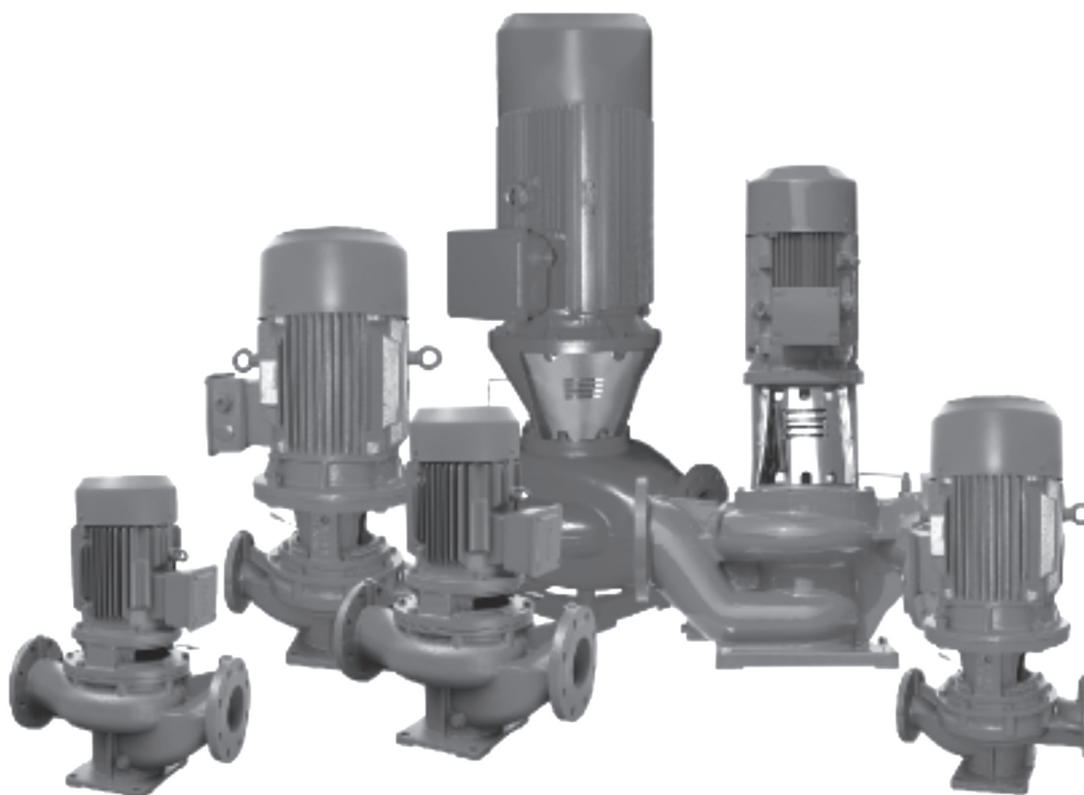




GLC series pipeline pump Installation Manual



Please leave the manual to the user

Read the instructions carefully before Installation,
operation and maintenance



Bell & Gossett
a xylem brand

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1 General

1.1 Preface

This manual provides basic information necessary for the installation, operation and maintenance of GLC series pipeline pump. The operation of GLC pipeline pump should strictly follow related requirements in this manual and local regulations and rules.



The installation, operation and maintenance personnel must grasp related rules for accident prevention and are qualified for the activities. If they do not acquire necessary knowledge, they shall be duly trained.

- ① The operator should operate according to the safety requirements provided in this manual.
- ① Should the pump or pump sets (pump + motor) be not installed, operated or maintained as per this instruction manual, the manufacturer assumes no responsibility.
- ① The installation and maintenance of pump or pump set can be smoothly performed only in accordance with the regulations of generally applied engineering and electrical engineering fields.
- ① The manufacturer assumes no responsibility for the pump or pump set not working within the scope specified in the order.
- ① The equipment can be modified only with the consent of the manufacturer. The original spare parts and auxiliaries supplied by the manufacturer are for safer use of pump or pump set. We assume no responsibility in case other parts are used.
- ① This operation instruction manual does not consider every detail and change in the design as well as everything that might happen during the installation, operation and maintenance.
- ① Keep this operation instruction manual properly for future use.
- ① In case this pump or pump set is transferred to any third party, this operation instruction manual together with the operating conditions and the work scope in the purchase order should be transferred to the third party as well.
- ① We reserve all copyright of this operation instruction manual, which is for the use of the end users of the pump or pump set only. The operation instruction manual, including the technical guideline and the drawings, partly or whole, should not be duplicated, distributed or used for competitive purpose.

1.2 Commitment

This commitment is based on the delivery and order conditions. Within the warranty period of the pump, only

we or those with our written authorization are qualified for the maintenance and service. Otherwise we cannot ensure the effective implementation of the commitment. We will provide respective maintenance warranty only when the customer use the pump and handle certain material in a proper way. Our commitment does not cover natural wear of pump and its parts and components, for example, impeller, shaft seal, shaft, shaft bushing, bearing, wear ring and etc., or any harm from improper shipping and handling.

To ensure the effective implementation of the commitment, make sure that the pump or pump set runs under the operating conditions indicated in the nameplate and the purchase order, so as to achieve extended service life of parts and ensure stable operation of pump.

In case one or more changes take place during actual operation of the pump, the user shall consult us in written whether this commitment is still effective.

1.3 Safety regulations

This operation instruction manual includes various important instructions during the installation, operation and maintenance process, therefore, the professional technicians and personnel responsible for this project should read the manual carefully prior to the installation and commissioning of the pump. The executor must make sure that all the working personnel fully understand this operation instruction manual. To ensure effective implementation of this regulation, the executor must sign on the "12 Equipment administrators list".

This operation instruction does not involve with the general regulation for accident prevention and local safety practice. The operator is responsible to obey this regulation (please inform other technicians if necessary).

The safety instructions include the following warning symbols:



This symbol represents that there may be accident of personal injury if the safety practice is not followed.



This symbol represents that attention should be paid to electric shock risk.

Note! This symbol represents that attention should be paid to potential damage to property and environment.

- ① It must be ensured that the safety information and maintenance regulations directly related to the pump operation are legible and easily recognizable.

1.4 Safety instructions

Hazard may be caused if the safety instructions are not followed.

The following consequences may be resulted when the safety instructions are not followed:

- The personnel are exposed to the hazards of electric shock, mechanical injury and harm from chemical substances.
- Some important functions of pump and pump system are unable to work.
- Damage to environment may be caused owing to the spill of hazardous substances.

