Submersible Sewage And Wastewater Pumps

ENDURO SERIES

OPERATING MANUAL

Mas Grup

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EC DECLARATION OF CONFORMITY

AT UYGUNLUK BEYANI

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Teknik Dosyayı Derleyen Yetkili Kişi ve Adresi
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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 içüretim kontrollerine bağlı olarak **MAS DAF MAKİNA SANAYİ A.Ş.** *tarafından kontrol edilmiştir.*

Equipment / *Ürün* :Dalgıç Kanalizasyon ve Atık Su Pompaları- Submersible Sewage and Waste Water Pumps

Seri / *Model-Tip* :ENDURO Seri – ENDURO Series

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 60204-1:2011, TS 12599

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 yada 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, 29.11.2012
Name and position of authorized person **:** Vahdettin YIRTMAÇ
Yetkili Kişinin Adı ve Görevi General Manager / GenelMüdür
Signature of authorized person **:**
Yetkili Kişinin İmzası

TABLE OF CONTENTS

INTRODUCTION

- This manual contains instructions for the installation, operation and maintenance of the ENDURO Submersible Sewage and 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. 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 by-pass line
8. Use helmet, eye glasses 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. Be careful about the direction of transport and storage.
12. All the electrical and electronic applications must be performed by authorized person conforming EN60204-1 and /or domestic instructions.
13. Protect the electrical equipment and motor against overloading
14. Do not expose the pump unit to sudden temperature variations
15. All personnel who work with the waste water system need to be vaccinated in case of contagious diseases.
16. 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, Law and Regulations Must Be Applied

2. GENERAL

2.1. Definition of Pump and Usage Areas

ENDURO series submersible sewage and wastewater pumps are designed for pumping domestic and industrial raw sewage waste transport, sewage waste transport, sewage treatment plants, liquids containing sludge and solid particles transport, factory waste water transport, liquids containing fibrous particles and other applications. They are used;

For pumping liquids containing long fibers (hair, thread, etc.), small solid particles and having a certain rate gaseous or air. (X Type Vorteks Impellers)

For pumping liquids containing long fibers, big solid particles (close to the diameter of the pump intake). (S Type Single Vane Impellers)

For pumping liquids containing up to certain size sludge and solid particles but not containing fiber, gaseous or air. (D Type Double Vane Impellers)

CAUTION

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

Technical Specifications of ENDURO Type Pumps:

Discharge Flanges	**DN 50 - DN 200**
Operating Pressure	**10 bar**
Impeller Diameter	**ø140 - ø360**
Q:	**20 - 600m^3/h**
Hm:	**10 - 45m.**
Speed:	**1000 - 3600 rpm**

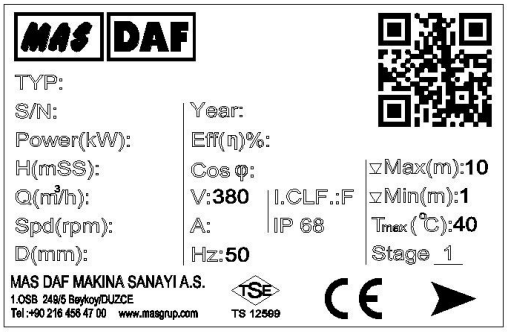

Figure 1 - Pump Label

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 ρ=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

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

All Pumps are dispatched for sale when all the performance and pressure tests are completed. Proper assurance of material and fault-free operation of pumps whose performance tests are made is under the warranty of **MAS DAF MAKINA SANAYI A.Ş.**

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 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 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

ENDURO Series submersible pumps are designed for pumping solid particles, raw sewages, industrial sewages.
Three type of impellers including single vane, double vane and vortex are used in ENDURO series to pump containing long fibers, solid substances, coarse dirt as well as gaseous or air, raw sewage, activated sludge, circulated and heated sludge, raw and digested sludge, mixed water.

4.1.1. Volute Casing

Volute casing has large profile and designed for handling large solid particles. Solid particles that can pass through the impeller, can be easily handled with the volute casing.

4.1.2. Impellers

X Type Vorteks Impellers

In this type of impellers, liquid transfer is provided by vortex movement in front of impeller. These type of impellers are suiteble for pumping liquids containing long fibers (hair, thread, etc.), small solid particles and having a certain rate gaseous or air. General applications of these type of impellers are raw sewage, activated sludge, circulated and heated sludge, wastewater containing hair, thread etc.

S Type Single Vane Impellers

S type of impellers have single vane and easily handles
large solid particles. These type of impellers for liquids containing long fibers, big solid particles (close to the diameter of the pump intake). General applications of these type of impellers are raw sewage, solid - liquid mixtures, raw and digested sludge, circulated and heated sludge.

D Type Double Vane Impellers

D type impellers are designed with double vanes. Its symmetrical design provides balanced operation without vibration. These type of impellers for liquids containing up to certain size sludge and solid particles but not containing fiber, gaseous or air. Generally used for pumping grilled sewage, mechanically purified sewage, industrial waste water, activated sludge and floodwaters.

Grinding Blade Design*

ENDURO Series submersible sewage and waste water pumps which have grinding blade design, can grind solid particles and fibers inside liquids and transport to the system. Thus, the blockage does not occur Enduro Submersible Pumps.

Special design grinding system is designed towork in accordance with difficult conditions. Grinding blades are manufactured from stainless steel which resistance corrosive effects with precision casting technology and have been made capable of against wear and tear at the most difficult operating conditions after heat treatment process.

**Can be used only 2" (inches) pumps.*

Pump Type	Motor Type (IEC)	Bearing		MechanicalSeal		OilSeal
		Top	Bottom	Quantity	MG1 TypeRubberBellows	
50-160	90L	6205	6306	1	ø25 SiC-SiC	30 x 52 x 10
	100L	6305	6306			
	112M	6305	6306			
50-200	100L	6305	6306	1	ø30 SiC-SiC	30 x 52 x 10
	112M	6305	6306			
	132S	6205	6306			
	132M	6307	3308			
80-190	100L	6305	6306	1	ø25 SiC-SiC	30 x 52 x 10
	112M	6305	6306			
80-250	112M	6305	6306	1	ø30 SiC-SiC	30 x 52 x 10
	132S	6205	6306			
	132M	6307	3308		ø30 SiC-SiC	35 x 60 x 10
	160M	6307	3308	2	ø30 SiC-SiC	-
	160L	6307	3308		ø40 SiC-SiC	
100-240	100L	6305	6306	1	ø30 SiC-SiC	30 x 52 x 10
	112M	6305	6306			
	132M	6307	6308		ø30 SiC-SiC	35 x 60 x 10
100-250	112M	6305	6306	1	ø30 SiC-SiC	30 x 52 x 10
	132M	6307	6308		ø30 SiC-SiC	35 x 60 x 10
	160L	6307	3308	2	ø40 SiC-SiC	-
100-315	132M	6307	6308	1	ø40 SiC-SiC	40 x 60 x 10
	160L	6307	3308	2	ø40 SiC-SiC	-
	180L	6309	3310		ø45 SiC-SiC	
150-315	160L	6307	3308	2	ø40 SiC-SiC	
	180L	6309	3310		ø45 SiC-SiC	
	200L	6309	3310			

Table 1- Bearing And Mechanical Seal Table

4.1.3. Spare Parts

Please refer to the technical drawing of the pump for necessary spare parts.

4.1.4. Shaft

The pumps are provided with the rigid shaft capable of supporting different loading conditions. Since the shaft diameter is highly resistant to bending and the distance between the bearing and the sealing is short, pump can operate at optimal conditions for the sealing.

4.1.5. Bearing and Lubrication

Lifelong grease lubricated bearings are used in ENDURO series submersible pumps. There is no need any extra lubrication for bearings. On the side of the pump and motor side 3300/6300 series bearings can be used.

4.1.6. Seals

Special Stuffing Box Design*

Spiral grooves in the big conical seal chamber avoid contamination of the sealing environment with solids improved mechanical seal life.

**Available on some models.*

Shaft Sealing

To prevent water pass to motor two sets of mechanical seals with oil bath in the middle of these seals are used.

In standard production, SiC-SiC mechanical seals are used for sealing.

Water Leakage Warning System

An electrode system is used in case of water leakage caused by worn out mechanical seal or any other reason.

4.1.7. Drive

MASDAF ENDURO Series Submersible sewage pumps are developed for the purpose of pumping domestic and industrial waste water containing large solid particles. These pumps are suitable for operating entirely immersed in water. Different types of impeller are used in ENDURO Series pumps for different purposes of pumping clean and waste water, sewage containing solids and fibrous materials and sludge.

5. TRANSPORT AND STORAGE

Suction, discharge and all auxiliary fittings must be closed during transport and storage. Flange 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.

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. Prefer fabric cable for suspension.

RIGHT **WRONG**

Figure 2 - 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.

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. Spray an anti-corrosive into the pump casing.
5. If the pump is not operated immediately, it has to be kept in clean and dry area in vertical position.

