Horizontal centrifugal bloc pumps

Installation and operation instructions
series: DPNM

EC declaration of conformity

DP-Pumps
Kalkovenweg 13
2401 LJ Alphen aan den Rijn, The Netherlands
Tel: (+31)(0)-172-48 83 88

Hereby declares as manufacturer entirely on his own responsibility, that the products:

Vertical single-stage centrifugal pumps, series: DPNL
Horizontal single-stage centrifugal pumps, series: DPNT and DPNM
Horizontal single-stage split case pumps, series: DPAS

to which this declaration refers, are in accordance with the following standard: **EN 809/A1** according to the provisions of the harmonized standard for pumps and which implies the regulations of **Machine Directive 2006/42/EC, EMC Directive 2004/108/EC, Ecodesign Directive 2009/125/EC, Regulation 547/2012 (for water pumps with a maximum shaft power of 150kW)** in the most recent form.

The pump is subject to this declaration of conformity as a stand-alone product. An installation in which the pump is built in must be declared as compliant to all relevant regulations and standards for the complete assembly.

Alphen aan den Rijn
14/02/2013

Authorized representative
W. Ouwehand, technical director

Table of contents

1 Introduction

This manual contains instructions for the installation, operation and maintenance of the DPNM type single-stage centrifugal bloc pumps from DP-Pumps.

- Please read carefully this manual and apply all the instructions to operate pumps without problems. Pumps shall be used for their intended duties. In this manual, there are information on operating conditions, installation, starting-up, settings and main controls of pumps.
- These operating and maintenance instructions contain DP-Pumps' suggestions. The special operating and maintenance information of the plumbing that a pump is fitted to is not considered in these instructions. This information must be given by plumbing constructors only.
- Please refer to instructions of plumbing constructors.
- Please pay attention to the warnings in this manual and ensure that it is read before the installation-start up process. DP-Pumps is not responsible for the accidents resulting from negligence.
- If you cannot find an answer to your questions in this manual, it is suggested that you contact DP-Pumps. Please inform us about the rated value and especially the serial number of the pump when you get in contact for help.
- The safety instructions in this manual cover the current national accident protection regulations. Beside all of these, an operation, work and safety measure imposed by the costumer has to be applied.

The signs used in this operating manual

Read the instructions carefully in this operating manual and store it for future reference.

Warning sign against electrical risks.

Sign for the operator's safety.

2 Important safety precautions

In order to minimize the accidents during the mounting and putting into service of the pump, the following rules have to be applied:

1. Do not work without taking safety measures relevant to equipment. Cable, mask and safety band must be used when necessary.
2. Be sure there is adequate amount of oxygen and there is no toxic gaseous around.
3. Before using welding or any electrical equipment make sure that there is no risk of explosion.
4. Check the cleanliness of the area to take care of your health (dust, smoke, etc.).
5. Do keep in mind that there is a risk of having accidents related to electricity.
6. Do not lift the pump before you check the transport equipment.
7. Be sure you have a by-pass line.
8. Use helmet, eye glasses and protective shoes for your safety.
9. Place a protective barrier around the pump within the necessary safety area.
10. Dust, liquids and gaseous that may cause overheating, short circuit, corrosion and fire must be kept away from the pump unit.
11. By checking the noise level of the pump unit, take necessary measures to avoid noisy operation of the pump that can have harmful effects on the personnel and environment.
12. Be careful about the direction of transport and storage.
13. Cover appropriately the moving parts to avoid possible injury of the personnel. Mount the coupling guard and belting before starting-up the pump.
14. All the electrical and electronic applications must be performed by authorized person conforming EN 60204-1 and/or domestic instructions.
15. Protect the electrical equipment and motor against overloading.
16. If flammable and explosive liquids are pumped, ground connection of electricity should be carried out properly.
17. Do not expose the pump unit to sudden temperature variations.
18. All personnel who work with the waste water system need to be vaccinated in case of contagious diseases.
19. If the pump contains hazardous liquids, one must use protective helmet against the risk of splatter. One also must accumulate the liquid in a proper container against any risk of leakage.

All other health and safety rules, laws and regulations must be applied.

3 General

3.1 Definition of pump and applications

DPNM series pumps are single stage, close coupled volute type pumps and are used in:

- Water networks and pressurization facilities
- Irrigation, sprinkling and drainage systems
- Filling and draining of tanks and reservoirs
- Hot and cold water circulation in heating and cooling systems
- Condense water pumping
- Water circulations in pools
- Health and purification facilities
- Industrial and social facilities
- Fresh and sea water pumping in ships

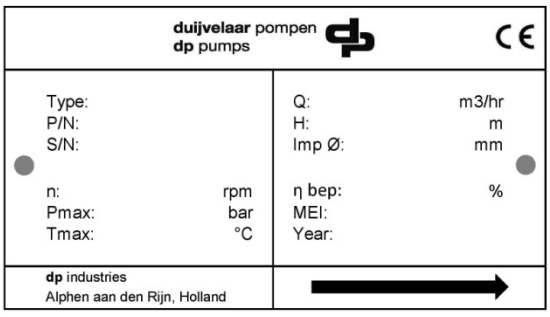
Pumps shall be used to pressurize liquids (up to 90°C), which are clean or mildly impure, non-abrasive, and not containing large solid particles or fibre.

CAUTION
Please contact DP-Pumps for liquids that have different chemical and physical specifications.

DPNM pumps consist of 23 types, whose casing sizes are all conform to DIN 24255 (T.S. EN 733).
Technical specifications of DPNM type pumps

Suction Flange	DN 50-DN 150
Discharge Flange	DN 32-DN 125
Operating Pressure	10 Bar
Capacity	2-450 m^3/hour
Head	4-70 m
Speed	1000-3600 rpm

Pump Label



3.2 Performance information

Actual performance of the pump can be obtained from the order page and/or from the test report. This information is given on the pump label.
The performance curves given in the catalogue are valid for water whose density and viscosity are ρ=1 kg/dm3 and v=1 cst. respectively. For those liquids whose densities and viscosities are different from those of water, please consult with DP-Pumps since the performance curves vary with density and viscosity.

CAUTION
Do not operate the pump with a motor that has a different power except for the given catalogue and label values.

3.3 Warranty conditions

The entire products in our selling program are warranted by DP-Pumps. The warranty period is 24 months after delivery.

Warranty conditions will only be valid when all the instructions about installation and start-up operations of the pump unit are taken into account.

3.4 Test

All Pumps are dispatched for sale when all the performance and pressure tests are completed. Proper assurance of material and fault-free operation of pumps whose performance tests are made is under the warranty of DP-Pumps.

3.5 Pressure limit

CAUTION
Pressure at the discharge flange must not exceed 10 bar. A special order is necessary for applications with higher pressures.

3.6 Ecodesign

Product according to Regulation 547/2012 (for water pumps with maximum shaft power rating of 150 kW) to the Ecodesign Directive 2009/125/EC.

