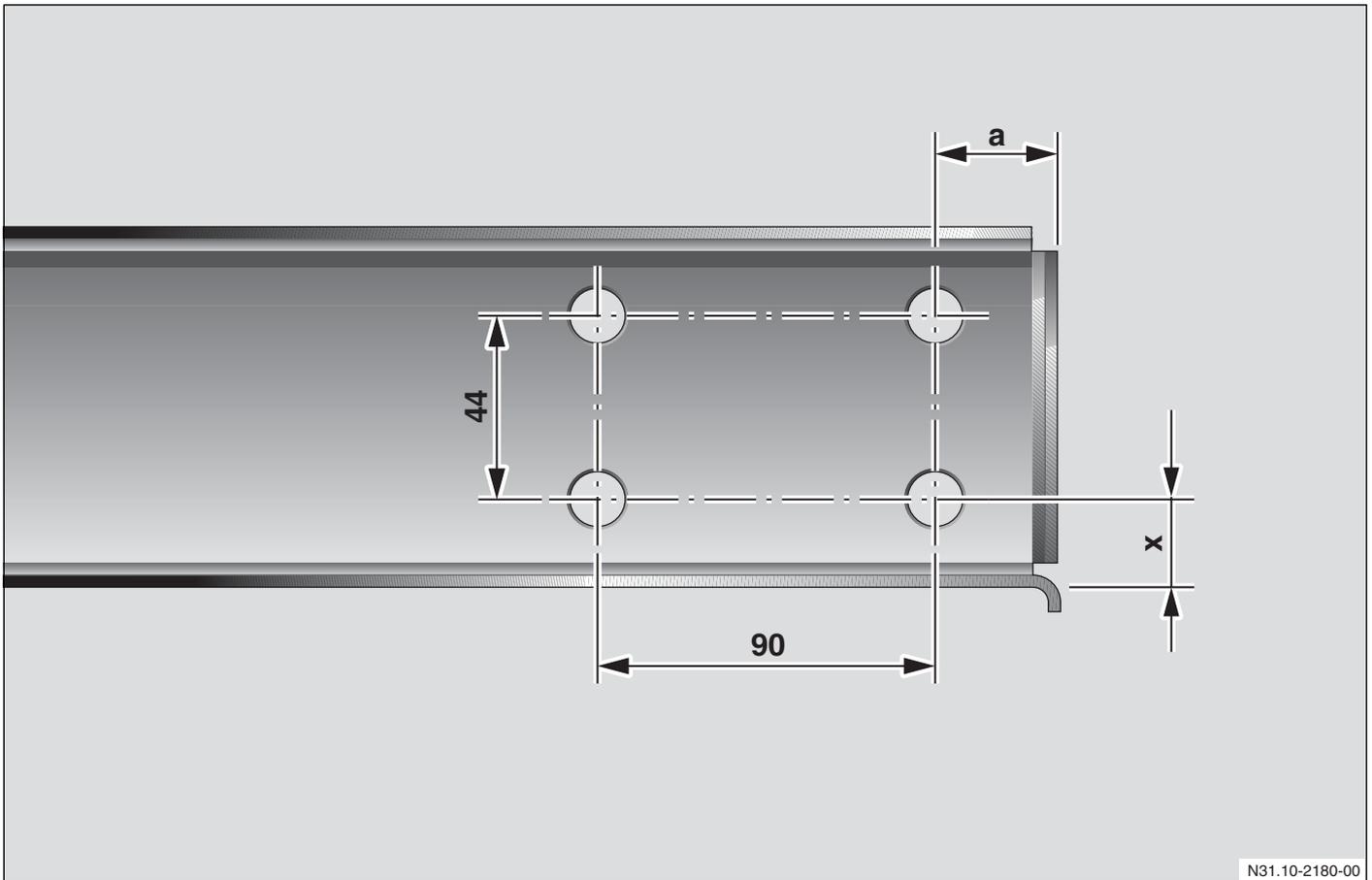


N31.10-2179-00

Vehicle type	Wheelbase	Dimension a	Dimension x	Overhang
Chassis / platform / tipper	3,250 mm	34 mm	39 mm	950 mm
with cab / with crewcab	3,665 mm	34 mm	39 mm	1,150 mm
3.0 t to 3.5 t	4,325 mm	34 mm	39 mm	1,250 mm

