轻卡出口纯电动系列车型
改装指南
Light-duty Electric Truck Modification Guide

北汽福田汽车股份有限公司

Beiqi Foton Motor Co., Ltd.

2023 年 5 月

May 2023

前 言

Foreword

本改装指南适用于由北汽福田汽车工程研究总院轻卡技术中心开发的轻卡出口纯电动系列底盘的改装。

This Modification Guide is applicable to the modification of chassis of light-duty electric trucks developed by the Light-duty Truck Technology Center of Automotive Engineering Research Institute of Beiqi Foton Motor Co., Ltd.

轻卡出口纯电动系列底盘车身为 1880 单排。

The chassis of light-duty electric trucks is of day-cab type with a width of 1,880 mm.

轻卡出口纯电动系列底盘目前有及物流车两个系列的底盘产品，驱动形式为 4×2，吨位系列总重为 6 吨。

At present, there are two series of chassis product for light-duty electric trucks , one for special application and the other for logistics vehicle, with a drive mode of 4×2 drive mode and a total load capacity of 6 tons.

本改装手册主要介绍了轻卡出口纯电动系列底盘的主要技术参数和各大总成的结构参数特点，为各类改装行业提供必要的技术参数。改装企业使用本手册进行改装时务必严格遵守本手册要求，否则可能影响底盘的使用性能和可靠性。

This Modification Guide mainly introduces the main technical parameters of chassis of light-duty electric trucks and the structural parameters of each major assembly, providing necessary technical parameters for various modification industries. Modification enterprises must strictly abide by the requirements of this Modification Guide during modification using this Modification Guide. Otherwise, the service performance and reliability of chassis may be affected.

在改装过程中请参考本手册要求内容进行改装，若有不清楚部分或对底盘提出特殊要求时，请及时与北汽福田汽车股份有限公司联系。希望本手册在改装过程中对您有所帮助，本手册与车辆使用说明书配合使用，可进一步增加您对车辆的了解。

In the process of modification, please refer to the requirements of this Modification Guide. If there are unclear parts in this Modification Guide or there are

special requirements for chassis, please contact Beiqi Foton Motor Co., Ltd. in time. This Modification Guide is intended for providing necessary help for modification, and should be used together with the User Manual of this vehicle to enable you to better understand the vehicle to be modified.

由于本公司产品的结构和性能在不断的改进和完善中，可能出现实际产品与本指南所列参数有不同之处，所有参数均以实际产品为准，本指南仅供参考。

Due to the continuous improvement and perfection of the structure and performance of our products, there may be differences between the actual products and the parameters listed in this Modification Guide. All parameters are subject to the actual products, and this Modification Guide is for reference only.

改装后的车型必须符合相关标准、法规及公告、CCC、环保等认证的相应规定，满足改装手册要求，经北汽福田汽车股份有限公司授权后方可使用福田品牌。

An authorization of use of Foton logo will be given by Beiqi Foton to the modified model provided it complies with relevant standards, regulations and announcements, as well as certification regulations of CCC and environmental protection, and meets the requirements in this Modification Guide.

本公司承诺将定期修订完善本指南，但对在使用本指南申请所列数据进行改装设计时，请自行确认本指南数据与实际产品是否完全一致。北汽福田汽车股份有限公司不承担任何由于拥有或参考本指南而造成的任何人身伤害、物质损失和其他损失，同样不承担由于拥有或参考本指南而引起的一切法律后果。

We promise to revise and improve this Modification Guide regularly. However, for modification design using the data listed in this Modification Guide, please confirm whether the data in this Modification Guide is completely consistent with the actual product. Beiqi Foton Motor Co., Ltd. does not bear any losses such as personal injury and material loss caused by owning or referring to this Modification Guide, and neither bears any legal consequences caused by owning or referring to this Modification Guide.

如果用户有特殊需要或任何与改装中的与底盘相关的问题，北汽福田汽车股份有限公司将提供进一步的技术咨询服务。

If users have special needs or any problems related to chassis during modification, Beiqi Foton Motor Co., Ltd. will provide further technical consultation services.

目录

CONTENTS

第一章 改装原则

Section 1 Principles of Modification

1.1 二类底盘改装的范围

1.1 Modification scope of chassis

改装厂家在使用轻卡出口纯电动系列底盘进行不涉及任何总成的更换时改装各种专用车辆，为使更好地保证改装后的质量，请各改装厂家依据本指南指导改装。

When modification factories modify any kinds of special vehicles using the chassis of light-duty electric trucks without replacing any assemblies, in order to ensure better quality after modification, please carry out the modification according to this Modification Guide.

涉及改装的部分（禁止以下项目之外的部分进行改装）

Parts involving modification (modification of parts other than the following items is prohibited)

- 驾驶室改制
- Cab
- 车架改制
- Frame
- 制动系统改制
- Brake system
- 备胎安装及固定
- Installation and fixing of spare tire
- 传动轴改制
- Drive shaft

- 附加装置
- Additional devices

1.2 改装的基本原则

1.2 Basic principles of modification

1.2.1 改装技术要求

1.2.1 Technical requirements for modification

改装厂使用轻卡出口纯电动系列车型进行改装，必须对整车负责。改装时的技术要求：

When modification factories modify light-duty electric trucks, they must be responsible for complete vehicles. Technical requirements for modification:

- 改装部分的结构与底盘连接的合理性；
- Rational connection between the structure of modified parts and the chassis;
- 改装后的整车重心位置的合理性（轴荷分配、重心高度、左右承载均匀平衡等），
- Rational position of the center of gravity of modified vehicles (distribution of axle load, height of center of gravity, uniform balance of left and right loads, etc.),
- 根据轴荷分布确定整车重心位置，整车重心位置应尽可能低；改装后的整车应根据底盘、上装及载货质量确定整车质量及重心位置，应尽量使上装的重心与底盘有效载荷的中心重合,保证整车轴荷左右分布均匀，不得偏向一侧;
- The center of gravity of the complete vehicle shall be determined according to the axle load distribution, as low as possible; after modification, the mass and center of gravity of the complete vehicle shall be determined according to the mass of the chassis, bodywork and cargos, and the center of gravity of the bodywork shall coincide with the payload center of the chassis as accurately as possible to ensure that the axle load of the complete vehicle is evenly distributed in transverse direction, instead of on either side;
- 因改装需求，在原底盘上进行再加工的合理性；
- Rational reprocessing of the original chassis due to modification requirements;

- 最小离地间隙、纵向通过角、接近角和离去角等通过性指标不得低于原二类底盘车型。
- Trafficability indexes such as minimum ground clearance, ramp angle, approach angle and departure angle shall not be lower than those of the vehicle with original chassis.
- 设计上装时，应使所有保养部位、润滑点、注油口、充电口和检查螺塞、液面观察口、蓄电池箱、备胎架和驾驶室翻转操纵装置等使用方便。不允许改装厂家改变标牌及其位置。上装的结构不应使底盘的维修及保养变得困难，并应确保驾驶室都能翻转到最大角度。
- For design of the bodywork, all maintenance parts, lubrication points, lube fillers, charging ports, check plugs, liquid level sight glasses, battery case, spare tire carrier, cab tilting device, etc. shall be easy to use. Modification factories shall not alter the sign plates and their positions. The bodywork shall be such structured that the repair and maintenance of the chassis are not difficult and the cab can be tilted to the maximum angle.
- 改装车不应拆改原底盘的产品标牌，并应保留非完整车辆产品原有的 VIN，将原有的 VIN 完整标示在改装产品的改装部件或产品标牌上。
- For modified vehicles, the nameplate plate of the original chassis shall not be removed or altered, and the original VIN of the incomplete vehicle product shall be retained and completely marked on the modified parts or labels of the modified products.
- 上装设计时，应遵守底盘方面的有关规定，不要随意改动底盘上已有的功性能。上装制造和安装时，未经许可不能随意改变底盘轴距和轮距、有关部件及其布置位置。
- For design of the bodywork, please abide by the relevant regulations of chassis. Do not alter the existing functions and performance of the chassis without authorization. During the manufacturing and installation of the bodywork, the wheelbase and wheel track of the chassis, related components and their positions shall not be altered without authorization.
- 改装厂家对专用车辆底盘的改装及上装的设计、制造和安装负全部责任，对整车负责。

- Modification factories take full responsibility for the modification of the chassis and the design, manufacturing and installation of the bodywork of special vehicles, and are responsible for complete vehicles.
- 改装后的整车可靠性与维修性应保证与原车保持一致水平。
- The reliability and maintainability of modified vehicles shall be at the same level as that of original vehicles.
- 改装后的专用车辆各项参数必须符合相关标准、法规等认证的相应规定;
- All parameters of modified special vehicles must conform to corresponding provisions in relevant standards, regulations and certifications;
- 改装前请必须按 1.3 要求将必要的说明和技术资料提供给北汽福田汽车股份有限公司确认是否允许进行改装。
- Before modification, please submit necessary instructions and technical data described in 1.3 to Beiqi Foton Motor Co., Ltd. The later will confirm whether modification is allowed.

1.2.2、改装基本要求

1.2.2. Basic requirements for modification

- 整车外廓尺寸
- Overall dimensions of the vehicle

改装车辆整车外廓尺寸必须符合(EU)1230/2012《关于机动车及其拖车的质量与尺寸型式认证要求》的相关规定。

The overall dimensions of complete vehicles after modification must comply with the relevant provisions of (EU) 1230/2012 Mass and Dimensions of Motor Vehicles and Their Trailers.

① 整车质量参数

① Mass parameters of vehicle

- 改装后的专用车辆的轴荷必须符合认证公告要求及技术允许轴荷要求。
- The axle load of modified special vehicles must meet the requirements in certification announcements and technical requirements of axle load.

- 上装设计时，应对整车总质量进行计算，确保合理的轴荷分布。
- For design of the bodywork, the gross vehicle weight (GVW) of a complete vehicle shall be calculated to ensure reasonable distribution of axle load.
- 载荷分布左右应基本均匀，不得出现偏向车辆一侧的情况，最大偏差不得超过3%～4%。
- The axle load distribution shall be generally uniform in transverse direction, instead of on either side of the vehicle, the maximum deviation within 3%~4%.
- 改装车的最大总质量及其轴载质量应尽可能与原车接近，不得随意增大汽车的总重。用户如果降低载重 20%，汽车可以在平坦坚实的非公路路面上行驶。轻卡出口（欧洲）纯电动系列车型技术上允许最大轴荷见下表 1-2。
- The GVW and axle load of modified vehicles shall be as close as possible to original vehicles, and the GVW shall not be increased without authorization. If users reduce the load by 20%GVW, the vehicles can drive on flat and solid off-road. The maximum allowable axle loads of light-duty electric trucks (exported to Europe) are shown in Table 1-2 below.

表 1-2 技术上最大允许轴荷

Table 1-2 Maximum allowable axle loads

序号. No.	项目 Item		非完整车辆 Incomplete vehicle		
			3360 轴距、205/75R16 铝轮 3360 wheelbase, 205/75 R16 aluminum wheels		
			Model A	Model B	Model C
1	运行质量(kg) Operation mass (kg)		2500	2500	2500
2	运行质量的轴荷分配 Axle load distribution of operation mass	前轴(kg) Front axle (kg)	1540	1540	1540
		后轴(kg) Rear axle (kg)	960	960	960
3	GVW (kg)		4250	6000	4495
4	制造商规定的技术允许最大	前轴(kg) Front	1800	2120	1828

	载重质量在车轴间的分配 Distribution of maximum allowable loads on axles specified by manufacturers	axle (kg)			
		后轴 (kg) Rear axle (kg)	2450	3880	2667
5	每个轴/轴组上的技术允许最大质量 Maximum allowable mass on each axle/axle group	前轴 (kg) Front axle (kg)	2120	2120	2120
		前轴 (kg) Front axle (kg)	3900	3900	3900
序号. No.	**项目 Item**		**非完整车辆 Incomplete vehicle**		
			3360 轴距、205/75R17.5 铝轮 3360 wheelbase, 205/75R17.5 aluminum wheels		
			Model A	**Model B**	**Model C**
1	运行质量(kg) Operation mass (kg)		2671	2671	2671
2	运行质量的轴荷分配 Axle load distribution of operation mass	前轴 (kg) Front axle (kg)	1589	1589	1589
		后轴 (kg) Rear axle (kg)	1082	1082	1082
3	GVW (kg)		4250	6000	4495
4	制造商规定的技术允许最大载重质量在车轴间的分配 Distribution of maximum allowable loads on axles specified by manufacturers	前轴 (kg) Front axle (kg)	1824	2141	1852
		后轴 (kg) Rear axle (kg)	2426	3859	2643
5	每个轴/轴组上的技术允许最大质量	前轴 (kg) Front axle	2400	2400	2400

	Maximum allowable mass on each axle/axle group	(kg)			
		前轴 (kg) Front axle (kg)	4500	4500	4500

② 汽车侧面防护装置

② Lateral protection devices

根据 ECE R73.01《关于就侧面防护装置方面批准货车、挂车和半挂车的统一规定》规定，汽车必须安装侧面防护装置，各改装厂家可根据车辆、车型需要自行设计、安装侧面防护装置，侧防装置设计、安装应注意下面条件：

According to ECE R73.01 Uniform Provisions Concerning the Approval of: I. Vehicles with Regard to their Lateral Protection Devices (LPD), II. Lateral Protection Devices (LPD), III. Vehicles with Regard to the Installation of LPD of an Approved Type according to Part II of this Regulation, vehicles must be equipped with lateral protection devices. Modification factories can design and install lateral protection devices according to the needs of vehicles and models and paying attention to the following conditions:

- 侧防护装置设计、安装必须符合 ECE R73.01《关于就侧面防护装置方面批准货车、挂车和半挂车的统一规定》的规定。
- Lateral protection devices shall be designed and installed in accordance with ECE R73.01 Uniform Provisions Concerning the Approval of: I. Vehicles with Regard to their Lateral Protection Devices (LPD) II. Lateral Protection Devices (LPD) III. Vehicles with Regard to the Installation of LPD of an Approved Type According to Part II of this Regulation.
- 侧防护装置设计、安装不能与底盘电瓶箱、电池及支架，备用轮胎（侧置）等部件干涉。
- The designed and installed lateral protection devices shall not interfere with components such as chassis battery case, battery and bracket, and spare tire (side-mounted).

③ 汽车后下部防护装置

③ Rear underrun protection devices

根据 ECE R58.03 《关于：1.下部防护装置 2.就已批准的后下部防护装置的安

装方面认证车辆 3.就后下部防护装置方面认证车辆的统一规定》规定，汽车必须安装 ECE R58.03 规定的后下部防护装置。一般情况下福田轻卡出口（欧洲）纯电动底盘提供后下防护装置，各改装厂家也可根据自己要求自行设计、安装后下防护装置，但是后下防护装置的设计、安装必须符合 ECE R58.03 的规定。

According to ECE R58.03 Uniform Provisions Concerning the Approval of: I. Rear Underrun Protective Devices (RUPDs); II. Vehicles with Regard to the Installation of an RUPD of an Approved Type; III. Vehicles with Regard to their Rear Underrun Protection (RUP), vehicles must be equipped with rear underrun protection devices specified in ECE R58.03. Under normal circumstances, rear underrun protection devices are provided with Foton light-duty electric trucks (exported to Europe). Modification factories can also design and install rear underrun protection devices according to their own requirements. However, the designed and installed rear underrun protection devices must comply with ECE R58.03 .

④ 汽车侧标志灯、反光标志及示廓灯

④ Side marker lamps, retro-reflective markings and end-outline marker lamps

各改装厂家 根据车辆、车型需要，依据 ECE R48《关于车辆照明及照明信号装置安装认证的统一规定》自行设计、安装汽车侧标志灯、反光标识及示廓灯，汽车侧标志灯、反光标识及示廓灯的造型应符合国家相关的规定和标准。

According to the needs of vehicles and models, modification factories shall design and install side marker lamps, retro-reflective markings and end-outline marker lamps according to ECE R48 Uniform Provisions Concerning the Approval of Vehicles with Regard to the Installation of Lighting and Light-signalling Devices. The styling of side marker lamps, retro-reflective markings and end-outline marker lamps shall conform to relevant national regulations and standards.

⑤ 汽车护轮板

⑤ Wheel guards

根据要求，汽车必须装有护轮板。护轮板的设计和安装应遵循以下原则：

According to the requirements, vehicles must be equipped with wheel guards. The design and installation of wheel guards shall follow the following principles:

- 护轮板的设计和安装应符合的规定。

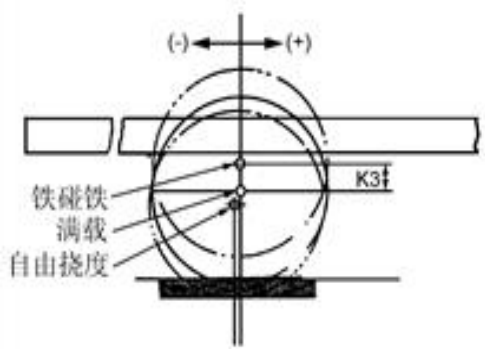
- The design and installation of the wheel guards shall comply with the regulations.
- 护轮板的支架应尽可能设计和安装在上装的车架或车身上。
- Brackets of wheel guards shall be designed and installed on the bodywork frame or the vehicle body when possible.

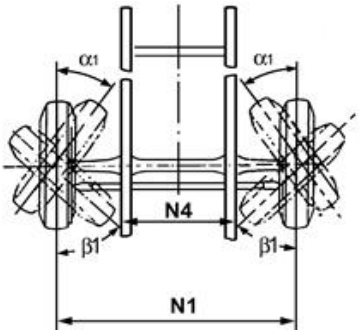
⑥ 车轮运动空间

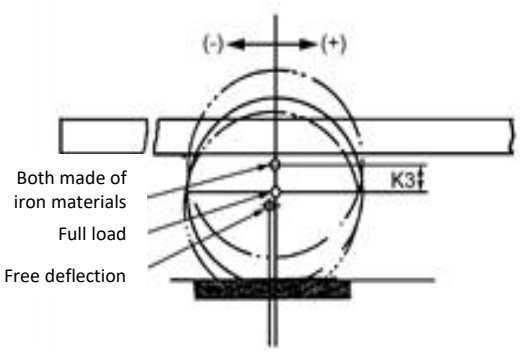
⑥ Wheel movement space

底盘的车轮运动空间见图1-1、图1-2：

See Fig. 1-1 and 1-2 for wheel movement space of chassis:







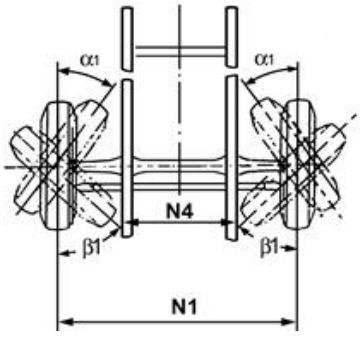


图 1-1 轮胎跳动

Fig. 1-1 Tire runout

图 1-2 车轮转动

Fig. 1-2 Wheel rotation

K3：车轮上跳空间　α1：前轮最大角（外轮）、β1：前轮最大角（内轮）　N1：前轮距、N4：车架前宽

K3: wheel upward runout space　α1: maximum angle of front wheel (outer wheel), β1: maximum angle of front wheel (inner wheel)　N1: front wheel track, N4: front width of frame

1.3 改装前需提供的资料

1.3 Information to be provided before modification

改装厂家在进行改装时，除了参考本指南外，如果进行较大或较复杂的工作，如轴距的变化、改装后轴荷超出最大设计轴荷、电机调速器的变化或使用其它厂家的取力器时，改装厂家必须将必要的说明和技术资料提供给北汽福田汽车股份有限公司确认是否允许进行改装。

During modification, in addition to referring to this Modification Guide, if large amount of or complicated work is carried out, for example, changed wheelbase, axle load after modification more than the designed maximum axle load, altered motor governor, or PTO from other manufacturers, modification factories must provide necessary instructions and technical data to Beiqi Foton Motor Co., Ltd. The later will confirm whether modification is allowed.

提供的技术资料中至少应包括下列内容：

The technical data provided shall at least include the following:

- ✓ 改装车的用途和工况
- ✓ Purposes and working conditions of modified vehicles
- ✓ 改装车的总重和轴荷
- ✓ GVW and axle load of modified vehicles
- ✓ 改装车的外形尺寸（包括工作状态）
- ✓ Overall dimensions of modified vehicles (including working conditions)
- ✓ 改装车的上装的固定方法
- ✓ Fixing method of bodywork of modified vehicles
- ✓ 改装车的副车架简图

✓ Sketch of subframe of modified vehicles

北汽福田汽车股份有限公司审阅了有关资料后，应提出确认意见，对于未经审查的改装车，由于上装配置不当造成底盘非正常损坏的，北京福田汽车有限公司将不承担经济的和法律的责任，底盘的保修保证也自动作废。

After reviewing the relevant materials, Beiqi Foton Motor Co., Ltd. shall give confirmation opinions. For modified vehicles without review, if the chassis is damaged abnormally due to improper bodywork configuration, Beijing Foton Motor Co., Ltd. will not bear economic and legal responsibilities, and the warranty of the chassis will be automatically invalidated.

