GUIDE TO
WORLD-CLASS BODY BUILDING
12.

GUIDELINES

Guidelines and Precautions

Daimler India Commercial Vehicles Pvt. Ltd., as the manufacturer of BharatBenz vehicles, publishes this body/equipment mounting directive to provide body manufacturers with important technical information about the basic vehicle. This information must be observed by the body manufacturer in the production of bodies and equipment, fittings and modifications for BharatBenz vehicles.

Due to the large number of body manufacturers and body types, Daimler India Commercial Vehicles Pvt. Ltd., cannot take into account all the possible modifications to the vehicle, e.g. performance, stability, load distribution, center of gravity and handling characteristics, that may result from the design of attachments, bodies, equipment or modifications. For this reason, Daimler India Commercial Vehicles Pvt. Ltd., can accept no body manufacturer liability for accidents or injuries sustained as a result of such modifications to the vehicles if such modifications have a negative impact on the overall vehicle.

Accordingly, Daimler India Commercial Vehicles Pvt. Ltd., will only assume liability as vehicle manufacturer within the scope of the design, production and instruction services which it has performed itself.

The body manufacturer is bound to ensure that its bodies and equipment, fittings and modifications are themselves not defective, nor capable of causing defects or hazards to the overall vehicle. If this obligation is violated in any way, the body manufacturer shall assume full product liability.

Daimler India Commercial Vehicles Pvt. Ltd., does not issue body/equipment approval certificates for bodies not manufactured by BharatBenz. These directives only supply important information and technical specifications to body manufacturers explaining how to handle the product.

These body/equipment mounting directives are primarily intended for the professional manufacturers of bodies, equipment, fittings and 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 to our vehicles, please be aware that certain type of work (e.g. welding work on loadbearing components) may only be carried out by qualified personnel.

This will avoid the risk of injury while also ensuring that the degree of quality required for the attachments, bodies, equipment and modifications is given.
THE AIM OF DIRECTIVES

These directives serve as instructions for the manufacture of attachments, bodies, equipment and modification to other make bodies and major assemblies. The following graphics show the distinction between the basic vehicle and the body.

Illustrations and schematic drawings are examples only and serve to explain the texts and tables. References to regulations, standards, directives etc. are given in keywords and serve for information only.

Additional information is available from any of the Daimler India Commercial Vehicles Pvt Ltd authorised Dealers or Service Centres.

Warning

Before installing any attachments, special-purpose bodies, equipment or carrying out any modifications to the basic vehicle and/or its assemblies, you must read the relevant sections of this Operator’s Manual, as well as the operating and assembly instructions issued by the manufacturer of the accessories and items of optional equipment. You could otherwise fail to recognise dangers, which could result in injury to yourself or others.

The instructions listed herein must be observed in full to maintain the operational reliability and road safety of the chassis and for observance of material defect claims.

Property Damage

General recommendations are being highlighted below in Operators Manual. For detailed body building guidelines please contact BharatBenz dealer for expert advice.

Additional Information

BharatBenz body building guidelines for trucks is also hosted in BharatBenz official website and it can accessed by any customer / bodybuilder / end user.
This note draws your attention to possible damage to your vehicle.

**Conventions / Interpretation**

The following conventions are used in these directives:

- **Warning**
  
  A warning note draws your attention to possible risks of accident and injury to yourself and others.

- **Property Damage**
  
  This note draws your attention to possible damage to your vehicle.

- **Additional Information**
  
  This note points any advice or further information you may find useful.

- **Environmental Note**
  
  An environmental note gives you tips on the protection of the environment.

- **Reference TOC**
  
  This symbol indicates the reference TOC on which you will find further information on the subject.

**Warning**

The use of parts, assemblies or conversion parts and accessories which have not been approved may put the safety of the vehicle at risk. Before installing any attachments, special-purpose bodies, equipment or carrying out any modifications to the basic vehicle and/or its assemblies, you must read the relevant sections of the this Operator’s Manual, as well as the operating and assembly instructions issued by the manufacturer of the accessories and items of optional equipment. You could otherwise fail to recognise dangers, which could result in injury to yourself or others. Official acceptance by public testing bodies or official approval does not rule out safety hazards.
Notes on vehicle safety

Daimler India Commercial Vehicles Pvt. Ltd recommends using appropriate parts only for each particular vehicle model. In many countries, parts that make extensive changes to the vehicle can invalidate the general operating permit. Specifically, this concerns parts which:

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

Additional Information

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.

Operational Reliability

Warning

Before installing any attachments, special-purpose bodies, equipment or carrying out any modifications to the basic vehicle and/or its assemblies, you must read the relevant sections of this Operator’s Manual, as well as the operating and assembly instructions issued by the manufacturer of the accessories and items of optional equipment. You could otherwise fail to recognise dangers, which could result in injury to yourself or others. Work incorrectly carried out on electronic components and their software could prevent this equipment from working correctly. Since the electronic systems are networked, this might also affect systems that have not been modified.

Warning

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

Accident Prevention

The body, the attached or installed equipment and any modifications must comply with the applicable laws and ordinances as well as work safety or accident prevention regulations, safety rules and accident insurer leaflets. All technical means shall be used to avoid operating conditions that may be unsafe or liable to cause an accident. All national laws, directives and registration requirements must be complied.

The manufacturer of the attachment, body, equipment or conversion or the device manufacturer is responsible for compliance with these laws and regulations.
Vehicle and Model Designations

This body/equipment mounting directive applies for the following vehicle model designations:

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Model</th>
<th>Model Designation</th>
<th>Wheelbases (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10T Rigid</td>
<td>1015R</td>
<td>04x</td>
<td>3360, 3760, 4250, 4800</td>
</tr>
<tr>
<td>12T Rigid</td>
<td>1215R</td>
<td>05x</td>
<td>3360, 3760, 4250, 4800 and 5050</td>
</tr>
<tr>
<td>12T Const</td>
<td>1217C</td>
<td>06x</td>
<td>3160 &amp; 3760</td>
</tr>
<tr>
<td>14T Rigid</td>
<td>1415R</td>
<td>05x</td>
<td>3360, 3760, 4250, 4800 and 5050</td>
</tr>
<tr>
<td>16T Rigid</td>
<td>1617R</td>
<td>07x</td>
<td>5100, 5900 &amp; 6700</td>
</tr>
</tbody>
</table>

Identification of Model Designation

The model designation can be identified from the model plate attached to the cab. Please refer digits 4, 5 & 6 in the VIN to get the model designation. Digit 4 & 5 indicate the model designation and Digit 6 indicate the variant in the specific model.

VIN example for Model Description:

For VIN No. 0000503AJBP000005, the digits 4, 5 & 6 are 0, 5 and 0. Therefore the model designation is 050.

Additional Information

Information on latest vehicle models and its range can be known from BharatBenz Authorised dealerships.
Both the vehicle manufacturer and the body manufacturer must always ensure that they introduce their scopes into the market in a safe condition and that third parties are not at risk of any safety hazard. If this is not adhered they may be subject to civil, criminal and public law consequences. Every manufacturer is liable for the products it manufactures.

From this, it follows that the body/conversion manufacturer therefore also bears responsibility for the following:

- the operating and road safety of the body, 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 body, attachment, equipment, retrofitted electrical and electronic systems or modification.

- 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, gearbox 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 “Service Records”

> **MAINTENANCE AND LUBRICATION**

**Guarantee of Traceability**

Hazards in your equipment/body which become known after delivery may necessitate supplementary measures in the market (customer notification, warnings, recalls). In order to make these measures as efficient as possible, your product must be traceable after delivery.

For this purpose and to enable the Road Transport Inspector or comparable registers abroad to be used for determining which owners are affected, we advise you to promptly file the serial number/identification number of your equipment/add-on part linked to the vehicle identification number for the truck in your databases. Similarly, it is also advisable to store the addresses of your customers for this purpose and to grant subsequent purchasers the opportunity to register.

Body builder identification plate as per the local laws to be incorporated in the body/equipment, meeting the regulations.

**After Sales Central (ASCENT)**

An additional source of information available to you is the ASCENT which provides information on basic data (dimensions, tightening torques), function descriptions, circuit diagrams, repair instructions and maintenance sheets. Information about ASCENT can be obtained from any Bharat-Benz dealership (Refer to BODY BUILDING GUIDELINES to the contact details for technical support).

**BharatBenz Logo and Emblem**

The BharatBenz logo and emblem are registered trademarks of Daimler AG. They must not be removed or affixed in another position without approval.

BharatBenz logo and emblem shall not be affixed/painted at a place other than that is provided by Daimler India Commercial Vehicles Pvt. Ltd.

**Overall appearance of the overall vehicle**

If the vehicle fails to comply with the appearance and quality standards as required by Daimler India Commercial Vehicles Pvt Ltd, the trademarks such as the BharatBenz logo and emblem must be removed.

**Third-party trademarks,**

- may not be affixed next to BharatBenz trademarks.
- may not be affixed at any other points on the basic vehicle without necessary approval of the department responsible.

(Refer to BODY BUILDING GUIDELINES to the aim of directives for basic vehicle)
RECYCLING OF COMPONENTS

Environmental Note

All attachments, bodies, equipment and modifications shall be done with environmentally compatible design and material selection shall be done taking environment protection into account.

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.
- Plastics are to be used only where they provide advantages in terms of cost, function or weight.

- Materials and production processes are to be selected such that only low quantities of waste are generated during production and that this waste can be easily recycled.
- 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.
- Wherever possible, components should not be painted or coated; coloured 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.

Quality System

World-wide competition, increased quality standards demanded by the customer from the product 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.