- Minimum Efficiency Index: See pump label.
- The reference value MEI of a water pump with the best efficiency is = 0.70.
- Year built: See pump label.
- Manufacturer's name or trademark, official registration number and place of production: See manual or order documentation.
- Information about type and size of the pump: See pump label.
- Performance curves of the pump, including efficiency characteristics: See documented curve.
- The efficiency of a pump with a corrected impeller is usually lower than that of a pump impeller with a full diameter. A pump with a corrected impeller is adapted to a certain duty point, thereby reducing the energy consumption. Minimum Efficiency Index (MEI) refers to the full impeller diameter.
- The operation of this water pump at different operating points can be more efficient and more economical when it is controlled, for example using a variable speed controller which adjusts the pump operation to the system.
- Information for disassembly, recycling or disposal after the final shutdown: See sub chapter 11 Disassembly.
- Information about the efficiency reference value or MEI = 0.7 (0.4) benchmark index for the pump on the basis of the pattern in the picture, please visit: http://www.europump.org/efficiencycharts.

4 Safe operating conditions

This manual contains main safety instructions for the installation, operation and maintenance.
It must be read by the personnel who are responsible for installation and operation.
This manual should always be kept near the installation location. It is important to comply with safety precautions stated in page 1 along with the general safety instructions as well as preventive measures repeated in other sections of this manual.

4.1 Training of personnel

Installation, operation and maintenance personnel must have necessary knowledge in order to accomplish the given job. The responsibility, adequacies and controlling duties of such personnel must be determined by the costumer.
It has to be certain that these personnel comprehend totally the content of the operating manual.
If the personnel do not have enough knowledge, required training must be given by the costumer.
If training support is needed by the costumer, it will be provided by the manufacturer/seller.

CAUTION
Untrained personnel and unwillingness to comply with safety instructions may be risky for both machine and environment.
DP-Pumps is not responsible for this kind of damages.

4.2 Hazardous conditions that may occur when one does not comply with the safety instructions

Incompliance with safety regulations may put the personnel, the environment and the machine in danger and thus may cause damages.
Incompliance with safety regulations may give rise to situations listed below:

Important operational functions of the factory may stop.
Maintenance may get difficult.
One may get injured by electrical, mechanical or chemical hazards.

4.3 Safety measures for operator

Dangerous, hot or cold components in the pump area must be covered so that one cannot touch them.
Moving components of the pump (such as coupling) must be covered so that one cannot touch them. Those covers must not be dismounted while the pump is running. Dangers that results from electrical connections must be removed. To get more information about this subject, we refer to VDE and domestic electrical instructions.

4.4 Safety measures for maintenance and installation

The costumer must assure that all maintenance, check and instalment tasks are performed by qualified personnel. Repair work must only be performed while the machine is not running.
The pump and its auxiliary system must be cleaned thoroughly if it contains hazardous liquids.
At the end of the repair work, all safety and protective equipment must be re-installed.

4.5 Spare parts replacement

Replacement of spare parts and all modifications must be done after contacting with the manufacturer. Spare parts and accessories certified by the manufacturer are important for the safe operation of the system.

Notice: DP-Pumps is not responsible for using improper spare parts.

5 Technical information

5.1 Design

These are close coupled, single stage, single suction with a horizontal opening and a vertical discharge opening volute type (with horizontal shaft) pumps. They have closed radial impellers and their casing sizes are in accordance to DIN 24255 and EN 733 standards.

5.1.1 Locations of flange – flanges

Suction Flanges in axial direction		DN 50-DN 150
Discharge Flange radially upward		DN 32-DN 125
Discharge Flanges		DIN 2533-PN 16
Suction Flanges	50-150	DIN 2533-PN 16

5.1.2 Connection of pump and motor

Motor is close coupled to the pump with a rigid coupling using and an adapter and flange. In this way, the shafts of the motor and pump constitute a complete unit.

5.1.3 Impeller

The closed radial type impeller of the pump is balanced dynamically in an electronic balance machine. The thrust (axial force) is balanced with the back wear ring and balance holes.

5.1.4 Shaft

The shaft, impeller and other parts of the pump is designed to be dismountable without moving (dislodge) the suction and discharge pipes and volute of the pump. In this way, the installation and maintenance operations can be performed very easily.

5.1.5 Bearing and lubrication

Rolling bearings are not used in DPNM type pumps. Motor bearing is enough for countervailing all axial and radial forces.

5.1.6 Seals

In standard production, various mechanical seal types (e.g., bellow type, spring actuated type) are used for sealing.

5.2 Construction of pump group

5.2.1 Drive

A hermetic, 3 phase, totally enclosed, fan cooled, squirrel caged, in according to DIN 42673, IM 2001-B35 (footed-flanged) type electrical motor which complies with DIN IEC, VDE standards is used to drive the pump in proper speed and power.

Specifications of electrical motor

Isolation class	: F
Protection class	: IP 54-IP 55
Frequency	: 50 Hz.
Running type	: S1
Start-up type	:

- 3x380 V(Y) up to 4 kW
- More than 4 kW, 3x380(Δ) + (Y/ Δ)

5.2.2 Coupling and coupling guard

In DPNM type pumps, a clamped type rigid coupling is used. A coupling guard is provided in accordance with EN 294 in the rigid coupling area.

Pump can only be run with a coupling guard in accordance with EN 294 according to the safety instructions.

6 Transport and storage

6.1 Transport

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

CAUTION
Current general lifting safety instructions must be applied. Please use a suspension system shown in figure while you are carrying and lifting the pump unit. The suspension rings may be broken because of the excessive load and may result in a damage of the pump. Prefer fabric cable for suspension.

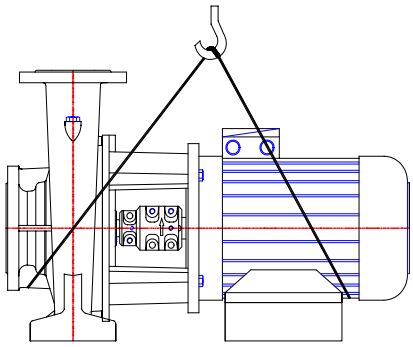


Figure 1 Transport of pump group

Incorrect lifting may damage the pump unit and cause injuries.

Damages caused in transport
Check the pump when it is delivered to you. Please let us know of there is any damage.

6.2 Storage

Please keep the unit clean and dry area during storage.

If the pump is out of use for a long time, please consider the instructions below.

1. If there is water inside the pump, drain it.
2. Clean the pump casing and impeller by jetting clean water for a short time.
3. Empty water inside the pump casing, suction line and discharge line.
4. Add small amount of antifreeze inside the pump casing if it is not possible to empty it completely. Rotate the pump shaft by hand to mix the antifreeze.
5. Close the suction and discharge exits with gasket.
6. Spray an anti-corrosive into the pump casing.
7. Rotate the pump shaft by hand once in every month, in order to protect it from freezing and to lubricate the bearings.

7 Assembly / installation

DPNM type close coupled pumps are mounted to the ground by foots of the volute and also fixed to the ground with a supporting pedestal at the bottom of the motor.

7.1 Location of installation

Pump shall be installed in a location where the control and the maintenance of the pump are easily made. The pump room shall be suitable for operation of lifting systems such as freight elevator, forklift, etc.
The pump group should be installed in the lowest possible location of the pumping system in order to achieve the highest suction pressure.

