High Pressure Horizontal or Vertical Shaft Multistage Stainless-Stell Pumps or Booster Sets

Hexa, HexaLite, MultiHexa, MultiHexa GenIO, MiniHexa Series

Operating Manuel 2024

MDKBK032024

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TÜV AUSTRIA CE

EuP COMPLIANT

EC DECLARATION OF CONFORMITY

AT UYGUNLUK BEYANI

Manufacturer / *İmalatçı* **: MAS DAF MAKİNA SANAYİ A.Ş.**

Address / *Adres* : Orta Mah. Atayolu Cad. No: 16 Tuzla - İSTANBUL / TÜRKİYE
Organize Sanayi Bölgesi, Beyköy Beldesi, İstiklal OSB 1 Mah. 5. Cad. Dış Kapı No:7 Merkez/ DÜZCE

Name and address of the person authorised to compile the technical file
Teknik Dosyayı Derleyen Yetkili Kişi ve Adresi
Vahdettin YIRTMAÇ
Orta Mah. Atayolu Cad. No: 16
Tuzla - İSTANBUL / TÜRKİYE

The undersigned Company certifies under its sole responsibility that the item of equipment specified below satisfies the requirements of the mainly Machinery Directive 2006/42/EC which is apply to it.
The item of equipment identified below has been subject to internal manufacturing checks with monitoring of the final assessment by **MAS DAF MAKİNA SANAYİ A.Ş.**
Aşağıda tanımlanmış olan ürünler için Makine Emniyeti yönetmeliği 2006 / 42 / AT' nin uygulanabilen gerekliliklerinin yerine getirildiğini ve sorumluluğun alınmış olunduğunu beyan ederiz.
Aşağıda tanımlanan ürünler iç üretim kontrollerine bağlı olarak **MAS DAF MAKİNA SANAYİ A.Ş.** *tarafından kontrol edilmiştir.*

Equipment / *Ürün* : High Pressure Horizontal or Vertical Shaft Multistage Stainless-Steel Pumps or Booster Sets
Yüksel Basınçlı Yatay veya Dikey Kademeli Paslanmaz Çelik Pompa veya Hidrofor Setleri
Seri / *Model-Tip* : Hexa, HexaLite, MultiHexa, MultiHexa GenIO, MiniHexa Series
Hexa, HexaLite, MultiHexa, MultiHexa Genio, MiniHexa Serileri

For pumps supplied with drivers / *Elektrikli Pompa Üniteleri*
Related Directives / *Yönetmelikler*
2006/42/EC Machinery Directive **/ 2006/42/AT** *Makine Emniyeti Yönetmeliği*
2014/35/EU Low Voltage Directive **/ 2014/35/AB** *Alçak Gerilim Yönetmeliği*
2014/30/EU Electromagnetic Compatibility Directive **/ 2014/30/AB** *Elektromanyetik Uyumluluk Yönetmeliği*
EUP 2009/ 125 /EC Electric Used Products Directive/ *Elektrik Kullanan Ekipmanlar Direktifi (EUP)*
2009/125/EC European Ecodesign Directive, Regulation No: 547/2012 Ecodesign Requirements for Water Pumps / *Avrupa Ekotasarım Direktifi, (SGM-2015/44) 547/2012 No'lu Su Pompalarında Ekotasarım Regülasyonu*

Regulations applied acc. to harmonize standards / *Uygulanan Uyumlaştırılmış Standartlar*
TS EN ISO 12100:2010, TS EN 809+A1, TS EN 60204-1:2018.

We hereby declare that this equipment is intended to be incorporated into, or assembled with other machinery to constitute relevant machinery to comply with essential health and safety requirements of Directive The machinery covered by this declaration must not be put into service until the relevant machinery into which it is to be incorporated has been declared in conformity with provisions of the directive.
Ekipman, uygun bir makina oluşturmak amacıyla diğer ekipmanlar ile birleştirilirken ya da monte edilirken gerekli sağlık ve güvenlik yönetmeliklerine uyulması gerekmektedir.
Bu bildiri kapsamında yönetmelikte belirtilen bütün hükümler yerine getirilmeden makinanın devreye alınmaması gerekmektedir.

Place and date of issue / Yer ve Tarih **:** İstanbul, 01.08.2019
Name and position of authorized person **:** Vahdettin YIRTMAÇ
Yetkili Kişinin Adı ve Görevi General Manager / Genel Müdür
Signature of authorized person **:**
Yetkili Kişinin İmzası

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INTRODUCTION


- This manual contains instructions for the installation, operation and maintenance of DAF, DAFLite, MultiDAF, SuperDAF, MiniDAF, DSP type booster pumps or booster sets of **MAS DAF MAKINA SANAYI A.Ş**.
- Please read carefully this manual and apply all the instructions to operate pumps without problems. Pumps shall be used for their intended duties. In this manual, there are information on operating conditions, installation, starting-up, settings and main controls of pumps.
- These operating and maintenance instructions contain **MAS DAF MAKINA SANAYI A.Ş**.`s suggestions. The special operating and maintenance information of the plumbing that a pump is fitted to is not considered in these instructions. This information must be given by the plumbing constructors only.
- **Please refer to instructions of plumbing constructors.**
- Please pay attention to the warnings in this manual and ensure that it is read before the installation-start up process. **MAS DAF MAKINA SANAYI A.Ş.** is not responsible for the accidents resulting from negligence.
- If you cannot find an answer to your questions in this manual, it is suggested that you contact **MAS DAF MAKINA SANAYI A.Ş.** Please inform us about the rated value and especially the serial number of the pumps or booster sets when you get in contact for help.
- The safety instructions in this manual cover the current national accident protection regulations. Beside all of these, an operation, work and safety measure imposed by the costumer has to be applied.

The Signs Used in This Operation Manual

 	Read the instructions carefully in this operating manual and keep it for your future reference.
	Warning sign against the electrical risks.
	Sign for the operator's safety.