Safety instructions related to operator

- Owing to the diversified operating conditions, the rust, wear and aging of pump and pump system will shorten the service life and affect the working performance. The operator should perform inspection and maintenance of pump at regular interval in order to ensure that every part and component are in good working conditions, or it may bring hazard to the system operation. If any abnormality is found during the pump operation, stop the pump immediately for inspection.
- If personnel or property damage may result from a pump failure, the system should be equipped with an alarm device, which should be regularly maintained so as to ensure that it can effectively function.
- When the machine has hot or cold part which may cause harm to personnel in contact, such part should be effectively protected or be provided with warning symbol.
- The protective device (for example the protective housing) for running part must not be removed during operation.
- In case of leakage of hazardous media (e.g. explosive, toxic, hot), the media must be completely eliminated immediately for fear that it may damage the personnel and environment. The operation should adhere to related laws and regulations.
- Measures must be taken to prevent electric shock. To work on electric components, first plug out the power supply socket, or turn off the main switch or screw out the fuse and provide related protective switch for electric motor.
- In general, maintenance work on pump or pump set can be performed only when the pump stops and there is no pressure present. All parts and components must return to the same temperature as the ambient temperature and it must be ensured that no one can start the motor under this circumstance. The system should be shut down in accordance with the steps specified in the operation procedure. Before dismantle the pump, first eliminate the remaining hazardous substances in the pump. When the work is completed, the safety protective device must be restored.
- It is recommended that each unit of equipment should be provided with one or more devices to

handle emergency cases so as to avoid potential hazard. But this shall not include the following: The emergency switch inside the machine is unable to minimize the hazard, or they cannot reduce the time for shutting down the machine or take measures to prevent hazard. This emergency switch must have explicit control indication and be installed to a location with easy access. Once hazard happens, it must be able to be stopped rapidly and cause no other additional risk.

- If the emergency handling device is unable to function normally because the "STOP" button is open after the emergency, the handling device must no longer be used until it is repaired.
- In case of failure or recovery of power or other changes, it must ensure that no hazard will be caused (for instance, water hammer phenomenon).

Rotation speed, pressure, temperature

Related safety measures must be taken to ensure that the rotation speed, pressure and temperature are within certain range and the actual values should not exceed the values given in the datasheet. Specific pressure (system pressure) must be high enough. Moreover, the pump should be protected (with e.g. check valve and etc.) from abruptly increased pressure owing to rapid shutdown of equipment.

Nozzle load

Generally it is required that the force and moment the water suction and discharge pipe exerted on the pump should keep to a minimum level, but if this requirement is not fulfilled, they should in no case exceed the requirement of "Form 3 Nozzle load (max.)".

Cavitation allowance

When entering the pump, the liquid must keep a minimum pressure to prevent cavitation and discontinuous flow, which is achieved when NPSHa is far above NPSHr in normal operation. When temperature of the media transferred is nearly its boiling point, special attention must be paid to NPSH value. If it is less than NPSHr of pump, cavitation and extra high temperature will result in serious damage to the pump. NPSHr values of various pump types are given in the performance curve.

Sealing, purging, cooling

- Suitable equipment for adjusting and monitoring sealing, purging and cooling systems.
- When handling hazardous or hot liquid, the pump should stop operation immediately in case the sealing, purging and cooling systems are ineffective.
- Prior to the startup of pump, it must be checked that the sealing, purging and cooling systems are in operation, which should not be stopped before the pump is shut down, unless the design of operation system allows.

Minimum flow

If the pump starts with the valve closed, the energy that pump delivered to the liquid is transferred in the form of heat, which may result in rapid temperature increase of liquid in a short time, cause damage to the parts and components inside the pump. Therefore, quickly open the water discharge valve when the pump reaches operating speed. In case the operating conditions of pump inevitably reaches zero flow or the hot water is in circulation, related overflow valve must be provided or a bypass line should be provided for smaller system. It is recommended to determine a min. flow or design an auxiliary line

Zero load protection

In no case the pump is allowed to run with zero load as such operation will result in extra high pump temperature and damage the parts and components of pump (e.g. mechanical seal).

Backflow

When the system runs under pressure in a closed status, the pressure cannot be reduced via pump, as it may cause a backflow speed far above the pump speed and thus damage the system

When using, the user should consider the effect of various factors on the use, and its maximum suction height H should be lower than the calculated value below (negative value should be inverted). Otherwise, the pump will not work properly.

P_b : local atmospheric pressure unit bar(sea level is 1bar)

$NPSH_r$: water pump must be cavitation margin, unit m

H_f : loss of inlet pipe in m

H_v : liquid saturated vapor pressure unit is m (converted to water column height)

H_s : safety margin in m (usually 0.5m)

Such as:

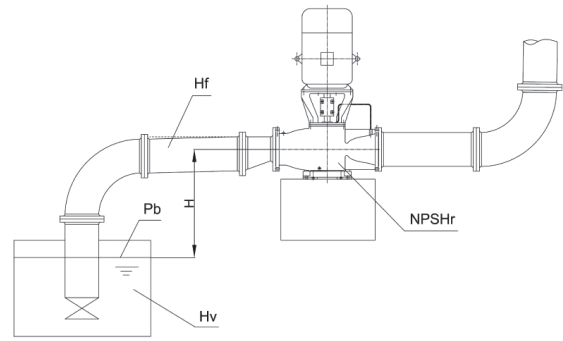
$P_b=1\text{bar}$, pump cavitation margin $NPSH_r=2\text{m}$,

Pipe loss $H_f=2\text{m}$, safety margin $H_s=0.5\text{m}$

When liquid temperature 40°C saturated vapor pressure

$H_v=P_v/\rho g$, $g=0.7\text{m}$ (converted to height of water column)

$H = 1 \times 10.2 - 2 - 2 - 0.7 - 0.5 = 5\text{m}$



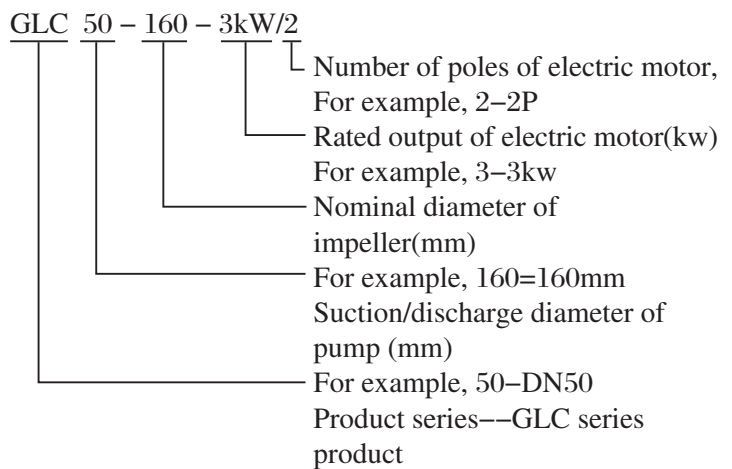
2 Introduction of pump

2.1 Configuration and application

GLC series pipeline pump is a single stage single suction vertical centrifugal pump with extended shaft design and with no bearing body component at the pump head; the suction and discharge flanges of the pump are of the same size and the flange centerlines are at the same axis. The pump rotates clockwise viewing from the driving end. This pump is suitable for heating system, air conditioning system, cooling system, water supply and other industrial systems.

