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Erduro Fluid Solutions

EARS-D

MULTI STAGE PUMPS USER MANUAL

Fluid Solutions

GENERAL WARNINGS ABOUT USER MANUAL

Aim of this user manual is; ,

- to convey instructions about installation, maintenance and repair of pump, and to explain start, operation and stop methods of pump.

-. Absolutely keep this manual in a secured place to be accessed easily by official who is responsible for safe operation and maintenance of pump.

- Pump should not be operated under conditions which are not mentioned in purchase order. Because, operational conditions which are given in purchase order are considered at material selection and trial.

ERDURO , does not accept any warranty conditions for all kind of changes and repair operations which are performed by user and unauthorized people.

- Instructions in this manual should carefully be examined and applied in every installation and operation process of pump for preventing misuse.

- Responsible Personnel should be experienced and have knowledge about related standards.

- If it is necessary to operate pump under conditions out of the ones those are mentioned in purchase order, please contact with ERDURO authorized service. ERDURO shall not be liable for damages which may occur because of operation under conditions out of mentioned ones without written permission of service.

- If carried pumps shall not be installed immediately, it should be kept in an environment where temperature and humidity does not change so frequently. If appropriate precautions are not taken, very high temperatures and low temperatures and humidity may severely damage pump.

- User is responsible for control and installation to be performed by authorized personnel who have read and examined this user manual.

This user manual does not cover safety rules to be applied in usage area.

Usage tine for pumps which is determined and announced by Ministry is 5(five) years.

SAFETY INSTRUCTIONS

- You should absolutely obey the following safety instructions.

- Never touch the pump and pipes having temperature more than 80 ºC. Necessary precautions should be taken for warning users. (E.g Warning signs and signboards)

- Never operate pump in reverse direction.

- Do not walk over pump pr pipes which are connected to pump.

- Any operation which will be done in pump should be performed by at least two staffs.

- No works should certainly be done over without stopping pump group.

- Power coming to pumps should be off and you should be sure that it will not operate again before you make any work

- Absolutely install the safety guards which were dismounted before after work in pump has finished.

- Tensions and cricks in pipe system absolutely should not reach to pump.

- Do not make any operation while pump and pipes which are connected to pump are under pressure.

- Cloths of personnel who will work over should be suitable and/or they should use safety equipments.

- Never do any operations when pump is still hot.

- Electrical connection related with pump and auxiliary equipments should be suitable with local rules and made by authorized personnel.

- Operate pump with only specified conditions.

- Do not insert your hand and fingers into holes and spaces over pump body.

- Be always careful while working with pumps discharging hazardous liquids.

EARS-D SERİES PUMPS

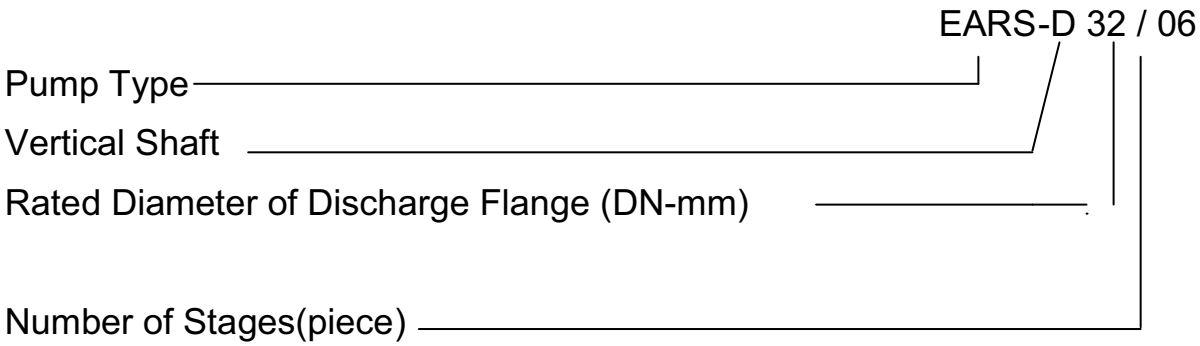
EARS Series Pumps are centrifugal pumps having horizontal shaft, separable radial body, are multi staged, has closed impellor, diffuser

Usage Areas of Motor Water Pump

Pumps are suitable for discharging liquids which are low viscose, whose flow temperature is up to 120ºC and which are clean or a little dirty. (Max20mg/dm³) . In addition to others; main application areas are:

- Heating and Cooling Systems
- Water Supply
- Fire Extinguishing Plants
- Water Supply and Circulation Systems in Industrial Plants
- Watering Systems
- Power Stations

Explanation of Pump Codes



Technical information

Speed : Up to 3600 d/d rpm

Discharge Flange :DN32 …DN200

Suction Flange :TS ISO 7500-2/PN16,DIN2533/PN16

Discharge Flanges :TS ISO 7500-2/PN40,DIN2535/PN40

Operational Temperature :-10ºC…140ºC cooled soft gasket

Ambient Temperature (Maximum) :+40ºC

Body Pressure :30 bar-(50 Bar)

Isolation Class :F

Protection Class :IP55

Motor Connection :3 Phase-380 V-50 Hz

Motor Options(Optional) : Special Voltage Special Frequency

SHIPPING OF PUMPS

- Check whether all materials in delivery list are sent. .