1. IMPORTANT SAFETY PRECAUTIONS

In order to minimize the accidents during the mounting and putting into service of the booster, the following rules have to be applied:

1. Do not work without taking safety measures relevant to equipment. Cable, mask and safety band must be used when necessary.
2. Be sure there is adequate amount of oxygen and there is no toxic gaseous around.
3. Before using welding or any electrical equipment make sure that there is no risk of explosion.
4. Check the cleanliness of the area to take care of your help. (Dust, smoke, etc.)
5. Do keep in mind that there is a risk of having accidents related to electricity.
6. Do not lift the booster before you check the transport equipment.
7. Be sure you have a by-pass line.
8. Use helmet, eyeglasses and protective shoes for your safety.
9. Place a protective barrier around the booster within the necessary safety area.
10. Dust, liquids and gaseous that may cause overheating, short circuit, corrosion and fire must be kept away from the booster unit.
11. By checking the noise level of the booster pumps or unit, necessary measures to avoid noisy operation of the booster that can have harmful effects on the personnel and environment.
12. Be careful about the direction of transport and storage.
13. Cover appropriately the moving parts to avoid possible injury of the personnel. Mount the coupling guard and belting before starting-up the booster.
14. All the electrical and electronic applications must be performed by authorized person conforming EN60204-1 and /or domestic instructions.
15. Protect the electrical equipment and motor against overloading.
16. Do not expose the booster unit to sudden temperature variations.

All Other Health and Safety Rules, Laws and Regulations Must Be Applied

2. GENERAL

At high-rise and common buildings, industrial plants, hotels, in areas where is not sufficient city network water or pressure, pressure increasing equipment are used which are called booster set or pump, to transfer clean water insufficient pressure and quantities instead of the place of use.

2.1. Application Fields of Booster Sets and Booster Pumps

- Apartments, and villas
- Hotels, social facilities and resorts
- Factories
- Water treatment and industrial plants
- Greenhouses and farms
- Hospitals, schools and business centers
- Gardens and parks
- Warehouses, refineries and shipyards
- Boiler feed and condensate systems
- Firefighting systems

Thin, non-explosive, non-corossive liquids, containing no solid particles or fibres.

When pumping liquids with a density and/or viscosity higher than that of water, motors with correspondingly higher outputs must be used, if required..

COUTION

The chemical and physical properties of the fluid must be considered for right choice of the pump type and other elements of booster.

Product Information as per Regulation No. 547/2012 (for Water Pumps with a Maximum Shaft Power of 150 kW) Implementing "Ecodesign" Directive 2009/125/EC.

Minimum Efficiency Index for Hexa Pump Series is shown on the pump label.

MEI values of Hexa Pump Series are shown on the pump characteristic curves.

Minimum Efficiency Index for Hexa Pump Series; Minimum 0.4. (MEI≥0,4)

'Vertical multistage water pump' (MS-V) means a glanded multistage (i>1) rotodynamic water pump in which the impellers are assembled on a vertical rotating shaft, which is designed for pressures up to 25 bar, with a nominal speed of 2900 rpm and a maximum flow of 100 m3/h.

Efficiency values of the pump characteristic curves, which are cut diameter, are expressed in %.

Hexa Series water pumps, the pump efficiency can be achieved more than fix speed in case of variable speed control.

More information about the Ecodesign can be reached at www.europump.org.

2.2. Performance Information

The performance curves given in the catalog are valid for water whose density and viscosity are p=1 kg/dm3 and v=1 cst. respectively. For those liquids whose densities and viscosities are different from those of water, please consult with MAS DAF MAKINA SANAYI A.Ş. since the performance curves vary with density and viscosity.

COUTION

Do not operate the pump or booster set with a motor that has a different power except for the given catalog and label values.

The booster is not to be operated at off-design point given in the order and supplied from the firm.

It is necessary to ensure that the instructions are obeyed for the safe running of the pump or booster set.

2.3. Warranty Conditions

The entire products in our selling program are warranted by MAS DAF MAKINA SANAYİ A.Ş.

The warranty conditions will only be valid when all the instructions about installation and start-up operations of the booster unit or the pumps are taken into account.

For free repair of the booster unit or pumps, following conditions must be fulfilled during the warranty period.

- Validate the warranty document to the vendor on the date you received the pump unit.
- Comply with the requirements stated in the manual in the installation and operation of the device.
- Please call our authorized service without intervene in case of failure.

Failure and problems, because of the following conditions, are not covered by the warranty.

- Failure to comply with the terms of the operating manual.
- Maintenance and repairs made by unauthorized services.
- Incorrect booster unit or pump selection, faulty installation and misuse.
- Disadvantages of transport, storage and atmospheric conditions.
- Removing, replacing or deleting the label of the pump or the motor.
- Using any strainer, the presence of solid particles (sand, gravel, plastic, etc.) in water.
- Failures and damage because of External physical (Shock, scratch, break) and chemical factors.
- Failures because of not using grounding plug.
- Failures resulting from Low voltage, overload,power supply or sudden changes in faulty electrical installation.

2.4. Test

Pump performance values are valid under our factory test conditions.

3. SAFE OPERATING CONDITIONS

This manual contains main safety instructions for the installation, operation and maintenance. It must be read by the personnel who are responsible for installation and operation. This manual should always be kept near the installation location. It is important to comply with safety precautions stated in page 1 along with the general safety instructions as well as preventive measures repeated in other sections of this manual.

3.1. Training of Personnel

Installation, operation and maintenance personnel must have necessary knowledge in order to accomplish the given job. The responsibility, adequacies and controlling duties of such personnel must be determined by the costumer. It has to be certain that these personnel comprehend totally the content of the operating manual.

If the personnel do not have enough knowledge, required training must be given by the costumer. If training support is needed by the costumer, it will be provided by the manufacturer/seller.

CAUTION

Untrained personnel and unwillingness to comply with safety instructions may be risky for both machine and environment. MAS DAF MAKINA SANAYI A.Ş. is not responsible for this kind of damages.

3.2. Hazardous Conditions That May Occur When One does not Comply with the Safety Instructions

Incompliance with safety regulations may put the personnel, the environment and the machine in danger and thus may cause damages. Incompliance with safety regulations may give rise to situations listed below.