2.2 Type and technical parameters

2.2.1 Vertical single pipette pump



Technical parameters:

Maximum flow rate: $1900\text{m}^3/\text{h}$

Maximum head: 160m

Work pressure: 1.6mpa, 2.5mpa (please check Xylem)

Inhalation pressure: less than 1.0mpa (greater than 1Mpa, please consult Xylem)

Medium temperature: $15^\circ\text{C} \sim +120^\circ\text{C}$

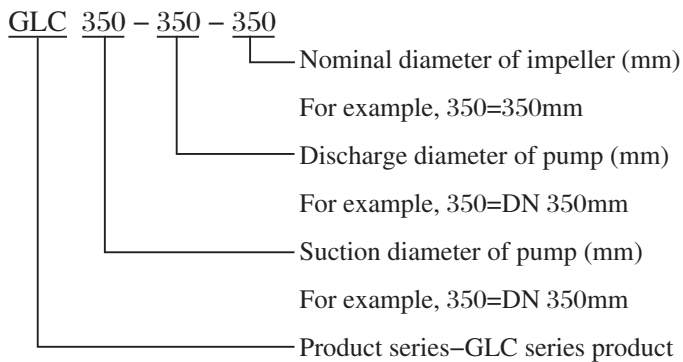
Seal: mechanical seal

Inlet and outlet diameter: DN40 ~ DN350

Inlet and outlet flanges conform to GB/T 17241.6 standard

It can also be produced according to user requirements

2.2.2 Vertical double pipette pump



Technical parameters:

Maximum flow rate: 2100m³/h

Head: 10 ~ 46m

Rated working pressure: 16bar (for import pressure greater than 6bar or working pressure greater than 16bar, please refer to Xylem)

The medium temperature: 15 °C ~ + 120 °C

Seal: there are two types of mechanical seal and packing seal

Inlet and outlet diameter: DN250 ~ DN350

Inlet and outlet flanges conform to GB/T 17241.6 standard

It can also be produced according to user requirements

2.3 Nameplate

Every product from Xylem has its own nameplate indicating basic information of the product as shown in Fig. 1.

The designation on the nameplate is a permanent number to record the pump information, which must be mentioned in related purchase order and ordering process of spare parts.

Note! Please refer to "5.4 Operation and monitoring" and "6 Service" in this manual for more information on the mechanical seal and potential risks.

3 Shipping, handling and storage

3.1 Shipping handling

Check in time if any part is damaged during the shipping and receiving process of pump. The pump must be shipped by professional personnel in order to prevent collision. When delivered from the factory, avoid changing the orientation of the pump and pay attention to the instructions on the packing.

Seal the suction/discharge of the pump during shipping and storage.

Note! All packing material should be disposed of according to local laws and regulations

The lifting devices (such as fork lift, crane, pulley, rope and etc.) must be adequately safe. The weight of pump or electric motor can be found on the nameplate.

The pump set should be lifted as shown in Fig. 2. When the electric motor has no lift lug, it should be bound and located with nylon tapes

It is prohibited to stand below lifted load. Please obey the regulations to prevent accident. The pump or pump set cannot tip or fall before it is finally located.

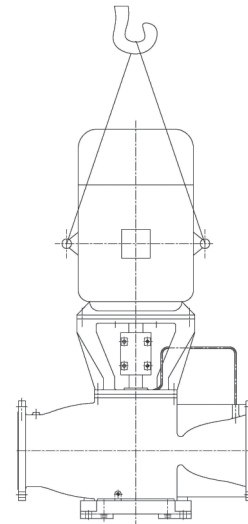


Fig.4



It is prohibited to stand below lifted load. Please observe the rules to prevent accidents. The pump or pump unit cannot tip or fall before it is finally located.

plastics). Basically the pump cannot be stored in nude and should be covered. During the storage period, all suctions/discharges must be sealed with flange cover plug.

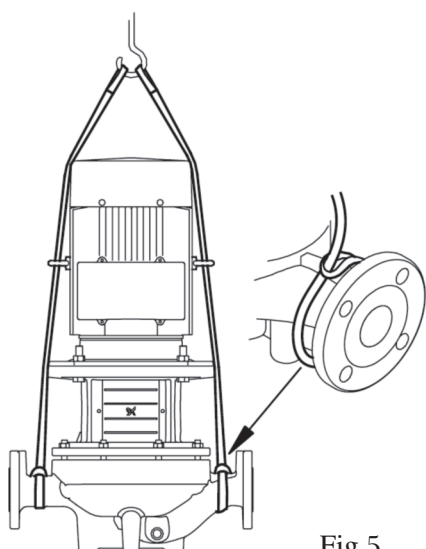
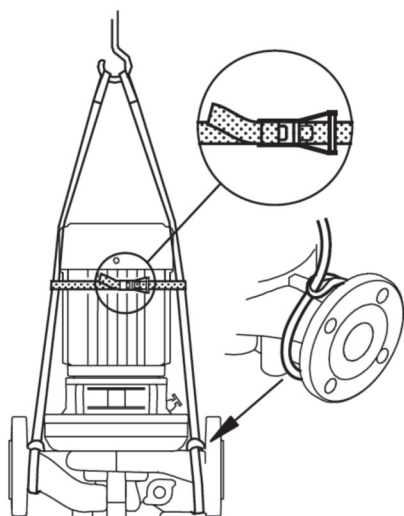


Fig.5

3.2 Storage

In case of long period storage, make sure that the pump or pump set is protected from humidity, vibration and filth (it may be wrapped with waterproof oil paper or

4 Installation

4.1 Pump installation

The installation of pump should reserve sufficient space for the maintenance and service activities, especially for replacement of the driving motor or the entire pump set, as shown in Fig.3.

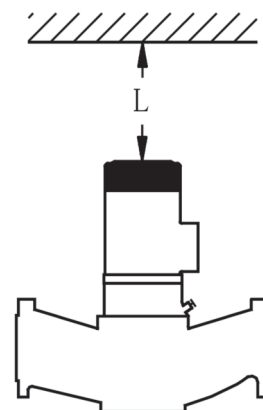
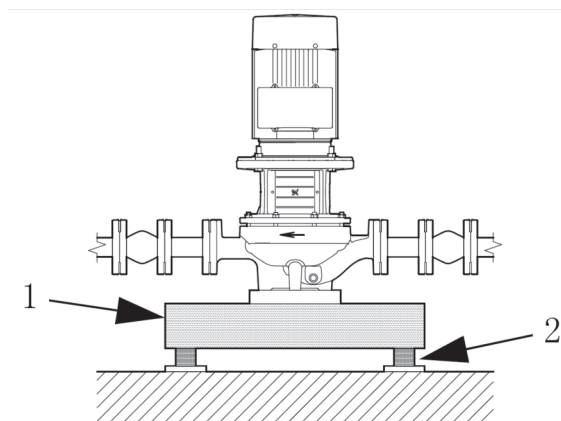


Fig.6

The concrete base must be able to absorb vibration effectively; The base shall provide a permanent and solid foundation for the pump unit and shall be constructed in accordance with local conditions. When installed without vibration isolation, the base platform of the pump should be 100~150mm wider than the width around the base of the pump set. When installed with vibration isolation, the vibration damping platform should be 150mm wider than the water pump vibration isolation base. Elevation on top of foundation shall be higher than 100mm above pump room ground without vibration isolation installation, and above 50mm above pump room ground completion surface with vibration isolation installation, and water accumulation shall not be formed as shown in figure 7. The peripheral area of the foundation is provided with drainage facilities to facilitate the drainage or the elimination of leakage during maintenance. The oil, gravel, soil and water should be clear and clean in the hole reserved by the water pump foundation surface and anchor bolts. The thread and nut of the embedded anchor bolts shall be well protected. The surface of the placer should be chiselled. Before the installation of the equipment, the surface of the foundation secondary grouting layer shall be scooped into a hemp surface with a depth of no less than 10mm and no less than 3 points per square metre.



