

TCD

Technical Customer Documentation (TCD)

Product Name: Common Rail High Pressure Pump

产品名称: 共轨高压泵

Type designation: CPN2-18/2

型号: CPN2-18/2

Product Number: 0445 020 619

产品号: 0 445 020 619 (On-HW)

Application: HD On_High Way

应用: HD 道路车辆

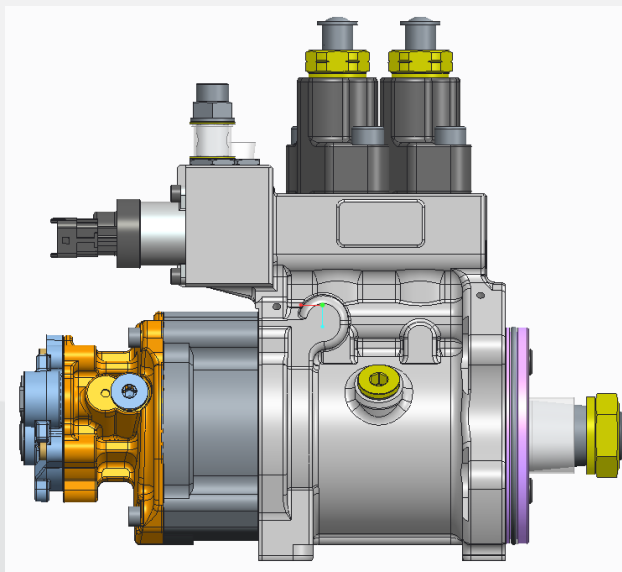
Version: 00 **Date:** 2019.05.06

版本: 00 日期: 2019.05.06



BOSCH

Invented for life



Product advantage for the customer:

- High robustness with oil lubrication drive train
- Full function till low inlet pressure
- Fulfill system quantity requiemment with gear ratio 1:2
- Plug&Play with former CPN2 generation

产品优势:

- 机油润滑传动系保证油泵高鲁棒性
- 在低进口压力下仍然可以全功能运转
- 在速比1:2下满足系统油量需求
- 即插即用兼容CPN2历代产品



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1. Product identification

Product designation: Common Rail high pressure Pump

Type designation: CPN2-18/2

Part number: 0 445 020 619 (On_HW)

Number of offer drawing: 0 445 A30 151(On_HW)

Name of customer: JMCH

Number, edition/version, date, and title of the customer specification:

Tepr16_051

This product is solely intended for use in:
Vehicle type<Trailer, dumper>, engine version<12.7L CN6>

1 产品信息

产品名称: 共轨高压泵

型号: CPN2-18/2

物料号: 0 445 020 619 (On_HW)

客户图纸号: 0 445 A30 151(On_HW)

客户名称: 江铃重汽

号码, 版本, 日期, 客户规范标题:

Tepr16_051

本产品仅用于:
车辆类型<挂车, 自卸车>, 发动机型号<12.7L CN6>

Other applicable documents

Following sub-documents can be revised without losing the validity of the signed TCD. Sub document refer to the latest released version.

*Detailed information is in the sub-documents.

其它适用文档

TCD 子文件的更改不会使整个签字确认的客户技术文档的失效, 子文件以最新放行的版本为准。

具体信息在各个子文件中

| sub-Document*/ 子文件 | Document Nr./ 文件号 |
|--|-------------------|
| Allowed Fuel/允许燃油 | 0 449 D05 135 |
| Fuel Filter system/燃油滤清系统 | 0 449 D00 023 |
| Mounting instruction/安装指导 | 0 445 Y30 202 |
| Requirement on water traps/油水分离规范 | 0 449 D00 006 |
| Test method for common rail pump/共轨泵测试方法 | 0 445 Y30 324 |

In case of any differences or ambiguities between the English and the Chinese translation, the English prevails.

Bosch has the privilege of final interpretation of this TCD.

如英文和中文翻译之间有任何的歧异或冲突, 应以英文为准。

本 TCD 的最终解释权归博世所有。

If no special remarks, all the “speed” in this TCD is pump speed, all the “pressure” is relative average pressure.

如果没有特别的说明, 该 TCD 中所有的“速度”是泵的转速, 所有的“压力”是相对平均压力。

2. General product description

Common rail pump is designed for usage on fixed-installation engines, commercial vehicles, and construction and agricultural machinery. They enable high power outputs per cylinder on diesel engines with between 6 and 8 cylinders. The mechanical energy is converted into hydraulic energy by translating the rotary movement of camshaft into reciprocating movement of piston through the roller tappet. The fuel delivered by the feed pump (mechanical vane pump) flows into fuel pump gallery which in turn is pressurized with controlled quantity into rail. It provides rigid support for mounting of components such as feed pump and governor.

This product is an oil lubricated 2-cylinder inline pistons high pressure pump. It generates the pressure required by the Common Rail Injection System for all operating conditions of the engine. The fuel is pumped from the tank by a feed pump which is integrated on the high pressure pump.

The fuel delivery quantity can be controlled by the fuel metering unit mounted on the pump. The system pressure can be governed continuously by pump working at maximum, partial and minimum delivery.

The most important criteria in that regard are:

- Compress fuel to rail for engine start.
- Provide pressurized fuel required by the FIE system.
- Regulate the rail pressure by controlling MPROP.

2 产品总体描述

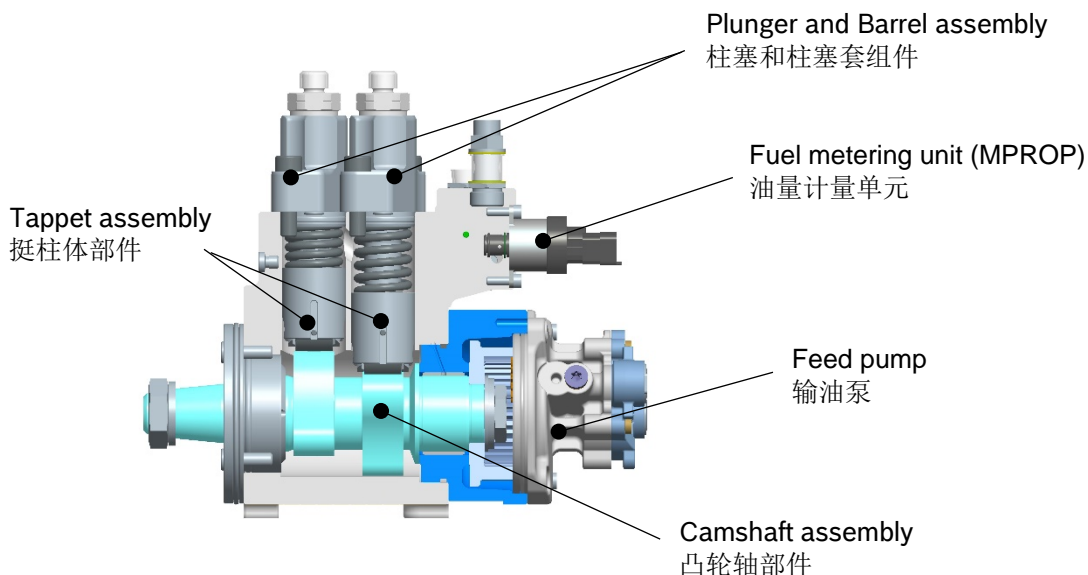
共轨泵是为固定安装的发动机、商用车、建筑和农用机械的使用而设计的。它可以使6-8缸的柴油发动机每缸输出较高的动力。通过挺柱体把凸轮轴的旋转运动转换成柱塞的往复运动，从而将机械能转换成液压能。燃油通过输油泵进入到油泵的油道，并通过柱塞压缩成高压油供给油轨。高压泵为输油泵和调节器的部件的安装提供了支撑。

本产品是机油润滑两缸直列式柱塞高压泵，它为共轨喷射系统提供发动机各种工况所需的喷油压力。由集成在高压泵上的输油泵将燃油从油箱中吸出。

通过安装于泵上的油量计量单元，可对高压泵的供油量进行控制，从而实现系统压力的调节。高压泵供油量可在最大油量，部分油量与最小油量之间连续控制，从而实现对系统压力进行连续、平滑控制。

高压泵最重要的功能为：

- 为发动机启动提供高压油至油轨
- 为燃油喷射系统提供所需要的高压油
- 通过控制 MPROP 调节油轨压力



Structure of common rail pump CPN2-18 / CPN2-18共轨泵结构图

2.1 Main function and properties of the product**2.1 产品主要功能及属性****2.1.1 Characteristic data****2.1.1 特征数据**

| Item /项目 | Value /数值 | Unit /单位 | Remarks /备注 |
|---|--|----------------------|----------------|
| Pump type/油泵类型 | 2-piston inline pump / 2 柱塞直列泵 | | |
| Feed pump/输油泵 | Mechanical gear pump integrated on high pressure pump/集成在高压泵上的机械式齿轮泵 | | |
| Cam lobes/凸轮桃头数 | 3 | lobes | |
| Plunger diameter/柱塞直径 | 8.0 | mm | |
| Plunger stroke(lift) /柱塞行程 | 15.0 | mm | |
| Theoretic fuel delivery /理论供油量 | 4524 | mm ³ /rev | |
| Driving type/驱动形式 | 齿轮驱动 /Gear driven | | |
| Transmission type/传动形式 | Cone/锥面 | | |
| Transmission ratio (pump to engine) / 传动比(油泵对发动机) | 1:2 | | |
| Direction of rotation View from pump driving side/转向 (从泵驱动端看) | Counter clockwise 逆时针方向/ | | |

2.1.2 Functional data**2.1.2 功能数据**

| Item /项目 | Value /数值 | Unit /单位 | Remarks /备注 |
|---|--------------|-------------|---|
| Pump working pressure/油泵工作压力 | | | |
| Max. rated working rail pressure/ 最大额定工作轨压 | 1800 | bar | |
| Max. pump outlet peak pressure/ 最大泵端峰值压力 | 2050 | bar | Measured at 10mm from HP outlet /在距高压接头 10mm 处测量 |
| Pump working speed/ 油泵工作转速 | | | |
| Max. rated speed /最大额定转速 | 900 | rpm | |
| Max.speed at high idle /最大空转转速 (高怠速) | 1075 | rpm | Rail pressure < 800 bar /轨压 < 800 bar |
| Over speed for long time /长时间超速 | 1200 | rpm | 250h accumulated over lifetime Rail Pressure≤300bar, Injection Q=0 /全寿命累计运行不超过 250 小时, 轨压≤300bar 供油量=0 |

| | | | |
|--|------|-----|---|
| Over speed for short time /短时间超速 | 1350 | rpm | 1h accumulated over lifetime Rail Pressure≤300bar, Injection Q=0 /全寿命累计运行不超过 1 小时， 轨压≤300bar 供油量=0 |
| Min. pump speed at max. rated pressure/最大额定轨压时的最低许 用转速 | 600 | rpm | |

Bosch points out that the ASIL-classified requirements as per ISO 26262, their implementation and the assumptions made for this purpose are documented in "Safety Case".

It is the customer's responsibility to validate these documented requirements, their implementation and the assumptions made for this purpose.

The customer must ensure that the Bosch scope of delivery complies with the requirements on the functional safety within the overall system.

博世指出，按照 ISO26262 的 ASIL 分类要求以及他们的实施和基于此目的的任何假设，都在“安全情况”中进行描述。

客户需负责对这些文件要求及他们的实施和基于此目的的假设进行验证。

客户必须确保博世交付的产品符合整体系统的功能安全要求。

2.2 Intended use

2.2.1 Agreed use

Bosch complied with the following regulations specific to the target market when developing the product: <target market :China>

If other or additional regulations are required for marketing the product or marketing is effected outside the named target market, the customer requests compliance with the specific regulations of the target market from Bosch, or ensures these by itself.

Provided that the pump is used within the conditions (environment, application, installation, loads) as described in this TCD and the corresponding agreed upon documents, Bosch ensure that the product complies with the agreed properties. Agreements beyond this require the written approval by Bosch. The product is considered fit for the intended use when the product successfully has passed the tests in accordance with the TCD and agreed upon documents. It is the responsibility of the customer to ensure the proper application of the product in the overall system/vehicle.

Bosch does not assume any responsibility for changes to the environment of the product that deviate from the TCD and the agreed upon documents.

2.2.2 Intended use

CPN2-18 are designed for usage on high way application. Pump operates at a full load and full speed with specified delivery quantity according to the test specification data.

Should Bosch have agreed that the product should be fit for the use or purpose intended and/or having a defined level of quality, such agreement is subject to the application of common rail pump within the conditions (environment, application, installation, loads) as described in this TCD and the agreed upon documents.

All contractual requirements, including the aforementioned, are deemed to be fulfilled, when the product has passed the tests in accordance with the TCD and agreed upon documents.

This is especially applied for applications that place special demands on durability and safety.

The product's operating safety is only ensured if the specified permissible conditions (e.g. for transport, storage, assembly, operation, service, shutdown, recycling etc.) are maintained.