10.4 Trailer coupling hole patterns

Installation dimensions, version 3



Vehicle type	Wheelbase	Dimension a	Dimension x	Overhang
Chassis / platform	3,665 mm	27 mm	34 mm	1,250 mm
with cab / with crewcab	4,325 mm	27 mm	34 mm	1,350 mm
5.0 t				

A	
ABH CAN	205
Accident prevention	22
Additional equipment	135
Additional lamps	74, 75
Adjusting the headlamps	74
Advice for body manufacturers	15
Aerial	77
Air intake	110
Air intake (engine)	119
Air suspension	94
Airbag	
Control unit	125
Disposal	132
Front airbag	128
General	49, 124
Side-impact airbag	129
Thorax bag	125
Transportation and storage	131
Windowbag	130
Air-conditioning system	135
Alarm functions	210
Alternator	69, 141
Anti-roll bars	92
Assemblies	120
Attachment	
Attachments on the roof	114
Lifting platform	150
Attachment above cab	143
Attachment points on the frame	44
Attachment to the frame	
Attachment at the front	101
Attachment at the rear	101
Bodyshell / body	101
Mounting frame	159
Threshold values	53
Threshold values for the body	55, 189
Attachments	142
Threshold values	52
Auxiliary brakes	141
Auxiliary heating	136
Axle loads	27, 42
B	
Ball coupling	152
Basic vehicle (modifications)	91
Batteries	
Auxiliary battery	65
Main battery	65
Maintenance	36
Battery isolating switch	65
Belt tensioners	49, 126
Bi-xenon headlamps	74
Block with logical links	218
Body	
Threshold values	53
Version	157
Body manufacturer information and certification	15
Body support brackets	160, 161
Attachment	161
Bodyshell	
General	97
Modifications	44
Bodyshell / body	
Section dimensions of longitudinal frame members	98
Welding	99
Bolted connections	31
Brake hoses	56
Brake system	43, 91, 93
Auxiliary brakes / retarders	94
Disc brakes	94
Hydraulic brake system	93
Parking brake cable	93
Routing lines	93
Bulb ratings (exterior lighting)	236
C	
Cab	109
Cab rear panel	110, 166
Cab roof	110
Cables and lines	56
Calculating the centre of gravity	195
Calculations	195
CAN bus	50, 67, 83



Caravans	42, 189
CB radio	77
Central locking	78, 210
Central locking unlocked	204
Central locking/rescue vehicle fittings	78
Centre of gravity heights with ESP deactivated	40
Certificate of endorsement	15, 16
Chassis	25
Chassis with frame front end/windscreen support structure	167
Checking the entire vehicle	38
Control units	83
Cooling system (engine)	119
Corrosion protection	
After welding	34
Coatings	59
Component design	59
General	58
Preventive measures	58
Counter block	220
D	
Damage prevention	56
Dimensions	27
Door	80
Doors	80, 111
Drawbar ratio semitrailer coupling	198
Drilling	
Bodyshell/body	99
Frame	99
Drivetrain	117
Threshold values	48
E	
Earth bolts	72
EIS (electronic ignition switch)	78
Electric wiring/fuses	50, 68
Electrics/electronics, threshold values	50
Electromagnetic compatibility	64
Electronic ignition switch (EIS)	78
Electronic Stability Program (ESP)	50, 82, 106
EMC (electromagnetic compatibility)	64
End frame cross member	101, 113
Engine	48
Engine air intake	119
Engine cooling system	119
Engine flap	168
Engine peripherals	117
Engine peripherals, threshold values	48
Engine power take-off	139
Engine remote start/stop function	214
Engine run-on	214
Engine speed regulation	123
Engine-speed control	214
ESP (Electronic Stability Program)	82, 106
Exhaust system	118
Exterior lamps	75
Connection of an additional lamp	75
Lamp monitoring	75
Exterior mirrors	81
F	
Fitted shelving	144
Fixed engine speed specification	215
Flaps	111
Flexible connection	162
Flip-flop block	220
Floor assembly/side panels	166
FMS	225
Frame forestructure	101
Frame, cutting areas	46, 106
Reinforcement	108
Freely assignable messages	225
Front axle	91
front axle load	40
Front perimeter lamps	75
Fuel filler neck	97
Fuel level sensor shield	117
Fuel system	117