7.1.1 Location of installation- local ambient temperature

When the local ambient room temperature exceeds +40°C in a pumping system, suitable ventilation should be provided in order to remove the heat dissipated to the environment and supply fresh air.

7.2 Fixing (securing) of pump group

After the alignment of the pump group on the foundation has been made, the mutual securing bolt screws should be used alternately to fix the pump group.

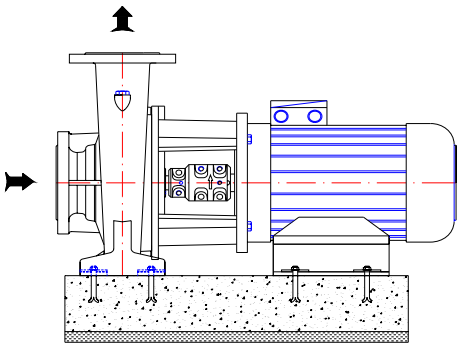


Figure 2 A typical concrete foundation

7.3 Coupling alignment

7.3.1 General

Since DPNM type pumps are close coupled, they are provided mostly with a motor. The shafts of the motor and the pump are coupled with a rigid coupling and all of the necessary alignments are performed at the factory. Therefore, the coupling alignment is not necessary for DPNM pumps provided with a motor. However, if for any reason the pump and the motor are separated (i.e., rigid coupling is dismounted), it is necessary to re-align the coupling in installation.

7.4 Coupling alignment for DPNM pumps supplied without motor or dismounted motor

1. Unscrew the rigid coupling bolts with, take apart the coupling halves from each other.
2. Hook up motor shaft upper part of the coupling, and then fix the motor from flange holes into its place.
3. Push the rigid coupling upward (to the motor side) with a screwdriver or a similar tool (Figure 3-a)

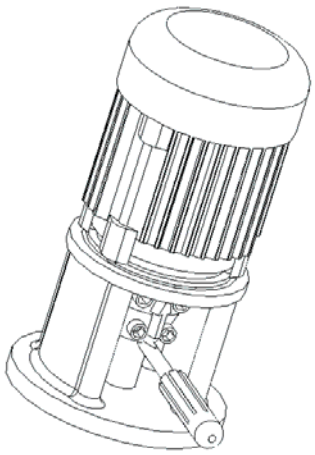


Figure 3-a

4. Using a gauge stick, align the distance between coupling and the adapter. After placing the gauge stick, push the coupling downward (in pump direction).

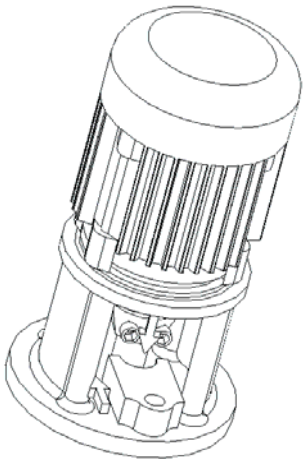


Figure 3-b

5. After aligning the distance of the coupling, screw each bolt by applying equal torque. When the screwing is done, the openings in two sides of the rigid coupling should be equal.

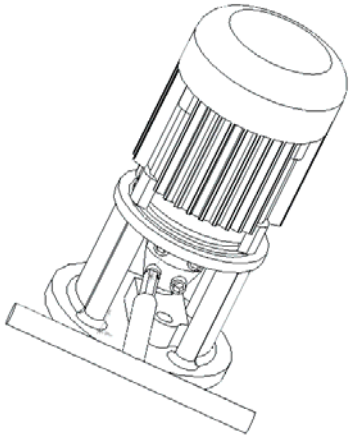


Figure 3-c

6. Dismantle the volute of the pump.
7. Bring the group formed by parts other than the volute in a vertical direction so that the motor stays below. This way, the pump impeller stands at the very top and open.
8. Connecting a magnetic comparator to the adaptor as shown in Figure 4, check the shaft and face runout on the front wear ring. In this way, the maximum allowable shaft runout shall be 0.05 mm. If the runout is more than the maximum allowable value, by loosening the bolts of the rigid coupling a little bit and then hitting slightly the shaft nut, ensure that shaft runout is removed. Then, screw the rigid coupling bolts securely. At this instance, you can also align the position of the impeller in the axial direction.

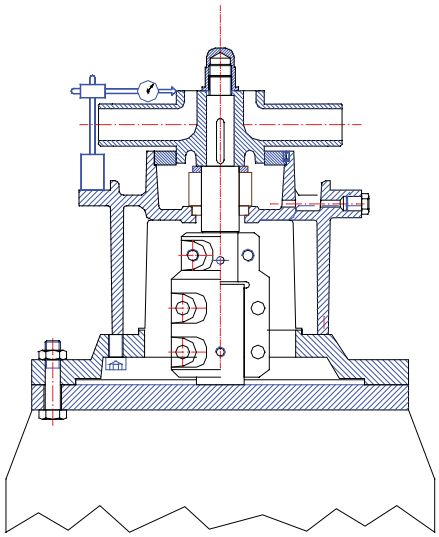


Figure 4

9. If you do not achieve sufficient correction after this alignment, dismantle also the impeller and using a comparator check the runout of the pump shaft in a similar way.

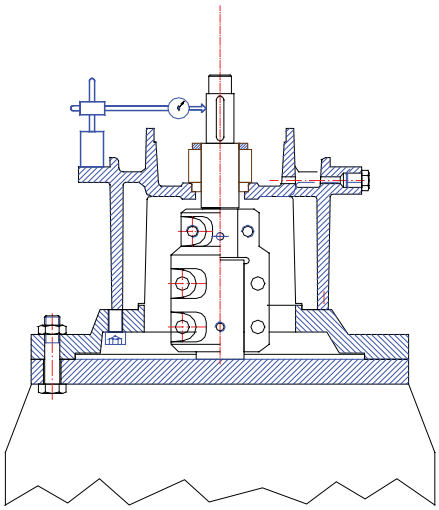


Figure 5

10. By mounting impeller again, check the runout once more and screw the coupling bolts.
11. Position the volute into its place and fix it. By manually rotating the shaft make sure that the shaft rotates easily. Finally, place the pump in the horizontal position.

After the coupling has been fixed, mount a coupling guard. According to the accident prevention regulations, all preventions and protective devices related to rotating parts shall be in their intended place and in operational form.

7.5 Piping

7.5.1 General

Do not use the pump as the hinged support for the piping system.

- Put enough supports under the piping system in order to carry the weight of the pipe and fittings.
- Avoid piping system loads on pump by installing flexible components (compensator) to suction and discharge of the pump.
- By mounting flexible supporting items, take into consideration the fact that these items may elongate under the pressure. Especially, the supporting items shall be placed in the direction of discharge flange axis of the pump (generally in vertical direction).
- Suction pipe shall be in a constantly increasing slope to the pump. Air in the suction pipe shall be arranged to move into the pump.
- Discharge piping shall be in a constantly increasing slope to the reservoir or discharge point, without up and downs which can cause air pockets in the piping system. At locations where forming of air pockets is possible, special items like air valve and air cock are mounted to evacuate the trapped air.
- It is important that pipe diameter and fittings are at least as much as the pump opening diameter or preferable one or two size higher. One should never use fittings with smaller diameters than the pump exit diameter. In particular, preferred fittings like foot valve, strainer, filter, check valves and valves shall have large free passing area, and low friction loss coefficient.
- For piping systems with hot liquids, thermal expansions are to be taken into account and compensators shall be mounted in accordance with these expansions. Caution shall be exercised to avoid the loading of pump in this installation.

