Gear Pumps

DP Series

Operating Manual 2024

MDKBK032024

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AT UYGUNLUK BEYANI

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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* : Gear Pumps / *Dişli Pompalar*

Seri / *Model-Tip* : DP Series / *DP Serisi*

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)*

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, 31.01.2025
Name and position of authorized person
Yetkili Kişinin Adı ve Görevi : Erhan ÖZDEMİR
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 pump, 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 pump before you check the transport equipment.
7. Be sure you have a bypass line
8. Wear a helmet, eyeglasses and protective shoes for your safety
9. Place a protective barrier around the pump 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 pump unit.
11. By checking the noise level of the pump unit,necessary measures to avoid noisy operation of the pump 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 pump
14. All the electrical and electronic applications must be performed by authorized person confirming EN60204-1 and /or domestic instructions.
15. Protect the electrical equipment and motor against overloading
16. If flammable and explosive liquids are pumped, ground connection of electricity should be carried out properly
17. Do not expose the pump unit to sudden temperature variations
18. All personnel who work with the wastewater system need to be vaccinated in case of contagious diseases.
19. If the pump contains hazardous liquids, one must use a protective helmet against the risk of splattering. One also must accumulate the liquid in a proper container against any risk of leakage.

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

2. GENERAL

2.1. Definition of Pump and Usage Areas

DP series are gear type pumps. They are used in

- Pressurization high viscosity clean liquids
- Diesel and fuel oil plants
- Transportation of viscous fluid

They shall be used to pressurize liquids (up to 900C) which are clean or mildly impure, nonabrasive, and not containing large solid particles or fiber.

CAUTION

Please contact MAS DAF MAKINA SANAYI A.Ş. for liquids that have different chemical and physical specifications.

Technical specifications of DP type pumps

Capacity	:1-10m3/h
Manometric Head	:30-90m.
Speed	:1000-1500 d/d.
Operating Pressure	:16 bar.
Operating Temperature	:-20 – 140°C

2.2. Performance Information

Actual performance of the pump can be obtained from the order page and/or from the test report. This information is given on the pump label.

The performance curves given in the catalog are valid for water whose density and viscosity are p=1 kg/dm^3 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

CAUTION

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

The pump 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.

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 pump unit are taken into account.

2.4. Test

Pump performance values are valid under our factory test conditions.

2.5. Pressure Limit

Pressure at the discharge flange must not exceed 16 Bar. A special order is necessary for applications with higher pressures.

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 results from electrical connections must be removed. To get more information about this subject, you can refer to VDE and 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. TRANSPORT AND STORAGE

4.1. Transport

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

CAUTION

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

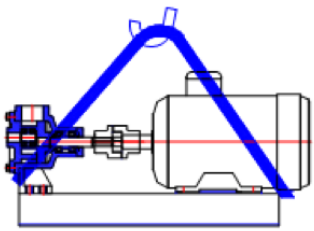

Figure 1: Transport of pump group

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.

4.2. Storage

If the pump is not to be installed instantly, it should be stored in a dry and clean place.Every two months, turn the pump shaft and check that the protector oil in the pump casing.

During storage, keep the unit clean and dry area.

5. ASSEMBLY / INSTALLATION

5.1. Installation

In our standard production, the pump and the motor have been installed in a common base plate.

5.1.1. Location of Installation

Pump shall be installed in a location where the control and the maintenance of the pump are easily made. The pump room shall be suitable for operation of lifting systems such as freight elevator, forklift, etc.

The pump group should be installed in the lowest possible location of the pumping system in order to achieve the highest suction pressure.

5.1.2. Location of Installation- Local Ambient Temperature

When the local ambient room temperature exceeds +40 ^{0}C in a pumping system, suitable ventilation should be provided in order to remove the heat dissipated to the environment and supply fresh air.

5.2. Type of Connection

Type of connection depends on the design type and the size of the pump and the motor, as well as the local installation conditions. Foot-mounted horizontal pump-motor units have been installed in a common base plate.