北汽福田汽车股份有限公司不对所有改装单位及改装车的改装技术方案负责；改装单位必须对改装后的整车负责。

Beiqi Foton Motor Co., Ltd. is not responsible for the technical schemes of modification of all modification organizations and modified vehicles; modification organizations must be responsible for complete vehicles after modification.

1.4 安全操作规程

1.4 Safety practices

为了提高整车可靠性，车辆进行改装时应遵守安全操作规程及注意事项。

In order to improve the reliability of complete vehicles, the safety practices and precautions shall be observed during vehicle modification.

1.4.1 管路系统安保改装注意事项

1.4.1 Precautions for safe modification of pipeline system

- 进行焊接、钻孔磨削以及使用磨擦锯进行工作时，应该采取防护措施，应避免高压线束及尼龙管受到火星和飞屑的伤害。
- For welding, drilling and grinding, and working with friction saws, protective measures shall be taken to prevent high-voltage harnesses and nylon pipes from being damaged by sparks and flying debris.
- 在进行蒸汽清洗、防锈处理或红外线烘烤油漆等工作时，应保护高压线束及尼龙管不受热损害。

- During steam cleaning, antirust treatment or infrared paint baking, high-voltage harnesses and nylon pipes shall be protected against heat damage.
- 装配钢管之前，必须检查钢管与接头的配合面，不允许有毛刺、铁屑等杂物及凹坑、划伤等缺陷。
- Before a steel pipe is installed, the mating surface between the steel pipe and the joint must be checked. No sundries such as burr and iron scrap or defects such as pit and scratch are allowed.
- 气路钢管装配前，应在钢管和接头配合的外锥面上均匀地涂上密封胶。
- Before a gas circuit steel pipe is installed, sealant shall be evenly applied to the outer conical surface where the steel pipe and the joint match.
- 钢管两端的螺母拧紧时，必须保证正确走向。
- Before tightening the nuts at both ends of the steel pipe, make sure the direction is correct.
- 钢管每隔 600-700mm 加装管夹固定。软管每隔 400-600mm 加装支架或管夹固定，每隔 150-200mm 用扎带捆绑，易发生干涉的地方，根据需要增加固定。线束每隔 300-400mm 应固定，确保固定点之间线束的摆动幅度在 30mm 以下。
- Steel pipes shall be fixed with pipe clamps at intervals of 600-700mm. A hose shall be fixed with brackets or pipe clamps every 400-600mm, and tied every 150-200mm. Where interference is easy to occur, fasteners shall be added as needed. A harness shall be fixed every 300-400mm, and the swing amplitude of the wiring harness between the fixing points shall be below 30mm.
- 在进行制动系统改装时必须将车轮楔住，更改制动装置时，只允许使用北汽福田汽车股份有限公司审批过的管路连接件和塑料软管。制动管路中的压缩空气要全部释放掉，
- During modification of the braking system, the wheels must be wedged. During modification of braking devices, only the pipe connectors and plastic hoses approved by Beiqi Foton Motor Co., Ltd. are allowed for use. All compressed air in the brake pipeline should be released.

1.4.2 电气系统

1.4.2 Electric system

1）只允许从底盘预留接口上取电，用电负荷不能超过限定值；另行取电时，线路中必须有可靠的过流保护装置，防止对整车电路产生损伤；加装用电设备时需向福田提供详细的电器原理图，获得福田许可后方可执行。

1) Power can only be supplied from the reserved interfaces on the chassis, and the power load shall not exceed the limited values; in case of power supply in other ways, reliable overcurrent protection devices must be provided in the circuits to prevent damage to circuits of the complete vehicle; when electrical consumers are added, detailed electrical schematic diagrams shall be provided to the FOTON and the implementation can only be carried out after the permission of FOTON.

2)线束走向及卡固规范合理，远离热源避免干涉及摩擦，必要时增加隔热装置、护套或套管。

2) The direction and clamping of harnesses shall be reasonable. Keep harnesses away from heat sources to avoid interference and friction, and add heat insulation devices, sheaths or sleeves when necessary.

3)加装的灯具应符合公告及相关认证一致性及法规要求。

3) Added lamps shall comply with conformity and regulatory requirements of ECE/EC.

4)自卸汽车必须安装符合法规要求的举升报警装置。

4) Dump trucks must be equipped with lifting alarm devices that meet the requirements of laws and regulations.

5)焊接作业时，须先关闭电源总开关几分钟后，以便让电控单元将前数据的存储信息存储完整，再拔掉发动机 ECU、DCU、ABS 等控制单元接插件；必须对焊接附近的电器件和管线束进行防护，必要时拆除线束和电器件，以免烧坏电控单元或其它用用电设备的元器件。

5) For welding, be sure to turn off the main power switch for several minutes first so that ECUs can save current data completely, and then unplug the connectors of control units such as engine ECU, DCU and ABS; be sure to protect electrical devices, pipe bundles and harnesses near welding places, and if necessary,

remove the harnesses and electrical devices to avoid burning out the components of ECUs or other electrical equipment.

- 电机在运转期间，不允许松开、取下或置电机三项线和蓄电池连接线。
- Do not loosen, remove or replace motor three phase wires and LV battery wires during the operation of the motor.
- 蓄电池快速充电时要与汽车的电气设备断开。
- When the battery is under fast charging, it shall be disconnected from the electrical equipment of the vehicle.
- 汽车搭铁连接有变动时，必须能够重新形成完全有效的接地。
- When the ground connection of the vehicle is changed, complete and effective grounding shall be established again.
- 电线因结构更改而被切断时，必须使用防水连接件。
- When wires are cut due to structural changes, waterproof connectors must be used.
- 更改导线位置时，必须套上绝缘胶皮，并牢固地固定在车架上。
- When wires are moved to other positions, they must be protected with insulating rubber and firmly fixed on the frame.
- 改装时不能改变与电控系统相关的各传感器的位置及连接方式。
- The positions and connection modes of sensors related to the electronic control system shall not be changed during modification.
- 在焊接、切割车架等作业时，必须关断所有电气设备，将电瓶正负极拆下，将焊接、切割部位的线束及电气设备拆下，远离作业部位，并用防火材料隔绝，避免因高温、火花飞溅损坏电器设备。在装配货箱压板、骑马螺栓等固定件时，必须避开附近线束，避免线束的挤压损伤，防止出现短路断路等故障。
- For welding and frame cutting, all electrical equipment must be turned off, the positive and negative terminals of the battery must be removed, and harnesses and electrical equipment at the welding and cutting places must be removed, kept away from the parts that are worked on, and isolated with fireproof materials to avoid damaging the electrical equipment due to high temperature and flying sparks. For assembling of fixed parts such as cargo body pressure plate and U-bolt, be sure to avoid nearby harnesses and avoid

extrusion damage of harnesses, so as to prevent faults such as short circuit and open circuit.

- 电器系统相关零部件，已进行相关设计匹配验证工作，不得随意进行供应商的开发，如有需求，提出需求，经公司正规流程审批后进行，未经允许，随意采用电器系统相关部件，出现质量问题及其他后果，由相关责任部门承担。
- If the relevant design, matching and verification have been carried out for the relevant parts of the electrical system, further supplier sourcing shall not be performed without authorization. If there is any demand, it shall be put forward and carried out after being approved by formal processes of the company. For relevant parts of the electrical system without authorization, the quality problems and other consequences shall be borne by the relevant responsible departments.
- 所有连接器插件不要暴力插拔，减少插拔次数，应少于 10 次，尤其 VCU。
- All connectors shall not be plugged and unplugged violently, and the number of times of plugging and unplugging shall be minimized to less than 10, especially for VCU.
- 改装时，外漏插件应有防水栓，防水堵等防水措施，线束布置远离高温、运动部件，固定牢靠，原则高低压线束分开布置。
- During modification, exposed connectors shall be provided with waterproof measures such as seal and plug. Harnesses shall be arranged away from high temperature and moving components, and shall be firmly fixed. In principle, the high and low voltage harnesses shall be arranged separately.
- 上装取电严格按照上装预留接口位置及定义改制。
- The power interface of the bodywork shall be modified in strict accordance with the position and definition of reserved interfaces on the bodywork.

1.4.3 管线支架要求

1.4.3 Requirements for pipe brackets

- 软管线束支架：支架与管线的接触面不能有毛刺、尖角和刃口。
- Hose bracket: the contact surface between the bracket and pipeline shall be free of burrs, sharp corners and cutting edges.
- 金属管支架：支架不能直接与管接触，要用非金属管夹固定，避免摩擦干涉。

- Metal pipe bracket: the bracket shall not come into direct contact with the pipe, and the pipe shall be fixed with non-metal pipe clamps to avoid friction and interference.
- 不能借用热源部件的固定支架，防止支架导热危害管线。
- Do not share the fixing bracket with any heat source component, for fear of pipeline damage due to the heat conduction of the bracket.
- 支架的固定点要求避开热源，如果无法避开一定要增加隔热措施保护管线。
- The fixing point of the bracket shall avoid heat sources. Otherwise, heat insulation measures must be added to protect the pipeline.
- 在热源附近的管线除了有距离和隔热要求外，还要求通风避免热能聚集。
- In addition to distance and heat insulation requirements, pipelines near heat sources shall also be ventilated to avoid heat accumulation.

1.4.4 驾驶室的翻转注意事项：

1.4.4 Precautions for cab tilting:

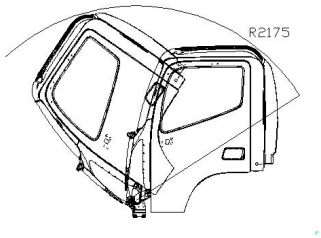


图 1-3 车身翻转示意图

Figure 1-3 Tilting of vehicle body

- 将车停在平坦的地面上，检查驾驶室前面和上面是否有充分的空间。驾驶室顶部、后部都请留出足够的空间，最大翻转半径，不能影响驾驶室的翻转特性，尤其是在驾驶室上方装有制冷装置的冷藏车车厢。
- Park the vehicle on flat ground and check whether there is sufficient space in front of and above the cab. Please leave enough space, i.e., maximum tilting radius, at the top and rear of the cab to prevent affecting the tilting characteristics of the cab, especially when a refrigerated truck is equipped with refrigeration device above the cab.

- 将变速杆挂在空挡位置。
- Set the shift lever in N position.
- 挂好驻车制动器，必要时应将车轮楔住。
- Apply the parking brake and wedge the wheels if necessary.
- 驾驶室内容易掉下的东西取出。
- Take out articles that fall easily in the cab.
- 翻转驾驶室时，在驾驶室前 2500mm 严禁站人或放东西。
- During cab tilting, nobody and no things shall be within 2500mm in front of the cab.
- 驾驶室一定要翻转到位（最大翻转角度为 44°），切忌中间停留，翻转到位后将锁销插上。
- The cab must be tilted in place (maximum tilting angle of 44°). Do not stop tilting halfway, and insert the locking pin after tilting in place.
- 本驾驶室为前翻驾驶室，对车顶上部、驾驶室后部有运动空间要求，注意要在驾驶室后部和上部留有翻转的运动空间。
- This cab is the forward tilting type, which requires movement space above the roof and behind the cab. Be sure to leave movement space above and behind the cab.
- 驾驶室翻转手动操作杆需要运动空间，上装装配时要留有操作空间。
- The manual control lever for cab tilting needs movement space, and there should be operation space for bodywork assembling.

1.4.5 表面喷涂

1.4.5 Surface painting

表面喷涂作业应符合相关的国家标准和行车安全标准。表面喷涂不能损坏汽车底盘的性能及表面质量，喷涂时应注意以下部位：

Surface painting shall comply with relevant national standards and driving safety standards. Surface painting shall not damage the performance and surface quality of automobile chassis. Pay attention to the following parts during painting:

- 说明牌及标志牌。
- Instruction plates and sign boards.
- 驾驶室举升油缸活塞。
- Cab lift cylinder piston.
- 变速器和桥等的通气阀。
- Vent valves of transmissions, axles, etc.
- 制动软管。
- Brake hose.
- 蓄电池、线束、插接件。
- Battery, harnesses, connectors.
- 副水箱及动力转向储油罐。
- Auxiliary radiator and power steering fluid reservoir.
- 灯具、玻璃及密封条。
- Lamps, glass and sealing strips.
- 驾驶室内饰、开关、铰链及橡胶密封件。
- Cab interiors, switches, hinges and rubber seals.
- 车轮和制动鼓之间的接触表面。
- Contact surface between the wheel and the brake drum.
- 后挡泥板。
- Rear mudguard.
- 电动机高低压接线盒、通气阀、钢印和铭牌位置不能喷涂。
- High and low voltage PDUs, and vent valve, embossing seal and nameplate of the motor.

Painting is not allowed in these areas.

1.4.6 焊接时注意事项

1.4.6 Precautions for welding

- 焊接时，必须完全断开蓄电池上的正、负极电源线接头；
- For welding, the positive and negative power cable connectors of the battery must be completely disconnected;
- 焊接时，必须将高压配电盒上主正主负 MSD 拔掉；同时保证焊接时，不要有杂质进入高压箱 MSD 位置。焊接时需保证焊接焊渣等杂质不碰触、不掉落至电池箱体等高压部件上；电池系统箱体等部件完全不允许与热源接触；焊接时需做好高压部件防护；
- Before welding, unplug the main positive MSD and main negative MSD on the high-voltage distribution box; prevent foreign matters from entering the MSD position of the high-voltage distribution box during welding. During welding, prevent foreign matters such as welding slag from contacting or fall onto high-voltage components such as the battery box; completely prevent components such as battery system box from coming in contact with heat sources; during welding, take appropriate protection measures for high-voltage components;
- 关掉启动开关，因为车辆装备有大量电器，在焊接过电流时易损坏；
- Turn off the ignition switch, because the vehicle is equipped with a large number of electrical devices, which are easy to be damaged when welding overcurrent occurs;
- 严格避免水和潮湿；
- Strictly avoid water and moisture;
- 焊接后不允许剧冷；
- Rapid cooling is not allowed after welding;
- 焊接时应防止焊接飞溅损坏线束、油管、橡胶、树脂部件；
- During welding, welding spatters shall be prevented from damaging harnesses, fuel/oil pipes, rubber and resin parts;
- 施焊前应去除表面涂层；
- Surface coatings shall be removed before welding;
- 车架一般采用高强度钢，施焊时应事先预热，同时使用低氢焊条。

- The frame is generally made of high-strength steel, which shall be preheated in advance for welding. Low-hydrogen welding rods shall be used.

1.4.7 三电系统改装注意事项

1.4.7 Precautions for modification of EIC system

- 改装时，不允许带电操作，钥匙要处于 OFF 档。同时要拔掉高压箱 MSD（高压箱位于驾驶室下部位置），然后再卸开电池 MSD（电池端 MSD 位于电池箱体上，为螺栓固定状态）（样车恢复时先装电池 MSD，然后安装高压箱 MSD）。
- It is not allowed modification with vehicle in operation, and the ignition switch shall be in OFF position. At the same time, unplug the high voltage PDU MSD (the high-voltage PDU is located at the lower part of the cab), and then remove the HV battery MSD (the battery MSD is bolted on the battery case) (install the HV battery MSD first and then install the high voltage PDU MSD for restoring).
- 改装时防止高压线打折、损坏；
- Prevent high-voltage lines from being broken and damaged during modification;
- 改装时避免尖锐、锋利物碰触高压线束；
- Avoid sharp objects touching high-voltage harnesses during modification;
- 改装前必须将高压配电盒上主正主负 MSD 拔掉；
- Before modification, the main positive and main negative MSDs on the high-voltage PDU must be unplugged;
- 高压线束必须维持原布局，不可随意更改走向；
- High voltage harnesses must be kept in the original layout, and their routing shall not be changed without authorization;
- 高压接插件插拔时需将锁止装置解锁时方可插拔；
- Locking devices shall be unlocked for plugging and unplugging high-voltage connectors;
- 高压线束安装时需用专用耐高压、耐绝缘管夹；
- Special high-voltage-resistant and insulating pipe clamps are required for installation of high-voltage harnesses;

- 高压接插件安装时应保证插头插座在一直线，防止顶翻防水圈；
- When installing high-voltage connectors, ensure that the plug and socket are in a straight line to prevent the waterproof ring from turning over;
- 改装过程中不允许对高压零部件进行私自拆盖处理；
- During modification, covers of high-pressure parts shall not be removed without permission;
- 除设计预留接口外不允许私自增加或改动新能源任何部件；
- Except for reserved interfaces in design, do not add or change any components of new energy vehicles without permission;
- 针对有预留接口按照车型配电容量及机械性能进行改制；
- Reserved interfaces can be modified according to the vehicle model, PDU capacity and mechanical performance;
- 所有高压部件不能承受重量，不能在新能源零部件上方增加重物；
- No high-voltage components shall bear weight, and no heavy objects shall be added above components for new energy vehicles;
- 新能源部件支架均按照部件重量和应力进行匹配，所有新能源部件支架不能改制，不能在支架上增加重物；
- Component brackets for new energy vehicles are matched according to the weight and stress of the components. No component brackets for new energy vehicles shall be modified and no heavy objects shall be added to the brackets;
- 电池组周围不能有明火（电焊等）、高温烘烤（烤漆房），同时不能紧靠高温辐射部件；
- There shall be no open flame (electric welding, etc.) and high-temperature baking (baking booth) around the battery pack, and the battery pack shall not be close to high-temperature radiant components;
- 改制后车辆车中不能超过车辆最大牵引力要求，否则对电驱动系统会造成较大伤害；
- After vehicle modification, the maximum traction force of the vehicle shall not be exceeded, otherwise it will cause great damage to the electric drive system;

- 改制车辆不能在高压线束上捆绑或约束其他形式的电缆或拉力较大钢缆；
- For vehicle modification, other cables, or wire ropes with large tension, shall not be bound or tied on high-voltage harnesses;

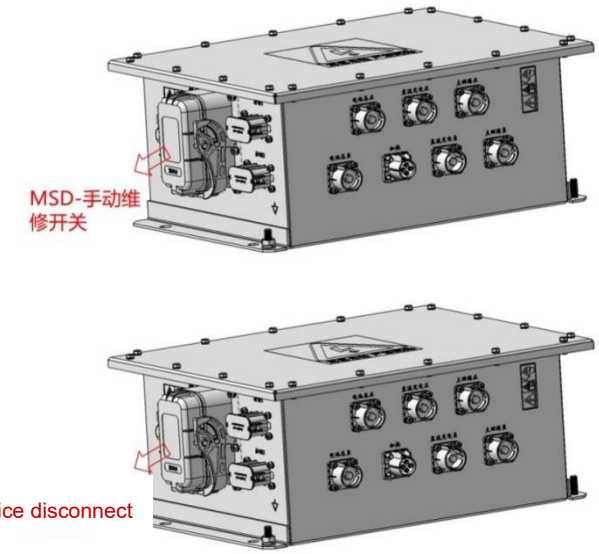


图 1-4 高压箱 MSD-手动维修开关示意图

Fig. 1-4 Schematic diagram of high voltage PDU MSD

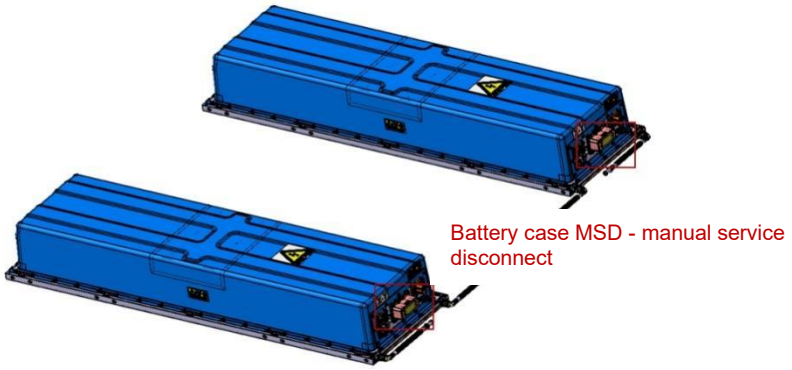


图 1-5 电池箱 MSD-手动维修开关示意图

Fig. 1-5 Schematic diagram of battery case MSD

- 对于车辆久置：
- For vehicles not used for a long time:

车辆久置（存放天数大于 15 天），电池存放的最佳 SOC 区间为 40%~80%；

If the vehicle is not in use for a long time (more than 15 days), the optimal SOC range for stored battery is 40%～80%;

电池系统的存放环境要求通风、干燥、不受阳光直晒、不受雨淋、远离热源；

The storage environment of the battery system should be well-ventilated, dry, free from direct sunlight, rain, and away from heat sources;

车辆必须每 1 年或 2 万公里做一次“ 电池保养” ， 防止造成电池损伤；

The battery maintenance must be carried out every year or 20,000km whichever come first to prevent battery damage;

久放车辆首次使用前，为激活电池系统需至少做一次“电池保养”，以恢复电池的性能到最佳状态。

Before vehicle use for the first time after storage for a long time, "battery maintenance" should be done at least once to activate the battery system to restore its performance to the best state.

