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CS系列中开蜗壳式离心泵 安装、操作及维护手册

CS Series Centrally-Split Volute Centrifugal Pump
Manual Book for Installation, Operation and Maintenance

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1、概述 Description

本使用说明书包括基本介绍及注意事项。在泵的安装、电路连接及泵运行之前，请仔细阅读本说明书。当涉及到各机组零件时，请务必参照所有其它使用说明书及资料。

CS型泵是根据先进技术开发出来的，产品经过连续的质量控制。编写本使用说明书的目的是为了便于熟悉泵以及它的特定用法。

本说明书含有关于泵可靠、安全及其有效运行的重要介绍，请务必按照使用说明书所要求的去做，这对于确保泵的可靠、寿命及安全来说极其重要。

本使用说明书并没有考虑到当地的规定，操作人员、包括那些被请来安装的人员，都必须严格遵守这些规定。

泵运行时，所输送的介质、流量、流速、密度、压力、温度和电机转速一定不能超过技术文件中所规定的极限值，以确保泵的运行能符合本说明书及合同文件中的规定。

铭牌上已标明了泵型号/规格、运行数据/系列编号，有疑问或重复订购，特别是在订购备件时，请参照这些数据。如果您需要本手册以外的其它介绍或说明，或者泵万一发生故障时，请与**美瑞夫泵业**售后服务部门联系。（服务热线：0086 - 152 6152 7552）

2、安全 Safety

本操作手册给出了泵在安装、操作和维护保养期间必须遵守的基本规则，因此，负责人员操人员在安装及投产前必须阅读本手册。在安装地点这些规则始终有效。

不仅要遵守主标题下的总的说明，而且还要遵守其它标题下的详细说明。

2.1 本手册中安全说明的标志

不遵守本手册中的安全说明将会影响到安全，安全标志符号如下：



危险
Dangerous



触电危险警告
Get an electric shock hazard



注意
Attention

必须将固定在设备上的符号保留好并清楚可见，如：

--指示旋转方向的箭头

--表示流体接头的符号

Some other indicators are marked on the machine directly,for example:

--The arrow indicating the rotation direction

--the symbol for fluid connection

The manual includes a basic introduction and some notices.Prior to the pump installation,electrical connection and pump operation,please read carefully this manual.

CS type pump is developed according to advanced technology,the product has passed continuous quality control.The manual is edited to facilitate our users to have a good understanding of the pump and its specific usage.

The manual includes an important introduction to the reliable,safe and effective operation.Please take care to do as requested in the use of manual,which is essential to the pump reliability,its longevity and safety.

The manual does not take into consideration of the local rules.The operators,including those invited installation personnel must strictly abide by these rules.

While the pump is being operated, the transmitted medium,capacity,flow,density,pressure,temperature and motor speed can not exceed the stipulated limit values in the technical documents to make sure that the pump operation shall be in conformity with the stipulations stated in the manual and contract document.

The pump model/specification,operating data/series No.are marked on the nameplate,and if you have any questions or there are any repeated orders,especially the order of the spare parts,these data shall be referred to.If you are in need of some other introductions or instruction manuals besides this manual,or if there are any failures,please contact our sales person or call on our customer service hot-line directly(our service hot-line:0086 - 152 6152 7552)

The manual includes a basic introduction.While there is assembly,operation and maintenance,these must be referred to.These regulations are still valid at the installation place.

2.1 Safety instruction symbol in manual book

In case that the safety rules stated in the manual are not abided by,there may be some damages done to the personnel.So these danger codes must be marked out remarkably.

2.2 操作人员的资格及培训

负责操作、维护保养、检验及安装的工作人员必须具有足够的资格，工作人员的责任和管理范围必须由站场操作者确切地制定。如果工作人员不具备所需的知识，就必须进行培训。这项工作可以由设备生产厂家或供货商代替站场操作人员完成，并且设备操作人员要确保工作人员完全理解操作手册中的内容。

2.3 如果不遵守安全说明将会出现危险

如果不遵守安全说明将会对工作人员、对环境及设备产生危害，导致失去对设备损坏的索赔权。例如，不遵守安全说明引起以下危险：

设备 / 机器的主要功能不能实现

维护及维修的具体措施失效

人员处于电、机械、化学和热等方面的危险之中由于危险物质的释放，造成对环境的危害

2.4 在工作中遵守安全规则

在操作泵时，必须遵守本手册中的安全说明、有关的国家事故预防条例及设备操作人员编写的其它维护和安全说明。

有关操作的安全说明：

如果设备的热或冷部件有危险时，应避免接触这些部件（挂警示牌）

在设备运行时，不能将运动部件（如联轴器）的保护装置从设备上拆卸下来（安装时必须使用专用工具）。

任何泄漏的具有危险性（如爆炸性的、有毒的或热的）的流体（如从轴封处泄漏）都必须清除掉，以防止对人员产生危害或者遵照环境法的规定进行处理。

防止由电气设备产生的危险（如VDE规范和当地供电部门的法规）。

2.5 有关维护、检验和组装工作的安全说明

设备操作人员的责任就是确保所有的维修、检验和安装工作是由专业的和具备资格的工作人员来完成，这些工作人员要详细地学习本手册后面所述的停机程序。

当输送危险性介质时，泵和泵机组必须是清洁的。

工作结束后，所有的安全及保护性措施必须重新安装上，并且恢复其可操作性。

在重新启动设备前，应遵守“开始启动”中所列出的说明。

2.6 未经许可的备件改造

只有在同设备生产厂家协商后，才能对设备进行任何改造。为了安全起见，只能使用厂家确认的备件和附件，使用其它备件时，厂家概不承担责任。

2.2 Qualification and training of operator

Working staff who are responsible for operation,maintenance,inspection and installation must have enough qualification.Responsibility and management scope of working staff must be formulated by the operator.If the working staff do not have related knowledge,they must be trained.And the training work can be done by manufacturer or supplier,and operator must make sure that the working staff understand the contents of manual book completely.

