

Instruction for Operation and Maintenance



ECO SNT

Single Stage Norm Centrifugal Pumps

yaşamı koru! save life!

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1. GENERAL

The objective of this manual is to:

- Instruct the users on installation, dismounting, maintenance and repair of the pump, and
- Describe methods of start-up, operation and stop of the pump.

1.1 Safety Signs



General Risk

Signifies safety precautions which if not applied may cause vital.



Electrical Risk

Warnings about the electrical current



Warning

Safety instructions that if not applied may cause damage to the machine or operation.



Explosive atmosphere

Information to prevent explosion in the explosive atmosphere as per EC Directive 94/9/EC (ATEX)

1.2 General Instructions



This manual should be made available at a safety place easily accessible by personnel responsible for safe operation and maintenance of the pump the qualified

- The authorized personnel should be experienced and well - informed about the related standards.
- The instructions given in this manual should be carefully read and applied at any phase of the installation and operating process of the pump.
- The user is responsible to ensure that the inspection and installation are performed by the authorized and qualified personnel, who read this manual thoroughly.
- The pump should never be operated beyond the operating conditions set forth in the purchase order. The reason is that the operating conditions set forth in the purchase order have been taken into consideration in the selection of the pump material and trial of the pump.
- If the pump is required to be operated apart from the conditions set forth in the purchase order, please contact with does not assume any responsibility for any damages that may arise from operation of the pump beyond the specified conditions without written consent.
- If the pump will not be installed at its place immediately after delivery, it should be stored at a clean and dry place where the ambient temperature does not change excessively. If the proper precautions are not taken, excessively low or high temperatures may cause serious damages to the pump.
- does not accept any responsibility under warranty for any repair or replacement performed by the user or any other unauthorized persons.
- This manual does not include safety rules applicable at the place of use.

1.3 Safety Instructions



Always observe the following instructions to prevent any physical and/or property damages.

- Operate the pump only under the specified pump.
- Any tension, contraction and strain on the piping system should never transfer to the pump.
- Electric wiring of the engine and auxiliary components should definitely comply with the local rules and be performed by the authorized personnel.
- Never perform any work on the pump before the pump set is stopped completely.



Always disconnect power connection with the engine before you perform any work on the pump and make sure that no connection is made accidentally.

- Any work on the pump should always be performed by at least two workers.
- Clothing of the personnel to work on the pump should always be suitable for the works they **will** perform and/or the personnel should use necessary safety equipment.
- Never perform any work on the pump when it is hot.
- Never touch the hot pump and pipes by naked hand. The user personnel should take necessary warning precautions (e.g. warning signs, barricades, etc.).
- Always be careful when working on the pumps delivering hazardous liquids (e.g. acid or hazardous fluids).
- When the pump and pipes connected to the pump are under pressure, do not perform any work on the pump definitely.
- Once the work on the pump is over, put in place all safety shields previously removed.
- Never operate the pump in reverse direction.
- Never insert your hands and fingers into any hole or openings of the pump.
- Do not trace on the pump and/or pipes connected to the pump.

1.3.1 CE signs and approvals

It is a legal requirement that machinery and equipment put into service within certain regions of the world shall conform with the applicable CE Marking Directives covering Machinery and, where applicable, Low Voltage Equipment, Electromagnetic Compatibility (EMC), Pressure Equipment Directive (PED) and Equipment for Potentially Explosive Atmospheres (ATEX).

Where applicable, the Directives and any additional Approvals, cover important safety aspects relating to machinery and equipment and the satisfactory provision of technical documents and safety instructions. Where applicable this document incorporates information relevant to these Directives and Approvals. To confirm the Approvals applying and if the product is CE marked, check the serial number plate markings and the Certification, see the last page of this document.

1.3.2 Explosive atmosphere



This section should be read carefully for the pumps operating at explosive atmospheres.



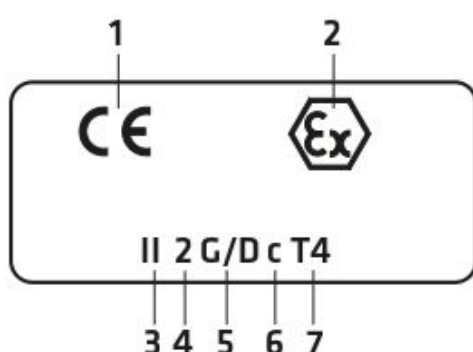
Only the products certificated for the explosive atmospheres should be used at the explosive atmospheres.

Detailed information about the operating conditions at the explosive atmospheres are found in Directive on Equipment for Potentially Explosive Atmospheres 94/9/EC (ATEX 95).

The pumps to be used at the explosive atmospheres should never be used at areas apart from the specified areas.

1.3.3 Labelling

Label on the pump is related with the pump only.



- 1- CE logo
- 2- Ex logo
- 3- Group
- 4- Category
- 5- Explosive Atmosphere [Gas(G) and/or Dust(D)]
- 6- Protection Type (Constructional Safety as per EN 13463-5)
- 7- Temperature Class

Example II 2 G/D c T4

II 2 G/D : Group II, Category 2 Gas (G) and/or Dust (D) ambient.

c : Constructional Safety (c)

T4 : Temperature Class (T4)

Coupling: It should be informed by the coupling manufacturer and the coupling should have ATEX sign on it.

Motor: It is required to be documented and labelled by the engine manufacturer.

1.3.4 Temperature classes and limits

During the pumping applications, the highest temperature occurs in the areas of the bearing area, sealing area and volute casing. The volute casing temperature is almost same with that of the fluid delivered by the pump. If the pump casing is heated externally, the technical personnel should keep the temperatures under control according to the temperature classes.

Temperature classes given in the **Table 1** and the highest permissible temperature for the pump during operation are shown in the following table.

Temperature Limits

Temperature Class	Maximum Surface Temperature	Maximum Permissible Fluid Temperature
T3	200 °C	180 °C
T4	135 °C	110 °C

Table 1

1.3.5 Monitoring



Pump and/or pumpset should be operated according to duty point and the limit described in nameplate.

The technical personnel should operate the pump within these limits and the status monitoring system should be used for the pump set.

