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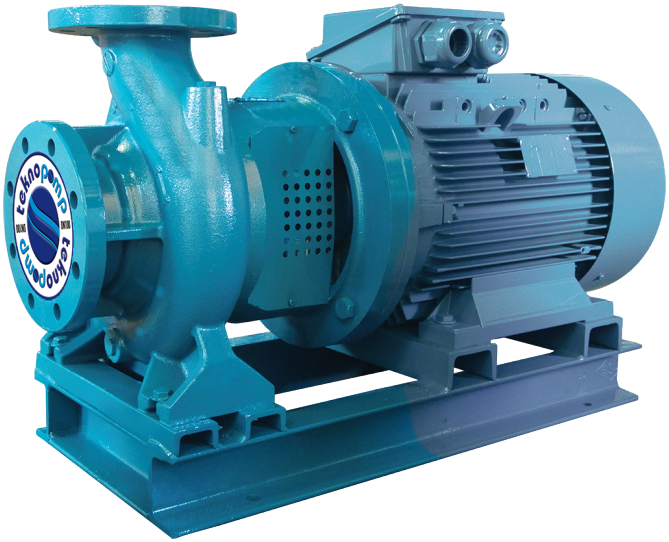
Teknolojik Pompa ve Hidrofor Sistemleri

SERVICE MANUEL FOR TNM SERIES

INSTRUCTIONS FOR INSTALLATION, OPERATION & MAINTENANCE



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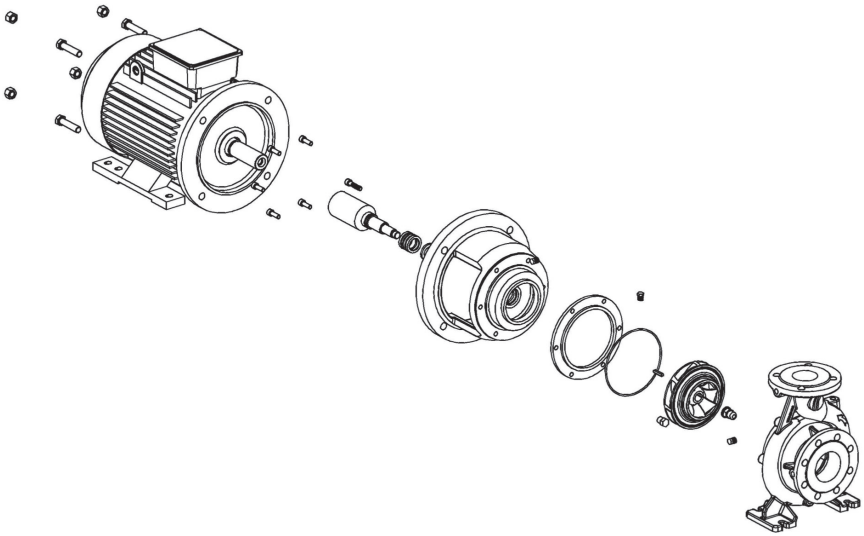

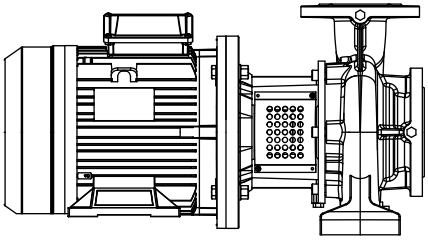

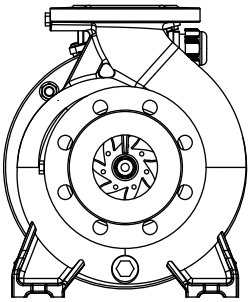

CONTENTS

This booklet consists of installation, implantation and maintenance recommendations for Pump Unit with in TEKNOPOMP product range.

Please read this booklet in order to prevent failure of the correctly chosen and used Pumps Unit and provide its operation free of problems and apply all of the warnings. There are information about operational conditions, installation, commissioning, settings and main controllers.
These operation and maintenance instructions include TEKNOPOMP recommendations. In these instructions special information about operating and maintenance had been taken into consideration. These information must only given by production and planning responsible (system manufacturer).

Please refer to operational instructions of system manufacturer.

Please be careful about the warnings given in this booklet and provide this booklet to be read before the installation. TEKNOPOMP will not be held responsible from accidents caused by defects or their results. Please appeal for help from TEKNOPOMP for the questions and problems that you can not find their answers in this booklet. When you appeal for help please notify Pumps Unit tag value and serial number.

Safety instructions given in this booklet include valid national accident protection regulations. In addition to these customer's work, operation and occupational safety precautions must also be applied.

Signs used in Operational Instructions


Please read these instructions carefully and keep this booklet in order to use when it is necessary


Warning sign for Electricity Risks


Warning sign for user safety

1.IMPORTANT SAFETY PRECAUTIONS

Following rules must be applied in order to minimize the occupational risks during connection and start-up.
1. Do not operate before taking necessary precautions about the equipment.
Rope, safety line and mask must be used when it is necessary.
2. Be sure that there is enough oxygen in area and there is no poisonous gas.
3. Control the welding and electrical device for blasting risk before using them.
4. In order to prevent risking your health, check the environment hygiene (dust, smoke..).
5. Please do not forget the risk of electrical hazards.
6. Do not lift the Pump Unit before controlling the lifting equipment (crane, rope..)
7. Be sure that you have a by-pass line and your line is open.
8. Use helmet, glasses and protective shoes in order to provide your safety.
9. Mount protective barriers around the Pump Unit at determined safety distance for trip and fall risks
10. Dust, liquid and gas that may cause overheating, short circuit, oxidation and fire must be kept away from the Pump Unit and required safety measures must be taken.
11. Take measures by controlling noise levels (Ref. ISO EN 3744) against the effects, damages and rough running that may damage personnel and environment.
12. Be careful about the carriage and storage direction.
13. Please close the moving parts properly in order to prevent personnel injuries. Connect the coupling protection before operating the pump.
14. All electrical and electronic applications must be conducted according to EN60204-1 and/or local instructions by authorized personnel.
15. Protect the electrical equipment and engine against the overloading.
16. Do not expose the pump unit to sudden temperature changes.