- 电池保养方法：
- Battery maintenance method:

1、调整电池电量（SOC）在 25%~40%区间;

1. Adjust the battery power (SOC) in the range of 25%~40%;

2、保持车辆上高压状态，静置 12~15 小时，期间无需人工值守。

2. Turn on the high-voltage power supply of vehicle, and set it aside for 12-15 hours, without the need for attended personnel.

3、静置结束后需进行一次满充电。

3. A full charge is required after soaking.

执行操作步骤 3 期间，不允许使用车辆或任何用电设备。

In step 3, the vehicle or any electrical consumer shall not be used.

1.4.8 动力传动

1.4.8 Powertrain

- 不允许用户自行加长或截短传动轴。
- Users shall not extend or cut off the drive shaft without authorization.

1.4.9 动力附件

1.4.9 Powertrain accessories

冷却系统禁止改装，其他改装应避免与冷却系统中冷却模块、副水箱、水泵、管路支架等部件发生动静态干涉，同时须为冷却系统各部件留出维修空间。

It is forbidden to modify the cooling system. Other modifications should avoid dynamic and static interference with the cooling module, expansion tank, coolant pump, pipeline bracket and other components in the cooling system. At the same time, maintenance space should be reserved for all components of the cooling system.

- 动力悬置系统禁止改装，其他改装不得出现与悬置零部件、相关标准件发生动静态干涉现象，同时须为动力悬置软垫、支架支撑等留出操作空间。
- It is forbidden to modify the powertrain mounting system. Other modifications should avoid dynamic and static interference with the mounting parts and related standard parts. At the same time, operating space shall be reserved for the powertrain mounting cushion and bracket support.

第二章 汽车主要技术参数

Section 2 Main Technical Parameters

本章介绍北汽福田汽车股份有限公司轻卡出口纯电动系列车型的底盘尺寸和参数，

以供广大用户和改装厂进行选型和改装。

This section introduces the chassis dimensions and parameters of light-duty electric trucks of Beiqi Foton Motor Co., Ltd., for the selection and modification of users and modification factories.

2.1 载货车底盘尺寸参数

2.1 Dimensions of truck chassis

2.1.1 BJ1045EVJAD、BJ1045EVJAR2、 BJ1045EVJAR3 **载货车 (纯电/单排) 底盘尺寸参数**

2.1.1 Chassis dimensions of BJ1045EVJAD, BJ1045EVJAR2 and BJ1045EVJAR3 **trucks (pure electric/single cable)**

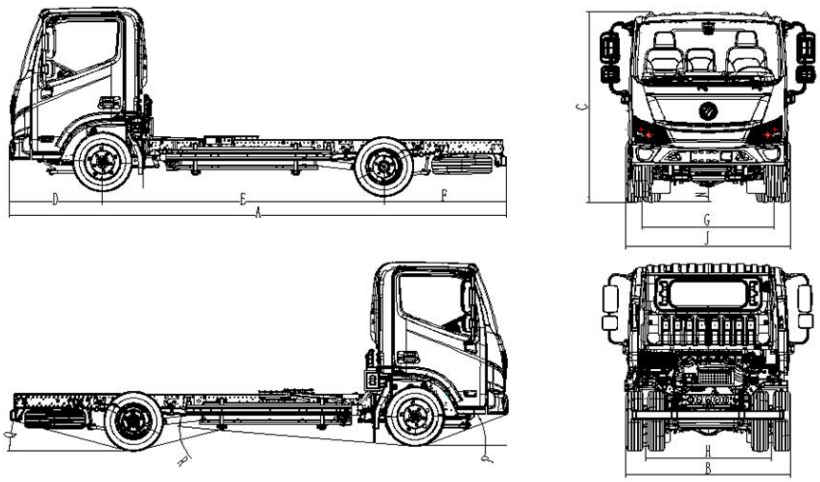


图 2-1

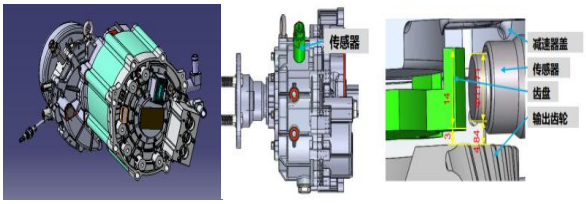
Fig. 2-1

车辆 *Vehicle*	*Dimension* *Wheelbase 3360*
A (Length, mm)	5960
B (Width, mm)	1960
C (Height, mm)	2210
D (Front overhang, mm)	1110
E (Wheelbase, mm)	3360
F (Rear overhang, mm)	1490
G (Axle track of front axle, mm)	1590
H (Axle track of real axle, mm)	1497
J (Width of the widest real axle, mm)	1960
N (Min. of ground clearance, mm)	154
P (Approach angle, °)	21.4
Q (Department angle, °)	14.8
R (Ramp angle, °)	16.2

2.2 电机技术参数

2.2 Technical parameters of motor

车型/参数 Model/parameter	BJ1045EVJAD/ BJ1045EVJAR2/ BJ1045EVJAR3
电机额定功率（kW） Rated power of motor (kW)	64
电机峰值功率（kW） Peak power of motor (kW)	115
峰值功率持续时间(s) Duration of peak power (s)	30
电机输出峰值扭矩（Nm） Peak output torque of motor (Nm)	300
电机输出峰值转速（rpm） Peak output speed of motor (rpm)	12000

电机峰值相电流（A） Peak phase current of motor (A)	380
电机线反电势（Vrms） Back EMF of motor line (Vrms)	502
电机防水等级 IP rating of motor	IP67
电机绝缘等级 Motor insulation class	H
电机总成重量（kg） Weight of motor assembly (kg)	84
示意图 Schematic diagram	

2.3 电机控制器技术参数

2.3 Technical parameters of motor control unit (MCU)

车型 Vehicle model	BJ1045EVJAD
型号 Model	FTIVT200
冷却方式 Cooling method	液冷 Liquid-cooling
控制方式 Control mode	转矩控制 Torque control
额定电流（A DC） Rated current (A DC)	180
最大工作电流（A DC） Maximum operating current (A DC)	360A
额定电压（V DC） Rated voltage (V DC)	540
最低工作电压（V DC） Minimum working voltage (V DC)	350
最高工作电压（V DC） Maximum working voltage (V DC)	650

2.4 电池技术参数

2.4 Technical parameters of battery

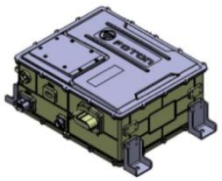
Vehicle model	BJ1045EVJAD
电池系统类型	磷酸铁锂

Energy (KWh)		81.14
容量/电压（Ah/V）		150/540.96
产品组合方式		2 箱电池，1 并 168 串 2 battery packs, 1 cell in parallel and 168 cells in series
冷却形式 Cooling method		液冷 Liquid-cooling
充电方式（快充，环境温度25℃） Charging method (fast charging, environment temperature 25℃)	充电电压（V） Charging voltage (V)	550DC
	充电电流（A） Charging current (A)	202
	充电时间（h） Charging duration (h)	1
慢充，车载充电机为 11kW，环境温度 25℃） Slow charging, 11kW on-board charger, ambient temperature 25℃	输入电压（V） Input voltage (V)	220（三相四线） 220 (three-phase four-wire)
	最大输入电流（A） Maximum input current (A)	32（单相）/18（三相） 32 (single-phase)/18 (three-phase)
	输出电压（V） Output voltage (V)	400-670
	最大输出电流（A） Maximum output current (A)	23
	充电时间（h） Charging duration (h)	7（SOC: 20%-100%）

2.5 电控配电单元技术参数

2.5 Technical parameters of PDU

项目 **Item**		电力电子单元 **PEU**
结构尺寸 Structural dimension		422*368*193
输入电压范围 Input voltage range		350V-650V
持续/峰值输出电流 Duration/peak output current		180/380Arms@10s
最高效率 Maximum efficiency		≥98%
冷却方式 Cooling method		水冷 Water cooling
防护等级 IP rating		IP67
低压控制电压 Low voltage control		24V
上装配电 Bodywork PDU	取电方式 Power supply mode	从整车直流高压回路取电，直流高压电 HVDC power from HVDC circuits of complete vehicle
	最大支持功率 Max. operating power	15kW
	最大支持电流 Max. operating current	40A
	回路保险 Circuit fuse	63A
	预充 Pre-charging	None
重量 Weight		27kg

示意图 Schematic diagram	

第三章 改装相关参数计算

Chapter 3 Calculation of Modification-related Parameters

3.1 轴距及后悬

3.1 Wheelbase and rear overhang

3.1.1 理论轴距的计算

3.1.1 Calculation of theoretical wheelbase

汽车前轴中心至后轴中心的水平距离，如下图:

The horizontal distance between the center of the front axle and the center of the rear axle is shown in the following figure:

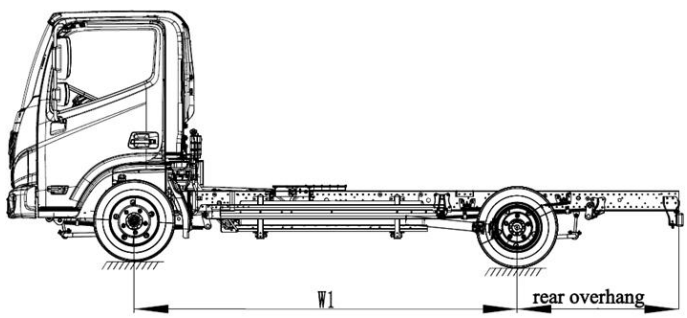


Fig. 3-1

理论轴距=W1

Theoretical wheelbase = W1

3.1.2 汽车的后悬

3.1.2 Rear overhang

车辆后悬应小于或等于轴距的 65%，

The rear overhang of the vehicle should be less than or equal to 65% of the

wheelbase

3.2 重心

3.2 Center of gravity

3.2.1 确定最佳重心位置的要点

3.2.1 Key points for determining the optimal center of gravity position

上装和装载货物的最佳重心位置是根据最大允许轴荷确定的。在计算时必需考虑底盘上的重物如电瓶箱、电池组和备胎架是否发生位置的变化，以及是否增添了其他重物如随车起重机或副水箱等。

The optimum center of gravity position of the bodywork and loaded cargos is determined according to the maximum allowable axle load. For calculation, it is necessary to consider the positions change of heavy objects on the chassis such as battery case, battery pack and spare tire carrier , and whether other heavy objects such as on-board crane or expansion tank are added.

表 3-1

Table 3-1

汽车重心高度（mm） Height of center of gravity of vehicle (mm)	重心距前轴距离（mm） Distance between center of gravity and front axle (mm)	重心距纵向中心面距离（mm） Distance between center of gravity and longitudinal center plane (mm)
579（满载状况下重心最大高度） 579（Maximum height of center of gravity at full load）	1322（满载状况下重心最大距离） 1322（Maximum height of center of gravity at full load）	偏右 5 5 towards the right side

当改装后的整车最大总质量小于前后轴允许的最大轴荷之和时，建议根据具体情况充分利用前轴的最大轴荷，但不得超过最大设计总质量。

When the GVW of the complete vehicle after modification is less than the sum of the maximum allowable axle loads of the front and rear axles, it is suggested that the maximum axle load of the front axle shall be fully utilized according to the specific situation, but the designed GVW shall not be exceeded.

机动车在空载和满载状态下，整车整备质量和总质量应在各轴之间合理分配，轴荷应在左右车轮之间均衡分配。

When the power-driven vehicle is under no load or full load, the unladen kerb mass and GVW of the complete vehicle shall be reasonably distributed between the axles, and the axle load shall be evenly distributed between the left and right wheels.

在各种负荷情况下，机动车在空载和满载状态下，转向轴轴荷（或转向轮轮荷）分别与该车整备质量及总质量的比值应大于或等于 20%。

When the power-driven vehicle is under no load or full load, the ratio of the steering shaft load (or steering wheel load) to the unladen kerb mass and GVW shall be not less than 20%.

汽车或汽车列车驱动轴的轴荷不允许小于汽车或汽车列车最大允许总质量的25%。

For vehicles or combination vehicles, the axle loads of drive axles shall not be less than 25% of the GVW of the vehicles or combination vehicles.

确定了改装后专用车辆的轴荷后，根据轴荷分配计算出上装的最佳重心位置。

After the axle load of a modified special vehicle is determined, the optimum center of gravity position of the bodywork is calculated according to the axle load distribution.

3.2.2 重心高度的计算

3.2.2 Calculation of height of center of gravity

为方便改装厂家对改装后的整车做必要的计算，改装厂家可根据上装改装情况计算出货箱中心到车架上翼面的距离，然后根据第二章“后桥中心处车架上平面至地面高度（空载）”就可计算出改装后车型的底盘重心高度。

In order to facilitate modification factories to make necessary calculations for modified complete vehicles, modification factories can calculate the distance between the center of the cargo body and the upper wing surface of the frame according to the modified bodywork, and then calculate the height of chassis center of gravity of modified vehicles according to Section 2 "Height of upper plane of frame at center of rear axle off the ground (no load)".

改装后的车辆重心在汽车纵向方向位置应根据前、后轴荷确定，车辆重心应尽可能低，以保证改装车有较好的纵向和侧向的稳定性，改装时应注意车轮弹跳的空间。

For a modified vehicle, the position of the center of gravity in the longitudinal direction shall be determined according to the front and rear axle loads, and the center of gravity of the vehicle shall be as low as possible to ensure better longitudinal and lateral stability of the modified vehicle. Pay attention to the space for wheel bouncing during modification.

由于轮胎气压及零部件的公差，底盘重心高度的公差为±30mm。

Due to the tolerance of tire pressure and parts, the tolerance of height of chassis center of gravity is 30mm.

改装后空、满载时的整车高度的计算方法就是将底盘质量、上装质量、设计装载质量和其他附加质量分别乘以各自的重心高度并且相加之后除以当时的总质量而得出的。

The vehicle heights with no/full load after modification are calculated by multiplying the chassis mass, bodywork mass, designed loading mass and other additional mass by heights of their respective center of gravity, adding the products and obtaining the sum, and dividing this sum by the total mass.

3.3 质量利用系数

3.3 Mass utilization factor

质量利用系数体现了底盘及上装在减轻自重，合理利用材料方面的设计和制造能力。同类型车型该系数越大越好。

The mass utilization factor reflects the design and manufacturing ability in rational utilization of materials by reducing the dead weights of chassis and bodywork. For the same vehicle model, large values of this factor are preferred.

$$f_{mass} = \frac{LD_P}{G_E}$$

公式中：fmass 质量利用系数、LDP 最大允许装载质量 GE 汽车空载质量

Where: f_{mass} mass utilization factor, LD_P maximum allowable loading mass, G_E empty vehicle mass

3.4 最高车速

3.4 Maximum vehicle speed

在剩余功率不为零的情况下，最高车速可按下式计算。

When the excess power is not zero, the maximum vehicle speed can be calculated according to the following formula.

$$V_{\max} = \frac{0.377 \times n_E \times r_1}{i_G \times i_0}$$

公式中： $V_{\max}$ 最高车速、 n_E 电机峰值转速、 r_1 胎滚动半径、 i_G 减速器速比、 i_0 驱动桥速比

Where: $V_{\max}$ maximum vehicle speed, n_E peak speed of motor, r_1 tire rolling radius, i_G Motor reducer ratio, i_0 drive-axle ratio

在出现剩余功率为零的情况时，最高车速可根据《汽车理论》进行详细计算。

When the excess power is zero, the maximum vehicle speed can be calculated in detail according to the Automobile Theory.

3.5 最大爬坡度

3.5 Maximum gradeability

最大爬坡度可按下列公式分三步计算得出：

The maximum gradeability can be calculated in three steps according to the following formula:

$$F_{\tan} = \frac{M_{E\max} \times i_G \times i_0 \times \eta_G \times \eta_0}{r_2}$$

$$\alpha = \arcsin\left(\frac{F_{\tan}}{G_{\max}}\right)$$

最大爬坡度（%）= 100×tan a

Maximum gradeability (%) = 100 × tan a

式中： $M_{E\max}$ 电机最大扭矩、η_G 变速器机械效率、η_0 驱动桥机械效率、r_2 轮胎静力半径、$F_{\tan}$ 驱动力

Where: $M_{E\max}$ maximum torque of motor, η_G mechanical efficiency of transmission, η_0 mechanical efficiency of drive axle, r_2 static radius of tire, $F_{\tan}$ driving force

第四章 电器改装

Section 4 Modification of Electrical System

4.1 高压取电改装

4.1 Modification of HV power interface

电力电子单元设置有取电接口，可使用高压接插件连接此接口，为专用设备提供高压直流电源。

Power interfaces are set for electrical and electronic units, and can be connected using high-voltage connectors to provide HVDC power supply for specialized equipment.

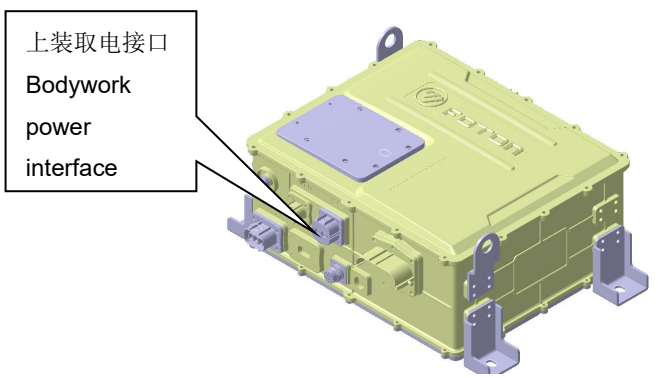


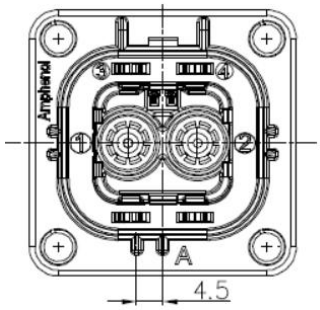
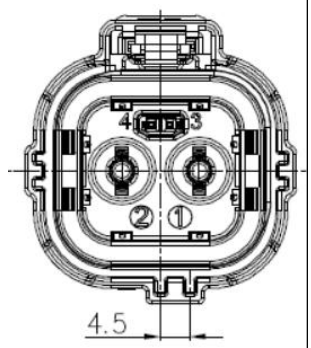
图 4-1 高压取电接口位置示意图

Figure 4-1 Location of HV power interface

4.1.1 高压直流取电接口参数

4.1.1 Parameters of HVDC power interface

高压接插件型号 HV connector model		插座 Socket	插头 Plug
电力电子单	厂家及型号	插座：安费诺	插头：安费诺

元零部件号：L121300000215，整车为欧标充电资源号 Part number of electronic an electric unit: L121300000215, European standard charging resource number	Manufacturer/model	HVC2PG36MV110 Socket: Amphenol HVC2PG36MV110	HVC2PG36FS106 Plug: Amphenol HVC2PG36FS106
	脚位定义：插座左①+右②-，信号线为互锁信号 Definition of pins: socket, left ① + right ② -, signal line is interlocking signal line		

高压直流取电接口的输出功率取决于动力电池的荷电状态（SoC），以5045XXYEVD00D001 车型为例，动力电池的电压在 420-613V DC 之间波动，造成高压直流取电口可用功率变化：

The output power of the HVDC power interface depends on the State of Charge (SoC) of the battery. Taking 5045XXYEVD00D001 as an example, the voltage of the battery fluctuates within 420-613V DC, resulting in changes in the available power of the HVDC power interface:

插座型号 **Socket model**	母线电压 **Bus Voltage**	持续输出能力 **Continual improvement Output capacity**	持续输出电流 **Continual improvement Output current**	短时输出能力 **Instantaneous Output capacity**	短时输出电流 **Instantaneous Output current**	允许峰值输出时间 **Allowed peak Output time**
安费诺 HVC2PG36MV110 Amphenol	420V DC	12kW	30A	21kW	50A	60S
	613V DC	18kW		30kW		

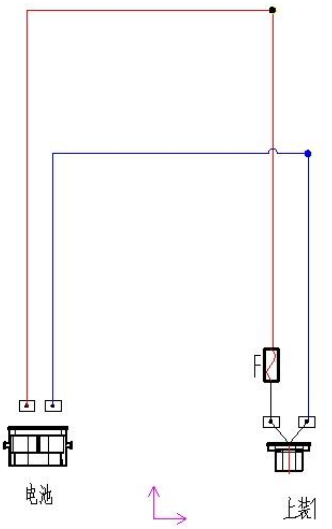
HVC2PG36MV1 10						

4.1.2 高压直流取电原理

4.1.2 Working principle of HVDC power interface

如高压原理图所示，高压直流取电接口通过 PEU 内部铜排直接连接 PEU 电池输入口，故整车底盘上电后，上装即有高压输出。高压直流取电正极一路配有 1 个 63A 保险。

As shown in the high-voltage power supply diagram, the HVDC power interface is directly connected to the PEU battery input port through the busbar in the PEU. Therefore, after the chassis of the vehicle is powered on, HV output is available for bodywork. The positive electrode of the HVDC power interface is equipped with one 63A fuse.