6. ASSEMBLY / INSTALLATION

6.1. Connection Type

i. **Suspended Connection:** The pump is hanged to the inlet of the pipe system on the ground by a special connecting device. Pump does not sit on the base of the sump. If required, the connection elbow can be used as a non-return valve. Steel discharge pipe between the pump and suspension part keeps the pump on suspension. Suspended connection can apply on 50-160, 50-200 (up to 5,5 kW) and 80-190 types.At suspended connection option,it should be noted that these pumps enables to operate more reliably by not bringing overload to the discharge pipe because of being lighter.It is not necessary for sump bottom to be flat and solid for suspended connection. Suspension elbow and complete suspension set are needed for this application.

Figure 3 - Suspended Connection

ii. **Hose Connection:** In this kind of application the pump is sat on the base of the sump. In this application the bottom of the sump should be flat and solid (in order to make the pump not to sink but to stay vertically). The pump is put down to the sump and uplifted by means of a chain. For ease of assembly and disassembly, should be used the flexible hose as a discharge pipe. Water is pumped up to the surface by a flexible hose and can be connected to a pipe system if necessary. Necessary auxiliary parts for this application: Hose connecting union, elbow, sit-on-foot and riser chain.

Figure 4 - Hose Connection

iii. **The Automatic Coupling System:** This application easily connected and removal of the pump to the installation is to provide an improved system. It is not necessary doing some operations such as emptying the sump, where the pump is, and installing and uninstalling bolt, etc. to make the pump flange-pipe connections during the coupling.

Figure 5 - The Automatic Coupling System Part Numbers

1. **Carrier Elbow:** It is a special strong and broad-based elbow which placed to the sump base before starting up. This elbow carries the weight of the pump. Therefore it must be assemblied very stable to sump base.
2. **Slideway:** It consists of from two parallel pipes. It is connected to the carrier elbow from the bottom. When lowering down the pump acts as guide. Length is set according to the depth of the tank in place.
3. **Coupling Hook:** It is a carrier special part, which is connected to the discharge flange of the pump.
4. **Special Coupling Gasket:** It is a rubber gasket, which located in the coupling hook. Through special shape, it prevents water leakage by expanding while the pump is running.
5. **Carrier Chain:** It provides to dip the pump to the water. It is given with all ENDURO type pumps.

Operation of The Automatic Coupling System

Figure 6

1. When suspended from the rear suspension hole pump stops inherently slightly tilted. In this case, the hook is passed to slideway.

Figure 7

2. The pump is slid down in inclined state.

Figure 8

3. When the special slots of the hook contact carrier brackets on the elbow, scrolling of the pump stops. Carrier chain is still tense.

Figure 9

4. When the carrier chain has been released, the weight of the pump is loaded to the elbow via hook. The press of the pump's weight to the elbow, provides the gasket pressed against the elbow. When the pressure occurs in the pump, gasket prevents water leakage by expanding.

It is adequate the pump is pulled out from the chain for dismantling. Installation of the carrier elbow and the discharge pipe are required when the sump is dry (during construction). In case of this installation make subsequently, the system mat not be strong enough.

6.1. Electrical Connections

6.1.1. General

- All electrical works must be done by qualified electricians. All main electrical equipment must be earthed. Failure to heed this warning may cause lethal accident. Make sure that the earth lead is correctly connected by testing it.
- Use MASDAF RLE-1C Motor Protection and Control Relay which is supplied with the pump. We do not guarantee the pumps running without RLE-1C *
- Motor Control Panels must be manufactured according to the circuit diagrams in this booklet. If you use a different circuit diagram, please contact our technicians and have their approval.
- Make sure the currents and cable diameters of contactors, overload relays and fuses are suitable for motors nominal currents.
- Check the mains voltage and be sure it corresponds to the value on motor label.
- Check the connection of motor cable socket and secure the tightness before initial operation.
- Connect the energy and control cable to the motor control panel complying with the colors and diameters stated in the diagrams.
- Make sure the outer cover of the energy cable is protected against damages that might be caused by sharp metal or concrete corners and prevent it from being squeezed in narrow spaces.
- Do not use the energy and control cable to lift the pump.

It is not valid, in cases where the panel is supplied with the pump by* ***MAS DAF MAKINA SANAYI A.Ş.*

6.1.2. RLE-1C Motor Protection and Control Relay

MASDAF RLE-1C Motor Protection and Control Relay is very important part of ENDURO Series submersible sewage pumps. It is supplied with the pump and it shall be used to secure smooth operation of motor and the pump.
When the device is switched on, all indicator lights blinks in order and the control unit makes a self-check. If there is not any failure, NORMAL indicator light switches on in green indicating it is ready to run the motor.

Water Leakage: In case of water leakage into the motor casing or oil chamber, red indicator light switches on and the relay shuts down the motor. Alarm relay becomes activated and until the RESET button, which located on RELAY, is pressed, alarming goes on by blinking of red indicator light in short periods. In this fault, if the RESET button is not pressed, motors is not stepped in. In this case, must do maintenance by removing the pump and repair the case of water leakage. The sign by blinking continues until you press the RESET button. When RESET button is pressed, the lamp goes out and alarm relay is deactivated.

Overheat: In case of overheating of motor windings, in which the temperature exceeds 130°C, the red indicator light switches on and the relay shuts down the motor. Indicator light blinks in short periods at alarming position. When motor has cooled down, relay restarts the motor while alarming goes on until the RESET button is pressed. Pressing the RESET button disables the alarm relay and indicator light stops blinking.

Overload: The relay shuts down the motor, if the current overload limit is exceeded. Alarm relay becomes activated and until the RESET button, which located on RELAY, is pressed, alarming goes on by blinking of red indicator light in short periods. As the failure is fixed, pressing the RESET button will disable the overload and the alarm relay, so the system turns back to normal conditions.

Maximum Level: When water level reaches the maximum level, which is set by the user, float switch sends on alarm signal. MAX yellow indicator light starts blinking. This alarm does not affect the current state (run or stop) of the pump. Pressing the RESET button disables the alarm relay and indicator light stops blinking. When RESET button is pressed, the lamp goes out and the alarm relay is deactivated.

Phase Failure: An external phase protection relay, mounted in the control panel, is connected to RLE-1C for checking phase sequence and phase failures. When there is a failure in mains voltage or in phase sequence, the motor is shut down by the relay and red indicator light starts blinking. By the time the failure is fixed, the motor restarts automatically while alarming goes on until the RESET button is pressed. When RESET button is pressed, the lamp goes out and the alarm relay is deactivated.

Ready By the time all red indicator lights on RLE-1C switch off, green indicator light switches on, meaning that it is ready to run the motor. In case of failure, green indicator light switches off and the relay shuts down the motor.

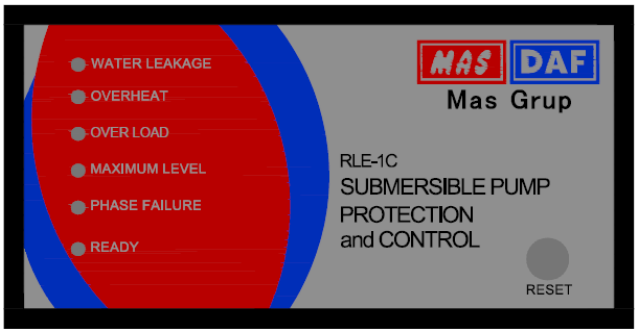

Figure 10 - RLE-1C Motor Protection And Control Relay

6.1.3. Control Panel

The control panel is designed in order to safer operation of ENDURO submersible pump can be claimed as extra. Single-pump or the 2 and 3 pump groups can be operated by the control panel.

In the pump operating principle of a multi-pump panel, all pumps can be operated simultaneously or as a backup.

The control panel is in protection class IP 55 and it is isolated from dust, splashing water and wastewater environment gas. Short circuit protection, phase failure and protection against phase sequence, thermistor protection, water leakage protection, over current protection, the indicator lights, manual-automatic paco, start-stop as manual and the main switch equipments are available control panel.

Floater is included in the package of submersible pump.

When the pump is supplied with control panel, there will not need a relay. In this case the control panel will make the protection task of the motor.

When the pump is supplied without control panel, relay is sent with the pump.

CAUTION

If the control panel is not supplied from our company, MAS DAF MAKINA SANAYI A.Ş. is not responsible for the malfunction resulting from electricity supply. In this case the pump and the relay will remain out of warranty.