Function

Alarm functions	210
Central locking	210
Engine remote start / stop function	214
Engine-speed control	214
Light functions	210
Power take-off	214
Sliding sunroof	210
Speed limiter	214
Warning signals	211
Windscreen / rear window (cleaning function) ...	211
Fuses	68

G

Gas-shielded plug welding	33
Global parameter programming options	203
Global PSM undervoltage	204
Global run-on	204

H

Hand throttle	215
Handing over	38
Headlamp basic setting	74
High-side / low-side	204
Hysteresis block	223

I

ICAN faults	204
Increasing the height of the roof	194
Input/output	204
Installations	144
Installing propeller shafts	141
Interior	49, 124
Modifications	165
Threshold values	49
Interior lamps	76
ISO 11992-2 /	225

J

Jump-starting connection	36
---------------------------------------	----

K

Keyless entry	79
----------------------------	----

L

Lashing eyelets	144
Legal claims	16
Liability (product liability)	19
Lifting platform	89, 149, 150
Lifting press	184
Lifting work platform	191
Light functions	210
Lighting	74
Liquid-petroleum gas (LPG) system	136
Load compartment sliding door	80
Load rails	144
Loading crane	147
Loading tailgate (lifting platform)	89, 149, 150
Longitudinal frame member	98, 99
Low frame	169
Lowering the roof height	110

M

Maintenance	36
Maintenance and repairs	36
Maintenance work on the stored vehicle	38
Marker lamps	75
Material quality	157
Max. position of centre of gravity	40
Memory-programmable control unit (SPS)	85
Mercedes star and logo	21
Messages (freely assignable)	225
minimum front axle load	40
Mini-SPS	85

- Mobile communications systems** 50, 77
 Aerial 77
 Maximum transmission output 77
- Mobile phone** 77
- Model designation** 10, 11
- Model overview** 11
- Modifications to the wheelbase** 46, 97, 106
- Motor caravans** 42, 189
- Mounting frame** 157
 As floor assembly 163
 Dimensioning 159
 General 157
 Material quality 54
 Offset frame 158
 Threshold values 53
 Tipper bodies 184
- Mounting plate** 186
- Mudguards** 112
- N**
- Noise in the interior, reducing** 133
- Noise insulation** 35
- O**
- Open-jaw coupling** 152
- Open-load detection** 204
- Operating safety** 9
- Optional equipment** 39
- Overall appearance of the entire vehicle** 21
- Overhang extension** 103
- P**
- Paintwork** 60, 87
- Panel van, closed** 166
- Panel van/MPV roof structure** 114
- Panel vans** 182
- Parktronic** 87
- Partitions** 166
- Pivots** 184
- Platform bodies** 181
- Position of the centre of gravity** 40
- Power supply** 71
- Power take-off** 214, 216
- Power take-offs** 136
- Power windows / window hinges** 80
- Product information** 17
- Product liability** 19
- Programmable options of the outputs** 204
- Programmable options of the SPS outputs** 218
- Programmable special module (PSM)** ... 83, 88, 199
- Propeller shafts** 120
- PSM (programmable special module)** ... 83, 88, 199
- PSM (retarder)** 122
- PSM functions** 84
- PSM stay-awake active** 213
- PSM undervoltage**
 Activation threshold 212
 Deactivation threshold 212
 Time for activation 212
 Time for deactivation 212
 Time for termination 212
- Pulse and ramp mode** 215
- PWM output** 204
- PWM soft start** 204
- Q**
- Quality system** 24
- R**
- Radiator grille** 119
- Radio** 77
- Rain-light sensor** 76
- Raised roof** 116
- Rear door opening** 112
- Recycling** 23
- Refrigerated vehicles** 183
- Remote control key** 78
- Remote engine start** 216
- Remote engine stop** 217
- Reprocessing components** 23
- Rescue vehicles** 187
- Resistance spot welding** 32
- Retarder** 88, 122, 141
- Retrofitting electrical equipment** 69
- Rigid attachment, mounting frame** 162
- Roof** 114
- Roof arches** 115
- Roof load** 47
- Roof loads, permissible** 116
- Roof racks** 143
- Run-on** 204
- S**
- Safety equipment** 125
- SAM (signal acquisition and actuation module)** 85, 235
- Seat belts** 126
- Seats** 49, 132, 165
- Section dimensions, mounting frame** 159
- Self-supporting bodies** 164

