

Vertical Shaft Wastewater Pumps

PS/PSH Series

OPERATING MANUAL

MDKBK022024



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EC DECLARATION OF CONFORMITY

AT UYGUNLUK BEYANI

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Teknik Dosyayı Derleyen Yetkili Kişi ve Adresi

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 olduğunu beyan ederiz.

Aşağıda tanımlanan ürünler iç üretim kontrollerine bağlı olarak MAS DAF MAKİNA SANAYİ A.Ş. tarafından kontrol edilmiştir.

Equipment / Ürün : Vertical Shaft Wastewater Pumps
Düşey Milli Atık Su Pompaları
Seri / Model-Tip : PS and PSH Series
PS ve PSH 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)

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 the PS/PSH type vertical shaft wastewater pumps 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 pump when you get in contact for help.
- The safety instructions in this manual cover the current national accident protection regulations. Besides all of this, an operation, work and safety measure imposed by the customer 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 circuits, corrosion and fire must be kept away from the pump unit.
11. Be careful about the direction of transport and storage.
12. Cover appropriately the moving parts to avoid possible injury of the personnel. Mount the coupling guard and belting before starting-up the pump
13. All the electrical and electronic applications must be performed by authorized person conforming EN60204-1 and /or domestic instructions.
14. Protect the electrical equipment and motor against overloading
15. If flammable and explosive liquids are pumped, ground connection of electricity should be carried out properly

16. Do not expose the pump unit to sudden temperature variations
17. All personnel who work with the waste water system need to be vaccinated in case of contagious diseases.
18. If the pump contains hazardous liquids, one must use protective helmet against the risk of splatter. 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

PS/PSH series pumps are single stage, vertical shaft wastewater pumps. They are used in:

- Refining plants
- Mine plants
- Casting centrals
- Coal thermic centrals
- Iron and steel industry
- Petro-chemical industry
- Paper industry
- Wastewater, oil, and mud pumping

Pumped Liquids

This series are used for transferring clean and waste water including little particles but not wearing, explosive, fibres and big solid particles.

For special applications, please consult **MAS-DAF MAKINA SAN. A.Ş.** representative.

CAUTION

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





Teknik Özellikler

Discharge Flange	2" (DN 50)
Operating Pressure	10 Bar (16 Bar)
Capacity	6-26 m ³ /h
Hm	4-19 m.
Temperature	-10 – 105 °C
Speed	1450 rpm.

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 $\rho=1 \text{ kg/dm}^3$ and $\nu=1 \text{ cst.}$ respectively. For those liquids whose densities and viscosities are different from those of water, please consult with MAS DAF MAKINA SANAYİ 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 10 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 SANAYİ 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 dismantled 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 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. Design

PS/PSH pump is a circulating wastewater pump with the open impeller, which has specially designed for wastewater pits.

Impeller is designed as open type and balanced dynamically according to ISO 1940/1-6.3

Pump and motor are assembled by a flexible coupling.

PS/PSH pumps, in contrast to a basic single stage, volute casing, open impeller centrifugal pumps and submersible pumps, are designed to operate the pump side (hydraulic unit) in the water to be pumped, the motor side taking place outdoors not in contact with water.

PS / PSH pumps can pump clean water and the particulate liquids up to 50 mm (2").

In order to avoid clogging the filters can be attached to the pump inlet.

4.1.1. Casing

The suction nozzle and the impeller are in the water and there is a filter. It has large cross-section for wastewater transmission.

4.1.2. Impeller

In PS/PSH pumps, channel type impeller is available. With its design it provides superior protection against engorging.

4.1.3. Filter

The filter apertures are sized to prevent the entry of large solid particles.

4.1.4. Column Pipe

The column pipe has flanged connection and the pipes are machined to provide accurate parallelism.





4.1.5. Shaft

PS/PSH pump shafts are manufactured by steel material (AISI1045/C45) and shaft is fine grinded.

4.1.6. Motor Connection Part

Motor connection part is manufactured from casting and it is machined precisely to be smooth alignment between the motor and pump. Motor connection part is designed for vertical flanged motors.

Pump and motor are assembled by a flexible coupling.

4.1.7. Bearings

Ball bearings are used for the shaft on pump side. When pipe length increase, the pump shaft length increase, there will be needed an extra bearing on the motor side.

4.1.8. Sealing

PS / PSH series pumps are run in the water. Behind the impeller, there is a bellows type mechanical seal that prevents the water get into the bearing.

4.2. Construction of Pump Group

4.2.1. Drive

TEFC (Totally Enclosed Fan Cooled) 3 phase, squirrel caged, in accordance to DIN 42673, IM 1001B3 type electrical motor which complies with DIN IEC and VDE is used to drive the pump in proper speed and power.