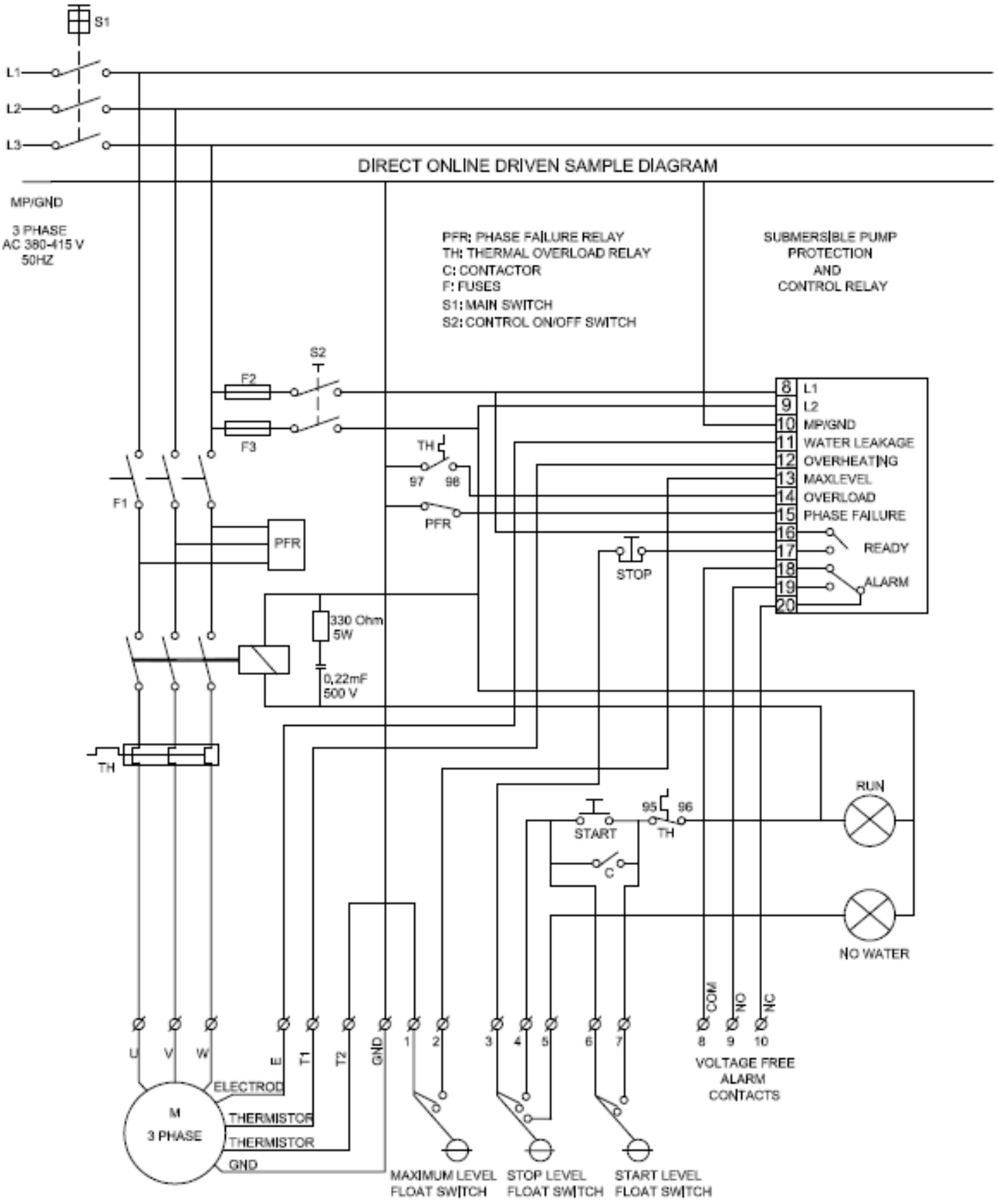

Figure 11 - Motor Protection and Control Relay Circuit Diagram – Direct Online Driven Sample Diagram

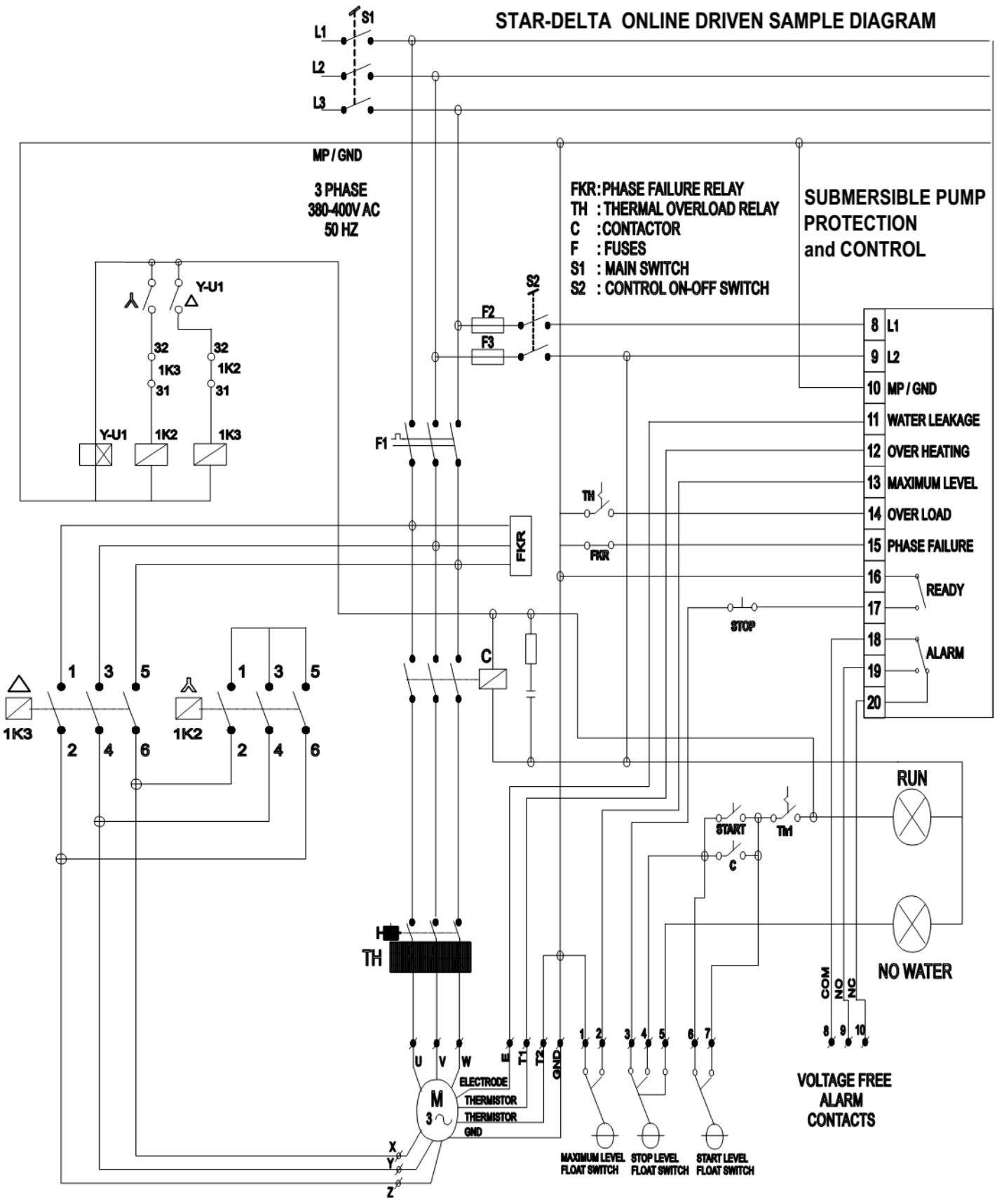

Figure 12 - Motor Protection and Control Relay Circuit Diagram – Star – Delta Online Driven Sample Diagram

7. COMMISSIONING, START UP AND OPERATING

Before pump is connected to the system, some points have to be controlled.

- Piping has to be made.
- Valves have to be closed and the piping should be empty.
- The entire pump must be in water.
- If there is electricity in control panel, electricity has to be cut off by switches and fuses.
- Oil leakage should be checked where the pump and other parts are located.
- It is certainly important that the ends of the cables are dry and not be submerged into the water.
- The voltage difference between phases should not be more than %5 in system where motor connected.
- Some precautions should be taken to prevent over and under voltage of electric motor. Suitable voltage control and phase control relays have to be used.
- Rotation of pump has to be controlled and if it is wrong, the cable connects have to be fixed by licensed electricians.

CAUTION

Do not start your pump dry (WITHOUT WATER)

7.1. Checking The Direction of Rotation

CAUTION

All types and of ENDURO Series Submersible Waste Water and Sewage Pumps rotate in clockwise (CW) direction viewed from the top. If all the electrical connections are done according to the instructions, the pump will rotate in the right direction. However, it is strongly advised to check the direction of rotation before installation of the pump down in the sump. To check the direction of rotation, while the pump is suspended in the air, first press the start button and then quickly press the stop button. Although the impeller cannot be seen, direction of the casing's reaction can be observed.

There are 3 situations;

1. If the reaction of the casing is in Counter Clock Wise (CCW), the direction of rotation is correct (CW). Electrical connections are done in the right way. Pump can be installed to the sump.
2. If the reaction of the casing is in clock wise (CW), the direction of rotation is incorrect (CCW). To fix the problem, the position of two motor cables to the panel must be exchanged. Please recheck the direction of rotation after exchange.
3. When the start button is pressed, if the contactor on the panel is not energized, PHASE FAILURE light is blinking and the motor is not running, whether there is a phase sequence failure or one of the phases is not energized. Make sure that all three phases one energized. Then, check for the phase sequence. The correct sequence is to be set according to direction of rotation.