1-Concrete base 2-Shock absorber

Fig.7

Pump installation procedure:

a)The anchor bolts are mounted through the holes on pump base and align the pump suction flange with the pipeline flange.

b)Perform the first grouting till 20–30mm below the pump base. Do not move the equipment during grouting and" the anchor bolts should be placed vertically in the foundation holes.

b)When the concrete is completely cured, align the pump suction/discharge flange and pipeline flange again and perform the second grouting till the pump base.

4.2 Mounting of coupling (some models are equipped with coupling)

Power must be cut off or switched off before maintenance operation.

Installation steps:

1. Check the water pump and motor shaft to remove all burrs, rust, etc.
2. Install the positioning ring 2 and screw 4 onto the motor shaft, and locate the ring end face level with the motor shaft end face, then use the electric drill to spot-face the motor shaft, and the position corresponds to that of screw 4.
3. Install the positioning plate 3 and lifting bolt 8 onto the pump shaft without tightening. The positioning plate can be moved up and down.
4. Align the groove of the coupling with locating ring 2 before adjusting locating plate 3, so that the coupling can be installed smoothly on locating ring 2 and locating plate 3.
5. Tighten the lifting bolt 8 on the pump shaft end until it is in place to lift the rotor assembly.
6. Then install the other half coupling on the locating

ring 2 and locating plate 3.

7. Then screw down bolt 5, nut 7 and washer 6 evenly. Check the middle joint of the coupling.

8. Disk coupling, it is confirmed that the impeller and shaft assembly can rotate normally, and the shaft hopping between the coupling and the gland is not greater than 0.1mm.

9. Finally install the coupling guard.

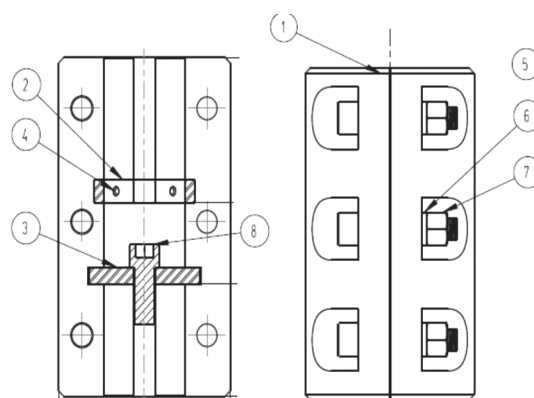


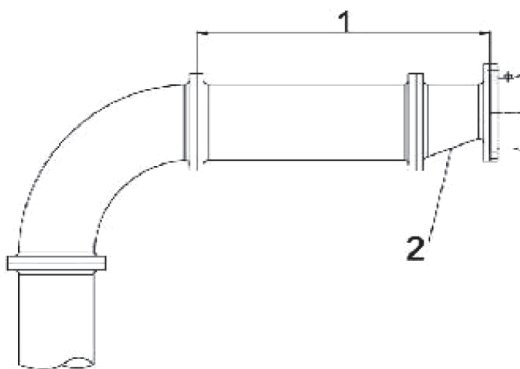
Fig. 8 Schematic diagram of coupling structure

1. Coupling 2. Positioning ring 3. Positioning plate
4. Screw 5. Bolt 6. Washer
7. Nut 8. Lifting bolt

Installation of the coupling must be very careful so that the pump runs reliably for long periods of time. Incorrect coupling installation causes noise and vibration, as well as damage to sliding bearings and seals.

4.3 Piping connection

- Check that the piping is installed in such a way that it does not affect the operation, service and maintenance of pump.
- To install pipelines, remove the weld slag, rust, filth and etc. in the pipe, especially for suction line. Pump set directly or indirectly connected to potable water system must completely eliminate all dirt and filth before installation and use.
- The pipelines are to be firmly and reliably installed. The pipe support near the pump flange should have adequate rigidity for fear that the pump flange may sustain too much load. The force and moment on pump flange should not exceed the values in "Form 3 Nozzle load".
- The suction/discharge pipe should be designed such that the liquid delivered can enter the pump body freely and do not impact the normal operation of pump. Especially it should be noted that the suction line is sealed and there must be enough cavitation allowance. Arrange the suction line horizontally with the pump side slightly inclined upward, so that no air pocket will be generated (as shown in Fig. 5).



- 1 This distance must be at least 5 times the pipe diameter to prevent air pocket.
2 Use an eccentric reducer with flange.

- When the pump is mounted above the suction level, usually a foot valve will be mounted for priming startup.
- Usually a gate valve or check valve is mounted between pump and discharge line for flow regulation and easy maintenance and to prevent potential damage to pump by water hammer generated during shutdown.
- In case the piping system is to be tested with pump installed, the test pressure should not exceed the max. allowed pressure of pump or shaft seal.
- Drain the liquid in the pipeline after test and please check that all liquid is actually drained (to prevent rust and potential failure during restart).

4.4 Electrics connection



The electric connection must be carried out by professional personnel strictly following related electrics technical regulations currently in force, especially those related to the safety. And the work should strictly follow the operation regulations of local state-owned power company.

Prior to the startup, check that the requirements on the nameplate of the electric motor conform to local grid. The power line connected to the electric motor must be wired according to the wiring diagram from the motor manufacturer. Protective motor switch must be provided.

A typical wiring of three phase asynchronous electric motor is given below:

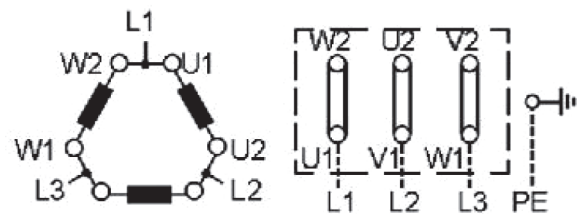


Fig. 6 Δ type wiring

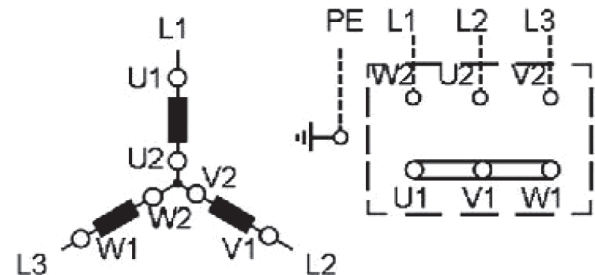


Fig. 7 Y type wiring

Note! The rotation direction must be checked when the pump is filled with liquid. GLC pump rotates clockwise when viewed from the electric motor end. Operation with zero load may damage the pump.

5 Operation



The equipment must be started by personnel familiar with local safety regulations and this operation manual, especially the safety instructions and safety practice in this operation manual.

5.1 Preparations and checklist prior to startup

Check the following before the pump starts:

1. Check the connection of electric motor and start the device according to the circuit diagram. Check the voltage, phase and frequency against the nameplate.
2. Check if the suction and discharge lines and the pressure gauge of the impeller function normally.
3. Turn the rotating parts manually to check that they can move freely.
4. Check the lubrication of the drive.
5. Make sure that the pump is full of liquid (see 5.2 Priming). When close the discharge valve and open the suction valve, make sure that all valves are properly mounted and can function normally.
6. Rapidly change over the power switch. Check that the rotation direction is clockwise when viewing from the electric motor end, otherwise serious damages could occur. Check the rotation direction before every startup of pump.