- Semitrailer coupling** 186, 198
Semitrailer tractors 185
Sensors 125
Shock absorbers 43, 92
Short-circuit monitoring 204
Side marker lamps 71, 75
Side underride guards 155
Sidewall 111, 166
Signal acquisition and actuation module (SAM) 85, 235
Signal pool 200
Sliding door 80
Sliding sunroof 80, 210
Spare wheel 96
Speed limiter 214
Speed regulation (engine) 123
Speed signal 72
Springs / shock absorbers 91
SPS (memory-programmable control unit) 85
Standard seats 132
Stay-awake function 204
Steerability 40
Storing the vehicle 37, 62
Suspension 43, 91, 92
Symbols (in these body / equipment mounting directives) 7
- T**
- Tack welding** 34
Tail lamps 74
Tank 97, 117
Technical advice 15
Telephone 77
Tender drawings 17
Thorax bag 125
Threshold value switch 221
- Threshold values**
 Additional equipment 51
 Attachments 52
 Basic vehicle 40
 Body 53
 Bodyshell 44
 Electrics / electronics 50
 Engine peripherals / drivetrain 48
 Interior 49
 Suspension 42
- Timer block** 219
Tipper bodies 184
Torsional rigidity of body types 188
TPMS (tyre pressure monitoring system) 86
Trailer coupling 101, 151, 153
 Ball coupling 152
 Clearance dimensions 151
 Dimensioning 151
 Hole patterns 238
 Open-jaw coupling 152
- Transmission output** 77
Transmission output (mobile communications systems) 50
Tyre load-bearing capacity 27
Tyre pressure monitoring system 86
Tyre sizes, permissible 42, 95
Tyres 29, 30, 95
- U**
- Underride guard** 154
Undervoltage (detection) 212
Undervoltage (termination) 212

V	
Vehicle approval	26
Vehicle frame, threshold values	44
Vehicle handover	38
Vehicle identification number	28
Vehicle identification plate	28
Vehicle modifications	26
Vehicle overhang	44, 45
Vehicle perimeter lamps	50, 71, 75
Vehicle safety	8
Vehicle stability	29
Vehicle type identification data	28
Ventilation	134
W	
Wake-up capability/load detection	204
Warning signals	211
Warranty claims	20
Water separation	168
Weights	27
Welding	
Bodyshell/body	99
General	57
Resistance spot welding	32
Welded connections	32
Welding process	32
Wheel alignment	43
Wheel arch lowering	112
Wheel arches	44, 112
Wheels	95
Winches	142
Wind deflectors	142
Window heating	81
Windowbag	125
Windows	80, 111
Windscreen support structure	114
Windscreen wipers	80
Windscreen/rear window	
(cleaning function)	211
Wiring diagrams	90
Workshop Information System (WIS)	18