Specifications of electrical motor;

Isolation class	: F
Protection class	: IP 54-IP 55
Frequency	: 50 Hz
Running type	: S1
Start up type	: Up to 4 kW, 3x380V (Y) More than 4 kW, 3x380V (Δ)+(Y/ Δ)

4.2.2. Coupling and Coupling Guard

In PS/PSH pumps, a flexible coupling with spaces

or without spaces is used in accordance with DIN 740.

5. TRANSPORT AND STORAGE

Please check after receiving the pump. Carefully check that everything is in accordance with order. If there are damaged or missing parts, please contact Mas-Daf Makine San. A.Ş.

5.1. Transport

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

5.2. Storage

Short-term: (Less than 6 months)

The packaging procedure of **MAS DAF MAKİNA SANAYİ A.Ş.** is designed that how the pump will be transport.

Keep the pump indoor and dry places.

Long-term: (More than 6 months)

In storage for long-term, protection applications are necessary for bearings and machined surfaces. It is necessary to change the contact surfaces of the shaft by rotating shaft once every three months. The pump and motor must be kept in dry places.

5.3. Transportation



The pump and its parts are heavy so incorrect lifting may damage the pump unit and cause injuries. The personnels working during the loading should wear special shoes.

Be careful when moving pumps. Ensure that lifting equipments support all installation enough. Remove the pump in the vertical by position using the appropriate ring and rope. Try to prevent the movement of the pump and damages and injuries that it will cause. Put down the pump to the well. Determine the final position of the motor and balance it.





6. ASSEMBLY / INSTALLATION

6.1. Control

1. Remove all parts inside the transportation container.
2. Clean the underside of the support plate.
3. Clean the grease on machined parts.

6.2. Installation Location - Foundation

It must be enough space for installation, operation, maintenance and examination procedures of the pump. Space at the upper side of the pump must be such as to allow installation and movement of the pump. The pump should be at least 10 mm away from any edge of the pit.

Vertical well pumps are normally connected to the concrete well and steel tanks. The support structure extinguishes vibrations by providing rigid support consistently. If the anchor bolt is poured into the concrete, sleeve-type structure shown below must be preferred.

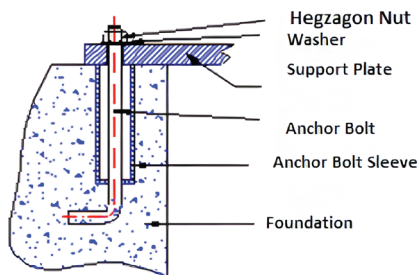


Figure 1: Sample Foundation

1. Put down the pump and the support plate over the bolt in the foundation.
2. By using washers and wedges, bring the support plate at the same level from all sides.
3. Tighten the anchor bolt by hand and check level of the support plate, if it is necessary balance it again.

4. Tighten all anchor bolts with box end wrench without damaging the support plate.
5. Make sure that the same level of support plate.

6.3. Motor Mounting

PS/PSH series are designed to work with DIN 42673-IM 3011 V1-A type electric motors in accordance with the standard IEC and VDE with appropriate speed and power.

1. Before making the assembly of the motor, insert the coupling parts to the pump shaft and the motor shaft.
2. Down carefully the motor over the pump by using hoisting ropes and superimpose the bolt holes.
3. Assemble bolts by hand.
4. Make wiring of motor before completion of installing couplings and check the direction of motor rotation. In PS/PSH pumps, the correct direction of rotation is clockwise when looking down from the motor.

6.4. Piping

6.4.1. General

- Do not use the pump as the hinged support for the piping system.
- Piping should be as little to reduce friction losses.
- Don not connect piping before connection of the pump to the ground.
- Clean all pipes, valves and fasteners before the pipe installation.
- Check-valves and isolation valves should be installed on the discharge side. Place check-valf in between the pump and isolation valf. Check-valf prevents damage of back flow when the pump stopped.
- Expansion elements sholuld be put between the pump and check-valf to reduce friction losses.





6.5. Motor Connection

Motor shall be connected by an electrical technician according to the connection (switch) diagram. Local electricity policies 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.

6.5.1. 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.

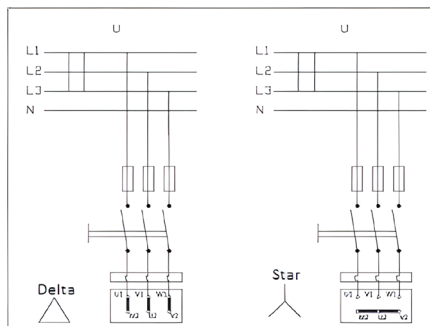


Figure 2: Electric Connection Diagram

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

6.5.3. 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.