2.3 Danger shall be caused if not abiding by manual book

Not abiding by manual book shall do harm to person's safety,environment and machine itself,and shall lead to lose the right of claim for the damaged equipments.For example,the following danger shall be caused if not abiding by manual book:

The main function of equipment,machine fails.

Specified measures of the repair and maintenance fail.

The electrical,mechanical,chemical and heat effect shall do harm to persons.

The release of dangerous substance shall be harmful to the environment.

2.4 Abiding by safety rules during operation

The safety rules, some health and safety rules stipulated by our country,and some working,operation and safety rules stipulated by the operators must be abided by strictly when operating the pump.

Safety rules about operation:

If the hot or cold parts of the equipments are dangerous,please try not to contact these parts(put up a warning board).

Do not disassemble the protective guard from the running parts(like coupling) when the equipment is operating(Special tools must be used when installation).

Any fluid that is leaked and dangerous (explosive,poison,or heated),(if leaking from shaft seal),must be cleaned out,in case it shall do harm to persons,or manage it according to environment law.

Prevent any danger caused by electrical equipment (Like vde Specifications and laws of local power supply department).

2.5 Safety instruction for relevant maintenance, inspection and installation

The responsibility of operator is to make sure all the maintenance ,inspection and installation work is completed by professional and qualified working staff.And these working staff shall learn the turn-off procedure in the manual book carefully.

The pump and pump set must be cleaned when transmitting hazardous substance.

All the relevant safety protective devices must be re-installed and are operable.

Before the pump is being restarted,the illustration in the Start-up must be referred to.

2.6 Unauthorized remodeling for spare parts

Remodeling the equipment can be allowed after negotiating with manufacturer.Approved spare parts and accessories by manufacturer can only be used, for the sake of safety.If using other spare parts, manufacturer shall not be responsible for the possible danger.

2.7 未经许可的操作模式

如果泵机组按照指定的用法使用，并且严格按照本使用说明书的要求进行操作，那么就能保证泵可靠安全地运行。在任何情况下，一定不要超过数据表里的极限值。

3、运输与安装前的储存

Transportation and storage prior to installation

3.1 运输

为了避免损坏设备，应小心运输和装卸，并将设备轻轻地放在水平面上。



电机起吊孔仅用于起吊电机而不能起吊机组，用起重机起吊泵机组时，要注意拉力的方向，角度不要大于90°，两边分别使用起吊绳，正确的起吊方法如右图所示：

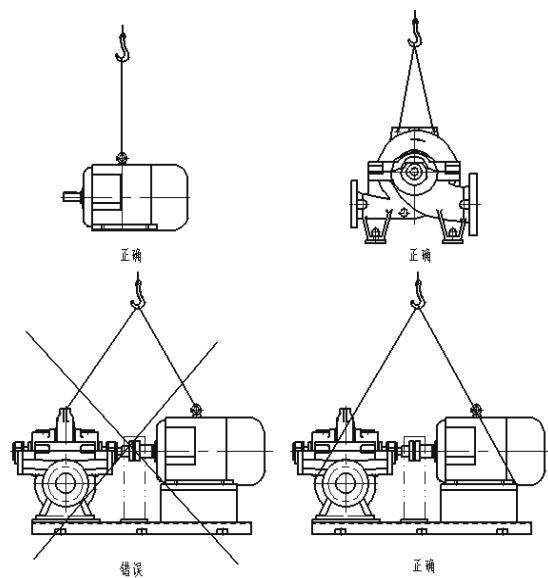
2.7 Unauthorized operation mode

If the pump set can be used and operated according to the relevant specifications and manual book strictly, then safe reliable operation can be assured. Under any case, limit value can not be exceeded.

3.1 Transportation

In order to avoid damage of equipment, the equipment shall be transported, loaded and unloaded carefully, and shall be placed on the level place gently.

Lifting holes of motor shall be only used for lifting the motor instead of pump set. When lifting the pump set, pay attention to the direction of pulling force, and the angle shall not exceed 90 with lifting ropes on both sides of the pump set. The correct lifting method is as follows:



在泵机组运输过程中，绳子既不能拴在电机的吊耳处；也不能拴在泵的吊耳处。

3.2 安装前储存

在设备到货后，如果不立即进行安装，就应安全地储存起来。

储存在一个防震的地方

每隔3个月检查一次包装损坏情况

修复损坏的地方

When transporting the pump set, the rope can not be fixed on the lifting lug of motor, nor the lifting lug of pump.

3.2 Storage prior to installation

When the equipment reaches the destination, it shall be stored if it does not need to be installed right away.

The equipment shall be stored in a shockproof place. The damage condition of package shall be examined every 3 months.

Repair the damaged location.

3.3 储存

所有外露的、机制的、工作面（法兰、密封、电机支撑面）。轴端和未涂漆的联轴器等都要被清洗并且用防腐剂处理。清洗之后，泵腔内的各种零件都应喷上防腐剂。

如果储存在干燥的地方，由这些保护措施提供的保存期约为18个月。

如果储存在恶劣的气候条件下，保存期将会相应缩短。

如果防腐层遭到破坏，可通过重新刷漆或喷涂来处理。泵腔内的防腐层在泵操作之前，必须用中性溶剂处理。请遵照溶剂制造厂家的安全说明！

在泵投入运行之前，不必将外露部件的防腐层清除。

3.3 Storage

All the exposed, machine-made, working surface (flanges, seals, supporting surface of motor). Shaft end and unpainted coupling etc. shall all be cleaned and dealt with antiseptic. After cleaning, all kinds of parts in the pump shall be painted with antiseptic.

If the equipment is stored in a dry place with these protective measure, and its preserve time is about 18 months.

If stored in a bad condition, its preserve time shall be shortened.

If the anti-corrosion coat is damaged, re-painting can be done to solve it.

Before the pump operates, the anti-corrosion coat must be dealt with neutral solvent.

Please abide by the safety manual of solvent manufacturer.

Prior to the operation of pump, there is no need to clean the anti-corrosion coat on the exposed parts.