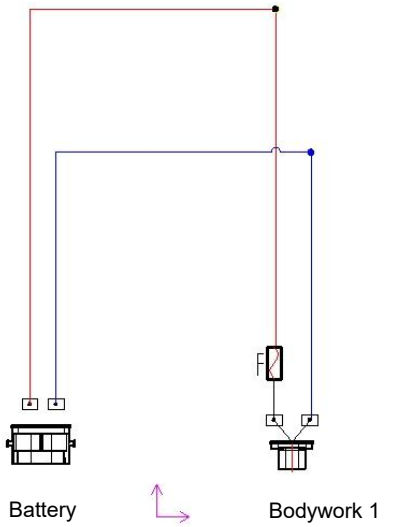


图 4-2 高压直流取电接口高压原理图

Figure 4-2 High-voltage power supply diagram of HVDC power interface

4.1.2 高压直流取电注意事项

4.1.2 Precautions for HVDC power

PEU 上装取电接口出厂带有临时堵头，可提供车辆由下线到运输至改装厂期间的临时防护，但严禁车辆销售后不安装上装，只带堵头行驶运行。

When the vehicle is delivered, the bodywork power interface of PEU comes with a temporary plug, which can provide temporary protection for the vehicle from EOL, transportation, to arrival at the modification factory. However, it is strictly forbidden for vehicles after sale to run without bodywork and only with the plug.

改装过程中请注意高压安全：安装上装配电线束时，请提前关闭车辆钥匙电并拔掉 MSD，静置 5min，以保证无整车高压，再插拔上装取电接口插头；改装过程中，注意保持上装取电接口附近清洁、干燥。改装完成后，务必确认上装配电线束两侧插头均已牢固可靠连接，锁止机构已锁止，严禁在插头拔掉状态下车辆上高压。

Pay attention to high voltage safety during modification: when installing the PDU harness of the bodywork, turn off the ignition switch of the vehicle in advance and unplug the MSD, and let it stand for 5 minutes to ensure that the complete vehicle has no high voltage, and then plug and unplug the connector at the bodywork power

interface; During modification, pay attention to keeping the vicinity of the bodywork power interface clean and dry. After the modification is completed, make sure that the connectors on both sides of the bodywork PDU harness are firmly and reliably connected, and the locking mechanism is locked. It is strictly forbidden to switch on the high voltage power supply of the vehicle when the connectors are unplugged.

4.2 低压取电改装

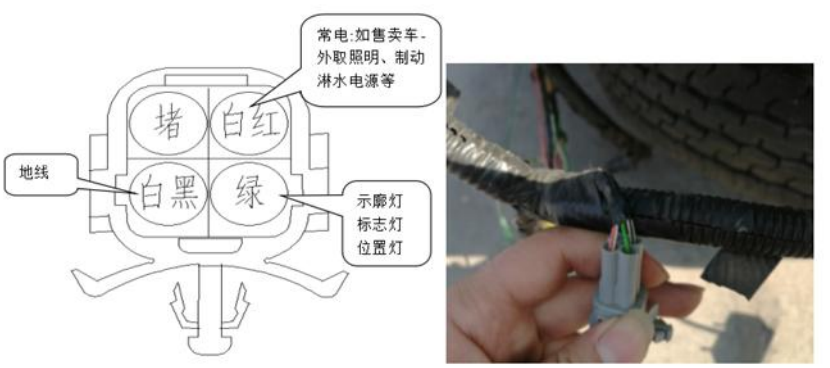
4.2 Modification of LV power interface

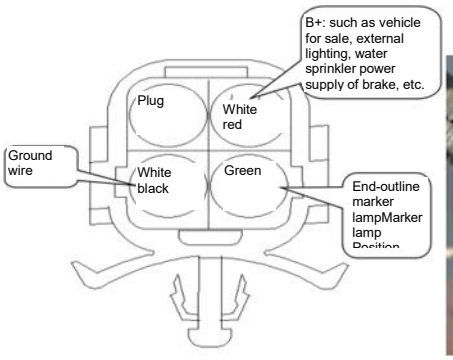
取电接口是为专用设备提供电源的装置。加装用电设备时需向福田提供详细的电器原理图，获得福田许可后方可执行。

The power interface provides power supply for special equipment. To add electrical equipment, it is necessary to provide detailed electrical schematic diagrams to the OEM. The electrical equipment can only be added after the permission of the OEM is obtained.

只允许从底盘预留接口上取电，用电负荷不能超过限定值；另行取电时，线路中必须有可靠的过流保护装置，防止对整车电路产生损伤,线束走向及卡固规范合理，远离热源避免干涉及摩擦，必要时增加隔热装置、护套或套管。

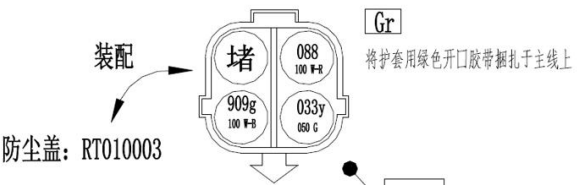
Power can only be supplied from the reserved interfaces on the chassis, and the power load shall not exceed the limited values; in case that power is supplied from other sources, reliable overcurrent protection devices must be provided in the circuits to prevent damage to circuits of the complete vehicle. The direction and clamping of harnesses shall be reasonable. Keep harnesses away from heat sources to avoid interference and friction, and add heat insulation devices, sheaths or sleeves when necessary.





⑫电路改装接口

护套：PP0427307 THB
端子：PP0117101（0.5-1.0）THB
防水堵：DD3402
防水栓：PP2011102 THB
尾盖：WG0005-PKC或者27-000164宏致

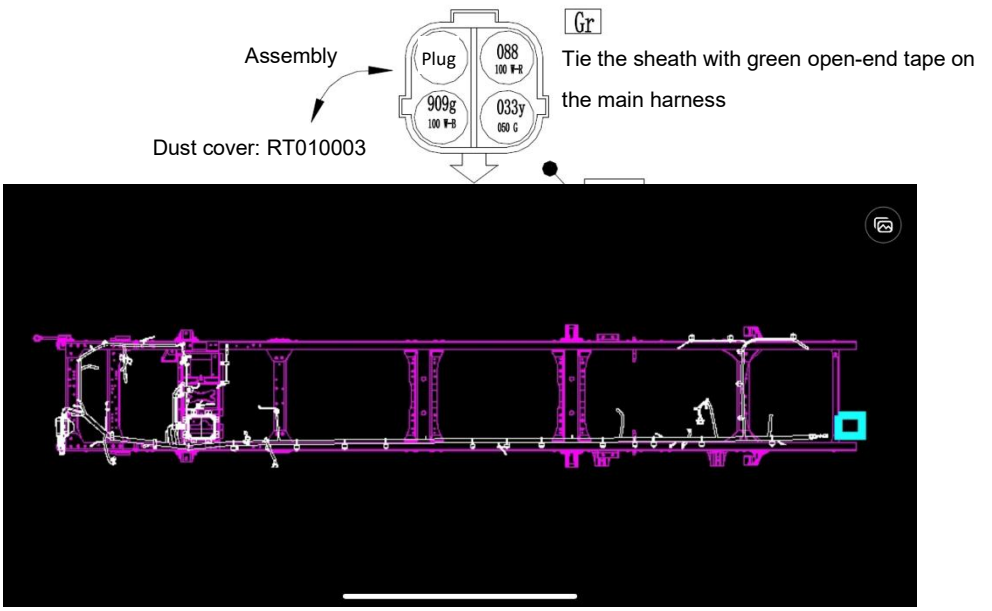


F2 Circuit modification interface

Sheath: PP0427307 THB

Terminal: PP0117101 (0.5-1.0) THB

Waterproof plug: DD3402



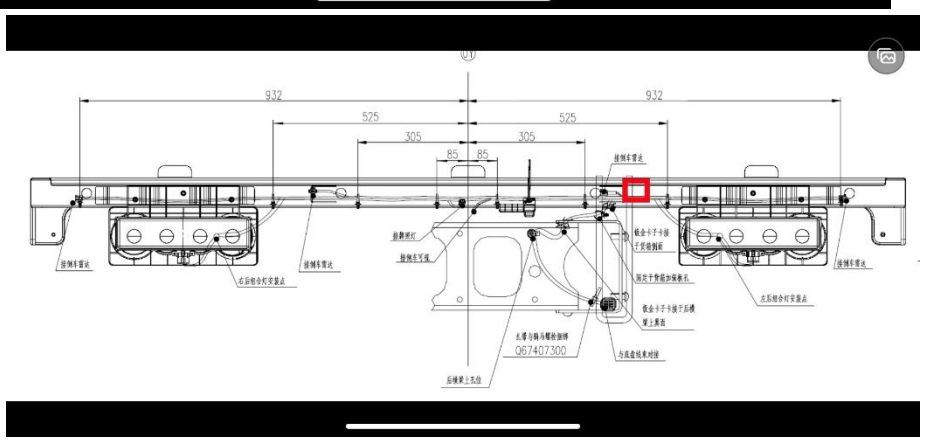


图 4-2 上装低压取电示意图

Figure 4-2 Installation of bodywork LV power interface

底盘尾部线束已预留上装改装专用电源接口，并已配备专用保险保护，预留改装接口中常电配有 15A 保险丝，车型增加负载额定值不得高于 150W。改装接口中示廓灯 、标志灯、位置灯与车身小灯共用保险，增加负载额定值不得高于 50W。

A special power interface for bodywork modification is reserved on the rear harness of the chassis, and a special fuse is provided for protection. B+ pin in the reserved modification interface is provided with a 15A fuse, and the added load rating of the vehicle model shall not be higher than 150W. In the modified interface, end-outline marker lamps, marker lamps, position lamps and clearance lamps share a fuse, and the added load rating shall not be higher than 50W.

上装改制接线必须采用日标或德标汽车专用导线，并外加波纹管防护，在线束走向每间隔最少 300mm 用扎带可靠固定，在穿孔处用橡胶圈防护，避免出现磨损短路等异常故障。

For wiring of the bodywork modification, special automobile wires meeting Japanese or German standards must be used, and must be protected with bellows. Harnesses shall be reliably fixed with binding straps at an interval of at least 300mm in the harness direction, and protected by rubber rings at through holes to avoid faults such as wear and short circuit.

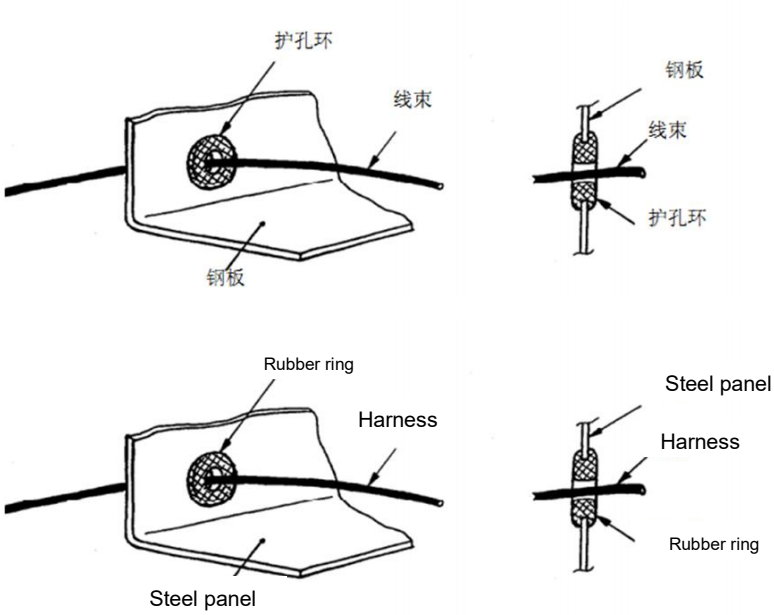


图 4-3 上装低压取电用橡胶圈防护示意图

Fig. 4-3 Schematic diagram of rubber ring for bodywork LV power harnesses

4.2.1 低压取电接口选择与改装

4.2.1 Selection and modification of LV power interface

用户和改装厂家可根据需求选取取电接口的型式，取电接口的选择应主要考虑以下几个方面：

Users and modification factories can select the type of power interface according to their needs. The following aspects shall be mainly considered:

取电接口位置合理，便于检查维修；

The position of the power interface shall be reasonable, and convenient for inspection and maintenance;

取电接口线经应与上装电器功率电流匹配；

The wire diameter of the power interface shall match the power and current of electrical consumers in the bodywork;

取电接口预留功能，用户和改装厂家应有明确输入；

The function of the reserved power interface shall be clearly marked by the users and modification factories;

不允许从取电接口之外的地方改装，避免整车用电风险；

Do not make modification from places other than the power interface, for fear of the electrical risk of the complete vehicle;

改装选取取电接口时要注意：

Pay attention when modifying and selecting the power interface:

所有外接用电设备、线束、插件等应满足防水等级要求；

All external electrical equipment, harnesses, connectors, etc. shall meet the requirements of waterproof rating;

所有改装设备及线束应避开高温运动部件；

All modified equipment and harnesses shall avoid high temperature moving parts;

不允许随意插拔除取电接口外其他整车线束插接件；

Do not plug or unplug any vehicle harness connectors without authorization,

except the power interface;

严格按照要求选装插件，改装用线束满足车规级要求，底盘改装线束外部防护选用波纹管防护并固定到位，驾驶室内部采用绒布胶带全缠方式防护并固定到位。

Connectors shall be selected in strict accordance with the requirements, and harnesses used in modification shall meet the requirements of automotive grade. Harnesses for chassis modification shall be protected with bellows and fixed in place, and all interiors of the cab shall be fully wrapped with flannelette tape for protection and fixed in place.

4.3 电器系统的改装

4.3 Modification of electrical system

底盘的电气系统原理复杂，故如需对电气系统进行改装时，应仔细阅读车辆的电气系统原理图，理解整车电气系统的原理，以免造成差错。

Since the principle of electrical system of chassis is complex, when the electrical system needs to be modified, the relevant personnel should carefully read the schematic diagram of the electrical system of the vehicle and understand the principle of the electrical system of the vehicle to avoid errors.

4.3.1 电气系统改装要求

4.3.1 Requirements for modification of electrical system

①在对车辆电气线束进行改装前，要求必须断开电源总开关,并断开电瓶正负极电源线，防止改装时短路故障烧毁线束或其他电器设备。

① Before modification of the electrical harness of the vehicle, it is required to turn off the main power switch and disconnect the positive and negative power lines of the battery to prevent burnout of the harness or other electrical equipment due to short circuit during modification.

②纯电动系列产品均为单线制，负极搭铁。改装油罐车等专用车辆时，应设置专门的接地线，不可将车架作为接地线；

② The electric truck products shall be of single-wire system, and the negative pole shall be grounded. For modification of special vehicles such as tank trucks, special ground wires shall be set, and the frame shall not be used as a ground wire;

③点烟器及电源插座电压为 24~27.5V，外接设备不得大于 120W，负载过大可能会烧毁保险及线束，引起火灾。

③ The voltage of cigar lighter and power socket shall be 24~27.5V, and the power of external equipment shall not be greater than 120W. Excessive load may burn out the fuse and harness and cause a fire.

④禁止从继电器盒处、蓄电池桩头或其他电源线剖开取电连接改装负载设备，禁止从单块蓄电池取 12V 电源，会导致电瓶内阻变化长时间不平衡充放电导致蓄电池损坏。

④ It is forbidden to cut the power connection and modify load equipment from the relay box, battery terminal or other power lines, or take 12V power from a single battery, which will lead to changes in internal resistance of the battery and long-term unbalanced charging and discharging and thus cause battery damage.

⑤当出现保险熔断，应先进行故障排查，排除故障后更换标签规定的保险，不得更换比规定值大的保险丝，不允许用铜丝或其他金属导体代替保险。

⑤ If the fuse is blown, troubleshooting shall be carried out first, and it shall be replaced with a fuse specified on the label after troubleshooting. Fuses with rating greater than the specified value shall not be used, and copper wires or other metal conductors are not allowed to replace fuses.

⑥禁止使用黑色导线充当电源线，极易引起危险的维修操作。

⑥ It is forbidden to use black wires as power lines, because this is very easy to cause dangerous maintenance.

⑦严禁采用短路“试火”的方法检修电路系统。

⑦ It is strictly forbidden to overhaul the circuit system with the short circuit or “test fire” method.

⑧如需更换灯具，更换的灯具功率应与原车灯具功率保持一致，否则导致仪表报欠载故障，如转向快闪、制动断丝等故障。

⑧ If a lamp needs to be replaced, the power of replacement lamp shall be consistent with that of the original lamp; otherwise, the instrument cluster will report underload, such as turn signal lamp flashing fast and brake lamp filament break.

⑨改装车材料需满足汽车环保及材料阻燃等级要求。

⑨ Materials of modified vehicles should meet the requirements for the automobile environmental protection and the flame retardant grade of materials.

⑩上装改制接线必须采用日标或德标汽车专用导线，并外加波纹管防护，在线束走向每间隔最少 300mm 用扎带可靠固定，在穿孔处用橡胶圈防护，避免出现磨损短路等异常故障。

⑩ For wiring of the bodywork modification, special automobile wires meeting Japanese or German standards must be used, and must be protected with bellows. Harnesses shall be reliably fixed with binding straps at an interval of at least 300mm in the harness direction, and protected by rubber rings at through holes to avoid faults such as wear and short circuit.

4.3.2 改装要求及责任判定

4.3.2 Modification requirements and liability judgment

整车线束、空调、暖风、蓄电池、灯具、音响、电器盒安装位置等与电器相关部件，严禁进行私自变更改装，如有特殊需求，由市场部门、规划部门经流程报批后输入设计部门，进行专用接口的预留。如私自改装引起的烧线、短路、断路、功能紊乱等故障由改装厂及用户承担一切责任。

It is strictly forbidden to change or modify the installation position of relevant parts of the electrical system without permission, such as harness, A/C, heater, battery, lamp, A/V and electrical box. In case of special requirements, the marketing department and planning department shall send them to the design department after approval, for reserving special interfaces. The modification factories and users shall bear all the responsibility for faults such as wire burnout, short circuit, open circuit and malfunction caused by unauthorized modification.

第五章 底盘的改装

Section 5 Modification of Chassis

各改装厂家根据改装车辆设计、安装的需要，改装应遵循第一章的改装总则。下面对于底盘改装过程中几种常见的操作加以说明。

According to the design and installation requirements of modified vehicles, modification factories shall follow the principles of modification in Section 1. Several common operations during chassis modification are described below.

5.1 驾驶室的改制

5.1 Modification of cab

福田轻卡出口（欧洲）纯电动车型不允许用户自行对驾驶室进行大的改动，在改制驾驶室过程中请注意以下几点：

Users are not allowed to make major changes to the cab of Foton light-duty electric trucks (exported to Poland) by themselves. During modification of cab, please pay attention to the followings:

- 驾驶室在切割和焊接时必须断开 ECU 电源，且不得损坏汽车底盘的电路、气路和油路等设备，焊接应符合焊接工艺，应保证整个驾驶室线性的流畅性、密闭性，必要时应作密封试验。

- During cutting and welding of cab, the ECU power supply must be switched off, and the electrical circuit, gas circuit and oil circuit of the vehicle chassis shall not be damaged; the welding shall accord with the welding process, the linear fluency and tightness of the whole cab shall be ensured, and the sealing test should be carried out if necessary.

- 改制不允许对车身骨架等主要承载件进行改制，避免影响车身强度。

- It is not allowed to modify main load-bearing parts such as body frame, to avoid affecting the strength of the body.

- 如原车电瓶箱、高压箱需移动时，应保证电路、气路的畅通，且不影响其它元件的性能。

- If the original battery case and high voltage PDU need to be moved, the unblocked electrical circuit and gas circuit shall be ensured without affecting the performance of other components.