Do not start pump before the protective casing is mounted, or it may result in serious personnel injury or property loss.



Do not run the pump dry or it may damage the seal and cause property loss and minor personnel injury.

5.2 Priming

Before the pump is started, the suction line and the pump must be full of liquid and drain all air. The operation procedure is as follows:

1. Close the discharge valve and screw out the vent screw plug.



Note the orientation of the vent port and make sure that the liquid discharged, especially hot liquid, will not damage personnel or other equipment.

2. Open the suction valve and feed water into the pump. Make sure that the pump is full of water inside till stable water flow is discharged from the vent port.
3. Screw in the vent screw plug and make sure that the suction valve is fully open.



It is prohibited to run pump when the suction valve is closed or not fully opened.

5.3 Startup

1. Verify that preparations and checks before startup are fulfilled.
2. Make sure that personnel at equipment site are in safe range.
3. Start the electric motor.
4. Once it reaches normal operation speed, open the discharge valve immediately and adjust to the working condition point.

5. Check if the suction and discharge pressure of pump is normal. If not, stop the pump immediately for inspection.
6. Check if the current at electric motor is normal. If not, stop the pump immediately for inspection.
7. Check if the pump has abnormal vibration or noise. If yes, stop the pump immediately for inspection.
8. Check if there is leakage at shaft seal. If yes, stop the pump immediately for inspection.



The pump should run continuously for no more than 3 minutes when the discharge valve is closed.

5.4 Operation and monitoring



It should be specially noted not to contact hot components and work at shaft seal zone without protection. Bear in mind that all auto-control system may start automatically at any time. Paste necessary warning symbols.

Note! Regular monitoring and service will extend the service life of your pump or pump system.

1. The working range specified in the purchase order must be followed.
2. The rated output on the nameplate of electric motor should not be exceeded.
3. Avoid running under zero load, with discharge valve closed or with liquid transferred in steam phase.
4. Avoid abrupt change to the temperature of liquid transferred (thermal shock).
5. The pump and electric motor should run stably and receive inspection once every week.

5.5 Shutdown

1. Close the discharge valve. And if a check valve is provided, it is unnecessary to close the discharge valve.
2. Disconnect the power supply to electric motor (check that the electric motor stably stops).
3. Close the suction valve.
4. If there is freezing risk, the pump should be completely drained.
5. If the pump stopped is still under operating conditions (pressure and temperature), keep all sealing, purging and cooling system running. The shaft seal must be able to prevent air ingress (for example, when there is negative pressure at pump inlet or the pump in parallel connection with the suction line is still running).
6. If the pump is not to use in a prolonged period, turn the rotor of pump at regular interval to facilitate the restart of pump.

5.6 Dismantling

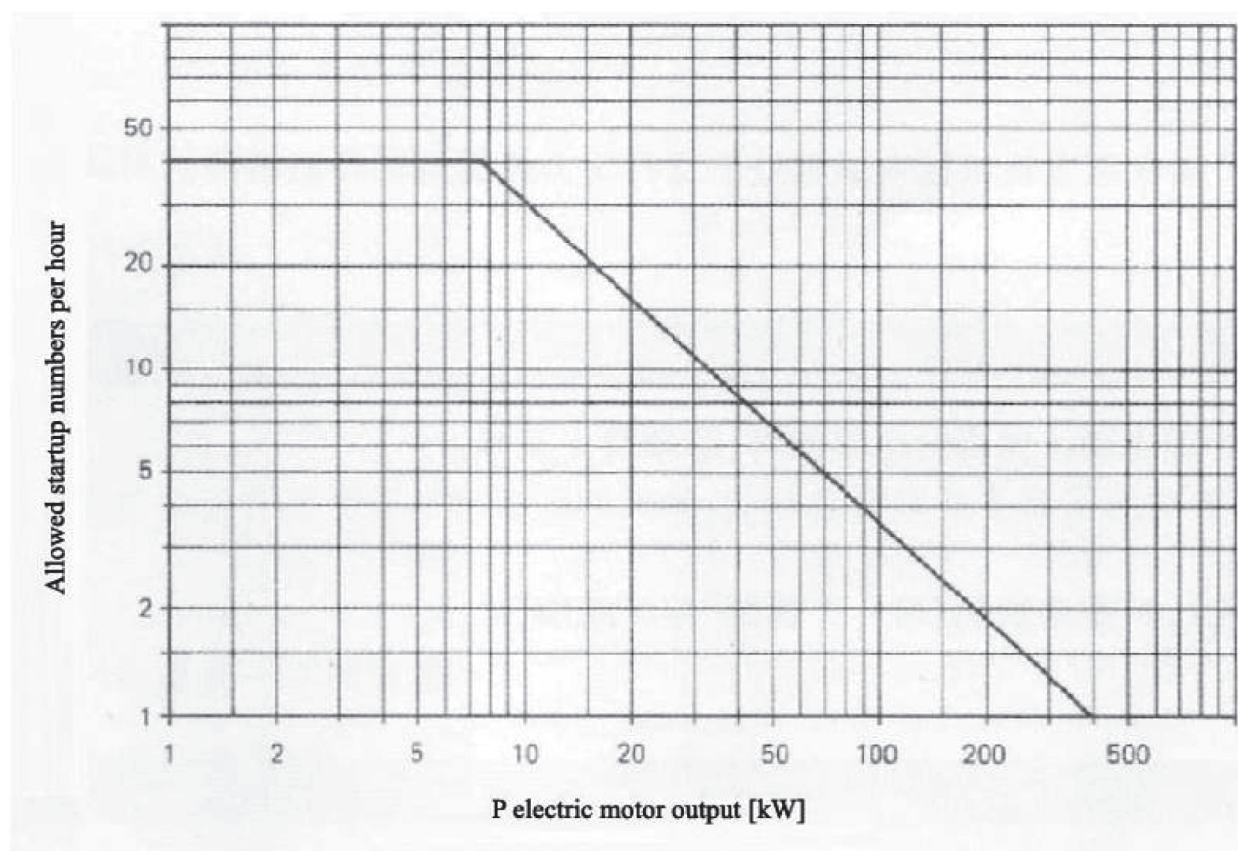


The operator and the fitter at the manufacturer must understand the property of the liquid transferred. If the pump delivers hazardous liquid, acceptable environmental protection measures must be taken to handle the liquid before the pump is dismantled.

1. Check that the electric motor is disconnected from power before the pump set is dismantled.
2. The pump body should be depressurized or drained.
3. All valves on suction and discharge lines must be closed.
4. All components must be cooled down to the ambient temperature.

Allowed startup numbers

Do not exceed the allowed startup numbers (see the figure below). The allowed startup numbers of the electric motor is listed on the Operation manual along with the electric motor. If the two values are different, take the less one as standard.



6 Service



The service work should be performed only when the pump and pump set stops operation and strictly following to 1.4 "Safety instructions".

Note! The service and maintenance work must be carried out by skilled personnel received related training and familiar with this operation manual or by professional service personnel from manufacturer. All service and maintenance work must be recorded at "Log book" and signed for verification.

Packing seal:

Packing seals require frequent maintenance. If leakage is not properly set and the packing seal is severely worn, it must be replaced (otherwise the shaft sleeve or shaft will be worn).