5.3. Foundation

5.3.1. General

Base plate of the pump must be grouted. The foundation shall be of concrete or steel framework.

NOTE: The foundation shall distribute the weight of the pumping group evenly.

5.3.2. Main Properties of the Steel Framework Bases

Foundations with steel framework shall be designed in such a way that the base plate is bolted or welded contacting to all area.

CAUTION

If base plate is supported from only four points, pump group will stay in the middle, causing misalignment of the coupling and increasing the noise level.

5.3.3.Foundation Properties

The foundation shall be horizontal, flat and clean and shall support all the weight.

NOTE: Reinforced concrete bases are constructed from standard concrete with at least B 25 resistance class.

5.3.4. Fixing (Securing) of Pump Group

After the alignment of the pump group on the foundation has been made, the mutual securing bolt screws should be used alternately to fix the pump group.

All of the area of the base plate should be filled with gout as much as possible.

NOTE: While securing pump group with the mortar bonding agents and molding, one has to make sure that the base plate contacts completely with the base with no cavities between the surfaces. Inside of the chassis (frame) should be completely filled with concrete

5.4. Coupling Alignment

5.4.1. General

For a proper operation of a pump group, a good alignment of the coupling is necessary. Vibration, noise, overheating of the bearings, overcharge problems can be attributed to the misalignment of coupling or using an improper coupling.

Flexible coupling does not correct the axial misalignments between the pump and the motor axes. However, it allows to pinpoint the misalignments.

In order to avoid overheating, vibration, noise and wearing of the rolling bearings, alignment of the coupling has to be made properly and checked often.

Do not use a different coupling other than the original type installed on pumping group.

5.4.2. Method of Coupling Alignment

In order to make the alignment of the coupling, it is required to have at least two smooth edged metal pieces (e.g. a steel ruler or a gauge stick) and one precision calipers. (Figure 2.)

(For more precision alignments, special apparatus can be used).

Coupling misalignments in general are of two kinds:

1. Parallel Axis Misalignment

In order to control parallel axis misalignment, a smooth edged gauge stick is pressed axially over the upper half of the coupling. Then, the gauge stick is checked for the other half of the coupling. For alignment, the gauge stick shall be in contact with both of the halves at the same time. This procedure shall be repeated for four sides of the coupling. (i.e., top, bottom, left and right sides of the coupling). When all four sides give reasonably accepted results, alignment of the coupling has been ensured.

2. Angular Misalignment

In order to control the angular misalignment, the distance between the two halves of the coupling is measured in both horizontal and vertical planes. Measurements taken at four points shall be in agreement for the alignment

Misalignments can be in horizontal or vertical planes. Misalignments in horizontal plane can be fixed by placing sheet iron at the bottom of the pump or motor base, while misalignments in vertical plane can be fixed by sliding the pump or the motor in horizontal plane.

Install the coupling guard only when the alignment of the coupling is checked.

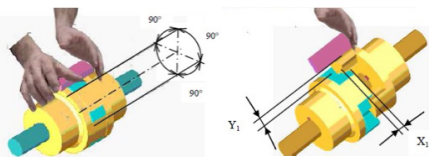

Figure 2: The control of the coupling alignment in horizontal and vertical planes.

Install the coupling guard only when the alignment of the coupling is checked.

5.4.3. Pump and Motor Mounting (Coupling)

If the coupling of the pump group is to be mounted on site, the following procedure should be followed.

1. Coat the shaft tip of the pump and the motor sides with a sheet of molybdenum disulfide.
2. Push the coupling halves with a driving apparatus towards the pump and the motor shafts, until the shaft is fit to snag to the hub of the coupling. If a driving apparatus is not available, heating coupling halves (with coupling rubbers off) to an approximately 100 OC may help the pushing. It is important that axial force is prevented from occurring while mounting the coupling. Support pump shaft from the impeller side, and motor

shaft from the fan side while mounting the coupling. If necessary, dismantle the fan cover.