7.5.2 Specification of work in piping installation

In installation of pipes, follow the procedures below certainly.

- Install the pump on the concrete base as illustrated in Figure 2.
- Take out the guards (placed by the manufacturer) from suction and discharge openings of the pump.
- Close the suction and discharge flanges with rubber gaskets. This precaution is important to avoid the undesired substances (weld crust, weld slag, sand, stone, wood piece etc.) get into the pump. Do not take off this gasket until the installation is completed.
- Start the installation of piping from the pump side. Do the necessary assembling and welding of the parts in a successive order.
- In these operations, do not neglect to put the necessary supports in their respected locations.
- Following above procedure, complete all piping system at suction side up to the suction tank (or foot valve if available), at discharge side up to do discharge collector and discharge pipe.
- When all installation and welding process is done and the heat dissipated by welding is removed, dismantle all the bolted connections from the suction tank to discharge pipe. Take out all demountable parts.
- Clean these parts and then paint body coat completely inside and outside.
- Mount the parts again in their intended places. However, this time start from the discharge line and move downward to the pump. In this instance, do not forget to check the flange gaskets. If needed, (for example deformation during welding) replace them.
- Concerning the connection of the pump flanges to piping, in case of misalignment of axis and flange holes, do not force the system to eliminate the misalignment. Forcing the system may cause difficult-to-correct problems.
- If there is an axial misalignment between the flanges of the pump and the pipe, due to the welding or any other reasons, cut the pipe from a suitable location in order to fix the problem. Connect the pipe (pump side) to the pump. After carrying out the necessary correction, connect the parts again by welding.
- Dismantle and clean the last welded part. Repaint again and mount on its place.
- After all these processes are accomplished, remove the rubber gasket from the suction and discharge openings. Open their holes and mount them again on their intended place.

7.5.3 Specification of work after installation of piping and piping system

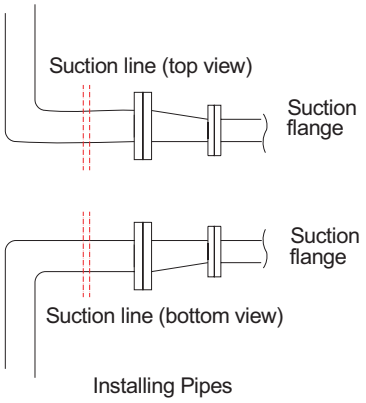


Figure 6 Piping system

An illustrative piping system is shown in Figure 8.

Complete the auxiliary pipe connections in piping system if exist (cooling to bearing housing, and stuffing box (seal), relief pipe, oil pipe etc.). Appropriate manometers shall be mounted on suction and discharge pipe lines.

7.6 Motor connection

Motor shall be connected by an electrical technician according to the connection (switch) diagram. Local electricity policies and current VDE regulations have to be applied.

- **Electrical connections have to be made by authorized electricians.**
- **In dismantling the pump, make sure the electricity is cut off before taking the motor cover out.**
- **Use the appropriate electrical connection to the motor.**

In environments where there is a risk of explosion, prescribed protective law and regulations shall be applied by competent authorities.

7.6.1 Motor connection diagram

- Motors requiring high moments at start up shall not be connected star/delta.
- Frequency controlled motors, require high moment at start up and have to be cooled properly at low speeds. Provide the necessary cooling for the motors.

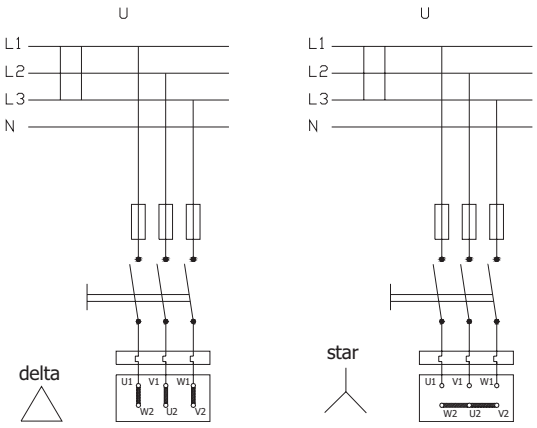


Figure 9 Electric Connection Diagram

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

7.6.2 Motor protection

- Three phased-motor shall be connected to power supply.
- Wait the motor to cool down when thermic protected motor breaks in circuit due to the overheating. Make sure the motor does not start automatically until it cools completely.
- In order to protect the motor from overcharging and short circuit use a thermic or thermic-magnetic relay. Adjust this relay to the nominal current of the motor.

Electrical equipment, terminals and the components of the control systems may carry electric current even though they are not operating. They may cause deadly and serious injuries or irreparable material damages.

8 Commissioning, start up and operating

8.1 Preparations before start-up

- Make sure that the pump and the suction pipe is completely filled with water before the starting. If the pump operates on a positive suction head, no problem will be encountered. Suction valve is opened and air drains are un-tightened.
- Pumps with foot valve are filled with water by opening the pump filling tap or, one takes advantage of the water accumulated in the discharge pipe and by using a small valve the check valve is bypassed and the pump is filled.
- In vacuum pump driven pumps, by operating the vacuum pump one achieves to fill the pump via increasing the water level in the suction pipe.

CAUTION
Do not start your pump dry.

8.2 Checking the direction of rotation

CAUTION
The direction of rotation is indicated on the pump label with an arrow. Apart from special cases, it is clockwise direction when looking from the motor end. Observe if the pump is rotating in the expected sense by starting the motor for a very short instant. If it is turning in the opposite sense, interchange any of two motor leads.

- If the motor connection is delta, open the discharge valve slowly.
- If the motor connection is star/delta, set the time relay to maximum 30 seconds. Monitor the passage from star to delta by pressing the start button. As soon as you are assured that the connection is delta, open the discharge valve slowly. Continue opening the valve until you read the amperage on the electrical panel.
- One should always check the labels which show the direction of rotation and the direction of fluid flow. If you dismount the coupling guard to monitor the direction of rotation, do not restart the engine before remounting the guard.

8.3 Start-up procedure

- Check if the suction valve is open and the discharge valve is closed. Start the motor.
- Wait until the motor reaches sufficient speed (in star/delta connections, wait until the engine passes to delta connection).
- Keeping an eye on the amperage shown on the panel, open the discharge valve slowly.
- In the primary operation, if the discharge pipe is empty, do not open the valve completely. By keeping an eye on the amperage, open the valve with care regarding that it should not exceed the value indicated on pump's label.
- After opening the valve completely, check the pressure from the pump exit manometer and make sure that this value is the pump operating pressure value and is indicated on pump's label.
- If the value one reads is less than the pump label value when the valve is completely open, it means that the height is miscalculated. Increase the value by narrowing the valve and bring it to pump's label value.
- If the value one reads is greater than the pump label value when the valve is completely open, it means that the height is calculated less than what it should be in reality. The device is pumping less than what is requested. Check the installation and the calculations.
- Minimum flow rate: If the pump is working with zero flow rate (closed valve) from time to time during its operation, the water inside the pump may endanger the pump by getting warmed up. In such cases, a minimum flow valve must be connected to the pump exit.