- If there is damage during shipping please notify ERDURO Shipping Department and Transportation company.

- If there are missing materials, immediately inform ERDURO Shipping Department.

-. Check whether packaging is damaged during transportation.

- Please carefully take out packaged pump and accessories (if any). Check whether they are damaged during transportation.

CARRYING

General warnings.

Absolutely obey the following rules during transportation.

-. Use proper wooden crane, forklift, or hoisting mechanisms For unloading or loading wooden cases, packages, boxes and palettes depending on their weight and volume.

- Wear gloves, hard tip shoes and helmet during carrying works.

Pump and Motor Group Loading/Unloading

Before lifting pump group please determined the following properties.

- Locations of lifting points
- Total weight and centre of gravity.
- Packaging external dimensions
- During loading/unloading make accelerating and braking operations as it shall not cause any damage for working personnel.
- Load lifting capacity should be suitable with pump and pump group weight.
- You should never stay under or near lifted load.
- Pump should be hoisted as it is indicated in Figure 1 -1 and Figure 1 -2 for not causing any damage in pumps. Motor hanging ring should absolutely not be used while lifting complete group.
- Load should be kept in lifted position more than required time.
- Pump and pump group should always be lifted and carried in horizontal position

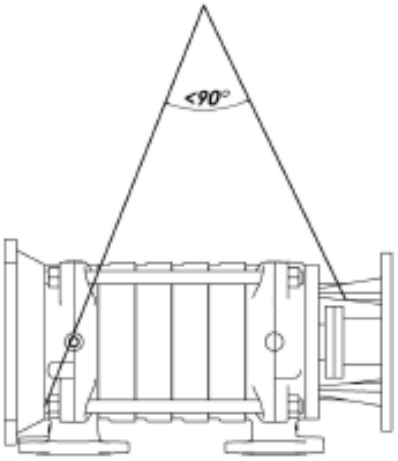


Figure 1 -1 Single Pump

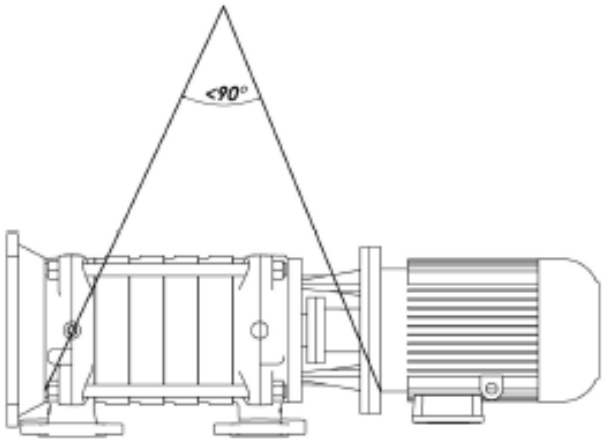


Figure 1-2 Motopomp

STORAGE

- If pump group is not immediately installed, it should be stored in a place which is clean dry and does not include freezing and explosion risk.
- If pump bearing are type which should be greased, they should be extra greased for preventing entry of moisture to bearings around shaft
- Pump should be protected from moisture, dust, dirt and foreign objects by covering with suitable material.

- Pump shaft should be rotated a few turns (e.g once a week) for preventing pitting around pump bearing surfaces and jamming of shaft.

INSTALLATION

Installation of pump to its place and connection setup should only be done by expert personnel. Failed installation and pump ground may cause failures.

This situations are not covered with warranty

- If pump is supplied without motor (without motor, proper motor should be selected prior start to installation of group.

Following properties should be considered during motor selection.

- Maximum power of pump (in all operation ranges)

- Operational revolution of pump shaft

- Necessary power supply

- Motor Type

- Motor connection type (footed, flanged, horizontal, vertical etc.)

- If pump is purchased as single pump (without motor and chassis); a proper frame should be constructing for putting this group over it. Frame to be constructed should have dimensions and strength which will not permit vibration and shape defects. Starting the motor should be done with control cabinet which is prepared according to power of motor and floater should absolutely be used for preventing to operate without water. Also collector diameter should be suitable with pumps efficient operational ranges not with installation.

Before start to pump installation

- Protecting parts in discharge and suction pumps should be removed and cleaned well.

-. Pump should be installed in a places which does not have freezing or explosion risk and have well air conditioning.

- There should be enough space around pump for accessing pump easily and for maintenance operations and there should be sufficient height and space for lifting pump if necessary.

- Pump suction pipe should be as short as possible.

- You should be carefully work at pump installation ground preparation and installation of pump group into its place. Incorrect and careless installation causes early wearing of pump parts and failures.

- Pump ground should be so heavy to absorb vibrations and sturdy to prevent bends and adjustments defects. Ground concrete should completely be solidified, completed its plug time and proper stud bolts are placed in pump frame fixing holes and proper fixing lugs should be placed for using in making connections with welding. Concrete and plate upper surface should be horizontal and very smooth.