4、泵的结构 Structure of pump

CS型泵是一种单级双吸中开蜗壳式离心泵，泵的蜗壳是沿轴向分开的，地脚安装。这样就可在不拆除进出、水管路和电机的情况下，拆卸旋转零件，而下半部分蜗壳与连接管线仍然固定在机座上。可更换的壳体耐磨环可以防止蜗壳磨损，吸入口与排出口分别位于泵体两侧，对于高扬程泵采用双蜗壳流道，抵消了大部分径向力，使两端的轴承寿命更长。

叶轮为双吸叶轮，进口面积大，抗汽蚀性能好，两端进水，平衡泵转子的轴向力。轴承采用油脂润滑封闭式结构、无需加油。对于需采用稀油润滑的结构，可配置恒定油位油杯。泵填料压盖为可拆式填料压盖，使之有足够的空间来用于保养、维修。

轴封可选用机械密封或填料密封，二种密封均安装于可拆卸的填料箱内，安装维护方便。

CS type pump is single stage double suction split casing volute centrifugal pump. Volute of pump is divided along axial direction, foundation installation. The rotating parts can be dismantled without disassembling inlet & outlet pipe and motor, while the lower half of volute casing is still fixed on the motor frame with connecting pipeline. Replaceable casing wear ring can prevent the abrasion of volute casing, inlet and outlet are located at the two sides of pump separately. As for the pump with high head, double volute passageway shall be used, which counteracts most of the radial force and prolongs the life of the bearings on both sides.

Impeller is double suction impeller with large inlet area, good anti-cavitation. Water comes in from two sides, which balances the axial force of pump rotor. Grease lubrication close type structure shall be used on the bearing, with no need to fill the oil. For the structure that needs thin oil lubrication, a constant oil level oil cup shall be furnished. The packing gland of pump is detachable packing gland, which has enough room for maintenance.

Mechanical seal or packing seal shall be used on the shaft seal, and both of these two seals can be installed in the detachable packing box to make the installation and maintenance easy.

5、组装、安装 Installation, assembly

正确的并且按次序组装是设备无故障运行所必须的。由于组装不当造成的损坏，责任不在我方。

5.1 安装（现场安装）

1) 安装之前混凝土基础必须坚固、表面应光滑平整。

2) 把地脚螺栓插入底座上的地脚孔，把泵放在基础上，用水平仪在轴端或出口端调整水平，在底座和基础间靠近地脚螺栓处必须垫垫块。

The correct and orderly assembly is a must for the non-false operation of equipment. Damage caused by inappropriately assembling, and we (Sanlian) are not responsible for the damage.


5.1 Installation (On site)

1) Before the installation, the concrete foundation must be very firm and surface must be smooth and flat.

2) Place the foot bolts into the foot holes on the base. Put the pump onto the foundation, make adjustment over the leveling with a gradienter at the shaft end or outlet. The block must be placed next to foot bolts between the base and foundation.

3) 泵调整好水平后,给地脚螺栓灌浆,当砂浆坚固后,均匀地拧紧螺栓,并重新调整水平,然后给底座灌浆。

5.2 泵和电机带公共底座的安装

 泵的安装须由经过培训的、对水泵安装富有经验的人员进行。

泵和电机带公共底座的安装形式:

- 1) 测量并记下泵的位置。
- 2) 把泵机组放在基础上,地脚螺栓插入基础中并调整。基础和底座之间保留4-5cm间隙。
- 3) 对基础螺栓灌浆并让其坚固。
- 4) 用调整螺钉精确地调整机组,并在联轴器处对中。
- 5) 均匀地拧紧地脚螺栓。
- 6) 对底座灌浆,重新检查,如果有必要的话重新调整(用垫片)。

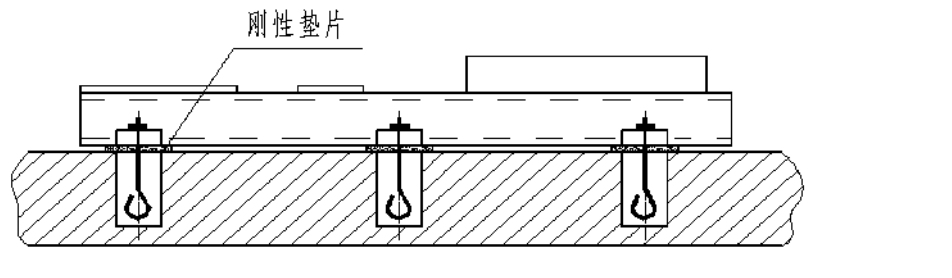
3)After the leveling is adjusted,the foot bolts shall be grouted.After the mortar becomes solidified,the bolts shall be screwed down uniformly and then its leveling must be readjusted.Then the base shall be grouted.

5.2 Installation of pump&motor with a common base

The pump installation must be carried out by those well-trained personnel who have rich experience in installation.

The installation form for the installation of pump and motor with a common base:

- 1)Have a measure and keep a record of the pump location.
- 2)Put the pump set onto the foundation.Place the foot bolts into the base and make some adjustments.There shall be space of 4-5cm between the base and foundation.
- 3)Grout the foundation and make it solidified.
- 4)Adjust the pump set accurately with the adjustment bolts and make alignment at the coupling.
- 5)Screw down the foot bolt uniformly.
- 6)Grout the foundation.Have a re-checkup.If needed, the re-adjustment shall be carried out(with washers).

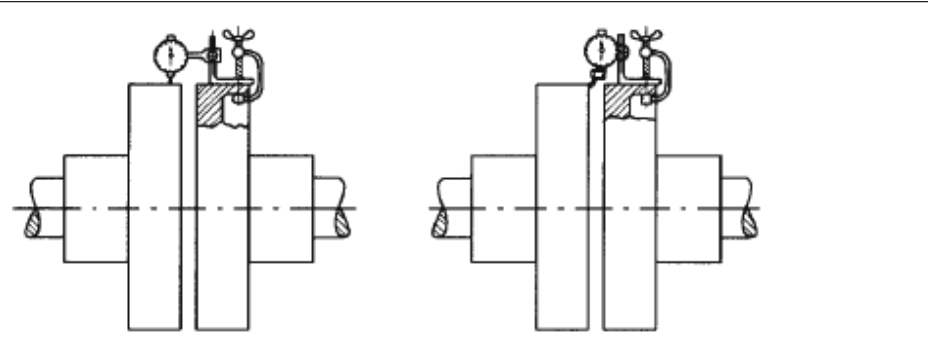


5.3 泵和电机的调整

必须确保泵和电机在联轴器处精确对中。即使泵和电机作为一个完整的机组提供,如果有必要也需对中。方法:如果联轴器的轴向和径向偏差超过0.1mm,那么可以认为泵机组已很好地对中,每次联轴器两端均匀旋转量具90°,用游标卡尺或千分尺检查,所有点的读数必须均匀。