CAUTION
Stop the motor if the pump gets too hot. Wait until it gets cold. Then start the system up again carefully.

8.4 Shut down procedure

CAUTION
During sudden startups and stops, a pressure reducing valve must be placed at the exit section of high flow rate pumps whose discharge pipelines are long, in order to reduce water hammer effect. Water hammer may explode the pump.

In normal conditions (apart from sudden power shut down, etc.), stop the pump as below:

- Close the discharge valve slowly.
- Switch the power off, stop the motor. Notice that the rotor slows down.
- Do not start up the motor at least before 1 to 2 minutes.
- If the pump will be out of use for a long time, close the suction valve and auxiliary circuits. If the pump is outside and if there exists a danger of frost, remove all drain taps and empty all the water inside the pump. See chapter 6 Storage.

CAUTION
If the pump is outside and if there exists a danger of frost, remove all drain taps and empty all the water inside the pump.

9 Maintenance

CAUTION
Maintenance operations must be done by authorized personnel with protective clothing only.
The personnel must also beware of high temperatures and harmful and/or caustic liquids. Make sure that the personnel reads carefully the manual.

- The instructions in Safety Precautions must be executed during maintenance and repair
- Continuous monitoring and maintenance will increase the engine's and pump's lives.

9.1 Checks during operation

- Pump must never be operated without water.
- Pump must not be operated for a long time with the discharge valve closed (zero capacity).
- Precautions must be taken against flare up when the component temperatures are over 60°C. 'Hot Surface` warnings must be placed over necessary areas.
- All the auxiliary systems must be in use while the pump is operating.
- If the pump has mechanical sealing, there is no need for excessive maintenance. Water leakage from the mechanical sealing indicates the fact that the sealing is worn out and therefore needs to be replaced.
- If the system consists of a substitute pump, keep it ready by operating it once a week. Check also the auxiliary systems of the substitute pump.

9.1.1 Component check

CAUTION
To make possible the visual control, one must be able to reach the pump from any direction. Especially, to be able to dismount the internal units of the pump and the engine, sufficient free space must be created around them for maintenance and repair. Furthermore, one must make sure that the piping system can easily be dismounted

9.1.1.1 Bearing and lubrication

Rolling bearings are not used in DPNM type pumps. Motor bearing is enough for countervailing all axial and radial forces. Motor bearings are provided with lifelong heat resistant grease.

9.1.2 Mechanical Seals

Mechanical seals are used in DPNM type pumps. Mechanical Seals are absolutely leak-proof and needs less maintenance than soft packing.

Mechanical seal

1) Provides leak-proof operation in heavy operating conditions (in waste water pumps, chemical process and refinery pumps).
2) Easily mountable and needs less maintenance.
3) Does not cause wearing on the shaft.
4) Sealing operation does not depend on the quality of shaft finishing.

9.1.3 Drive

Apply to the operating instructions of the motor manufacturer.

9.1.4 Auxiliary Components

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

9.2 Service

Our Customer Service Department offers after-sale service. Manager should employ authorized and trained personnel for mounting/dismounting procedures. Before these procedures, one must make sure that pump interior is clean and empty. This criterion is also valid for the pumps which are sent to our factory or to our service points

Maintain the safety of the personnel and the environment in every field procedure.

9.3 Spare parts

The spare parts of DPNM type pumps are guaranteed for 10 years by DP-Pumps. In your spare parts requests, please indicate the below listed values that are indicated on your pump's label.

Pump type and size:
Motor power and speed:
Pump serial number:
Capacity and head:

If you wish to keep spare parts in store, depending on the number of same type of pumps, for two operation years, the quantities which are listed in the table below are recommended.

Component name	**The number of equivalent pumps in the installation**						
	1-2	**3**	**4**	**5**	**6-7**	**8-9**	**10 +**
Shaft (key included) quantity	1	1	2	2	2	3	% 30
Impeller (quantity)	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 clamped coupling	1	2	2	3	3	4	% 50

10 Noise level and vibration

The reasons to increase the noise level are indicated below:

- Noise level increases due to the fact that the pump is not founded properly (vibration).
- If the installation does not have compensator noise and vibration increases.
- Wearing in ball bearing also increases noise level.

Check if there is any noise increasing elements in your installation.

10.1 Expected noise values

Mpower of Motor PN (KW)	Sound Pressure Level (dB) *	
	Pump with Motor	
	1450 rpm/min.	2900 rpm/min.
0.25	53.0	-
0.37	54.0	-
0.55	55.0	-
0.75	56.0	66.0
1.1	57.0	66.0
1.5	58.0	67.0
2.2	59.0	67.0
3.0	60.0	68.0
4.0	61.0	68.0
5.5	62.0	70.0
7.5	64.0	70.0
11.0	65.0	73.0
15.0	67.0	74.0
18.5	68.0	75.0
22.0	69.0	76.0
30.0	70.0	77.0
37.0	71.0	78.0

(*) Without protective sound hood, measured at a distance of 1 m directly above the driven pump, in a free space above a sound reflecting surface.

The above values are maximum values.
The surface noise pressure level at dB(A) unit is shown as (LpA). This complies with TS EN ISO 20361.

11 Disassembly, repair and reassembly

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

Follow the safety precaution measures outlined in the `safety instructions` section.

11.1 Disassembly

- Close all valves in the suctions and discharge lines.
- Remove the safety guard .
- Thanks to “Back Pull Out Design”; the impeller, shaft and other rotating parts being removable no need to disconnect the suction and delivery pipes.
- If to take out the complete pump is necessary, disconnect pump from the driver, suction and discharge pipes and detach the baseplate (if any).
- Dismantle the rotor group with motor from the volute casing (Be careful to keep the stuffing box cover in place to avoid any mechanical seal trouble).
- Unscrew the end nuts (65) of the impeller and take out the impeller (20) and impeller key (210). Use rust remover solvent if necessary during dismantling.
- Take out the set screws on the pump shaft .
- Take off the motor by unscrew the hex bolts (320).
- Pull out the rotating part of the mechanical seal (250).
- Take out the shaft.

11.2 Reassembly

- Reassembly proceeds in reverse sequence to disassembly as described in section F1. You may find the attached drawings useful.
- Coat the seats and screw connections with graphite, silicon or similar slippery substance before reassembly. If you cannot find any of the above you may use oil instead (except the pumps for drinking water).
- Never use the old O-rings and make sure the O-rings are the same size as the old ones.
- Slip the pump shaft (60) onto the motor shaft, fix the set screws.
- Place the stationary part of mechanical seal to its place on the adaptor (12).
- Mount the adaptor to the motor flange.
- Slip the rotating part of the mechanical seal onto the pump shaft (61).
- Place the impeller key (210) into keyway, slide the impeller (20) onto the shaft (61) and screw the impeller nuts (65).
- Now reassembly of the rotor group is completed.
- Finally mount rotor assembly to the volute casing (in the repair shop or on-site).
- Make sure the gaskets and O-rings are evenly placed without sliding and not damaged or not squeezed at all.
- Place the pump on the baseplate, couple the motor. Connect suction and discharge pipes as well as auxiliary pipes. Take the unit into operation as is indicated in chapter 8.