3. Screw the two bolts in coupling hub.
4. Make sure that a suitable spacing is left between the coupling halves while mounting pump and the rotor.
5. Horizontal pump groups mounted on the base plate or directly mounted on the base, alignment of the coupling shall be as described in 6.4.2.
6. Put into place the coupling guard.

According to the accident prevention regulations, all preventions and protective devices should be in their intended place and in operational form.

5.5. Piping

5.5.1. General

- Do not use the pump as the hinged support for the piping system.
- Put enough supports under the piping system in order to carry the weight of the pipe and fittings.
- Avoid piping system loads on pump by installing flexible components (compensator) to suction and discharge of the pump.
- By mounting flexible supporting items, take into consideration the fact that these items may elongate under the pressure.
- Suction pipe shall be in a constantly increasing slope to the pump. Air in the suction pipe shall be arranged to move into the pump
- Discharge piping shall be in a constantly increasing slope to the reservoir or discharge point, without up and downs which can cause air pockets in the piping system. At locations where forming of air pockets is possible, special items like air valve and air cock are mounted to evacuate the trapped air.
- It is important that pipe diameter and fittings are at least as much as the pump opening diameter or preferable one or two size higher. One should never use fittings with smaller diameters than the pump exit diameter. In particular, preferred fittings like foot valve, strainer, filter, check valves and valves shall have large free passing area, and low friction loss coefficient.
- For piping systems with hot liquids, thermal expansions are to be taken into account and compensators shall be mounted in accordance with these expansions. Caution shall be exercised to avoid the loading of pump in this installation.

5.5.2. Specification of Work in Piping Installation

In installation of pipes, follow the procedures below certainly.

- Install the pump on the concrete base.
- Take out the guards (placed by the manufacturer) from suction and discharge openings of the pump.
- Close the suction and discharge flanges with rubber gaskets. This precaution is important to avoid the undesired substances (weld crust, weld slag, sand, stone, wood piece etc.) get into the pump. Do not take off this gasket until the installation is completed.
- Start the installation of piping from the pump side. Do the necessary assembling and welding of the parts in a successive order.
- In these operations, do not neglect to put the necessary supports in their respected locations.
- Following above procedure, complete all piping system at suction side up to the suction

tank (or foot valve if available), at discharge side up to do discharge collector and discharge pipe.

- When all installation and welding process is done and the heat dissipated by welding is removed, dismantle all the bolted connections from the suction tank to discharge pipe. Take out all demountable parts.
- Clean these parts and then paint body coat completely inside and outside.
- Mount the parts again in their intended places. However, this time start from the discharge line and move downward to the pump. In this instance, do not forget to check the flange gaskets. If needed, (for example deformation during welding) replace them.
- Concerning the connection of the pump flanges to piping, in case of misalignment of axis and flange holes, do not force the system to eliminate the misalignment. Forcing the system may cause difficult-to-correct problems..
- If there is an axial misalignment between the flanges of the pump and the pipe, due to the welding or any other reasons, cut the pipe from a suitable location in order to fix the problem. Connect the pipe (pump side) to the pump. After carrying out the necessary correction, connect the parts again by welding.
- Dismantle and clean the last welded part. Repaint again and mount on its place.
- After all these processes are accomplished, remove the rubber gasket from the suction and discharge openings. Open their holes and mount them again on their intended place.

5.5.3. Specification of Work after Installation of Piping and Piping System

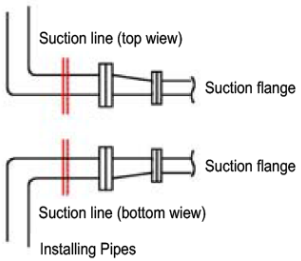

Figure 3: Piping system

Appropriate manometers shall be mounted on suction and discharge pipelines.

Complete the auxiliary pipe connections in piping system if exist (cooling to bearing housing, and stuffing box (seal), relief pipe, oil pipe etc.)

5.6. Motor Connection

Motor shall be connected by an electrical technician according to the connection (switch) diagram. Local electricity policies and current VDE regulations have to be applied.