Apply all other health and safety instructions, Law and Regulations.

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2. General

2.1. Usage Areas of Pump Unit

TNM series pumps are single-stage, volute type monoblock pumps.
• Water networks and pressurization plants
• Irrigation, sprinkling and water discharge
• Loading and unloading of tanks
• Hot or cold water circulation in heating and cooling systems
• Condensate pump
• Water circulation in swimming pools
• Health and cleaning facilities
• In industrial and social facilities
• For pumping sea water on ships,

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It can be used to pressurize liquids up to 90°C.
For correct selection of the pump type and other elements creating the Pump Unit, chemical and physical properties of the fluid must be taken into consideration.

TNM type pumps body with DIN 24255 standard.
Technical Specifications
Suction Flange: DN 40 –DN 250
Discharge Flange: DN 40- DN 250
Q (Capacity): 2-700 m3 / h
Hm (Head Height): 2-70m.
Speed: 900-3600 rpm.

2.2. Performance information

Real performance of the Pump Unit can be taken from catalogue. This information is written on the Pump Unit label.

Performance curves had been drawn for the fluid (water) with density p=1 kg/dm3 and V=1cst kinematic viscosity. For the fluids that their density and kinematic viscosity is different than water are different, so please consult to our firm if it is necessary.

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Please do not operate the Pump Unit with different engine power except from the values given on catalogue and label. There must be no operating point except of the value defined in order and provided by our firm. In order to provide the safety of the procured Pump Unit defined instructions must be fulfilled.

2.3. Guarantee Conditions

Products within the scope of our sales program are

under the safety and security of our firm and international TEKNOPOMP Company. Guarantee conditions will become valid when installation and start up of the Pump Unit is done according to the warnings given in this booklet. Repair of the device free of charges within the guarantee period, following conditions must be fulfilled.

• Comply the conditions about installation and operation that are given in user manual.
• The warranty period begins on the date of delivery of the products and two years.
• All parts of the products are guaranteed by our company except electrical engines.
• If the user uses the product against the manual, the warranty terms are not applied.
• The product life is 10 years.

2.4. Test

All Pumps Unit are delivered from our factory after performance and pressure test has made. Pump Unit that performance guarantees is given by us are under TEKNOPOMP guarantee for exact operation and suitable material procurement.

2.5.Pressure Limit

The pressure in the outlet flange should not be higher than 10 Bar while the pump is running.

3. Safe Working Conditions

This booklet consists of basic safety instructions for installation, operation and maintenance. This booklet must be read by all personnel before installation and start-up. Personnel must comply the important safety measures given at the first page together with general safety instructions and safety measures repeated in other parts.

3.1. Personnel Training

Operation, maintenance control and installation personnel must have necessary information to satisfy the given duty. Responsibilities, qualifications and control duties of these personnel must be determined by the customer and personnel must understand the content of the operation instructions. If personnel have not enough information; necessary training must be provided by business manager. There will be training support provided by manufacturer/seller when it is requested.

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Non-conformity to safety measures and lack of education of the personnel may create risk against the personnel and as well as system and environment. TEKNOPOMP will not be responsible from potential hazards.

3.2. Potential dangers caused because of failure to comply with safety instructions

In case of failure to comply with safety instructions; It can create risk and damage by keeping people, the environment and the pump in danger.
Failure to comply the safety measures may cause the following hazards:

• Maintenance and service ways may be blocked
• Human life may be under danger due to electrical, mechanical or chemical effects.

3.3. Safety measures for User/Operator

Dangerous, hot or cold parts must be protected against accidental contact.
Moving parts (like coupling) must be protected against accidental contact. Protections of these parts mustn't demounted during machine is operating.

3.4. Safety measures for maintenance and montage

Firm must provide all maintenance, sub-control and installation works completed by authorized and qualified personnel.
Operation on machine must only be made when it is stopped. This operation requires the application of the instructions related with shutting down the machine that explained.
Pumps and sets that are pumping unhealthy liquids must be cleaned properly. At the end of the work, all safety and protective equipments must be mounted and made operational. Before setting into operation instructions given in "preparation for operation" must be applied.

3.5. Part replacement

Part replacement and modifications must only be made after negotiating with manufacturer. Replacement parts and accessories approved by manufacturer are important for safety.
NOTE: Usage of non-conforming parts is not under the TEKNOPOMP responsibility.

4. Technical Information

4.1 Structural Design

Single-stage non-self-priming monoblock centrifugal pumps are equipped with standard engines and mechanical seals.

4.1.1. Flange Positions - Flanges
Discharge Flanges: DN2533 - PN16 Suction Flanges: DN2533 - PN16

4.1.2 Pump-Engine Connections
The engine is coupled to the pump by means of a rigid coupling using an adapter and flange.

4.1.3 Impeller
The closed radial-type pump impeller is dynamically balanced on the electronic balancing pump. The axial thrust force is balanced with the wear ring and balance holes.

4.1.4 Shaft
Pump shaft, impeller and other parts can be removed without moving the suction and discharge pipes and pump volute. Thus, assembly and maintenance operations are much easier.

4.1.5 Bearing and Lubrication
In TNM type pumps, no bearings are used. The engine bearing is sufficient to accommodate axial and radial loads.