12 Possible failure, causes, solutions

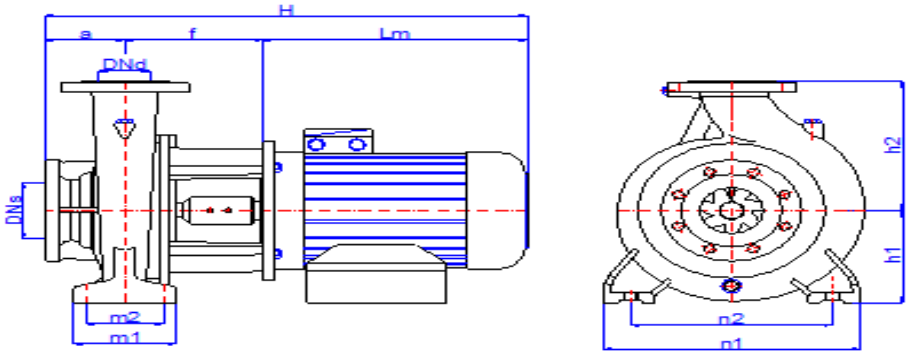
Possible failures and solution strategies are listed in the table below. Please apply to the Customers' Service Department of our company when a generic solution is not found to your problem.

While the failures are repaired the pump must always be dry and un-pressurized.

POSSIBLE FAILURE	CAUSES	SOLUTIONS
1) The pump delivers insufficient capacity	• Discharge head too high • Very high counter pressure • Pump and/or pipe cannot discharge air, cannot suck • Occurrence of air pockets inside the pipe • NPSH is too low	• Readjust the operating point • See if there is any undesired material inside the pipe • Vent completely the pump and the pipe • Change the piping configuration • Increase the liquid level
2) Motor overload	• System pressure is lower than the requested pressure level • Speed too high • Liquid pumped of different specific gravity and viscosity than that for which pump is rated • Engine works at two phases	• Adjust the operating pressure to the label value • Decrease the speed • Increase the engine power • Replace the fuse and control the electrical connections
3) Pump head is too high	• System pressure is higher than the requested pressure level	• Set the operating pressure to the label value
4) Bearing temperatures are high	• Worn out coupling • Too much, too little or improper lubrication • Increase in axial forcing	• Replace the coupling • Change the oil, decrease or increase its quantity • Clean the balance holes on the impeller disc
5) Excessive leakage from the stuffing box	• Worn out gland • Loose gland	• Use brand new gland • Change the stuffing bush • Tighten the gland nuts
6) Noisy operation	• Worn out motor or pump ball bearings • Cavitation • Worn out or misaligned coupling • Operation in the far left or right of the performance curve	• Replace • Close the delivery partially in order to reduce the capacity. • Replace the coupling or align it • Operate the pump at its label setting
7) Excessive increase in pump temperature	• Pump and/or pipe can neither discharge, nor aspirate air • Too low capacity	• Bleed completely the pump and the pipe • Open more the valve
8) Vibration	• Pump and/or pipe can neither discharge, nor aspirate air • NPSH is too low • Internal components of the pump are worn out • System pressure is lower than the requested pressure level • Coupling is misaligned • Too much, too little or improper lubrication • Rotor unbalanced • Improper bearings	• Bleed completely the pump and the pipe • Increase the liquid level • Replace the worn out components • Adjust the operating pressure to the label value • Align the coupling • In case of continuous overload, decrease the impeller diameter • Change the oil, decrease or increase its quantity • Balance the impeller again • Use new bearings

13 Pump dimensions table and weights

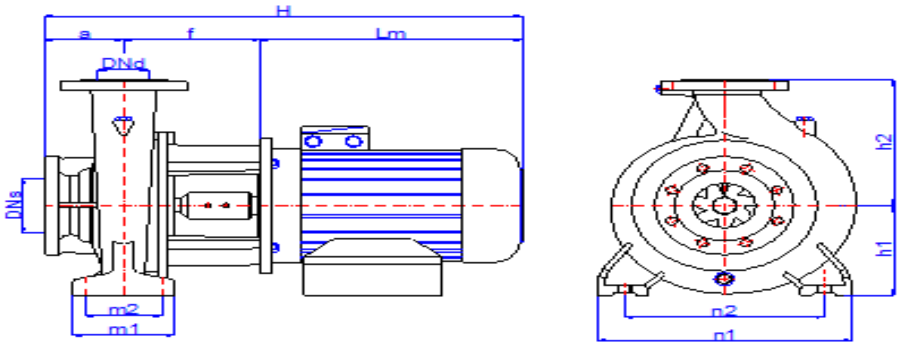
Pump Dimensions Table And Weights 2950 rpm



Pump Type	KW	DN Flanges		Dimensions (mm)										Pump and Driver 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 80-200	37	80	100	637	1042	125	180	250	345	280	125	95	280	332
	30			637	1032	125							270	324
DPNM 100-200	37	100	125	637	1032	125	200	280	360	280	160	120	270	344

Pump Dimensions Table And Weights 1450 rpm



Pump Type	KW	DN Flanges		Dimensions (mm)									Pump and Driver Weight
		Suction	Discharge	Lm	H	a	h1	h2	n1	n2	m1	m2	f	kg
	0,55			233	473	80							160	40,6
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 65-160	2,2	65	80	305	595	100	160	200	280	212	125	95	190	68,3
	2,2			305	585	100							180	69,3
	3			305	585	100							180	72,7
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 80-200	9	80	100	413	753	125	180	250	345	280	125	95	215	132
	5,5			375	715	125							215	130
	7,5			413	753	125							215	138
	11			484	849	125							240	214
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 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
DPNM 125-315	37c	125	150	637	1062	140	280	355	500	400	200	150	285	436

14 Tightening torques

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

15 Forces and moments at the pump flanges

All of the applied loads if not reached the maximum allowable value, to provide that the following additional conditions, one of these loads may exceed the normal limit:

Any component of a force or a moment, must be limited 1.4 times of the maximum allowable value. The actual forces and moments acting on each flange, should provide the following formula

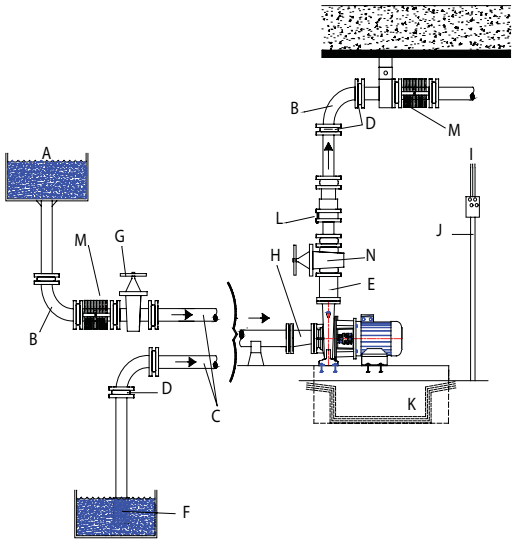
$$\left(\frac{\sum|F|_{actual}}{\sum|F|_{maximum\ \ allowable}}\right)^2+\left(\frac{\sum|M|_{actual}}{\sum|M|_{maximum\ \ allowable}}\right)^2\le 2$$

In here, $\sum|F|$ and $\sum|M|$ are arithmetic sum of the loads for each flange at the pump level, without regard of the algebraic signs of the actual and maximum allowable values.