2.2 设计用途

2.2.1 使用协议

博世在开发产品过程中遵守以下特定于目标市场的规定：<目标市场：中国>

如果营销产品需要其他或额外的规定或已在目标市场之外营销，客户要求必须符合博世特定的目标市场的规定，或由客户自行确保满足额外的规定。

在油泵按照本 TCD 及相关文档中规定的产品使用条件(环境、应用、安装、载荷)使用的前提下，博世保证产品满足其约定的特性。

超出本 TCD 及相关文档中规定的产品使用条件需要博世的书面批准。当产品根据 TCD 及相关议定文档成功通过验证时，认为该产品满足建议使用条件。

客户需负责保证产品在整个系统/车辆中的正确的匹配。

对于任何超出 TCD 及相关议定文档要求的产品匹配环境的变更博世不承担任何责任。

2.2.2 设计用途

CPN2-18 是为道路应用而设计的，泵在全载全速的高压流量定义在了测试规范中。

博世同意，产品适用于以上建议的使用和目的，具有规定的质量水平，这种协议是以共轨泵工作在本 TCD 描述的条件（环境、应用、安装、载荷等）为依据的。

当产品根据 TCD 及其相关文档成功通过验证时，包括以上提到的所有合同要求都被视为满足。

对于这一点，尤其适用于对耐久性和安全性有特殊要求的匹配。

本产品的操作安全仅在特定许可条件下并得到很好维护的情况下才可以保证（如运输、储存、装配、运行、服务、停机、循环等）

2.3 Safety and warning notes

2.3.1 Unintended use

The CPN2-18 pump is only to be used in civil area, diesel fuel injection systems on diesel cycle combustion engines, for automotive applications and using permissible fuels. Applications in air-, water- and space crafts are neither tested nor approved by Bosch and can be dangerous. Other applications of the pump with the purpose of preparing or metering fluids or gases (e.g. paints, medicaments ...) are not allowed and regarded as misuse and may cause severe damage.

Additionally, the operation of the pump with non-approved media and parameters is not allowed and can be hazardous.

2.3.2 Misuse

Continued operation at conditions outside of the characteristic data given in the TCD (example: due to a system failure) is not permitted. Consequences have to be checked and approved by Bosch.

Misuse is present if the oil supply is delayed after the beginning of start process, because then the high pressure pump have to provide high pressure fuel without lubrication is ensured. The consequence can be a pump damage on account of a lack lubrication or air / foam in the system.

2.3.3 Assembly of the pump on the engine

All work on the common rail system may only be performed in a voltage- and pressure-free state.

When assembling, disassembling or cleaning of the pump, pay attention to cleanliness, to prevent the entry of particles into the pump or the engine.

Remove the protective caps until immediately before installation. Outer seals (O-rings) moisturize with mounting oil, motor oil or diesel. Water-containing lubricants are not allowed.

A force transmission to the return port or the plastic extrusion should be avoided.

The O-ring and washer should be inspected prior to each installation of the return plug for damage and deformation and possibly replaced by a new one. After replacing the O-ring that has to be checked again for damage and proper fit. Outer seals (O-rings) moisturize with mounting oil, motor oil or diesel. Water-containing lubricants are not allowed. A force transmission to the return port or the plastic extrusion should be avoided.

The nut of the high-pressure line must be fixed properly during assembly.

2.3 安全与警告

2.3.1 非设计用途

CPN2-18泵仅在民用领域使用，用于使用规定燃油的柴油机的燃油喷射系统。航空，水上和宇宙飞船的应用没有经过试验也没有被博世批准，可能是危险的。其它以准备或作为液体或气体的计量为目的的应用是不允许的，这些都将视为错误使用，可能会造成产品的严重损坏。

另外，油泵也不允许使用未经批准的介质和参数，这将可能造成人身伤害。

2.3.2 不正当使用

严禁在TCD规定的产品特性以外的条件下进行连续操作（例如：系统故障）。在非正常操作后应当由博世进行检查并批准。

如果在启动刚开始的时候，润滑油供油出现延迟，这种情况出现就是使用不当，高压泵将在没有机油润滑的条件下工作并提供高压燃油，其结果将是油泵由于润滑不良对系统造成损坏。

2.3.3 油泵在发动机上的装配

操作共轨系统的所有工作只能在断电和无压力的状态下进行。

在装配、拆卸或清洗泵时，应注意清洁，防止颗粒进入泵或发动机。

保护帽一直保留到安装前再拿掉。外部密封件（O型圈）需要用润滑油、机油或柴油来润滑。含水润滑剂是不允许的。

应避免将密封件强行推送到安装位置，避免密封件塑性挤出。

O型圈和垫圈在安装之前需要检查是否有损坏或变形，若有则需换新的零件。替换之后O型圈需要重新检查是否有损伤以及是否安装到位。在安装过程中所有连接都必须锁紧。外部密封件（O型圈）需要用润滑油、机油或柴油来润滑。含水润滑剂是不允许的。应避免将密封件强行推送到安装位置，避免密封件塑性挤出。

安装过程中，高压油管的螺母必须固定到位。

The installation of dropped pumps into the vehicle is not allowed because concealed damage may have occurred.

Information on commissioning the overall system can be provided by the Bosch system development.

2.3.4 Disassembly at the engine

The exchange of the product must be done by trained specialist in workshops with suitable perform tool. There are only using the provided original spare parts.

WARNINGS

Fuel exit from the high pressure system can cause serious injury. It must be ensured that fuel pressure of the high pressure system is lowered in an appropriate manner to ambient pressure before disassemble. To reduce a risk of burns and fire hazard, the system needs to cool down to room temperature before the pump is dismantled. Before the harness and connector disconnected, the pump needs to be de-energized appropriately.

The dismantling of the pump has to be done analogously to the assembly. Exposed connections shall be closed with caps.

2.3.5 Dry operation

Lube oil filling is mandatory before first start. (During stop of the pump the oil may discharge.)

Operation of the pump without lubrication is not allowed and may cause mechanical damage.

2.3.6 Improper cleaning

An ultrasonic cleaning or cleaning with other inputs admissible marked, for example, with other cleaning fluids or mechanical tools is not allowed because it may lead to mechanical damage and dirt / functional impairments.

掉在地上的油泵不允许安装，因为潜在的损坏可能已发生。

整个系统的调试信息由博世系统开发部门提供。

2.3.4 油泵在发动机上的拆卸

该产品更换需要由经过培训的专业人员使用合适的专用工具来进行，只能使用原装备件。

警告

燃油从高压系统泄出会引起严重的人身伤害。油泵拆卸前，必须确保燃油压力以适当的方式转成环境压力。为了降低灼伤和火灾的危险，在油泵拆除之前系统需要将系统冷却到常温。线束插头断开前，油泵需要以合适的方法断电。

油泵的拆卸过程与装配类似，外露的接头用保护套封闭保护。

2.3.5 干运行

首次启动前必须加润滑油（在油泵静止期间润滑油可能被排空）

泵在无润滑油的情况下运行是不允许的，这会造成机械性损伤。

2.3.6 不适当的清洁

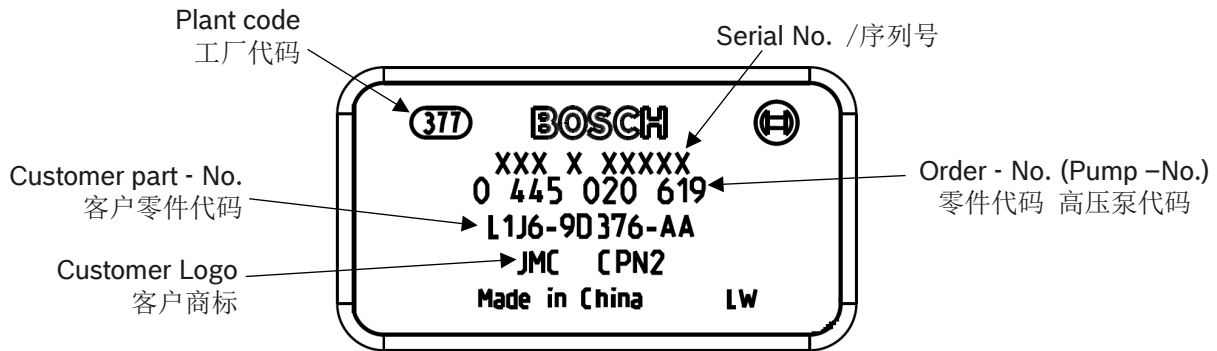
超声波清洗或者使用其它许可的品牌清洗剂进行清洗，使用其他清洗液或机械工具是不允许的，因为会造成机械损害和污染/功能影响。

2.4 Labelling of the product

The specific labeling of the pump is given in the offer drawing (see chapter1) and in individual cases depending on the customer requirements.

2.4 产品标牌

在客户图纸（见章节1）里有油泵标牌的特殊说明及根据客户要求有个别说明。



Labelling/标牌

2.5 Dimensions and weights

Dimensions and weights are dependent on the specific design of interfaces, refer to offer drawing (see chapter1) and related documents.

The weight of the pump:

Net weight: approx. 13kg

The outer dimension of the pump:

Dimension in X-axis: 298 mm

Dimension in Y-axis: 265 mm

Dimension in Z-axis: 183 mm

2.5 尺寸及重量

尺寸和重量取决于接口的特定设计，可参考客户图纸（见章节1）和相关的文件。

油泵重量:

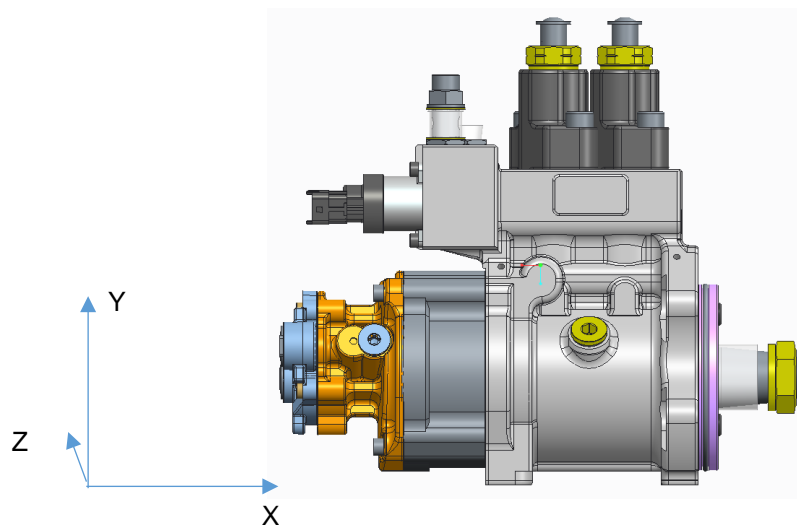
净重量: 大约13 公斤

油泵外形尺寸:

X方向: 298 mm

Y方向: 265 mm

Z方向: 183 mm



Dimension / 尺寸

2.6 Power consumption/power output

Electrical power consumption is specified by corresponding ECU and the installation environment.

Pump driving torque and mechanical power consumption see table below

2.6 功率消耗/输出

电功率消耗由相应的ECU和安装环境决定。

泵驱动扭矩及功率消耗见下表

| Item /项目 | Value /数值 | Unit /单位 | Remarks /备注 |
|---|--------------|-------------|--|
| Max. Positive torque /最大正扭矩 | 230.1 | Nm | Measured on customer engine test bench /在客户发动机上测量值。 |
| Average torque /平均扭矩 | 49.6 | Nm | |
| Max. Negative torque /最大负扭矩 | -59.6 | Nm | |
| Max.powerrequired(average) /最大功率消耗(平均值) | 4.56 | kW | |

2.7 General remarks on service, repair, and maintenance

Service and repair or replacement of the product may only be performed by authorized personnel.

The pump can only be rinsed or washed with approved operating materials. It is important to ensure a particular degree not to cause unwanted partial problem in the pump, please check the maxium partial loading in new condition.

For safety reasons, diassembly of the pump is not allowed.

WARNINGS

Fuel exit from the high pressure system can cause serious injury. It must be ensured that fuel pressure of the high pressure system is lowered in an appropriate manner to ambient pressure before it exit from the high pressure system. To reduce a risk of burns and fire hazard, the system needs to cool down to room temperature before the pump is diamantled. Before the harness and connector disconnected, the pump needs to be de-energized appropriately.

2.8 Information on disposal and recycling

All items are in an environmental protection concept of the production to recycling or to disposal involved.

Legal regulations, generally accepted rules of technology and operational standards are met.

2.7 服务，维修及维护

只有经过授权的人员才能对产品提供服务、进行维修及更换。

油泵的清洗只能使用经批准的清洗液，确保清洗液特殊的等级以免在泵中造成颗粒问题是很重要的，并检查在新的状态下颗粒允许的最大数量。

为安全起见，禁止拆解油泵。

警告

燃油从高压系统泄出会引起严重的人身伤害。燃油从高压系统泄出之前，必须确保燃油压力以适当的方式转成环境压力。为了降低灼伤和火灾的危险，在油泵拆除之前系统需要将系统冷却到常温。线束插头断开前，油泵需要以合适的方法断电。

2.8 废弃和回收

生产到再循环利用或废弃均遵循环境保护理念。

满足法律法规，技术的通用规则和操作标准。

3. System description

3.1 System of interest (SOI)

The common rail pump is part of a common rail system of a diesel engine.

The pump is disposed between the fuel tank and the fuel rail.

The pump provides high pressure to the fuel system and the injector injects the fuel to the combustion chamber. The figure below illustrates the essential components of a CR system using the example of a 6-cylinder engine and illustrates the arrangement of the whole system.