For the reasons quoted above, Daimler India Commercial Vehicles Pvt. Ltd., advises body manufacturers to set up a quality management system with the following minimum requirements:

- The quality management system should clearly define responsibility and authority.
- There should be a description of processes/workflow.
- The body build orders / contracts has to be checked for its feasibility with respect to its application / usage.
- Product checks on the basis of specified instructions to be carried out.
• Provisions are made for the handling of faulty products.
• The inspection results must be documented and archived.
• All employees concerned should have valid proof of qualification required to perform their task.
• The test equipment must be monitored and calibrated regularly.
• There should be a system for labelling materials/parts.
• Quality assurance measures should be carried out at suppliers end.

Planning of Bodies Selecting the Chassis

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

Along with the selection of the correct vehicle version, the required series and special equipment such as
- Wheelbase
- Engine/Gearbox
- Power take-off
- Axle ratio
- Position of the centre of gravity
- Legal registration requirements (eg. underride guard)
- Permissible and technical gross vehicle weight

should be taken into consideration and be appropriate for the intended use.

Warning

Do not carry out any modifications to major assemblies (steering, brake system etc.). 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.

Additional Information

The non-availability of a vehicle version may be an indication that the vehicle is not suitable for the intended application. For clarification contact BharatBenz authorised dealership.

Property Damage

When planning attachments, bodies, equipment or modification work, the selected vehicle must be checked to verify whether it fulfils the necessary requirements.

Observe the weight code. The axle designation or the load capacity of the tyres has only limited relevance to the gross weight of the vehicle.
**Warning**

Alterations to the basic vehicle are permitted only within the framework of the procedures described in this body/equipment mounting directive.

Standard vehicles ex-factory comply with Central Motor Vehicle Rules (vehicles produced for countries outside of India may be exceptions). The vehicles must still comply with CMVR after modifications have been carried out.

The body manufacturer must inform the officials of recognised approval authority or inspector about any modifications done to the chassis when the vehicle is inspected.

Following all work on the brake system, i.e. even if merely disassembling parts, a complete check (operation, effectiveness and visibility) of the entire brake system must be performed.

**Dimensions, Weights, Overall Vehicle Height**

**Warning**

The vehicle tyre load capacity may not be exceeded by overloading the vehicle beyond its specified gross vehicle weight. The tyres could overheat and suffer damage.

This could cause you to lose control of the vehicle and cause an accident with possible injury to yourself and others.

Information on the permissible axle loads can be found on the vehicle model plate. All legal provisions governing the permissible vehicle height must be taken into account when planning bodies.

Standard vehicles ex-factory comply with Central Motor Vehicle Rules (vehicles produced for countries outside of India may be exceptions).

The vehicles must still comply with CMVR after modifications have been carried out.

The body manufacturer must inform the officials of recognised approval authority or inspector about any modifications done to the chassis when the vehicle is inspected.

Following all work on the brake system, i.e. even if merely disassembling parts, a complete check (operation, effectiveness and visibility) of the entire brake system must be performed.

**Additional Information**

The non-availability of a vehicle version may be an indication that the vehicle is not suitable for the intended application. For clarification contact BharatBenz authorised dealership.
Tyres
The body manufacturer must ensure that:
• The largest permissible tyres can be fitted.
• The distance between the tyre and the mudguard or wheel housing is sufficient even with the suspension fully compressed (including any twist) (adherence to valid regulations).
• The relevant information in the drawings to be observed.

Bolted and Welded Connections

Warning
Do not modify any bolted connections that are relevant to safety, e.g. that are required for wheel alignment, steering or braking functions.

When unfastening bolted connections make sure that, when work is complete, the connection again corresponds with the original condition. Welding work on the chassis/body may only be carried out by trained personnel. The body, the attached or installed equipment and any modifications must comply with the applicable laws and ordinances as well as work safety or accident prevention regulations, safety rules and accident insurer leaflets.

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

Also note:
It is strictly prohibited to shorten the length of the free clamping bolt, change to a stretch-shank bolt or use bolts with a shorter thread.
• No design modification is possible if bolts are tightened to the required torque and angle by Daimler India Commercial Vehicles Pvt Ltd.
• The settling behaviour of bolted connections must be observed.

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

The use of Daimler India Commercial Vehicles Pvt Ltd tightening torques assumes coefficients of friction for the bolts in the tolerance range of 0.08 - 0.14.

Daimler India Commercial Vehicles Pvt Ltd recommends the use of Daimler India Commercial Vehicles Pvt Ltd standard parts.
Flange head bolts
Thanks to the use of flange head bolts, all bolted connections on the chassis of BharatBenz commercial vehicles are maintenance free, i.e. retightening of the bolts in the context of regular service intervals is no longer necessary. We expect all bolted connections used for work on BharatBenz vehicles to satisfy the same requirements.

Causes for the loosening of bolted connections
Bolted connections work loose when a permanent change in length occurs in the axial direction of the bolt. This leads to a reduction in the preload force and thus a reduced clamping force under operating loads.

A permanent change in length can be caused by:

Settling
The surfaces of parts that make contact with other parts (e.g. nuts, washers) are coated with corrosion protection and settle under the pressure of the clamping force. This means that more the connecting points are bolted together, greater the length change due to settling.

Creepage
The pressure per unit area of the bolt and nut on the contact surfaces exceeds the specific pressure strength of the material of the clamped parts.

Description of flange head bolts
The main feature of this type of bolt is a press-fitted flange which increases the contact area of the bolt head.

Properties
Flange head bolts and nuts that comply with MBN standards 10105 and 13023 reduce the danger of loss of pre-load by setting on the bearing surface. The pressure intensity that is created during the process of tightening is low in contrast to other types of screw heads, because it is spread over the increased bearing surface.

Advantages of flange head bolts and nuts to MBN 10105 and 13023
• Reduced risk of creep due to an enlarged contact area and thus a lower pressure per unit area than other types of bolt heads.
• Reduced settling effect due to a lower number of parts to be connected compared with bolted connections with washers.
• The pressure concave contact disc increases the elasticity of the connection so that any settling or creep behaviour that still occurs can be compensated, largely preventing any decrease in the clamping force.
• The elasticity of the bolted connection can be increased further by selecting a high clamping length ratio l/d (l = shank length, d = shank diameter).
• The use of flange head bolts and nuts guarantees a secure and maintenance-free bolted connection.

(For attached components, e.g. fifth wheel couplings, the maintenance guidelines of the component manufacturer should be followed.)

Conformity of lengths and reach in blind holes must be ensured.
As the nuts conforming with MBN 13023 feature clamp locking, they must not be used more than once.
When flange head bolts and nuts are used, the tightening torques in the following tables must be complied.

**Extract from MBN 10130 Part 3 Class II**
Torque variation in tightening process: ± 3% to ± 8%
Bolt driver with shutoff clutch; torque wrench: -5%

<table>
<thead>
<tr>
<th>Thread</th>
<th>Tightening Torque (Nm)</th>
<th>Pre-load Force Fvmin. (kN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M8 x 1.25</td>
<td>29.5±2.3</td>
<td>16.3</td>
</tr>
<tr>
<td>M10 x 1.5</td>
<td>58±4.5</td>
<td>25.9</td>
</tr>
<tr>
<td>M12 x 1.5</td>
<td>106±8</td>
<td>39.7</td>
</tr>
<tr>
<td>M14 x 1.5</td>
<td>172±13</td>
<td>56.0</td>
</tr>
<tr>
<td>M16 x 1.5</td>
<td>260±20</td>
<td>74.4</td>
</tr>
<tr>
<td>M18 x 1.5</td>
<td>380±30</td>
<td>96.9</td>
</tr>
<tr>
<td>M20 x 1.5</td>
<td>520±40</td>
<td>120</td>
</tr>
</tbody>
</table>

**Extract from MBN 10130 Part 3 Class III**
Torque variation in tightening process: ± 3% to ± 20%
Impulse wrench; “good impact wrench”: −20%

**Tightening torque for BharatBenz original flange-bolts and flange-nuts**
- For torque and turn-angle tightening a minimum clamp-length (L) of 1.5 x D must be guaranteed
- Bolt spec -MBN 10105; Nut spec -MBN 13023
Use of bolted connections

All bolts and nuts used to connect implements or equipment to the BharatBenz chassis (e.g. fuel tank, exhaust system, implement carrier, end cross member) must always be selected according to the criteria described in section “Flange head bolts” (according to MBN 10105 and 13023).

The exception to this rule is body mounting. For this it is possible to use bolts conforming to standards ISO 4162 and ISO 1665 (both of the normal shank design) and nuts according to ISO 7044 of property class 10.9.

Welded Connections

Welding work on the chassis/body may only be carried out by trained personnel.

<table>
<thead>
<tr>
<th>Flange - bolts &amp; nuts</th>
<th>M12 x1.5 10.9</th>
<th>M14 x1.5 10.9</th>
<th>M16 x1.5 10.9</th>
<th>M18 x1.5 10.9</th>
<th>M20 x1.5 10.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque tightening</td>
<td>92 Nm</td>
<td>150 Nm</td>
<td>225 Nm</td>
<td>330 Nm</td>
<td>460 Nm</td>
</tr>
<tr>
<td>Torque and turn-angle tightening. Only for nuts MBN 13023</td>
<td>92 Nm + 90°</td>
<td>150 Nm + 90°</td>
<td>225 Nm + 90°</td>
<td>330 Nm + 90°</td>
<td>460 Nm + 90°</td>
</tr>
</tbody>
</table>

Property Damage

Parts which must not be welded:
- Assemblies such as the engine, gearbox, axles, etc.
- The chassis frame.

Pass-By Noise

No modification (from the original spec) is permitted on the parts that change the pass-by noise quality, e.g.
- Engine
- Exhaust system
- Air intake system
- Tyres, etc.,

Noise-insulating parts fitted as standard must not be removed or modified.

Exhaust System

The original exhaust system mounting, by this we mean the bracket components including frame mounted castings, may not be modified. Modifications can lead to damage to the exhaust system.