INSTALLATION

Installation of pump group to ground by anchoring stud bolts:

- Pump group is placed to center the stud bolt slots which are opened in ground concrete.

- Anchoring stud bolts are inserted through fixing holes over pump frame fixing holes and places into their slots.

- Pump group is places over base concrete. Water balance is placed over pump discharge flange and horizontality of pump is controlled. If there is a horizontal imbalance in pumps position, steel wedges are put under frame and balance of pump group is obtained.

- Nuts of anchoring stud bolts are installed.

- Anchoring stud bolt holes are filled with concrete grout.

- Anchoring stud bolts are reciprocally tightened.

- Coupling setup is controlled in this situation.

- Concrete is poured into pump frame. Joining of poured concrete and ground concrete is cared.

- Complete binding of concrete is controlled and anchoring stud bolts are reciprocally tightened.

- Coupling adjustment is again controlled with template. If there is maladjustment, coupling adjustment is made again.

- Discharge and suction flange fixings of pump are controlled again. If there are unnecessary strains and cricks they are eliminated.

- Coupling guards are placed after coupling adjustment.

:Installation of pump group with concrete fixing plug :

- Pump is placed into ground concrete or the ground to be installed carefully.

Pump group frame fixing holes are marked to concrete. Pump group lifted again.

- Marked places where fixing plugs will be placed are drilled carefully according to standards.

- Fixing plugs are carefully placed into drilled places.

- Steps for installation with anchoring stud bold are made here with same order.

INSTALLATION OF PIPE EQUIPMENT

- Nominal diameter of pump discharge and suction pumps are not an indicator for correct diameters for discharge and suction pipes. Pipes and accessories having diameter less than pump opening diameter should absolutely not be used. Especially bottom backwater valve, dirt retainer, filter and check valves and similar elements should be chosen to having a larger passing area. Never use pump as a supporting point for pipe installation or a as a carrier.

-Cricks and stresses in pipe and pipe weight equipments should be controlled whether they effect pump. For this reason, bolts of discharge and suction flanges should be loosen and it should be controlled whether pipe system exerts a stress over pump.

- Never use pumps as a support point or carrier for a pipe installation

- Flow rates generally should not exceed 2m/s in suction pipe and 3 m/s discharge pipe. High speeds cause decrease in pressure which will cause cavitations conditions and excess friction losses in discharge pipe.

- Pipe system should be supported from points which are close to pipe

- Pipe connections should be made by flanges. Flanges gaskets should be produced from suitable material and should have suitable dimensions. Gaskets which will be used between flanges should be centered for not preventing water flow.

- Proper expansion equipments should be used for preventing additional forces to pump which may occur because of expansion in systems which operate in over vibrant and hot liquids.

- Welding burrs, metal particles, which may occur during pipe equipment production sand, and oakum and similar foreign objects may present inside pump. Suction and discharge flanges should be closed with gasket without hole for preventing those materials enter into pump during installation. At the end of installation, all pipe parts should be dismounted, cleaned and dyed and installed again. If dirt retained is used at pump suction line, it should be removed and cleaned after first few days of operation and installed again.

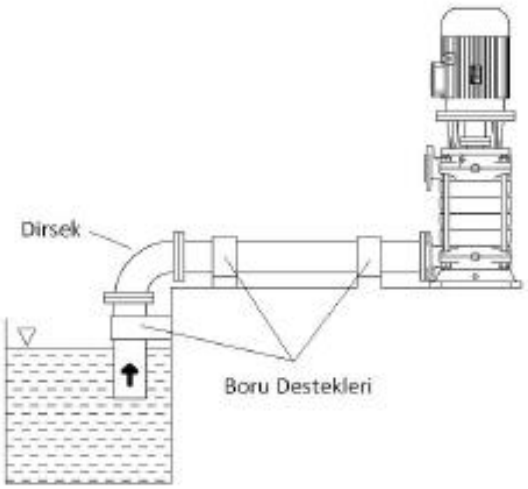


Figure 2-1Suction from Height

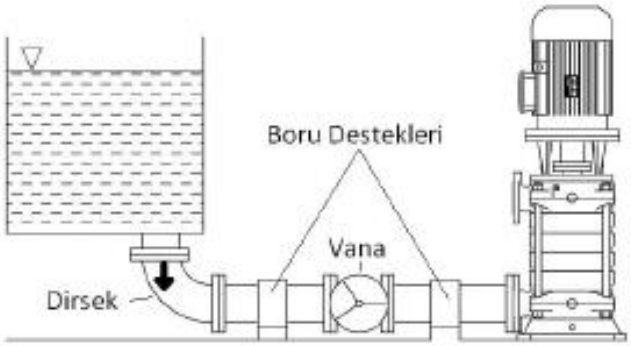


Figure 2-2 Suction from Height

Suction and Discharge Pipe Connections

- If pump is supplied from a tank which is higher than pump, there should be an isolation valve in suction pipe whose axis will be in horizontal position. This valve should be completely open while pump is in operation and should never be used as flow rate adjustment valve. (Attention: Closing valve may cause pump operation with cavitations.)