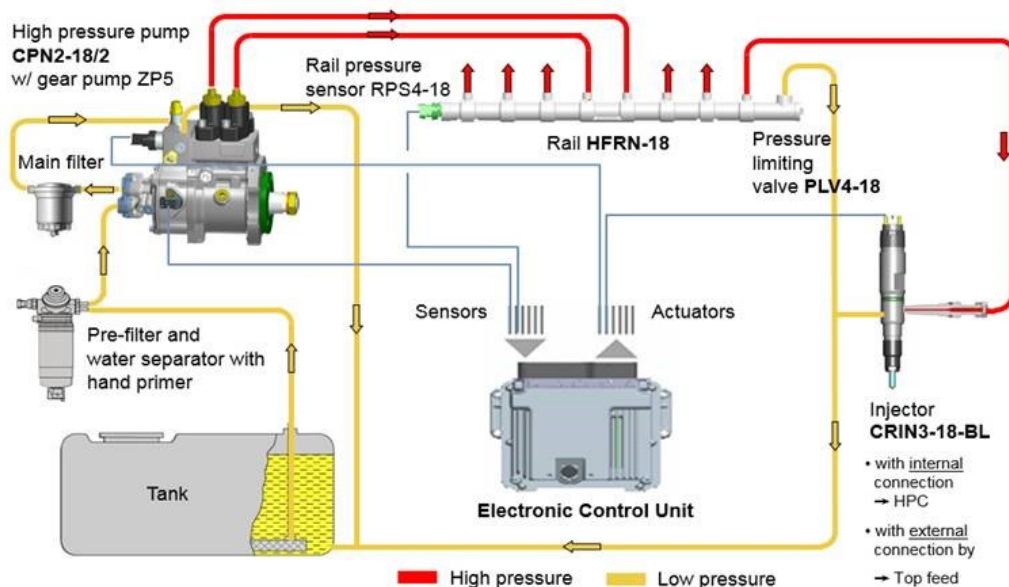
3 系统描述

3.1 系统

共轨泵是柴油发动机共轨系统的一个部件。

共轨泵位于油箱和油轨之间。

共轨泵给燃油系统提供高压油，由喷油器将高压油喷射到燃烧室。下图以一个六缸机的例子阐述了共轨系统的主要组成部件并阐述了整个系统的布局。



CRSN3-18BL System layout with CPN2-18/带CPN2-18泵的CRSN3-18BL共轨系统

3.2 Hardware and software interfaces

3.2.1 Interface to engine

Within the CR system, pump is connected by mechanical interface, hydraulic interface (low pressure), hydraulic interface (high pressure) and electrical interface with the surrounding components, engine, rail, low pressure, and harness connector substantially.

The tightening torque must be according to offer drawing (see chapter 1).

Bosch is only responsible for the compliance of the product side plug (interface) with the agreed upon customer specification. Since the plug system is used per customer request, Bosch is not responsible and does not warrant for the connection assembly, especially not for its electrical function, durability and sealing.

3.2 硬件及软件接口

3.2.1 发动机接口

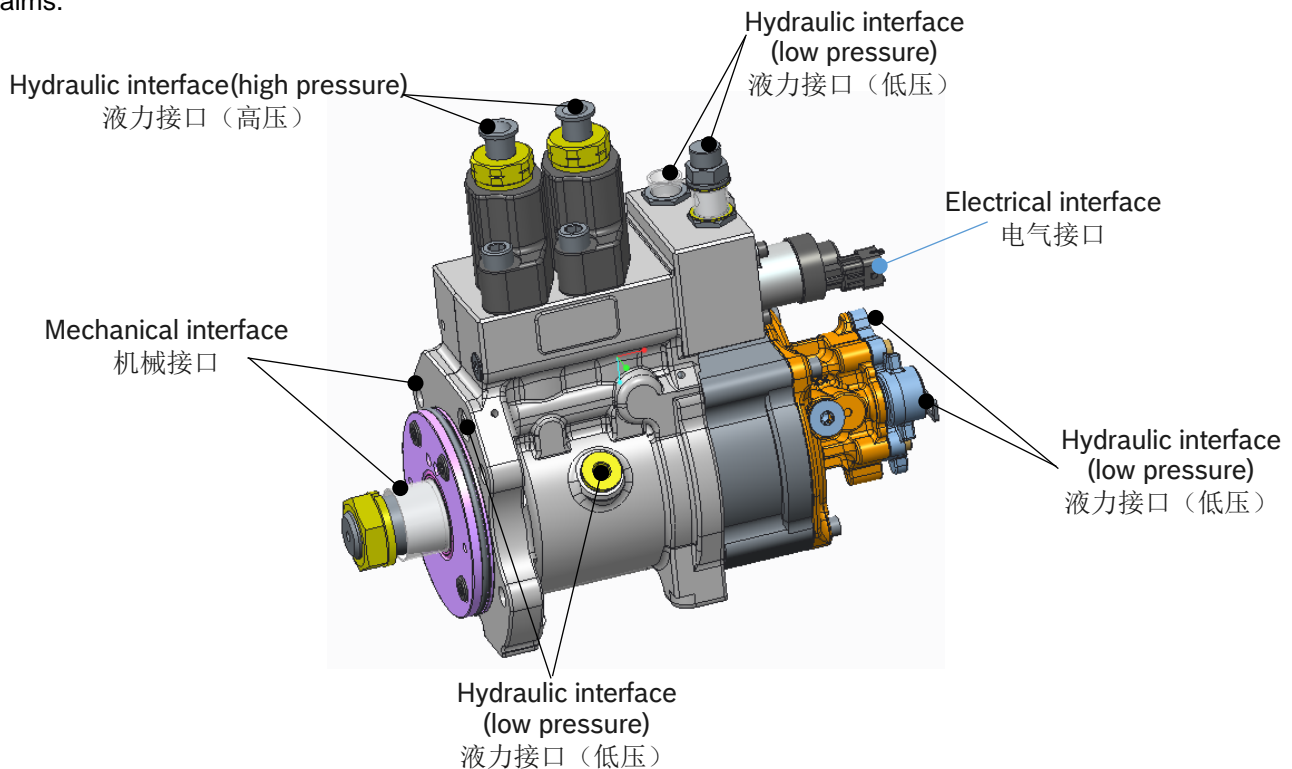
共轨系统中，共轨泵通过机械接口、液力接口（低压）、液力接口（高压）及电气接口与周围的发动机、油轨、低压油路和线束相连接成一体。

各接口拧紧力矩参照客户图纸（见章节1）。

根据议定的客户规范，博世只对油泵自带接头（接口）的配合性负责。对于其连接件，尤其是电气性能、耐久性和气密型是免责和免担保的，因为这是应客户要求而使用的。

In particular, for defects in the connector and any other resulting sequence defects assumes Bosch no liability for defects and shall be indemnified third of claims.

特别对于连接件的缺陷和连接件导致的任何后果，博世予以免责和免第三方索赔。



Interface to engine/油泵-发动机接口

3.2.2 Mechanical interface

The CPN2-18 HP-pump is installed directly on the vehicle engine. It is driven via gear. The drive element is screwed onto the cone of the camshaft.

The pump is mounted on the engine body through the pump flange. The drive axis of the CPN2-18 must be centered in order not to clamp the camshaft in the bearing positions of the CPN2-18 and thus to overload it.

3.2.2 机械接口

CPN2-18高压泵直接安装在车用发动机上。它是通过齿轮驱动。驱动元件拧紧在凸轮轴的锥体上。

油泵通过泵体法兰安装在发动机体上。驱动轴必须居中，以免夹紧凸轮轴，从而导致轴承过载。

3.2.3 Hydraulic interface (low pressure)

The low pressure connectors are the interface to the low-pressure line which connected to the pump and filter. The customer is responsible for ensuring sufficient quality of the low-pressure line and assembly (tightness, material fatigue strength, stress and sealing), the information in the offer drawing (see chapter1) must be observed. The content of residual dirt in the fuel system must be checked by the customer and minimized by suitable filters. A fuel filter recommendation is passed through Bosch-investigator in the project phase.

3.2.3 液力接口 (低压)

低压接头通过低压油管提供泵和滤清器的接口。客户负责低压油管的质量和安装（拧紧力，材料疲劳强度，应力和密封），客户图纸（见章节1）上的信息必须要遵循。燃油系统的残余污质成分须由客户检查并通过合适的滤芯把它最小化。燃油滤芯须在项目阶段由博世专业的调研人员确认通过。

Note:

When screwing, it should come to an adjustment of the head line in the contact area to the interface cone. Plastic deformation must take place at the line head to ensure the tightness in a multiple installation of the cables.

Bosch is neither high pressure (HP) pipe supplier nor low pressure (LP) pipe supplier and therefore for mounting orientation, Bosch takes no responsibility for HP pipes, LP pipes, assembly and tightness. Bosch doesn't specify the assembly process either of the HP nor LP for the series assembly at the customer.

Bosch bears no responsibility for leakage due to wrong assembly process or wrong design of HP pipes or LP pipes. The correct assembly parameters, sequence and process have to be ensured, if the specified values in the Bosch TCD are exceeded.

The sequence of the assembly process has a strong influence on tightness over life time.

Bosch recommends the assembly of high pressure pipes with a minimum of bending and torsion stress under observance of the threshold values specified by the pipe supplier.

To avoid loosening of the screws at the pump from clients, appropriate measures should be taken. For example, using suitable fixtures which engages directly on the pump. Tension forces to fix the pump axially incorporate into the pump. Torsional and bending during clamping and installation of the high pressure line must be avoided.

3.2.4 Hydraulic Interface (high pressure)

The high pressure connector is the interface to the high-pressure line which connected to the rail. A defined tightening torque to ensure the metallic sealing is required. The customer is responsible for ensuring sufficient quality of the high-pressure line and assembly (tightness, material fatigue strength, stress).

To prevent damage to the high pressure connector, the information in the offer drawing (see chapter1) must be observed.

The tightening torque and the axial force is determined by the customer response to its specific line interpretation (note information in the Offer drawing (see chapter1)).

The connection of the high-pressure line must be designed to fit, otherwise there is a danger that a sufficient tightness is not guaranteed.

3.2.5 Electrical Interface

This serves for the electrical connection of the control unit via the compact connectors (2 pin) on the wiring harness to the pump.

注释:

拧螺纹时，须将油管连接部分的头部对准接口的锥面部分。油管头部必须产生一定的塑性变形来确保拧紧力。

博世非高压油管和低压油管供应商，因此对于安装的结果，博世不承担高压油管、低压油管、安装和拧紧力矩等造成的不良后果。博世对客户量产的高压低压油管的安装工艺不做规定。

博世不对因错误的安装工艺或错误的高压低压油管的设计而造成的泄漏负责。

安装工艺不应超出博世 TCD 文档中的规定值。

博世推荐，在遵循油管供应商定义的阈值之内，尽可能使油管的弯曲和扭曲的应力最小。

为避免泵上螺纹在客户处的松脱，需要采取一些合适的措施，譬如，用适当的支架直接固定在油泵上。在固定油泵时，张紧力在轴向上与泵一致，应避免装夹和安装油管过程中产生的扭曲和弯曲。

3.2.4 液力接口（高压）

高压接头通过高压油管与油轨相连接。必须采用定义的拧紧力矩确保机械连接的密封性。客户负责高压油管的质量和安装（拧紧，材料疲劳强度，应力）。

为防止高压接头损坏，须遵循客户图纸（见章节1）上的相关信息。

拧紧力矩与轴向力由客户根据特定的油管说明来确定（注解在客户图纸（见章节1）上）。

高压油管的连接设计必须与高压接头匹配，否则无法保证充分紧固。

3.2.5 电气接口

通过带有线束的小型连接器（2脚），将控制器和与泵相连接

Via the control device (ECU), the pressure of the pump is controlled. Electrical control values comply with predetermined values of the electrical control.

The specific design of the electrical interface and the wiring harness directive and the information in the offer drawing (see chapter1) must be observed.

高压泵工作的压力是由控制单元来控制的。电气控制值要符合设定要求值。

电接头的特定设计及线束的标识和信息必须遵循客户图纸（见章节1）。

3.3 Permissible operating conditions

3.3.1 Allowed fuels

Allowed Fuel 0449D05135

No claims acceptable if fuels which are not clearly allowed in this TCD are used.

Bosch does not release any markets since we can only release our product for specified conditions; these are represented by fuel standards (public and in-house), not markets or countries.

Since the fuel in many markets widely does not comply to the locally required standards or is locally and temporally even worse than the surveyed quality, the resulting failures are non-warrantable.

3.3 许用操作条件

3.3.1 许用燃油

允许燃油0449D05135

如果使用的燃油不是TCD中明确允许的，将不接受索赔

博世并不会针对任何市场放行产品，只会针对指定条件放行产品。这由燃油标准（公共和内部标准）体现，而非市场或地区。

由于很多市场的油品不符合当地要求的标准，有些甚至低于市场调研的油品，由此造成的失效，博世不予质保。

Exclusion of materials in supplies:

All component surfaces which are in contact with the fuel, must be no copper (Cu), zinc (Zn) or lead (Pb). E.g. Copper-containing materials in the diesel fuel will cause catalytically reinforcing aging process, with the result of FAME or deposit formation, and corrosion can occur in the injection system, in particular in admixture with the fatty acid methyl esters. Out of the materials dissolved zinc and lead can lead to increased deposit formation. FAME increases the risk that these substances are extracted from the corresponding materials or surfaces.

Of these different fuels standards must be determined in consultation with Bosch and possibly tested separately, this also applies in the case of additives such as cleaning additives.