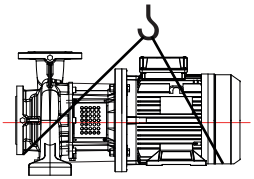
4.1.6 Seal
In standard production, elastomer rooted, spring loaded mechanical seal types are used as sealing elements.

4.2 Pump Group Construction
4.2.1 Drive
3 phase, fully closed, fan cooled, squirrel cage, IM 3611V 18 type in accordance with DIN IEC, VDE and TSE standards; Electric engine is used to drive at power and speeds according to DIN 42673. Electric engine; Insulation class: F Protection class: IP54-IP55 Frequency: 50 Hz. Mode of Operation: S1 Starting Form: 3x380V (Star) up to 4 kW It has 3x380V (Triangle + Star /Triangle) connection for powers larger than 4kW.

4.2.2 Shaft Coupling and Coupling Guard
In TNM type pumps, clamp type rigid coupling is used.

The pump should only be operated with the coupling guard according to EN 953.

5.Transport and Storage
The pump and pump group should be transported safely to the installation site using lifting equipment. The applicable general lifting safety regulations must be followed. When lifting and carrying the pump unit, use a hanging system as shown.



Do not use the engine suspension ring when lifting the pump assembly. It may break due to overload and cause damage. Prefer a braided cloth rope for the hanger. Wrong transport can cause injury to personnel and damage to the pump unit.

5.1 Storage
Store the unit in a clean and dry area during storage.
In cases where the pump will not be used for a long time, follow the instructions below.
1. Unload the water in the pump.
2. Clean the pump casing and impeller, the suction and discharge line by giving clean water.
3. Unload the pump body, suction and discharge line.
4. If it is impossible to completely empty, add a small amount of anti-freeze antifreeze into the pump body. Provide anti-freeze by driving the shaft manually.
5. Close the suction and discharge outlets with gaskets.
6. Apply a suitable of anti-rust and anti-corrosion agent inside the pump body.
7. Turn the pump by hand to prevent freezing.

6.Installation / Assembly
TNM type monoblock pumps are connected to the ground and fixed by the holes on the carrier table.

6.1 Assembly Site
The pump should be easily accessible for inspection and maintenance. Pump room; it must be suitable for use in lifting vehicles such as cranes forklifts. In order for the pump suction pressure to be at the highest value, the group should be mounted to the lowest point of the facility as much as possible.

6.1.1 Assembly Site - Ambient Temperature
In cases where the ambient temperature of the pump groups exceeds + 40 ° C, a suitable ventilation should be provided that will provide fresh air flow.

6.2 Coupling Set

6.2.1 General

TNM type monoblock pumps are mostly supplied with the engine. Engine and pump shafts are connected by a rigid coupling. Necessary settings were made during assembly. For this reason, no coupling adjustment is required for the TNM type pump you supply with the engine. However, if the engine and pump are disconnected, a coupling adjustment is required again.

6.3 Making Coupling Adjustment of TNM Type Pump Provided Without Engine or Removed Engine

1. Loosen the bolts of the rigid coupling, pull the coupling parts apart.
2. Insert the engine shaft into the upper part of the coupling and connect the engine through the flange holes.
3. Push the rigid coupling up (on the engine side) with a screw driver or similar tool.
4. Using the gauge, adjust the distance between the coupling and the adapter (the invoice on the rigid coupling is at the level of the adapter).
5. After adjusting the distance of the coupling, tighten the bolts with equal torque.

Install the guard after fixing the coupling. According to the accident prevention regulations, all guards for rotating parts must be in place and functioning.

6.4 Piping

6.4.1 General

Do not use the pump as a carrier or support point for piping. Ensure that the weight of the pipes and parts are carried by placing enough supports under the pipe system.

Prevent the pipe system from loading on the pump by placing flexible parts (compensator) at the inlet and outlet of the pump. Place these carrier flexible parts in the direction of the pump flange axis (usually in the vertical direction).

The suction pipe should be on a rising slope towards the pump, and the air in the pipe should be directed towards the pump. It is important that the discharge pipeline is on a slope that rises from the pump to the tank or outlet point and does not rise or fall in a way that makes it an air pocket. Parts suitable for air discharge, such as suction cups, should be placed at the points that can make air pockets.

It is important that the pipe diameter and the parts used are at least as large as the pump nozzle diameter or preferably one or two sizes larger.

Parts smaller than the pump nozzle diameter should never be used.

In systems working with hot liquids, thermal expansions should be calculated, compensators should be placed in such a way that they are suitable for this expansion and do not impose any load on the pump.

6.4.2 Actions to be Taken in Pipe Assembly

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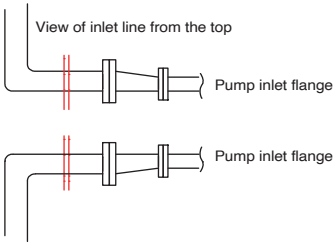
Make sure to do the following in pipe installation.

• Remove the protectors with the company's logo on the suction and discharge nozzles.
• Close the suction and discharge nozzles with solid (center hole not opened) rubber or clutch seals.
Do not disassemble these seals until assembly is completed.
• Start the pipe installation by the pump. Proceed by assembling and welding the parts.
• Do not forget to replace the carrier support parts during these operations.
• Complete all piping systems.
• After all assembly and welding processes are completed, disassembly all the bolts from the suction tank to the discharge pipe, and disconnect all removable parts.
• Clean these parts and then paint the inside and outside with primer.
• Reconnect the parts, but this time start from the discharge line and proceed towards the pump. Do not forget to check the flange gaskets at this time. Replace if necessary.
• When the pump flange is reached, if there is an axis or hole misalignment between the pump flange and the last flange of the piping system at this suffix, the lever, etc. to eliminate this misalignment, etc. Do not force the system using. You can cause errors that cannot be easily fixed.
• If there is any misalignment between the pump flange and the pipe flange due to welding pulls or other reasons, cut the pipe from a suitable place to correct it. Part on the pump side to the pump. Combine parts with welding again by making the correction where you cut.
• Disassemble and clean the last welded part and reassemble it.
• After all processes are finished, remove the gaskets you put on the pump inlet and outlet.