- Suction pipe should absolutely be impermeable and should not be arranged to cause any air wall. In this case if a tank is supplied from a tank which is higher than pump, (suction high installation) suction pipe should be slightly decreasing sloped towards pump and supplied from a tank which is lower than pump, suction pipe should be slightly increasing sloped towards pump.

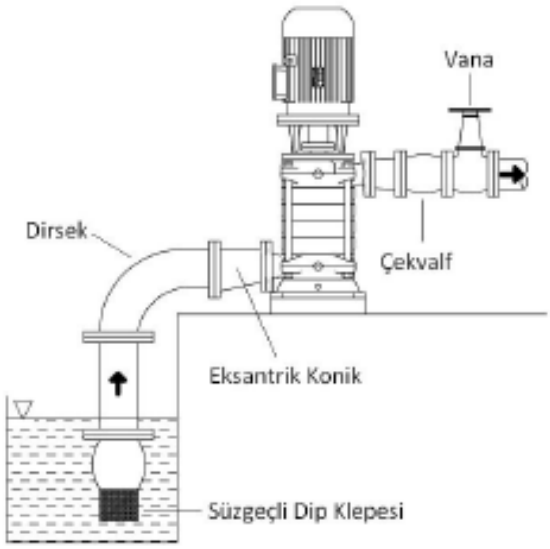


Figure 3-1Suction from Height

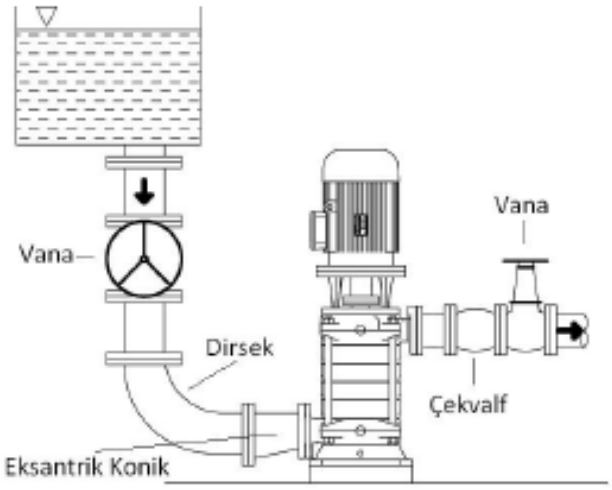


Figure 3-2 Suction from Height

- Sharp bends should not be used, sudden direction changes and cross section narrowing should be avoided and suction pipe should be short as possible for keeping pump friction losses as low as possible. If there is need of cross section change in horizontal suction pipe, an intermediate eccentric conical part whose flat type is at upper side should be used.

-. If pump discharging height is more than 10 m or discharging line is very long, a check valve should be placed over discharging pipe between pump and isolation valve for protecting pump against water impulses and reverse flows during stop.

- A control valve which is close to pump should be connected for flow rate and discharge height adjustment.

- If pump discharging height is more than 10 m or discharging line is very long, a check valve should be placed over discharging pipe between pump and isolation valve for protecting pump against water impulses and reverse flows during stop.

AUXILIARY PIPE CONNECTIONS AND ACCESSORIES

Depending on the practice auxiliary pipe connections (necessary seal, cooling, seal washing, watering, drain, etc and/or) pressure gauge, temperature gauge connections can be used for controlling operational conditions.

- Pressure or vacuum gauges should be installed sturdy in measurement points which are over flanges or very close to flanges by means of estimated 8 mm pipes which are bended in spiral form. Air taking valves should be used for devices to operate safely and precisely.

- There are connection places in every pump for discharging pump and removing leakages in seal bed. (Figure 6). Those connections can be connected to discharge tank by means of pipes if requested. There should be isolation valve in pipe which is used for pump discharging and this valve and pipe should be suitable with maximum operational pressure of pump.

-Seal cooling, watering and washing pipes should be connected to correct places over pump body which are specified for them.

BY- PASS VALVE CONNECTION

-. A by-pass valve should be places over discharge pipe just after pump and before adjustment valve or outlet flange of pump if there is a case that pump will operate in conditions that pump discharge valve is completely closed(that is with zero flow rate) or almost closed (that is with very small flow rate). If such valve is not used and pumps operates with closed valve for a long time, power which is provided by motor will completely transform into heat energy and pass into discharged liquid. This may cause over heating and abnormal failures in pump.

- Those connections can be connected to discharge tank if requested with pipes. There should be an isolation pump over the pipe which is used for discharging pump and both valve and pipe should be suitable with maximum operational pressure of valve.