3.3.2 Fuel pressure (low pressure)

Low pressure system: the corresponding application has to adapt to following requirements

输入端的禁用材料:

所有与燃油接触的部件表面都不允许含有铜、锌或铅。例如，在脂肪酸甲脂的作用下，燃油中含铜会加速燃油老化或形成沉积物，使燃油喷射系统产生锈蚀，尤其是在脂肪酸甲脂的混合下。溶解了锌和铅的物质导致沉积物的加速形成。脂肪酸甲脂增加了这些物质从相应材料或表面中萃取的风险。

这些不同的柴油标准，须咨询博世或尽可能分别试验后再确定，此要求同样适用使用添加剂如清洁剂等情况

3.3.2 燃油压力（低压）

低压系统：需针对具体应用进行调整，使之满足以下要求

| Item/项目 | Value/数值 | Unit/单位 | Remarks/备注 |
|---|--|------------------|---|
| Low pressure system sealing /低压系统密封性 | Low pressure system sealing must be ensured to prevent air entry(No continuous air bubbles in the backflow pipe of the pump). /确保低压系统密封性, 防止空气进入低压回路(高压泵回油没有连续气泡) | | |
| Pressure allowed before feed pump/输油泵前端许用进油压力 | $0.35 \leq p \leq 1.0$ | bar abs /绝对压力 | Measured at inside of eye bolt connector of feed pump /在输油泵进油口螺栓接头内测量 |

| | | | |
|--|-----|------------------|--|
| Max. backflow pressure at outlet of high pressure pump/ 高压泵回油出口处的最大背压 | 1.2 | bar abs /绝对压力 | |
|--|-----|------------------|--|

3.3.3 Fuel temperature**3.3.3 燃油温度**

| Item/项目 | Value/数值 | Unit/单位 | Remarks/备注 |
|---|----------------------------|---------|--|
| Min. fuel inlet temperature/最低燃油进油温度 | - 25 | °C | Feed pump inlet/输油泵进油 |
| Max. fuel inlet temperature (feed pump inlet) /最高进油温度 | ≤ 70 | °C | Complete life time/全寿命 |
| | $70 \leq T_{\max} \leq 90$ | | ≤200h accumulated over for complete life time, in which: ≤100h accumulated and max. 1h continuously when $80\text{ °C} < T_{\max} \leq 90\text{ °C}$ / 全寿命累计≤200h, 其中, 温度在 $80\text{ °C} < T_{\max} \leq 90\text{ °C}$ 期间累计不能超过 100 小时, 且连续运行不能超过 1 小时 |

3.3.4 Oxidation stability of fuel**3.3.4 燃油的氧化安定性**

Aged bio-diesel is not allowed, details refer to fuel TCD 0449D05137

不允许使用老化的生物柴油, 详见燃油 TCD 0449D05137

3.3.5 Fuel cleanliness**3.3.5 燃油清洁度**

Particles loaded with fuel has an influence on the damage to the components of the whole system. The degree of damage of the components depends on the number, size and composition of the particles in fuel. At fuel stations arises depending on market and region has a different particle loading of the fuel. The amount of particle loading of the fuel is a determining factor in the lifetime of the system. Therefore, it is important to limit the particulate loading of the fuel before the inlet into the pump through a suitable fuel filter (e.g. a suitable fuel filter optimized aeration tank ...). The engine or vehicle manufacturer to interpret them is filtering based on the relevant environmental, operational, and vehicle-specific conditions. Design objective is to ensure a specified degree of purity of the fuel during operation of the vehicle. In order to protect product against damage caused by particles, a suitable fuel filter must be installed. A similar recommendation is made by Bosch.

In addition, an optimized aeration tank to further reduce the particle loading is recommended.

It is the responsibility of the customer to equip all applications with suitable fuel filters, so that does not cause damage within the required service life for the common rail system by particles loaded with fuel.

燃油中含有颗粒有损于整个燃油系统所有部件。部件的损坏程度取决于燃油中颗粒的数量、大小和成分。根据市场和地区不同, 各加油站燃油含颗粒的情况也不同。燃油中颗粒的总含量对系统寿命有决定性影响。因此通过在油泵前端使用合适的燃油滤清器来限制燃油系统中颗粒是非常重要的(如使用合适的燃油滤清器, 优化油箱通风)。发动机厂商或整车厂商根据相关的环境、运行工况和车辆特定条件决定过滤方式。设计目标就是保证在车辆运行中燃油一定的纯净度。为了防止产品因颗粒等造成的损坏, 需要安装合适的燃油滤清器。博世可以进行这方面的推荐。

另外, 推荐通风优化的油箱以进一步减少颗粒的导入。

客户有责任对所有的车辆安装合适的燃油滤清器, 以免在保修期内发生因燃油中的颗粒而对共轨系统造成损坏。

3.3.6 Requirements for fuel filter**3.3.6 燃油滤清器的要求**

In order to protect the Common Rail system from damages by particles, a suitable fuel filter must be installed according to the Fuel Filter system (see chapter1) (classifying of fuel filters for CR components). The selection of the suitable filter efficiency class depends on the most sensitive

为了防止共轨系统因颗粒造成损坏, 根据 燃油滤清系统 (见章节1) (共轨用滤清器分级), 必须安装合适的滤清器。合适的过滤效率等级的选择取决于共轨系统中最敏感的部件, 系统取决于油泵的型号, 应用的场地,

component of the injection system in dependence of the type of pump, the field of application, the market and the low pressure system. Beyond that an optimized tank vent is recommended for a further limitation of the particle loading.

市场和低压系统。除此以外，优化油箱的通风装置可以进一步限制颗粒的进入。

| Item/项目 | Value/数值 | Unit/单位 | Remarks/备注 |
|---|---|---------|------------|
| Filter specification/滤清器规范 | ≥460 | l/h | |
| Requirement for fuel filter grade/滤清器等级要求 | Fuel Filter system (see chapter1) (System requirement fuel-filter, in accordance with injector) 见燃油滤清系统（见章节1）（系统要求，与喷油器一致） | | |

3.3.7 Requirements on water trap

An increased water content in fuel causes a strongly reduced lifetime. (Corrosion defects and wear defects as a result of decreased lubricity). The water can be taken away from the fuel by the application of efficiently working and correct serviced water separators and thereby defects in the CRS components can be fought. Therefore the usage of a effective water trap in the low pressure system in front of HP-pump is strongly recommended, definition see: Specification for water separator(water trap) (see chapter1) (System requirements on water traps). The target consists in avoiding free water within the CRS.

No undissolved water flush from tank or water trap (water over overflow from not serviced water trap) should not reach HP-pump over low pressure system.

It is in the responsibility of the customer to guarantee that in all application cases of the engine functional and efficient devices are used to the water separation, that during the lifetime of CRS components no impairments of the CRS components can enter by free water in the fuel. The liability with corrosion defects or visibly by aqueous fuel caused other defects is expelled.

3.3.7 水分离器要求

燃油中含水量的增加会大大降低产品寿命（润滑性的降低会导致锈蚀和磨损）。燃油中的水分可以通过水分离器的有效工作和正确维护来去除，这样可以避免共轨部件的失效。因此，强烈推荐低压系统中油泵前端使用水分离器，定义参见油水分离规范（见章节1）（系统关于水分离器的要求）。使用水分离器的目的主要是避免共轨系统中含有自由水。

油箱或油水分离器排出的非溶解水，不允许通过低压系统进入高压油泵。

客户有责任确保在发动机运行的各种状态下都必须使用水分离器，以避免因燃油中自由水进入系统而对共轨部件在寿命期间遭受损坏。锈蚀或者明显是因燃油中含水造成的故障，博世不承担责任。

| Item/项目 | Value/数值 | Unit/单位 | Remarks/备注 |
|----------------------------|--|---------|------------|
| Water trap condition/水分离条件 | Specification for water separator(water trap) (see chapter1) (System requirement water trap) 见油水分离规范（见章节1）（系统关于水分离要求） | | |

3.3.8 Allowed lubrication oil

3.3.8 许用润滑油

| Item/项目 | Value/数值 | Unit/单位 | Remarks/备注 |
|--|--|---------|------------|
| Viscosity grade /粘度等级 | SAE 40 or multi grade oil for high temperature(summer) SAE 5W or multi grade oil for low temperature(winter) /SAE 40 或者多级高温油(夏季), SAE 5W 或者多级低温油(冬季) | | |
| Permitted filtration quality 允许清洁度等级/ | < SAE 6 /class 6 (not allowed: silicon particles, sand, hard particles like metal balls coming from blasting process). (禁止成分: 硅粒子、沙子、硬质颗粒)。 | | |
| Quality grade/质量等级 | API class CD / CD 级或以上 | | |

3.3.9 Quantity & pressure for lubrication oil

3.3.9 润滑油流量和压力

| | | | |
|---|-----------------------|-----|--|
| Min. quantity at rated speed /额定转速最小流量 | 20 | l/h | For customer's design of oil pump /供客户设计机油泵 |
| Idle speed/怠速 | $0.5 \leq p \leq 6.0$ | bar | To be confirmed/measured with engine/vehicle endurance test 需发动机/车辆耐久确认/测量 |
| Max. torque speed/最大扭矩点转速 | $2.5 \leq p \leq 6.0$ | bar | |
| Rated speed/额定转速 | $3.5 \leq p \leq 6.0$ | bar | In case of pressure out of range, discussion is necessary with pump development department. 一旦压力超出范围, 需要与油泵开发部门讨论 |

3.3.10 Inlet temperature for lubrication oil

3.3.10 润滑油进油温度

| | | | |
|---|-----------------------------|----|--|
| Min. Lube oil inlet temperature/最低润滑油进油温度 | -25 | °C | Permitted for lower starting temperature /允许启动的最低温度 |
| Max. temperature of lube oil(pump oil inlet) /最高润滑油进油温度 | ≤ 100 | °C | Complete life time/全寿命 |
| | $100 \leq T_{max} \leq 120$ | °C | $\leq 200h$ accumulated over for complete life time, in which: $\leq 100h$ accumulated and max. 1h continuously when $110\text{ °C} < T_{max} \leq 120\text{ °C}$ /全寿命累计不超过200小时, 其中 $110\text{ °C} < T_{max} \leq 120\text{ °C}$ 累计不超过100小时, 并且连续运行时间不超过1小时。 |

4. Technical data with measured variables and measuring conditions

4 测量数据和测量条件的技术参数

4.1 Function, function states (modes of operation), functional characteristics and boundary constraints

4.1 功能描述, 功能特性和边界约束

4.1.1 HP delivery quantity

4.1.1 高压供油量

HP delivery quantity, see test data sheet (chapter 5.3)

高压供流量, 见测试数据表 (章节5.3)

4.1.2 Pump start parameters

4.1.2 油泵启动参数

| Item/项目 | Value/数值 | Unit/单位 | Remarks/备注 |
|--|----------|---------|---|
| Min. speed of cold start /冷启动最低启动转速 | 67 | rpm | (T _{coolant temperature} /冷却水温度 = - 23.4°C) Validated in winter test/冬季试验确认 |
| Min. speed of hot start /热启动最低启动转速 | 81 | rpm | (T _{coolant temperature} /冷却水温度 = 97.5 °C) Validated in summer test/夏季试验确认 |
| Min. speed of normal T start /常温启动最低启动转速 | 75 | rpm | (T _{coolant temperature} /冷却水温度 = 20 °C) Validated in vehicle test/车辆试验确认 |
| Maximum pump starting speed /最大启动转速 | 300 | rpm | with oil lubrication/需机油润滑 |
| Max. set rail pressure at start /最大设置启动轨压 | 300 | bar | |

4.1.3 Number of engine starts

4.1.3 发动机启动次数

| Item/项目 | Value/数值 | Unit/单位 | Remarks/备注 |
|---|----------|----------|------------|
| Engine key start stop over life time /寿命周期内发动机钥匙启停 | 50,000 | 次数/Times | |

4.1.4 Restart after empty tank

4.1.4 空油箱启动

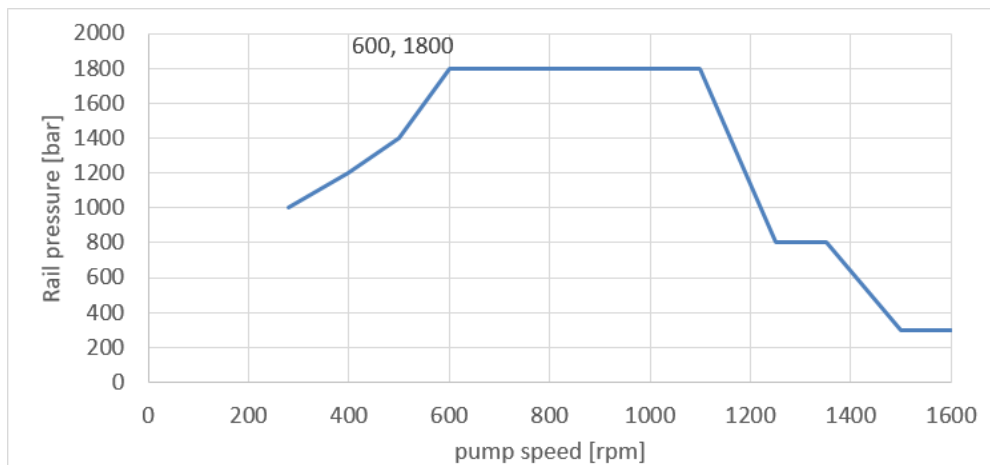
| Item/项目 | Value/数值 | Unit/单位 | Remarks/备注 |
|---|----------|---------|---|
| Restart after empty tank. Allowed running time of a pump which is not fed, but with lubricated inner components. /空油箱状态下重启, 在泵未充油, 但内部零件已润滑的条件下, 泵的允许运转时间 | ≤ 3 | min | Pump speed ≤ 300 rpm 高压泵转速 ≤ 300 rpm |

4.1.5 Speed and rail pressure map

Rail pressure at each pump speed must be under the limit, see the following limit rail pressure over pump speed curve.