5.3 Adjustment of pump & motor

It must be guaranteed that the pump and motor must be aligned accurately at the coupling.Even if the pump and motor are provided as a complete set,the alignment must be made if needed.Means:If the tolerance between the radial force and axial force does not exceed 0.1mm,in which case it is considered as well-aligned.The gauge shall be turned at an angle of 90 uniformly at both ends of the coupling for each time,which is to be tested with a vernier caliper or a micrometer caliper.All the readings must be uniform.



注意! 泵起动之前,要检查运行数据,以确保铭牌上的数据,例如:工作压力、频率、输送液体的温度等,与合同上的数据及系统数据相符。

5.4 管路的连接

注意! 不要把泵本身当作管路支撑点。吸上管路应成向上的斜度布置,倒灌管路应成向下的斜度布置,泵的进口管路力求简短,装置汽蚀余量必须大于泵汽蚀余量。管路应该在泵的附近设可靠支撑,并且不能承受任何压力或发生变形。它们的重量一定不要对泵施加任何负载。对于短管来说,标称直径至少要等于泵进出口标称直径。对于长管来说,最经济的标称直径应视具体情况而定。

注意! 注意由以下原因产生的出口和进口附加负载:充满液体的管子的重量,温度变化引起的管子长度的变化,伸缩器放松引起的反作用力。它们一定不要超过给定值。

注意! 管路中的力过大或超过允许值会导致泵的泄漏,从而输送的介质会逸到空气中,输送热介质时会有生命危险!管路安装之前必须将进出口法兰盖拆除。

5.4.1 辅助管路

如果泵需要辅助装置(如冷却、加热、密封、冲洗和润滑液等),请按装配图上的尺寸和位置或参照辅助管路示意图连接。更多的信息请参阅相关使用说明书中有关辅助管路的章节。

注意! 安装这些辅助管路能使泵正常工作,所以它具有重要意义。

5.4.2 联轴器防护罩

为了避免事故的发生,泵不能在联轴器防护罩的情况下工作。交货时如果用户特殊要求不要防护罩,那么操作人员必须安装一个。

6、运行、启动、停机 Operation,start-up,turn-off

请务必按以下要求去做,避免不遵守规章制度所发生的故障。

6.1 启动前

- 泵启动之前,必须遵守以下几点:
- 泵所带的底座是否与基础紧固
 - 联轴器与泵机组是否校正
 - 管路是否按要求连接
 - 电机是否按使用说明书安装
 - 手是否能容易地转动转子(至少一周)
 - 联轴器防护罩是否装好

Before the pump is being operated,the running data shall be checked up to be assured of the data marked on the nameplate.For instance,the working pressure,frequency,the temperature of the liquid transmitted,etc must be in line with the data in the contract and systematic data.

5.4 Pipe connection

Don't make the pump itself become the pipe support point.The suction pipe shall be displayed aslant upwards.The reverse-grouting pipe shall be laid aslant downwards.The pump inlet is required to be cut short,and the device NPSH must be exceeding the pump NPSH.A reliable support shall be set near the pump,without bearing any stress or any distortion.Their weights can not apply any load onto the pump.For the short pipes,their nominal diameter shall be equal to the pump inlet and outlet nominal diameter at least.For the long pipes,the most economical diameter shall be decided based upon the specific conditions.

Pay attention to the outlet and inlet additional load brought about by the following reasons:the weight of the filled pipe,the changes over the pipe length as a result of temperature rise,the counter-force resulting from the looseness of the slip joint,all of which can not exceed the certain value specified.

If there is too much strength on the pipe or the strength value exceeds the allowable limit,then the pump leakage shall be brought about;in which case,the medium transmitted may float out into the air and so when it comes to transmitting hot medium,a person's life may be threatened!Before the pipe is being installed,the inlet and outlet flange cover must be removed.

5.4.1 Auxiliary pipes

If the auxiliary device is needed for the pump(for instance,cooling,heating,sealing,flushing and lubrication,etc),the connections shall be made according to the size and location marked on the assembly diagram or referring to the auxiliary pipe illustration.More information can be referred to the relevant chapter about the auxiliary pipes in the corresponding instruction manuals.

The installation of these auxiliary pipes can facilitate the pump normal operation,which has significant meaning.

5.4.2 Coupling guard cover

The pump can not be operated without the coupling guard cover so as to avoid accidents.If the customer does not need to install the guard cover for the delivery,the operator must install one.

Please carry out the job as requested by the following to avoid the failures resulting from the non-conformance with the rules and regulations.

6.1 Check-up prior to operation

The following shall be checked up before the pump is being started up:

- Whether the pump base and foundation are fixed firmly or not
- Whether the coupling and pump set is made adjustment or not
- Whether the pipe is connected as requested or not
- Whether the motor is installed in accordance with the use manual or not
- Whether the rotor can be turned over easily with hands (at least one circle)or not
- Whether the coupling guard cover has been well installed or not

操作人员是否充分了解可能发生的故障以及要遵守的有关安全规范

是否排除过载

轴封是否按使用说明予以安装

如果提供辅助装置,那么这些装置是否按使用说明予以安装

是否所有的轴承已作了良好的润滑

泵是否已排气

泵转向是否正确(严禁反转)