Use of the monitoring system is important especially for the following areas of the pump:

- Temperature values on the pump casing
- Temperature values in the sealing area

In the systems where buffer liquid is supplied or double mechanical seal is available the buffer liquid should be observed.

- Temperature values in the bearing area

For proper operation of the bearings, it would also be useful to monitor vibration and temperature values in the roller bearing.

- The pump should be operated according to ordered duty point.

1.3.6 Constructional requirements

When explosive fluid is pumped, all parts under pressure should be made of ductile material.

Coupling protection housings should be made of non-sparking materials.

Mechanical seals should never be operated dry. The sealing area should be filled with liquid completely as long as the pump operates. If you are not sure that the sealing area is filled with liquid, then the buffer liquid may be applied.

Frame of the pump and/or pump set should always be earthed.

1.3.7 Personnel qualification and training

All personnel involved in the operation, installation, inspection and maintenance of the unit must be qualified to carry out the work involved. If the personnel in question do not already possess the necessary knowledge and skill, appropriate training and instruction must be provided. If required the operator may commission the manufacturer / supplier to provide applicable training.

Always co-ordinate repair activity with operations and health and safety personnel, and follow all plant safety requirements and applicable safety and health laws and regulations.

1.4 Recycling

For products and parts which will not be used and scraped, use the local or private waste collection services. If it is not possible, consult the nearest authorized service centre

ECO SNT PUMPS

2- GENERAL PUMP DESCRIPTION

2.1- Pump Description

- ECO SNT series pumps are horizontal, radially split volute casing, single stage, end suction centrifugal pumps with closed impeller.
- Dimensionally complies with EN 733.

2.2- Application Areas

ECO SNT series pumps are suitable for clean or slightly contaminated (max. 20 mg/dm³) liquids with low viscosities and temperatures up to 140 ° C . The main application areas, among others, are:

- Water supply, water treatment and irrigation systems,
- Heating, chilled and cooling water systems,
- Water systems for industrial uses,
- Industrial circulating systems,
- Fire fighting,
- Chemical and petrochemical industries.

2.3- Pump Designation

Pump Type _____
Discharge Nozzle (DN-mm) _____
Nominal Impeller Diameter (mm) _____
Impeller Type _____

ECO SNT 100 - 250

2.4- Product Information according to European Commission's Regulation EU 547/2012

Relevant Pump Series

Water pump, end suction own bearing (ESOB) -ECO SNT

Water pump, end suction close coupled (ESCC) - ECO SNM

Water pump, end suction close coupled inline (ESCCI) - ECO SNL

Minimum efficiency index: $MEI \geq 0,4$

The benchmark for most efficient water pumps is $MEI \geq 0,7$

Year of production: Please see the pump label.

Place of production: Turkey

Product's type and size indicator: Please see the pump label and data sheets.

Pump performance curves, including efficiency characteristics: see documented characteristic curve

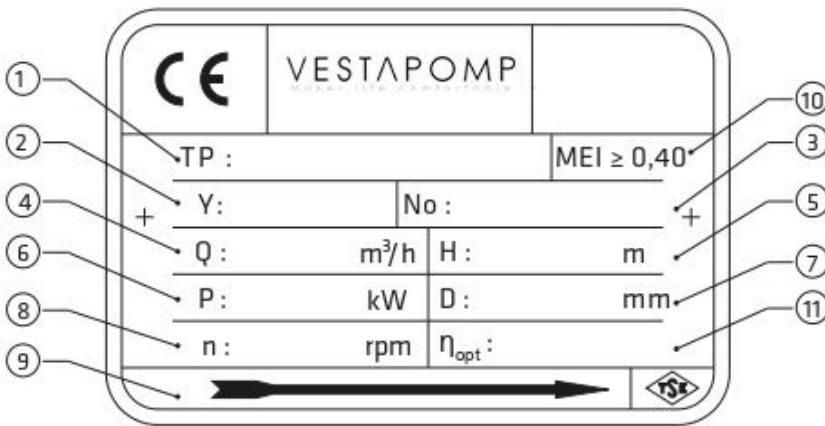
The efficiency of a pump with a trimmed impeller is usually lower than that of a pump with full impeller diameter. Trimming of the impeller will adapt the pump to a fixed duty point, leading to reduced energy consumption. The minimum efficiency index (MEI) is based on the full impeller diameter.

Operation of this water pump with variable duty points may be more efficient and economic when controlled, for example, by the use of a variable speed drive that matches the pump duty to the system.

Information relevant for disassembly, recycling or disposal at end of life: see installation/operating manual section 1.4

Information on benchmark efficiency graph is available at www.europump.org/efficiencycharts

2.5 Pump Nameplate



- 1- Pump Type and Size
- 2- Production Year
- 3- Serial No
- 4- Capacity
- 5- Head
- 6- Motor Power
- 7- Impeller Diameter
- 8- Speed
- 9- Direction of Rotation
- 10- Minimum efficiency index
- 11- Efficiency

2.6- Technical Information

Discharge Nozzle : DN 32 ... DN 150 mm
 Operation Temperature : -20 °C - 100°C with uncooled soft packing
 100 °C - 140 °C with cooled soft packing *
 - 20 °C - 140 °C with mechanical seal

Casing Pressure (max) : 10 bar (16 bar)*

Permissible Liquids : See Section 2.2

The service life of this product as determined and announced by the Ministry is 10 years.

(*) **Note: Contact our company for more detail.**

3- UNPACKING, HANDLING and STORAGE

3.1- Unpacking

- Check whether the package has been damaged during transportation.
- Remove unpackaged pump and accessories (if any) carefully. Check whether they have been damaged during transportation.
- If any damage has occurred during transportation, notify SERVICE DEPARTMENT, and SHIPPING COMPANY about it immediately.
- Check whether all materials in the shipping list have been delivered. If there is any missing article, advise SERVICE DEPARTMENT
- Remove the liquid inside the pump, for preventing corrosion due to transportation.

3.2- Handling

3.2.1- General warnings



- Follow the rules at work to prevent occurrence of any accidents.
- Wear gloves, steel-tooled shoes and helmet during handling.
- You may use forklift, crane or hoisting ropes to lower wooden crates, packages, pallets or boxes depending on volume, weight and construction of them.

3.2.2- Lifting operation



ATTENTION

- Determine the following points prior to lifting and handling the pump or pump and motor group on the joint frame.