4.1.5 转速轨压参数

泵各个转速下的轨压必须低于限值，见如下轨压转速图。



3lobe 15.0mm lift/ 3 桃头15mm升程

4.2 Mechanical characteristics

4.2 机械参数

4.2.1 Allowed load

4.2.1 许用载荷

| Item/项目 | Value/数值 | Unit/单位 | Remarks/备注 |
|--------------------------------|-------------|-------------------|--|
| Radial bearing load /径向轴承载荷 | ≤ 14.0 | N/mm ² | 在发动机上测量的最大轴承载荷值 19MPa，基于 LCM，平台验证和发动机验证结果评估可接受。 The actual max. Bearing load value is 19MPa which is measured on engine. It is evaluated as acceptable based on LCM, platform validation and engine validation. |
| External axial force /外部轴向力 | ≤ 1122 | N | |

4.2.2 Acceleration

4.2.2 振动加速度

Acceleration has to be measured on engine. The following values are the max. allowed values. 0-P value used.

振动加速度要在发动机上测试。以下是最大限值。加速度值采用 0-P 值。

| Item/项目 | Value/数值 | Remarks/备注 |
|------------------------------|--|------------------------|
| Sinusoidal vibration 正弦振动 | Vibration amplitude or acceleration /振幅或加速度 | Measuring point 测量点 |
| Pump/油泵 | from 70 to 200 Hz: 0.1 mm from 200 to 500 Hz: 16 g from 500 to 2000 Hz: 8 g 从 70 到 200 Hz: 0.1 mm 从 200 到 500 Hz: 16 g 从 500 到 2000 Hz: 8 g | Pump flange 油泵法兰 |
| MPROP/油量控制单元 | from 70 to 147 Hz: 0.35 mm | MPROP housing |

| | | |
|---|--|-------------------------|
| | from 147 to 1000 Hz: 30 g from 1000 to 2000 Hz: 20 g 从70 到147 Hz: 0.35 mm 从147 到1000 Hz: 30 g 从1000 到2000 Hz: 20 g | 油量控制单元壳体 |
| Speed sensor: DG6 /速度传感器: DG6 | from 100 to 200 Hz: 0.126 mm from 200 to 500 Hz: 20 g 从 100 到 200 Hz: 0.126 mm 从 200 到 500 Hz: 20 g | DG6 housing 速度传感器壳体 |
| 3D random vibration 三维随机振动 | Acceleration 加速度 | Measuring point 测量点 |
| Peak level value on flange 法兰上允许峰值 | 60g | Pump flange/油泵法兰 |
| Peak level value on MPROP 油量控制单元上允许峰值 | 100g | MPROP housing/油量控制单元壳体 |
| Peak level value on feed pump/输油泵上允许峰值 | 100g | Feed pump housing/输油泵壳体 |

4.3 Electrical characteristics

4.3 电气参数

| Item/项目 | Value/数值 | Unit/单位 | Remarks/备注 |
|--|--------------------------------------|---------|--|
| Electrical data for MPROP /MPROP电特性值 | | | |
| MPROP type /MPROP 类型 | Variant: current-less open /可变: 断电常开 | | |
| Voltage/电压 | 8 - 32 | V | |
| Pulse frequency/脉冲频率 | 120 - 200 | Hz | Frequency of pump control to be defined by application/由标定情况确定泵的控制频率 |
| Coil resistance R ₂₀ /线圈电阻 R ₂₀ | 2.60 - 3.15 | Ω | 20 °C |
| I _{max.} /最大电流 | 1.7+0.1 | A | Including ECU tolerance/包含ECU公差 |
| Improper polarity/错误的极性 By the physical property of the magnet coil circuit the polarity (+/-) is irrelevant for its function. 电磁线圈极性 (+/-) 的物理特性与功能不相关。 | | | |

4.4 Climate characteristics

4.4 环境参数

4.4.1 Ambient temperature

4.4.1 环境温度

| Item/项目 | Value/数值 | Unit/单位 | Remarks/备注 |
|---|-------------|---------|--|
| Pump ambient temperature is from -40 °C to 140 °C /油泵所处环境温度(- 40~140 °C) | - 40 ~ - 25 | °C | No leakage if pump is not running, perspiration might be seen from sealing if pump runs. /泵不运转则没有泄漏。如果运转, 则密封处可能会有轻微渗漏。 |
| | - 25 ~ 120 | °C | Running condition /运转条件 |
| | 120 ~ 140 | °C | For non-running condition /非运转条件 |

4.4.2 Corrosion protection

4.4.2 腐蚀防护

The pump are designed without permanent corrosion protection of steel parts. The environmental conditions at the installation site must be interpreted by the client so that it should be no corrosive media collections (e.g. salt water) directly on housing and connectors and at the plug connections. In extreme corrosion, this can reduce the compressive strength of pressure area. Loss of function, and the risk of fuel leakage are then not be excluded. The pump Fuel metering unit (MPROP) meets the splash proof tests according to ISO 20653 (2013-02-16) IPX6K and IPX9K. And the speed sensor (DG6) meets DIN40050 sheet 9(IEC 529) IPX4K.

高压泵设计对金属零件不具有永久防腐蚀功能。安装现场的环境条件须由客户澄清, 不应该有易腐蚀的介质(如盐)直接聚集在泵体、接头和接插件等地方。严重的锈蚀可以降低压力部件的耐压强度, 不排除功能丧失、泄漏等风险。本油泵油量计量单元防水等级满足 ISO 20653 (2013-02-15) IPX6K 和 IPX9K.

If there is no surface protection, pump could be rusted or corroded which could lead to pump leakage or even impaired under different climatic conditions. Bosch does not take any responsibility or liability for the losses caused by climatic corrosion

4.5 Chemical characteristics

NA

4.6 Acoustic characteristics

NA

4.7 Lifetime

With respect to the use and usage conditions described in this TCD, the life of the product is designed for maximum 700Tkm, 8000h (whichever occurs first).

The commercial warranty and liability is not affected by this and is governed separately by the delivery conditions.

若油泵表面未做防护，则油泵在不同气候环境下有可能受到锈蚀或侵蚀导致泄漏甚至损坏。博世不对由于环境因素造成的损失承担任何责任。

4.5 化学参数

无

4.6 噪音参数

无

4.7 寿命

基于本TCD规定的使用和使用条件而设计的产品寿命目标为最大700Tkm 和8000h（以最先发生时间为准）。

商业质保和产品责任不受本文影响，应在发货条件中单独定义。

| Item/项目 | Value/数值 | Unit/单位 | Remarks/备注 |
|---------------------------------|----------|---------|---|
| Useful life time target /有效寿命目标 | 700 | Tkm | Max pump running time is 8000h. 泵最长运转时间为8000h whichever occurs first 以最先发生时间为准 |

4.8 Transport, assembly, start and end of operation, storage

Please pay special attention to the safety and warning notes!

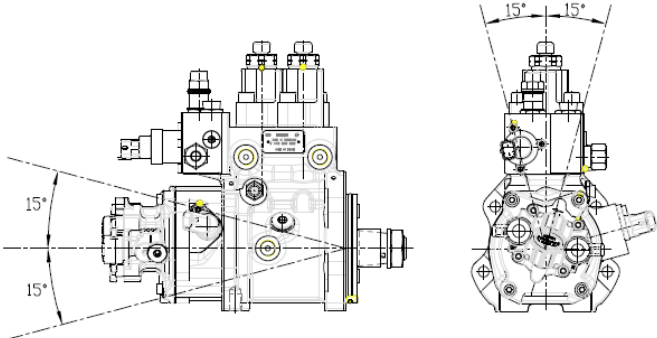
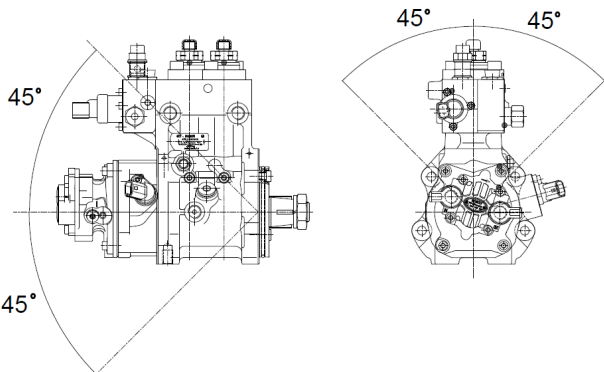
4.8 运输，安装，启动及停止运转，储存

需特别注意安全与警示标志！

4.8.1 Recommended mounting

4.8.1 推荐安装

| Item /项目 | Value /数值 | Unit /单位 | Remarks /备注 |
|---|--|-------------|---|
| Installation method/安装方式 | See Mounting instruction (see chapter1) / 见安装指导书（见章节1） | | |
| Tightening torque/拧紧力矩 | See offer drawing (see chapter1) / 见客户图纸（见章节1） | | |
| Hardness of Cylinder Head/高压接头硬度 | ≤ 250 | HV | Hardness of HP pipe lower than pump HP connector /高压油管硬度低于共轨泵高压接头硬度 |
| Allowed mounting inclination/许用安装倾角 15° | | | In case of angle out of range, evaluation must be done by pump development department |

| | |
|---|--|
|  | <p>/一旦超出许用范围，须由高压泵开发部门评估</p> |
| <p>Allowed working inclination/许用工作倾角 45°</p>  | <p>≤100h accumulated running time under inclined working inclination. /在倾斜工作状态下,累计运行不超过100小时</p> |

4.8.2 Start and end of operation

For a safe operation, fuel and lube oil filling before start of the pump is necessary. Dry running can lead to damage to the pump.

4.8.2 启动及停止运转

为确保油泵安全运行，油泵启动前需预充燃料和润滑油。干运行会导致油泵损坏。

| Item /项目 | Value /数值 | Unit /单位 | Remarks /备注 |
|---|--|------------------|----------------|
| Fuel filling before first start. /首次启动预充燃油 | Pre-filling procedure: see Mounting instruction (see chapter1) / 预充程序：见安装指导书（见章节1） Diesel fuel with HFRR $\leq 400 \mu\text{m}$ is strongly recommended for initial filling. /首次启动强烈推荐使用燃油HFRR $\leq 400 \mu\text{m}$ | | |
| Max. pressure during fill up with diesel fuel/预充燃油的最大许用压力 | 4 | bar_abs /绝对压力 | |
| Lube oil filling quantity before first start/首次启动预充机油量 | 60-200 | ml | |

4.8.3 Storage

Storage conditions

4.8.3 储存

存储条件

| | | | |
|--|---|----------------|---------------------------------|
| OEM(Original equipment manufacturer) and aftermarket service OEM及售后服务用/ | Storage conditions (with original Bosch packaging) 存储条件（保持原有博世包装） | Temperature/温度 | - 30 ~ 60 °C |
| | | Humidity/相对湿度 | 0 ~ 80 % |
| | | Protect from/防 | Rain/雨 Snow/雪 Sunshine/日照 |
| | Longest storage period allowed 最长允许存储时间 | 1 year /1年 | |

If the storage period is exceeded, it is necessary to check the pump in the manufacturing plant. All costs for the re-test are to be incurred by the customer.

如果存储时间超过期限，需在泵的制造厂对泵重新进行检查，所产生的费用由客户承担。

5. Series-accompanying test

The measurement of the test data is shared by Bosch and in the control system of the Bosch.

5.1 Cleanliness inspection

Task: It is to ensure an objective and reproducible evaluation.

For this reason, using fixed facilities for the extraction and evaluation of the filter sample.

Test procedure: After flushing and testing of the pump, the cleanliness inspection of the completed pump is carried out.

(Test results are only valid when the test was done on specified equipment)

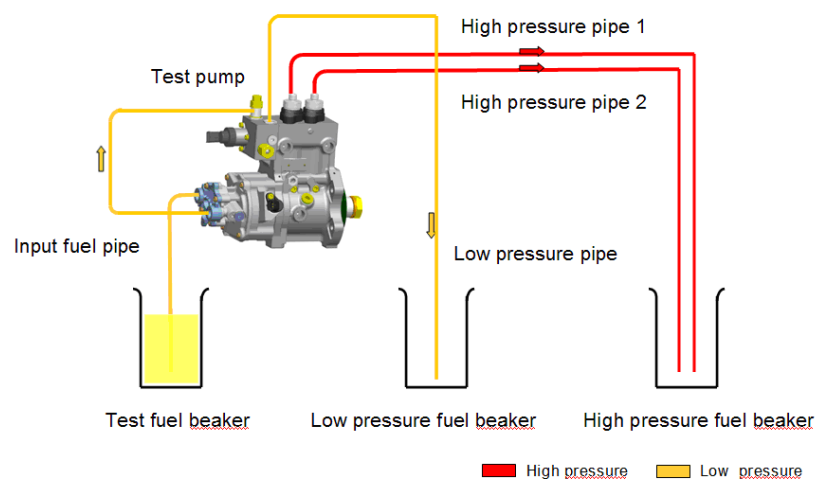
5 产品检查

试验数据的测量方法由博世提供并且纳入控制系统。

5.1 清洁度检查

任务：为保证达到客观和可重复性的评估，必须使用固定的设备来提取和评估过滤的样品。

测试程序：高压油泵冲洗测试以后，进行整泵清洁度检查。（测试结果必须在指定设备上做才有效）。



Cleanliness test layout/生产中清洁度检查布局图

Pass Criteria: No particles out of the limit value according to VDA19

通过标准：根据 VDA19,无超限值的颗粒

Permissible particle limit values for the cleanliness inspection of completed pumps /整泵颗粒允许限值

| Test chamber/测试油腔 | Particle limit value [μm]/颗粒限值 |
|---------------------------------------|--------------------------------|
| | ≥500 |
| Pump low pressure fuel chamber/低压燃油腔 | Not allowed/不允许 |
| Pump high pressure fuel chamber/高压燃油腔 | |

5.2 Leakage test

Task: It is to ensure the sealing to the environment of o-rings, balls, valves, screws,...