Replace it by opening its holes or using another suitable gasket.

6.4.3 Processes after pipe assembly and Pipe Equipment



Example piping is shown in the Figure.

6.5 Engine Connection

The engine must be connected by the electrician in accordance with the wiring diagram. Local electricity rules and applicable regulations must be followed.

• Electrical connections should be made by authorized electricians.

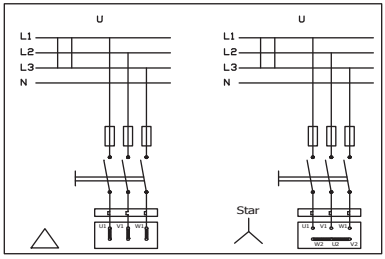
Make sure that electricity is cut off without removing the engine cover during pump installation.

• Use an electrical connection suitable for your engine.

6.5.1 Engine Connection Scheme

• Do not connect pump engines (star-delta) that require high torque at take-off.

• Frequency controlled engines; they require proper cooling at high torque and low speeds at take-off. Provide the necessary cooling for these engines.



6.5.2 Engine Protection

• Three-phase engine must be connected to the power supply.

• After a thermally protected engine is cut out due to heat, wait for the engine to cool down and make sure that the engine will not start automatically until it cools down completely.

• Use thermal or thermal-magnetic relay to protect the engine against overload and short circuits. Adjust this role according to the current drawn by the engine.

Elements of electrical equipment, terminals and control systems can always carry current. It can cause fatal and serious injury and material damage

7. Start-up / Stop

7.1 Preparations Before Start-up

• Before starting, make sure that the pump and suction pipe are filled with water. There is no problem for self-priming pumps. If there is a suction valve, the air plugs are loosened and the air is discharged and the pump is filled with water.

• In pumps with bottom flap, the pump filling plug is opened and filled with water, or the pump is filled by bypassing the check valve with a small valve by using the accumulated water in the unload line.

• In pumps that are started with the vacuum pump, the vacuum pump is operated to increase the water in the suction pipe and then fill the pump.

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Do not run the pump without water.

7.2. Rotational Direction Control

• The direction of rotation of the pump is indicated by an arrow on the pump label. Except for special cases, it rotates clockwise when viewed from engine to pump. Press the switch for a very short time to see that the pump rotates in this direction. If turning in the opposite direction, change the location of the two phase connections.

• If the engine connection is triangular, open the valve slowly on the discharge side.

• If the engine connection is star-delta, set the time relay to a maximum of 30 seconds.

By pressing the start button, watch the transition to the star triangle. When you are sure that it is going into a triangle, open the outlet valve slowly. Open the valve until you read the amperage value on the engine on the panel. Pay attention to the direction of rotation and fluid connection. It should always be kept in a visible way.

If you removed the coupling guard for direction of rotation check, do not restart the pump without retaining the guard in reverse.

7.3. Starting the Pump

• Check that the suction valve is open and the discharge valve is closed. Turn the switch off and give way to the engine.
• Wait for the engine to reach sufficient speed. (In engines with star-delta connection, wait for the engine to switch to triangular connection)
• Open the discharge valve slowly by observing the ampere meter on the panel.
• If the pipe is empty during the first start, do not open the valve completely. The value of the current written on the engine label by following the ampere meter. Open it in a controlled way to ensure that it does not pass.
• After opening the valve completely, check the pressure from the manometers at the pump outlet. See that this value is the value on the pump label.
• The value read on the manometer should be the label value.

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If the pump overheats, stop the engine and wait for it to cool down.
Open it carefully after it cools down

7.4 Stopping the Pump

In high-flow pumps with long discharge pipes, a pressure reducing valve should be placed in between to prevent water hammer. Otherwise, in the sudden stop, the backward movement of water will cause water hammer and the pump may explode.
Slowly close the discharge valve.
• Turn on the switch, stop the engine. See that the rotor slows down.
• Do not start the engine again before at least a few minutes.
• If the pump will fail for a long time, close the suction valve and auxiliary circuits. If the pump is outside the building and there is a danger of frost, remove all drain plugs and drain the water in the pump completely.

8.Maintenance

Maintenance operations should only be carried out by authorized personnel. Protective clothing should be worn at all times. Improve protection against high temperatures, harmful and flammable liquids. Read the manual of authorized personnel. Regular follow-up and maintenance will increase the life of the pump and engine.

8.1 Controls During Operation

• The pump should never be run without water.
• The pump should not be operated in closed valve position for a long time.
• When the parts of the system or the temperature of the system exceeds 60 ° C, measures should be taken against fire. “Hot surface” warning, which means protection, should be placed in the required areas.
• If the pump is with mechanical seal, it does not require much maintenance. Water coming from the mechanical seal indicates that the packing surfaces are worn and need to be replaced.
• If there is a spare pump in your system, run the spare pump once a week and keep it ready for operation. Also check the auxiliary systems of these pumps..

8.1.1 Part Control

The pump must be accessible from all directions to make a visual check. Especially the engine and pump indoor unit should be easily removable.

8.1.1.1 Bearing and Lubrication

Bearings are not used in TNM type pumps.
The engine bearing is sufficient to meet axial and radial forces. These bearings are filled with heat-resistant grease that will last a lifetime.