7.2. Start-up Procedure

When the control panel is energized, make sure that sure that green indicator light (NORMAL) is switched on. This indicates there is not any failure and the electrical connections are done in the right way. Pressing the START button or increasing of water level to the set level will start up the motor.

7.3. Shut Down Procedure

The motor can be shut down manually by pressing the STOP button. The motor will also automatically stop when the water level drops below the minimum set level. If another application will be used instead of Level Controlled Automatic Starting System, please have **MAS DAF MAKINA SANAYI A.Ş.**' s approval for changed electrical diagram. **MAS DAF MAKINA SANAYI A.Ş.** refuses to assume any responsibility if the pump used for different applications without prior written permission.

8. MAINTENANCE

CAUTION

- 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.

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).
- 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.

8.2. Mechanical Seal

Mechanical Seals are absolutely leak tight and needs less maintenance than soft packing.

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.

Lay down the motor at which one of the two oil plugs is upside and the other is downside.

Open oil plugs and empty the oil into a clean pot.

If the oil is clean and clear, it means the mechanical seal is in good condition. The same oil can be used again.

If the oil is in yellow-gray color or it is mixed with water, it shows the mechanical seal is worn out and it needs to be changed. In this case the WATER LEAKAGE light will be off on the motor control panel and the motor will stop.

If the results of these four stages are positive, you can take down the pump into the sump.

8.3. Auxiliary Components

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

9. SERVICE AND SPARE PARTS

9.1. 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.

9.2. Spare Parts

The spare parts of ENDURO Series 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.

Component name	The number of equivalent pumps in the installation						
	1-2	3	4	5	6-7	8-9	10+
Impeller	1	1	2	2	3	4	%50
Rotor shaft	-	-	1	1	1	2	%20
Impeller nut	1	1	2	2	3	4	%50
Stator	-	-	1	1	1	2	%20
Bearings (motor side)	1	2	2	3	4	5	%60
Bearings (pump side)	1	2	2	3	4	5	%60
Mechanical seal	2	3	4	5	7	9	%100
O-rings	1	2	2	3	4	5	%60

Table 2 - Spare Part List

10. TIGHTENING TORQUES

Thread Diameter	**Tightening Torque Max (Nm)**	
	Property Classes	
	8.8	**10.9**
M4	3.0	4.4
M5	5.9	8.7
M6	10	15
M8	25	36
M10	49	72
M12	85	125
M14	135	200
M16	210	310
M18	300	430
M20	425	610
M22	580	820
M24	730	1050
M27	1100	1550
M30	1450	2100
M33	1970	2770
M36	2530	3560

Table 3 - Tightening Torque List

11. DISASSEMBLY, REPAIR AND 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”.

11.1. Disassembly

	STEPS OF ENDURO DISASSEMBLY	1,5 - 2,2- 3 - 4- 4 Compact - 5,5 Compact KW	5,5 - 7,5 - 11 Compact KW	11 - 15 - 18,5 Compact - 22 -30 - 37 KW
1	Disconnect the **CABLE** connection**.**	X	X	X
2	Separate **BOTTOM SUPPORT FOOT [40]** from the **VOLUTE CASING [1]**.		X	X
3	Unscrew **PLUGS [260]**, and drain the oil inside **OIL BOX [50]**.	X	X	X
4	Separate **TOP COVER [33]** from the **MOTOR CASING [3]**.			X
5	Separate **TOP BEARINGS [32]** from the **MOTOR CASING [3]**.			X
6	Unscrew bolts / nuts of **VOLUTE CASING [1]**, lift **MOTOR HOUSING [3]** with the help of cranes and remove the **VOLUTE CASING [1]**.	X	X	X
7	Position vertical builted **MOTOR CASING [3]**, the bottom to be the top on the suitable ground.	X	X	
8	If the pump type is PB, separate **CUTTER BLADE-INSIDE [42]** and **IMPELLER [20]** from the **SHAFT [60]**.	X	X	
9	Remove **IMPELLER WASHER [370]**, take out **IMPELLER [20]** by passing from the **SHAFT [60]**.	X	X	X
10	Remove **IMPELLER KEY [210]** from the slot.	X	X	X
11	Remove **2nd MECHANICAL SEAL [2/240].**			X
12	Remove **OIL BOX [50].**			X
13	Remove **1st MECHANICAL SEAL [1/240].**			X
14	Separate **TOP BEARING HOUSING [31]** from the **MOTOR CASING [3]**.			X
15	Remove **THE SHAFT [60]**,connected to the **BOTTOM BEARING [201]**, from the **STATOR [501]**.			X
16	Remove **BEARING COVER [32].**			X
17	Remove the **MECHANICAL SEAL [240].**	X	X	
18	Remove **OIL BOX [50].**	X	X	
19	Remove **TOP COVER [33]**.	X	X	
20	Take up **ROTOR [500]** and **BOTTOM BEARING HOUSING [30]** from the **STATOR [501]** by laying the motor body.	X	X	
21	Remove **SHAFT [60]** from the **BOTTOM BEARING [201]**.			X

Table 4 - Sorting of ENDURO Disassembly

11.2. Reassembly

	STEPS OF ENDURO REASSEMBLY	1,5 - 2,2- 3 - 4- 4 Compact - 5,5 Compact KW	5,5 - 7,5 - 11 Compact KW	11 - 15 - 18,5 Compact - 22 -30 - 37 KW
1	Seat **BOTTOM BEARINGS [201]** on the **BOTTOM BEARING HOUSING [30]** by passing **SHAFT [60]** through **BOTTOM BEARING HOUSING [30]** (use oil).			X
2	Mount **BOTTOM BEARING [30]** by attaching **1st MECHANICAL SEAL FIXED ELEMENT [240/1]** to **BEARING COVER [32]** with the help of oil.			X
3	Mount the **BOTTOM BEARINGS [201]** of **SHAFT [60]** to **BOTTOM BEARING HOUSING [30],** attach **INNER RETAINING RING [230].**	X	X	X
4	Insert **ROTOR [500]** and **BOTTOM BEARING HOUSING [30]** to the **STATOR [501]** by laying the **MOTOR CASING [3]**.	X	X	
5	Close **TOP COVER [31],** seat **TOP BEARING [200]** on the **TOP BEARING HOUSING [31]**/ connect with bolts.	X	X	
6	Position vertical builted **MOTOR CASING [3]**, the bottom to be the top on the suitable ground.	X	X	
7	Mount **OIL BOX [50].**	X	X	
8	Connect **MECHANICAL SEALS [240]** carefully.	X	X	
9	Bearing the **ROTOR BEARINGS [200 and 201]** by inserting **TOP BEARING HOUSING [31]**.			X
10	Connect **1st MECHANICAL SEAL [1/240]** carefully.			X
11	Mount **OIL BOX [50].**			X
12	Connect **2nd MECHANICAL SEAL [2/240]** carefully.			X
13	Insert **IMPELLER KEY [210]** into the slot on the **SHAFT [60]**.	X	X	X
14	Pass **IMPELLER [20]** to the **SHAFT [60]** and tighten **IMPELLER WASHER [370].**	X	X	X
15	If the pump type is PB, connect **CUTTER BLADE-INSIDE [42]** and **IMPELLER [20]** to the **SHAFT [60]** end.	X	X	
16	Lift **MOTOR HOUSING [3]** with the help of cranes and sat on **VOLUTE CASING [1]** and tighten the connecting bolt.	X	X	X
17	Fill **OIL BOX [50]** with 30 number mineral oil and insert **PLUGS [260].**	X	X	X
18	Mount **TOP COVER [33].**			X
19	Connect **BOTTOM SUPPORT FOOT [40]** to the base.		X	X
20	Make the **CABLE** connection.	X	X	X

Table 5- Sorting of ENDURO Reassembly

12. 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.