6.2 轴封

装轴封时,请参阅使用说明书“轴封”一节。

6.3 排气

泵起动之前,泵和管路必须排尽空气,并且用介质灌注,在吸上状态时用泵体上部的螺塞孔来排气,在倒灌状态时,泵也须排空。

6.4 运行

6.4.1 检查泵的转向

泵的转向必须正确。如果转向错误,泵就达不到工况点,就会产生振动和过热现象,泵机组或轴封也可能损坏。

正确的转向:泵转子的转向必须与泵壳上标记的箭头方向一致。

6.4.2 启动

泵不允许干运转。

如果在出口管路中没有止回阀,就关闭出口阀

如果有的话,进口阀必须完全打开

打开所有的辅助管路(冷却、加热、密封、冲洗和润滑液),并检查流量

完成第二节中所介绍的步骤后,启动电机

当系统开始泵送介质时,可以在压力表上看到压力升高,然后慢慢打出口阀。

注:泵只有在起动和停止时才关闭出口阀,否则泵将因过热而损坏。

6.4.3 泵工作范围

根据Q-H特性曲线,流量Q可自行调节以适应扬程的变化,泵允许的工作范围有限,这是由各种原因造成的。

1) 低流量部分负载工作极限:

这个极限在Q-H特性曲线中有 Q_{min} 表示,或用未画的特性曲线的延长线表示。如下页图所示。

注:泵不允许在 $Q=0-Q_{min}$ 的范围内工作,若在这个范围长期运行会引起机械负载大量增加,从而使零件无法承受,但允许瞬时通过此临界范围,如启动泵时。

2) 部分负载和过载范围内汽蚀余量NPSH的极限

Whether the operators know well possible failures and some relevant rules that they must conform to or not

Whether the overload has been eliminated

Whether the shaft seal is installed according to the use manual or not

If the auxiliary devices have been provided, whether these devices are being installed according to the use manual or not

Whether all these bearings have been well lubricated or not

Whether the air in the pump has been discharged or not

6.2 Shaft seal

While the shaft seal is being installed, please refer to the chapter of "shaft seal" in the manual. If the pump is not being used for a long period of time, the measure in chapter of 4.6 shall be taken.

6.3 Air discharge

Before the pump is being operated, the air inside the pump and pipe must be discharged fully and then get it fed with the medium. While it is sucking upwards, the plug holes on the casing shall be applied for air discharge. While the pump is being fed, the air inside the pump also needs to be discharged fully.

6.4 Operation

6.4.1 Check-up on the pump rotation direction

The pump rotation direction must be right. If the rotation direction is wrong, the pump shall not reach its working point, and then the vibration and over-heating shall arise, and the pump set or shaft seal may also be damaged.

The correct rotation direction: The pump rotor direction must be in line with the arrow marked on the pump casing.

The motor rotation direction can be confirmed through the means of contacting start-up button.

6.4.2 Start-up

The pump is not allowed to run dry. If there is no check valve at the outlet, the outlet valve shall be closed.

If there are check valves, the inlet valve shall be opened fully.

Open all the auxiliary pipes (cooling, heating, sealing, flushing and lubrication oil), and the capacity shall also be checked on.

After the steps introduced in the chapter two have been finished, the motor can be turned on.

While the system begins to transmit the medium, the pressure rise can be seen from the pressure gauge, and then the outlet valve can be opened slowly. The outlet valve can be closed only when the pump is being started up or turned off, otherwise, the pump shall be damaged resulted from overheating.

6.4.3 The pump working range

According to the O-H characteristic curves, the capacity of Q can be adjusted automatically to be adapted to the head changes. The pump allowable working range is limited, which is caused by several reasons.

1) The working limit: the low capacity part overload

This limit is shown as Q_{min} in the Q-H characteristic curve, or it can be illustrated as the lengthened line in the un-drawn characteristic curve, which is illustrated as follows.

The pump is not allowed to be operated within the range of $Q=0-Q_{min}$. If it has been running within the range for a long period of time, the mechanical seal overload shall be enhanced so that the parts can not bear. But it is allowed to pass the critical range just for an instant, for example, while the pump is being started up.

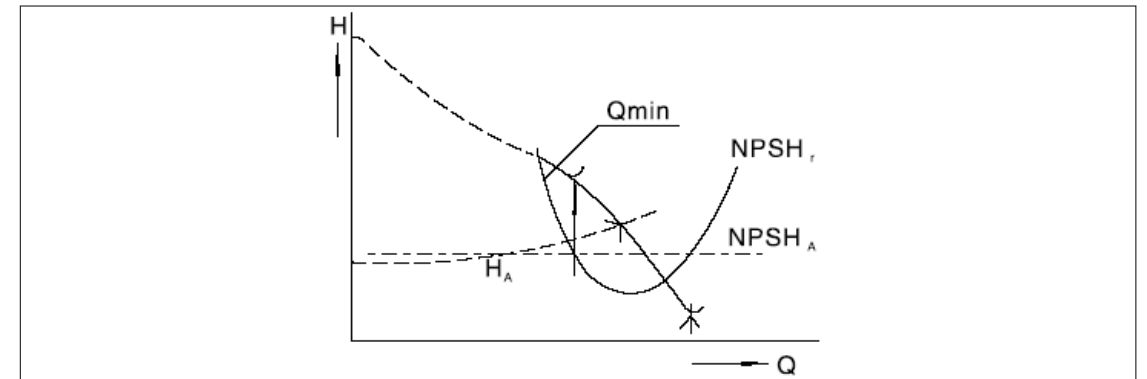
2) Partial overload and the limit NPSH within the overload range

这两个极限可由必需汽蚀余量 $NPSH_r$ 和有效汽蚀余量 $NPSH_a$ 的关系确定,它们按以下方法得到: $NPSH_r$ 和 $NPSH_a$ 的交点投影到Q-H特性曲线上,这两个投影点就确定了工作极限(指曲线以下部分)。

泵在设计工况下工作时不必检查NPSH的工作极限,但如果系统发生变化时,就必须检查NPSH值,若有必要应向三联公司技术部门咨询。

These two limits can be decided based on the relations between the $NPSH_r$ and $NPSH_a$, which can be obtained through the following means: the intersection of $NPSH_r$ and $NPSH_a$ is projected onto the O-H characteristic curve, and these two points determine the working limit (indicating the part below the curve).