Maintenance and Repairs

Warning

Do not modify any bolted connections that are relevant to safety, e.g. that are required for wheel alignment, steering or braking functions.
**Warning**

When unfastening bolted connections make sure that, when work is complete, the connection again corresponds with the original condition. Welding work on the chassis/body may only be carried out by trained personnel. The body, the attached or installed equipment and any modifications must comply with the applicable laws and ordinances as well as work safety or accident prevention regulations, safety rules and accident insurer leaflets.

Maintenance and repair of the vehicle should not be made difficult by the body. Maintenance points and major assemblies must be easily accessible.

- This Operator’s Manual must be complied with and supplemented as necessary.
- 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.

Any additional expenses arising from the body in connection with warranty, maintenance or repair will not be borne by Daimler India Commercial Vehicles Pvt. Ltd.

**Maintenance Instructions**

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

- Due date of inspection
- Check the condition and capacity of batteries and service them in accordance with the manufacturer’s specifications.
- Check the head lamp setting or have this checked at a qualified specialist workshop.
- Retighten the wheel nuts to the specified torque.
- This Operator’s Manual and directives for maintenance of attachments, bodies, installations or conversions, which have been installed by the body manufacturer, must be provided with the vehicle in the language of the country of use.

- Daimler India Commercial Vehicles Pvt Ltd recommends adapting to each individual body the scope of maintenance work which has to be carried out on the body, coordinating it by means of the valid BharatBenz 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.

**Preparation for Storing the Vehicle**

**Storage in an enclosed space:**

- Clean the overall 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.

Maintenance work on stored vehicles (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.
• Remove the battery.

Removing the vehicle from storage:
• Check the fluid levels in the vehicle.
• Correct the tyre pressures to the manufacturer’s specifications.
• Check the battery charge and install the battery.
• Clean the overall vehicle.

Battery Maintenance and Storage
• To avoid damage to the battery, disconnect the battery if the vehicle is to be immobilised for a period of more than 1 week.
• If the vehicle is immobilised for a period of more 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.

Property Damage
If the battery voltage drops below 12.1 V, the battery is damaged and it will have to be replaced. Leaving the vehicle parked up for a long period of time can lead to battery damage. This can be avoided by disconnecting the battery and storing it appropriately.

Work before handing over the body built vehicle
The body manufacturer must confirm the work and modification carried out by making an entry in the “Service Records” MAINTENANCE AND LUBRICATION. Body manufacturer should strictly advise the customer to carry out a detailed check on the vehicle after the body is mounted, at BharatBenz authorised dealership.

Checking the overall vehicle
• Check the vehicle for its perfect condition. All damages must be repaired.
• If it is not known how long a vehicle equipped with a hydraulic clutch operating system has been in storage, the brake fluid must be replaced by BharatBenz authorised dealership.

**Checking the batteries**
• Test 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**
When equipment, attachments and bodies have been mounted, it is recommended to have the toe setting checked by a Daimler India Commercial Vehicles Pvt Ltd authorised Dealer or Service Centre.
Daimler India Commercial Vehicles Pvt Ltd recommends authorised Dealer or Service Centre for this work.
It is absolutely essential that all safety-relevant work and all work on safety-relevant systems is performed by Daimler India Commercial Vehicles Pvt Ltd authorised Dealer or Service Centre.

**Pneumatic Auxiliary Consumers**
If pneumatic accessories are installed, the following must be observed:
• In the System protection valve of Pneumatic brake circuit the outlet port number 24 is provided for any auxiliary usage. If necessary T-Junction should be installed to this air line.
• To protect the other (on-board) auxiliary usages, the connection may only be made using an additional overflow valve without return flow.
• Do not use auxiliary outlet port that consume compressed air continuously.

**Maximum Permissible Air Consumption**
The air requirement must be checked in the case of arduous vehicle operation, e.g. stop/start traffic and/or when pneumatic auxiliary usages with high air consumption are installed.

The total air consumption must not exceed the limit curve indicated in the diagram.
Ensure that all available pneumatic utilities are considered, e.g. brakes, air suspension, trailer, etc.

**Additional Information**
The non-availability of a vehicle version may be an indication that the vehicle is not suitable for the intended application. For clarification contact BharatBenz authorised dealership.
Below illustration represents the maximum permissible air consumption.

Max. permissible air consumption
rpm = average engine speed
l/min = permissible air consumption (litres/min) free air
Pneumatic line routing examples

Incorrect

Brake lines are routed poorly without cable ties.

Correct

Brake lines should be secured against chafing with cable ties.

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Pneumatic line routing examples

**Incorrect**

Line runs over sharp edge, risk of chafing.

**Correct**

Proper routing should be done with cable tie to avoid chafing.

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Pneumatic line routing examples

Incorrect

Intersecting point is not properly secured, risk of chafing

Correct

Intersecting point is secured with cable tie.

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Pneumatic line routing examples

Incorrect

Pneumatic line is kinked, bending radius is not provided to avoid kinks.

Correct

Bending radius and adequate length should be provided for pneumatic lines to avoid kinks.

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Pneumatic line routing examples

Incorrect

Chafe protection is not provided on the frame holes, risk of line chafe.

Correct

Chafe protection should be provided with rubber grommet in the frame through holes to avoid damages to the pneumatic holes.

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
AdBlue System

- DICV does not recommend to relocate the AdBlue tank as the AdBlue line re-routing may have an impact on dosing, if not done properly.
- AdBlue & Pneumatic lines are not to be disturbed as it may impact AdBlue dosing.
- Bodybuilder to ensure sufficient space is provided for filling of AdBlue tank upon building the load body.
- As the AdBlue tank is made of polymer, care to be exercised while welding so that no weld sparks fall on the tank. Protective shield may be used in such cases.
- The electrical connection should not be removed unless vehicle ignition is OFF. If not, there will be fault codes which would be registered.

Additional Information

Further information about “AdBlue System” → AFTER TREATMENT SYSTEM

Technical Threshold Values for Planning

Vehicle Overhang

Warning

The body must be designed in such a way that placing of excessive load weight at the rear is prevented. It is important to comply with the points listed below, otherwise the necessary steering and braking forces for safe vehicle operation cannot be transferred to the road.

Weight Distribution, CoG Height, Anti-Roll Bars

Warning

The body must be designed in such a way that placing of excessive load weight at the rear is prevented. It is important to comply with the points listed below, otherwise the necessary steering and braking forces for safe vehicle operation cannot be transferred to the road.

Weight Distribution

The wheel load (1/2 the axle load) may be exceeded by no more than 4%. Observe the tyre load capacity. Ensure proper load distribution by proper positioning of the body (Axle loads not to exceed limits)

- Permissible front and rear axle loads not to be exceeded
- Pay attention to steerability (Do not mount body at the rear end)
- Avoid one-sided weight distribution

- It is strongly recommended not to alter the vehicle overhang the specification offered by BharatBenz.
Example
- Permissible axle load 10,200 kg
- Permissible wheel load distribution 5,300 kg - 4,900 kg

Property Damage

At any point of time the sum of wheel load distribution shall not exceed legally permitted axle loads as per the national regulations.

CoG Height

BharatBenz cannot vouch for the handling, braking and steering characteristics of vehicles with attachments, installations or modifications for payloads with unfavourable centres of gravity (e.g. rear-mounted, over height and side mounted loads). The vehicle body/equipment manufacturer/converter is responsible for the safety of the vehicle in the case of these bodies.
Ensure proper gap between cab & body

Incorrect

Clash between air intake & load body is not ok

Correct

Minimum clearance of 50mm should be maintained between cab and load body / bunker.

Note: All the modifications comply as per AIS 093 (Rev.1):2015 standard;
Note: Picture for symbolic representation only, actual product may vary.
Stabilisers

Make sure that the vehicle you are building is correctly equipped. BharatBenz provides stabilisers for different model series. It is recommended to use additional stabiliser (in addition to standard fitment) for vehicles with high loads in accordance with the table below. Stabilising equipment is required if the vehicle is used for extremely high loads. If no stabilising equipment is available for a model series, or if this equipment is unsuitable due to operating conditions (such as a need for OFFroad capability), the mounting frame must be designed in a manner that stabilises the overall vehicle in consultation with the department responsible (Refer BODY BUILDING GUIDELINES to the contact details for technical support).

### Centre of gravity height (A) above top edge of chassis frame

<table>
<thead>
<tr>
<th>Up to</th>
<th>550 mm</th>
<th>Normal load</th>
</tr>
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<tbody>
<tr>
<td>550–1250 mm</td>
<td>High load</td>
<td></td>
</tr>
<tr>
<td>Over</td>
<td>1250 mm</td>
<td>Extremely high load</td>
</tr>
</tbody>
</table>

**Warning**

The body must be designed in such a way that placing of excessive load weight at the rear is prevented. It is important to comply with the points listed below, otherwise the necessary steering and braking forces for safe vehicle operation cannot be transferred to the road.

To ensure sufficient vehicle steerability, the minimum front axle load must be maintained under all load conditions. Consult the department responsible in the event of any deviations.

**Property Damage**

The permissible front axle load as per the national regulations shall not be exceeded.
Clearance for Assemblies and Cab

Certain clearances must be maintained in order to ensure the function and operational safety of assemblies. Dimensional data in the quotation drawings must be observed.

Gearshift Linkage

- Sufficient distance from the body, including when the cab is tilted.
- Observe the vertical slewing range of the semitrailer.

Spring-loaded brake cylinder

- For vehicles with drum brakes, check that the spring-loaded brake emergency release screw moves freely and is accessible.

Engine and gearbox

- Minimum distance from body 30 mm.

Attachment above Cab

- Observe the permissible centre of gravity location and the front axle load.
- Make sure that there is sufficient space for tilting.