- Total weight and centre of gravity,
- The largest outer dimensions, and
- Location of the lifting points.
- The load lifting capacity should comply with the weight of the pump or pump group.
- The pump or pump group should always be lifted and handled horizontally.
- Never stand under or near the load being lifted.
- Do not keep the load lifted longer than necessary.
- Accelerating and braking operations during the hoisting should not be performed in such a way that may be dangerous for the working personnel.

The pump or pump group should be hoisted as shown in the Figure 1a or Figure 1b in order to avoid from any deformation. (When the group is hoisted as a whole, never use the suspension hook of the electric motor.

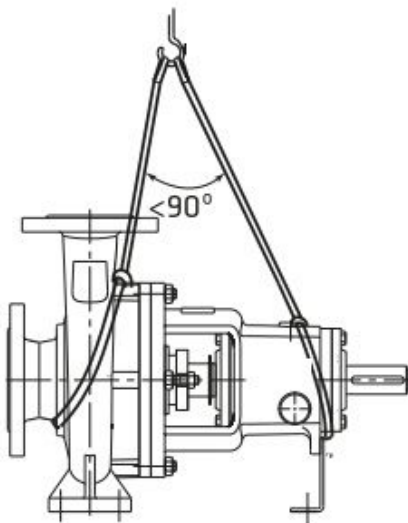


Figure 1a. Bare shaft pump

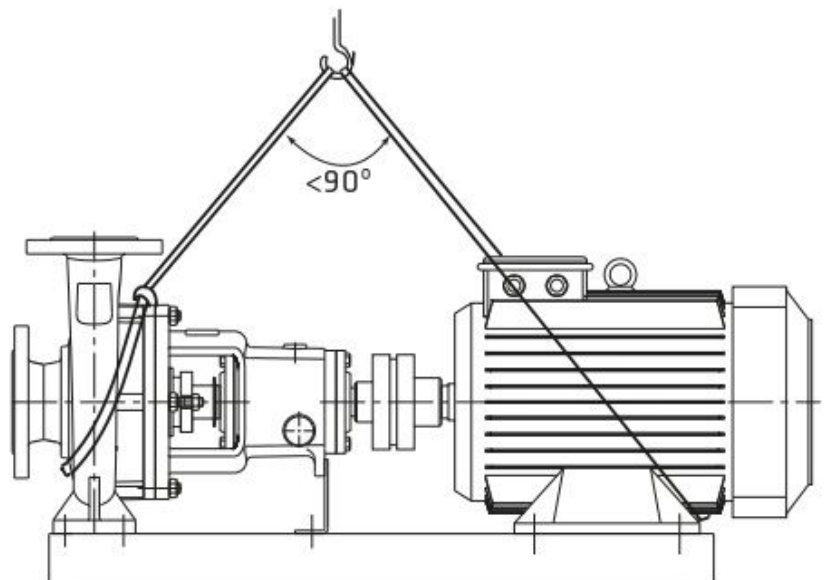


Figure 1b. Pump and motor on a common baseplate

3.3- Storage

- If the pump will not be installed in place immediately, it should be stored at a clean and dry place free of any frost hazard without excessive change in the ambient temperature.
- If the pump bearings are of grease-applied ones, extra grease should be applied to the bearings to prevent moisture ingress around the shaft.
- Necessary precautions should be taken to protect the pump against humidity, dust, dirt and foreign materials.
- The pump should be rotated manually by some turns occasionally (e.g. once in a week) to prevent pitting on the bearing surfaces and sticking of the pump.

4- INSTALLATION ON SITE

ATTENTION Installation on site should be performed as per EN 60204-1 standard.

Installation of the pump on site and levelling and adjustments of it should be performed only by qualified personnel. Improper installation or pump base (foundation) may cause failure. Such situations are excluded from warranty.

4.1- Bare Shaft Pump

- If the pump is purchased as bare shaft pump, then first a proper baseplate should be constructed to connect the pump and motor group. The baseplate should be designed and manufactured in such a way that it will have resistance to prevent vibration and deformation.
- If the pump is supplied without motor, proper motor and coupling should be selected before the group is installed.
- Following points should be taken into consideration when selecting motor:
 - Maximum power drawn by the pump along the entire operating range,
 - Running speed of the pump,
 - Applicable power supply (frequency, voltage, etc.),
 - Motor type (TEFC, Exproof, etc.),
 - Motor connection form (pedestal, flanged, horizontal, vertical, etc.), and
- Rated motor power, rpm and type of drive should be taken into consideration when selecting coupling.

4.2- Preparation for Installation

Prior to installation of the pump in place:

- Suction and delivery flanges should be cleaned thoroughly.
- Protective film on the pump shaft should be removed.
- If the pump has been stored temporarily, the liquid oil in the bearings should be drained completely (in case of pumps manufactured with liquid oil) and the bearings should be cleaned by a proper cleaning agent and then oiled again. This operation is not required for the pumps lubricated by grease and for the pumps using enclosed type of ball bearing.

4.3- Installation Site

ATTENTION • The pump should be installed at a well-ventilated place free of freezing and explosion risk.

- There should be sufficient space around the pump being installed to allow easy access for maintenance of the pump as well as sufficient space above the pump to hoist it when required.
- Suction pipe of the pump should be short as far as possible.

4.3.1- General characteristics of the pump foundation (baseplate)

ATTENTION You should work carefully for preparation of the pump base and installation of the pump group in place. Improper and careless installation may cause excessive vibration and premature wear of the pump equipment as well as pump failure.