Test procedure: Connect pump with pressurized air, immerse pump into the leakage test tank.

Pass criteria: No continuous bubbles by visual inspection

5.2 泄漏测试

任务: 确保O-型圈、钢球、阀、螺纹等处的密封。

测试程序: 将高压油泵接上压缩空气, 同时将高压油泵浸没于测试油中。

通过标准: 目测无连续冒泡



Leakage test in production/生产中密封性测试图

5.3 Functional test

Description: Acc. to Test method sheet for common rail pump (see chapter1)

Task: It is to ensure the flow rate according to the specifications of the pump

Test procedure: Check the pump flowrate at different running conditions.

Pass criteria: Flow rate fulfill the test data sheet (Test data sheet see below)

5.3 功能测试

描述: 参见共轨泵测试方法 (见章节1)

任务: 确保流量满足高压油泵规范

测试程序: 在油泵不同的运行工况下检查高压泵流量。

通过标准: 流量满足测试点要求 (见下表)

| Test data sheet /测试数据表 | | | | |
|------------------------|------------------------|----------------------------|------------------------------------|---------------------------------------|
| Test point /测试点 | Pump speed /油泵转速 [rpm] | MPROP current /MPROP 电流[A] | Flow rate /流量[l/h] (0-mileage/0公里) | Flow rate/流量[l/h] (Field return/场地返回) |
| Rated delivery 额定流量点 | 1000 | 0 | ≥160 | ≥144 |
| I-Q point 电流-流量参考点 | 1000 | 1.2 | 53 ± 12 | 53 ± 17 |
| Start point 启动点 | 100 | 0 | ≥21 | ≥19 |

5.4 Reliability (Z) test

Task: This test specification directs the procedures of reliability test (Z-test). This specification describes the general procedures of the process. The details concerning the frequency and running times, test values, tolerances, defects evaluation and corrective measures are clearly explained and must be followed

Test procedure: The Z- test consists of

- taking the product from series production
- incoming inspection
- endurance test
- final inspection

Test conditions: Perform program endurance test

Preparation:

- pre-ageing
- components mounted according to Bosch installation instructions

Goal: FIE validation (system/components) of applications in on highway or off highway usage.

Testprofile: Test according diagram shown below

Duration: 500 h

Pump inlet temperature: According to TCD for whole life time

Pressure: According basic platform maps

Engine speed: Dynamic as shown in diagram below

criteria: Mechanic/electric no failure; hydraulic measurements within specification acc. to test data sheet (see 5.3)

5.4 可靠性试验

任务: 本试验规范指导可靠性试验的程序（Z-测试）。本规范描述了试验的通用程序，详细描述了关于试验频率、运行时间、测试数据、公差、失效评估、纠正措施及跟踪。

测试程序: Z-测试包含如下内容

- 量产线抽取测试泵
- 初始检查
- 耐久试验
- 最终检查

测试条件: 执行交变耐久程序

准备:

- 进行预老化
- 根据安装指导安装油泵

目标:道路或非道路用的FIE（系统/部件）的验证

测试程序: 根据下图

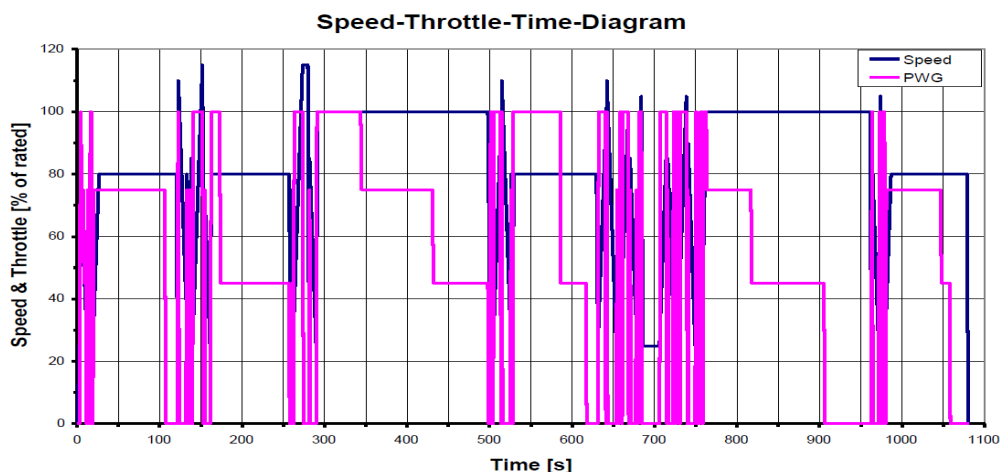
试验时间: 500 h

油泵进油温度: 根据TCD全寿命要求

压力: 根据平台MAP图

油泵转速: 如下图

评价: 机械/电气无失效, 供油量满足测试数据表（见 5.3）



Standard program endurance test for HD On_HW applications (Nr. 3.1.7.5.7)
/重载道路应用标准耐久测试程序3.1.7.5.7

6. Testing

6.1 Testing by Bosch

The product was tested at Bosch during the platform development stage on endurance test benches and was validated in respect of service life requirements. The conditions governing these endurance trials and their results as well as the relevant Product-FMEAs can be viewed at Bosch.

The scope of testing carried out will be documented in the context of product development on the project-specific test sheet.

The functionality of this product in the context of the complete system must be assured by the customer through vehicle trials under realistic application conditions.

The function and reliability of the pump, during the development phase of samples secured by design validation (= platform testing).

The design validation tests have been carried out with the current pump platform and successfully concluded.

For setting (e.g. pressure, temperature, time ...) without tolerance indication the general tolerance of $\pm 5\%$.

6.1.1 Mechanical Dynamic Testing

6.1.1.1 3D-random vibration with drive

Norm: N42AP 411

Preparation: Pump mounted according to Bosch installation instructions

Task: Wear and strength testing by three-dimensional noise-like or pulse-like excitation.

Criteria: No cracking or other mechanical failure, hydraulic measurements within specification according to Test data sheet (see 5.3)

6.1.1.2 Sinusoidal vibration test

Norm: Robert Bosch: N42AP 440, public: IEC 68-2-6

Task: Strength testing by one-dimensional sinusoidal excitation. The frequency of the excitation can be adjusted in the range of 70Hz to 2KHz

Criteria: No cracking or other mechanical failure.

6 试验验证

6.1 博世内部试验

产品在平台开发阶段已通过试验台的耐久测试和使用寿命要求的验证。这些试验的条件和结果以及相关的产品 FMEA 在博世都可以查阅。测试执行的范围已在该项目测试表的产品开发文档中记录。

本产品在整个系统中的功能应由客户通过在实际应用条件下进行车辆试验来保证。

在样件开发阶段，油泵的功能和耐久性由设计验证（平台试验）来保证。

设计验证的试验采用的是当前的平台泵且成功通过了试验。

在验证条件设置中（如压力，温度，时间等），未注公差均为 $\pm 5\%$ 。

6.1.1 机械动态试验

6.1.1.1 三维随机振动

标准: N42AP 411

准备: 根据博世安装指导安装油泵

任务: 通过3维方向类的脉冲激励，来评估磨损和强度

评价: 样品无开裂或其他损坏，流量满足测试数据表（见 5.3）

6.1.1.2 一维正弦振动测试

标准: 博世标准: N42AP 440; 公布标准: IEC 68-2-6

任务: 通过加载一维正弦激励源进行强度测试。激励源的频率在70Hz-2KHz之间可调。

评价: 样品无开裂或其他损坏。

6.1.2 Endurance Tests for Mechanics / Hydraulics

6.1.2.1 Robustness validation with RB kerosene

Preparation: Pump mounted according to the Bosch installation instructions

Goal: Robustness analysis of CR CV-components with kerosene to cover specific fuel aspects for world wide usage

Test profile: Combination of test according to NATO 3.1.7.5.8 program for 800h followed by Off_HW according to program 3.1.7.5.4 for 800 h with RB kerosene

Duration: NATO + Off_HW PDL → 1600 h

Pump inlet temperature: 80 °C constant

Pressure: According to the basic platform or customer maps

Pump speed: Dynamic as descript in 3.1.7.5.8 and 3.1.7.5.4

Fuel: RB kerosene

Oil: According to the spec. in the TCD

Criteria: mechanic/electric no failure; hydraulic measurements within specification according to Test data sheet (see5.3).

6.1.2 机械/液力的耐久试验

6.1.2.1 使用煤油进行鲁棒性验证

准备: 根据博世安装指导安装油泵

目标: 通过煤油试验后对部件的鲁棒性分析来覆盖全球使用的油品表现

测试程序: 800 小时 NATO 3.1.7.5.8 程序和 800 小时 OHW 程序 3.1.7.5.4

试验持续时间: NATO + Off_HW PDL → 1600 h

油泵进油温度: 恒定80°C

轨压: 根据平台或客户 MAP 图

油泵转速: 动态程序, 见 3.1.7.5.8 和 3.1.7.5.4

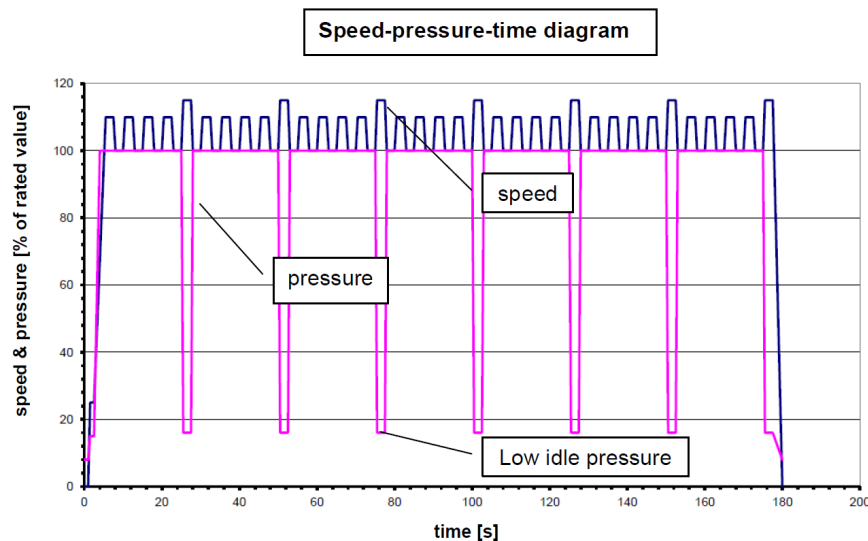
燃油: 博世煤油

机油: 根据 TCD

标准: 机械/电气无失效, 流量满足测试数据表规范 (见 5.3)

| Subcycle | Rated speed [%] | Load ⁽⁶⁾ [%] | Duration [min] |
|----------|--|---|----------------|
| 1 | Low Idle | 0 ⁽⁵⁾ | 30 |
| 2 | 100 | 100 ⁽⁴⁾ | 120 |
| 3 | High idle / End of governed speed ⁽¹⁾ | 0 | 30 |
| 4 | 75 | 100 ⁽⁴⁾ | 60 |
| 5 | Low idle ----- 100 4 min ----- 6 min ⁽²⁾ | 0 ----- 100 4 min ----- 6 min ⁽²⁾ | 120 |
| 6 | 60 | 100 ⁽⁴⁾ | 30 |
| 7 | Low idle | 0 ⁽⁵⁾ | 30 |
| 8 | Begin of governed speed ⁽³⁾ | 70 | 30 |
| 9 | Max. torque speed | 100 ⁽⁴⁾ | 120 |
| 10 | 60 | 50 | 30 |
| Total | | | 600 |

Description of the test cycle(3.1.7.5.8) acc. to NATO AEP5 Part II/程序3.1.7.5.8



Standard Off_HW Program Endurance Test(program 3.1.7.5.4)/ Off_HW 标准耐久程序3.1.7.5.4

6.1.2.2 speed increase at idle pressure (n-HALT at p_{rated})

Preparation: HP pump mounted according to the Bosch installation instructions

Goal: Weak point analysis as well as to prove robustness of high pressure pumps by stepwise speed increase at rated pressure

Testprofile: According to the table shown below

Duration: 250 h

Pump inlet temperature: According to the spec in the TCD

Pressure: Rated pressure

Pump speed: According to the table shown below

Fuel: see chapter1 Allowed fuel

Oil: According to the spec. in the TCD

Criteria: Mechanic/electric no failure; hydraulic measurements within specification according to the test data sheet (see5.3)