Cab

- The distance between the cab and the body or vertical exhaust must be at least 50 mm (AIS 093 (Rev:1): 2015).

---

### Vehicle Cab A B

<table>
<thead>
<tr>
<th>L/MDT Model Designation (0xx)</th>
<th>Short Cab</th>
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<th>mm</th>
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<td>1275</td>
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</table>

---

Damage Prevention Electrical System

**Warning**

Work carried out incorrectly on the electrical system may impair its function. This may lead to the failure of components or parts relevant to safety.

All accident prevention regulations must be complied with when working on the vehicle.

Comply with all national regulations and laws. Work on live electrical lines carries a risk of short circuit. Before starting work on the electrical system, disconnect the on-board electrical system from the power source, e.g. battery.
General Instructions:

- This vehicle is having advanced E&E system, Vehicle ECU, Engine ECU, ABS ECU & Cluster is connected by CAN.

- Don’t tamper (cutting and joining of the existing wiring harness) for taking output for Lamps, Horn, Fan, Audio System, VTS etc.

- Don’t tamper earth points and power net connections like Ignition Switch, Starter motor, Battery & Alternator etc.

- Use BharatBenz approved accessories to avoid tampering.

- After making changes in Electrical connections, check for fault codes and malfunction indicator lamp in the cluster.

Batteries

- Never place any metal objects or tools on the batteries.

- There is a risk of short circuit if the positive terminal clamp on the connected battery comes into contact with vehicle parts. This could cause the highly explosive gas mixture to ignite. You and others could be seriously injured as a result.

- When disconnecting the batteries, always disconnect the negative terminal clamp first and then the positive terminal.

- When connecting the batteries, always connect the positive terminal clamp first and then the negative terminal.

- Incorrect polarity of the supply voltage can cause irreparable damage to the control units.

- Never start the engine without a connected battery (battery terminals tightened).

- Do not disconnect or remove the battery terminals while the engine is running.

- If the batteries are flat, the engine can be jump-started using jump leads connected to the batteries of another vehicle. Observe the Instruction Manual. Do not use a quick charger for jump-starting.

- Only tow-start the vehicle with the batteries connected.

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

Lines, plug connections and control units

- A plug connection must not be unplugged from or plugged into the control units while the ignition is on.

- Lines must be protected from heat by means of insulation.

- Route cables in such a way that chafing cannot occur, particularly at crossover points and sharp edges. If necessary, use cable ducts or guide pipes.

- Do not carry out tests at connector terminals using unsuitable tools (test probes, wire ends, etc.). This may lead to contact damage and subsequent problems. Use suitable test leads.

- The department responsible must be consulted if a battery isolating switch is to be retrofitted.
Electrical line routing examples

Incorrect
Electrical lines are poorly routed with tension.

Correct
Electrical cables and connectors should be routed properly without tension.

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Electrical line routing examples

Incorrect

Line chafes against / lies on thread of a bolt.

Correct

Electrical line should be routed with sufficient clearance to avoid contact with other components.

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Electrical terminal for accessories (Inside cab)

Below illustration represents the location and wiring harness for the electrical accessories inside the cab.

24V Connector - For Radio
Location: Center console
Harness: Body harness

24V Socket - 24V Output
Location: Center console
Harness: Body harness

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Electrical terminal for accessories (On chassis)

Load body lamp connector at rear cross member

24V connector (1 no) – On chassis rear cross member

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Brake Hoses/Cables and Lines

Warning

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

- Compressed-air, fuel and gas lines, hydraulic lines and brake hoses must be covered or removed if necessary before carrying out any welding, drilling and grinding work and before working with cutting discs.
- After installing compressed-air, fuel and gas lines, hydraulic lines and brake hoses, the system must be tested for pressure loss and leaks.
- No other lines may be attached to brake hoses.
- Lines must be protected from heat by means of appropriate insulation.
- Line routing must be designed to prevent any increase in pressure loss.
- Comply with all national regulations and laws.

Mobile Communications Systems

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

Equipment
- Always use equipment approved by competent authorities as per the national regulations.
- The equipment must be permanently installed.
- Operation of portable or mobile equipment inside the cab is only permitted if this equipment is connected to a permanently installed external aerial.
- The transmitter must be installed separately from all other vehicle electronics.
- Protect equipment from moisture.
- Observe the permissible operating temperature.
- Protect the equipment against severe mechanical vibrations.

Aerial (for two-way radio sets)
- The aerial must be officially licensed.

Connection and wiring
- The connection should be made only from the additional 12-volt sockets inside the cabin for auxiliary consumers. It is recommended to take connection via an additional fuse.
- Disconnect the unit from the electrical system before jump-starting.
- Cables should be wired via the shortest possible route (not looped) and twisted.
- 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
control panel must be routed separately from the vehicle wiring harness in the vicinity of the body earth.

- Make sure that the aerial cable is not kinked or crushed.

**Electromagnetic Compatibility (EMC)**

The different electrical consumers on board the vehicle cause electrical interference in the vehicle’s electrical circuit. At BharatBenz, electronic components installed at the factory are checked for their electromagnetic compatibility in the vehicle. When retrofitting electric or electronic systems, they must be tested for electromagnetic compatibility and this must be documented.

The equipment must have been granted type approval in accordance with AIS 004 (for India) or any applicable regulation as per the national regulations.

**Welding Work**

All laws governing explosive substances must be complied with the following safety measures must be observed to prevent damage to components caused by overvoltage during welding work:

- 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 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, 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, natural gas and fuel system (lines, etc.) before carrying out welding work.
- Avoid welding work on inaccessible cavities in the cab.

**Property Damage**

Do not connect the arc welder earth clamp to assemblies such as the engine, gearbox or axles. Welding work is not permitted on assemblies such as the engine, gearbox, axles, etc.

**Additional Information**

All welding should comply as per the AIS 093 (Rev.1):2015 standard.

**Corrosion Protection Measures**

**General**

In order to preserve the durability and quality standard of the vehicle, measures must be taken to protect it against corrosion when the vehicle is modified and after installing bodies and fittings.

- When chassis paint is damaged during body installation, proper primer and top coat to be used for repair

**Additional Information**

Ensure proper cleaning of surface before primer coating.
Information on the design, execution of work and the requirements of the materials and components to be used with regard to corrosion protection is listed below.

Information provided in this material may be used for body/equipment fabrication also. BharatBenz recommends to follow appropriate procedures to protect body/equipment from corrosion and to ensure that the base vehicle is not affected due to the corrosion of body/equipment.

To achieve good corrosion protection, the areas of design (1), production (2) and materials (3) must be perfectly matched.

**Damage to components**
If components are damaged during disassembly (scratches, scuff marks), they must be professionally repaired. This applies especially for drilled holes and openings. Two-component epoxy primers are particularly suitable for repair work.

**Cutting of components**
When cutting and grinding work is carried out, the adjacent painted components must be protected against flying sparks and shavings. Grinding dust and shavings must be carefully removed because these contaminants can spread corrosion.

**Corrosion protection on fittings**
All fittings must receive adequate anti-corrosion priming prior to installation. In addition to galvanising, cataphoretic dip-priming and zinc-rich paint in sufficient coatings have proved satisfactory for this purpose.

**Additional Information**

All paint coat corrosion protection should meet as per JIS DO202 standard & as per AIS 093 (Rev.1):2015 standard.
Examples of inferior corrosion protection

Incorrect

Top coat missing, parts are merely primed.

Corroded base metal used, top coat without surface preparation & primer application.

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Examples of inferior corrosion protection

Incorrect

Gaps cannot be reached for surface coating.

Parts are merely coated with top coat, primer is missing.

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Corrosion Prevention in Welding Work

In order to avoid crevice corrosion at weld seams, the welds should be made in accordance with the examples shown.

Preparation

The welding area must be free from corrosion, grease, dirt or similar contamination. If painted surfaces are to be welded, the paint coat must first be removed by grinding or chemical stripping. If this is not done, the paint will burn and the residues can impair corrosion resistance.

After welding work

- Remove drilling shavings.
- Deburr sharp edges.
- Remove any burned paint 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.

Bolted Connections

Finish-painted components

If painted parts are to be bolted together, the coats of paint must not cause settling in the bolted connections. In such cases, hard, high-density coatings such as cataphoretic immersion primers or powder coatings should be used. The coat thicknesses should be kept as small as possible (cataphoretic immersion primer approx. 20µm, powder coatings approx. 100 µm).

- If using bolts with serrations under the head, an additional top coat must be applied to touch up any paint damage.
- The use of hexagon socket or Torx socket bolts in a horizontal position is to be avoided, as moisture can accumulate in the bolt head under certain conditions, leading to corrosion.

Fasteners

In areas susceptible to corrosion always use bolts, nuts, etc. with higher corrosion resistance regardless of the required strength class.
Preventing contact corrosion
Direct contact between materials with different electrode potentials can lead to corrosion of the less noble material when exposed to moisture and salt ions.
When selecting materials, avoid the following combinations:
• Chrome/nickel-steel with aluminium
• Chrome/nickel-steel with zinc-coated steel

Insulation by coating
Contact corrosion can be prevented by using insulation such as washers, sleeves or bushings. Even in this case, however, the connecting points must not be persistently exposed to moisture.

Vehicle cleaning and care
When the vehicle is handed over to the body manufacturer, it must immediately be cleaned of salt and dirt. If it is to be stored for some time, the vehicle must be preserved.
During modification it must be ensured that load bearing components are additionally protected against aggressive chemicals and environmental influences. If the vehicle comes into contact with chemicals or salts (e.g. snow-clearing operations), it must be cleaned thoroughly at regular intervals.

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 base 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 minimized by selecting suitable materials.

Paints and lacquers are harmful to health and to the environment if they are not handled correctly. Dispose of paints and lacquers in an environmentally responsible manner.

Do not exceed a temperature of 80°C for drying the paint.