The working limit of NPSH shall not be checked up while the pump is working under the designed working conditions. But if there is any change over the system, the NPSH value must be checked on. If needed, Sanlian Company must be consulted for advice.



6.4.4 停机

1) 关闭出口阀,如果在出口管路中有止回阀,出口阀可以维持打开状态以得到一个回压。关闭泵时,进口阀不要关闭,关闭电机时,要确保机组能平缓地停下来。泵应当有一适当的后运转期,在这期间,要切断热源,这样才能使输送的介质完全冷却下来,从而避免泵中产生任何热量。

2) 泵长期停止工作时,进口阀必须关闭。

3) 关闭辅助管路,泵的轴封即使在停机状态也要用密封液润滑。

4) 在冰冻或长期停止使用时,应排除泵及管路中的介质,以免冻裂。

6.4.5 停机措施

所需的措施取决于预期的停机时间。

6.4.5 (1) 短期停机

如果泵被正确停机并且平顺的停止转动,重新启动时就不必采取特殊措施。如果由于可能存在的危险而被停掉,必须检查损坏情况。

6.4.5 (2) 长期停机采取的措施

1) 泵应保持装配状态,且应定期检查工作情况。泵长期停止使用时,为了确保泵随时可以启动,并防止泵内及泵吸入口处产生沉淀物,每个月或每三个月要启动一次泵(大约五分钟),泵工作之前要检查运转情况以确保泵内是否有足够的液体启动泵。

6.4.4 Turn-off

Close the outlet valve. If there is any check valve at the outlet pipe, the outlet valve can be kept being open so as to obtain a return pressure. While the pump is being turned off, the inlet valve shall not be closed. While the motor is being turned off, it must be guaranteed that the set can be turned off very smoothly. There shall be appropriate post-period of running time for the pump, during which period, the heating source must be turned off so that the medium transmitted can be cooling down completely to avoid any heat produced inside the pump.

While the pump is not being used for a long period of time, the inlet valve must be closed.

Close the auxiliary pipes. The sealing liquid lubrication must be applied even if it is in a state of turn-off.

When it is being frozen or in disuse for a long period of time, the medium inside the pump and pipe must be eliminated to prevent it from frost cracking.

6.4.5 Turn-off measures

Required measures are depended on the expected turn-off time.

6.4.5(1) Short-time turn-off

If the pump is turned off correctly and smoothly stopped rotating, then there is no need to take special measures when re-starting. If the pump is turned off because of possible existing danger, the damage status shall be examined.

6.4.5(2) Measures taken in case of the long period of the disuse

1) The pump shall be kept under the state of assembly, and the periodical check-up must be carried out. When the pump is the disuse for a long period of time, the pump shall be started up every 1 or 3 months (for about 5 minutes) to guarantee that the pump can be started up at any time to avoid any deposit from being produced at the inlet. Before the pump is operated, the operating status shall be checked up to guarantee that there is sufficient amount of liquid inside the pump to start up the pump.

2) 将泵从管路中拆下,并按5.1至5.4节所述进行检查。用防护剂喷涂泵壳内壁特别是叶轮间隙处,喷涂吸入口和排出口,然后将进出口盖住(如用塑料盖或与之类似的东西)。

7、维护检查 Maintenance

7.1 一般规定

必须确保所有的维修、检查和安装工作要由指定的、合格的并且对本使用说明书相当熟悉的专业人员执行。

定期维修计划可以避免昂贵的维修费用,可以使泵不发生故障。并且可以使泵在维修费用很低的情况下可靠地运行。

以上这些工作必须在切断电源的情况下进行,以免泵机组突然启动。(生命危险!)

泵输送对健康有害的液体时,必须消毒。只有将介质排尽,人对环境才没有危害。同时,还必须遵守有关规定。(生命危险!)

7.2 维护、检查

7.2.1 运行管理

泵在运行期间要特别注意以下几点:

泵必须平稳地运转

泵不允许干运转

为防止介质温升,泵不能在出口阀关闭的情况下长期运转

轴承温度不得超过75℃

定期更换润滑油脂

如果有进口阀,在泵运行时不能关闭

定期检查和起动备用泵

检查辅助管路是否良好连接

检查联轴器上的弹性元件,有磨损立即更换

如果轴封水不是用工作介质,必须保证使用的外接轴封水压力比进口压力高0.1~0.2Mpa;如果泵是填料密封,运行时填料函处允许有少量滴水,轻轻压紧填料压盖至少量滴水。

7.2.2 轴封的维护

轴封的维护可按使用说明书“轴封”一节进行维护。

7.2.3 轴承的维护

油脂润滑的深沟球轴承不需特别维护,定期更换或添加润滑油脂即可。

7.2.4 检查

泵运行两年后,应当对其进行一次检查。为达到这一目的,必须停泵并将其打开。泵的拆卸见

7.3 部分所述。

检查内容包括以下几点:

用眼睛检查所有零件是否有损伤

检查泵壳的磨损情况

检查叶轮磨损情况

2)Remove the pump from the pope and take a check-up according to the chapters from 5.1 to 5.4.Apply protective agent onto the inner wall of the casing,especially,onto the impeller gap.Te shall be applied at the inlet and outlet,and then the inlet and outlet shall be covered(for example,with plastic cover or something similar).

7.1Common regulations

Please make sure that all the maintenance,check-up and installation must be carried out by those designated,qualified professionals who are fairly familiar with the manual.

The periodical maintenance can avoid the expensive maintenance fee to make the pump free from any failures.Furthermore,the pump can be operated reliable at a very low cost of maintenance fee.

All the work mentioned above must be carried out while the electricity has been cut off to prevent the pump set from being started up all of a sudden(Death of Danger!)

When the pump transmits hazardous liquids,it must be sterilized.After the medium has been discharged completely,there is no danger for people and the environment.Besides,some relevant rules must be abided by (Death of Danger!)

7.2 Maintenance、Check-up

7.2.1Operation management

The following points must be paid great attention to while the pump is being operated:

The pump must be operated stably.

The pump is not allowed to run dry.

To avoid the medium temperature rise,the pump can not be operated for a long period of time while the outlet valve has been closed.