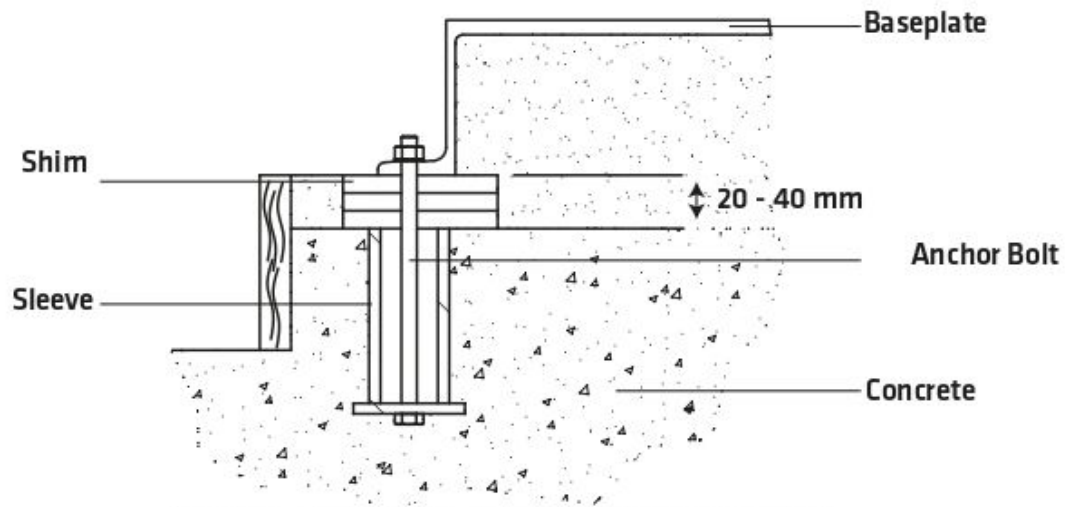


Figure 2. Foundation, baseplate and anchor bolt

- Sizes of the foundation concrete should be determined on basis of minimum 10% excess of the frame dimensions.
- Pump foundation should be independent of other foundation and platforms.
- Pump foundation should be capable to absorb vibrations and bear the loads to apply on the pump unit during operation.
- Place and dimension of the anchor bolts should be determined according to the hole dimensions of the pump unit.
- Washer should be used to prevent tension and distortion when tightening the foundation bolts.
- In order that the foundation bolts should align with the connection holes of the frame exactly and to allow for minor adjustments, the bolts are inserted into the bushings. The bushings should be place in such a way that they will not exceed top surface of the foundation concrete.

4.3.2- Placement of the Pump Group

- Preparation and pour of the foundation concrete mass.
 - The concrete mass is formed according to its dimensions.
 - The locations of the anchor bolts are measured and marked carefully and Styrofoam is cut to the dimension, placed and fixed.
 - The concrete is poured
 - Volume ratio: Cement 1: sand 2: gravel 4
 - Concrete hardens within 7 days (hardening may be shortened by use of special cement).
 - Upon hardening of the concrete, the Styrofoam is burned and removed. Locations of anchor bolts appear in the concrete.
 - Top surface of the concrete and holes of the anchor bolts are cleaned.
- Placement of the frame on the foundation concrete mass. (first adjustment)
 - Anchor bolts are mounted on the frame.
 - The frame is placed on the flattening chocks and the anchor bolts remain suspended in the holes. Make sure that the anchor bolts remain vertical.
 - Levelness of the frame is controlled in both directions from the pump and engine placement location by use of precise spirit level $0,25 \div 0,40 \text{ mm/m}$ is acceptable.
 - Anchor holes are filled with concrete. Anchor bolts are thus fixed.
 - Volume ratio: Cement 1 : sand 1.5: gravel 3
 - Concrete hardens within 7 days (hardening time may be shortened by use of special cement).

- Fixing of the frame on the foundation concrete mass exactly by adjustment.
 - The area about 30mm between the foundation concrete mass and frame is formed and concrete is poured through the holes in the frame.
Volume ratio: Cement 1: sand 2
Concrete hardens within 2 days.
 - Frame remains adjusted and fixed on the foundation concrete.

4.4- Installation of the Piping System

4.4.1- General Warning

ATTENTION • **Never use the pump as a point of support or bearer for the piping system.**

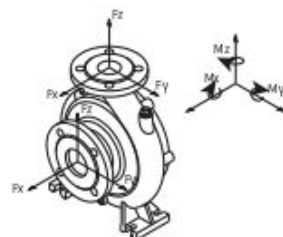
- The piping system should be supported at points near to the pump. For this purpose, after completion of the installation of the piping system, loosen the bolts of the suction and delivery flanges and control whether the piping system applies any tension on the pump. The maximum allowable forces and moments on the flanges are given in **Table 2**.
- Rated diameter of the suction and delivery flanges of the pump are not indicator of the correct sizes of the suction and delivery pipes at all. The rated diameter of the pipes and accessories used should be equal to or larger than the inlet diameters of the pump at least. Never use pipes and accessories having smaller diameter than the inlet diameters of the pump. Especially components such as bottom valve, strainer, dirt-retaining filter and check valves with larger free passage area should be preferred. In general, flow rates should not exceed 2m/s for the suction pipe and 3m/s for the delivery pipe. High speeds cause high pressure reduction and it, in turn, cause cavitation conditions on the suction pipe and loss arising from excessive friction on the delivery pipes.
- Pipe connections should be made with the flanges. Flange bolts should be made of proper material and in proper size. The flange bolts should be inserted between the flange bolts and centred in such way that it would not impair flow section.
- In case of excessive vibrations and systems operating with hot liquids, expansion parts should be used in order that any extra forces that may arise from thermal expansion are not transferred to the pump.
- Materials such as welding burrs, metal particles, sand and oakum arising from production of the piping system may remain in the pump and give damage to the pump. The suction and delivery flanges should be sealed blind washers in order to prevent such materials from entering into the pump during the assembly operations. After assembly, all pipe parts should be removed, cleaned, painted and reassembled. If dirt-retainer is used on the suction side of the pump, the dirt-retainer should be cleaned after working for several days.