Important operational functions of the factory may stop. Maintenance may get difficult. One may get injured by electrical, mechanical or chemical hazards.

3.3. Safety Measures for Operator

Dangerous, hot or cold components in the pump area must be covered so that one cannot touch them.

Moving components of the pump (such as coupling) must be covered so that one cannot touch them. Those covers must not be dismounted while the pump is running.

Dangers that result from electrical connections must be removed. To get more information about this subject, you can refer to domestic electrical instructions.

3.4. Safety Measures for Maintenance and Installation

The costumer must assure that all maintenance, check and installment tasks are performed by qualified personnel. Repair work must only be performed while the machine is not running.

The pump and its auxiliary system must be cleaned thoroughly if it contains hazardous liquids. At the end of the repair work, all safety and protective equipment must be re-installed.

3.5. Spare Parts Replacement

Replacement of spare parts and all modifications must be done after contacting with the manufacturer. Spare parts and accessories certified by the manufacturer are important for the safe operation of the system.

Notice: MAS DAF MAKINA SANAYI A.Ş. is not responsible from the usage of improper spare parts.

4. TECHNICAL INFORMATION

4.1. Selection Criteria of Pumps or Booster Sets

While determining booster set or pump, the selection must be made where the operation range is at the highest point of the pump efficiency curve.

4.2. Usage of Pumps or Booster Sets

- Pumps should never run dry.
- The air in the pump and the system must be taken out.
- The level floater on delivery should be installed in accordance with the store.
- Pressure of the tank with membrane should be checked periodically.
- Freezing of the water in the pumps should be avoided.

4.3. Correct Installation

- Pumps or booster sets should be placed in enclosed spaces to not expose to external influences like rain, frost etc.
- Pumps suction should not be performed from a lower level to their level (must be positive priming). Pump should be installed as close as possible to the water resource.
- Base of booster or pump must be secured properly to the floor against noise and vibration.
- Suction and discharge connections should be the same as the booster collector sizes or suction and discharge flanges of pump. Suction line should be selected appropriate size according to the pump. The suction pipe diameter should not be reduced.
- Always use a strainer at the booster set or pump suction line. The strainer should not be smaller than the diameter of the suction pipe and should be cleaned periodically.
- Installation Connection of should be rigid and installation load never transported to the booster set or pump.
- Do not use taking any information from our company in case suction needs to be done.
- Electrical connection must be performed by a qualified electrician.
- Do not run the pumps or booster set without water.
- When the water tank level is low, the pump will automatically stop due to float supplied with booster. In this way it is provided a self-protection against dry running.

4.4. Control Panel and Electrical Connection

The settings can be changed against for the protection of the faults that may occur on the system.

Before using, panel operating maintenance manual, that come with the booster, MUST BE READ CAREFULLY; control panel specifications should be learned from this manual and service that performed startup procedure.

Faults can be caused by inappropriate use, incorrect connection, any kind of modification and unauthorized intervention are not covered by warranty.

4.5. Pressure Switches

Pressure switches remain running in a certain pressure range of the booster pump.

The pump is activated at lower pressure value that the switch was adjusted and deactivated at upper pressure value that was adjusted.

CAUTION

Pressure switch used in boosters is set default. Do not definitely interfere to the settings. The switch is broken for any reason, as explained below, should be done by MAS DAF MAKINA SAN. TİC. A.Ş. authorized service.

CAUTION

Pressure settings for different types of boosters are different. While adjusting pressure of the booster upper and lower pressures should be selected on the Pump Characteristic Curve. Do not definitely drop below allowable lower pressure value at pump characteristic curve.

1. Pressure Range Adjustment Screw
Lower pressure is set from this screw. Pressure rises when turned in the direction of clockwise.

2. Differential Pressure Adjustment Screw
Pressure differential is set from this screw. When turned towards clockwise, the upper pressure rises.

4.6. Start-up Procedure

- Check the terms and conditions described in the user manual. When you recognized a situation that does not comply with the mounting scheme and described conditions, please ensure the correct conditions. Failures to comply with any faults that may occur from the conditions described in the user manual are out of warranty.
- Check that the water in the tank, the conformity of the electrical connections, making connections of float and arriving the three-phase to electrical panel.
- Open all vanes at suction line of booster or pump.
- Check the tank connections. If there is a vane at this line, open it.
- Take the air by loosening purge on the pump. Tighten again after continuous water arrived from the purge.
- Pay attention motor rotation direction and arrow on the pump at the same direction by turning on and off the switch on the start button. If the direction of rotation is reverse, ensure the correct direction of rotation of the electric motor by changing the places of any two of the phase input.
- Run the pump by activating switch. Check that increases the pressure on the pressure gauge by closing the valve on the discharge line. The pump should run to the upper pressure.
- Check that the pump run at lower pressure and stop at upper pressure by opening and closing the valve on the discharge line.

5. TRANSPORT AND STORAGE

Suction, discharge and all auxiliary fittings must be closed during transport and storage. Dead-end covers must be removed while the pump unit is being installed.

5.1. Transport

Pump and pump group must be carried safely to the installation location by lifting equipments.

COUTION

Current general lifting safety instructions must be applied. Please use a suspension system shown in figure while you are carrying and lifting the pump unit. The suspension rings may be broken because of the excessive load and may result in a damage of the pump. Prefer fabric cable for suspension.

Incorrect lifting may damage the pump unit and cause injuries.

Damages caused in transport

Check the pump when it is delivered to you. Please let us know of there is any damage.

5.2. Storage

Please keep the unit clean and dry area during storage.

If the pump is out of use for a long time, please consider the instructions below.

1. If there is water inside the pump, drain it.
2. Clean the pump casing and impeller by jetting clean water for a short time.
3. Empty water inside the pump casing, suction line and discharge line.
4. Add small amount of antifreeze inside the pump casing if it is not possible to empty it completely. Rotate the pump shaft by hand to mix the antifreeze.
5. Close the suction and discharge exits with gasket
6. Spray an anti-corrosive into the pump casing

6. ASSEMBLY / INSTALLATION

6.1. Installation

Install the pipes in such a way that air locks are avoided, especially on the suction side of pump. Correct Pipework shown in Figure 1.