Pump Type	DN Flange		Forces						Moments					
			Suction Flange			Discharge Flange			Suction Flange			Discharge Flange		
	Suction	Discharge	N			N			Nm			Nm		
			F y	F z	F x	F y	F z	F x	M y	M z	M x	M y	M z	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														

Forces at the pump flanges were calculated according to TS EN ISO 5199 standard. The calculations are valid for the materials of cast iron and bronze. Forces and moments at the flanges that made of stainless material will be approximately twice as moments in the table

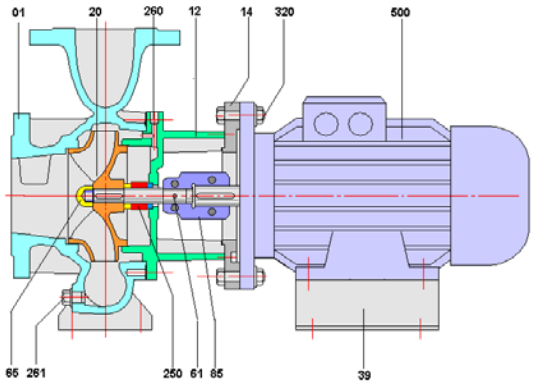
16 Sample pipework



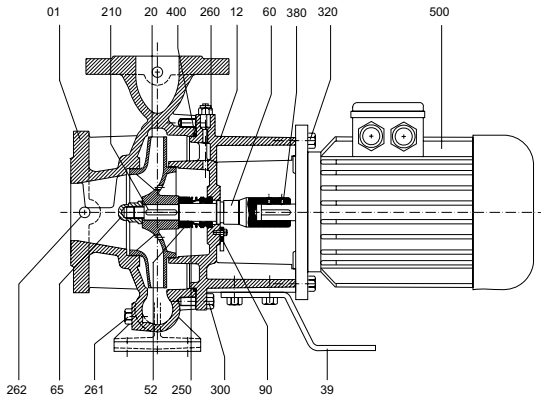
A. Tank
B. Large radius elbow
C. Minimum slope is 2 cm/m fittings, flanges etc.
D. Non-return valve
E. Foot valve
F. Suction valve
G. Reducer
H. Electrical connection
I. Insulated cable
J. Concrete foundation
K. Compensator
L. Compensator
M. Discharge valve

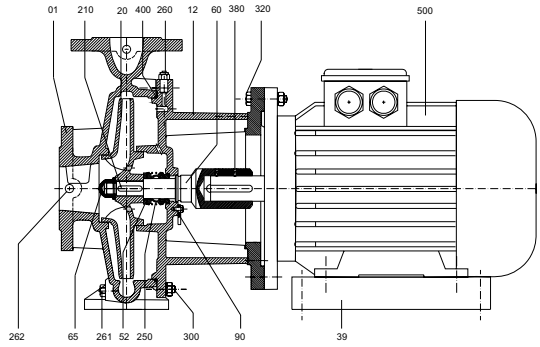
Figure 8 A Typical Pipework

17 DPNM sectional drawing and spare part list

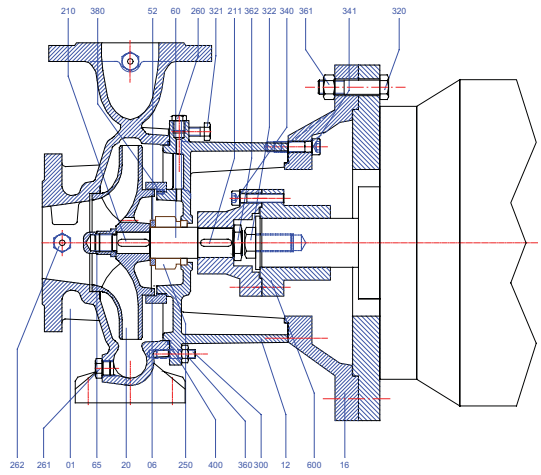


Part No	Part Name (Standard pump parts)	Part No	Part Name (Standard pump parts)
01	Volute casing	85	Rigid coupling
12	Adapter	250	Mechanical seal
14	Motor flange	260	Plug
20	Impeller	261	Emptying plug
39	Supporting pedestal	320	Hex-bolt
61	Shaft	500	Motor
65	Impeller nut		