Painting Work

Property Damage

1 - Insulating Washer
2 - Insulating Sleeve

Environmental Note

Mask the following areas before painting:
• Sealing surfaces
• Windows
• Contact areas between the wheels and wheel hubs
• Contact areas for wheel nuts
• Breathers on gearboxes, axles, etc.
Door locks

Door locks
Property Damage
When the warning buzzer sounds, the operating safety of the vehicle is in danger. Switch OFF the engine immediately (taking into account the traffic situation) and ascertain the cause.

If cranes are operated from outside the cab (e.g. loading crane), an additional visual warning system must be installed in the vicinity of the controls.

**Engine**
A warning buzzer is installed in the cab within the hearing range of the driver. The buzzer serves as an acoustic warning when e.g.:
- The maximum permissible engine speed is exceeded.
- The maximum permissible coolant temperature is exceeded.
- The coolant level is too low.
- The oil level or oil pressure in the engine is too low.

**Leaf Springs**
Parabolic springs
- Damaged parabolic springs must be completely replaced.
- Individual spring leaves may not be renewed.
- Only use spring leaves which have been tested and approved for the vehicle model in question. Reinforcement by installing additional spring leaves is not permitted.
- Do not damage the surface or the corrosion protection of the spring leaves when carrying out installation work.
- Before carrying out welding work, cover the spring leaves to protect them against welding spatter. Do not touch springs with welding electrodes or welding tongs.

**Warning**
Before tilting the cab, please make sure that you read the “Tilting the cab” section. You could otherwise fail to recognise dangers, which could result in injury to yourself or others.

**Tilting the Cab**

**Warning**
Before towing or tow-starting, please make sure that you read the “Towing” section. You could otherwise fail to recognise dangers and cause of an accident, which could result in injury to yourself or others.
Warning

Appropriate caps, seals and covers must be installed on the body in order to avoid the risk of fire.

Storing and Handing Over the Vehicle

Storage
To prevent any damage while vehicles are in storage, BharatBenz recommends that they be serviced and stored in accordance with the manufacturer’s specifications (Refer to BODY BUILDING GUIDELINES for the maintenance and repairs).

Handover
To prevent damage to the vehicle or to repair any existing damage, BharatBenz recommends that the vehicle be subjected to a full function check and a complete visual inspection before it is handed over (Refer to BODY BUILDING GUIDELINES for the maintenance and repairs).

Modification to the Basic Vehicle

Warning

Do not modify any bolted connections that are relevant to safety, e.g. that are required for wheel alignment, steering or braking functions. When unfastening bolted connections make sure that, when work is complete, the connection again corresponds with the original condition. Welding work on the chassis/body may only be carried out by trained personnel. The body, the attached or installed equipment and any modifications must comply with the applicable laws and directives as well as work safety or accident prevention regulations, safety rules and accident insurer leaflets.

Property Damage

Failure to observe the instructions in this Operator’s Manual can result in damage to the vehicle.

Risk of Fire

Warning

Work on live electrical lines carries a risk of short circuit. Before starting work on the electrical system, disconnect the on-board electrical system from the power source, e.g. battery. With all bodies make sure that neither flammable objects nor flammable liquids can come into contact with hot assemblies (including through leakages in the hydraulic system) such as the engine, gearbox, exhaust system, turbocharger, etc.
**Chassis Frame Extension and Wheelbase Modification**

Chassis frame extension and wheelbase modifications on BharatBenz chassis are not permitted. In case of violation, Daimler India Commercial Vehicles Pvt. Ltd., provides no guarantee for any consequences.

**Drilling Work on the Vehicle Frame**

*Property Damage*

Drilling work in the chassis frame is not permitted on BharatBenz chassis. In case of violation, Daimler India Commercial Vehicles Pvt. Ltd., provides no guarantee for any consequences.

**Welding Work on the Vehicle Frame**

*Property Damage*

Welding work on the frame is not permitted.

**Frame Modifications**

Chassis frame extension and wheelbase modifications on BharatBenz chassis are not permitted. In case of violation, Daimler India Commercial Vehicles Pvt. Ltd., provides no guarantee for any consequences.

*Property Damage*

Any frame modification, other than reduction of frame overhang, is not permitted. Reduction of frame overhang shall be done only after consulting responsible department (Refer **BODY BUILDING GUIDELINES** to the contact details for technical support).
Warning

The use of parts, assemblies or conversion parts and accessories which have not been approved may jeopardise the safety of the vehicle. Before installing any attachments, special-purpose bodies, equipment or carrying out any modifications to the basic vehicle and/or its assemblies, you must read the relevant sections of the Vehicle Instruction Manual, as well as the operating and assembly instructions issued by the manufacturer of the accessories and items of optional equipment. You could otherwise fail to recognise dangers, which could result in injury to yourself or others. Official acceptance by public testing bodies or official approval does not rule out safety hazards.

Attachment to the Chassis Frame

- BharatBenz recommends the use of flange head bolts and nuts complying with MBN standard (MBN) 10105 and 13023, strength class 10.9, pitch 1.5 mm, and self-locking nuts.
- (Refer .BODY BUILDING GUIDELINES to bolted connections)
- Use existing holes.
- Use the number of bolts appropriate to the load.

Mounting at side

- Install the bracket and assembly near a cross member. Fitting additional cross members is not permitted.
- Fit the reinforcement plate to the inside of the frame web.
- No load may be applied to the centre of the web of the longitudinal member (diaphragm effect). If this is unavoidable, make sure that there is a large area of support on both sides of the web.

Wheel Chocks

Mounting

- In a suitable bracket so that they cannot rattle.
- Secured to prevent loss.
- Ensure good accessibility.

Side Underride Guards

According to Central Motor Vehicle Rules, a side underride guard is stipulated for vehicles. Exceptions to this regulation are semitrailer tractor vehicles, machines and special-purpose vehicles whose purpose cannot be fulfilled if side underride guards are fitted.

- The function and accessibility of all equipment on the vehicle must not be impaired.
- The underride guards must extend continuously from the front to the rear wherever possible.
- All national regulations must be fulfilled.
Additional Information

Adjust the material thickness of the semitrailer bracket.

Rigid Truck

No measures necessary

 Variant 1

Compressor bracket lies near a vehicle cross member (i.e. the compressor bracket is bolted to the cross member gusset).

Variant 2

Only part of the compressor bracket lies near a vehicle cross member (i.e. the compressor bracket can only be partly bolted to the cross member gusset).

Rigid truck:

Reinforcing brackets with a material thickness of at least 8 mm must be installed both above and below on the longitudinal frame member, and extending at least 300 mm beyond the compressor bracket.

BharatBenz recommends the use of BSK 46 (min. St 52) material.

For compressors with a weight > 50 kg, reinforcement measures are required, depending on the installation position:

Variant 1

Compressor bracket lies near a vehicle cross member (i.e. the compressor bracket is bolted to the cross member gusset).

Variant 2

Only part of the compressor bracket lies near a vehicle cross member (i.e. the compressor bracket can only be partly bolted to the cross member gusset).
**Variant 3**
Compressor bracket lies outside the gusset of the vehicle cross member.

**Rigid truck**
For torque support, install an additional standard cross member or as an alternative, 2 vertically upright panels, connected by an L bracket to the longitudinal body member.

Material thickness: at least 8 mm
Material: BSK 46

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**Power Supply for Auxiliary Consumers**
- Sockets provided at appropriate positions for installing marker lamps on the body.
- 24V sockets provided in the cabin shall be used for power supply for auxiliary consumers.
- For any additional requirements, contact responsible department.

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**Property Damage**
Ensure to properly re-fit all sealing plugs in the cabin whenever removed. This will help to avoid water ingress and short circuit.
**Power Take-Off**

Power take-off versions available from the factory:

- Gearbox-driven power take-off
- Engine power take-off at the front

Consider the following when retrofitting power take-off:

- After installation, fill the gearbox with oil up to the lower edge of the filler opening.
- Allow the engine to run for approx. 2 minutes and engage the power take-off.
- Check the oil level again and correct if necessary.

Installation of a non BharatBenz power take-off must be approved by the department responsible (Refer **BODYBUILDING GUIDELINES** to the contact details for technical support). The operational reliability of the gearbox cannot be guaranteed if unsuitable power take-offs are used.

- The power take-off version and choice of ratio both depend on the power output and speed of the equipment to be driven.
- Gearbox-driven power take-off can only be engaged and disengaged with the vehicle stationary.
- Data on the maximum transferable torque (Nm) for the individual power take-off are guide values for operation without shock and vibration.
- The data was based on a highly durable gearing design and a calculated service life at maximum output. The additional mass forces of the driven PTO assemblies are not taken into account.
- Select the power take-off ratio such that a minimum engine speed of 650 to 800 rpm is maintained with the power take-off under load. The power output should be within the range of the maximum engine torque.
- Exposed propeller shafts or pulleys must be covered.
- Belts or chain drives must not be fitted to the drive shaft or flange of a power take-off. In special cases where absolutely necessary, submit drawings and required data for approval (Refer **BODY BUILDING GUIDELINES** to the contact details for technical support).

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**Property Damage**

Failure to observe these instructions could result in damage to the gearbox.

**Gearbox-Driven Power Take-Off**

The power take-off is driven by the gearbox countershaft:

- Refer **INSTRUMENT AND CONTROLS** for notes on engaging and disengaging the power take-off.
  - The power take-off is connected to the manual gearbox oil circuit.
  - The maximum permissible weight moment must not be exceeded if a hydraulic pump is directly connected.

Power take-off without an oil cooler are only approved for brief operation at full power.

**Brief operation:**

- Maximum running time approx. 30 minutes
- Subsequent cooling OFF period at least 30 minutes
Additional Information

All the modification should comply as per the AIS 093 (Rev.1):2015 standard.
The below table represents the Transmission PTO fitment details.