5.2 车架的改制

5.2 Modification of frame

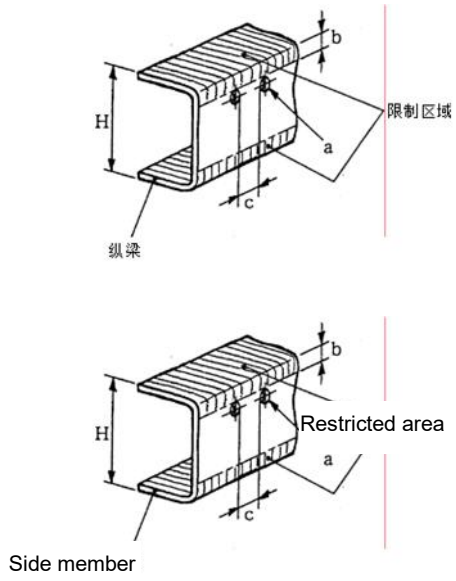


图 5-1 限制区域

Fig. 5-1 Restricted area

车型 Vehicle model	a（允许区域） a (allowed area)	b（限制区域） b (restricted area)	c（孔间距要求） c (hole spacing requirement)
M4 轻卡 M4 light-duty truck	孔径＜∮30 Hole diameter ＜ ∮ 30	25	>25

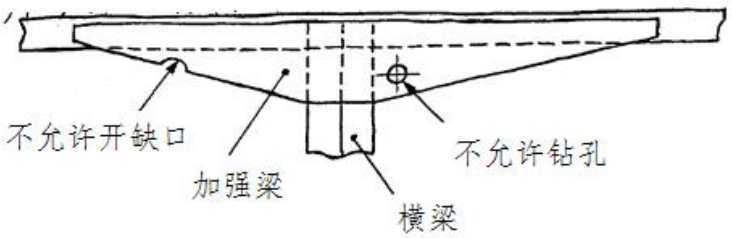
表 5-1 禁止在划线区域进行钻焊操作　　单位 mm

Table 5-1 Drilling and welding are prohibited in the marked area　　Unit: mm

车架是底盘最重要的承载部件，因此，特殊用途的改装会导致车架载荷条件的改变，甚至在载荷很小的条件下，每段应力增加都是变化的，这将导致车架损坏和断裂。因此，改装时必须注意如下事项。

The frame is the most important load-bearing component of chassis; therefore, modifications for special purposes will lead to changes in loading conditions of frame. Even under the condition of small load, the load is changed with stress increase of each segment, which will lead to the damage and fracture of the frame. Therefore, during modification, pay attention to the followings.

- 需开孔时必须钻孔（不允许用火焰吹孔）；
- When punching is required, drilling must be done (blowing holes with flame is not allowed);
- 焊缝为 30-50mm 时，间距需在 40mm 以上；
- When the size of welds is 30-50mm, the spacing should be more than 40mm;
- 开缺口可用砂轮机但不能用火焰吹；
- Notches can be made with a grinder instead of flame;
- 冷作采用铆钉；
- Rivets shall be used for cold work;
- 不允许在加强板上开缺口和钻孔。
- It is not allowed to make notches or drill holes in reinforcement plates.



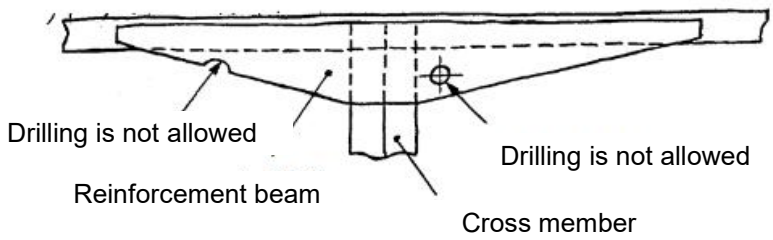


图 5-2 限制区域

Fig. 5-2 Restricted area

5.2.1 车架改制要求

5.2.1 Requirements for modification of frame

为了保证主车架的强度和刚度，原则上不允许在主车架纵梁上钻孔和焊接，尽量使用车架上原有的孔。

To ensure the strength and rigidity of the main frame, drilling and welding on the side member of the main frame are not allowed in principle, and the original holes in the frame shall be used as much as possible.

福田轻卡出口纯电动车型车架均为用高强度合金钢板板材冲压铆接而成的框架式结构。车架和整车其它部分共同组成了一个不可分割的整体，车架起着连接、承载、保护、隔振等作用。车架在设计、定型试验中证明车架和底盘的匹配是良好的，故对车架的改装不允许破坏车架的整体结构。加长、减短车架纵梁，增加、减少横梁数量，移动横梁的位置等改装我公司是不允许的。

The frame of Foton light-duty electric trucks shall be of frame structure stamped and riveted from high-strength alloy steel plates. The frame and other parts of the vehicle constitute an inseparable whole, and the frame plays the roles of connection, bearing, protection and vibration isolation. Since it is proved that the frame matches well with the chassis in design and approval tests, the modification of frame is not allowed to destroy the overall structure of frame. For our company, it is not allowed to lengthen or shorten the side member of the frame, increase or reduce the number of cross members, or move the position of cross members.

在车架上的任何机加工都必须考虑到对原有油漆的保护和后续修复，做好防锈处理是非常必要的。

For any machining on the frame, the protection of the original paint and subsequent repair must be considered, and antirust treatment is essential.

在专用车和改装车生产中，工作内容较多且较重要的是：专用装置在汽车上的连接和汽车原件的改制，特别是车架的改制。从以下几方面提出一些应该注意的事项。

In the production of special vehicles and modified vehicles, the connection of special devices on vehicles and the modification of original vehicle parts, especially modification of frame, involve much and more important work. Precautions are presented from the following aspects.

5.2.2 车架上的预留孔

5.2.2 Reserved holes in frame

福田轻卡出口纯电动系列车型在底盘车架上为连接上装预留了安装孔,这些孔已经针对载荷分布、底盘组件、操纵特性和稳定性等因素做了优化，上装连接时应优先使用预留孔。

Mounting holes are reserved in the chassis frame of Foton light-duty electric trucks for bodywork connection. These holes have been optimized for factors such as load distribution, chassis components, handling characteristics and stability. Priority shall be given to the use of the reserved holes during bodywork connection.

5.2.3在车架上加孔

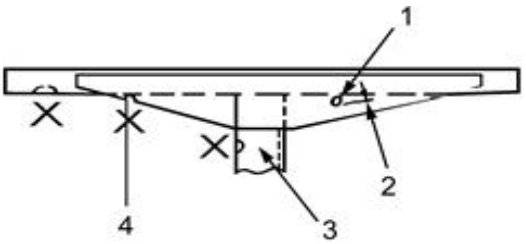
5.2.3 Making holes in frame

- 不得随意在车架上加孔。在纵梁的上下翼缘上加孔，更应慎重。应严格限制孔的数量和直径至最低水平。

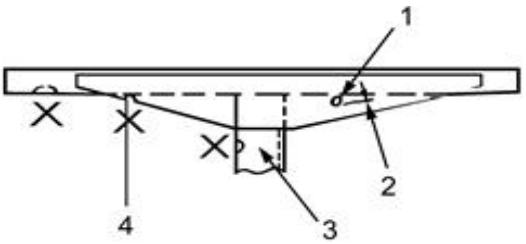
- Holes shall not be made in the frame without authorization. It shall be careful to make holes in the upper and lower flanges of side members. The number and diameter of holes shall be minimized.

- 在纵横梁连接处，严禁在其翼缘上加孔。在翼缘的其它部位加孔，应严格限制孔的直径，不大于φ13mm，且孔位不应距开口边太近(可稍偏向其腹板一侧)。更大的孔，只能加在纵梁腹板上， 并尽量接近腹板的中线。图 5-3

- It is strictly forbidden to make holes in the flange at the connection between the side member and the cross member. If holes are made in other parts of the flange, the diameter of the holes shall be not more than φ13mm, and the holes shall not be too close to the opening edge (they can be slightly tilted to their web side). Larger holes can only be made in the side member web, and should be as close to the center line of the web as possible. Fig. 5-3



1.钻孔的直径应限制　　3.不要在横梁上钻孔
2.最小距离30mm　　4.严禁在翼缘切口



3. The diameter of drilled holes shall be limited　　1. Do not drill holes in the cross member
4. Minimum distance 30MM　　2. It is strictly forbidden to cut the flange

图 5-3 限制区域

Fig. 5-3 Restricted area

- 在车架上加孔不得在车架腹板竖直方向钻孔，这样可能会在车架腹板上产生裂纹。特大的孔，只能加在腹板的中线上。图 5-4

- If holes are made in the frame, the holes shall not be drilled in the vertical direction of the frame web, which may cause cracks in the frame web. Extra large holes can only be made in the center line of the web. Fig. 5-4

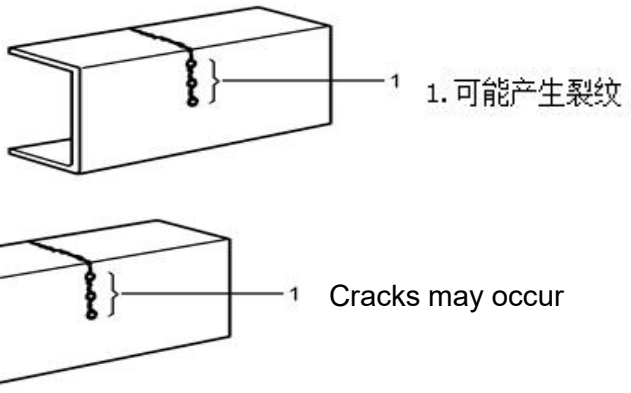


图 5-4 在车架上钻孔

Fig. 5-4 Drilling holes in frame

- 孔距最好保持在 40mm 以上，孔径大时，孔距也应相应加大。孔的加工精度愈高，零件疲劳强度也愈高，故应从工艺上制订适当的规范。腹板上的新钻孔必须远离原有的孔位或焊缝，否则腹板可能会产生裂纹。图 5-5

- It is best to keep the hole spacing above 40mm. When the hole diameter is large, the hole spacing shall be increased accordingly. The higher the machining accuracy of holes, the higher the fatigue strength of parts, so proper specifications shall be formulated technically. New drilled holes in the web must be far away from the original hole or weld; otherwise, cracks may occur in the web.

Fig. 5-5

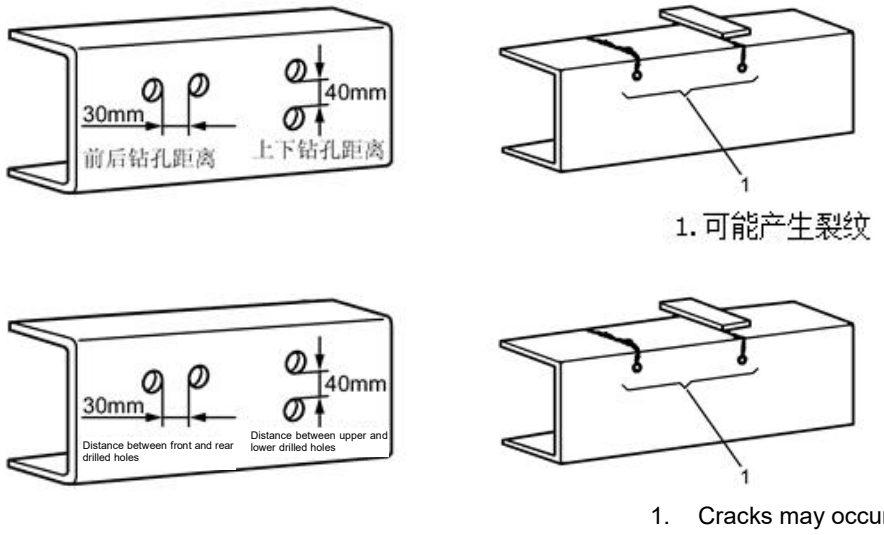


图 5-5 在车架孔距

Fig. 5-5 Spacing of hole in frame

- 禁止采用过于粗糙的钻孔，尤应禁止用汽焊吹孔。在车架上局部修切图 5-6

- It is forbidden to use too rough drilled holes, especially to blow holes by gas welding. Partial trimming on the frame is shown in Fig. 5-6

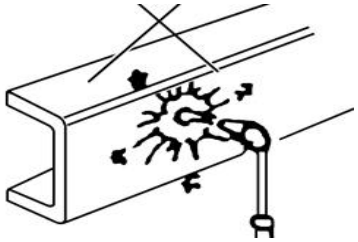


图 5-6 在车架上修切

Fig. 5-6 Trimming on frame

5.2.4 在车架上局部修切

5.2.4 Partial trimming on frame

因干涉问题,改装中往往在车架部件边缘上进行修切,这时必须特别慎重。因为任何修切都将使其强度和刚度受到削弱。在纵梁翼缘的全长上以及横梁两端的翼缘上，即使修切不大，也可能对其可靠性产生很坏的影响，应严格禁止，见图 6-6 在其它部位必须修切时，修切深度应尽可能小些，并限定出尺寸公差，防止随意操作。最好采用冷加工方法加工，保持表面光洁，修切边缘 过渡圆滑、无尖角。如无法避免采用气焊切割，则在气割后须再修磨，以消除割痕，做到表面平整无缺。图 5-7

Because of interference, trimming is often conducted on the edge of the frame components during modification; special care must be taken at this time. This is because any trimming will weaken its strength and rigidity. Even if the trimming is small in the full length of the side member flange and on the flanges at both ends of the cross member, it may have a bad influence on the frame reliability, so it shall be strictly prohibited. As shown in Fig. 6-6, when other parts must be trimmed, the trimming depth should be as small as possible, and the dimensional tolerance should be limited to prevent random operation. It is best to use the cold working method for machining to keep the surface smooth and make the trimming edge have smooth transition without sharp corners. If it is unavoidable to adopt gas welding and cutting, grinding shall be conducted after gas cutting to eliminate cutting marks and make the surface flat and intact. Fig. 5-7

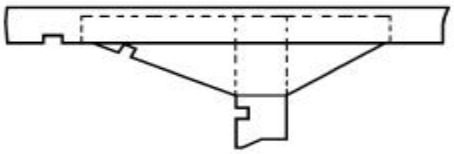


图 5-7 局部修切

Fig. 5-7 Partial trimming

5.2.5 车架焊接

5.2.5 Frame welding

焊接前必须将电机 VCU 插头拔出，否则将损坏电机 VCU

Before welding, the motor and VCU connectors must be pulled out; otherwise, the motor and VCU will be damaged.

货车车架多采用强度较高的材料和铆接结构。在改装时，构件和车架的连接也宜采用铆接或螺栓连接。不要贪图方便轻率地采用焊接。焊接不当，将使车架强度下降。

The truck frames are mostly made of high strength materials and riveted structures. During modification, riveting or bolted connection should be used for the connection between an member and the frame. Do not adopt welding rashly due to convenience. Improper welding will reduce the strength of the frame.

- 不要把装置件在紧固前先临时点焊在车架上。点焊处往往诱发裂纹，出现早期损坏。应绝对禁止在纵梁翼缘的边缘上点焊。

- Do not temporarily spot weld the assemblies to the frame before fastening. Cracks often occur at the spot weld, causing early damage. It is absolutely forbidden to conduct spot welding on the edges of side member flange.

- 焊接后避免用水冷却。

- Avoid cooling with water after welding.

- 焊接处应进行仔细清理，除掉油污、锈蚀，以免形成气孔等缺陷。

- The welds shall be carefully cleaned to remove oil stains and rust, so as to avoid defects such as pores.

- 每层焊渣必须彻底清理，避免形成夹渣。

- Each layer of welding slag must be thoroughly cleared to avoid slag inclusions.

- 焊条必须先经烘干后才可使用。从烘干箱取出的焊条必须于 5 小时内使用，否则必须再度烘干。

- The welding rods must be dried before use. The welding rods taken from the drying oven must be used within 5 hours; otherwise, they must be dried again.

- 焊接电流及速度必须合理优选，并形成工艺文件，认真贯彻执行。防止出现未焊透、咬边、夹渣、气孔、焊梗粗糙等缺陷。

- Welding current and speed must be reasonably selected, and process documents shall be formulated and implemented carefully, to avoid defects such as incomplete penetration, undercuts, slag inclusions, pores and rough welding stems.

- 焊缝太短，冷却太快，容易硬化开裂。通常焊缝长度不小于 30mm。

- Short welds and fast cooling are easy to cause hardening and cracking. Generally, the weld length is not less than 30mm.

- 焊接的起点和终点容易出现缺陷，应慎重处理。一般不应使其处于焊接件的拐角上，最好使其距离拐角 50mm 以上，在焊接起始处，可采用重复焊接法(先焊接 40~60mm 后再从头焊起)以减少缺陷。

- The start and end points of welding are prone to defects, which shall be handled with care. They shall not be located at the corner of weldment generally, and shall be more than 50mm away from the corner preferably. The repeated welding method (conduct welding for 40~60mm and then from the start point) can be adopted at the start point of welding to reduce defects.

- 最好采用多层堆焊。

- It is best to adopt multi-layer surfacing.

- 焊后应对焊缝仔细清理及检查，发现缺陷，应彻底清除，不得有咬边、缺肉、虚焊、气孔、夹渣等。

- After welding, welds shall be carefully cleaned and inspected, and defects shall be thoroughly removed if found; there shall be no undercuts, under-fills, false welding, pores, slag inclusions, etc.

- 焊接工作必须由经验丰富的技工按规定的、经过验证的工艺进行，不得任人随意操作。

- Welding must be carried out by experienced technicians according to the specified and verified process, rather than be conducted arbitrarily.

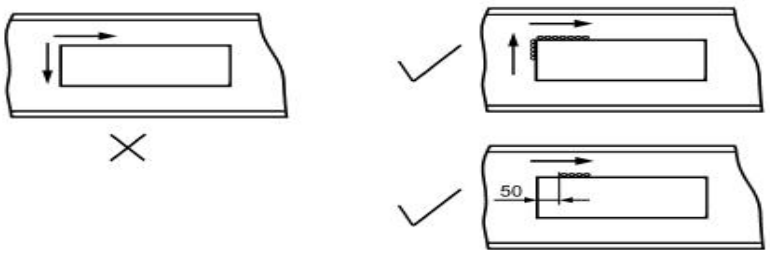


图 5-8 在车架上焊接

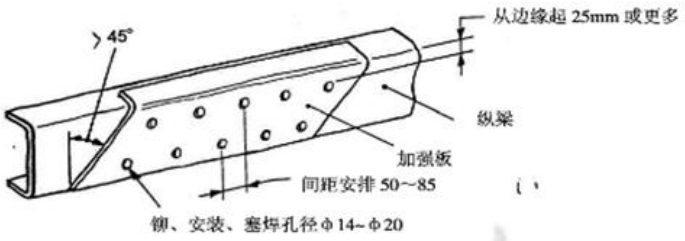
Fig. 5-8 Welding on frame

5.2.7 纵梁的加强

5.2.7 Reinforcement of side member

改装汽车时，由于轴载质量加大或其分布情况改变(如轴距增大等)，车架纵梁通常需相应加强。加强车架可能导致刚度急剧变化，在加强车架时需按照下面指导进行。

During vehicle modification, because of an increase in axle load or an change in its distribution (such as an increase in wheelbase), the side member of the frame usually needs to be reinforced accordingly. Since reinforcement of the frame may lead to an abrupt change in stiffness, the following instructions should be observed during reinforcement of the frame.



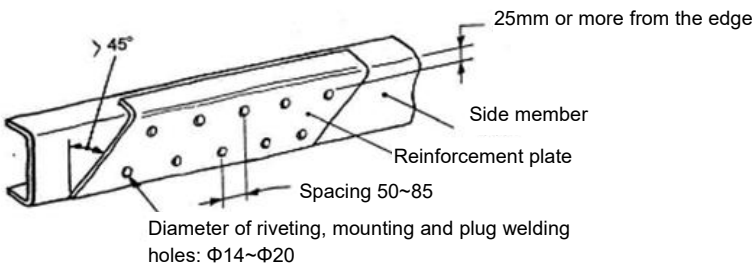


图 5-9 纵梁加强

Fig. 5-9 Reinforcement of side member

① 车架结构应能防止断面急剧变化及焊接时的应力集中。

① The frame structure shall be able to prevent abrupt changes in cross section and stress concentration during welding.

② 不允许在纵梁翼面焊接。

② Welding on the wing surface of side member is not allowed.