-Seal cooling, washing and watering pipes should be connected to correct places over body.

d1: Suction opening Pressure Meter Connection

d2: Discharge Opening Pressure Meter Connection

d3: Liquid Discharging Hole

d4: Seal Leakage Dİscharge

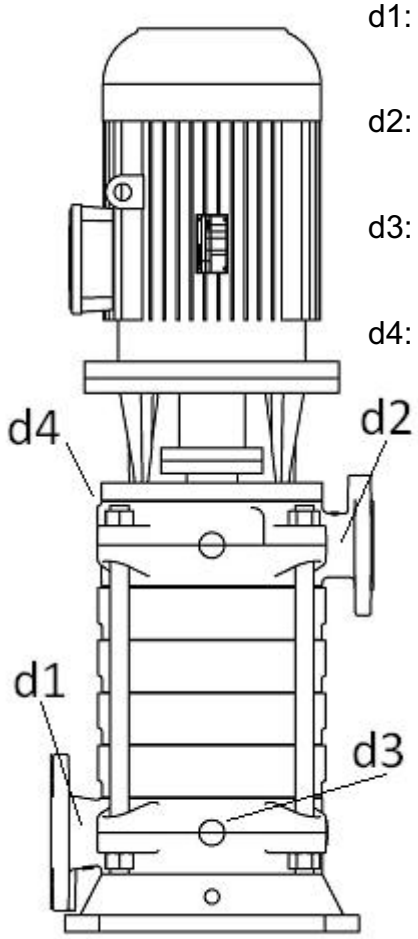


Figure4

ELECTRICAL CONNECTIONS

- Electrical connections should be done by authorized electricians National instructions, regulations and instructions of motor manufacturers should be obeyed.

- Power cables should absolutely be installed as not having contact with pipe installation, pump and motor body.

- Motor shaft should be rotated by hand before making electrical conditions to control whether it rotates easily.

- It is recommended to use PTC(Passive Thermal Control-Thermistor) in motors. However usage of those depends on customer. If PTC is used ends of those should be connected to motor terminal box and later should be connected to PTC control device in motor control panel.

- Electrical motors should be protected against overloading by circuit breakers and/or fuses. Circuit breakers and/or fuses should be selected with respect to full load values those are written in nameplate on motor.

- Compare and control voltage, ampere and frequency values which are given in motor nameplate with line values.

- Motor connection scheme can be found in motor terminal box or in handbook.

- Motor electrical connections should be done according to local Electrical Regulations and earthing connection should absolutely be done.

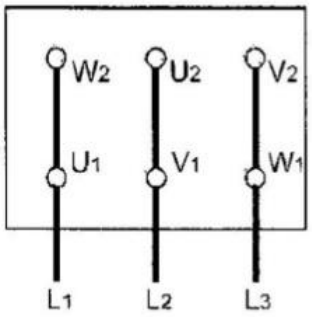
- Protection class of motor body and control system cases in pump should be at least EN 60029 IP 22. In addition to this, protection class of motor bodies and control systems in pump group should be determined according to operational and environmental conditions.

- Safety precautions which are determined in "Safety Instructions" should be applied. All power connections should be disconnected before starting to any work.

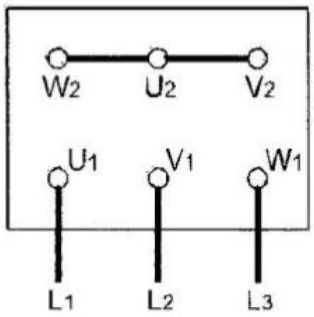
- Motor connection type changes according to motor mains power and connection type. Necessary connection types of jumpers in terminal box are displayed in Table 1 and Scheme 1a -1b and 1c

Start Type	Motor Power PN<4kW	Motor Power PN >4kW
	Mains Power 3~400V	Mains Power 3~400V
Direct	Y-connection (1b)	Δ-connection (1a)
Y/ Δ Star Delta	Impossible	Remove Jumpers (1c)

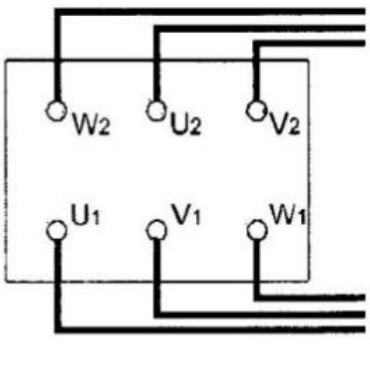
Table 1



Scheme 1a



Scheme 1b



Scheme 1c

Attention! Transition time from star to delta should be short in star-delta connected motors. In case that it is long damages may occur in pump and motors. (Table2)

Motor Power	Y- Setup time
<30 kW >30 kW	<3 seconds <5 seconds

Table 2

- After all abovementioned operations are completed, pump rotor should be rotated a few turns for being sure that it rotates easily.

- All safety guards should be installed into their places. Pump should absolutely be not operated after this operation is made. This is a safety and occupational safety rule which should absolutely be obeyed.

FIRST START

Controls Before Operation

- If there is bottom back flow water valve in pump with depth suction; they are filled with water from filling hole in highest point and its air is taken.

- This case does not cause problem in force feed pumps. Suction valve is opened if any. Air plugs are loosen and discharge of air and completely filling of pump is provided.

- If system includes vacuum pump, rise of water in suction pump by means of vacuum pump and filling pump is provided. When water reaches the highest level pump is started.