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<td>PTO Ratio</td>
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<td>PTO Mount Location (Engine/Transmission)</td>
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<td>11</td>
<td>PTO Actuation Control</td>
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<td>Electro Pneumatic</td>
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</table>
Installation of Propeller Shafts
Observe the following when installing propeller shafts:

- 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 at 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.
- Eliminate any vibrations, e.g. by optimising the propeller shaft angles.

Types of Angular Offset

Angle in one plane

Failure to observe these instructions could result in damage to the major assemblies.

Property Damage

Fig: Angle in two plane

Cab Roof Load Carrier

BharatBenz cab is reinforced for adding a cab roof load carrier that could be used for certain specific purposes. Necessary mounting provisions are provided as standard fitment on all cabs.

DICV standardized design concept and fitment procedure is available with BharatBenz Authorised dealerships. It is strongly recommended to follow the standard design and procedure provided by DICV and use the BharatBenz standard accessory only. In case of violation, Daimler India Commercial Vehicles Pvt. Ltd., provides no guarantee for any consequences.

Please ensure installation of roof load carrier complies with all local regulations as applicable.
Additional Information

All the luggage carrier/storage space should comply as per AIS 093 (Rev.1):2015 standard.

Construction of Bodies

Warning

Do not modify any bolted connections that are relevant to safety, e.g. that are required for wheel alignment, steering or braking functions. Appropriate caps, seals and covers must be installed on the body in order to avoid the risk of fire.

Warning

When unfastening bolted connections make sure that, when work is complete, the connection again corresponds with the original condition. Welding work on the chassis/body may only be carried out by trained personnel. The body, attached or installed equipment and any modifications must comply with the applicable laws and directives as well as workplace safety or accident prevention regulations, safety rules and accident insurer leaflets. With all bodies make sure that neither flammable objects nor flammable liquids can come into contact with hot assemblies (including through leakages in the hydraulic system) such as the engine, gearbox, exhaust system, turbocharger, etc.

Property Damage

Bodies on which the gearbox can be expected to be exposed to high levels of water, e.g. cleaning water (flushing, overflowing or similar), require an effective cover over the gearbox (gearbox guard) which will prevent abrupt cooling as well as water ingestion via the gearbox breather.

Additional Information

Further information on bolted and welded connections can be found in “Planning of bodies” and “Damage prevention” ➔ BODY BUILDING GUIDELINES
Body to be secured properly against all forces for safe vehicle handling and operation

**Special Areas**
(For other forces like tipping hinge, crane mounting, etc...)

**Lateral Fastening**
(For cornering forces)

**Longitudinal Fastening**
(For acceleration & braking forces)

**Vertical Fastening**
(For pitching & rolling forces)

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Mounting Frame (Sub Frame)

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

- The mounting frame longitudinal members must lie level on the upper flanges of the chassis frame and follow the course of the chassis frame.
- Position mounting frame cross members above the chassis frame cross member.
- For the longitudinal members, use flanged U-sections or commercially available U-sections for vehicle construction (not rolled steel sections).
- The dimensions of the longitudinal members are the function of the moment of resistance (Wx) required for the body and the chassis. (Refer to BODYBUILDING GUIDELINES to the section dimensions).
- The specified moments of resistance and section dimensions refer to longitudinal frame members subjected to identical loads on both sides.
- Mounting frame long member should be flat and follow the chassis frame.
- Flexible parts like packing material not advisable between chassis frame and sub frame.

Property Damage

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

Mounting Frame Material

Material quality of specified mounting frame made of:

- Mounting frame with U-bolt or bracket mounting (non-positive) = St 52 or S 380 MC.
- Mounting frame with rigid mounting (positive locking) via shackles (butt strap) = BSK 46.
- If high-strength steels (e.g. N-A.XTRA) are used for the mounting frames, their strength must be at least equivalent to that of steel mounting frames. The mounting must be non-positive.

<table>
<thead>
<tr>
<th>Material</th>
<th>Tensile Strength (N/mm²)</th>
<th>Yield Strength (N/mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S 380 MC (St 52.3)</td>
<td>&gt;450</td>
<td>380</td>
</tr>
<tr>
<td>BSK 46</td>
<td>&gt;600</td>
<td>460</td>
</tr>
</tbody>
</table>

Wooden runner between longitudinal frame members and mounting frame are not permitted.
Property Damage

Wooden runner between longitudinal frame members and mounting frame are not permitted.

Additional Information

In bodies made of hardwood, the mounting runner of the auxiliary frame may be used of the same quality wood. However, must be strengthened properly, with steel reinforcements to ensure the necessary structural strength.

Aluminium platform bodies:

- Observe the instructions given by the aluminium manufacturer.
- The longitudinal members, plank floor, floor panels and cross members must form one self-supporting unit.

BharatBenz recommends that you use the materials described or superior ones.

Further information on bolted and welded connections can be found in “Planning of bodies” and “Damage prevention” BODY BUILDING GUIDELINES

Fig: Mounting frame - Begin forward (ahead of front spring rear mounting)

Fig: Mounting frame starting position (MDT Day cab)
Mounting Frame - Follow the chassis frame profile and continuous

Incorrect

- Use of straight sub frame on joggle frame is not permitted

Correct

- In a joggled frame, sub frame to follow the joggle profile exactly

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Mounting Frame - Follow the chassis frame profile and continuous

There should be a gradual sectional transition at the forward ends of the longitudinal members. The edges should be deburred.

Incorrect

Correct
• Use flanged C-Sections or commercially available C-sections
• Ensure proper moment of resistance being offered by sub frame (for body & chassis)
• Sub frame should have same thickness and flange size as of chassis frame
• Material quality of sub frame:
  • For non positive mounting (with brackets): St52
  • For positive mounting (with butt straps): BSK 46

Continuous mounting frames are required for:
• Bodies with a high centre of gravity
• High point loading
• One-sided loading
• Superstructures extending over the cab

For example, for: tipper bodies, glass transport frame bodies, towing bodies, loading cranes, hinged booms, loading tailgates, etc. The longitudinal body members must extend as far forward as possible, but at the very least beyond the rear front spring brackets.

Radius of 5mm should be added on the sub frame bottom mounted over chassis frame (as mentioned below).

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 also the torsional stability. Ensure a good transition from a closed longitudinal body member to an open U-section.
Wooden longitudinal body members

While using hard wood for longitudinal body members, ensure that the runner follows the chassis frame profile. Adopt suitable design for the runner at the joggle area (Only for Model Designation (2xx)).

Radius of 5mm should be added on the sub frame bottom mounted over chassis frame (as mentioned below)
Below illustration represents the wooden long member connection.

1. Sub frame – Front section
2. Sub frame – Rear section
3. Clamping plates
4. Fasteners
5. Chassis frame

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Section Dimensions

The mounting frame and the chassis frame should have the same material thickness and flange width. Below illustration represents the longitudinal member section dimensions graph.
Mounting Frame Attachment
Mounting frame attachment to be designed as required depending on the chassis model and intended body as well as the conditions of use of the vehicle. Proper attachment is critical to the performance of the vehicle well as to the durability of the structure and chassis frame. Plan a sufficient number of mountings to absorb the braking and lateral forces. The concept shown in this directive are representative only. Detailed design based on the concept is to be carried out by body builder.

Correct mounting is decisive factor for:
• Vehicle handling and operational safety.
• The service life of chassis frame and body.

Friction Lock Connection
While using hard wood for longitudinal body members, ensure that the runner follows the chassis frame profile. Adopt suitable design for the runner at the joggle area (Only for Model Designation (2xx).
The longitudinal members must be fixed in both longitudinal and lateral directions for a friction locking connection.

Cross attachment:
• Use guide plates of sufficient size.
• There must be no gap between the guide plates and mounting frame.
• Install guide plates in the area of the first to third mounting brackets
• The guide plate is bolted to the vehicle frame or mounting frame on one side. When bolting to the mounting frame, a wear pad must be affixed to the opposite surface on the vehicle frame in order to prevent surface damage.

Friction lock connection (Non.positive connection bracket mounting):
• It may be possible to move the mounting frame longitudinal member in relation to the chassis longitudinal member.
• A stress calculation must be carried out for each longitudinal member separately.
• A bending moment must be distributed according to the moments of inertia.
• The forward mounting points must not be rigidly connected.
• The mountings must be based on the recommended designs (illustrations) shown below.
• Do not twist mounting frame while tightening the bolts.
• At the rear end of the frame, the mounting frame must be positively locked (Refer positive connection for details).
• Limited movement between chassis frame and sub frame is possible.
• First load body mounting should be provided within 250mm of mounting frame start.
Friction lock connection (Non-positive connection bracket mounting)

Below illustration represents 1st mounting point only.

**Incorrect**

1. Flanged bolt – M14 x 1.5
2. Space plate (5mm thick)
3. Washer (Plate)
4. Spacer plate (5mm thick)
5. Flanged nut – M14 x 1.5

**Correct**

1. Flanged bolt – M14 x 1.5
2. Space plate (5mm thick)
3. Washer (Plate)
4. Spacer plate (5mm thick)
5. Flanged nut – M14 x 1.5

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Friction lock connection (Non-positive connection bracket mounting)

**Incorrect**

**Recommended mounting**

1. Flanged bolt – M14 x 1.5
2. Metal sleeve
3. Plate spring (Belleville) – 16 nos or elastic element
4. Spacer plate (5mm thick)
5. Flanged nut – M14 x 1.5

- Insert a spacer (A – 1 mm) in the gap
- Torque tighten to 150 ± 30 Nm
- Loosen 3 turns
- Remove spacer

A (5 mm - min)

**Correct**

**Alternative mounting**

1. Flanged bolt – M14 x 1.5
2. Metal spacer tube
3. Washer (Plate)
4. Spacer plate (5mm thick)
5. Flanged nut – M14 x 1.5

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Other possible options for non-positive connection (Using mounting console brackets)

1st Mounting (Front end)  |  Remaining mounting points

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Screw without sleeve could damage the bracket

× Incorrect

Screw without a sleeve
Bracket will be deformed / Overloaded

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Friction Lock Connection (Non - positive connection - U-Bolt Mounting)

This mounting system should be used preferably in the bodywork with wood and mounting frame with wood. Always use seasoned hardwood for making the mounting frame.