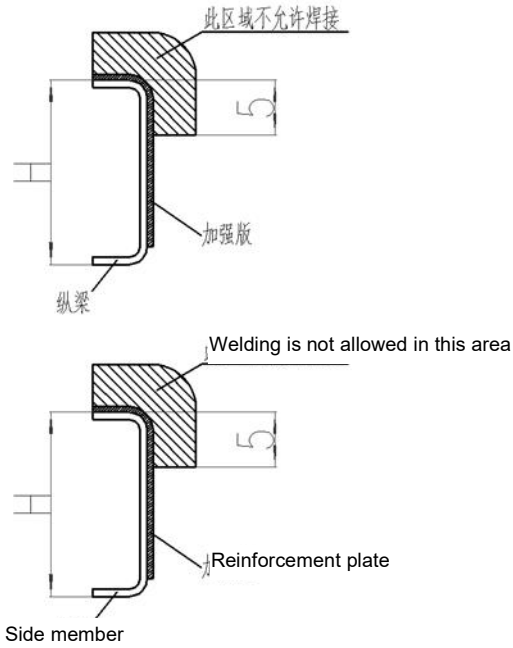


图 5-10 翼面焊接

Fig. 5-10 Welding on wing surface

③ 加强板材料

③ Materials of reinforcement plate

类别 Category	M4 轻卡 M4 light-duty truck

外侧加强版 Outer reinforcement plate	通用车架钢板 General frame steel plate
内侧加强版 Inner reinforcement plate	通用车架钢板 General frame steel plate

按照改装载荷需要确定加强版厚度和尺寸。

The thickness and size of reinforcement plates should be determined according to the modified load.

④ 加强版形状

④ Shape of reinforcement plate

最常见的加强板为 L 型。其在纵梁截面上的布置如图。

The most common reinforcement plate is of L-type. Its layout on the side member section is shown in the figure.

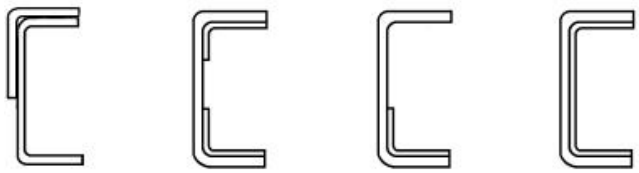


图 5-11 纵梁加强

Fig. 5-11 Reinforcement of side member

也有采用槽形加强板的。它要求较高的制造精度，否则将是装配困难或翼缘处存在间隙。采用时应当慎重。

Channel-shaped reinforcement plates are also adopted. They require higher manufacturing accuracy; otherwise, an assembly difficulty will occur or there will be gaps at the flange. They shall be used with caution.

加强板的两端，截面尺寸应逐步减小，以免刚度变化急剧，形成应力集中。通常采用的方案有若干种，如下图。我们特别推荐图中的(1)方案

The section size at both ends of reinforcement plate shall be gradually reduced to avoid an abrupt change in stiffness and stress concentration. There are several commonly used schemes, as shown in the figure below. We recommend scheme (1) in the figure particularly

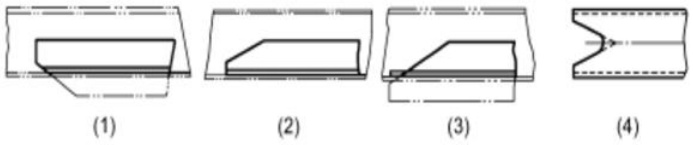


图 5-12 纵梁加强

Fig. 5-12 Reinforcement of side member

加强板的布置及连接也应仔细处理。通常加强板的两端或与横梁充分错开，或与横梁完全重合。还须注意，尽量不使加强板的端头处于驾驶室后壁处。

The layout and connection of reinforcement plates shall also be handled carefully. Generally, the two ends of reinforcement plates are either fully staggered from or completely coincide with the cross member. Ends of reinforcement plates should not be located at the rear wall of the cab.

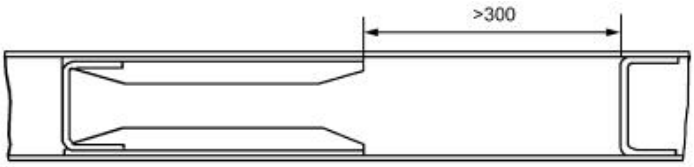


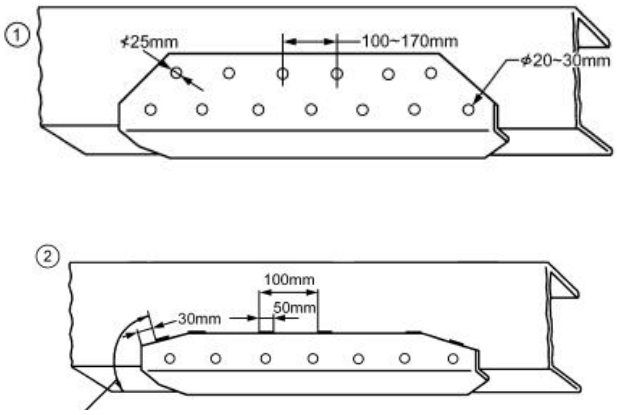
图 5-13 纵梁加强

Fig. 5-13 Reinforcement of side member

加强板最好采用冷铆与纵梁腹板连接起来。当冷铆有困难时，可采用塞焊和电焊。通常塞焊孔径不小于φ20，孔距为 150mm 左右，孔至加强板的边缘至少为 25mm。当加强板的宽度较大时，应安排两排塞焊孔，在纵向分布上，则应使其相互错开，如下图。采用点焊连接，效率较高，采用继续的电弧焊连接，不须特殊设备，故便于生产。

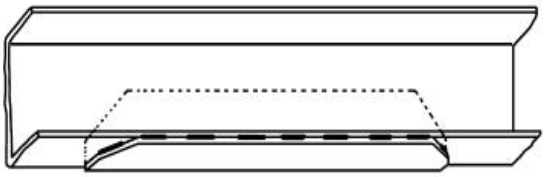
It is best to connect the reinforcement plate to the side member web by cold riveting. Plug welding and electric welding can be adopted when cold riveting is difficult. Generally, the diameter of plug welding holes is not less than φ20, the hole spacing is about 150mm, and the holes are at least 25mm from the edge of reinforcement plates. When the width of reinforcement plates is large, two rows of plug welding holes shall be arranged, and they shall be staggered with each other

longitudinally, as shown in the following figure. If spot welding is used for connection, the efficiency is high; if continuous arc welding is used for connection, no special equipment is required, so it facilitates production.



此范围内禁止施焊

Welding is prohibited in this range



✕严禁在翼缘边上施焊

✕ Welding on the edge of flange is prohibited

图 5-14 纵梁加强板

Fig. 5-14 Side member reinforcement plate

5.2.8 重新铆接

5.2.8 Re-riveting

需要在相同位置重新铆接时，需要增大 1～2mm 铆钉孔径。

When re-riveting is needed at the same position, it is necessary to increase the rivet hole diameter by 1~2mm.

5.2.9 附件的安装和改造

5.2.9 Installation and modification of accessories

在车架上安装附件的辅助装置时，通常使用螺栓进行连接，螺栓的强度应不小于8.8 级。原则上禁止使用紧固底盘装备(如贮气筒和蓄电池等)用的螺栓在车架上装置特殊装置。当这样使用是不可比避免的时候，应该使用更高一级的加长螺栓或更多的螺栓，使安装强度不至减小。如果车架不平，则可用垫板垫平，一定要使整个有影响的区域全部达到平坦。

When auxiliary devices of accessories are being installed on the frame, bolts with the strength not less than grade 8.8 are usually used for connection. In principle, it is forbidden to install special devices on the frame with bolts for fastening chassis equipment (such as air reservoirs and batteries). When this is unavoidable, a higher grade of lengthened bolts or more bolts shall be used to ensure that the mounting strength is not reduced. If the frame is uneven, it can be flattened with backing plates to ensure that the whole affected area is flat.

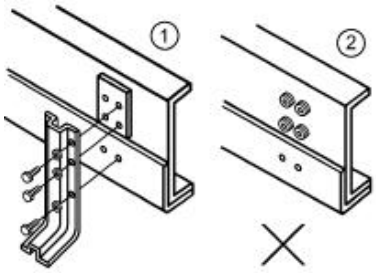


图 5-15 附件安装

Fig. 5-15 Installation of accessories

5.3 制动系统改制

5.3 Modification of braking system

轻卡出口纯电动系列底盘采用液刹系统，为保证安全，严禁对制动系统进行改装。

A hydraulic braking system is used for the chassis of light-duty electric trucks . Modification of the braking system is prohibited to ensure safety.

5.3.1 制动系统改制注意事项：

5.3.1 Precautions for modification of braking system:

5.3.1.1 不得擅自增加制动器淋水装置，由此造成后果由改装者自负。对于盘式制动器，严禁增加淋水装置。

5.3.1.1 The brake water-spraying device shall not be added without authorization; otherwise, the consequences arising therefrom will be at the modifier's own risk. For disc brakes, it is strictly forbidden to add a water-spraying device.

5.3.1.2 车辆改制过程中不能移动制动关键键，如阀类、HECU、ESC 电控单元、横摆率传感器、转角传感器、电动液压泵等部件的固定位置。

5.3.1.2 The fixing positions of key brake components such as valves, HECU, ESC ECU, yaw rate sensors and other components shall not be moved during vehicle modification.

5.3.1.3 制动系统管路原则不得改装,如必须拆卸,应该保证管路内清洁,不得进入脏物,复原后保证密封良好,固定牢靠,不得与周边物体磨碰。禁止更改 ESC 电控单元出油管路与轮边的对应关系，以及进油管路的对应关系。

5.3.1.3 The braking system pipeline is not allowed to be modified in principle, and if removal is necessary, the inside of pipeline shall be clean without dirt, and after recovery, the pipeline shall be well sealed and reliability fixed without collision with adjacent parts. Changes to correspondence between the ESC ECU oil outlet pipeline and the wheel, as well as the correspondence between the oil inlet pipelines are prohibited.

5.3.1.4 驻车制动器带拉线总成与电机为总成连接，改装时请不要随意更改驻车制动器带拉线总成与电机的对应关系，或者改装驻车制动器带拉线总成的位置。因为这样会影响整车的驻车制动性能。

5.3.1.4 The parking brake & cable assembly is connected to the motor, and neither the correspondence between the parking brake & cable assembly and the motor, nor the position of the parking brake & cable assembly should be modified without permission, as this will affect the parking brake performance of the complete vehicle.

5.3.1.5 改装时应防止管路磨损、烫伤。更改后的管路，不得出现窝折、漏气现象。管路或者拉线穿梁部位如果有与车架边缘接触可能时应加装橡胶龙骨条或者缠绕螺旋橡胶防护套。管路应远离热源，周围环境温度不应高于 60℃，如果因走向原因环境温度短时会超过 60℃但低于 80℃，应在管束外侧加装隔热材料。

5.3.1.5 During modification, pipeline wear and scalding should be prevented. The modified pipeline should be free of twist or air leakage. If the pipeline or cable passing through the beam is expected to come in contact with the edge of the frame, rubber keel strip or spiral rubber sheath should be installed. The pipeline should be kept away from heat sources, and the ambient temperature should not exceed 60℃. If the ambient temperature is expected to be greater than 60 ℃ but lower 80 ℃ for a short time due to routing, thermal insulation materials should be installed on the outer side of the pipeline.

5.3.1.6 制动器相关零部件、所有电动液压泵、控制单元、散热钢管的位置及相应固定支架的更改必须由北汽福田汽车股份有限公司认可后才能进行。

5.3.1.6 Changes to the positions of brake components, all electric hydraulic pumps, control units, cooling steel pipes, and corresponding brackets must be approved by Beiqi Foton Motor Co., Ltd. before implementation.

5.3.1.7 改装时不可踩踏电动液压泵，避免电动液压泵支架断裂。

5.3.1.7 It is prohibited to step on the electric hydraulic pump during modification to avoid breakage of its bracket.

5.3.1.8 改装过程中应远离热源，在焊接或切割时，应指导操作时加罩盖，防止火花溅上尼龙管。其他注意事项见下表：

5.3.1.8 The modification of pipeline should be carried out at a place away from heat sources. During welding or cutting, a cover should be installed to prevent sparks from splashing onto the nylon pipe. Other precautions are shown in the table below:

	操作注意事项 **Operation precautions**	**对策** **Countermeasure**	**对性能的影响** **Impact on performance**
1	焊接或钻孔时用防护板 Use of guard plates during welding or drilling	尼龙管上加防护板，如果必要则拆除尼龙管 Cover a guard plate on the nylon pipe, and if necessary, remove the nylon pipe	电焊火花溅上尼龙管使之熔化会引起压缩空气泄漏 Welding sparks splashing onto nylon pipe can cause smelting of pipe and thereafter leakage of compressed air
2	防止异物浸入尼龙管或接头 Prevention of entry of foreign matters into nylon pipes or	安装和拆除尼龙管及其接头时必须防止异物浸入或粘住，要加护套 When installing and removing nylon pipes and their joints, it is necessary to install a protective cover to prevent foreign	阀接头中浸入异物会导致油液泄漏或阀的故障 Entry of foreign matters into the valve joint can cause oil leakage or valve malfunction

	joints	matters from entering nylon pipes or joints	
3	安全的弯曲半径 Safe bending radius	尼龙管的弯曲半径如下： The specified bending radius of nylon pipes is as follows: φ8R50；Φ10R65；Φ12R70；Φ15R80 管子的弯曲半径不得小于以上的规定值 φ 8R50; Φ 10R65; Φ 12R70; Φ15R80. The bending radius of the pipe shall not be less than the value specified above.	如果尼龙管安装时的弯曲半径小于规定值会导致管子凹陷或折死弯影响气流通过 If the bending radius of the nylon pipe is less than the specified value during installation, pipe sag or twist may occur, affecting the normal air flow as a result
4	防止粘上酸液 Prevention of exposure to acid	尼龙管耐酸性差，要防护它不要溅到电瓶酸液 Nylon pipe has poor acid resistance, so it should be protected from exposure to battery electrolyte	如果电瓶之类的酸液粘上尼龙管会使管子熔化导致漏气 If acid such as battery electrolyte is splashed to the nylon pipe, the pipe will smelt and leak
5	高压清洗时防止水进入 Prevention of water entry during high-pressure spray cleaning	高压喷洗时喷射点和接头之间要留下至少300mm 间隙 At least a gap of 300mm should be left between the spray point and the joint during high-pressure spray cleaning	水会进入管子或者接插件导致短路等故障 Once the water enter pipes or connectors, short circuit and other faults will be caused

5.3.2 制动管路的布置

5.3.2 Layout of brake pipelines

考虑到安全和备件来源等因素，建议采用与北汽福田汽车股份有限公司相同的制动管和软管、管夹、管螺纹连接件。应注意制动器和制动软管同车桥及其限位块之间，都应留有足够的自由空间。制动管路与运动件的最小间隙不小于 40mm，与静态物体间的最小距离不小于 10mm。

Considering factors such as safety and source of spare parts, it is recommended to use the same brake pipes and hoses, pipe clamps, and pipe threaded connections as those of Beiqi Foton Motor Co., Ltd. It should be noted that a sufficient free space should be left between the brake/brake hose and the axle and its limit block. The minimum clearance between the brake pipeline and the moving parts shall not be less than 40mm, and the minimum distance between the brake pipeline and the static objects shall not be less than 10mm.

同样，安置的管路与运动件之间也应注意留有足够的自由空间。

Similarly, a sufficient free space should also be left between the pipeline and the moving parts.

钢管至少每 500mm 要用管夹加以固定。对于低温、高温高压以及无防护的场合，推荐采用钢管

Steel pipes should be fixed with pipe clamps at least every 500mm. When low temperature, high temperature or high pressure is present and no protection is provided, it is recommended to use steel pipe

5.3.3 电控件的布置

5.3.3 Layout of electrical controls

必须使制动系统的所有电动单元、电动液压泵等容方便进行检查与维修。

All electric units, electric hydraulic pumps, and other components of the braking system must be easily accessible for inspection and repair.

用在制动装置和制动阀上的控制元件，只要是涉及到行车安全的零部件。在正常的实际操作中，不允许发生破裂或者漏油。

Control elements of braking devices and brake valves, as long as they are related to the driving safety, shall be free from cracking or leakage during normal operation.

5.3.4 电动液压泵的安装

5.3.4 Installation of electric hydraulic pump

（1）电动液压泵带控制器总成不得倾斜安装。

(1) The electric hydraulic pump & control assembly should not be installed skewedly.

（2）电动液压泵带控制器总成高压电的输入与福田车型的电动液压泵带控制器总成高压电输入参数一致。

(2) The high-voltage power supply input parameters of the electric hydraulic pump & control assembly should be consistent with those of the original vehicle of FOTON.

（3）接插件务必做好防水，保证气密性，不得进水。

(3) The connector must be well protected against water to ensure a good air tightness and avoid water entry.

（4）电动液压泵带控制器总成的进油管位置要低于动转液储油杯的高度，管路最好逐级递减高度中途不得出现由低到高的走向

(4) The oil inlet pipe of the electric hydraulic pump & control assembly should be positioned at a height lower than the power steering fluid cup. It is recommended to route the pipe from high to low gradually, and routing from low to high is not allowed.

5.3.5 油液加注注意事事项

5.3.5 Precautions for refilling of brake fluid

若改装过程中涉及到添加制动油液，务必注意油液型号及加注位置，若出现混加或者错加，将会制动助力失效的情况。

If brake fluid needs to be added during modification, it is necessary to verify the brake fluid type and filling position. If brake fluids of different types are used together or brake fluid of incorrect type is used, brake booster may fail.

制动液：

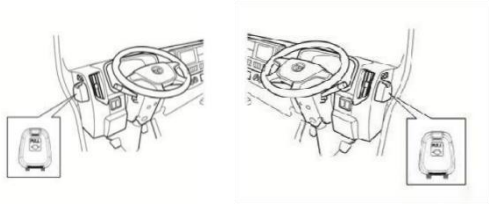
Brake fluid:

使用型号：DOT3/DOT4/HZY3/HZY4

Type: DOT3/DOT4/HZY3/HZY4

加注位置：驾驶室内部，舵位所在位置前方仪表板的侧面，如下图所示。

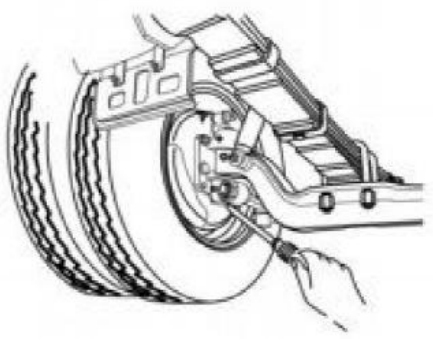
Filling position: on the side of the dashboard in front of the steering wheel in the cab, as shown in the figure below including LH and RH.



加注后注意事项：补加油液后需要进行排气，排气步骤见下：

Precautions after refilling: it is required to do bleeding as follows after refilling:

- 车辆进行多次紧急制动，便于将ABS内部阀体打开；
- Apply emergency braking for multiple times to open the valve in the ABS;
- 按照距制动总泵由远到近的原则进行排气，若制动总泵位于前左侧，其排气顺序如下：后右轮→后左轮→前右轮→前左轮。若制动总泵位于前右侧，其排气顺序如下：后左轮→后右轮→前左轮→前右轮；
- Do bleeding to brakes following a decreasing distance from the brake master cylinder. For example, if the brake master cylinder is located on the left front side of the vehicle, the bleeding sequence is as follows: rear right wheel → rear left wheel → front right wheel → front left wheel; If the brake master cylinder is located on the right front side of vehicle, the bleeding sequence is as follows: rear left wheel → rear right wheel → front left wheel → front right wheel;
- 从排气塞螺钉上拆卸橡皮罩，把排气塞螺钉擦拭干净。将乙烯软管接到排气塞螺钉上，再将乙烯软管的另一端放进透明的容器内；
- Remove the rubber cover from the bleeder plug and wipe the bleeder plug clean. Connect one end of the ethylene hose to the bleeder screw, and then place the other end of the ethylene hose into a transparent container;



- 由一人在驾驶室内深踩踏板 5 脚后踩住不动，另外一人在轮边打开放气螺栓，待油液排出后，将放气螺栓拧紧，此时踏板方可松开，进行下一次排气；（放气螺栓松开后，一定要踩住踏板不要松开）

- With an assistant depressing the brake pedal to the limit for 5 times and then keeping the brake pedal depressed without release, unscrew the bleeder bolt at the wheel, and after brake fluid flows out, tighten the bleeder bolt. Then, the brake pedal can be released to prepare for next bleeding (the brake pedal must be depressed without release when the bleeder bolt is unscrewed)

- 每个轮子排气 3-4 次，直到不出现气泡，再排 1-2 次；

- Do bleeding to each wheel 3-4 times, and when no bubbles are present, continue the bleeding for another 1-2 times;

- 在排气过程中，要使制动油杯内的制动液保持规定的液位。排气后，应重新装好橡皮罩。

- It is required to keep the brake fluid in the brake fluid cup at the specified level during bleeding. Refit the rubber cover after bleeding.