- Pump bearings are shipped from the factory as being filled with grease which will be enough for one year.

- Before first start of pump, bearings should be checked whether there dirt has entered into it during shipment and installation. If bearings are dirt they should be completely be cleaned and greased again.

- If pump has waited before installation for a long time (more than 6 months), new grease should be inserted into bearings.

- Be sure that pump and suction pipe is completely filled with water.

ATTENTION! Never let pump run in dry conditions.

DETERMINATION OF ROTATION DIRECTION

EARS-D type pumps rotates in clockwise direction when you look from clutch towards pump. This direction is shown with an arrow in pump body. Pump is operated for a short while and checked whether it rotates in correct direction. If protection guard is uninstalled during this operation, it should immediately be installed after this operation.

Starting Pump

- Check that suction valve is open and discharge valve is closed.

- Close the circuit breaker and start the motor.

- Wait motor to reach full speed. (Wait motor to pass delta in motors operation with star-delta)

- Observe the ammeter in panel and slowly open discharge valve. (If discharge pipe is empty in first start, do not open discharge valve completely and open in controlled way by controlling that value in ammeter is lower than motor rated values.)

Stopping the Pump

- Slowly close the discharge pump.

-. If there is water impulse prevention equipment in Discharge line and if the impulse which may occur is not in dangerous levels, you can stop the pump without closing the valve.

- Stop the motor. Watch that pump group has stopped calm and regular way.

- If there is external feed to seal, close this for decreasing the pressure in seal.

- If pump will be out of service for a long time close suction valve and auxiliary circuits if any.

- If there is freezing danger and /or it will not be used for a long time, completely discharge water inside pump by means of discharging plug over pump body. Take necessary precautions against freezing risk.

Controls to be Made While Pump is Running

- Pump does not need any maintenance since it has mechanical seal. Very few amounts of water may penetrate from mechanical seal but it can not ne noticed. If water comes from mechanical seal this means that it surface is worn and needs to be replaced. Lifetime of mechanical seal mainly depends on cleanness of discharged water.

- Motor current should sometimes be controlled from ammeter over electrical panel which controls the motor. If current values are more than motor nameplate values there may be friction or squeezing in pump. Pump should immediately be stopped and mechanical and electrical controls should be done.

- If there are spare pumps in system, this type of pumps should be run for a short while at least once a week and controlled whether read for operation. Control with auxiliary elements if any.

- Pump should absolutely be run in closed valve condition (zero flow rate) for a long time.

- Pump should operate silent and without operation.

- Bearing temperatures should never exceed ambient temperature (more than 50ºC). It should never exceed 80ºC

- Never operate pump without water.

LUBRICATION

EARS-D series pump are bedded with liquid in pump shaft body and "lifetime grease lubricated" in sliding bed and discharging body part. Entire bearings do not need maintenance since motor bearings are lubricated with lifetime grease.

OIL CONTROL

- If pump has waited before installation for a long time (more than 3 months), bearings should be greased. If liquid oil is used in bearings, old oil should be removed and filled with new oil.

- Before running the pump, pump bearings should be checked whether dirt has entered inside it. If there is dirt inside bearings they should completely be cleaned and new liquid oil or grease should be filled.

-Oil filling or adding operations should be determined by enterprise according to conditions in workplace and operation. This method is efficient.

-Pumps which are lubricated with liquid oil are shipped without oil. This type of pumps should be filled with oil up to indicator level before starting to operation.

SAFETY CONDITIONS

- Works should be done by obeying workplace occupational safety rules.

- Inside of pumps should be cleaned after fluid has been discharged from pump.

- Reliability of explosive, poisonous, hot and substances in crystal structure with respect to environment and human health should be assured.

- Considering that used cleaner and protector solvent wastes may give harm to environment and human health; precautions should be taken for preventing dissipation to environment and mixing to suction pool. Accumulation and putting the used waste solvents in disposal area should be cared.

- Working area where dismounting and installation works are performed should be clean.

- Pump should be free of all dangerous materials and be clean during return back.

- Lifting tools and equipments which are suitable with objective and occupational safety should be used in dismounting and installation operations.

DISMOUNTING OF PUMP AND REPAIR

ATTENTION! - Before starting to any operation over pump always disconnect the electrical connections and be sure that it will not run mistakenly. Certainly obey the instructions which are given in "Safety Instructions".

Dismounting of Pump

- Close isolation valves in suction and discharge pipes.

- Open the fuses of electricity line fuses coming to motor as they will not carry current and remove control cable coming to motor from motor terminal box.

- Open the discharge plug and discharge the water inside pump.

- If the liquid inside pump is special, discharge it after taking necessary safety precautions.

-Uninstall the bolts of pump's suction, discharge flanges and foot.

-Disconnect pump from installation.

-Before starting to dismount pump mark the suction, discharge and stage bodies for providing easiness during installation and mark the corresponding locations.

-Remove the clutch and other safety guards.

-Place the pump vertically from the motor carrier ground.

-Uninstall lower bearing feeding pipe.