- Electrical connections have to be made by authorized electricians.
- In dismantling the pump, make sure the electricity is cut off before taking the motor cover out.
- Use the appropriate electrical connection to the motor.

In environments where there is a risk of explosion, prescribed protective law and regulations shall be applied by competent authorities.

5.6.1. Motor Connection Diagram

- Motors requiring high moments at start up shall not be connected star-delta
- Frequency controlled motors, require high moment at start up and have to be cooled properly at low speeds. Provide the necessary cooling for the motors.

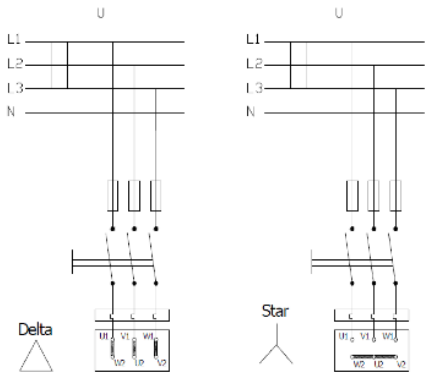

Figure 4: Electric Connection Diagram

Electrical Circuit	Motor	
U (Volt)	230/400 V	400 V
3 x 230 V	Delta	
3 x 400 V	Star	Delta

5.6.2. Motor Protection

- Three phased-motor shall be connected to power supply.
- Wait the motor to cool down when thermic protected motor breaks in circuit due to the overheating. Make sure the motor does not start automatically until it cools completely
- In order to protect the motor from overcharging and short circuit use a thermic or thermic-magnetic relay. Adjust this relay to the nominal current of the motor.

Electrical equipments, terminals and the components of the control systems may carry electric current even though they are not operating. They may cause deadly and serious injuries or irreparable material damages.

6. COMMISSIONING, START UP AND OPERATING

- Open all valves on the piping system and ensure that there is no blockage on the piping line.
- Fill the pump with liquid.
- Check all safety devices had connected fittingly and (for preventing personal injuries) and all moving parts had covered properly. Before running, protective cover is closed definitely to prevent personal injuries.
- Operate the pump slightly to check the direction of rotation. Pay attention the direction arrow on the pump cover.
- Run the pump and check the rate of liquid flow (its velocity). If it is not correct, stop the pump and follow the chart of trouble shooting.
- Check the pressure, the temperature and the capacity.

7. 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 reads 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 lives.

7.1. The Checks during the Operation

- Bearing temperature must never exceed 80^{0}C if the ambient temperature is 30^{0}C
- Precautions must be taken against flare up when the component temperatures are over 60^{0}C. "Hot Surface" warnings must be placed over necessary areas.
- All the auxiliary systems must be in use while the pump is operating.
- 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.
- Check the elastic components of the coupling. Replace them when necessary.

7.1.1. Component Check

COUTION

To make possible the visual control, one must be able to reach the pump from any direction. Especially, to be able to dismount the internal units of the pump and the engine, sufficient free space must be created around them for maintenance and repair. Furthermore, one must make sure that the piping system can easily be dismounted.

7.1.2. Coupling

As mentioned in Section 5.4, coupling adjustment must be checked regularly.

Worn out elastic bands must be replaced.

7.1.3. Drive

Apply to the operating instructions of the motor manufacturer.

7.1.4. Auxiliary Components

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

7.2. Service

Our After Sale Services Department provides service support. 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.

7.3. Spare Parts

The spare parts of DP 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:

If you wish to keep spare parts in store, depending on the number of same type of pumps, for two operation years, the quantities which are listed in the table below are recommended.