ERROR	POSSIBLE CAUSES	POSSIBLE SOLUTIONS
Motor is not working	No electricity	Electrical components should be checked by licensed electricians.
	Low voltage	Check the voltage
	Fuses cut down	Fuses should be replaced by licensed electricians
	Float gauges are broken	Check the gauges.
	Energy and control cable is broken.	Change the energy and control cables.
Low capacity or there is no discharge	Reverse direction of rotation.	Check the rotation and correct it if necessary.
	Discharge piping blocked.	Discharge piping should be cleaned up by backwashing.
	Manometric head is too high.	Recalculate the static pressure and system losses.
	Impeller/casing is blocked.	Clean inside of the pump.
	Impeller had worn out.or broken	Change the impeller.
Overheat	The level of the stop float switch is too low. Motor runs dry.	Increase the level of the stop float switch.
	Manometric head is too high.	Adjust the flow control valve according to the manometric head stated on the name plate.
	Pumped liquid is very dense or its specific gravity is high.	Adjust the flow control valve according to the current stated on the name plate.
Water leakage	Energy and control cable has been crushed or torn.	Change the power cable.
	O-rings are damaged.	Do not open the connections of electricity, motor body and oil bath. Call MASDAF Services immediately for technical support.
	Mechanical seals are damaged.	
	Inside of the casing filled with solid particles.	
	Connections of relays are wrong.	
	Relay is broken	

Table 6 - Possible Failures, Causes, Solutions

13.SECTIONAL DRAWING AND PART LIST

ENDURO 50-160 PB

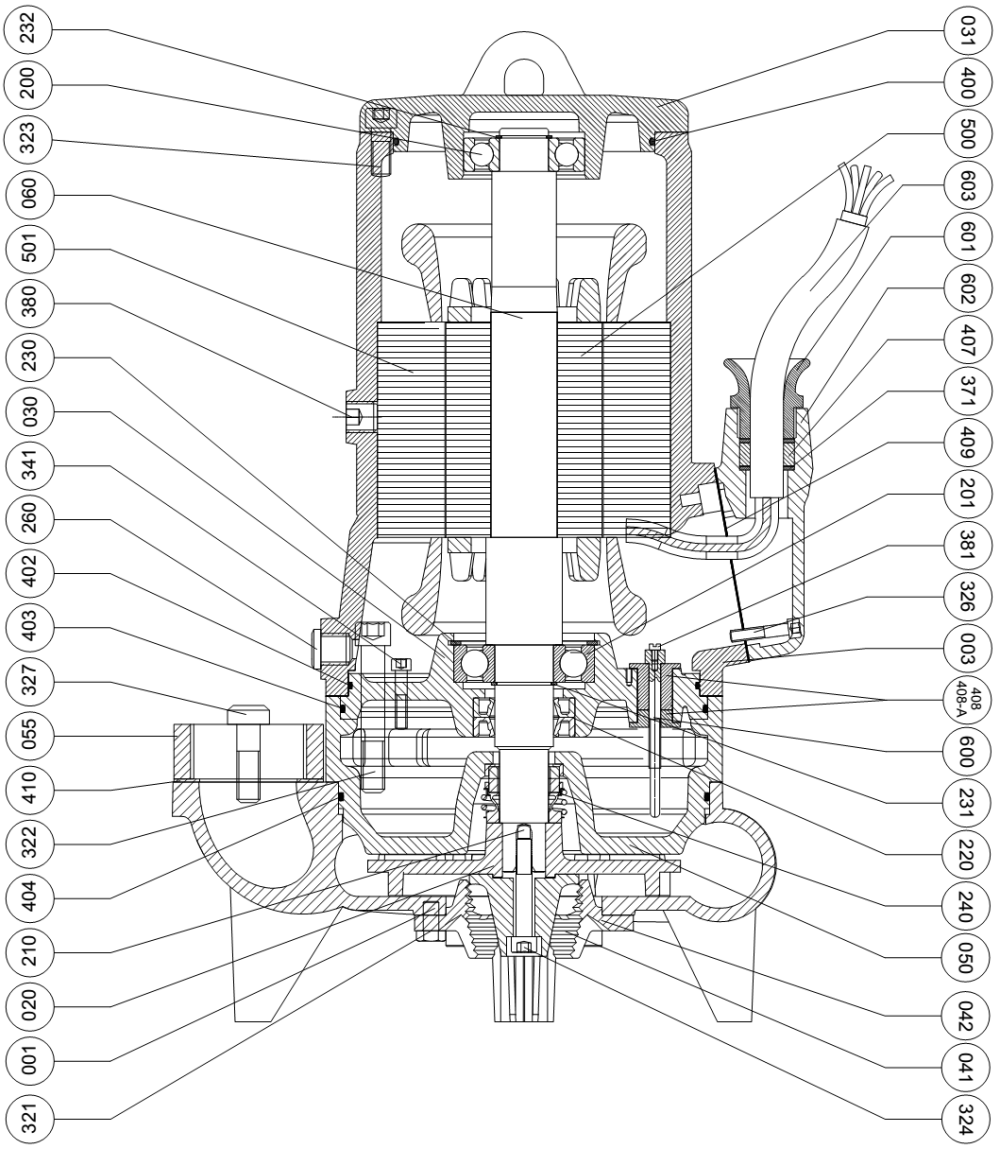

Figure 13 - ENDURO 50-160 PB Sectional Drawing

PART NO	PART NAME	PART NO	PART NAME	PART NO	PART NAME
01	Volute Casing	230	Retaining Ring	381	Electrode Screw
03	Motor Casing	231	Retaining Ring	400	O-Ring
20	Impeller PB Type	232	Retaining Ring	402	O-Ring
30	Bottom Bearing Housing	240	Mechanical Seal	403	O-Ring
31	Top Bearing Housing	260	Plug	404	O-Ring
41	Cutter Blade (inside)	321	Hexagon Head Bolt	407	Bushing Gasket
42	Cutter Blade (outside)	322	Imbues Bolt	408-408A	Electrode Seal
50	Stuffing Box	323	Imbues Bolt	409	Cover Gaskets
55	Flange	324	Imbues Bolt	500	Rotor
60	Shaft	326	Imbues Bolt	501	Stator
200	Top Bearing	327	Hexagon Head Bolt	600	Electrode
201	Bottom Bearing	341	Imbues Bolt	601	Bushing
210	Impeller Key	371	Gland Gasket Washer	602	Cable Cover
220	Oil Seal	380	Setscrew		