6.1.2.2 基于额定轨压的升速试验

准备: 根据博世安装指导安装高压油泵

目标: 产品薄弱点的分析以及通过在额定轨压下逐步加速验证高压泵的鲁棒性

测试程序: 根据下表

试验持续时间: 250 h

油泵进油温度: 根据 TCD 规范

轨压: 额定轨压

油泵转速: 根据下表

燃油: 见章节1允许燃油规范

机油: 根据 TCD 规范

评价: 机械/电气无失效, 流量满足测试数据表规范 (见 5.3)

| Time interval | Speed | Pressure | Specific bearing load | Fuel filling | Temperature | Fuel |
|--------------------|-------------------------|-------------|-----------------------|--------------|-------------|----------------------------------|
| $\Delta t_1 = 50h$ | $n_o = n_{rated}$ | P_{rated} | Specification limit | 100% | T_{rated} | According to specification / TCD |
| $\Delta t_2 = 50h$ | $n_o + 0,05 \times n_o$ | | | | | |
| $\Delta t_3 = 50h$ | $n_o + 0,10 \times n_o$ | | | | | |
| $\Delta t_4 = 50h$ | $n_o + 0,15 \times n_o$ | | | | | |
| $\Delta t_5 = 50h$ | $n_o + 0,20 \times n_o$ | | | | | |

Endurance test conditions for n-HALT at p_{rated}/基于额定轨压的升速试验条件

6.1.2.3 Pressure increase (p-HALT)

Preparation: HP pump mounted according to the Bosch installation instructions

Goal: Weak point analysis as well as to prove robustness of high pressure pumps by stepwise increase of pressure

Testprofile: According to the table shown below

Duration: 150 h

Pump inlet temperature: According to the spec in the TCD

Pressure: According to the table shown below

Pump speed: Rated speed

Fuel: see chapter1 Allowed fuel

Oil: According to the spec. in the TCD

Criteria: Mechanic/electric no failure; hydraulic measurements within specification according to the test data sheet (see5.3)

6.1.2.3 升轨压试验

准备: 根据博世安装指导安装高压油泵

目标: 薄弱点分析以及通过逐步增加轨压来验证高压泵的鲁棒性

测试程序: 根据下表

试验持续时间: 150 h

油泵进油温度: 根据 TCD 规范

轨压: 根据下表

油泵转速: 额定转速

燃油: 见章节1允许燃油规范

机油: 根据 TCD 规范

评价: 机械/电气无失效, 流量满足测试数据表规范 (见 5.3)

| Time interval | Speed | Pressure | Specific bearing load | Fuel filling | Temperature | Fuel |
|--------------------|-------------|-------------------|-----------------------|--------------|-------------|----------------------------------|
| $\Delta t_1 = 50h$ | n_{rated} | $P_o = P_{rated}$ | Specification limit | 100% | T_{rated} | According to specification / TCD |
| $\Delta t_2 = 50h$ | | $P_o + 200bar$ | | | | |
| $\Delta t_3 = 50h$ | | $P_o + 400bar$ | | | | |

Endurance test conditions for p-HALT/升轨压试验条件

6.1.2.4 Fuel Temperature increase (T-HALT)

Preparation: HP pump mounted according to the Bosch installation instructions

Goal: Weak point analysis as well as to prove robustness of high pressure pumps by stepwise increase of fuel inlet temperature

Testprofile: According to the table shown below

Duration: 210 h

Pump inlet temperature: According table shown below

Pressure: Rated pressure

Pump speed: Rated speed

Fuel: see chapter1 Allowed fuel

Oil: According to the spec. in the TCD

Criteria: Mechanic/electric no failure; hydraulic measurements within specification according to the test data sheet (see5.3)

6.1.2.4 燃油温度增加试验

准备: 根据博世安装指导安装高压油泵

目标: 薄弱点分析以及通过逐步增加燃油温度来验证高压泵的鲁棒性

测试程序: 根据下表

试验持续时间: 210 h

油泵进油温度: 根据下表

轨压: 额定轨压

油泵转速: 额定转速

燃油: 见章节1允许燃油规范

机油: 根据 TCD 规范

评价: 机械/电气无失效, 流量满足测试数据表规范 (见 5.3)

| Time interval | Speed | Pressure | Specific bearing load | Fuel filling | Temperature | Fuel |
|---------------------|-------------|-------------|-----------------------|--------------|---------------------|----------------------------------|
| $\Delta t_1 = 10h$ | n_{rated} | P_{rated} | Specification limit | 100% | T_{rated} | According to specification / TCD |
| $\Delta t_2 = 100h$ | | | | | $T_1 = 100^\circ C$ | |
| $\Delta t_3 = 100h$ | | | | | $T_2 = 120^\circ C$ | |

Endurance test conditions for T-HALT/燃油温度增加试验条件**6.1.2.5 Oil Temperature increase (oil T-HALT)**

Preparation: HP pump mounted according to the Bosch installation instructions

Goal: Weak point analysis as well as to prove robustness of high pressure pumps by stepwise increase of oil inlet temperature

Testprofile: According to the table shown below

Duration: 210 h

Pump inlet temperature: According to the spec in the TCD

Oil inlet temperature: According table shown below

Pressure: Rated pressure

Pump speed: Rated speed

Fuel: see chapter1 Allowed fuel

Oil: According to the spec. in the TCD

Criteria: Mechanic/electric no failure; hydraulic measurements within specification according to the test data sheet (see5.3)

6.1.2.5 机油温度增加试验

准备: 根据博世安装指导安装高压油泵

目标: 薄弱点分析以及通过逐步增加机油温度来验证高压泵的鲁棒性

测试程序: 根据下表

试验持续时间: 210 h

油泵进油温度: 根据 TCD 规范

机油进油温度: 根据下表

轨压: 额定轨压

油泵转速: 额定转速

燃油: 见章节1允许燃油规范

机油: 根据 TCD 规范

评价: 机械/电气无失效, 流量满足测试数据表规范 (见 5.3)

| Time interval | Speed | Pressure | Specific bearing load | Fuel filling | Oil Temperature | Fuel |
|---------------------|-------------|-------------|-----------------------|--------------|---------------------|----------------------------------|
| $\Delta t_1 = 10h$ | n_{rated} | P_{rated} | Specification limit | 100% | T_{rated} | According to specification / TCD |
| $\Delta t_2 = 100h$ | | | | | $T_1 = 120^\circ C$ | |
| $\Delta t_3 = 100h$ | | | | | $T_2 = 140^\circ C$ | |

Endurance test conditions for oil T-HALT/机油温度增加试验条件

6.1.2.6 Validation Test With Water Contaminated Fuel(WCF)

Preparation: HP pump mounted according to the Bosch installation instructions

Goal: Key life test with water contaminated fuel for assessment of fuel contamination limit downstream main fuel filter with water @ pump inlet for a special fuel injection system as input for TCD

Testprofile: Total 168h, during the first 5 days, the test program consists of a 6h/d running phase (idle, medium and full load, see figure below) and a standstill period during the rest of the day. After 48 h standstill on the 6th and 7th day, there is a short running phase directly before test stop.

Pump inlet temperature: 40 °C constant

Pressure: According to the figure shown below

Pump speed: According to the figure shown below

Fuel: According to the allowed fuel spec.(see chapter1) with 1% sea water

Oil: According to the spec. in the TCD

Criteria: Mechanic/electric no failure; hydraulic measurements within specification according to the test data sheet (see5.3)

6.1.2.6 燃油中含水试验

准备: 根据博世安装指导安装高压油泵

目标: 主要寿命试验, 通过燃油加水来评估燃油含水极限条件下的影响, 以此可以对特殊喷射系统在TCD中给出输入值

测试程序: 总共 168h, 前 5 天, 每天运行 6 小时 (包括怠速、中速、全速, 见下表), 其余时间静止。然后经过第 6 第 7 两天 48 小时静止以后, 直接进行试验结束前的短时间运行。

油泵进油温度: 40°C 恒定

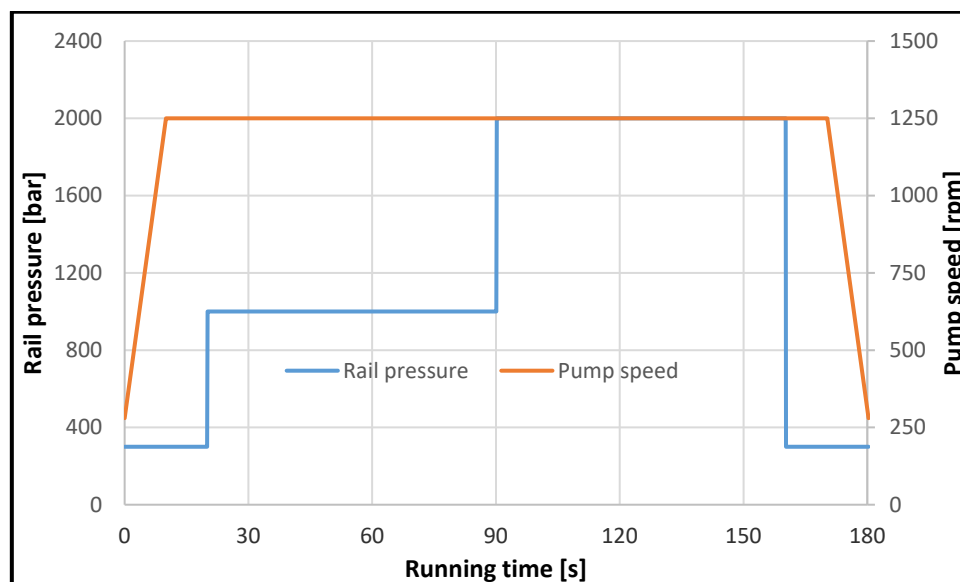
轨压: 根据下图

油泵转速: 根据下图

燃油: 据允许燃油规范 (见章节1) 加1%海水

机油: 根据 TCD 规范

评价: 机械/电气无失效, 流量满足测试数据表规范 (见 5.3)



Test program for WCF/WCF 程序

6.1.2.7 Standard endurance test program

Preparation: HP pump mounted according to the Bosch installation instructions

Goal: Proof of reliability of pump for On_HW applications

Testprofile: according to figure shown below

Duration: 3000h

Pump inlet temperature: T_{rated} in combination with high temperature phases acc. to chapter 3.3.3

Pressure: Variable according platform or customer maps

Pump speed: According to the figure shown below

Fuel: see chapter1 Allowed fuel

Oil: According to the spec in the TCD

Criteria: Mechanic/electric no failure; hydraulic measurements within specification according to the test data sheet (see5.3)

6.1.2.7 标准耐久试验程序

准备: 根据博世安装指导安装高压油泵

目标: 道路用泵的可靠性验证

测试程序: 根据下图

试验持续时间: 3000h

油泵进油温度: 额定温度并结合章节 3.3.3 中高温阶段

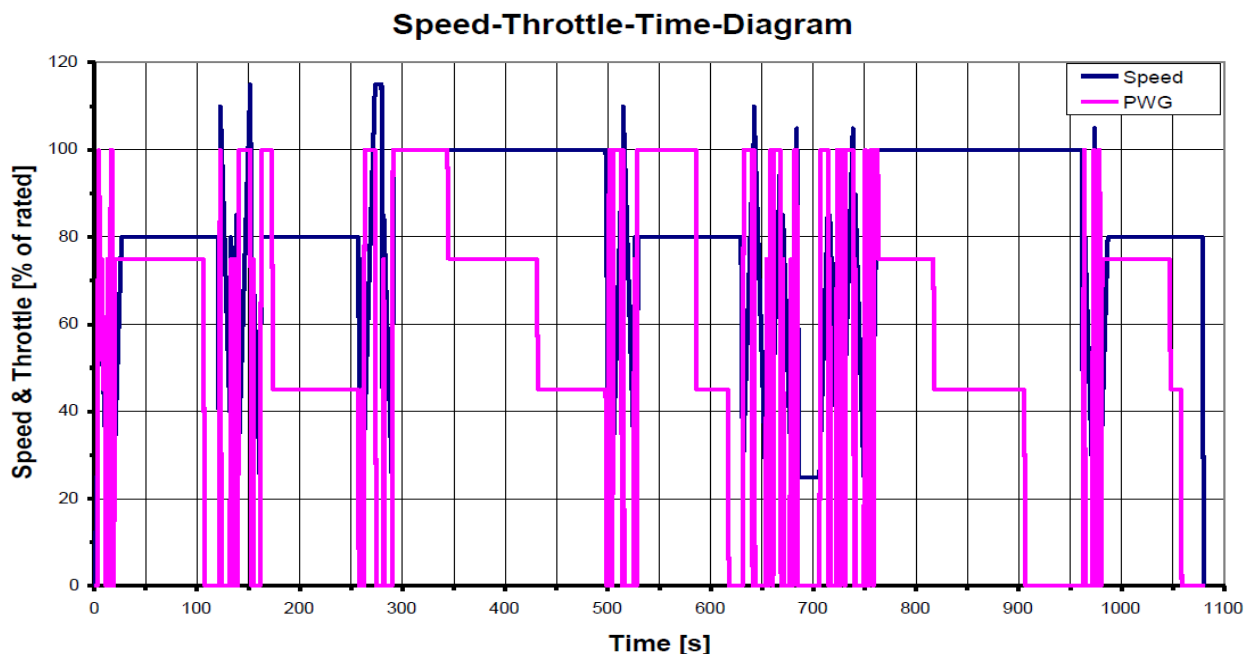
轨压: 交变根据平台或客户 MAP 图

油泵转速: 根据下图

燃油: 见章节1允许燃油规范

机油: 根据 TCD 要求

评价: 机械/电气无失效, 流量满足测试数据表规范 (见 5.3)



Standard program endurance test for HD applications(program 3.1.7.5.7)
/HD 应用标准耐久试验程序3.1.7.5.7

6.1.3 Climatic Tests

6.1.3.1 Temperature alteration test

Preparation: Specimen is dry and clean, all openings are closed as they will be in use

Goal: Testing of durability at fluctuating temperatures

Test profile: Lower temperature: -40 °C

Upper temperature: 140 °C

Tolerance: ± 3 K

Transfer time: <10 s

Duration: 50 cycles

Standard: IEC 60068-2-14

Specimen can be tested passive or operated

Criteria: mechanic/electric no failure; hydraulic measurements within specification according to Test data sheet (see 5.3).