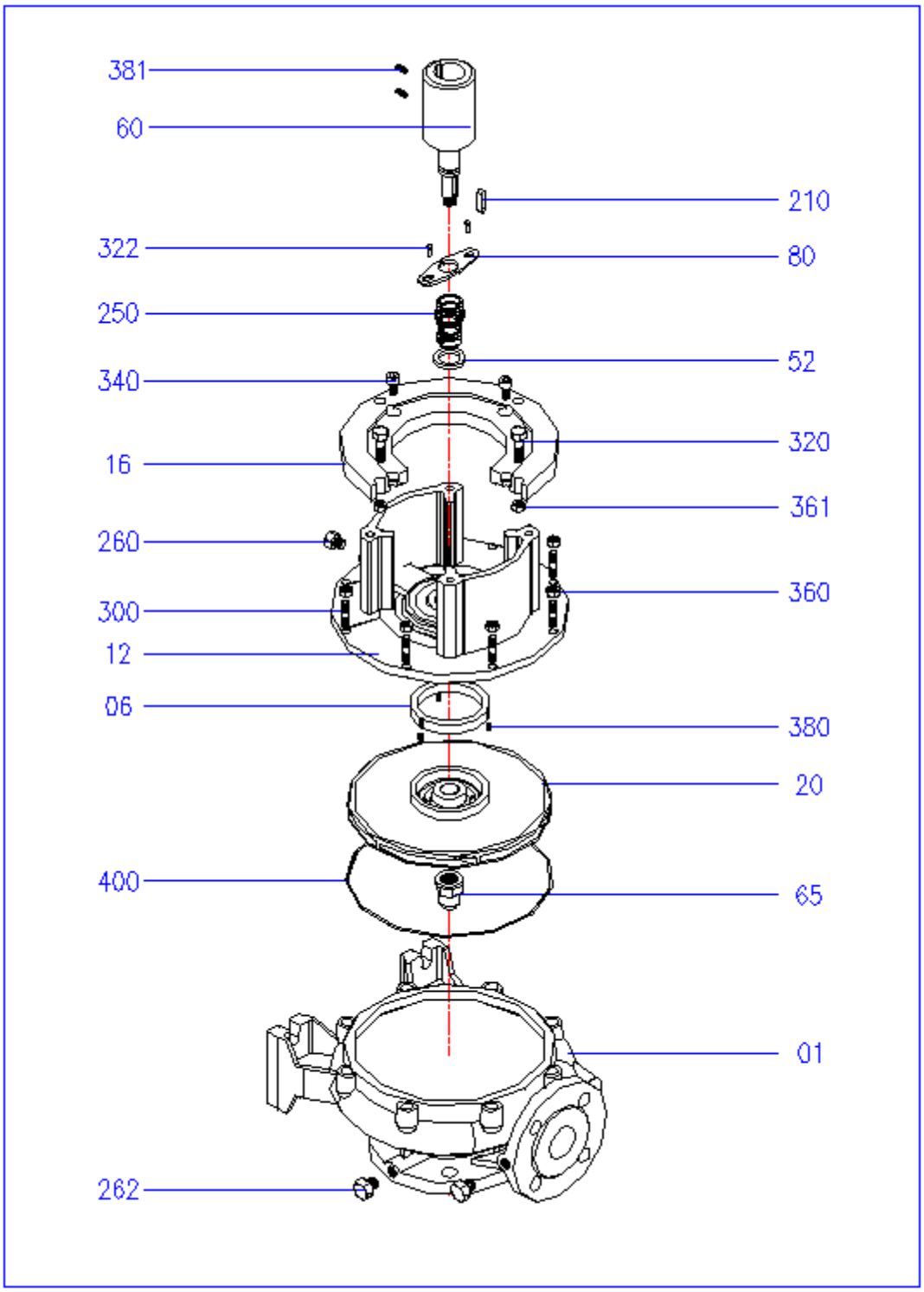
Part No	Part Name
01	Pump Casing
12	Adapter
20	Impeller
39	Support Foot
52	Mechanical Seal Sleeve
60	Shaft
65	Impeller Nut
90	Shaft Fixing Device
210	Impeller Key
250	Mechanical Seal
260	Plug
261	Drain Plug
262	Plug (Pump Casing)
300	Stud, Casing
320	Hexagonal Bolt
380	Set-Screw
400	O-Ring
500	Motor



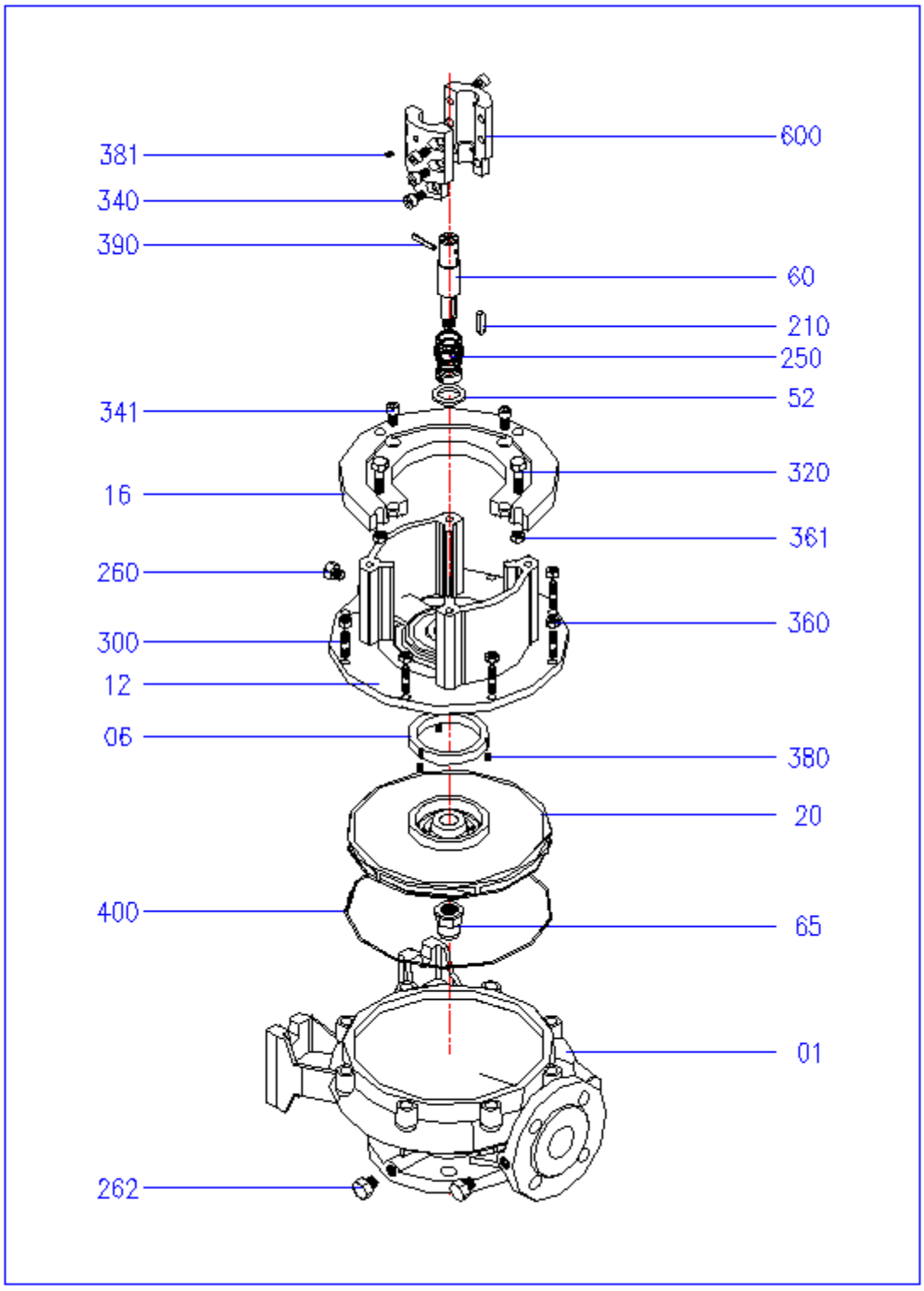
Note: This coupling system is applied with a motor power of 30kW and over.

Part No	Part Name
01	Pump Casing
06	Wearing Ring
12	Adapter
16	Motor Flange
20	Impeller
52	Mechanical Seal Ring
60	Pump Shaft
65	Impeller Nut
210	Impeller Key
211	Coupling Key
250	Mechanical Seal
260	Plug
261	Drain Plug
262	Plug (Pump Casing)
300	Stud, Casing
320	Hexagonal Bolt
321	Hexagonal Bolt
322	Hexagonal Bolt
340	Cap Screw
341	Cap Screw
360	Nut
361	Nut
362	Nut
380	Set-Screw
400	O-Ring
600	Coupling

18 DPNM series - exploded view (without coupling)



19 DPNM series - exploded view (with coupling)



dp pumps

dp pumps
P.O. Box 28
2400 AA Alphen aan den Rijn
The Netherlands

t +31 172 48 83 88
f +31 172 46 89 30

dp@dp.nl
www.dp.nl

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Original instructions