- The longitudinal members must be fixed in both longitudinal and lateral directions.
- Fixing for longitudinal direction may be done by using a bolted plate at the rear end.
- Fixing for lateral may be done with the help of guide plates in front end and area of rear axles / rear springs.
- Use U-bolts on other areas for connecting chassis frame and mounting frame.
- Use U-bolt guide made of aluminum or malleable cast iron for protection of chassis frame.
- Wherever U-bolts cannot be positioned, use bracket mounting with flexible connection.

- When bolts are used for connection with wood, use steel plates on both sides, so that fasteners do not come in direct contact with wood.
- Reinforce chassis long member with proper section to avoid local deformation of the flanges.
- The U-bolts shall not touch the chassis frame long member.
- Ensure that the U-bolts do not touch or damage any air / fuel pipes, electrical harness, leaf spring, etc.
- The U-bolts should not interfere with the brake pipe system and any other chassis components.
Friction lock connection (Non-positive connection)

1. Chassis frame
2. Mounting frame
3. Bracket (Mounting frame)
4. Bracket (Chassis frame)
5. Back plate

Friction lock connection for wooden mounting frame

1. Flanged nut
2. Top plate
3. U-bolt
4. Frame reinforcement
5. Bottom guide
6. Seating block
7. Sub frame to be reinforced

U-bolt connection

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Critical points in U-Bolt installation

× Incorrect

- U-Bolt mounted at an angle
- U-Bolt clash with chassis bolt
- U-Bolt touching fuel line
- Spring clamp rubbing against U-Bolt

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Critical points in U-Bolt installation

Incorrect

Avoiding bottom guide will damage chassis frame

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Form Lock Connection (Positive Connection):

- It is not possible to move the mounting frame longitudinal member in relation to the chassis longitudinal member.
- The longitudinal mounting frame member will move together with the chassis side member (bending, twisting).
- For the purposes of strength calculations, both longitudinal members are considered one component.
- On bodies for cement mixers, bodies with loading crane at the rear, rear dumpers and similar bodies, the mounting frame must be attached to the chassis frame by a rigid connection.
- The mounting frame in the rear area must be sealed OFF and reinforced by a diagonal cross.
- Mount torsionally rigid bodies (e.g. box-type bodies, tanks) on the mounting frame behind the cab in resilient mountings. Continuous elastic mounting is not permitted.

- Fasten the butt straps on the chassis frame with at least 3 flange head bolts next to one another, in accordance with MBN 10105, 10112 and 13023.
- Maximum distance between any two mountings must be between 500-700 mm.
- Match the material thickness of the butt straps to the strengths and weights of the body. The butt straps should be at least as thick as the chassis frame.
- Use bracket mountings at the front.
- For bodies on concrete mixer trucks, bodies loading crane at the end of chassis, rear end tilting dump truck bodies and similar, the sub frame must be mounted rigid.
- Movement between chassis frame and sub frame is not possible.
- The plates must be mounted with minimum 3 flange bolts and nuts (10.9 grade recommended)

Additional Information

All the frame mounting should comply as per AIS 093 (Rev.1):2015 standard.
Ear lobe shaped butt strap design

Butt strap design
(Welded to sub frame)

Butt strap design
(Bolted to sub frame)

Welding profile on sub frame

Area to be welded
(Horizontal strat & stop of weld)

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Other possible options for positive connection (Using butt straps)

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Butt strap design for offset sub frame

Note: All the modifications comply as per AIS 093 (Rev.1):2015 standard
Welding of the butt straps

**Incorrect**

- Start and stop welding
- Approx. 20mm
- Don't weld in the radius starting cracks

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
**Platform and Open 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).

- The body must have a torsion-free attachment to the chassis frame longitudinal members.
- Place the vehicle on a flat, horizontal surface before mounting the body.
- 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.

**Platform Body**

Moment of resistance of mounting frame longitudinal member:

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Moment of resistance for each longitudinal member (cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDT (Model Designation 0xx)</td>
<td>50</td>
</tr>
</tbody>
</table>

For section dimensions of longitudinal members, see diagram (Refer to BODY BUILDING GUIDELINES to the section dimensions).

**Additional Information**

All change should comply as per the AIS 093 (Rev.1):2015 standard.
Steel sub frame body mounting

✔ Correct

1 Guide plate front
   No weld on sub frame side

2 Friction lock 1st

3 Friction lock for rest

4 Guide plate at rear
   Weld or bolt to sub frame

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Wooden sub frame body mounting

Correct

1. Guide plate front
   No weld on sub frame side

2. Friction lock 1st

3. Friction lock 2nd

4. U-Bolt
   Weld or bolt to sub frame

5. Guide plate at rear

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Tipper Bodies

- The mounting frame must be manufactured without joints and with adequately dimensioned steel cross members.
- The connection between the mounting frame and the chassis frame must be rigid.
- Position the rear pivot as close as possible to the rear axle.
- Close rear end to form a box and reinforce it with a diagonal cross.
- To reduce the risk of the vehicle tipping, the tilting angle of the body towards the rear must be limited to 45 deg. Therefore, only transport a load that can slide out easily. Equip the tipper body with a tilt stabilizer and mount it precisely above the rear axle or the centre of the double axle.
- Only operate the vehicle tipping on sealed roads, not on construction sites.

Fit reinforced rear springs and anti-roll bars if required and available.

Warning

Ensure that the vehicle is stable when stationary, otherwise there is a danger of the vehicle toppling over. Observe the safety precautions and operating instructions of the tipper body manufacturer. All national laws, directives and regulations must be complied.

Additional Information

Observe notes on mounting frame design (Refer BODY BUILDING GUIDELINES to the mounting frame).

Mounting Frame

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

- The check straps should sag slightly in the end position.
- Fit a support (folding support) to prevent the tipper body from lowering.
• Safeguard controls against unintentional operation.
• Connect a “Tipper body” indicator lamp to provide a visual warning that the tipper body has not folded back completely (in driving position).

**Hydraulic Ram**
• If possible, position the mounting frame cross members directly above the chassis frame cross members.

**Three-way tipper bodies:**
• The application point of the hydraulic ram must be in front of the centre of gravity of the body and the payload.
Non-positive mounting proposal (Friction lock connection)

Correct

1. Flanged bold - M14 X 1.5
2. Metal sleeve
3. Bracket (welded to sub frame)
4. Spacer plates
5. Flanged nut - M14 x 1.5

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Diagonal cross in sub frame rear end

Incorrect

Correct

Minimum length: 1200 mm

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Correct

1. Guide plate front
   No bolt or weld on sub frame side

2. Friction lock tipper
   Weld to sub frame

3. Butt strap general
   Weld to sub frame

4. Butt strap bogie
   Weld to sub frame

5. Butt strap rear
   Weld to sub frame

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
**Tank and Dry-Bulk Bodies**

- Observe the permissible centre of gravity heights (Refer **BODYBUILDING GUIDELINES** to the sections CoG).
- Tank and dry-bulk bodies must be equipped with a continuous steel mounting frame.
- Make sure that the twisting ability of the chassis frame is not impaired by the connection between the body and the mounting frame or between the chassis frame and the mounting frame.
- Position the tank or dry-bulk body mounts as close to the spring brackets as possible.
- Position the rigid mounts at the rear to ensure good handling characteristics.
- Do not exceed the distance dimensions from the centre of the rear axle to the body mount specified in the below table. Position front body mounts as close as possible behind the cab.
- When goods with different specific weights are transported:

Mark filling levels on the tank so that the permissible filling capacity is visible. It is also possible to attach a load indicator to the rear axle which gives an audible or visual warning in the cab.

- On tank and dry-bulk bodies with separate compartments:
  - The loading and unloading plans must be attached to the vehicle where they are clearly visible.
  - BharatBenz recommends equipping the vehicle with high CG pack (with additional anti-roll bar).

### Vehicle Specifications

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Max. distance from centre of rear axles to body mount behind rear axle (cm³)</th>
<th>Moment of resistance for each longitudinal member (cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L/MDT (Model Designation 4x2 1000 70xx)</td>
<td>1000</td>
<td>70</td>
</tr>
</tbody>
</table>

**Fig: Example illustrations – Tank mounting at front**

1. Chassis frame
2. Mounting frame
3. Elastic mount
For section dimensions of longitudinal members, see diagram (Refer BODY BUILDING GUIDELINES to the section dimensions).

It must be guaranteed that the permissible axle loads are not and the specified minimum front axle load is achieved under all loading conditions.

**Tank & Dry-Bulk Bodies without Continuous Mounting Frames**

- Provide a base of a minimum of 1,000 mm for the front mounting frame section.
- Both sections should be designed as an edge profile (minimum dimensions 100x70x6 mm) with a reinforcement plate and smooth transition.

- Attaching the tank directly without mounting frame sections is not permissible.
- The tank must be attached rigidly at the rear and elastically at the front.
- If there are vehicle vibrations after the body has been mounted, a mounting frame with the appropriate fastenings is required.

Petroleum tanker capacities for 1617R - 12kL; 2823R -22kL; 3523R - 28kL and 4228R -34kL

Observe the permissible centre of gravity heights. Consult the department responsible in the event of any modifications to the wheelbase (Refer BODY BUILDING GUIDELINES to the section dimensions).