-Uninstall pump foot from suction body.

-Uninstall lower bearing cover.

-Uninstall shaft safety nuts.

-Uninstall body stud bolts nuts and remove body stud bo lts.

Take the suction body

-Remove the lower bearing from suction body.

- Remove the shaft bearing and wedge.

-Take the impellor, diffuser and together with stage bodies, and last stage body together.

-Uninstall the discharge body

-In mechanical seals first uninstall the mechanical seal cover from discharge body and then separate discharge body from roller bearing bed.

-Lay down the pump for uninstalling the remaining parts.

-Uninstall the motor carrier.

-Separate the clutch from pump shaft by using puller and take the wedge.

-Uninstall the bearing cover with roller bearing.

-Uninstall the shaft safety nuts.

-Slightly hit the end of shaft and take the shaft and roller bearing from bed.

Take the roller bearing out of shaft.

-Uninstall the intermediate bushing and seal bushing.

-Take the two piece ring.

Installation of Pump

-. Pump installation operation is made by reverse order of pump dismounting process. Pump cross section drawings will assist you for this subject.

-Clean all the parts, replace the damaged and worn onesç

- Before starting to installation operation, apply lubricious materials such as graphite, silicone or similar slippery substances over contact surfaces or bolt surfaces. If you can not find those substances use liquid oil. (drinking water pumps excluding

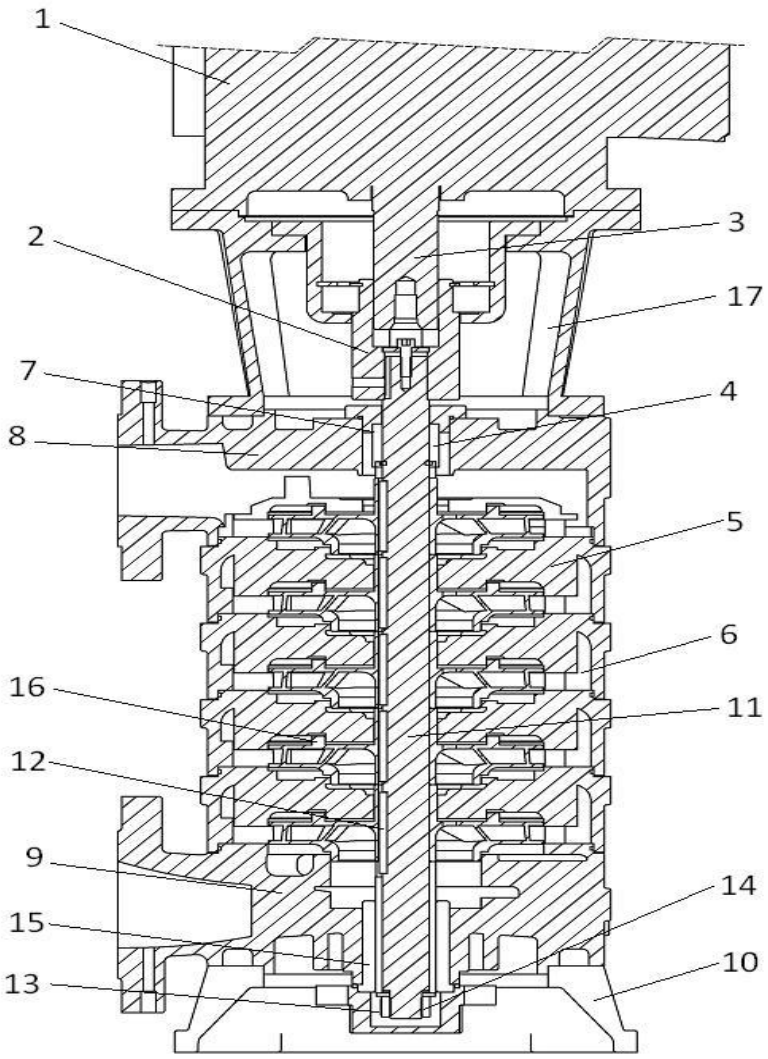
- Do not use gaskets which you had removed. Use new ones having same dimensions. Be careful that new gaskets and O-rings are in same dimensions.

Pumps with Mechanical Seal

- Water leakage does not occur in a mechanical seal which properly operates. Mechanical Seal does not need maintenance in cases that it does not have visible water leakage. Besides this impermeability of mechanical seal should be regularly controlled.

- Strictly obey the instructions of mechanical seal manufacturers instructions in pumps where mechanical seals are used. Never run mechanical seal in dry conditions.

PUMP CROSS SECTION DRAWING



1-Electrical Motor

2-Coupling

3-Motor Shaft

4-Roller B earing

5-Diffuser

6-Implellor

7-Mechanical Seal

9-Suction body

10-Foot

11-Pump Shaft

12 Impellor wedge

13- Lower Bearing

14- Lower bearing bushing

15-Sliding Bearing

SPARE PARTS

- ERDURO warrants to provide the spare parts for EARS-D Series pumps for 5(five) years beginning from production date. You can always easily obtain the spare parts you need.