Allowable Forces and Moments on Flange

Pump Type	Suction Flange									Discharge Flange								
	DN	F _x [N]	F _y [N]	F _z [N]	ΣF [N]	M _x [Nm]	M _y [Nm]	M _z [Nm]	ΣM [Nm]	DN	F _x [N]	F _y [N]	F _z [N]	ΣF [N]	M _x [Nm]	M _y [Nm]	M _z [Nm]	ΣM [Nm]
32-125	50	575	525	465	905	495	345	395	720	32	315	295	365	565	385	260	295	550
32-160																		
32-200																		
32-250																		
40-125	65	735	645	595	1145	525	385	415	775	40	385	350	435	680	455	315	365	660
40-160																		
40-200																		
40-250																		
40-315	50	525	465	575	905	495	345	395	720	50	525	465	575	905	495	345	395	720
50-125																		
50-160																		
50-200																		
50-250	80	875	785	715	1375	555	395	455	820	65	645	595	735	1145	525	385	415	775
50-315																		
65-125																		
65-160																		
65-200	100	1175	1045	945	1835	615	435	505	905	80	785	715	875	1375	555	395	455	820
65-250																		
65-315																		
65-400																		
80-160	125	1380	1245	1115	2160	735	525	665	1120	100	1045	945	1175	1835	615	435	505	905
80-200																		
80-250																		
80-315																		
80-400	150	1745	1575	1400	2735	875	605	715	1280	125	1245	1115	1380	2160	735	525	665	1120
100-160																		
100-200																		
100-250																		
100-315	200	2345	2095	1890	3650	1135	795	925	1650	150	1575	1400	1745	2735	875	605	715	1280
100-400																		
125-200																		
125-250																		
125-315	200	2345	2095	1890	3650	1135	795	925	1650	150	1575	1400	1745	2735	875	605	715	1280
125-400																		
150-200																		
150-250																		
150-315	200	2345	2095	1890	3650	1135	795	925	1650	150	1575	1400	1745	2735	875	605	715	1280
150-400																		

Table 2

Note: Above values are for GG25 material. For cast steel and stainless steel, multiply the above values by 2. For GGG40 material, multiply by 1.3. Please contact our company for more information.



4.4.2- Suction pipe

- The suction pipe should be definitely watertight and should not be arranged in a way to cause formation of air pockets. In other words, if it is supplied from a reservoir higher than it (system with elevated suction/supply), the suction pump should be slightly declined towards the pump; and if the pump is supplied from a reservoir lower than it (system with suction depth), then the suction pipe should be gradually inclined slightly towards the pump. **Figure 3a and 3b**

- In order to keep the loss from friction, sharp elbows should not be used; and abrupt change of direction and section should be avoided and suction pipe should be made short as far as possible. If it is required to make change of section on a horizontal suction pipe, an eccentric conical spacer with its flat side on the top should be used.

- If the pump is supplied from a reservoir higher than it, an insulation valve should be used to keep the axis on the suction pipe horizontally. This valve should always be open when the pump operates and it should never be used as flow rate adjusting valve (Caution: Throttle of the valve may cause the pump to operate with cavitation).

ATTENTION

4.4.3- Delivery pipe

- A flow control valve should be connected on the delivery pipe, near the pump as far as possible in order to adjust the flow rate and delivery head.

- If the delivery head of the pump is more than 10 m or the delivery line is quite long, a check valve should be connected between the pump and flow rate adjusting valve on the delivery pipe in order to protect the pump against water hammers when stopping the pump or prevent backflow.