For 5050WB models, no body mounting bracket or U-bolt to be provided in the welded frame area.
Correct

Centre of rear axle  Max 1000 mm  Centre of rear mounting

Forward mounting  (Flexible)
Sub frame length min 1000 mm

Rear mounting  (Non-Flexible)

Butt strap  (Chassis to sub frame)
Bolt or weld to sub frame

Frame  Sub frame  Body mounts  Guide plates

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Mounting proposal - 1

**Correct**

1. Tank shell
2. Mounting structure on tank
3. Bracket – Tank side
4. Elastic member (Only for forward mounting)
5. Sub frame & bracket – Chassis side

**Fig : Example Illustration - Tanker Mounting Proposal 1**

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Mounting proposal - 2

Permissible

Forward 2 mountings (Flexible on Sub frame)

Rear mountings with U-bolt (Conventional mounting)

Butt strap (Chassis to sub frame)
Bolt or weld to sub frame

Frame  Sub frame  Body mounts  Guide plates

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
**Reverse Parking Alert System**

Reverse Parking Alert System (RPAS) uses ultrasonic sensors and a buzzer to alert the driver when objects are detected in specified zones.

**Warning**

Ensure close attention during reverse operation to the objects on the rod, particularly pedestrians & children. Driver (or co-driver) should always perform a visual inspection to make sure the vehicle is clear of all obstructions before moving the vehicle in any direction.

Every vehicle has 4 sensors mounted at the rear end of the vehicle. The configuration for mounting may vary from vehicle to vehicle depending on the rear geometry.

**Warning**

1. Reverse Parking alert system (RPAS) may malfunction if the vehicle ride height or sensor installation has been modified or damaged. Any non-factory installed equipment or accessories may also interfere with the sensor performance.

2. When the sensor is frozen or covered with snow, dirt or water, the sensor may be inoperative until the material is removed using a soft cloth.

3. To prevent damage, do not push, scratch or strike the sensor.
Reverse Parking Assist System (RPAS)

Retro-fitment RPAS Bracket, Bezel and Sensor Assembly Instruction (10T/12T/14T):

**Specification:**
- Width of load body: 2260 mm max - 10 ton 2424 mm max - 12 ton & 14 ton

**Additional Information**

The height at which the brackets are mounted should not exceed 1000 mm at fully laden condition.

The sensor bracket bolts and rivets shown in the drawing are for reference purpose and not part of the RPAS kit. Use any standard bolt and nut for the holes size.

- Install the RPAS mounting bracket (A) and (B) to the load body cross member and mark the holes using suitable drill with the help of drilling machine.
- Install the RPAS mounting bracket (A) and (B) to be mounted on the sub frame of load body using suitable rivet (F) with using rivet gun.
- Install the bezel (C) to be assembled on to the front direction (as indicated by arrow) first image has to locked in the position, then bezel to be screwed out with the help of M6 screws (D) using T30 torx socket and ratchet. Set the Torque to 3.5 ± 0.5Nm.
- After bezel assembly is completed, RPAS sensor (E) to be assembled (as indicated by arrow) and Image locked into the bezel position.

**Additional Information**

Before install the bezel and sensor (Refer Sensor mounting guidelines).
RPAS Bracket, Bezel and Sensor Assembly Instruction (16T):

Specification:
- Width of load body - 2520 mm max

Additional Information

The sensor bracket bolts and rivets shown in the drawing are for reference purpose and not part of the RPAS kit. Use any standard bolt and nut for the holes size.

- Install the RPAS corner RH bracket (A) and LH bracket (B) to be mounted on the load body tail lamp mounting bracket with M8 hexagonal bolt (D) using 13mm hexagonal socket and ratchet. Set the torque to 29 ± 3 Nm.
- Install the middle bracket (C) to the mounted on chassis frame bolt using 21mm hexagonal socket and ratchet. Set the torque to 150 ± 30 Nm.
- Install the bezel (F) to be assemble on to the bracket (A) (B) (C) (as indicated by arrow) and shown in below image for lock in the position.
- Install the bezel to the screwed out with the help of M5 screws (E) using T30 torx screwdriver. Set the torque to 3±0.5Nm.
- Install the sensor (G) to the fitted on RPAS bracket and bezel assembly and sensor connecting port should point towards vehicle center.

Sensor Mounting Guidelines:
- The screw-mounted bezel has two grooves small one and big one, which can be marked in green color.
• The sensor has a mating groove, which can be marked in a green color.

• The mating groove in sensor should be mated with large groove for correct fitment.

• Bezels have to be mounted with large groove facing vehicle outside so that the wiring is proper to connect.

Additional Information

Sensor port should always point towards vehicle center for all 4 sensors. S1, S2, S3, S4 as shown in below image denotes sensors 1, 2, 3 & 4.

1. The height from the ground at which the brackets are mounted should not exceed 700 - 1000 mm at fully laden condition.

2. The distance between 2 sensors should not exceed 750 mm.

3. The distance between corner sensors (S1 & S4) and load body edge should not exceed 170mm.
**Harness routing guidelines for sensors:**
Remove the cable ties and separate 4 sensors harness lines.

- Install the connector to sensor in sequential manner from vehicle left (B133) to right (B136).

**Additional Information**

RPAS harness (sensor branch) to be bundled and available in end cross member routing at the rear end of the vehicle.

- Ensure the connectors are locked to sensors by hearing click sound.
- Install all cable ties in a regular intervals along the branches to ensure routing support using wire cutter.
Additional Information

Ensure there is no slack in the wiring harness.

Additional Information

The tail lamp brackets shown in the drawing are for reference purpose.
Correct

First mount of tank (Bolted connection)

1 Guide plate front
   No weld on sub frame side

2 Friction lock 1st

3 Friction lock 2nd

4 U-Bolt
   Weld or bolt to sub frame

5 Guide plate at rear

Frame  Sub frame  Body mounts  Guide plates  Fasteners

Note: All the modifications comply as per AIS 093 (Rev.1):2015 standard
Mounting proposal - 4

Correct

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
**Vehicles for the Transport of Hazardous Goods**

**Warning**

Comply with the applicable safety regulations and country-specific guidelines when handling hazardous goods. You could otherwise injure yourself and others.

**Legal Regulations**

For national approval in Republic of India:

- Any tank mounted on a truck for transport of hazardous material shall have a type approval for the fully completed vehicle (to be obtained from Chief Controller of Explosives) in addition to the base vehicle type approval obtained by Daimler India Commercial Vehicles Pvt. Ltd.

- It is assumed that the vehicle body/conversion manufacturer is familiar with these regulations.

- Obtaining type approved from CCOE is responsibility of body conversion manufacturer.

**Vehicles for the Transport of Aggressive Substances**

On vehicles used to transport aggressive substances, all compressed-air lines, brake lines, brake hoses and electrical wiring must be protected against chemical reaction by the body manufacturer.

**Self-supporting bodies**

**Van and box-type bodies**

A mounting frame with continuous longitudinal members is not required on self-supporting panel-van or box-type bodies if cross members are mounted that are less than 600 mm apart. In the rear axle fastening area, the maximum distance of 600 mm may be exceeded if this is necessary to realize tire clearances (jounce).

**Additional Information**

Anti-Lock Braking System (ABS) is applicable for hazardous goods package only.
Provide sub frame in front end (min 1.5m)
Use non-positive connection in front

Distance between cross members: max 600 mm
(Can exceed in rear axle area for tyre clearance)

Distance ‘A’ should be min 250mm for tire clearance from frame top (for rigids)

Fig: Example Illustration - Van and Box type body

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Bodies with sub frame as floor assembly

Correct

- Floor assembly used as sub frame
- Sub frame need not be continuous (can be weld joined)
- Mounting similar to closed containers can be used

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Closed Containers

Note: All the modification comply as per AIS 093 (Rev.1):2015 standard
Crane application bodybuilding guidelines:
Concrete bundle configuration should be 800 x 800 x 800mm (1.1 tons); Bigger configurations leads to parts wear
Duration of crane pump operation should not exceed 4 hours/day for higher durability of the crane
The engine speed at the PTO ON condition to be set at 1200 rpm by flashing dataset
Excessive acceleration shall not be done to achieve required rpm

<table>
<thead>
<tr>
<th>Crane Model</th>
<th>PK 10000 STD</th>
<th>PK 11.001 SLD 1</th>
<th>PK 15500 A</th>
<th>PK 17.001 SLD 1</th>
<th>PK 18500 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crane Capacity</td>
<td>9.5</td>
<td>10.3</td>
<td>14.1</td>
<td>16.3</td>
<td>17.9</td>
</tr>
<tr>
<td>Max Outreach</td>
<td>6.1</td>
<td>5.6</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Max Load at max Outreach + Weight of Grabber</td>
<td>1145 Kgs Brick Bundle + 400 Kgs</td>
<td>1440 Kgs Brick Bundle + 400 Kgs</td>
<td>1290 Kgs Brick Bundle + 400 Kgs</td>
<td>1560 Kgs Brick Bundle + 400 Kgs</td>
<td>1770 Kgs Brick Bundle + 400 Kgs</td>
</tr>
<tr>
<td>Suitable Vehicle GVW (Min)</td>
<td>11 Ton GVW</td>
<td>11 Ton GVW</td>
<td>25 Ton GVW</td>
<td>25 Ton GVW</td>
<td>25 Ton GVW</td>
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<tr>
<td>Suitable Vehicle Wheelbase (Min)</td>
<td>4200 mm</td>
<td>4200 mm</td>
<td>4880 mm</td>
<td>4880 mm</td>
<td>4880 mm</td>
</tr>
</tbody>
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1015R 3760WB BSVI
1015R 4800WB BSVI

DICV-MDT-1782
1215R 3760WB BSVI
1217C 3160WB BSVI
1415R 3360WB BSVI
1415R 5050WB BSVI