Mechanical seal

If there is leakage at the mechanical seal, it represents that the mechanical seal is damaged and needs to be replaced immediately.

After each removal of the seal, the auxiliary seal and static and static ring of the machine seal must be replaced.



In order to prevent accidents, it is strictly prohibited to fill during pump operation or when the pump is under operating pressure or operating temperature.

Pay attention to the noise during normal operation. If there is vibration, abnormal noise, abnormal temperature rise of motor, or other fault phenomena are observed, stop immediately to find out and eliminate the fault cause.

If the pump performance is not reduced due to changes in the pipe system or the scale in the pipe, it may be caused by the wear of parts in the pump, which must be stopped and repaired.

The operation and maintenance of the pump shall be recorded in the attached table.

7 Maintenance



The pump or pump system can be repaired by skilled professional personnel or professional personnel from the manufacturer only.

If required, we can provide detailed maintenance instructions and send after-sale service engineer to help you. The pump must be installed, maintained and dismantled according to 1.4 Safety instructions, 3.1 Shipping and handling and 5.6 Dismantling.

8 Trouble and troubleshooting

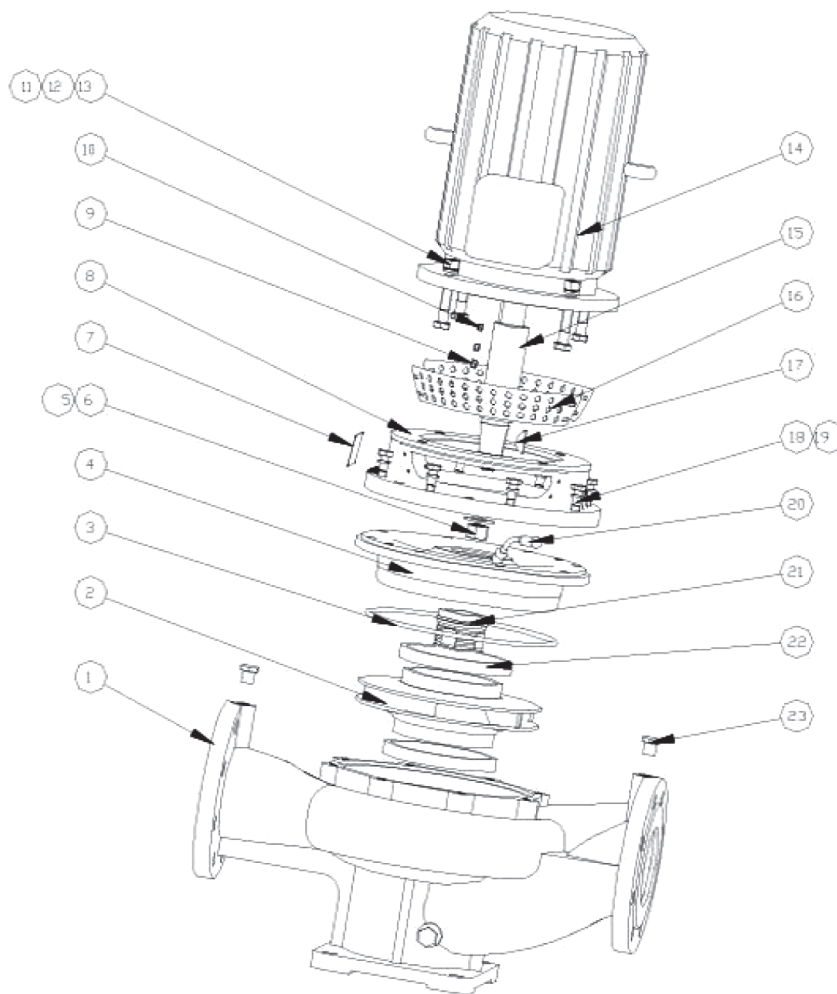
The cause and remedy of troubles listed below can help the user to find out the problem. If the operator cannot fix the problem, he may ask local after-sale service office of the manufacturer for help. The operator must follow the instruction in 1.2~1.4 during repair or replacement. If necessary, a written consent should be obtained from the manufacturer in advance.

Form 1 Trouble analysis form

Phenomenon		Cause	Remedy
The pump cannot suction in liquid	1	Inadequate or no priming	Repeat priming and check if the pump and suction line are full of liquid.
	2	Blocked suction line	Remove the blockage.
	3	Blocked impeller	Counter flush the pump to clean the impeller. If it still is blocked, dismantle the pump and clean the impeller.
	4	Wrong rotation direction of impeller	Change the rotation direction, which should conform to the arrow on the pump casing.
	5	Too much suction lift	If there is no obstacle at the suction, check the friction loss of the line. It may be because of too much static lift, which may be measured with mercury column or vacuum meter during pump operation. In case of too much lift, increase the lift or reduce the installation height of the pump.
	6	Too low rotation speed	Check if the electric motor starts directly and runs at full voltage. Or it may be because of too low frequency; the electric motor may be in open phase status.
	7	Too much discharge head	Check the friction loss. Large pipeline system may have better conditions. Check if the suction valve is fully open.
Inadequate flow of pump	8	Air leakage at suction line	Block the suction line and let the pipeline run under pressure to test if the flange has leakage. If the pressure gauge indicates a pressure drop, it means there is air leakage.
	9	Air leakage at washer or O ring	Replace washer or O ring
	10	Air leakage at shaft seal	Replace or re-adjust the shaft seal
	11	Too low rotation speed	Same as item 6
	12	Too much discharge head	Same as item 7
	13	Partial blockage of impeller	Same as item 3
	14	Cavitation occurs, inadequate cavitation allowance (determined by installation)	Reduce the installation height of pump
	15	Wrong rotation direction of impeller	The symptom is the motor is overloaded or the pump runs at around 1/3 rated output. Check the rotation direction against the arrow on the electric motor.
	16	Too high suction height	Same as item 5
	17	Worn or damaged impeller	Check the impeller and replace it if necessary.
Inadequate discharge pressure of pump	18	Too small impeller size (it is highly possible if the above causes are eliminated)	Consult the manufacturer if a bigger impeller can be used; otherwise reduce friction loss at the pipeline or increase the speed or perform both. But be careful that the electric motor should not overload.
	19	Air leakage at suction line	Same as item 8
	20	Air leakage at washer or O ring	Same as item 9
	21	Air leakage at shaft seal	Same as item 10
	22	Too low rotation speed	Same as item 6
	23	Partial blockage of impeller	Same as item 3
	24	Cavitation occurs, inadequate cavitation allowance (determined by installation)	Same as item 14
	25	Air or gas entrained in liquid	If possible, find a place with sufficient pressure by increasing the pump speed neglecting all other conditions. It is preferred to install a gas separator at the suction line near the pump end and consume all the gas accumulated at regular level. Reduce the installation height of pump.
	26	Wrong rotation direction of impeller	Same as item 15
	27	Too much suction lift	Same as item 5
Pump stops running after certain period	28	Worn or damaged impeller	Same as item 17
	29	Too small impeller size (it is highly possible if the above causes are eliminated)	Same as item 18
	30	Inadequate or no priming	Same as item 1
	31	Too much suction lift	Same as item 5
	32	Air leakage at suction line	Same as item 8
Too much noise and vibration	33	Air or gas entrained in liquid	Same as item 25
	34	Partial blockage of impeller	Same as item 3
	35	Damaged or bent impeller or shaft	Replace impeller or shaft if necessary
	36	Infirm foundation	Secure the bolts of pump and electric motor and then secure the anchor bolts.
	37	Improperly located or supported suction and discharge lines	Locate the suction and discharge lines properly.
Excessive leakage at sealing cavity	38	Cavitation of pump	Same as item 14
	39	Worn mechanical seal	Replace worn part or the seal directly
Electric motor overloaded	40	Scraped shaft bushing	Machine or replace the shaft bushing if necessary
	41	Excessive operating flow	Adjust the discharge valve and adjust the flow to allowed value
	42	The medium delivered has larger viscosity and specific weight than expected	Replace a electric motor with higher output. Consult the manufacturer for recommended type. Test actual viscosity and specific weight.
	43	Cavitation of pump	Same as item 14
	44	Excessive tension of suction/discharge line result in deformation of pump casing.	Check the alignment. Check the friction between pump impeller and pump casing. Replace worn part and component.
	45	Friction between rotating parts.	Check if the gap between worn parts is normal.
	46	Too high rotation speed	Check the voltage of electric motor.