While the ambient temperature reaches 30(80F),the bearing temperature can not exceed 90(194F);while the temperature is rising,the bearing temperature can not exceed 100(212F).

If there is ant inlet valve,it can not be closed while the pump is being operated.

Take a periodical check-up and start up the standby pump.

Check on whether the auxiliary pipe has been well connected.

Check on the flexible components on the coupling.If there is abrasion,please have replacement immediately.

If it is not the working medium that is applied for sealing,cooling or lubrication oil,it must be guaranteed that the applied liquid pressure must be 1.0-2.0 bar higher than the inlet pressure.If the packing seal is applied for the pump,the fact that several drops of water dribble is allowed at the packing box during the operation.Press lightly the packing gland until there are little drops of water dribbling.

7.2.2 Maintenance of shaft seal

For the maintenance of shaft seal,please refer to manual book chapter “shaft seal” .

7.2.3 Maintenance of bearing

It is unnecessary to maintain the deep groove ball bearing for grease lubrication.Replacing or adding lubricating grease shall be OK.

7.2.4 Check-up

After using for two years,the pump shall be examined by open it while it is turned off.As for the disassembly,please see 7.3.

The contents of examining shall be as follows:

Visual check up all the parts to see if there is damage.

Check up the abrasion status of the casing.

Check up the abrasion status of the impeller.

检查磨损后的径向间隙,其值应符合运行间隙表中的规定值。

清洗并检查耐磨轴承

检查泵轴中心度,在安装点其误差不超过0.05mm

清洗、检查所有附属管线

检查联轴器的传动元件,如油损坏应将其更换。

检查机械密封及轴套的磨损情况

注意! 机械密封上即使有微小的损伤,也应将其更换。

更换所有的垫片、口环及圆形环。

7.3 拆卸

拆卸前要确保泵不会突然运行,进口阀和出口阀必须关闭,泵必须冷却到环境温度,必须排空,压力必须释放。

拆卸和重新装配必须根据有关剖视图进行。

7.4 重新装配

重新装配按拆卸顺序相反进行,总装图和各零件表可作为参考。

装配和拆卸轴封、轴承时要按照规范的装配工艺或安装说明进行。所有“O”型圈、橡胶垫必须更换,其安装处必须清洗。在安装之前所有的密封元件必须装到合适的位置。

7.4.1 泵的组装

更换所有的垫片、口环和圆形环,保证所有的端面是清洁的并没有毛刺。组装之前,应检查泵轴的同轴度,同轴度的最大允许偏差为 0.05mm。

按图所示组装转子,根据X和Y尺寸用轴上的螺母调节叶轮,或者校正重新组装件。

按图所示组装。

将向心球轴承在油浴中加热,然后将其装上。

将整个转子组件吊起,放入泵壳下半部分。

组装好泵壳上半部分,并按下面的说明将所有的螺母拧上。

用手转动泵轴,看转子是否自由旋转。

加注润滑油

检查设备的对中情况



安装联轴器保护罩

安装辅助管线



保证螺栓连接是适当紧固的。如果螺栓连接有松动,输送介质就会泄漏,这会严重危及到操作人员的人身安全。

这项工作完成之后,就可以按照6.4部分的内容将泵投入运行。

7.5 备件

推荐满足两年以上连续运行所需的备件数量如下:

Check up the radial clearance that is after abrasion, and its value shall conform to the specified value in the operation clearance list.

Clean and check antifricition bearing.

Check the centrality of the pump shaf t,and its deviation at installation point shall be no more than 0.05mm.

Clean and check all the auxiliary pipes.

Check the driving components of coupling , for example ,the oil shall be replaced if it is damaged.

Check the mechanical seal and the abrasion status of shaft sleeve.

Even if there is a tiny little damage on the mechanical seal,it shall be replaced.

Replace all the washers,impeller rings and ircle rings.

7.3 Disassembly

Prior to the disassembly,please make sure that the pump shall not start running all of a sudden and the inlet valve and outlet valve must be closed.The pump must be cooled down to the ambient temperature.The pump must be discharged completely.The pressure must be released.

The disassembly and re-assembly must be carried out in accordance with the relevant sectional view.

7.4 Re-assembly

The re-assembly can be carried out counter to the disassembly process,and the overall installation diagram various part list can be referred to.

The assembly and disassembly of the shaft seal, bearing must be carried out in accordance with the specified assembly technique or installation instruction.All the O rings,rubber gaskets must be replaced,and the installation area must be cleaned.All the seal components must be installed at the proper location prior to the installation.

7.4.1 The assembly of pump

Replace all the washers,impeller rings and circle rings.Make sure all the end faces are clean with no burrs.Prior to assembly,the concentricity of pump shaft shall be checked,and the maximum allowed deviation of concentricity shall be 0.05mm.

Assemble the rotor,adjust the impeller by the nuts on the shaft,or adjust and reassemble.

Assemble according to the structure diagram.

Put the radial ball bearing in the oil bath to heat it, then assemble it.

Lift all the rotor assembly,and put it in the lower half of the pump casing.

Assemble the upper half of the pump casing , and screw all the nuts.

Turn the pump shaft with hands to see if it is rotated freely.

Fill the lubrication oil.

Alignment status of the equipment shall be checked.

Install coupling guard cover.

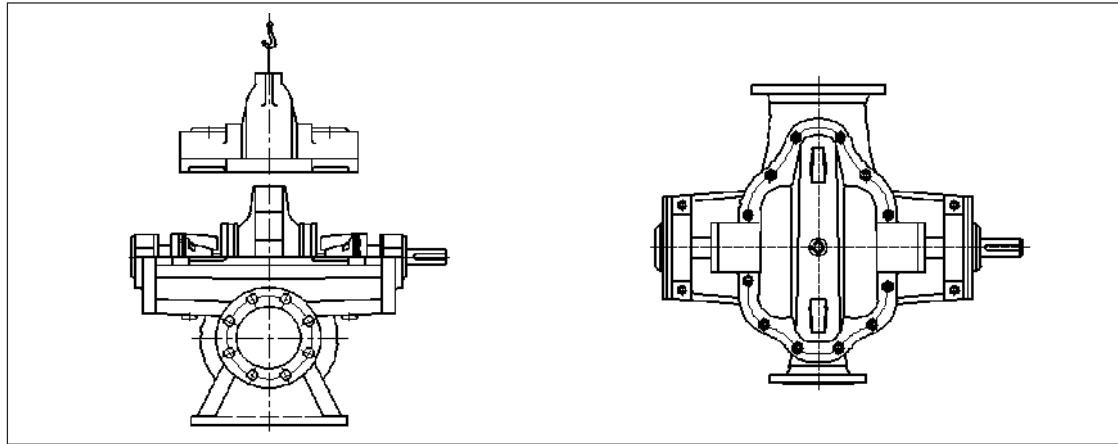
Install auxiliary pipes.