Table 7 - ENDURO 50-160 PB Part List

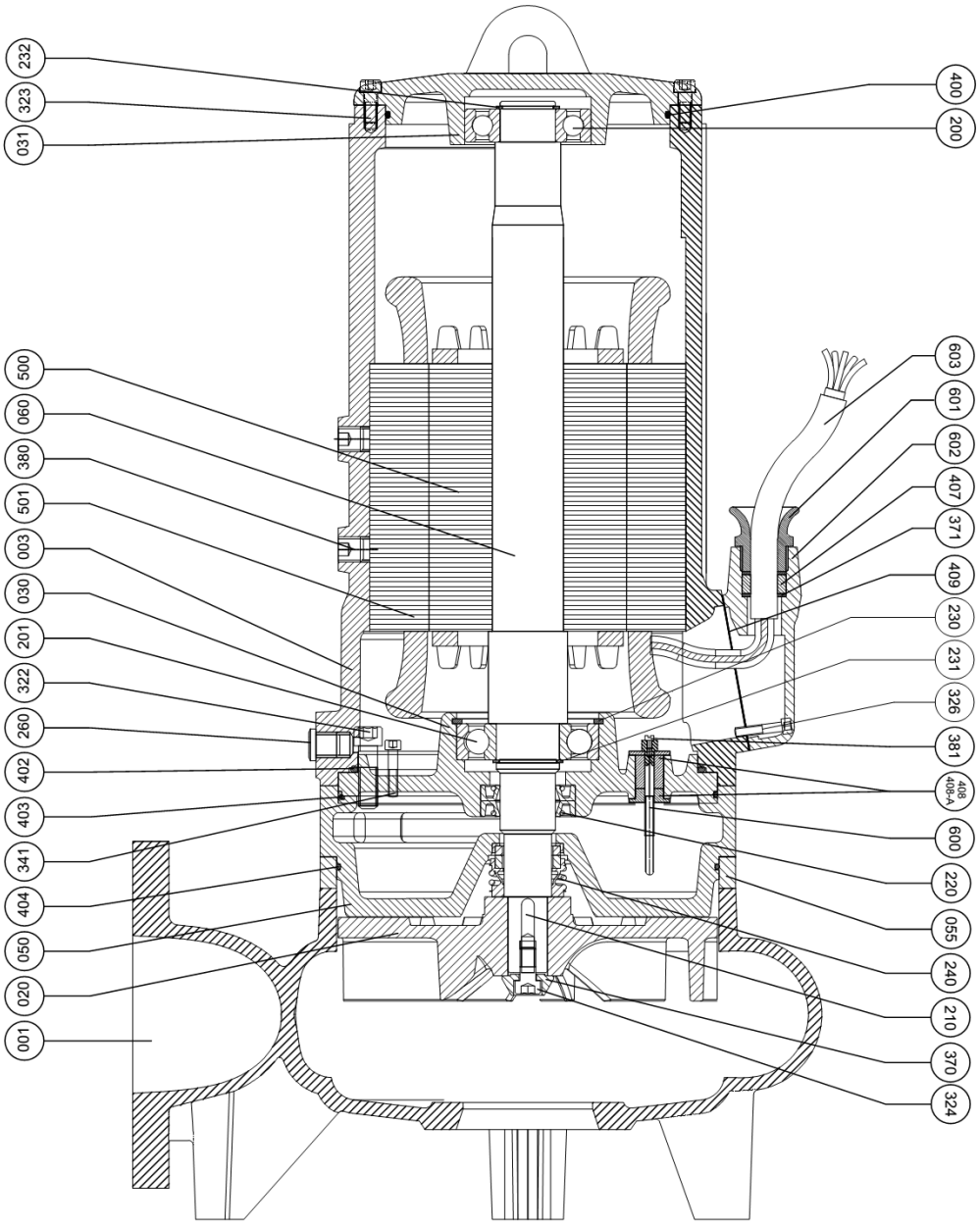

Figure 14 - ENDURO 100-240 X Sectional Drawing

PART NO	PART NAME	PART NO	PART NAME	PART NO	PART NAME
01	Volute Casing	232	Retaining Ring	400	O-Ring
03	Motor Casing	240	Mechanical Seal	402	O-Ring
20	Impeller X Type	260	Plug	403	O-Ring
30	Bottom Bearing Housing	322	Imbues Bolt	404	O-Ring
31	Top Bearing Housing	323	Imbues Bolt	407	Bushing Gasket
50	Stuffing Box	324	Imbues Bolt	408-408A	Electrode Gasket
60	Shaft	325	Imbues Bolt	409	Cover Gasket
200	Top Bearing	326	Imbues Bolt	500	Rotor
201	Bottom Bearing	341	Imbues Bolt	501	Stator
210	Impeller Key	370	Impeller Washer	600	Electrode
220	Oil Seal	371	Gland Gasket Washer	601	Bushing
230	Retaining Ring	380	Setscrew	602	Cable Cover
231	Retaining Ring	381	Electrode Screw		

Table 8 - ENDURO 100-240 X Part List

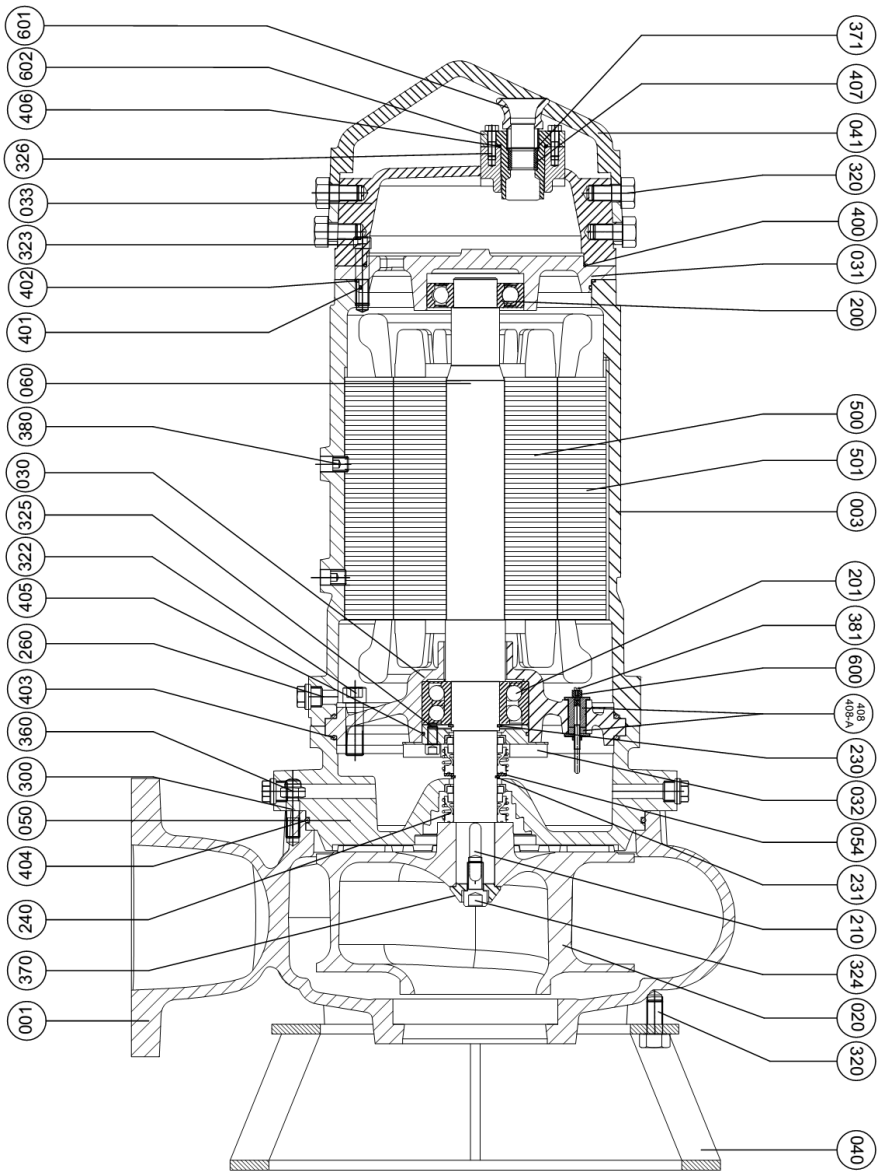

Figure 15 - ENDURO 150-315 D Sectional Drawing

PART NO	PART NAME	PART NO	PART NAME	PART NO	PART NAME
01	Volute Casing	230	Retaining Ring	381	Electrode Screw
03	Motor Casing	231	Retaining Ring	400	O-Ring
20	Impeller D Type	240	Mechanical Seal	401	O-Ring
30	Bottom Bearing Housing	260	Plug	402	O-Ring
31	Top Bearing Housing	300	Stud	403	O-Ring
32	Bearing Cover	320	Hexagon Head Bolt	404	O-Ring
33	Top Cover	322	Imbues Bolt	405	O-Ring
40	Bottom Support Foot	323	Imbues Bolt	406	O-Ring
41	Handle	324	Imbues Bolt	407	Bushing Gasket
50	Stuffing Box	325	Imbues Bolt	408-408A	Electrode Gasket
54	Mechanical Seal Sleeve	326	Imbues Bolt	500	Rotor
60	Shaft	360	Nut	501	Stator
200	Top Bearing	370	Impeller Washer	600	Electrode
201	Bottom Bearing	371	Gland Gasket Washer	601	Bushing
210	Impeller Key	380	Setscrew	602	Bushing Gland