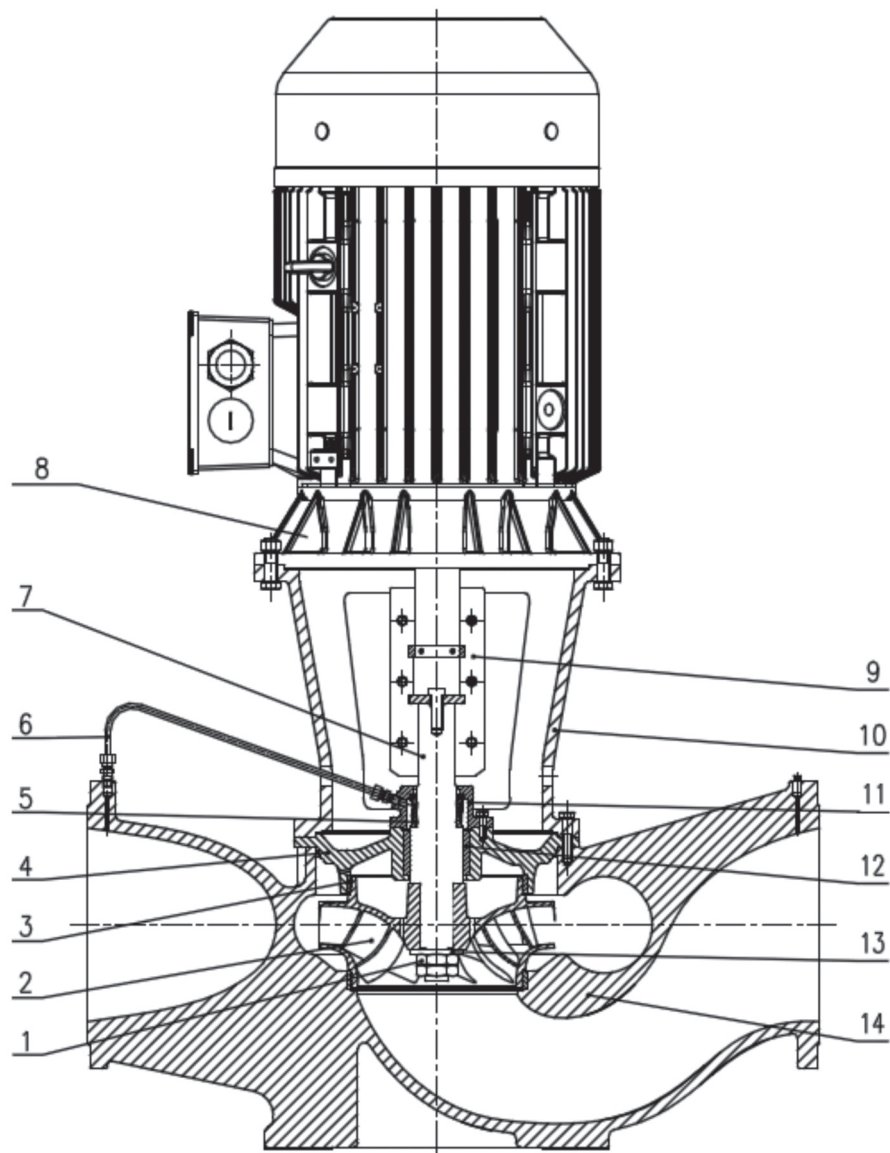
9 Assembly diagram

9.1 Vertical single pipeline pump (without coupling)



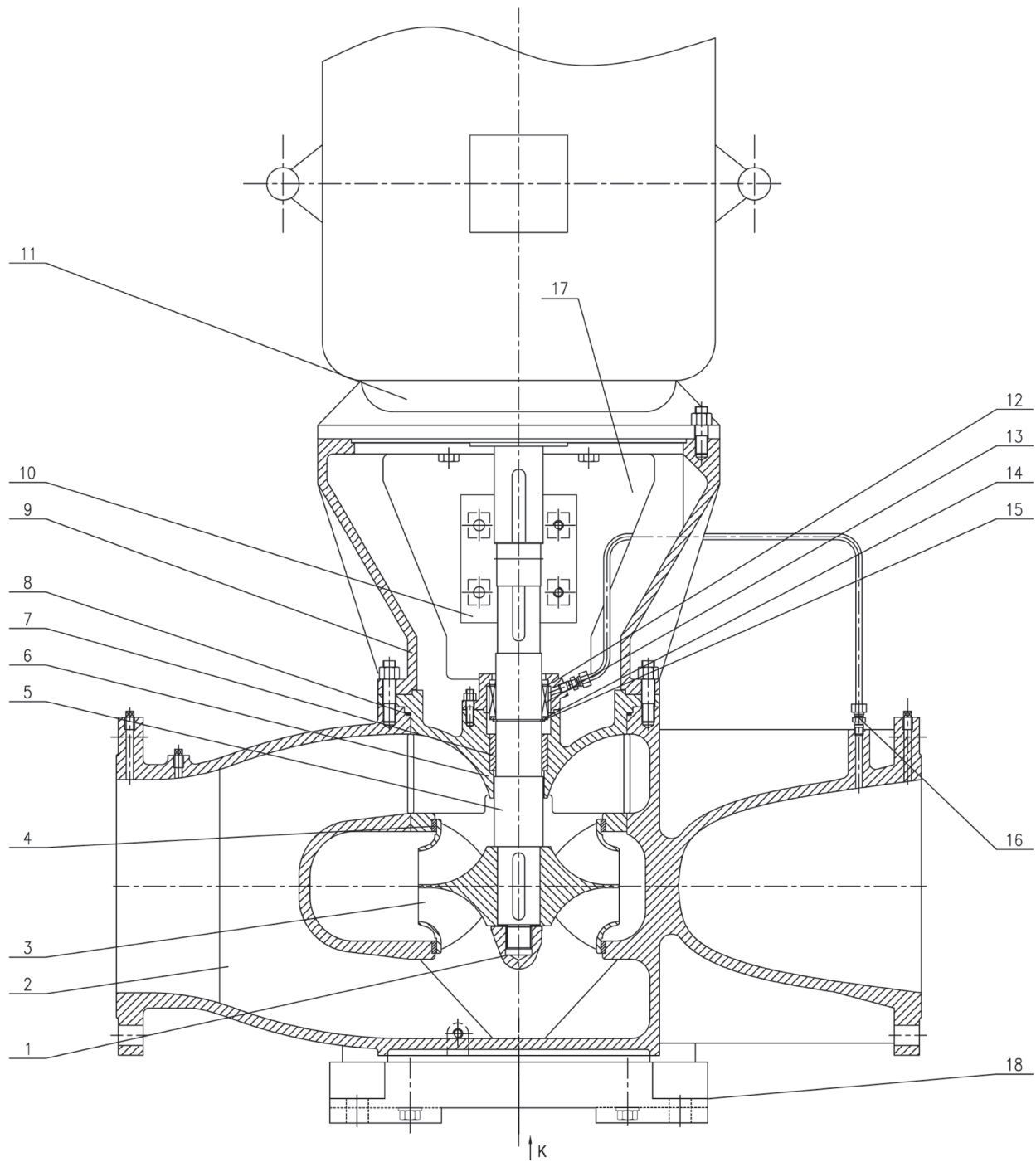
No.	Description	No.	Description
1	Pump body	13	Washer---motor end of electric motor bracket
2	Impeller	14	Electric motor-V1
3	O-ring	15	Shaft
4	Pump cover	16	Protective casing
5	Impeller nut	17	Shaft key
6	Impeller spacer	18	Bolt---pump cover end of electric motor bracket
7	Nameplate	19	Washer---motor pump cover end of electric motor bracket
8	Electric motor bracket	20	Vent assembly
9	Locating screw---at shaft	21	Mechanical seal
10	Locating screw---at shaft	22	Wear ring
11	Bolt --- motor end of electric motor bracket	23	Plug
12	Nut---motor end of electric motor bracket	24	Screw---at protective casing (not shown)