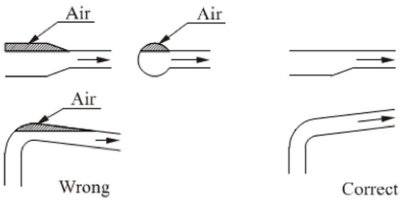


Figure 1: Section Conditions

Care should be taken while fitting the pipes so that any tension caused by variations in temperature does not affect the pump.

If the pump is installed with long pipes, these should be adequately supported before and after the pump.

If there is any risk of the pump being choked by sediments leaves, twigs, etc. measures should be taken to prevent this, a strainer should be fitted at the suction side of the pump.

In the case of installations in which the discharge pipe has been installed horizontally, or it slopes downwards away from the pump, which can or must be drained in certain periods, the pump should be protected against dry-running. This can be done by fitting a loop with a vacuum valve close to the pump.

The highest point of the loop should at least be in level with the lower edge of the pump motor.

The discharge pipe can then be drained independently of the pump and vice versa.

The pump should not be run with a closed discharge value as this will cause an increase in temperature/formation of steam in the pump which may cause damage to the pump.

If there is any danger of the pump running with a closed discharge valve, a minimum liquid flow through the pump should be ensured by connecting a bypass/a drain to the discharge pipe. The drain can be connected to a tank.

6.2. Electrical Connection

- The electrical connections should be carried out by a qualified electrician.
- To make sure the motor is suitable for the power supply; cables of the motor must be connected to power supply according to the figure on the terminal box and the motor nameplate.
- Motor shall be connected with a fast and effective motor starter, to ensure that the motor will not be damaged by lack of phase, unstable voltage or overload. The motor shall earth reliably.

CAUTION

Before taking apart the terminal box cover or dismantle pump, make sure that the power supply is switched off.

Warning – Electrical connection and safety devices

- The pump units should be connected to the power supply by the appropriately rated power cables according to the motor ratings.
- The pump units should always be equipped with safety devices as required in the standards (EN 809 and/or EN60204-1) as well as by the national rules of the country where the pump is used.
- Despite the rules of any country, the power supply to the pump unit must be equipped with at least following electrical safety devices with appropriate ratings:
- Emergency switch
- Circuit breaker (as a supply disconnecting (isolating) device as well as an over current protective device)
- Motor overload protection

Do not start the pump until it has been filled with liquid.

7. COMMISSIONING, START UP AND OPERATING

COUTION

It is prohibited to run without liquid, which will damage mechanical seal and sliding bearing.

COUTION

Do not start the pump dry (WITHOUT WATER).

- Fill water in pump in inverse pouring system.
- Close the pump outlet valve, release air vent screw on the pump head and open the inlet valve slowly until stable water flows from the air vent screw. Then fasten the screw.
- Fill water in pump when liquid level is lower than pump. Before installing, pump and pipes must be filled with liquid fully and air vented.

7.1. Checking the Rotary Direction

Switch on the power supply and view the rotary direction by viewing the motor fan. From the motor end, pump shall run counterclockwise.

7.2. Checking Before Pump Start-up

- Check whether the pump is fixed securely.
- Check whether pump is filled with water fully and check whether liquid can flow freely.
- Check whether the voltage of power supply is stable.
- Check whether it turns correctly.
- To make sure all pipelines are connected tightly and can supply water normally.
- The valves in the inlet pipeline are completely opened.
- The outlet valve shall be opened slowly after the pump is started up.
- Check the operation pressure if pressure meter is installed.
- Check all the controls for normal operation. If the pump is controlled by pressure switch, check and adjust the starting pressure and stopping pressure. Check the full load current to make sure it does not surpass the max allowed current.

7.3. Frequency of Pump Starts

- Pump should not be started too frequently. It is suggested pump shall not be started more than 100 times per hour if the motor power is less or equal to 4 kW. When motor power is big than 4 kW, pump shall not be started more than 20 times in one hour.
- Suggestion: When pump running; flow should be controlled at the range of 0.5-1.3 times of rated flow.
- There should be no noise when pump running. If there is something wrong, stop pump and check it and repair.

7.4. Frost Protecting

Pump can be used in the system with anti-frozen measures. If the pump is installed in easily frozen environment, suitable antifreeze shall be added to the transferring liquid to prevent pump from being damaged. If antifreeze is not used, pump shall not be used during periods of frost. Pump should be drained when stops using.

The following should be checked regularly for pump:

- Pump working and operating pressure.
- Possible leakage
- Possible motor overheats.
- Cleaning/replacement of all strainers (If strainers fit)
- The switch off time of motor overload
- Frequency of starts and stops.
- All control operation
-

If find faults, check system according to "Possible Failures, Causes, and Solutions".

- Pump shall be cleaned and kept appropriately when it is not used for a long time.
- Pump shall be prevented from being corrupted and damaged in storage.

8. MAINTENANCE

COUTION

Maintenance operations must be done by authorized personnel with protective clothing only. The personnel must also beware of high temperatures and harmful and/or caustic liquids. Make sure that the personnel read carefully the manual.

- The instructions in Safety Precautions must be executed during maintenance and repair
- Continuous monitoring and maintenance will

increase the engine's and pump' s life.

The instructions below should be applied.

8.1. The Checks During the Operation

- Pump must never be operated without water.
- Pump must not be operated for a long time with the discharge valve closed (zero capacity).
- Bearing temperature must never exceed 80°C if the ambient temperature is 30°C.
- Precautions must be taken against flare up when the component temperatures are over 60°C. "Hot Surface" warnings must be placed over necessary areas.
- All the auxiliary systems must be in use while the pump is operating.
- There is no need for excessive maintenance because of using mechanical seal. Water leakage from the mechanical sealing indicates the fact that the sealing is worn out and therefore needs to be replaced.
- If the system consists of a substitute pump, keep it ready by operating it once a week. Check also the auxiliary systems of the substitute pump.

8.1.1. Component Check

8.1.1.1. Mechanical Seal

Mechanical seals are used in Hexa type pumps. Mechanical Seals are absolutely leak-proof and needs less maintenance than soft packing.