Table 9 - ENDURO 150-315 D Part List

14. PUMP SIZE LIST

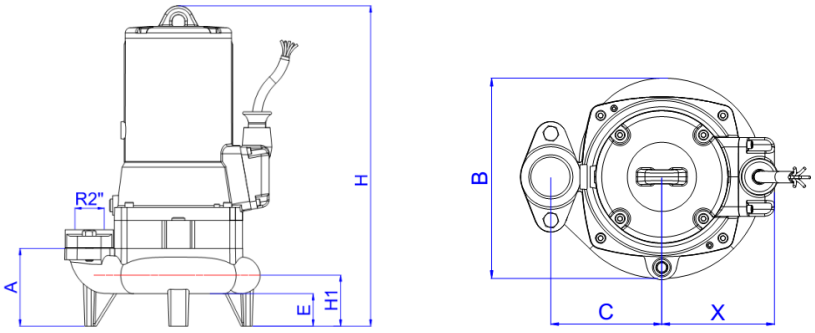

Figure 16 - ENDURO 50-160 Representation of Size

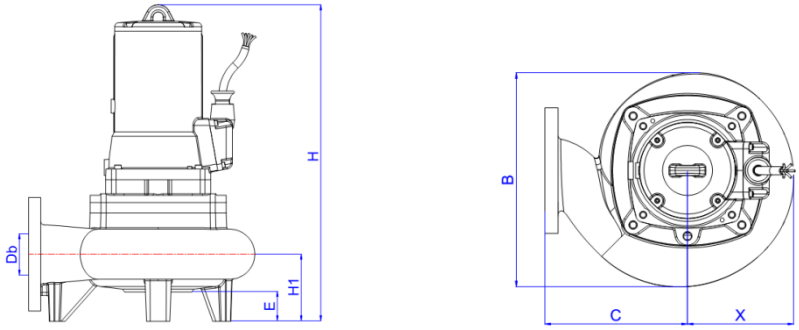

Figure 17 - ENDURO 100-240 Representation of Size

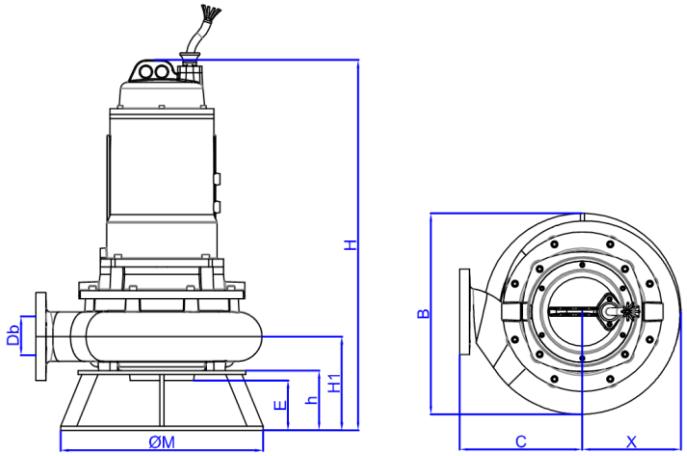

Figure 18 - ENDURO 100-315 Representation of Size

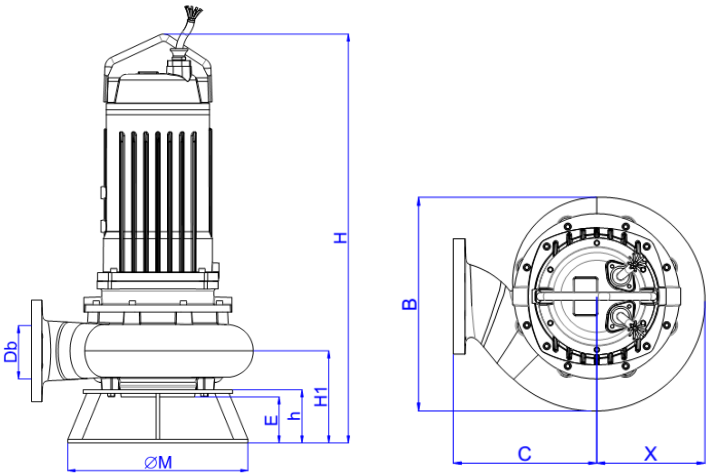

Figure 19 - ENDURO 150-315 Representation of Size

Pump Type	Motor Type (IEC)	Dbø	H	H1	h	E	C	X	B	Mø	A
50-160	90L	50	470	80	-	51	141	133	255	-	122.5
	100L		506					141			
	112M		540					149			
50-200	100L		525	85		50	227	160	313		-
	112M		560								
	132S		580								
	132M		680								
80-190	100L	80	570	100		38.5	200	157	300		
	112M		605								
80-250	112M		620	110		27	280	197	400		
	132S		640								
	132M		740								
	160M		795								
	160L		895								
100-240	100L	100	593	130		57	250	185	375		
	112M		630								
	132M		750								
100-250	112M		665	145		35	300	210	420		
	132M		785								
	160L		940								
100-315	132M		905	235	150	125	315	250	497	506	
	160L		1025								
	180L		1100								
150-315	160L	150	1067	260	150	130	355	270	530		
	180L		1142								
	200L		1200								

Table 10 - Pump Size Table

15. DRAWING FOR DISMANTLING

SMALL PUMPS

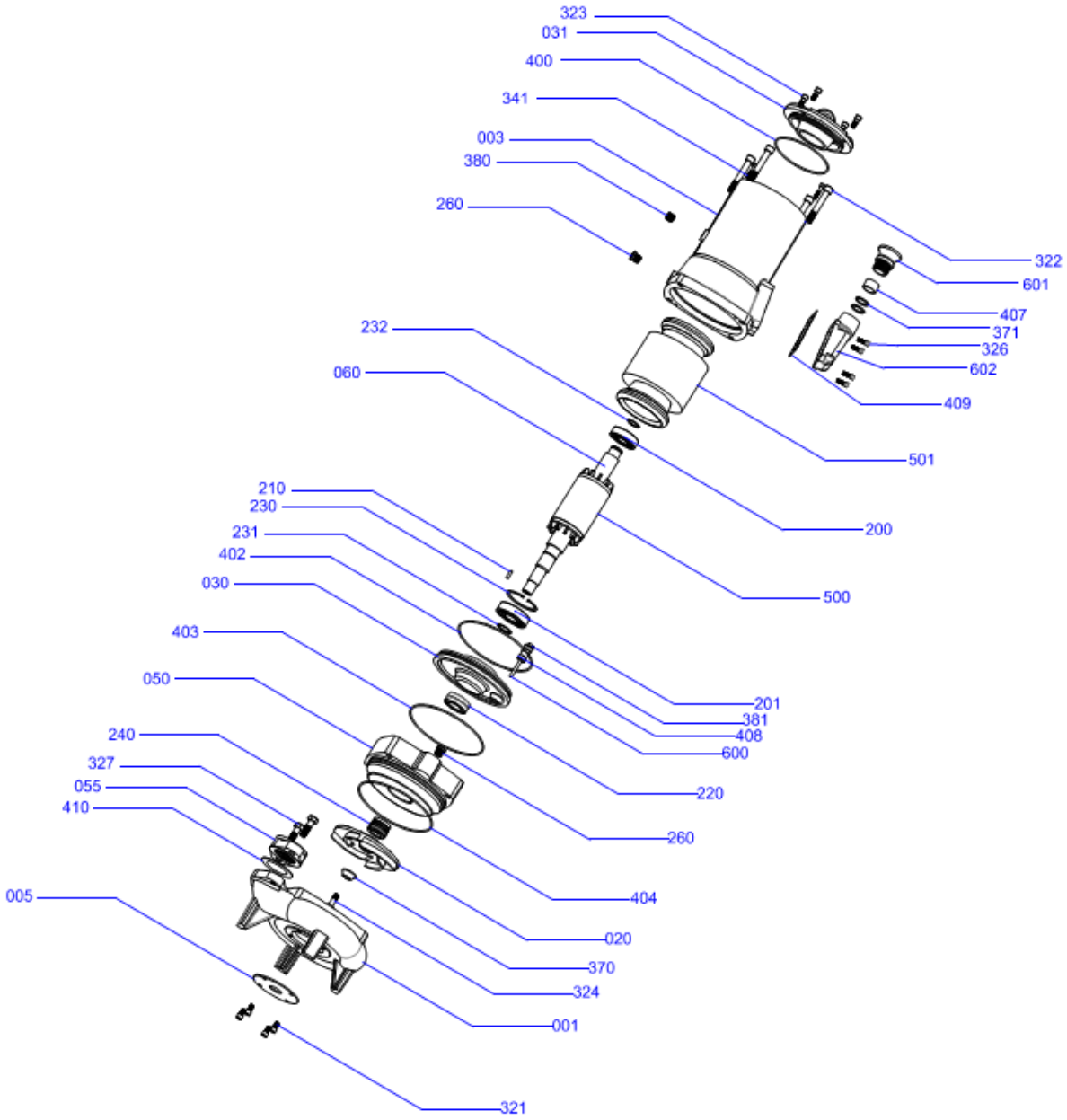

Figure 20 - Small Pumps Drawing for Dismantling

PART NO	PART NAME	PART NO	PART NAME	PART NO	PART NAME
01	Volute Casing	231	Retaining Ring	381	Electrode Screw
03	Motor Casing	232	Retaining Ring	400	O-Ring
05	Suction Opening	240	Mechanical Seal	402	O-Ring
20	Impeller PB Type	260	Plug	403	O-Ring
30	Bottom Bearing Housing	321	Hexagon Head Bolt	404	O-Ring
31	Top Bearing Housing	322	Imbus Bolt	407	Gland Gasket
50	Stuffing Box	323	Imbus Bolt	408	Electrode Gasket
55	Flange	324	Imbus Bolt	409	Cover Gasket
60	Shaft	326	Imbus Bolt	410	Flange Gasket
200	Top Bearing	327	Hexagon Head Bolt	500	Rotor
201	Bottom Bearing	341	Imbus Bolt	501	Stator
210	Impeller Key	370	Impeller Washer	600	Electrode
220	Oil Seal	371	Gland Gasket Washer	601	Bushing
230	Retaining Ring	380	Setscrew	602	Cable Cover