- 对各车轮都进行排气过程中，要检查制动油杯内的液位，如有必要，应予以补注。

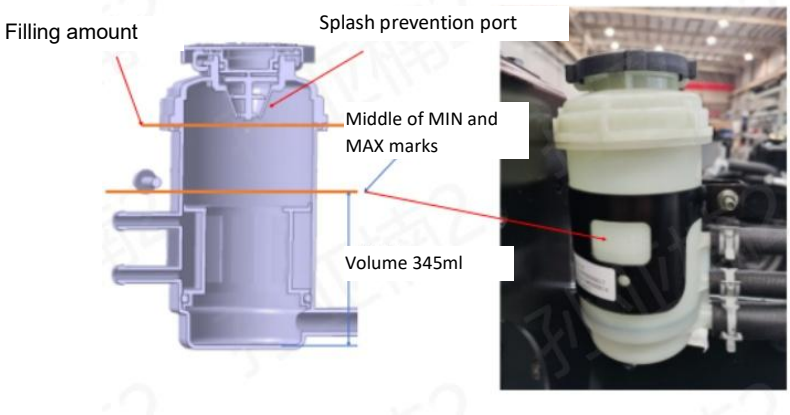
- During the bleeding of each wheel, check the level in brake fluid cup, and add brake fluid when necessary.

- 动转液：
- Power steering fluid:
- 使用型号：ATF3
- Type: ATF3
- 加注位置：驾驶室外部，将驾驶室翻起，动转液储油杯位于车架左纵梁上部，动转液储油杯形状如下图所示。
- Filling position: Outside the cab. The power steering fluid cup is located on the upper part of left side member of the frame, and is accessible after the cab is tilted. The shape of the power steering fluid cup is shown in the figure below.

加注后注意事项：

Precautions after refilling:

- 排气：观察储液罐内油液液面，如果在 min 刻度线以下，需要加注油液，加注后将电动液压泵启动，拉起驻车并旋转到 D 档，原地进行 5 次深度制动，当敲击噪音消失时，说明管路内的空气已全部排出。
- Bleeding: Check the fluid level in the reservoir, and if the level is below MIN mark, add fluid, and after the refilling is completed, start the electric hydraulic pump, pull up the parking brake lever and rotate to D position, and apply 5 times of full braking in situ, and when the knocking noise disappears, it indicates that all air in the pipeline has been discharged.



- 蓄能：深踩制动踏板，并保持10秒，反复2次，让蓄能器内部充满动转液。否则将造成制动踏板异响。
- Energy storage: Depress the brake pedal to the limit and hold for 10 s, and repeat this operation 2 times to fill the accumulator with power steering fluid. Otherwise, unusual noise of brake pedal may occur.
- 调整液面高度：完成蓄能后，观察动转液储油杯的油液刻度线，将动转油加注到上下刻度线之间即可。否则将造成制动踏板异响。
- Adjust the fluid level: After energy storage is completed, check the fluid marks of power steering fluid cup, and add fluid to the level between the MIN and MAX marks. Otherwise, unusual noise of brake pedal may occur.

5.4 冷却系统改装

5.4 Modification of cooling system

原则上不允许改变冷却系统的基本配置，即不能随意更换底盘电机冷却系统中的散热器、风扇、护风罩、散热器支架、膨胀箱、除气和回水管路、卡箍、电子水泵等零部件。

In principle, it is not allowed to change the basic configuration of the cooling system; that is, the radiator, fan, fan cowl, radiator bracket, expansion tank, bleed and water return pipes, clamp, electronic water pump and other parts in the chassis motor cooling system shall not be replaced without authorization.

散热器前端不允许有任何零部件的遮挡或覆盖，否则影响冷却性能，严重会导致驱动电机故障。

The front end of the radiator shall not be obscured or covered by any parts; otherwise, it will affect the cooling performance and even cause drive motor fault in severe cases.

在改装过程中，若的确需要改变布置，必须得到北汽福田汽车股份有限公司认可才能进行。

If it is really necessary to change the layout during modification, it must be approved by Beiqi Foton Motor Co., Ltd.

如果接入上装，应按照与福田约定的要求接入，并且确保二次加注福田指定的冷却液。

If the bodywork is to be connected, it shall be connected according to the requirements agreed by Foton, and the coolant specified by Foton shall be added twice.

5.5 备胎的安装和固定

5.5 Installation and fixing of spare tire

轻卡出口纯电动系列底盘备胎布置在尾部。

The spare tires are arranged at the rear of the chassis of light-duty electric trucks .

如果需要改动备胎的安装位置，各改装厂家可跟据改装车辆的实际情况进行备胎的安装设计。

If it is necessary to change the installation position of spare tire, modification factories can perform the installation design of spare tire according to the actual situation of modified vehicles.

备胎的安装设计应遵循：

The installation design of spare tire shall meet the following requirements:

1、满足改装车辆的通过性；

1. The requirements for trafficability of modified vehicles shall be met;

2、符合改装车辆外廓尺寸的要求；

2. The requirements for overall dimensions of modified vehicles shall be met;

3、备胎应固定牢固、安装可靠、易操作；

3. The spare tire shall be fixed firmly, installed reliably and operated easily;

4、备胎设计安装在侧面时，备胎架应最大限度靠近车架横梁，且水平距离不大于400mm。

4. When the spare tire is installed on the side in design, the spare tire carrier shall be as close to the frame cross member as possible, and the horizontal distance shall not be more than 400mm.

5、托盘螺母与链条紧固后，将螺母与链条进行焊接，保证焊接牢固，防止运行中松动，备胎掉落。

5. After the tray nut is fastened to the chain, the nut and the chain shall be welded to ensure firm welding and prevent spare tire fall-off due to looseness during operation.

5.6 后牵引装置

5.6 Rear coupling

北汽福田汽车股份有限公司轻卡出口纯电动车型仅提供简易牵引钩。

Only simple towing hooks are provided with light-duty electric trucks of Beiqi Foton Motor Co., Ltd.

如果需要加装重型后牵引装置或自动牵引钩以牵引较重的全挂车等，只允许采用北汽福田汽车股份有限公司认可的产品和型号。

If it is necessary to add a heavy-duty rear towing device or an automatic towing hook to tow heavy full trailers, etc., only products and models approved by Beiqi Foton Motor Co., Ltd. are allowed.

后横梁的改装以不改变底盘的后悬长度为宜，改装方案必须经北汽福田汽车股份有限公司的确认。

The modification of rear cross member should not change the rear overhang of the chassis preferably, and the modification scheme must be validated by Beiqi Foton Motor Co., Ltd.

5.7 附加装置

5.7 Additional devices

车辆改装时增加的附加装置（如上装操纵系统、备件箱和工具箱等）安装在车架外侧，规定必须在车架腹板的内侧装有加强板。

Additional devices (such as bodywork control system, spare parts kit and tool box) added during vehicle modification shall be installed on the outside of the frame, and reinforcement plates must be installed on the inside of the frame web.

应尽可能采用车架纵梁及横梁上现有的孔。如果必须钻孔时，钻孔的尺寸及距离应参照在车架上钻孔的相关规定。

Existing holes in the frame side member and cross member should be used as much as possible. If drilling is necessary, for the size and distance of drilled holes, refer to the relevant provisions of drilling on the frame.

如果有大型设备如发电机组、独立的空压机等重量和体积均不适合安装在车架外侧的时候，可以将其布置在车架正上方，一般是在驾驶室背后的合适位置，其底部必须通过副车架与车架相连。

If it is not suitable to install large equipment such as alternator set and independent air compressor on the outside of the frame due to the weight and volume, they can be arranged right above the frame, usually at a suitable position behind the cab, and their bottom must be connected to the frame through the subframe.

5.8 电机悬置

5.8 Motor mounting

电机不允许改变在底盘上的相对位置，如需改制，改装方案必须经北汽福田汽车股份有限公司的确认。

It is not allowed to change the relative position of motor on the chassis. If it needs to be modified, the modification scheme must be validated by Beiqi Foton Motor Co., Ltd.

悬置软垫、悬置支架不得进行改装，否则影响悬置隔振性能及可靠性；

Mounting cushions and mounting brackets shall not be modified; otherwise, it

will affect the vibration isolation and reliability of the mounting;

第六章 改装边界要求

Section 6 Requirements for Modification Boundaries

6.1 改装货箱外形尺寸要求

6.1 Requirements for overall dimensions of modified cargo body

货厢（货箱）应安装牢固可靠，且在设计和制造上不应设置有货厢（货箱）加高、加长、加宽的结构、装置。

The cargo body shall be installed firmly and reliably, and the structure and device for heightening, lengthening and widening the cargo body shall not be designed or manufactured.

货箱或其他载货装置，其构造应保证安全、稳妥地装载货物，栏板和底板应规整且具有足够的强度。

The cargo body or other loading devices shall be constructed to ensure safe and reliable loading of cargoes, and the ripping fence and bottom plate shall be regular and of sufficient strength.

仓栅式载货车辆的载货部位应采用仓笼式或栅栏式结构。载货部位的顶部应安装有与侧面栅栏固定的、不能拆卸和调整的顶棚杆；顶棚杆间的纵向距离应小于等于500mm。

The loading parts of stake trucks shall be of cage or fence structure. The top of the loading parts shall be equipped with canopy rods which are fixed to the side fence and cannot be removed or adjusted; the longitudinal distance between the canopy rods shall be less than or equal to 500mm.

厢式载货车辆的货厢的顶部应封闭、不可开启（翼开式车辆除外），其与侧面的连接应采用焊接等永久固定的方式；货厢的后面或侧面应设有固定位置的车门。

The top of the cargo body of vans shall be closed and not opened (except for wing opening vans), and permanent fixing methods such as welding shall be used for connection between it and the side; the rear or side of the cargo body shall be

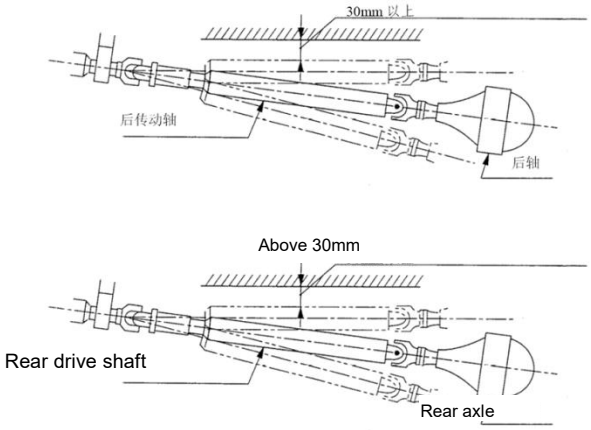
equipped with doors with fixed positions.

6.2 传动轴和后桥

6.2 Drive shaft and rear axle

传动轴的四周至少预留 30mm 以上的间隙，保证传动轴在每个位置与后轴及其他部件的运动无干涉。

The clearance of at least 30mm shall be reserved around the drive shaft to ensure that the drive shaft does not interfere with the movement of the rear axle and other components at each position.



第七章 典型专用车改装

Section 7 Modification of Typical Special Vehicles

7.1 安全防护装置

7.1 Safety protection devices

7.1.1 侧面防护装置

7.1.1 Lateral protection device (LPD)

总质量大于 3500Kg 的货车（半挂牵引车除外）、货车底盘改装的专项作业车和挂车，应按提供防止人员卷入的侧面防护。

Lateral protection against entanglement of personnel shall be provided for trucks with GVW greater than 3500 kg (except for semi-trailer towing vehicles), special motor vehicles with modified truck chassis and trailers.

侧面防护装置应由改装厂家按 ECE R73.01《关于就侧面防护装置方面批准货车、挂车和半挂车的统一规定》的规定设计安装。必须满足相应国家有关标准法规的要求。

Lateral protection devices shall be designed and installed by modification factories in accordance with ECE R73.01 Uniform Provisions Concerning the Approval of: I. Vehicles with Regard to their Lateral Protection Devices (LPD) II. Lateral Protection Devices (LPD) III. Vehicles with Regard to the Installation of LPD of an Approved Type According to Part II of this Regulation. They must conform to relevant national standards and regulations.

7.1.2 后下防护装置

7.1.2 Rear underrun protection devices

货车底盘改装的专项作业车和挂车的后下部，应提供符合 ECE R58.03 规定的后下部防护，以防止追尾碰撞时发生钻入碰撞。

The special vehicles and trailers modified from the chassis shall be equipped at their rear lower part with the rear underrun protective device meeting the

requirements of ECE R58.03 to prevent running under the truck in case of a rear-end collision.

后下部防护装置如需改装应由改装厂家根据 ECE R58.03《关于：1.下部防护装置 2.就已批准的后下部防护装置的安装方面认证车辆 3.就后下部防护装置方面认证车辆的统一规定》的具体规定设计安装。必须满足国家有关标准法规的要求。

If the rear underrun protection devices need to be modified, they shall be designed and installed by modification factories according to ECE R58.03 Uniform Provisions Concerning the Approval of: I. Rear Underrun Protective Devices (RUPDs); II. Vehicles with Regard to the Installation of an RUPD of an Approved Type; III. Vehicles with Regard to their Rear Underrun Protection (RUP). They must conform to relevant national standards and regulations.

7.2 专用类车辆的特殊要求

7.2 Special requirements for special vehicles

7.2.1 特殊安全防护要求

7.2.1 Special safety protection requirements

- 上装安装有起重尾板的货车和挂车，应安装防止其中尾板承载平台自动下落或自动打开的机械锁紧装置。
- Trucks and trailers fitted with tail lift at bodywork shall be equipped with a mechanical locking device to prevent the tail lift bearing platform from falling or opening automatically.
- 上装安装有悬臂式、垂直升降式起重尾板的货车和挂车，起重尾板背部应设置有警示旗，且警示旗应能摆动，警示旗上的反光标识应朝向车辆外侧。
- For trucks and trailers fitted with cantilever or column tail lift at bodywork, a warning flag shall be set on the back of the tail lift and be able to swing, with the retro-reflective marking facing the outside of the vehicles.

7.2.2 焊接及涂装要求

7.2.2 Welding and painting requirements

焊接要求：

Welding requirements:

1、 焊缝高度应满足：焊接料厚 t≤5mm 时，焊缝高度 3～5mm；焊接料厚 t≥6mm 时，焊缝高度 8～8mm。

1. The height of the weld should meet the following requirements: 3~5mm when the solder thickness t is ≤ 5mm; 6~8mm when the solder thickness t is ≥ 6mm.

2、焊缝表面和热影响区不得有裂纹，未熔合、夹渣、气孔、烧穿、焊瘤及明显的焊接变形，焊缝上的熔渣和两侧的飞溅必须清除干净。

2. The weld surface and heat affected zone shall be free of cracks, incomplete fusion, slag inclusions, pores, burn-through, overlaps or obvious welding deformation. Slag on the welds and splash on both sides must be removed.

3、连接质量及控制标准

3. Connection quality and control criteria

序号 No.	检验项 Inspection items	技术要求 Technical requirements
01	点焊 Spot welding 凸焊 Projection welding	1. 焊点间距均匀，间距符合 50~60mm，同一直线上焊点偏移量≤3mm 1. The welding spots shall have an uniform spacing of 50~60mm, and the offset of welding spots in the same line shall be not more than 3mm
		2.焊点呈圆形或椭圆形，表面平整，无飞溅、毛刺、焊穿、过烧、烧蚀等缺陷 2. The welding spots shall be round or elliptical, and their surface shall be flat, without splash, burrs, weld penetration, over-burning, ablation, etc.
		3.焊点直径φ6±0.5mm 3. The diameter of welding spots shall be 6±0.5mm
		4．点焊强度符合设计要求 4. The spot welding strength shall meet the design requirements

		5．凸焊强度符合设计要求，M8 凸焊螺母的剥离扭距≥44.1N.m 5. The projection welding strength shall meet the design requirements, and the peeling torque of M8 projection welding nuts shall be not less than 44.1N.m
02	手工电弧焊或 CO2 气体保护焊 Manual arc welding or CO2 gas shielded arc welding	1．焊缝表面呈均匀、整洁的鳞状波纹，无溅渣、弧坑、焊丝头、裂纹、焊瘤等缺陷；不允许有漏焊、假焊、裂纹、烧穿、夹杂等缺陷 1. The surface of welds shall show uniform and tidy squamous ripples, without splashing slags, crater, welding wire residue, cracks, overlaps, etc.; there shall be no defects such as missing welding, void welding, crack, burn-through and inclusions
		2.咬边深度不得大于板厚的 20%，无大焊渣、飞溅,,每个厢板总成外表面直径≤1mm 的焊渣≤2 个 2. The undercut depth shall not be greater than 20% of the plate thickness, there shall be no large welding slag or splash, and the number of welding slag with a diameter ≤ 1mm on the outer surface of each door board assembly shall be not more than 2
		3．除起弧和收弧处允许有气孔和凹陷外，其余焊缝不允许有密集性气孔和裂纹存在 3. Except that pores and dents are allowed at arc striking and extinguishing positions, dense pores and cracks are not allowed at other welds
		4、各焊缝必须与母材熔合彻底，成形饱满均匀连贯，杜绝电流小熔深不足焊缝凸起显直条状； 4. Each weld must be thoroughly fused with the base metal, the shape shall be full, uniform and coherent, and there shall be no raised welds with small current, insufficient penetration and straight strip shape;
03	螺栓或铆接 Bolting or riveting	1.螺纹连接紧固可靠，弹圈压平、不得松动等 1. The threaded connection shall be fastened reliably, and spring washers shall be flattened and free of looseness

		2.合页装焊规范，合页不得有发卡及异响现象 2. The hinges shall be assembled and welded in normative ways, and free of stagnation or abnormal sound
		3、被铆合的零部件必须贴紧，在三倍铆钉直径的尺寸范围内其间隙不得大于 0.2mm; 3. The riveted parts must fit tightly, and their clearance shall not be greater than 0.2mm within the range of three times the rivet diameter;
04	外观 Appearance	1.外露件（前板、边后板、地板表面、边框）不允许有严重划伤、变形，但允许有不影响外观质量及下道工序的轻微凹陷和变形；每个总成件 1 米范围内长≤50 mm 且手感不明显的划伤不超过 1 处，全长范围内不超过 2 处，全厢不超过 5 处 1. Exposed parts (front plate, rear side plate, floor surface and frame) shall be free of serious scratches or deformation, but slight dents and deformation that do not affect the appearance quality and the next process are allowed. There shall be no more than 1 scratch with a length ≤ 50mm and unobvious handfeel in the range of 1m from each assembly, no more than 2 scratches in the full length and no more than 5 scratches in the whole compartment
		2.货厢外表面无锈蚀、油污、缺材、裂纹和非工艺性孔洞 2. The outer surface of cargo body shall be free of rust, oil stains, material shortage, cracks or non-process holes
		3．各零部件搭接良好、过渡平顺，焊缝区打磨抛光适度，打磨光滑,焊件不得被磨伤，表面打磨后必须抛光至看不到磨痕 3. All parts shall be lapped properly with smooth transition; the weld area shall be polished moderately and smoothly; the welded parts shall be free of grinding damage, and their surface must be polished until no grinding cracks can be seen after grinding
		4.分总成不得有扭曲、偏斜、翘曲、外翘、变形等现象 4. The subassembly shall be free of twist, deflection, warpage, outward warpage or deformation
		5．货厢总成不得有偏斜、扭曲等现象 5. The cargo body assembly shall be free of deflection or twist

05	间隙及高度差 Clearance and height difference	1．边板与地板间隙在 2-4mm 之间 1． The clearance between the side plate and the floor shall be 2-4mm
		2．后板与地板间隙在 2-4mm 之间 2． The clearance between the rear plate and the floor shall be 2-4mm
		3．边板与前板、后板间隙 2-4mm 3. The clearance between the side plate and the front/rear plate shall be 2-4mm
		4．边板与后板高度差≤3 mm 4. The height difference between the side plate and the rear plate shall be not more than 3mm
		5．左、右边板高度差≤3 mm 5. The height difference between left and right side plates shall be not more than 3mm
06	装配主要尺寸要求 Requirements for main dimensions of assembly	1．两纵梁外侧间距符合设计要求 1． The outer spacing between two side members shall meet the design requirements
		2． 纵梁后安装孔到后框尺寸符合设计要求 2. The distance from the rear mounting hole of side member to the rear frame shall meet the design requirements
		3．底板长度，底板宽度符合设计要求 3. The length and width of bottom plates shall meet the design requirements
		4．底板对角线差≤6mm 4. The diagonal difference of bottom plates shall be not more than 6mm
		5．前板总成对角线尺寸差≤10mm 5. The diagonal dimension difference of front plate assembly shall be not more than 10mm
		6．货厢内长、内宽符合设计要求 6. The inner length and inner width of cargo body shall meet the design requirements