Mechanical Seal:

1. **Provides leak proof operation in heavy operating conditions (in waste water pumps, chemical process and refinery pumps).**
2. **Easily mountable and needs less maintenance.**
3. **Does not cause wearing on the shaft**
4. **Sealing operation does not depend on the quality of shaft finishing.**

8.1.1.2. Drive

Apply to the operating instructions of the motor manufacturer.

8.1.1.3. Auxiliary Components

Check regularly the fittings and the gaskets, replace the worn out pieces.

8.2. Service

Our Customer Service Department offers after-sale service. Manager should employ authorized and trained personnel for mounting / dismounting procedures. Before these procedures, one must make sure that pump interior is clean and empty.

This criterion is also valid for the pumps which are sent to our factory or to our service points.

Maintain the safety of the personnel and the environment in every field procedure.

8.3. Spare Parts

The spare parts of Hexa type pumps are guaranteed for 10 years by MAS DAF MAKINA SANAYI A.Ş.

In your spare parts requests, please indicate the below listed values that are indicated on your pump's label.

Pump type and size:

Motor power and speed:

Pump serial number:

Capacity and head:

9. DISASSEMBLY, REPAIR AND REASSEMBLY

Before starting work on the pump set, make sure it is disconnected from the mains and can not be switched on accidentally.

Fallow the safety precautions outlined in "Important Safety Precautions".

10. POSSIBLE FAILURES, CAUSES, SOLUTIONS

Possible failures and solution strategies are listed in the table below. Please apply to the Customers' Service Department of our company when a generic solution is not found to your problem.

While the failures are repaired the pump must always be dry and un-pressurized.

POSSIBLE FAILURE	CAUSES	SOLUTIONS	REMARKS
Motor does not run when started.	a) Power supply failure. b) Fuses are blown. c) Motor is overloaded. d) Main contacts of starter are not connected well or the coil is defective. e) Control circuit is defective. f) Motor is defective.	a) Check power supply. b) Replace fuses. c) Check system. d) Replace motor starter. e) Check control circuit. f) Repair.	
Overload device of motor starter trips out immediately when power supply is switched on.	a) Fuses are blown. b) Contacts of overload device are faulty. c) Cable connection is loose or faulty. d) Motor winding is defective. e) Pump mechanically blocked.	a) Replace fuses. b) Check motor starter. c) Check cables and power supply. d) Replace motor. e) Check and repair pump.	In the case of d) and e), users shall not disassemble the pump by themselves.
Overload device trips out occasionally.	a) The setting of overload is too low. b) Periodic power supply faults. c) Low voltage at peak times.	a) Reset overload setting. b) Check power supply. c) Add regulator.	
Motor starter has not tripped out but the pump does not run.	a) Contacts of starter are not contacted well or the coil is faulty. b) Control circuits are defective	a) Change motor starter. b) Check control circuit.	
Pumped water does not flow constantly.	a) Suction pipe is too small. b) There is not sufficient water in pump water inlet. c) Liquid level is low. d) Pump inlet pressure is too low compared with water temperature, pipeline loss and flow. e) Suction pipe is blocked by impurities.	a) Enlarge inlet pipeline. b) Improve system and increase coming water. c) Try to lift liquid level. d) Improve system and try to increase the inlet pressure. e) Check and clear impurities.	
Pump runs but gives no water.	a) Suction pipe is blocked by impurities. b) Foot valve or check valve is closed. c) Leakage in suction pipe. d) There is air in suction pipe or pump.	a) Check and clean suction pipe. b) Check and repair foot valve or check valve. c) Check and repair suction pipe. d) Refill liquid, release air.	
Pump runs backwards when switched off.	a) Leakage in suction pipe. b) Foot valve or check valve is defective. c) Foot valve is blocked in opened or partly opened position. d) There is air in suction pipe.	a) Check suction pipe. b) Check and repair foot valve or check valve. c) Check and repair foot valve. d) Check and repair suction pipe and release air.	
Abnormal vibration or noise from pump.	a) Leakage in suction pipe. b) Suction pipe is too small or suction pipe is partly blocked by impurities. c) There is air in suction pipe or pump. d) The comparison of the delivery head of device with delivery head of pump is very low. e) Pump mechanically blocked.	a) Check and repair suction pipe. b) Enlarge or check situation pipe. c) Refill liquid to the pump and vent air. d) Improve system or choose another pump model. e) Check and repair pump.	In the case of e), users shall not disassemble the pump by themselves.

Table 1: Possible Failures, Causes, Solutions

11. INFORMATION ABOUT FREQUENCY INVERTER

11.1. Installation of the Frequency Inverter on the Motor

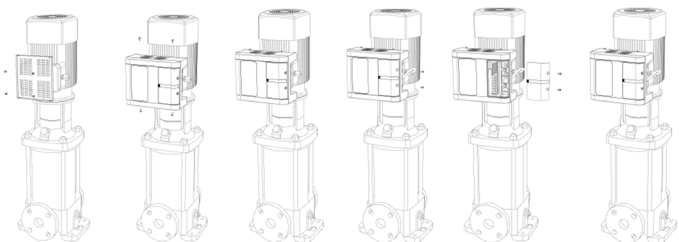


Figure 2: Installation of the Frequency Inverter on the Motor

First open the pump motor junction box, fix the connection terminal between the power line and the water pump, and then fix the bottom plate on the motor junction box, consider the frequency converter is centered, and the bottom plate should be adjusted reasonably.

Fix the machine on the bottom plate, remove the wiring surface shell on the right side of the machine, so that the pump output line, the input line of the frequency converter and the sensor line pass through the waterproof joint successively, and fix it according to the mark.

The main terminal of the machine is R/S/T is the input end of the power supply, U/V/W is the output end of the motor, pay attention to the wiring, to prevent the wrong connection resulting in the explosion of the machine.