Table 11 - Small Pumps Part List

SMALL PUMPS WITH GRINGING BLADE

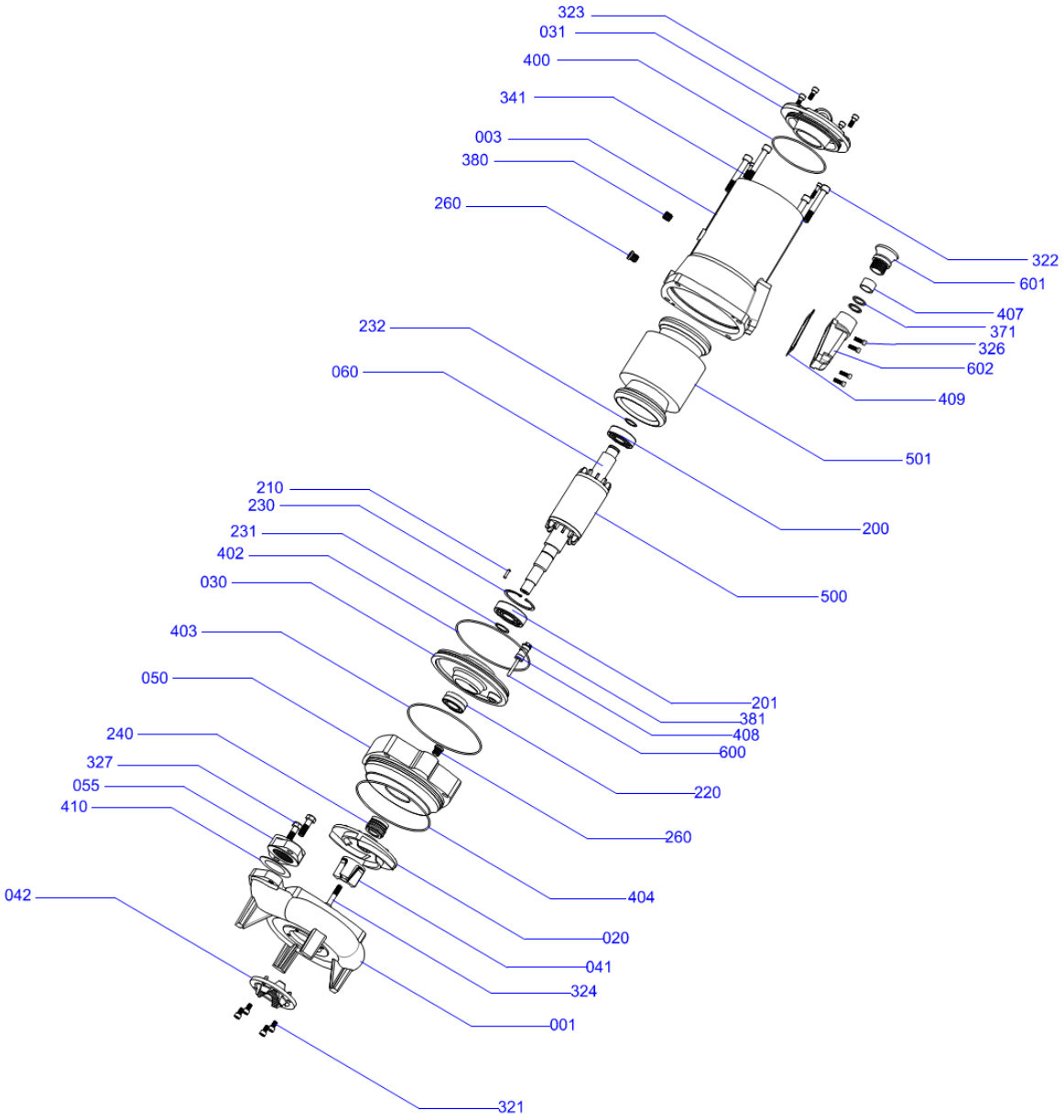

Figure 21 - Small Pumps With Gringing Blade Drawing for Dismantling

PART NO	PART NAME	PART NO	PART NAME	PART NO	PART NAME
01	Volute Casing	230	Retaining Ring	381	Electrode Screw
03	Motor Casing	231	Retaining Ring	400	O-Ring
20	Impeller PB Type	232	Retaining Ring	402	O-Ring
30	Bottom Bearing Housing	240	Mechanical Seal	403	O-Ring
31	Top Bearing Housing	260	Plug	404	O-Ring
41	Cutter Blade (inside)	321	Hexagon Head Bolt	407	Gland Gasket
42	Cutter Blade (outside)	322	Imbus Bolt	408	Electrode Gasket
50	Stuffing Box	323	Imbus Bolt	409	Cover Gasket
55	Flange	324	Imbus Bolt	410	Flange Gasket
60	Shaft	326	Imbus Bolt	500	Rotor
200	Top Bearing	327	Hexagon Head Bolt	501	Stator
201	Bottom Bearing	341	Imbus Bolt	600	Electrode
210	Impeller Key	371	Gland Gasket Washer	601	Bushing
220	Oil Seal	380	Setscrew	602	Cable Cover

Table 12 - Small Pumps With Gringing Blade Part List

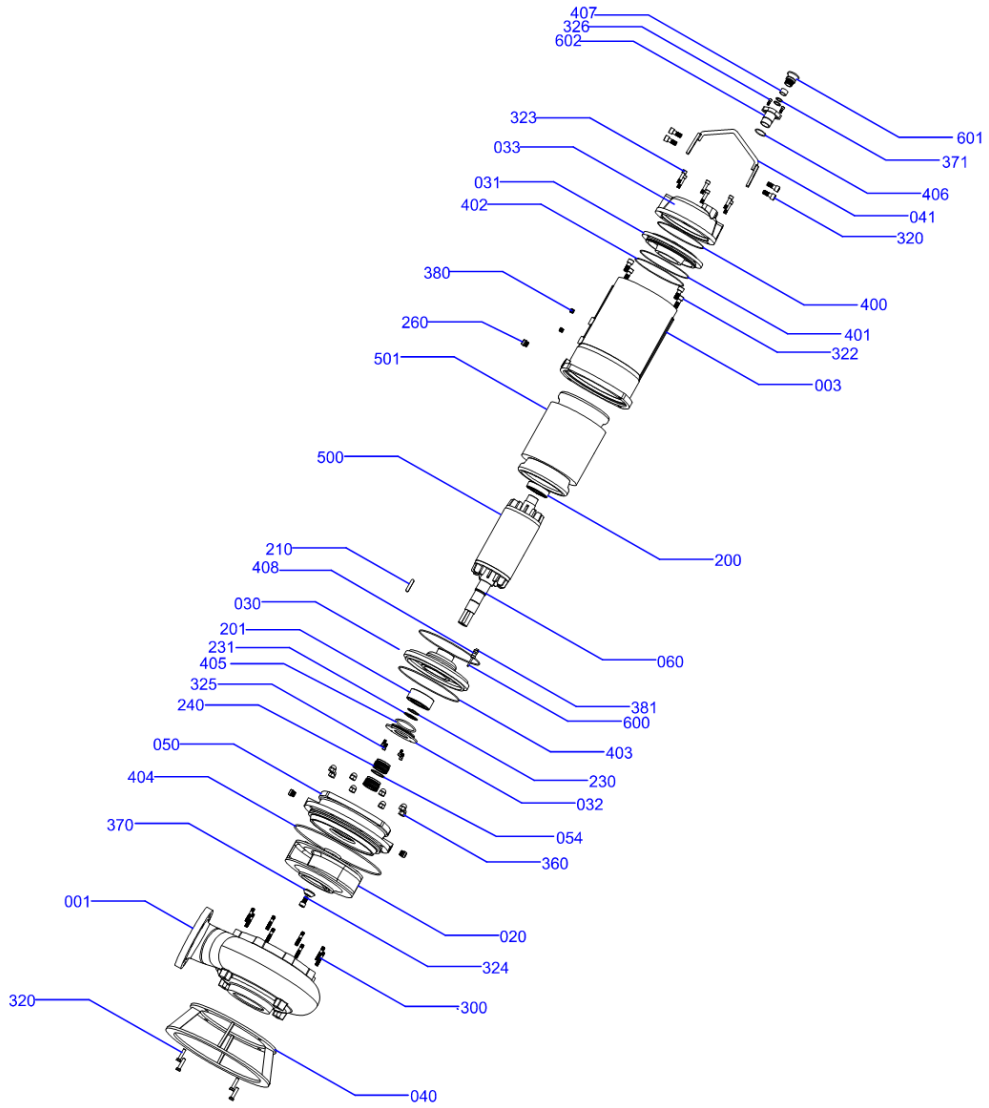

Figure 21 - Pumps With Double Mechanical Seal Drawing for Dismantling

PART NO	PART NAME	PART NO	PART NAME	PART NO	PART NAME
01	Volute Casing	230	Retaining Ring	381	Electrode Screw
03	Motor Casing	231	Retaining Ring	400	O-Ring
20	Impeller D Type	240	Mechanical Seal	401	O-Ring
30	Bottom Bearing Housing	260	Plug	402	O-Ring
31	Top Bearing Housing	300	Stud	403	O-Ring
32	Bearing Cover	320	Hexagon Head Bolt	404	O-Ring
33	Top Cover	322	Imbus Bolt	405	O-Ring
40	Bottom Support Foot	323	Imbus Bolt	406	O-Ring
41	Handle	324	Imbus Bolt	407	Bushing Gasket
50	Stuffing Box	325	Imbus Bolt	408	Electrode Gasket
54	Mechanical Seal Sleeve	326	Hexagon Head Bolt	500	Rotor
60	Shaft	360	Nut	501	Stator
200	Top Bearing	370	Impeller Washer	600	Electrode
201	Bottom Bearing	371	Gland Gasket Washer	601	Bushing
210	Impeller Key	380	Setscrew	602	Gland

Table 12 - Pumps With Double Mechanical Seal Part List

16. FIGURE LIST

17. TABLE LIST

Mas Grup

Head Office / Service Center:
Aydınlı Mah. Birlik OSB. 1.No'lu Cadde No:17 Tuzla - İSTANBUL / TURKEY
Tel: +90 (216) 456 47 00 pbx Fax: +90 (216) 455 14 24

Ankara Regional Directorate:
Aşağı Öveçler Mah. 1329 Sok. No:6/9 Öveçler ANKARA / TURKEY
Tel: +90 (312) 472 81 60-67 Fax: +90 (312) 472 82 51

Factory:
1. Organize Sanayi Bölgesi Parsel 249/5 Beyköy - DÜZCE / TURKEY
Tel: +90 (380) 553 73 88 Fax: +90 (380) 553 71 29