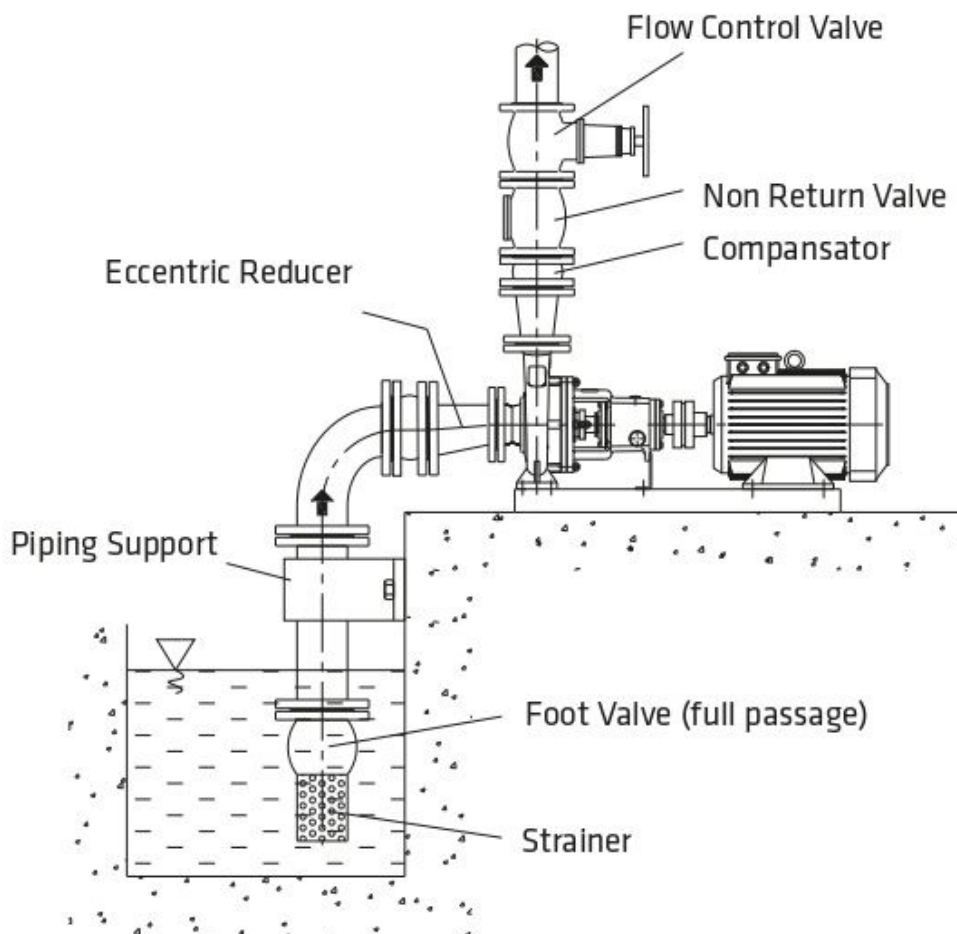


Figure 3a. Suction Lift

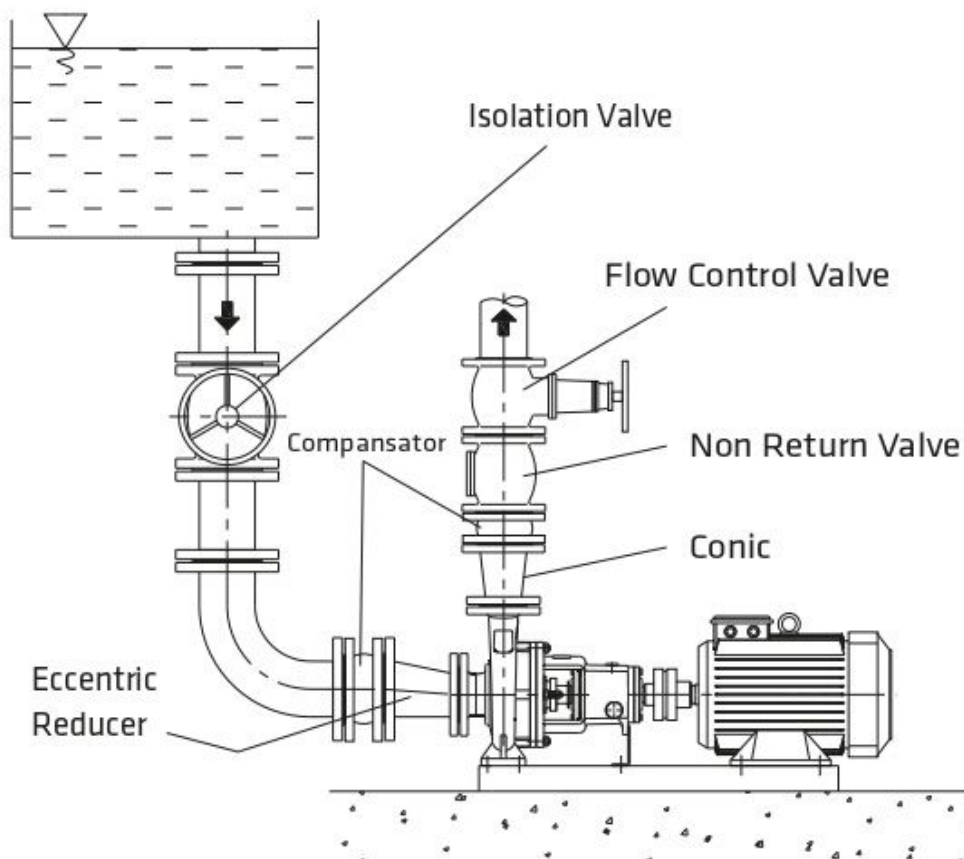


Figure 3b. Suction Flooded

ATTENTION

After installation of piping system, coupling alignment should be checked and if necessary it should be adjusted again.

4.4.4- Auxiliary pipe connections and accessories

- Depending on the application auxiliary pipe connections (for cooling, sealing and flushing of seal, drainage etc. necessary for the pumping system) and/or accessories to check operating conditions (pressure gauges, temperature gauges etc.) may be made up and lail.
- Pressure and vacuum gauges must be properly anchored and connected at the measuring points located on the pump flanges by means of or on the pipes close to the flanges approximately 8 mm diameter tubing with pig tail configuration to lessen pressure fluctuation. For safety purposes isolating and vent valves should be fitted before the gauges (**Figure 4**).
- Every pump is fitted with connections on the pump casing to drain the pump and the bearing bracket to evacuate the seal leakage from the stuffing box (**Figure 5,6**). If required the pump drain and seal leakage can be piped to a suitable reservoir. The pump draining piping must be fitted with an isolating valve and both must be suitable for the maximum operating pressure of the pump.
- Cooling, sealing and flushing of seal piping must be connected only to the designated connections located on the pump (**Figure 7,8**).

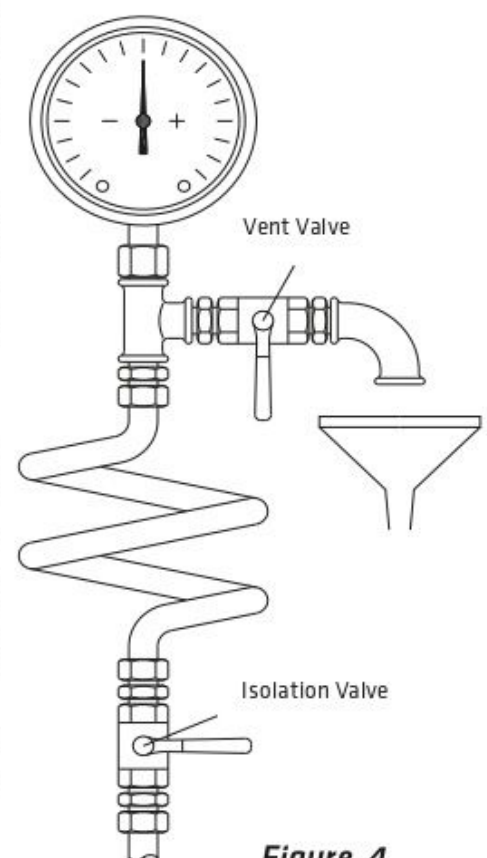


Figure 4

- d1** : Pressure gauge (discharge)
- d2** : Pressure gauge (suction)
- d3** : Filling or vent
- d4** : Drain
- d5** : Oil Filling (if applicable)
- d6** : Oil Drain (if applicable)
- d7** : Oil Level Indicator (if applicable)
- d8** : Seal Water Drain

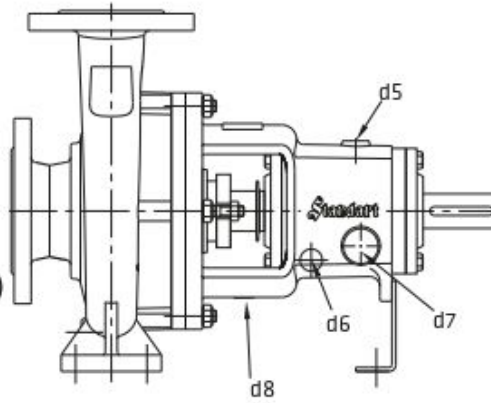


Figure 5

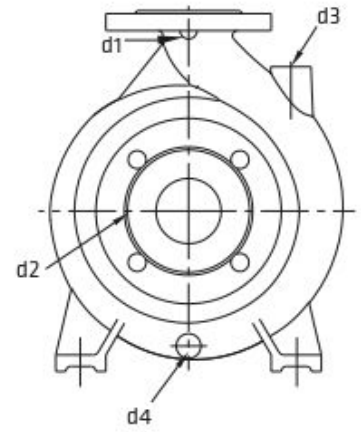


Figure 6

F1 : Seal flushing liquid inlet from external source

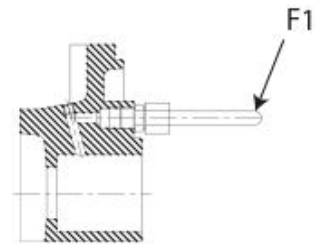


Figure 7

Q1 : Mechanical seal quench liquid inlet from external source.