11.2. Wiring Diagram

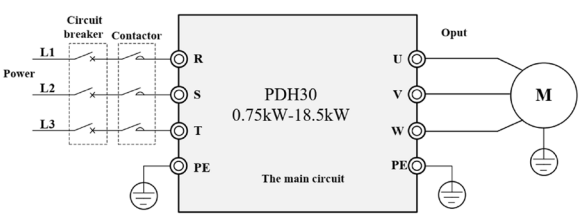


Figure 3: Wiring Diagram

Terminal mark	Name	Instructions
R, S, T	Three-phase power input terminal	Three - phase AC power input connection terminal
U, V, W	Inverter output terminal	Connection of three-phase motor
PE	Earthing terminal	Connect the earth terminal

Table 2: Wiring Diagram Description

11.3. Control Loop Terminals and Functions

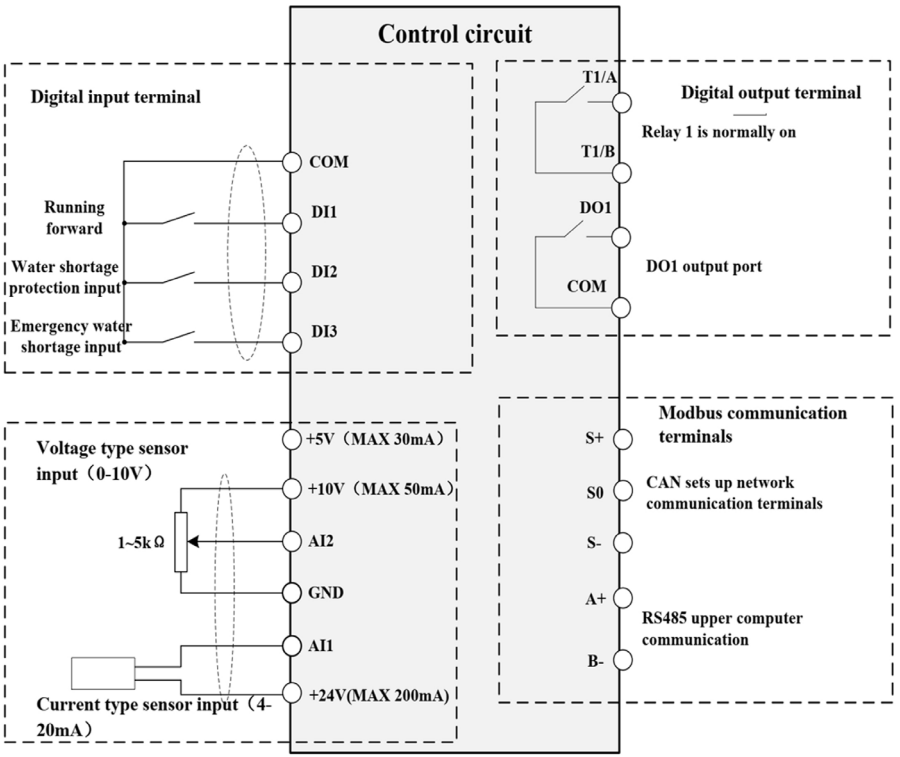


Figure 4: Control Loop

Control Terminal Instruction

Terminal symbol	Terminal name	Technical specification
DI1~DI3	Multi-function digital input terminal	1. Optical couplers isolation one-way input 2. Enabled when connected to GND. Disabled when open 3. Input voltage range: 9~36 VDC
AI1	Analog input terminal 1	1. Input voltage range: DC 0~10VDC or 0/4~20mA, determined by parameters. 2.Input impedance: 22KΩ when voltage input; 500Ω when current input
AI2	Analog input terminal 2	
5V	Analog reference voltage	5V, ±5% maximum output current 30mA
10V	Analog reference voltage	10V, ±5% maximum output current 50mA
GND	Analog ground terminal	5V and 10V reference zero potential
T1A/T1B	Relay RO1 output	T1A~T1B: normally open terminals Contact capacity:
24V	24V power for external devices	Provide +24V power to external devices. Maximum output current 100 mA. Commonly used as digital input working power and external sensor power
COM	24V power public terminal	Provide 24V power public terminal to external devices
A+	Standard RS485 communication terminal	Standard isolated485 communication interface. Please use twisted pair or shielded wire. Can be used for PC communication control.
B-		
S+	CAN communication terminal	Standard CAN communication interface. Please use twisted pair or shielded wire. Can be used for inverter on-line.
S-		
S0		

Table 3: Control Loop Description

11.4. Operation Panel Diagram

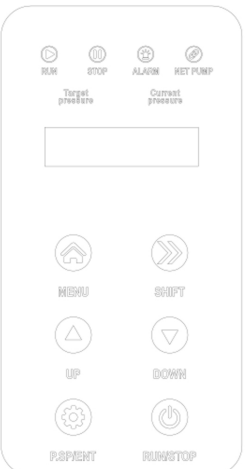


Figure 5: Operation Panel

(1) MENU: used to switch from fixed model to modification model.

(2) P.SP/ENT: shortcut key of water pressure setting and "confirmation" key of parameter setting.

(3) SHIFT: used to shift display and move cursors in parameter modification .In running status, pressing "shift" can switch back and forth among running frequency, output current, pressure setting and feedback pressure. Press "shift" to modify parameters. Flicker bit is the current bit which can be modified.

(4)▼▲ keys: used to modify parameter values.

(5) RUN: start button when using keyboard as starting mode.

(6) STOP: stop button and fault reset button when using keyboard as start mode.

Indicator Light Instruction

(1) Run: (Always on) Running instruction; (Flicker): Sleep or stop instruction

(2) Stop: Stop or standby instruction

(3) Alarm: Inverter protection alarm.

(4) Net Pump: Online instruction: When the light is on, the communication is successful.