6.1.3.2 Protection against water, IPX6K (MPROP)

Standard: ISO 20653 (2013-02-15)

Goal: Test of the water tightness in accordance with the IP specification.

Preparations: A The test sample is unused and clean; All openings are closed installation-realistic.

The test sample is fastened in the vehicle installation position

Test conditions: Deviations of the test conditions (mainly water-/ test sample-temperature) are to be indicated explicitly.

Degree of protection: IPX6K

Kind of nozzle: Water jet nozzle, aperture- \varnothing 6.3 mm

Distance to the nozzle: (2.5 to 3) m

Water flow rate: 75 l/min \pm 5%

Water pressure: ca. 1000 kPa

Water temperature: max. 5°C difference to the test sample temperature

Test sample temperature: (23 \pm 5) °C

Exposure time: min. 3 min

Acceptance conditions: -Water shall not have any harmful effects or impair performance

- Details are to be stipulated test sample-specific

6.1.3.3 Protection against water, IPX9K (MPROP)

Standard: ISO 20653 (2013-02-15)

Goal: Test of the water tightness in accordance with the IP specification.

Preparations: A The test sample is unused and clean; All openings are closed installation-realistic.

The test sample is fastened in the vehicle installation position

Test conditions: Deviations of the test conditions (mainly water-/ test sample-temperature) are to be indicated explicitly.

Degree of protection: IPX9K

Kind of nozzle: Fan jet nozzle, aperture angle 30° \pm 10°

6.1.3 环境试验

6.1.3.1 温度交变试验

准备: 把油泵控干并擦拭干净, 所有开口部分密闭

目标: 测试交变温度下的耐久性

测试程序: 低温: -40 °C

上限温度: 140 °C

公差: ± 3 K

切换时间: <10 s

试验持续时间: 50 cycles

标准: IEC 60068-2-14

试验样件可以静止或者运行

标准: 机械/电气无失效, 流量满足测试数据表规范 (见 5.3)

6.1.3.2 防水试验

IPX6K (MPROP)

标准: ISO 20653 (2013-02-15)

目标: 根据 IP 规范进行水密性测试

准备: 试验样件未经使用并且是干净的, 按实际安装形式将所有开口部分密闭, 试验样件固定到车辆上

测试条件: 测试条件偏差 (主要为水/测试样件温度) 需要精确标注出来

防水等级: IPX6K

喷嘴类型: 水喷嘴, 喷孔直径 \varnothing 6.3 mm

离喷嘴距离: (2.5 to 3) m

水流量: 75 l/min \pm 5%

水压力: ca. 1000 kPa

水温度: 与试验样件温度偏差最大 5°C

测试样件温度: (23 \pm 5) °C

暴露时间: min. 3 min

可接受的条件: - 未损坏样件或影响功能

- 具体应在测试样件规范中约定

6.1.3.3 防水试验

IPX9K (MPROP)

标准: ISO 20653 (2013-02-15)

目标: 根据 IP 规范进行水密性测试

准备: 试验样件未经使用并且是干净的, 按实际安装形式将所有开口部分密闭, 试验样件固定到车辆上

测试条件: 测试条件偏差 (主要为水/测试样件温度) 需要精确标注出来

防水等级: IPX9K

喷嘴类型: 扇型喷嘴, 喷孔角度 30° \pm 10°

Distance to the nozzle: (100 bis 150) mm

Water flow rate: (14 bis 16) l/min

Water pressure: (8000 bis 10000) kPa

Water temperature: (80 ± 5) °C

Test sample temperature: (23 ± 5) °C

Exposure time: 4 x 30 sec

Acceptance conditions: -Water shall not have any harmful effects or impair performance

- Details are to be stipulated test sample-specific

距喷嘴距离: (100 bis 150) mm

水流量: (14 bis 16) l/min

水压力: (8000 bis 10000) kPa

水温度: (80 ± 5) °C

测试样件温度: (23 ± 5) °C

暴露时间: 4 x 30 sec

可接受的条件: – 未损坏样件或影响功能

–具体应在测试样件规范中约定

6.1.4 Other Activities

6.1.4.1 Load collective measurement

Only for customer project(map used for RBCD products)

Standard: NA

Task: Determining the real stress while driving

Purpose: development-related studies. Derivation of load collectives, test program

Driving program: Fixed test track through and around Wuxi

6.1.4 其他测试

6.1.4.1 工作载荷测试

只针对客户项目（用于 RBCD 产品的 MAP 图）

标准: 无

任务: 确定车辆驾驶中实际的应力

目的: 开发相关的学习功能. 载荷收集的来源, 测试程序

驾驶程序: 无锡及周边指定的试验路线



Test track/试验路线图

6.1.4.2 Lifetime calculation

Standard: NA

Target: Calculation of the failure probability

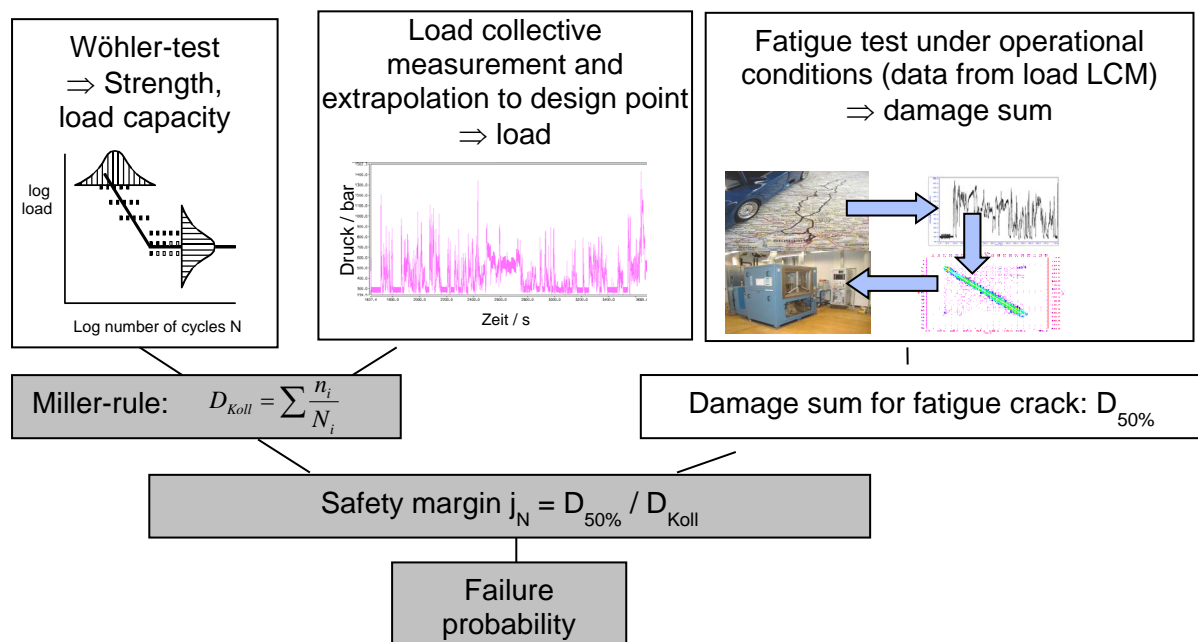
There are two options available for the design of components that are subject to possible fatigue: dimensioning for infinite or for finite life. Dimensioning for finite lifetime is only possible if the component has a load collective during its service life for which the maximum load to which it may be subjected occurs relatively infrequently. With this type of design, exceeding the component's fatigue limit is deliberately permitted for a limited number of load cycles. As a consequence, the component is designed to have a finite service life. The clear advantage of such a design strategy is that the components can be dimensioned far more lightly and cost-effectively. The aim of the lifetime calculation is to determine a failure probability for the respective design goal

6.1.4.2 寿命计算

标准: 无

目标: 失效概率的计算

对设计的部件进行失效概率计算有两种方法: 针对无限寿命或 针对有限寿命。有限寿命的尺寸计算仅用于这种情况, 即假如部件在寿命期间有载荷集中, 最大载荷的偶尔出现, 根据这种设计, 对于有限次的载荷循环的部件, 超出部件疲劳极限的是不允许的。因此, 部件需要设计成无限服务寿命, 这种设计的明显的好处是计算更简单和成本更低。寿命计算的目的地是针对设计目标确定失效概率



Faure probability calculation schematic/失效概率计算示意图

6.2 Testing by the customer**6.2.1 Testing on engine****Description**

1x1000h engine full load test

6.2.2 Testing on Vehicle

N.A

6.2 客户试验**6.2.1 发动机验证****描述**

1x1000h 全负荷耐久

6.2.2 整车验证

无

7. Assessment of products returned from the field

A detailed description of possible failure and a description of the used condition (including fuel) from the customers is needed to evaluate the field parts.

Products are considered good if they fulfill the specification/test data for 0-mileage and field listed in the TCD.

For checking the pump, testing results must be in accordance with test data sheet (see 5.3).

7.1 Zero mileage return

Criteria for the Zero-mileage return pump evaluation:

Mechanic/electric no failure; hydraulic measurements within the test data sheet (see 5.3).

Returned products are considered good if they fulfill the test data sheet for Zero-mileage return pumps.

7.2 Field return

Criteria for the field return pump evaluation:

Mechanic/electric no failure; hydraulic measurements within the test data sheet (see 5.3).

Returned products are considered good if they fulfill the test data sheet for field return pumps.

Usage and operation of the common rail pumps in accordance with the conditions specified in this TCD is a necessary condition for the recognition of field complaints.

7 场地验证件的评估

需要通过可能失效的详细描述和客户的使用条件来评估场地验证部件。

如果能满足TCD中所列的零公里和场地返回要求的特性/试验数据，产品可判为合格。

检查高压油泵时测试结果必须与测试数据表（见5.3）一致。

7.1 零公里返回

零公里返回件的评价：

机械/电气无失效，流量满足测试数据表（见5.3）

如果能满足测试数据表零公里返回要求的特性/试验数据，产品可判为无缺陷。

7.2 场地返回

场地返回件的评价：

机械/电气无失效，流量满足测试数据表（见5.3）

如果能满足测试数据表场地返回要求的特性/试验数据，产品可判为无缺陷。








共轨泵的使用和操作应遵循本TCD要求，这是确认场地抱怨的必要条件。

8. Appendices and references

8 附录和参考

8.1 Pictogram

8.1 图示

| Pictogram /图示 | Abbreviation /缩写 | Description /描述 |
|---|---------------------|--|
|  | 2W | Two-wheeler /两轮车 |
|  | PC | Passenger cars /乘用车 |
|  | LD | Light Duty - commercial vehicle /轻型商用车 |
|  | MD | Mid Duty - commercial vehicle /中型商用车 |
|  | HD | High Duty - commercial vehicle /重型商用车 |
|  | OHV | Off Highway /非道路 |
|  | | Not intended /禁止使用 |

8.2 Reference to standards

8.2 参考标准

| |
|-----------------------|
| ISO 26262 |
| ISO 20653 |
| VDA19 |
| DIN IEC 68-2-6 |
| DIN 50 100 |

8.3 Abbreviation

8.3 缩略语

| 解释/Explanation | 缩略语/Abbreviation |
|---|------------------|
| 博世/Robert Bosch | RB |
| 博世中国柴油/Robert Bosch China Diesel, wuxi | RBCD |
| 客户技术文档/Technical Customer Documentation | TCD |
| 电控单元/Electronic control unit | ECU |
| 加速踏板/Acceleration of pedal | APP |
| 电磁比例阀/Magnet Proportional Valve | MPROP |
| 燃油喷射设备/Fuel Injection Equipment | FIE |
| 高压组件/High Pressure Assembly | HPA |
| 共轨系统/Common Rail System | CRS |

9. History9 更改历史

| Version 版本 | Change number 更改号 | Changed on 更改日期 | Valid from 生效日期 | Release description 更改描述 |
|---------------|----------------------|--------------------|--------------------|-----------------------------|
| 00 | FXR1239646 | 2019.5.6 | 2019.5.6 | First version |
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9.1 Document Information9.1 文档信息

Issued by/创建:

夏玲玲 2019.5.7

Checked by/审核:

李冰 2019.5.7

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徐祥远 2019.5.7

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| RB Product development 博世产品开发 | RB Sales 博世销售 | Customer 客户 |
| RBCD/EHP [Department/部门] | RBCD/SCA [Department/部门] | [Department/部门] |
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|--|---|-----------------------|
| RB Product development 博世产品开发 | RB Sales 博世销售 | Customer 客户 |
| RBCD/EHP | RBCD/SCA | |
| [Department/部门] | [Department/部门] | [Department/部门] |
| 2019.05.07 | 2019.05.14 | |
| [Date/日期] | [Date/日期] | [Date/日期] |
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