8.1.2 Mechanical Seals

Mechanical seal is used in TNM pumps.
Mechanical seal;
1. It provides safe sealing under heavy working conditions.
2. It is easy to assemble and requires less maintenance.
3. It does not create abrasion on the shaft.
4. The operation of the seal does not depend on the shaft surface quality.

8.1.3 Drive

See operating instructions of the engine manufacturer.

8.1.4 Other Elements

Check the pipe connections and gaskets regularly, replace the worn parts.

8.2 Service Service

Our Service Department provides after-sales services and service support. The operator must have the assembly / disassembly done by authorized or trained personnel.
Make sure that the inside of the pump is empty and clean before assembly/disassembly.
Ensure personnel and environmental safety in all operations on the field.

8.3 Spare Parts

Spare parts of TNM type pumps are guaranteed to be supplied by TEKNOPOMP for 10 YEARS from the date of manufacture. The values written on the label of your pump should be reported when ordering spare parts.
Pump Type and Size
Engine Power and Speed
Pump Serial No
Flow
Discharge head
If you want to have spare parts in your storehouse, we recommend the table below for two years of operation.

Part name	Equivalent Number of Pumps in the Facility						
	1-2	3	4	5	6-7	8-9	10+
Shaft (Set)	1	1	2	2	2	3	%30
Impeller (Set)	1	1	1	2	2	3	%30
Mechanical Seal	1	2	2	3	3	4	%50
Wear Ring	1	1	1	2	2	3	%50
Rigid Clamp Coupling	1	2	2	3	3	4	%50

9.Volume And Vibration

The reasons that increase the volume are listed below;
• If the pump is not properly fixed on the floor, the sound level will increase due to vibration.
• If there is no compensator, it makes sound and vibration.

Engine Power P_N (Kw)	Sound Pressure Level (dB)* Pump with Engine	
	1450 rpm	2900 rpm
<0,55	64	65
0,75	64	68
1,1	66	68
1,5	67	71
2,2	69	72
3	70	74
4	71	75
5,5	73	83
7,5	73	83
11	74	84
15	75	85
18,5	76	86
22	77	93
30	80	94
37	80	94
45	81	96
55	82	96
75	83	96
90	86	97

• The wear on the engine bearing increases the sound level.
(*) Without sound protection screen, sound is measured in the free area above the reflecting surface, 1m from the pump.
The above values are maximum values and are shown as the surface sound pressure level (LPA) in dB (A).
Complies with TS EN ISO 20361

10.Disassembly,Assemble and Repair

Before working on the pump, disconnect all electrical connections and be sure to take necessary measures to prevent accidental start-up.

10.1 Disassembly

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•Close the isolation valves in the suction and discharge lines. Drain the water in the pump.
• Remove the safety guards.
•Since the pump design is in the "Back Pull Out" system, it is not necessary to remove the pipe connections if there is no operation on the body.
• Pump suction and discharge connections if the body is to be operated on or if the pump will be put into use elsewhere.
• If any, disconnect the auxiliary pipe connections from the pipe system and the chassis.
• Separate the adapter and rotor group with the engine from the volute body.
• Unscrew the impeller nut, remove the impeller and remove the impeller key. Use solvent if necessary.
• Loosen the setscrews on the shaft and remove the engine from the rotor group by removing the bolts connecting the engine flange to the adapter.
• Carefully remove the rotating element of the mechanical seal over the shaft.
• Take out the pump shaft.

10.2.Pump Installation

• The assembly process is done in reverse order of the disassembly process. The attached cross-sectional picture will help you.
• Before starting the installation, apply lubrication to the contact surfaces and screw surfaces. (Do not use metallic oil in pumps that pump drinking water.)
• Replace the gasket and O-Rings when you remove them.
• Connect the pump shaft to the engineand tighten the setscrews.

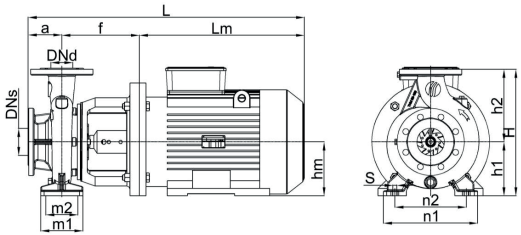
• Attach the fixed element of the mechanical seal to the adapter.
• Connect the adapter to the engine flange. If your pump has an additional engine connection flange (F1, F2, F3, F4, F5 Flange models), connect the flange to the adapter and connect the adapter and additionalengine flange to the engine flange.
• Place the rotating element of the mechanical seal on the shaft.
• Place the mechanical seal bushing.
• Fit the impeller key and pump impeller. Tighten the impeller nut.
Thus, the assembly of the rotor group is completed.
• Finally, connect the Engine + Rotor group to the volute body.
• Make sure that the gaskets and o-rings are properly seated, not crushed, slipped or caught in the assembly.
• Place the pump, connect the suction and discharge pipes, auxiliary pipes and equipment, make the engine electrical connections. Start up the pump as described in section 7.

11. Common Failures, Causes And Solutions

Common errors and solutions are given in the table. If you cannot solve the problem, please contact our company.
The pump must always be pressureless and dry when removing faults.