Q2 : Mechanical seal quench liquid outlet.

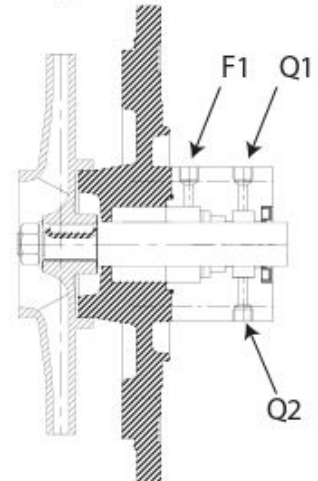


Figure 8

4.5- Coupling Adjustment

ATTENTION After installation of the baseplate and system connections, the coupling adjustment should be controlled finally. The reason that proper adjustment of the entire system is responsibility of the purchaser.

ATTENTION “Coupling Adjustment” is to ensure that the rotation axes of the motor and pump should be on the same plane. If ECO SNT type pumps are ordered with motor and baseplate, it is delivered with the coupling adjustments made at the factory. However, this adjustment may be easily impaired during transportation, handling, installation on site and installation of the system. For this reason, the coupling adjustment should be performed again after installation of the group on site, disregarding the adjustment made at the factory.

- The most important factor for problem-free operation of the pump group is correct coupling adjustment. The basic reason of a number of problems such as vibration, noise, bearing heating and overload is a coupling unadjusted or improperly adjusted. For this reason, coupling adjustment should be performed very well and controlled frequently.

- Elastic coupling should not be regarded as a component to correct an improper adjustment. Elastic coupling does not correct a poor axial adjustment between the pump and motor and does not remove excessively poor adjustments.

- A metal part (steel ruler or gauge, etc.) and a precise caliper are required to perform coupling adjustment (special equipment should be used for very fine and precise adjustment). Axial run-out of the coupling (see Figure 9) should not exceed 0.1 mm.

- There may be two types of adjusting mistakes on the coupling:

- a) Angular mistake
- b) Parallel displacement mistake

- In order to control the angular mistake, the distance between two parts of the coupling should be measured mutually on horizontal and vertical planes. The clearances measures at these four points should be equal (Figure 10a,10b).

- In order to control the parallelism mistake, a gauge with straight edge is pressed on a part of the coupling in parallel to the axis and the position of the gauge related to other part is observed. The gauge should contact with both two parts simultaneously and along its entire edge. This process should be performed at two opposite places on the horizontal and vertical plane (Figure 10c, 10d).

- Adjustment mistakes may be on the horizontal and/or vertical plane. Mistakes on the vertical plane may be made by putting thin metal sheets under the pump or motor mounts and the mistakes on the horizontal plane by benefiting from the gaps in the connection holes or sliding the engine on the horizontal plane. Manner and order of the coupling adjustment is shown in the Figures 10a, 10b, 10c and 10d, respectively.

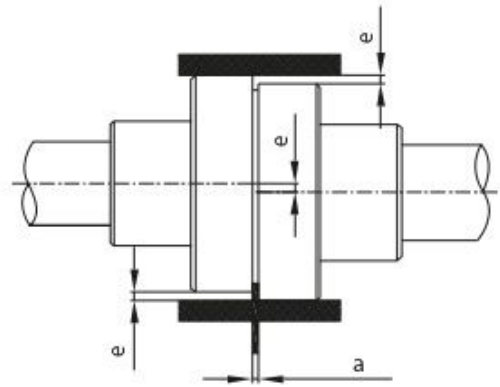


Figure 9. Aligning a flexible coupling

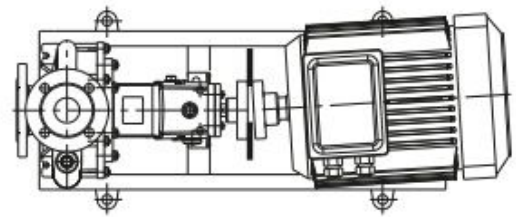


Figure 10a. Angle error in horizontal plane and adjustment

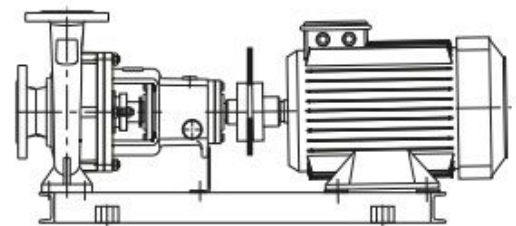


Figure 10b. Angle error in vertical plane and adjustment

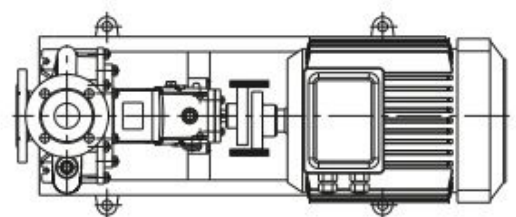


Figure 10c. Parallel sliding error in horizontal plane and adjustment.

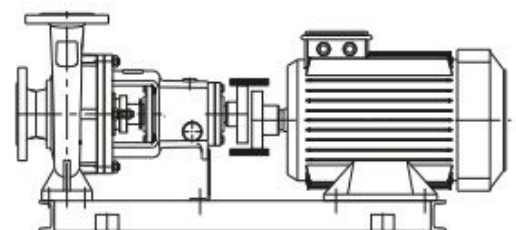


Figure 10d. Parallel sliding error in vertical plane and adjustment.

4.6- Minimum Flow



If there is possibility of the pump operating with its delivery valve is closed completely (that is, at zero flow rate) or almost closed (that is, at very little rate), a by-pass valve should be used on the outlet flange of the pump or on the delivery pipe just after the pump, but in advance of the control valve should be used. If such a valve is not used and the pump operates for a long time, almost all power given by the engine converts to thermal energy and transfers to the delivered liquid. This situation may cause overheating and, consequently, cause significant failures.