9.2 Vertical single pipeline pump (with coupling)



No.	Description	No.	Description
1	Impeller nut	8	Motor
2	Impeller	9	Coupling parts
3	Wear ring	10	Electric motor bracket
4	Pump cover	11	Sealing gland
5	Mechanical seal	12	Sliding bearing
6	Flushing pipe unit	13	Gasket
7	Shaft	14	Pump body

9.3 Vertical double pipeline pump (with Mechanical seal)



No.	Description	No.	Description	No.	Description
1	Impeller nut	7	Sliding bearing	13	Mechanical seal
2	Pump body	8	O-ring	14	Mechanical seal retainer
3	Impeller	9	Electric motor bracket	15	Shaft Sealing Ring
4	Wear ring	10	Coupling parts	16	Flushing pipe unit
5	Shaft	11	Motor	17	Shield
6	Pump cover	12	Sealing gland	18	Baseplate

11 Spare parts and pumps

11.1 Spare parts

Some spare parts have to be selected in order to keep 2 year continuous operation. If there are no other instructions, it is recommended to keep the following quantity of spare parts in stock:

Form 2 Recommended spare parts list

Spare parts	Pump quantity (including spare pump)						
	2	3	4	5	6/7	8/9	10/more
	Spare parts quantity (set)						
Impeller	1	1	1	2	2	3	30%
Shaft (with key, washer and nut)	1	1	1	2	2	3	30%
Front wear ring	1	1	1	2	2	3	30%
Rear wear ring	1	1	1	2	2	3	30%
Mechanical seal	2	3	4	5	6	7	100%
O-ring --- pump casing	2	3	4	5	6	7	100%
Connecting bolt--- rear cover plate and pump casing	2	3	4	5	6	8	20%
Connecting bolt--- electric motor connector and rear cover plate	2	3	4	5	6	8	20%
Shaft and its screws	-	-	-	-	-	-	2

*Note: One set means 100% for every pump

Ordering spare parts

To order spare parts, please provide the following information:

Pump type: _____

Number (serial number): _____

Description & quantity: _____ Number on the assembly drawing: _____

The above information can found in related datasheet or section drawing.

Note! The spare parts must be stored in clean and dry environment.

11.2 Spare pumps

Certain spare pumps are to be prepared for fear that the pump in use has trouble that may endanger the personal safety and cause property loss. Check the spare pumps at regular interval to make sure that they are ready to use.

Note! The spare pumps are to be stored as per 3.2 in the manual.

12 Equipment administrators list

Each equipment administrator must sign below to verify that he has received, read and understand this operation instruction manual. He promises to strictly follow this operation instruction manual. If this operation manual is not adhered to, the manufacturer will terminate the warranty and refuse to assume related responsibility.

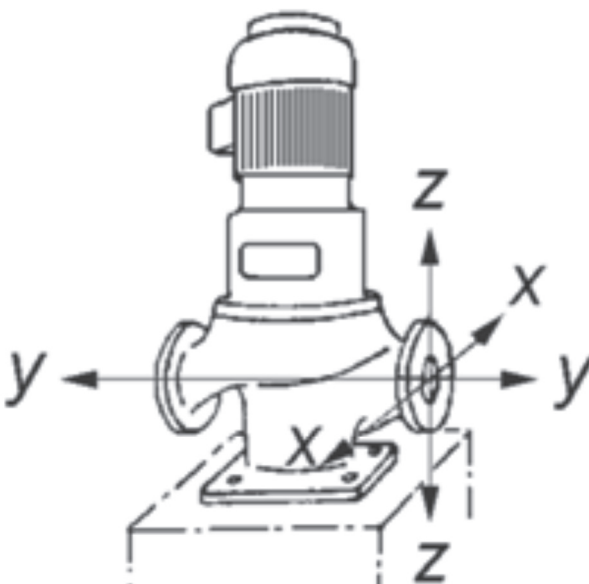
Name	Date	Signature

13 Log book

Each operator should record the maintenance and service activities performed in time and the supervisor is required to sign for verification.			
Maintenance and service activity	Date	Operator Signature	Supervisor Signature

13 Appendix

When the pump casing is made of grey cast iron, the allowed force and moment for suction/discharge flange of GLC pipeline pump are as listed in Form 3; when the pump casing is made of cast steel, the values are twice those listed Form 3.

Figure									
Flange Size	Force (N)				Moment (N · m)				
	F_y	F_z	F_x	ΣF_b	M_y	M_z	M_x	ΣM_b	
DN40	450	350	410	730	200	300	400	550	
DN50	600	500	550	1000	250	350	450	600	
DN65	800	650	700	1250	300	350	500	700	
DN80	950	750	850	1500	350	400	550	750	
DN100	1250	1000	1150	1950	400	500	650	850	
DN125	1500	1200	1350	2350	500	700	800	1200	
DN150	1900	1500	1700	2950	650	800	1000	1400	
DN200	2500	2000	2250	3950	900	1100	1400	1950	
DN250	3100	2500	2800	4900	1350	1600	2000	2850	
DN300	3750	3000	3350	5850	1900	2250	2800	4050	
DN350	4350	3500	3900	6850	2500	2950	3650	5300	

Allowable force and torque (maximum)

Xylem ['zil m]

1) The tissue in plants that brings water upward from the roots;

2) a leading global water technology company.

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