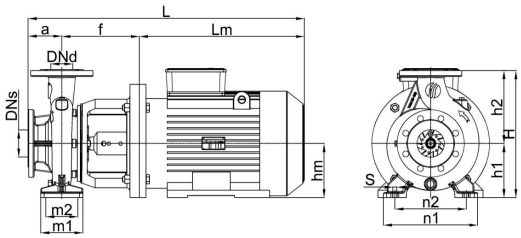
Common Failures	Causes	Solutions
Pump provides insufficient flow	-The pump runs at an extremely high outlet pressure. -Extremely high back pressure. -Pump and/or pipe can not blow air,can not suction. -Air pockets formed in the pipe. -The facility's net positive suction head(NPSH) is very low.	-Set the working point again. -Check foreign materials in the facility. -Unload the complete air of the pump and pipe. -Change the way of piping. -Increase the liquid level.
Engine is overloaded	-System Pressure is less than specified in the order value. -Overspeed. - The density or viscosity of the pumped fluid is higher than specified in the order value. -Engine is running in two phases.	-Set the working pressure again. -Speed should be decreased. -Engine power should be increased . -Check the circuit breaker and electrical connections.
Pump's hold-down pressure is high	-System Pressure is less than specified in the order value.	-Set the working pressure again. -Exchange or check the coupling.
There is increase in bearing house temperature	- Coupling worn or misaligned. -Irregular greasing. -Increase in axial thrust	-Change grease, decrease or increase. -Clean pressure balancing hole and exchange wear ring.
There is a leak in the seal	-Glen loose -Wear in the seal area	-Exchange seal. -Exchange seal bushing.
Rough Running	-Engine or pump bearings are worn -Low manometric height - Coupling worn or misaligned. -Flow rate is too much or too little.	-Exchange glen nut. -Turn off the outlet valve. -Exchange coupling or make the setting. - Unload the complete air of the pump and pipe. - Open the valve a little.
Extremely temperature increase inside the pump.	-Pump and/or pipe can not blow air,can not suction. -Flow rate is too little.	- Unload the complete air of the pump and pipe. -Increase the liquid level.
The pump is run vibrating.	-Pump and/or pipe can not blow air,can not suction. -The facility's net positive suction head(NPSH) is very low. -The internal elements of the pump are worn. - System Pressure is less than specified in the order value. -Coupling misaligned. -The rotor is unbalanced. -Faulty bearing house.	-Exchange worn component. -Set the working point again. -Check the coupling. -Chenge grease, decrease or increase. -Exchange bearing house. -Balance impeller after reassembly.

12. Pump Size Table and Pump Weights 2900 rpm



Pump Type	KW	DN Flanges		Size (mm)										Pump & Engine Weight
		Suction	Discharge	Lm	H	a	h1	h2	n1	n2	m1	m2	f	kg
	1,5			250	490	80							160	44,4
	2,2			275	515	80							160	46,8
	3			275	535	80							180	57,3
	4			324	584	80							180	67
TNM 32-160	5,5	32	50	324	604	80	132	160	240	190	100	70	200	77
	4			324	584	80							180	67
	5,5			324	609	80							205	83
	7,5			375	660	80							205	92
TNM 32-200	11	32	50	484	794	80	160	180	240	190	100	70	230	156
	3			305	565	80							180	58,5
	4			324	584	80							180	68
	5,5			375	655	80							200	78
TNM 40-160	7,5	40	65	375	655	80	132	160	240	190	100	70	200	84
	5,5			375	680	100							205	89
	7,5			375	680	100							205	95
	11			484	814	100							230	159
TNM 40-200	15	40	65	484	814	100	160	180	265	212	100	70	230	170
	15			484	814	100							230	180
	18,5			528	858	100							230	195
	22			544	874	100							230	230
TNM 40-250	30c	40	65	582	912	100	180	225	320	250	125	95	230	256
	4			324	604	100							180	72
	5,5			324	624	100							200	82
	7,5			375	675	100							200	88
TNM 50-160	11	50	65	484	784	100	160	180	265	212	100	70	200	108
	7,5			375	680	100							205	98
	11			484	814	100							230	162
	15			484	814	100							230	173
TNM 50-200	18,5	50	65	528	858	100	160	200	265	212	100	70	230	188
	22			544	884	100							240	237
	30			544	884	100							240	275
TNM 50-250	37	50	65	637	997	100	180	225	320	250	125	95	260	290
	7,5			375	685	100							210	94
	11			484	824	100							240	158
	15			484	824	100							240	169
TNM 65-160	18,5	65	80	528	868	100	160	200	280	212	125	95	240	184
	15			484	814	100							230	182
	18,5			528	858	100							230	192
	22			544	874	100							230	234
	30			637	997	100							260	299
TNM 65-200	37	65	80	637	997	100	180	225	320	250	125	95	260	319
	7,5			375	710	125							210	100
	11			484	849	125							240	164
	15			484	849	125							240	175
	18,5			528	893	125							240	190
TNM 80-160	22	80	100	544	909	125	180	225	320	250	125	95	240	232
	22			544	919	125							250	246
	30			637	1042	125							280	312
TNM 80-200	37	80	100	637	1042	125	180	250	345	280	125	95	280	332
	30			637	1032	125							270	324
TNM 100-200	37	100	125	637	1032	125	200	280	360	280	160	120	270	344