4.7- Electrical Connections



- The electrical motors have to be built in accordance with EN 60034-1.
- Enclosures of electrical motors and control systems on the pump unit shall as a minimum have protection in accordance with EN 60529 IP22. But in determining the degree of protection of enclosures of electrical motors and control systems on the pump unit the operating and environmental conditions must be taken into consideration.

- Electrical connection should be done by a qualified electrician. Current national regulation and motor manufacturer's instructions must be observed.
- Take all safety precautions listed in "Safety instructions". Disconnect all power supplies prior to doing any work.
- The supply cable must be laid in such a way that it never touches the pipework, pump and motor casing.
- Check voltage, phase and frequency on motor nameplate with the mains.
- The electric motor must be protected against overloading by means of circuit breakers and/or fuses. Circuit breakers and fuses must be selected in accordance with full load amperage of the motor appearing on the motor rating plate.
- It is recommended to use PTC (passive thermal control) on motor, but this is optional depending on customer requirement. In case of using PTC, these should be connected via corresponding terminals in the terminal box and the PTC should be connected to the thermal trip mechanism.
- Prior to connection the electrical wiring rotate the pump shaft by hand to make sure rotor rotates easily.
- Connect the electrical wiring in accordance with local electrical codes and make sure to ground the motor.
- The connection diagram can be found in the terminal box of the motor or in the instruction manual.
- The mains connection on the terminal box depends on the nominal power of the motor, the power supply and the type of connection. The necessary connection of the bridges in the terminal box is shown in the following (*Table 3 ve Figure 11a, 11b, 11c*).

Type of switch	Motor Power $P_N \leq 4 \text{ kW}$	Motor Power $P_N > 4 \text{ kW}$
	Power Supply 3 ~ 400 V	Power Supply 3 ~ 400 V
direct	Y - connection (11b)	Δ - connection (11a)
Y / Δ - start	Impossible	Remove connection bridges (11c)

Table 3

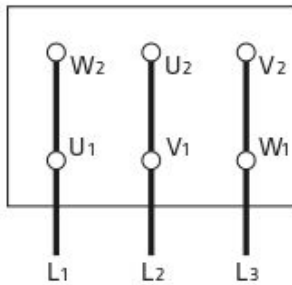


Figure 11a. Δ - connection

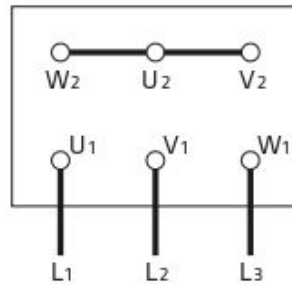


Figure 11b. Y - connection

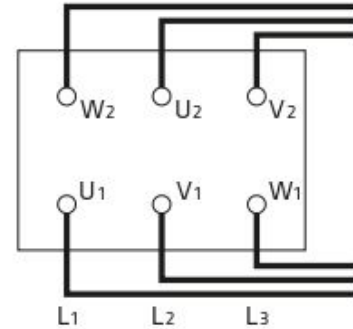


Figure 11c. Y / Δ - connection

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In the case of three-phase induction motors with Y - Δ connection it must be ensured that the change-over points between star and delta follow on from one another very quickly. Longer change-over times may result in pump damage (Table 4).

Motor Power	Y - set time
$\leq 30 \text{ kW}$	< 3 second
> 30 kW	> 5 second

Table 4

4.8- Final Controls

- After all operations given above are completed, the coupling adjustment should be controlled once more in accordance with the section 4.5. And if it is incorrect, it should be corrected.
- The pump rotor should be rotated several times manually to make sure it rotates easily.
- All security guards should be put in place.
- And the pump group should be operated and you should allow until the operating and heating conditions are reached.
- At the end of this term, the pump is stopped and thin metal sheets are put under the motor mounts only to perform coupling adjustment for the last time.
- Final coupling adjustment is especially recommended to be performed at the operating temperature.



- The pump should never be operated before the safety guards are put in place. This is a security and safety rule at workplace which should be definitely observed.

5- START UP / SHUT DOWN

5.1- Preparation

5.1.1- Lubrication control

- The bearings of ECO SNT type pump are always lifetime grease lubricated. Lifetime grease lubricated bearings are maintenance-free.
- Grease lubricated bearings are factory packed with grease enough for one year operation before dispatch. Before initial start up pump it should be ascertained that no dirt has penetrated inside the bearing during transport or installation on site. Otherwise, the bearings should be cleaned out and repacked with fresh grease before start up.



• **The oil lubricated bearing housing is delivered without oil and on it, there is a warning symbol for indication. The housing should be filled with oil until the oil comes on the middle (see. Figure 12 and 13).**

- Check lubrication (see Section 6).

5.1.2- Venting and priming

- Make sure that the pump and suction pipes are completely filled up with water. There is no problem for the pumps which have positive suction head. If there is a valve on suction line, it must be opened and air taps are loosened to enable the water replaces air in the pump, until it is completely full with water.
- If there is a foot valve on the suction line, the air should be emptied out.
- If the system has a vacuum pump, water is brought up in the rising pipe and filled up the pump through this vacuum pump. When water is risen up to the highest point then the pump is started up.



Make sure the pump never runs dry.

5.1.3- Checking the direction of rotation

- ECO SNT type pumps rotate in clockwise when it is looked from coupling to the pump. This direction is already indicated on the pump nameplate by an arrow. Check this by switching the pump on, then off again immediately. Fit the coupling guard back in place if you took it out.

5.2- Start Up The Pump

- Check if the shut off valve in the suction line is open and the shut off valve in discharge line is closed.
- Switch on the circuit breaker and run the motor.
- Wait until the motor reaches the full speed (on star-delta running motors wait until it switches on delta).
- Open the discharge valve slowly while watching the ampermeter on the control panel (if the discharge line is empty do not turn on the valve fully open on first start up. Turn it on slowly to maintain the value on the ampermeter is under the rated current value of the motor).
- When the valve is if fully open, check the pressure on the manometer and see it is the same with the duty point pressure. If the pressure on the pressure gauge is lower than duty point pressure brings them to the duty point value by slightly closing the valve. If it is higher value, check your installation, especially geometric height again.