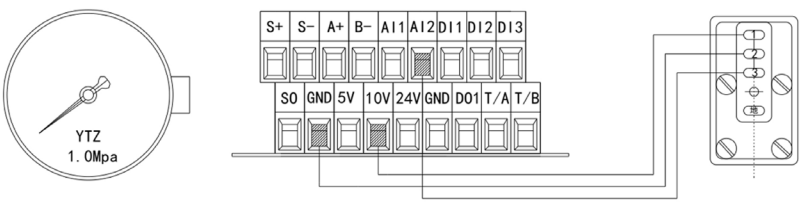
(5) Target pressure: When the display shows "target pressure" and "current pressure", it lights up when the pressure is adjusted;

(6) Current pressure: When the display is "target pressure" and "current pressure" light up;

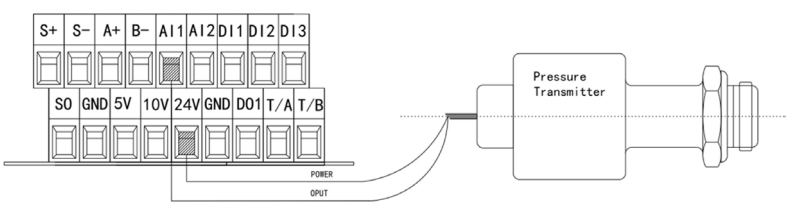
11.5. Sensor Connections

The VFD can be connected to remote pressure gauge and pressure transmitter. Please connect wire according to below diagrams.

11.5.1. Remote pressure gauge: Working voltage 4~13VDC, output 0~10VDC. Wiring method is shown as below, Signal input connection AI2;



11.5.2. 24V pressure transmitter: working voltage range 10~30VDC, output 4~20mA, Signal input connection AI1.



11.6. Quick Setting

Please follow the steps below to finish setting

Step 1: Set the sensor range, the sensor type

F0.08 = 16.0 Sensor's range

F0.09 = 2 Sensor feedback channel selection (0: AI1 channel 1: AI2 channel; 2: Max (AI1, AI2))

F2.00= 0 AI1 Sensor type (0:4-20mA; 1:0-10V; 2:0.5-4.5V)

Step2: Confirm the motor's rotation direction

Run the pump shortly, monitor if the direction is correct. Change the rotation direction by 2 ways below:

1- Disconnect the input power and make sure the display is OFF, then exchange two lines of any of U\V\W.

2- Stop the VFD, Modify to F0.02.

Step 3: Adjust the display pressure

There is two ways to adjust the display pressure and actual pressure:

1 - When the pressure is stable, adjust F2.01 or F2.03 within each range of 0.010.

2 - If the VFD pressure is a little higher, make the sensor range lower(F0.08); If the VFD pressure is a little lower, make the sensor range higher (F0.08).

Step 4: Macro Settings

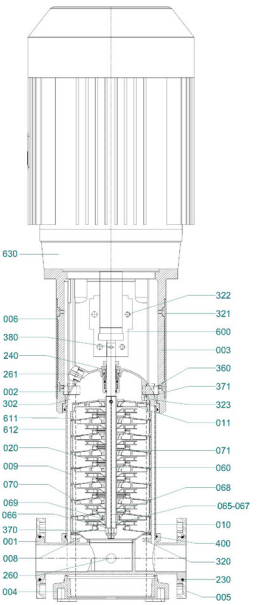
Please refer to the table below, to set the system quickly.

System Type	Parameter	Details of parameters changed automatically	Description
Solo Pump setting	F0.20=1	F0.06=1; F1.02=0; F1.03=0; F2.05=8; F8.00=1	Auto-Reset, Auto- Start enable,
Two VFDs, as Host drives	F0.20=2	F0.06=1; F1.02=1; F1.03=1; F2.05=8; F8.00=1	Auto-Reset, Auto- Start enable, an auxiliary drives can be controlled
Three VFDs, as Host drives	F0.20=3	F0.06=1; F1.02=1; F1.03 = 2; F2.07=8; F8.00=1	Auto-Reset, Auto- Start enable, two auxiliary drives can be controlled
Four VFDs , as Host drives	F0.20=4	F0.06=1; F1.02=1; F1.03=3; F2.05=8; F8.00=1	Auto-Reset, Auto- Start enable, three auxiliary drives can be controlled
Five VFDs , as Host drives	F0.20=5	F0.06=1; F1.02=1; F1.03=4; F2.07=5; F8.00=1	Auto-Reset, Auto- Start enable, four auxiliary drives can be controlled
Six VFDs, as Host drives	F0.20=6	F0.06=1; F1.02=1; F8.00=1 F1.03=5; F2.07=5	Auto-Reset, Auto- Start enable, five auxiliary drives can be controlled
One VFD drive two pumps mode	F0.20=7	F0.06=1; F1.02=0; F1.03=0; F2.05=8; F7.08=3; F7.09=4; F8.00=1;	Auto- Start; RO1 and RO2 through pressure output
One VFD drive multiple pumps mode	F0.20=8	F0.05=1; F2.00=1; F2.0 5 =2; F2.12=1;	Terminal start up, Free stop, Turn off water pressure alarm
Emergent Mode	F0.20=9	F2.05=1; F0.06=1; F8.00=1	Frequency source changed
VFD network, Auxiliary No.1	F0.20=11	F0.05=2; F0.06=1; F1.00=1; F1.04=0; F2.05=9; F8.00=2	Auto- Start enable, The VFD communication address set to 1, Start up the standby host
VFD network, Auxiliary No.2	F0.20=12	F0.05=2; F0.06=1; F1.00=2; F1.04=0; F2.05=9; F8.00=3	Auto- Start enable, The VFD communication address set to 2, Start up the standby host
VFD network, Auxiliary No.3	F0.20=13	F0.05=2; F0.06=1; F1.00=3; F1.04=0; F2.05=9; F8.00=4	Auto- Start enable, The VFD communication address set to 3, Start up the standby host
VFD network, Auxiliary No.4	F0.20=14	F0.05=2; F0.06=1; F1.00=4; F1.04=0; F2.05=9; F8.00=5	Auto- Start enable, The VFD communication address set to 4, Start up the standby host
VFD network, Auxiliary No.5	F0.20=15	F0.05=2; F0.06=1; F1.00=5; F1.04=0; F2.05=9; F8.00=6	Auto- Start enable, The VFD communication address set to 5, Start up the standby host