13. Pump Size Table and Pump Weights 1450 rpm



Pump Type	KW	DN Flanges		Size (mm)										Pump & Engine Weight
		Suction	Discharge	Lm	H	a	h1	h2	n1	n2	m1	m2	f	kg
	0,55			233	473	80							160	40,6
TNM 32-160	0,75	32	50	233	473	80	132	160	240	190	100	70	160	41,7
	0,55			233	473	80							160	44,6
	0,75			233	473	80							160	45,7
	1,1			250	490	80							160	48,5
TNM 32-200	1,5	32	50	275	515	80	160	180	240	190	100	70	160	50,6
	0,55			233	473	80							160	40,6
	0,75			233	473	80							160	41,7
TNM 40-160	1,1	40	65	250	490	80	132	160	240	190	100	70	160	43
	0,55			233	493	100							160	47,6
	0,75			233	493	100							160	48,7
	1,1			250	510	100							160	51,5
TNM 40-200	1,5	40	65	275	535	100	160	180	265	212	100	70	160	53,6
	1,5			275	555	100							180	68
	2,2			305	585	100							180	70,3
TNM 40-250	3	40	65	305	585	100	180	225	320	250	125	95	180	73,7
	0,75			233	493	100							160	46,7
	1,1			250	510	100							160	49,5
TNM 50-160	1,5	50	65	275	535	100	160	180	265	212	100	70	160	51,6
	0,75			233	493	100							160	54,2
	1,1			250	510	100							160	55,5
	1,5			275	535	100							160	57,6
TNM 50-200	2,2	50	65	305	565	100	160	200	265	212	100	70	160	63,3
	2,2			305	620	100							215	71,3
	3			305	620	100							215	74,3
	4			324	639	100							215	82,7
TNM 50-250	5,5	50	65	375	715	100	180	225	320	250	125	95	240	105
	0,75			233	503	100							170	51,7
	1,1			250	520	100							170	54,5
	1,5			275	545	100							170	56,6
TNM 65-160	2,2	65	80	305	595	100	160	200	280	212	125	95	190	68,3

13. Pump Size Table and Pump Weights 1450 rpm

	2,2			305	585	100							180	69,3
	3			305	585	100							180	72,7
TNM 65-200	4	65	80	324	604	100	180	225	320	250	125	95	180	80,7
	3			305	620	100							215	88,7
	4			324	639	100							215	96,7
	5,5			375	690	100							215	116
TNM 65-250	7,5	65	80	413	728	100	200	250	360	280	160	120	215	124
	5,5			375	715	125							215	136
	7,5			413	753	125							215	144
	9			413	753	125							215	153
	11			484	849	125							240	213
TNM 65-315	15	65	80	528	893	125	225	280	400	315	160	120	240	245
	1,1			250	535	125							160	60,5
	1,5			275	560	125							160	62,6
	2,2			305	610	125							180	74,3
TNM 80-160	3	80	100	305	610	125	180	225	320	250	125	95	180	77,7
	2,2			305	620	125							190	83.3
	3			305	620	125							190	83,7
	4			324	639	125							190	91,7
	5,5			375	715	125							215	115
	7,5			413	753	125							215	123
TNM 80-200	9	80	100	413	753	125	180	250	345	280	125	95	215	132
	5,5			375	715	125								130
	7,5			413	753	125							215	138
	11			484	849	125							240	214
TNM 80-250	15	80	100	528	893	125	200	280	400	315	160	120	240	246
	11			484	849	125							240	222
	15			528	893	125							240	254
	18,5			528	893	125							240	274
TNM 80-315	22	80	100	582	947	125	250	315	400	315	160	120	240	299
	3			305	620	125							190	95,7
	4			324	639	125							190	103,7
	5,5			375	715	125							215	127
	7,5			413	753	125							215	135
TNM 100-200	9	100	125	413	753	125	200	280	360	280	160	120	215	144
	5,5			375	730	140							215	135
	7,5			413	768	140							215	143
	11			484	864	140							240	218
	15			528	908	140							240	250
TNM 100-250	18,5	100	125	544	924	140	225	280	400	315	160	120	240	270
	18,5			544	924	140							240	283
	22			582	962	140							240	308
	30			637	1042	140							265	386
TNM 100-315	37c	100	125	637	1042	140	250	315	400	315	160	120	265	406
	5,5			375	730	140							215	152
	7,5			413	768	140							215	160
	11			484	864	140							240	228
TNM 125-200	15	125	150	528	908	140	250	315	400	315	160	120	240	260
	9			413	778	140							225	260
	11			484	874	140							250	235
	15			528	918	140							250	267
	18,5			544	934	140							250	235
	22			582	972	140							250	267
TNM 125-250	30	125	150	637	1057	140	250	355	400	315	160	120	280	378
	18,5			544	939	140							255	314
	22			582	977	140							255	339
	30			637	1062	140							285	416
TNM 125-315	37c	125	150	637	1062	140	280	355	500	400	200	150	285	436

14. Tightening Torque

SCREW DIAMETER	MAXIMUM TIGHTEENING TORQUE (Nm)	
	Class Property	
	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

15.The Force and Moments of Pump Flanges

When all of the applied loads cannot reach maximum values, one of these loads can exceed the normal value by providing the following conditions.
- Any component of a force or moment should be limited to x1.4 of the maximum value.
- The real forces and moments that affect each flange must provide the following formula:

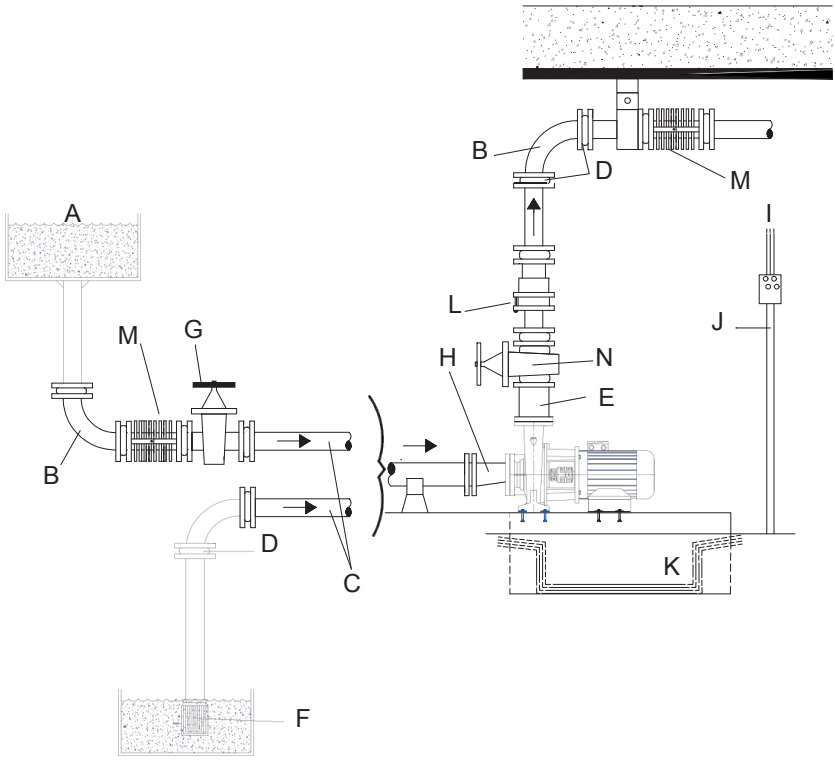
$$\left(\frac{\sum |F|_{calculated}}{\sum |F|_{permissible}}\right)^2 + \left(\frac{\sum |M|_{calculated}}{\sum |M|_{permissible}}\right)^2 \leq 2$$