Make sure bolts connection is fastened. If there is some looseness, the transported medium shall be leaked,which shall jeopardize the safety of the operator.

After this work is done,contents of chapter 6.4 shall be proceeded to make the pump operate.

7.5 Spare parts

The suggested spare part quantity for two years' operation



	泵的数量(包括备用泵) Pump quantity(Standby pump included)						
	2	3	4	5	6或7 6 or 7	8或9 8 or 9	10或以上 10 or above
	备 件 数 Spare parts quantity						
叶轮(不同的叶轮) Impeller(Different impeller)	1	1	1	2	2	3	30%
泵壳耐磨环, 叶轮口环 Pump casing wear ring, impeller wear ring	2	2	2	3	3	4	50%
带键的轴及轴上螺丝或螺母 Shaft with key,screw or nut	1	1	2	2	2	3	30%
轴承 Bearing	1	1	2	2	3	4	50%
轴承座组件、轴承等 Bearing seat assembly,bearing etc.	-	-	-	-	-	1	2
泵壳密封(套) Pump casing seal	4	6	8	8	9	12	150%
其它密封(套) Other seal	4	6	8	8	9	10	100%
轴套 Shaft sleeve	2	2	2	3	3	4	50%
动密封环 Rotating seal ring	2	3	4	5	6	7	90%
静密封环 Stationary seal ring	2	3	4	5	6	7	90%
圆形环 Round ring	2	3	6	8	8	10	150%
静密封环上的密封 Seal for stationary seal ring	2	3	6	8	8	10	150%
弹簧 Spring	1	1	1	1	1	1	20%
填料箱衬垫(片) Stuffing box gasket	1	1	1	1	2	2	20%

从投产开始起就应备足备件,一旦需要就可取出备件进行更换。当需要订货时,请给出以下内容:

- 泵的货号
- 泵的类型及尺寸
- 备件单中的编号
- 剖面图中的零件编号
- 数量
- 材质

Spare parts shall be prepared since production.Spare parts can be needed when replacing.When ordering the product,please provide the following contents:

- Item No. of the pump
- Type and dimension of the pump
- Serial number in the spare parts
- Parts serial number in the cross-section drawing
- Quantity
- Material

备件的存储
将备件存储在原始包装内
储存在一个干燥的地方,最好在恒温下储存
每6个月检查一次备件的腐蚀情况及包装状态
用防腐剂喷涂破损处,以便保存。
备件的保存
备件的保存方法与泵的保存方法一致,详见第3部分。

Storage of the spare parts
Spare parts shall be put in the original package.
Spare parts shall be stored in a dry place,and it is best to put them in a constant temperature.
Corrosion status and package shall be checked every 6 months.
The damaged area shall be sprayed with preservatives
Preservation of the spare parts
The method of preservation for the spare parts is the same as the pump,please see the third section.

8、技术问题、原因和排除方法 Technical problem,reasons and solutions

下表对可能发生的技术问题和产生原因进行了概括,如果出现的问题及产生的原因不在表内,请与我方联系。

在排除故障之前,必须保证电机不会被随意启动。泵内不能承压,必须排空。

The following lists summarize the possible technical problem and reasons.If the problem and reason are not included in the lists,please contact us.

Prior to finding the reasons,motor can not be started.And there is no pressure in the pump.

问 题 Problem	产生原因及排除方法序号 Reasons and solutions number
泵流量太小 The pump flow rate is low	1, 2, 3, 4, 5, 6, 7, 8, 9, 16, 17, 22, 27
压差太低 Differential pressure is too low	2, 3, 4, 5, 6, 7, 8, 9, 16, 17, 22, 27
压力太高 The pump pressure is too high	9, 11
泵功率太大 The power consumption is too much	3, 6, 8, 9, 10, 11, 13, 14, 16, 17, 20, 23, 24
泵体温度过高 The casing temperature is too high	2, 5, 8, 13, 19, 21, 23
泵运行不稳 The pump operation is not stable	2, 3, 4, 5, 6, 8, 10, 13, 14, 19, 20, 21, 23, 27, 28
轴承过热 The bearing temperature is too high	8, 9, 11, 13, 14, 15, 19, 20, 21, 23, 27, 28
轴封泄漏 There is leakage for the shaft seal	12, 13, 24, 29
泵壳体泄漏 The pump leaks	18

8.1产生原因及排除方法

序号	产生原因	排除方法
1	设备的反压大于泵的设计点压力	将排出侧的截流阀打开到所需位置,以达到操作点
2	泵或管线未被完全排空或充满	排空或充满水
3	给水管线或压力堵塞	清理管线及叶轮
4	管线中有气泡产生	安装排空阀,改变布管位置
5	许用的NPSH太低	检查泵吸入口水位 将进水管线上的截流阀完全打开 如果磨阻损失过大,重新布管
6	泵反转	改变电机上任意两相电极
7	转数太低	提高转数
8	泵内部件磨损	更换磨损部件
9	输送流体的密度、粘度和温度与设计值不符	与我方协商
10	泵的压差小于额定值	在压力管上的截流阀设定操作点
11	转数太高	降低转数
12	轴封损坏	检查轴封零件,如果需要则更换
13	泵未完全找正	重新找正
14	泵承受应力	检查管线连接有无应力
15	给出的半个联轴器的间隙未调整	重新调整,见装配图中的间隙值
16	电机电压不匹配	匹配电机电压