		7．厢体对角线差≤6mm，内高符合设计要求 7. The diagonal difference of compartment body shall be not more than 6mm, and its inner height shall meet the design requirements

4、涂装要求

4. Painting requirements

1）货箱总成表面不允许出现重影影响外观的留痕流，流挂。控制标准如下：

1) The surface of cargo body assembly shall be free of marks or sagging which affect the appearance due to ghosting. The control criteria are as follows:

项目 Item	控制标准 Control criteria	
底漆 Primer	漆膜厚度：底漆≥15μm； Paint film thickness: ≥15μm for primer;	1、漆膜外观：光色均匀，无明显“桔皮”，不允许有流痕和漏底，允许表面有轻度擦伤，不允许有掉漆、划伤、漆膜裂纹现象；面漆表面不允许有漆泡、漆渣、针孔和明显的腻子痕迹；对掉漆裂纹部位必须补漆，补漆后不允许有明显雾圈、明显色差现象； 1. Appearance of paint film: there shall be uniform color and no obvious "orange peel", flow marks or bottom exposure, and slight bruises are allowed on the surface, but paint falling-off, scratches and cracks on paint film are not allowed; the surface of top coat shall be free of blistering, paint slag, pinholes or obvious putty traces; parts with paint falling-off or cracks must be repainted, and free of obvious spray circles or obvious color difference after paint repair; 2、附着力：≥1 级； 2. Adhesion: ≥ level 1;
本色漆、亚光漆 Natural paint, matte paint	漆膜厚度：外表面≥45； 内表面≥40， Paint film thickness: ≥ 45 for outer surface; ≥ 40 for inner surface	
金属漆 Metallic paint	漆膜厚度：外表面≥55； 内表面≥50 Paint film thickness: ≥ 55 for outer surface; ≥ 50 for inner surface	

		3、漆膜硬度≥HB； 3. Paint film hardness ≥ HB; 4、不允许存在带锈喷漆和涂漆不到位现象； 4. There shall be no rusty painting or uncompleted painting; 5、零部件 3C 证书及模压证书有效，且在有效期内； 5. The 3C certificate and mould pressing certificate of parts shall be valid and within the validity period;

2）在进行改装部分油漆时尤其注意不要让油漆飞溅到以下部位：

2) During painting of modified parts, care should be taken not to splash paint onto the following parts:

1. 警示牌及标志牌
1. Warning plate and sign board
2. 前盖周围的铰链及橡胶密封
2. Hinges around front cover, and rubber seals
3. 玻璃及密封条
3. Glass and sealing strips
4. 车灯及其衬带
4. Lamps and their lining belts
5. 前下面罩
5. Front lower face shield
6. 后挡泥板
6. Rear mudguard
7. 门把手及其衬带

7. Door handles and their lining belts
8. 蓄电池及软管
8. Battery and hose
9. 线束及电线接头
9. Harnesses and wire connectors
10. 驾驶室内饰和开关
10. Cab interiors and switches
11. 副水箱及动力转向
11. Auxiliary radiator and power steering fluid reservoir

附件 A 网关 CAN 信号及引脚定义

Appendix A Gateway CAN Signals and Pin Definition

速度 Speed	刹车（踏板激活） Brake (with pedal activated)	驻车制动（手刹） Parking brake	油门位置 Throttle position
旋钮（D-N-R）位置 Knob (D-N-R) position	电池SOC Battery SOC	电压 Voltage	电流 Current
电池温度 Battery temperature	电池警告和警报 Battery warning and alarm	逆变器警告和警报 Inverter warning and alarm	电机温度 Motor temperature
逆变器温度 Inverter temperature	电机转速 Motor speed	ABS 信号（一旦激活） ABS signal (once activated)	低压电池电压 Low-voltage battery voltage
总计里程 Odometer	ABS故障状态 ABS fault status	发动机状态 Engine status	发动机转速 Engine speed

燃料消耗率 Fuel consumption rate	空调压缩机工作状态 Working conditions of A/C compressor	压缩机欠压故障 Compressor undervoltage	压缩机过流故障 Compressor overcurrent
过流降频 Frequency reduction due to overcurrent	压缩机过温故障 Compressor overtemperature	过温降频 Frequency reduction due to overtemperature	压缩机控制端电压故障 Failure of voltage of compressor control terminal
EAS与ECC节点失去通讯 Lost communication between EAS and ECC node	EAS与VCU节点失去通讯 Lost communication between EAS and VCU node	压缩机过压故障 Compressor overvoltage	压缩机功率 Compressor power
空调制热系统使能指令 Enable command from A/C heating system	空调制冷系统使能指令 Enable command from A/C cooling system	液冷系统工作模式请求 Working mode request from liquid cooling system	制冷剂温度传感器故障 Refrigerant temperature sensor fault
模式风门电机故障 Mode damper motor fault	冷暖风门电机故障 Temperature damper motor fault	ECC电源过压 ECC power supply overvoltage	ECC电源欠压 ECC power supply undervoltage

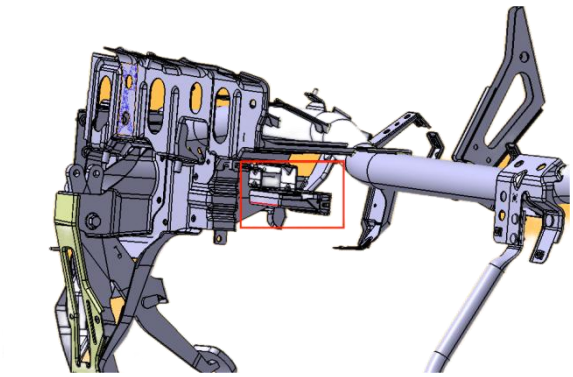
ECC与WPTC通信 丢失 Lost communication between ECC and WPTC	ECC与EAS通信丢失 Lost communication between ECC and EAS	蒸发器温度传感器 故障 Evaporator temperature sensor fault	ECC与VCU通信丢失 Lost communication between ECC and VCU
ECC工作状态 ECC working conditions	制冷请求 Refrigeration request	制热请求 Heating request	循环状态 Circulation state
风量状态 Air volume state	空调吹风模式状态 A/C blowing mode	控制器设置档位 Set mode of ECU	制冷剂温度 Refrigerant temperature
蒸发器温度 Evaporator temperature	蒸电磁阀状态 Evaporator solenoid valve status	Chiller电磁阀状态 Chiller solenoid valve status	中压压力开关状态 Medium pressure switch status
高低压力开关状态 High/low pressure switch status	蒸发器温度有效 Evaporator temperature valid	水泵1错误 Water pump 1 error	水泵2错误 Water pump 2 error
电池包进水温度 Water inlet temperature of battery pack	PTC1开关状态 PTC1 switch status	PTC2开关状态 PTC2 switch status	PTC3开关状态 PTC3 switch status
PTC4开关状态	PTC故障	PTC严重故障	PTC 出口温度

PTC4 switch status	PTC fault	PTC serious fault	PTC outlet temperature
PTC IGBT温度（多路中最大值) PTC IGBT temperature (maximum in multiple channels)	PTC 高压值 PTC high voltage	PTC 功率值 PTC power	PTC 高压异常 (不在设定范围内) Abnormal PTC high voltage (not within the set range)
PTC 高压接反 PTC high-voltage part connected reversely	PTC IGBT驱动电压异常 Abnormal PTC IGBT driving voltage	PTC 超温（默认>=95℃) PTC overtemperature (default ≥ 95°C)	PTC IGBT超温（默认>=95℃) PTC IGBT overtemperature (default ≥ 95°C)
PTC 过流 PTC overcurrent	PTC 防冻液流量低 Low flow of PTC antifreeze	PTC CAN通讯超时 PTC CAN communication timeout	PTC 发热芯1短路 Short circuit in PTC heating core 1
PTC 发热芯2短路 Short circuit in PTC heating core 2	PTC 发热芯3短路 Short circuit in PTC heating core 3	PTC 发热芯4短路 Short circuit in PTC heating core 4	PTC IGBT1击穿 PTC IGBT1 breakdown
PTC IGBT2击穿 PTC IGBT2 breakdown	PTC IGBT3击穿 PTC IGBT3 breakdown	PTC IGBT4击穿 PTC IGBT4 breakdown	PTC IGBT或发热芯1开路 Open circuit in PTC IGBT or heating core 1

PTC IGBT或发热芯 2开路 Open circuit in PTC IGBT or heating core 2	PTC IGBT或发热芯 3开路 Open circuit in PTC IGBT or heating core 3	PTC IGBT或发热芯 4开路 Open circuit in PTC IGBT or heating core 4	PTC 温度传感器开路 Open circuit in PTC temperature sensor
PTC 温度传感器短路 Short circuit in PTC temperature sensor	PTC IGBT温度传感器开路 Open circuit in PTC IGBT temperature sensor	PTC IGBT温度传感器短路 Short circuit in PTC IGBT temperature sensor	充电模式 Charging mode

网关位置示意图（网关控制器安装在前面板圆管梁上）

Gateway position (Gateway controller mounted on front panel pipe beam)



引脚的定义

Definition of pins

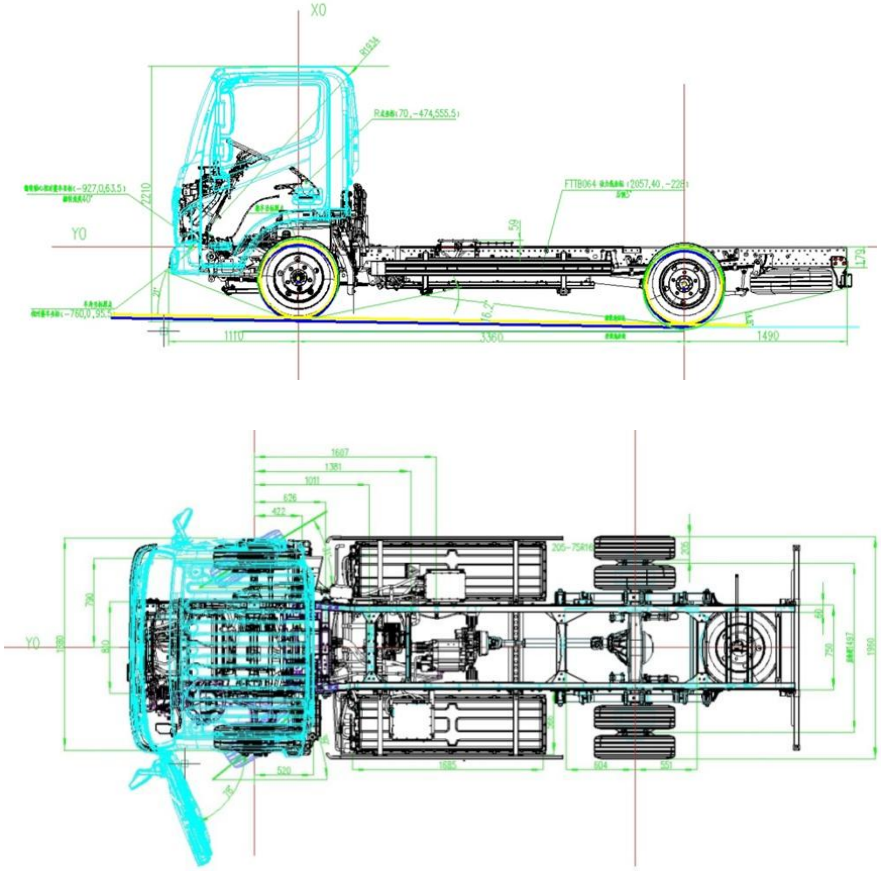
PIN 号 PIN number	功能定义 Function definition	功能描述 Function description	备注 Remarks	推荐路径 Recommended wire diameter
1	/	/	Reserved	
2	/	/	Reserved	

3	GND GND	地 Ground		
4	/	/	Reserved	
5	/	/	Reserved	
6	IGN 信号 IGN signal	IGN 信号 IGN signal		
7	**/**	**/**	**Reserved**	
8	GND	地 Ground		
9	/	/	Reserved	
10	/	/	Reserved	
11	/	/	Reserved	
12	CAN4_L	CAN LOW BCAN		
13	/	/	Reserved	
14	CAN2_L	CAN LOW BCAN		
15	GND	地 Ground		
16	/	/	Reserved	
17	CAN1_H	CAN HIGH PCAN		
18	GND	地 Ground		
19	GND	地 Ground		
20	电源 Power supply	电源 Power supply		
21	/	/	Reserved	
22	/	/	Reserved	
23	GND	地 Ground		
24	/	/	Reserved	
25	/	/	Reserved	
26	/	/	Reserved	
27	/	/	Reserved	
28	GND	地 Ground		
29	/	/	Reserved	

30	/	/	Reserved	
31	/	/	Reserved	
32	CAN4_H	CAN HIGH PCAN		
33	/	/	Reserved	
34	CAN2_H	CAN HIGH PCAN		
35	GND	地 Ground		
36	/	/	Reserved	
37	CAN1_L	CAN LOW PCAN		
38	GND	地 Ground		
39	开关公共地 Switch common ground	开关公共地 Switch common ground		
40	/	/	Reserved	

附件 B 底盘总布置图

Appendix B General Layout of Chassis



附件 C 整车参数总述

Appendix C Overview of Vehicle Parameters

车型/参数 Model/parameter		BJ1045EVJAD/ BJ5045EVJAD	
尺寸参数 Dimensions	二类底盘外形尺寸(mm) Overall dimensions of Class II chassis (mm)	5960x2000x 2210	5960x2000x 2210
	轴距(mm)	3360	3360

	Wheelbase (mm)		
	前/后轮距(mm) Front/rear wheel track (mm)	1590/1497	1590/1497
质量参数 Mass parameters	整备质量 (kg) kerb mass (kg)	2500	2671
	总质量(kg) GVW (kg)	6000	4250
动力电池 Power battery	厂家 Manufacturer	CATL	CATL
	电池类型 Battery type	磷酸铁锂	磷酸铁锂
	系统额定电压（V） Rated system voltage (V)	540.96	540.96
	总能量(kW·h)（常温） Total energy (kW h) (at normal temperature)	81.14	81.14
	能力密度（wh/kg） Energy density (wh/kg)	146.7	146.7
驱动电机 Drive motor	驱动方案 Drive scheme	540.96	540.96
	额定功率（kw ） Rated power (kW)	64	64
	峰值功率（kw ） Peak power (kW)	115	115
	峰值扭矩（N.m ） Peak torque (N.m)	300	300
	峰值转速（rpm ） Peak speed (rpm)	12000	12000
	额定转速（rpm ） Rated speed (rpm)	4300	4300
后桥	型式	冲压焊接整体桥壳	冲压焊接整体桥壳

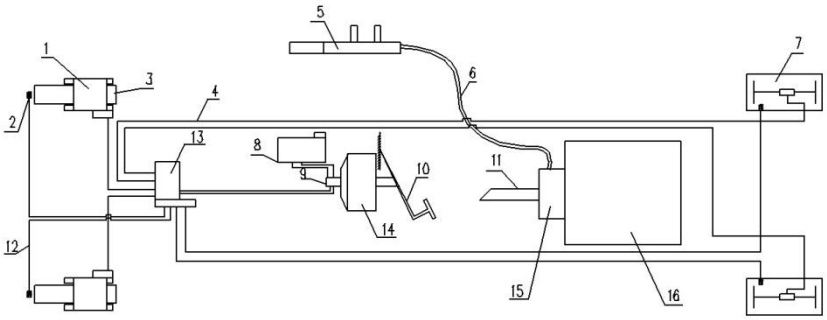
Rear axle	Type	Integral press-welding axle housing	Integral press-welding axle housing
	断面尺寸(mm) Cross section dimensions (mm)	106×106×6	106×106×6
	承载能力 Bearing capacity	4.5T	4.5T
	速比 Speed ratio	5.125	5.125
轮胎 Tire	型号 Model	205/75R16	205/75R16
前桥 Front axle	承载能力 Bearing capacity	2.4T	2.4T
	下沉量（mm ） Sinkage (mm)	83+15	83+15
	板簧托距（mm ） Leaf spring support distance (mm)	750	750
车架 Frame	形式 Type	铆接车架 Riveted frame	铆接车架 Riveted frame
	宽度mm（前/中/后） Width (mm) (front/middle/rear)	810/810/750	810/810/750
	纵梁断面（mm ） Cross section of side member (mm)	179*59.5*4	179*59.5*4
前悬架 Front suspension	形式 Type	非独立悬架 Non-independent suspension	非独立悬架 Non-independent suspension
	板簧片数 Number of leaf springs	3	3
后悬架 Rear suspension	形式 Type	非独立悬架 Non-independent suspension	非独立悬架 Non-independent suspension
	板簧片数	5+2主副簧	5+2主副簧

	Number of leaf springs		5+2 main and auxiliary springs	5+2 main and auxiliary springs
制动系 Braking system	制动型式 Brake type		液刹 Hydraulic brake	液刹 Hydraulic brake
	行车制动 Service brake	形式 Type	前盘后鼓 Front disc brake and rear drum brake	前盘后鼓 Front disc brake and rear drum brake
		制动器规格（mm） Brake specifications (mm)	前16寸浮钳；后320*100双领蹄鼓式 Front 16-inch floating caliper brake; rear 320*100 twin leading shoe type drum brake	前16寸浮钳；后320*100双领蹄鼓式 Front 16-inch floating caliper brake; rear 320*100 twin leading shoe type drum brake
	驻车制动 Parking brake	形式 Type	中央鼓式 Central drum type	中央鼓式 Central drum type
		规格 Specifications	—	—
转向系统 Steering system			低压电动转向系统 Low-voltage EPS	低压电动转向系统 Low-voltage EPS
低压电器电压 Voltage of low-voltage electrical apparatus			24V	24V

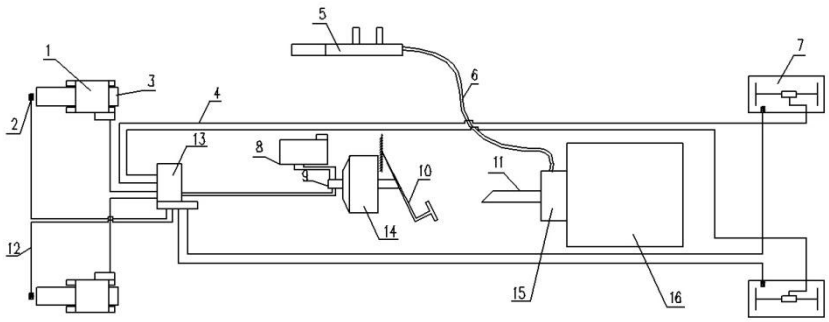
附件 D 制动原理图

Appendix D Schematic Diagram of Brake

液刹车型



Vehicle models with hydraulic brake



1. Front brake caliper 2 Wheel speed sensor 3 Front brake disc 4 Brake pipeline 5 Parking brake control mechanism 6 Parking brake cable 7 Rear drum brake 8 Brake fluid cup 9 Brake master cylinder 10 Brake pedal 11 Transmission shaft 12 Wheel speed sensor harness 13 ABS+ESC ECU 14 Hydraulic booster 15 Parking brake 16 Motor

附件 E 引用标准

Appendix E References

本指南引用了以下汽车标准，由于标准的不断改进和完善，请各用户和改装厂家以最新版本标准为准。

This Modification Guide references the following automobile standards. The latest version of the standards shall prevail due to the continuous improvement and perfection of the standards.

1 整车部分

1 Complete vehicle

标准号 Standard No.	标准名称 Standard name
(EU)1230/2012	《关于机动车及其拖车的质量与尺寸型式认证要求》 Mass and Dimensions of Motor Vehicles and Their Trailers
ECE R73.01	《关于就侧面防护装置方面批准货车、挂车和半挂车的统一规定》 Uniform Provisions Concerning the Approval of: I. Vehicles with Regard to their Lateral Protection Devices (LPD) II. Lateral Protection Devices (LPD) III. Vehicles with Regard to the Installation of LPD of an Approved Type According to Part II of this Regulation
ECE R48.06	《关于车辆照明及照明信号装置安装认证的统一规定》 Uniform Provisions Concerning the Approval of Vehicles with Regard to the Installation of Lighting and Light-signalling Devices
ECE R58.03	《关于: 1.下部防护装置 2.就已批准的后下部防护装置的安装方面认证车辆 3.就后下部防护装置方面认证车辆的统一规定》 Uniform Provisions Concerning the Approval of: I. Rear Underrun Protective Devices (RUPDs); II. Vehicles with Regard to the Installation of an RUPD of an Approved Type; III. Vehicles with Regard to their Rear Underrun Protection (RUP)