PART NO	PART NAME	PART NO	PART NAME
01	Pump Casing	73	Spacer Sleeve Back
02	Back Cover	200	Bearing
12	External Gear	201	Bearing
13	Internal Gear	211	Coupling Key
35	Bearing Cover	220	Oil Seal
60	Shaft	320	Hex Bolt
61	Pin	321	Hex Bolt
72	Spacer Sleeve Front		

Table 1: Spare Part List

8. NOISE LEVEL AND VIBRATION

The reasons which increase the noise level are indicated below:

- Touch of coupling halves due to worn rubber sleeves (incorrectly aligned)
- Noise level increases due to the fact that the pump is not founded properly (Vibration)
- If the installation does not have compensator noise and vibration increases.
- Wearing in ball bearing also increases noise level..

Check if there is any noise increasing elements in your installation.

8.1. Expected Noise Values

Measurement conditions:

- The distance between the measure point and the pump : 1m
- Operation : Without Cavitation
- Motor : IEC Standard Motor
- Tolerance : ±3 dB

Motor Power PN (kW)	Sound Presure Level (dB)* (Pump with Motor)	
	1000 rpm	1450 rpm
0,55	-	46
0,75	46	46
1,5	50	46
2,2	55	50
3	61	50
4	-	52

Table 2: Sound Pressure Level

The above values are maximum values. The surface noise pressure level at dB(A) unit is shown as (LpA). This complies with ISO 4871 and the tolerance is +3dB(A).

9. DISASSEMBLY, REPAIRAND REASSEMBLY

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

Fallow the safety precautions outlined in "Safety instructions".

9.1. Disassembly

- Close all valves in the discharge lines
- Drain the pump by the drain plug.
- Remove coupling guard and other safety guards.
- Disconnect the pump from the piping system by dismantling connections of the discharge and the suction nozzles.
- Disconnect the motor from the pump. Take out the pump by dismantling the pump from the chassis.
- Disconnect the coupling part, on the pump

shaft with a puller and by using a rust solvent if necessary. Remove the coupling key.

- Disassemble the internal gear group from the pump by taking down the bolts connecting the back cover with the casing.
- Take out the external gear coupled with the shaft by pulling the pump shaft from the coupling side with an appropriate device.
- Remove the bearing cover, the bearings and the bearing spacer sleeve.
- Clean all parts, replace the parts if they are damaged or worn.

9.2. Reassembly

- Reassembly proceeds in reverse sequence to disassembly as described in section 9.1.
- Coat the seats and screw connections with graphite, silicon or similar slippery substance before reassembly. If you cannot find any of the above you may use oil instead (except the pumps for drinking water).
- Never use the old gaskets, make sure the new gaskets and O-rings are the same size as the old ones.
- Place the bearings, the oil seals and the bearing spacer sleeve and mount the bearing cover and place the shaft coupled with external gear.
- Assemble the internal gear to back cover on the clearance-fit pin.
- Tighten the bolts by mounting the internal gear group to the casing.
- Place the pump on the base plate, assembly the motor. Connect suction and discharge pipes as well as auxiliary pipes. Take the unit into operation as it was indicated in section 7.

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
While the pump is running, there is no flow.	Wrong direction of rotation	Turn down the direction of rotation.
	There is air the in suction pipe	Fill the suction line. Drain all air by sucking.
	Clogged check-valve.	Clean the check valve.
	The pump is not removed correctly (insufficient sealing), it is sucking air from the suction line or the shaft seal. Provide the sealing.	Check and provide sealing in the suction line. Change the seal if necessary.
Insufficient capacity and / or power	Clogged check valve.	Clean the check valve.
	Air leakage	Check and provide sealing in the suction line. Change the oil seal if necessary.
	NPSH too low (Manometric suction head too much)	Increase the diameter of the suction pipe and / or shorten the suction pipe. Decrease the Manometric suction head.
	Pump is worn	Check the rotor clearance. Reduce the rotor clearance by removing shims if necessary.
	Cavitation – Manometric suction head too much	Increase the diameter of the suction pipe and / or shorten the suction pipe. Decrease the Manometric suction head. Check the filters/ strainers at suction side.
Noisy operation	Rotor / gear damage	Check and change if necessary.
	Misalignment of pump/motor shaft	Align with shims.

Table 3: Possible Failures, Causes, Solutions

NOTES:

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