Table 4: Quick Setting Table

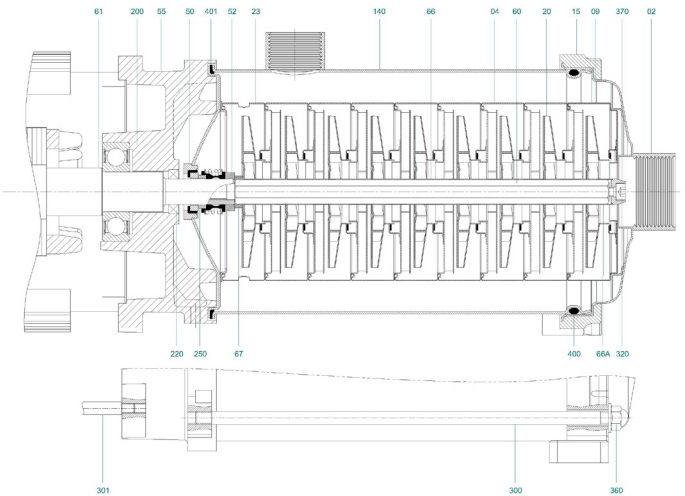
12. SECTIONAL DRAWINGS AND PART LISTS

12.1. Hexa Sectional Drawing and Part List



PART NO	PART NAME	PART NO	PART NAME	PART NO	PART NAME
1	Discharge Casing	67	Impeller Spacer Busher	322	Coupling Bolt
2	Ball-Shaped Lining	68	Completing Bushing	323	Ball-Shaped Lining Busher
3	Adapter	69	Spacer Bearing Bushing	360	Stud Nut
4	Base Plate	70	Flange Segment	370	Upper Fibered Nut
5	Casing Flange	71	Impeller Spacer Bushing	371	Shim
6	Coupling Guard	230	Flange Segment	380	Coupling pin
8	Inlet Fluid Director	240	Mechanical Seal	400	O-Ring
9	Fluid Director with Bearings	260	Setting Valve	600	Coupling
10	Fluid Director	261	Air Valve	611	Connect Band
11	Outlet Fluid Director	302	Stud	612	Outside Cylinder (Shield)
20	Impeller	320	Bolt		
60	Shaft	321	Protection Bolt		

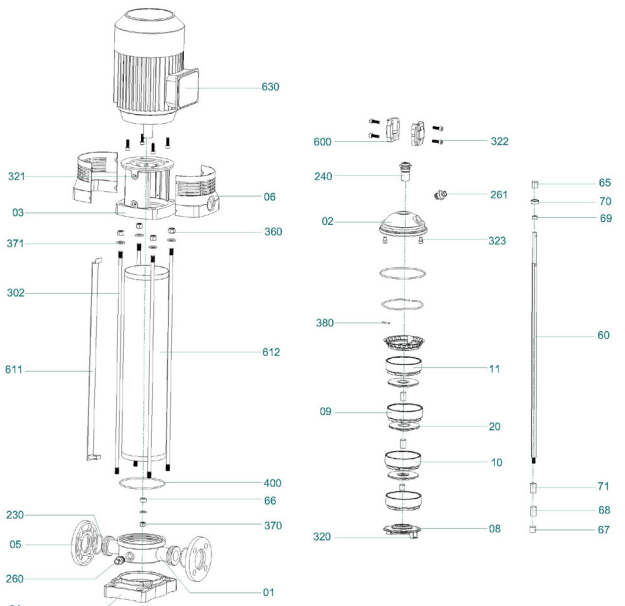
12.2. HexaLite Sectional Drawing and Part List



PART NO	PART NAME	PART NO	PART NAME	PART NO	PART NAME
2	Front Case Cover (Suction)	60	Pump Shaft	250	Mechanical Seal
4	Diffuser Stage	61	Motor Shaft	300	Stud
9	Inlet Stage	66	Spacer Bushing (Impeller)	301	Stud (Motor)
15	Thrust Plate	66A	Integration Bush (Length)	320	Imbus Bolt
20	Impeller	67	Fastening Washer (Shaft)	360	Nut
23	Outlet Stage	140	Shield	370	Washer (Impeller)
50	Sealing Bearing	200	Deep Groove Ball Bearing	400	O-Ring
52	Mec. Seal Press Bush	220	Oil Seal	401	Rubber Gasket
55	Engine Cover				

13. EXPLODED VIEWS AND PART LISTS

13.1.Hexa Exploded View and Part List



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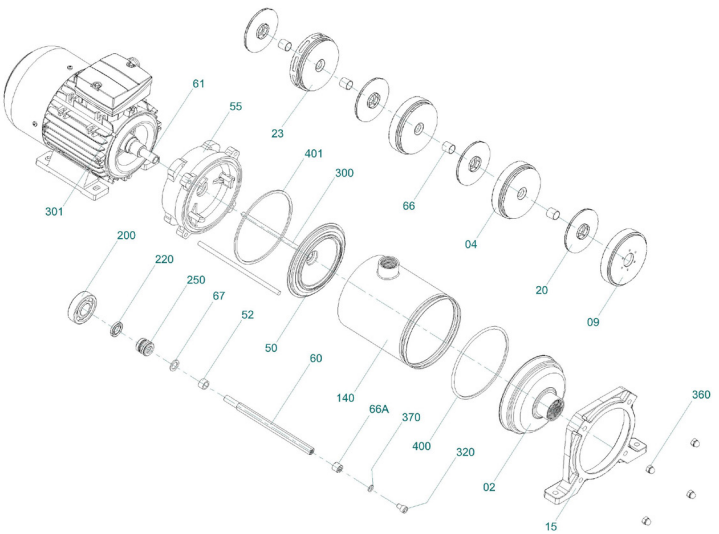
10	Fluid Director	261	Air Valve	611	Connect Band
11	Outlet Fluid Director	302	Stud	612	Outside Cylinder (Shield)
20	Impeller	320	Bolt		
60	Shaft	321	Protection Bolt		

13.2. HexaLite Exploded View and Part List



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50	Sealing Bearing	200	Deep Groove Ball Bearing	400	O-Ring
52	Mec. Seal Press Bush	220	Oil Seal	401	Rubber Gasket
55	Engine Cover				

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