7. COMMISSIONING, START UP AND OPERATING

7.1. Preparations Before Start Up and Start-up Procedure

1. Fasten the pump base firmly.
2. Select the switches for electric motor in accordance with appropriate amperage.
3. Have an authorized personnel do motor electric connection absolutely.
4. Ensure the motor shaft rotation easily by turning with hand.
5. While the pump is operated, make sure that the direction of pump rotation is the same as





the direction of the arrow on the pump label.

6. While the pump is operated, close down the valf on the discharge pipe and then open it slowly.
7. Fill oil reservoir with 30 numbers and check it every 15 days.

8. SPARE PARTS

The spare parts of PS/PSH 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 want to keep the spare parts in your warehouse please get in contact with **MAS DAF MAKINA SANAYI A.Ş.**

9. DISMANTLING - INSTALLATION



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



The pump parts may be heavy. Apply appropriate lifting methods to prevent damage to the pump parts and/or physical injury. Use protected shoes.



Operator must be aware of properties of liquids and safety precautions to prevent physical injuries.

9.1. Dismantling of The Pump (Disassembly)

- Take the pump out of the well by using appropriate hanger.
- Place the pump so that the gap to make the dismantling horizontally on a plate.
- Remove the coupling guard.
- Ensure the separation of the coupling parts by dismantling the bolts on coupling.
- Disconnect the motor by dismantling the motor connection bolts.
- Disconnect the coupling part and the coupling key from the pump shaft.
- Disconnect the motor connection part from the pipe by dismantling the bolts on the motor connection part.
- Remove the filter bottom of the pump casing





by dismantling the bolts on the casing.

- Remove the impeller by dismantling the nut.
 - Remove the impeller key on the shaft after removing the impeller.
 - Remove the moving part of the mechanical seal from the impeller side.
 - Separate the casing from the flange by dismantling the bolts on the casing.
 - Remove the fixed part of the mechanical seal remaining on the casing and the oil seal.
 - Remove the bearing on the shaft.
 - Take the idle shaft out of pipe.
- Mount the motor to the motor connection part and fasten it with bolts.
 - Connect discharge pipes as well as auxiliary pipes. Take the unit into operation as it was indicated in section 7.

9.2. Installation

- Reassembly proceeds in reverse sequence to disassembly as described in section 10.1. You may find the attached drawings useful.
- 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)
- Mount the shaft to the pipe.
- Mount the pipe to the motor connection part and fasten the pipe by tightening the bolts on it.
- Connect the bearing to the shaft from the pump side.
- Connect the fixed part of mechanical seal to the casing from the impeller side (in another place) and also connect the oil seal from the shaft side.
- Fasten the casing to the flange with bolts.
- Connect the moving part of the mechanical seal to the shaft carefully from the impeller side.
- Insert the impeller key to its slot.
- Insert the impeller and then tighten the nut.
- Insert the filter to the casing and then tighten the bolts.
- Kaplini ve kaplin kamasını yerine takınız.





10. POSSIBLE FAILURES, CAUSES AND 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
The pump delivers insufficient capacity.	Pump and/or pipe cannot discharge air, cannot suck.	No water in the wells. Vent completely the pump and the pipe.
	Discharge head too high	Check the discharge head and friction losses. Readjust the operating point
	Speed is too low	Check the motor speed.
	Direction of rotation is wrong	Check the direction of rotation.
The pump delivers insufficient capacity or discharge head.	Impeller, discharge pipe, filter are completely engorged.	Remove obstruction
	Some part of impeller, discharge pipe and filter is engorged.	Remove obstruction
	Direction of rotation is wrong	Check the direction of rotation.
	Discharge head may be higher than expected.	Check the discharge head and friction losses.
	Corroded impeller	Check and if necessary replace it
	Speed is too low	Check the motor speed.
	Entering air or gas into the liquid	Dip deeper. Check the piping and edit air inlet.
	NPSH _{Available} is too low.	Check NPSH _A and NPSH _R
The pump stops after starting.	Flow control was set incorrectly.	Check it.
	Entering air or gas into the liquid	Dip deeper. Check the piping and edit air inlet.
	Entering air into the suction pipe	Prevent leaks.
	Incorrect adjustment	Be coupled pump and motor properly.
Noisy operation and vibration.	Inappropriate pump / motor coupling	Correct the direction of the shaft.
	Some part of impeller is engorged or unbalanced.	Clean shaft with backward flow.
	Broken rotating elements	Check and if necessary replace it.
	The shaft is bending	Straighten or replace.
	The bearing is wearing	Check and if necessary replace it.
The motor is consuming too much power	It gives more flow in the same discharge head	Cut the impeller.
	The fluid is heavier than expected	Check density and viscosity.
	Rotating parts are rubbing.	Check the wearing rings.
	Rotational speed is too much	Check the motor.





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