It is the sum of arithmetic loads for each flange (input and output) at the pump level (input flange / output flange), regardless of the algebraic signals of real and normal values.

Pump Type	Forces								Moments					
	DN Flange		Suction Flange			Discharge Flange			Suction Flange			Discharge Flange		
	SS	DS	N			N			Nm			Nm		
			Fy	Fz	Fx	Fy	Fz	Fx	My	Mz	M_x	My	Mz	M_x
32-160	50	32	500	450	550	283	350	300	333	383	467	250	283	367
32-200														
32-250														
40-160	65	40	617	567	700	333	417	367	367	400	500	300	350	433
40-200														
40-250														
50-160	65	50	617	567	700	450	550	500	367	400	500	333	383	467
50-200														
50-250														
50-315														
65-160	80	65	750	683	833	567	700	617	383	433	533	367	400	500
65-200														
65-250														
65-315														
65-400	100		1000	900	1117				383	433	533			
80-160		80				683	833	750				383	433	533
80-200														
80-250														
80-315														
80-400														
100-200	125	100	1183	1067	1317	900	1117	1000	417	483	583	417	483	583
100-250														
100-315														
100-400														
125-200	150	125	1500	1350	1667	1067	1317	1183	500	633	700	500	633	700
125-250														
125-315														
125-400														

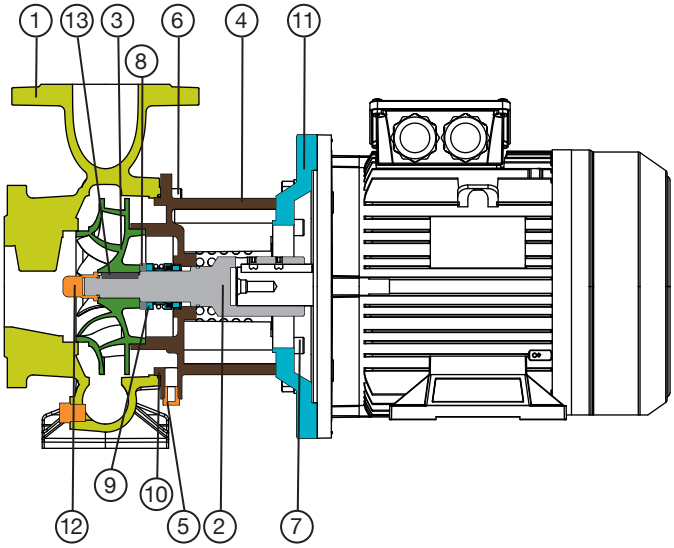
The forces in the pump flanges are calculated according to TS EN ISO 5199 standards.
Calculations apply to cast iron and bronze materials.
If the product is made of stainless material, to the flanges will be approximately double the forces and moments in the table.

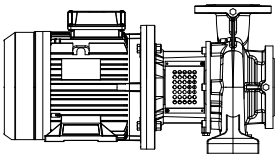
16.Sample Piping

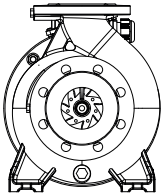


A-Tank
B-Large Radius Bracket
C-Min. Slope 2cm/m.
D-Easy Detachable Connections, Flanges etc.
E-Check Valve
F-Strainer and Base Flap
G-Suction Valve
H-Eccentric Suction Reduction
I-Network Connection
J-Armoured and Airtight Cable
K-Concrete Block
L-Compensator
M-Compensator
N-Discharge Valve

17.TNM Sectional Picture and Parts List







1- Casing
2- Shaft
3- Impeller
4- Motor Pedestal
5- Air Vent. Plug
6- Imbus Bolt
7- Motor Flange Bolt
8- Mec. Seal Ring
9- Mec. Seal
10- O-ring
11- Motor Flange
12- Impeller Bolt
13- Impeller Key

NAME OF THE PART	MATERIAL			
	Standard Prod.	Bronze-Impeller Prod.	Full Bronze Production	Stainless Steel
Body	GG 25	GG 25	Bronze	AISI 304 - 316
Impeller	GG 25	Bronze	Bronze	AISI 304 - 316
Wear ring	Bronze	Bronze	Bronze	AISI 420
Pump shaft	AISI 420	AISI 420	AISI 420	AISI 304 - 316

Warranty Terms & Conditions

- The warranty period begins on the date of delivery of the products and two years.
- All parts of the products are guaranteed by our company except electrical motors.
- If the user uses the product against the manual, the warranty terms are not applied.

Pump Type	: .....
Serial No	: .....
Capacity	: .....m^3/h
Head	: .....m
Motor Power	: .....kW
Speed	: .....rpm

Teknolojik Pompa ve Hidrofor Sistemleri

Factory – Center Service and Spare Parts

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