- In spare parts order, it will be sufficient for you to inform the following values which are written in pump nameplate.

Pump Type : EARS -D50/04

Motor Power(P) and Revolution(n) : 22kW - 2900 d/d

Production Year and Serial No : 12/2011 - 201112-001

Flow rate(Q) and Manometric Height (Hm): 45 m³/h - 120mSS

REASONS FOR FAILURES AND TROUBLE SHOOTING

In this chapter failures which can be seen in EARS type pumps, possible reasons (Table 3) and trouble shooting methods (Table 4) are given.

ATTENTION! Control the accuracy of all measurement gauges before starting to eliminate the failure operation.

FAILURES	POSSIBLE REASONS
Started pumps never discharges water	1-5-7-10-11-13
Flow rate decreases or no water is discharged	2-3-8-10-14
Motor is overloading	9-12-17-18-19-27-28
Bearings have over temperature	19-20-21-22-24
There is vibration in pump	15-16-19-23-25
Noise level is high	4-6-26

Table 3

No	Possible Reasons	Trouble Shooting Methods
1	There may be air in pump and/or suction line	Fill pump or suction pipe completely with liquid and repeat the start process
2	Air is not absorbed from seal, suction pipe, or connections. Pump absorbs liquid which is mixed with air	Control all connections in suction pipe. Check seals. If necessary feed seals with pressurized water. Check the submersion depth of suction pipe pr deep back water valve and increase submersion depth if necessary.
3	Air pocket in suction pipe	Control the slope of suction pipe and whether there are suitable places for formation of air pockets, if any make necessary corrections.
4	There is air in liquid	Swirls occur since depth of submersion pipe is not enough and there fore air is not absorbed. Control the liquid level in suction tank and increase the depth of bottom/suction pipe back water valve.
5	Suction depth is very much	If there is no obstacle which may cause clogging control the friction losses of suction line. If necessary use a suction pipe having larger diameter. If static suction depth is too much you should raise the height of water level in suction tank or pump should be places in lower levels.
6	Pump operates with cavitations	NPSH of plant is very low. Check the water level in suction tank. Check whether there are over friction losses in suction line. Check whether isolation valve in suction line is completely open. If necessary place the pump in low levels and increase the load of pump at suction side
7	Pumps discharge height is insufficient	Actual discharge height of plant is higher than given values. Check the total static height and friction losses of discharge pipe. Using pipes having greater diameter may be solution. Check whether valves are completely opened.
8	Increase in discharge height	Check whether valves are completely open. Check whether there is an obstacle which may cause clogging in discharge pipe.
9	Pump is operating at lower discharge height	Discharge height of plant is lower than given values. Lathe the impellor diameter according to manufacturer suggestions
10	Pump rotates reverse	Check rotation direction of motor whether it is same with the direction which is indicated in pump body or nameplate
11	Speed very low	Check the voltage and frequency of line and check whether phase is missing in motor.
12	Speed very much	Decrease the motor revolution if possible or Lathe the impellor diameter according to manufacturer suggestions

13	Impellor, check valve or filter clogged	Clean Impellor, check valve or filter
14	Impellor, partially filter clogged	Clean Impellor, or filter
15	Impellor partially clogged	Clean the impellor
16	Worn or malfunctioned impellor	Replace the impellor
17	Mechanical friction in pump	Check whether there are any obstacle or bend in pump rotor
18	Soft seals are over tightened	Loosen the seal bushing
19	Clutch adjustment is broken	Check the clutch rubber and adjust again
20	Bearing covers are over tightened.	Check the covers and make necessary corrections
21	Flow rate is less than pumps necessary flow rate	Increase the flow rate, use by pass valve or line if necessary
22	There is so much grease in bearing	Remove the excess grease
23	Shaft is bend	Check the shaft and replace if necessary
24	Insufficient lubrication or lubricant is dirty	Check the amount of lubricant, clean bearing bed and capsules and grease again
25	Imbalanced rotating parts	Adjust the balance of rotating parts
26	Pump operates out of its operation region	Check the operational region values
27	Density or viscosity of discharged liquid is more than given value	Use motor having greater power
28	Motor Failure	Check the motor,. Motor is not suitable for its air conditioning position

Table 4

TIGHTENING MOMENT

SCREW DIAMETER	MAXIMUM TIGHTENING MOMENT(Nm)	
	CLASS PROPERTIES	
	8.8	10.9
M4	3	4,4
M5	5,9	6,7
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

EXPECTED NOISE LEVELS

Motor Power PN (kW)	Sound Pressure Level (dB) Pump and Motor	
	1450 rpm	2900 rpm
<0,55	63	64
0,75	63	67
1,1	65	67
1,5	66	70
2,2	66	71
3	70	74
4	71	75
5,5	72	83
7,5	73	83
11	74	84
15	75	85
18,5	76	85
22	77	85
30	80	93
37	80	93
45	80	93
55	82	95
75	83	95
90	85	95
110	86	95
132	86	95
160	86	96

* It is the value which is measured from 1 m distance from the pump in a free area over the surface which reflects sound without having sound screen.

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