

Horizontal multi-stage centrifugal pumps

Installation and operating instructions

series: DPHM(C)

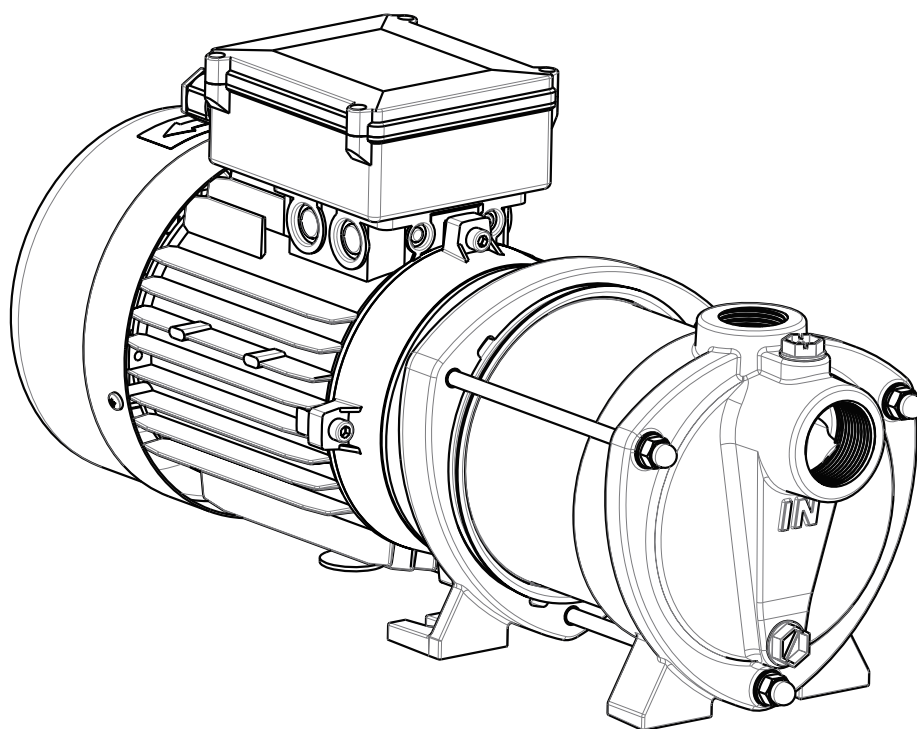


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1 Manual Introduction

1.1 Preface

This manual contains important information for reliable, proper and efficient operation. Compliance with the operating instructions is of vital importance to ensure reliability and a long service life of the product and to avoid any risks.

The first chapters contain information about this manual and safety in general. The following chapters provide information about normal use, installation, maintenance and repairs of the product. The annex contains the declaration(s) of conformity.

- Make yourself familiar with the content.
- Accurately follow the directions and instructions.
- Never change the sequence of the operations to be carried out.
- Keep this manual or a copy of it together with the logbook in a fixed place near the product which can be accessed by all personnel.

1.2 Icons and symbols

In this manual and in all accompanying documentation the following icons and symbols are used.



WARNING

Danger of electric Voltage. Safety sign according to IEC 417 - 5036



WARNING

**Operations or procedures, if carried out without caution, may cause personal injury or damage to the product.
General hazard sign according to ISO 7000-0434**



ATTENTION

Is used to introduce safety instructions whose non-observance may lead to damage to the product and its functions.



ENVIRONMENTAL INSTRUCTION

Remarks with respect to the environment.

2 Identification, service and technical support

2.1 Obtaining data and information DPHM(C) 2/4/6

The name plate indicates the type series / size, main operating data and identification number. Please quote this information in all queries, repeat orders and particularly when ordering spare parts. If you need any additional information or instructions exceeding the scope of this manual or in case of damage, please contact DP-Pumps nearest customer service centre.

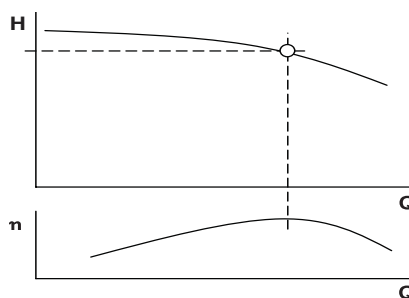


Figure 2: Duty point

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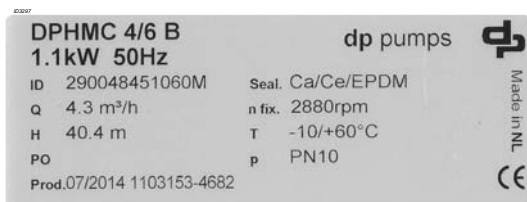


Figure 1: Pump with motor

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Table 1: Description nameplate

Indication		Meaning
DPHMC 4/6 B		Model key (design version B)
1.1 kW		Installed motor power
50 Hz		Nominal frequency
ID	290048451060M	Pump ID
Q	4.3 m ³ /h	Optimum capacity running at n_{fix} (see fig. 2: Duty point)
H	40.4 m	Optimum head running at n_{fix} (see fig. 2: Duty point)
PO		Purchase order number
Prod.	07/2014 1103153-4682	Production week/year and production serial number > as built file
Seal.	Ca/Ce/EPDM	Mechanical Seal Surface Code and elastomer, see fig. 2.2: Seal codes
n fix.	2880 rpm	Rotation speed indication at which Q/H are given
T	-10/+60°C	Temperature range
p	PN10	Pressure Class connection

2.2 Seal codes

Table 2: Material code shaft seal

Code acc. to EN 12756	Description	Material		Note
B	Spring loaded ring	Carbon graphite	Ca	Resin impregnated
V	Seat ring	Ceramic	Ce	Aluminium oxide
E	Elastomers	EPDM	EPDM	Ethylene propylene rubber
P		NBR	NBR	Nitrile butadiene rubber
F	Spring	CrNi steel		
F	Other metal parts	CrNi steel		

2.3 Current

2.3.1 Nominal current

The nominal allowable current of the motor is stated on the motor plate. This shows the nominal working range of the motor and can be used to protect the motor.

Measuring the actual current of the pump during operation can be used to pre-set the motor protection switch to protect the pump/motor combination. This current value can also be used to determine the proper electrical equipment such as variable frequency drive, main switch, wiring diameter etc.



WARNING

Not only the motor, but also the pump has to be protected in its application.

2.3.2 Motor protection

Standard single phase motors are delivered including motor protection. The motor protection is provided either by a thermal circuit breaker or by a motor winding protection.

Protection device variant	Type of protection	Suitable for ambient temperature [°C]	Located in	Reset
1	Thermal circuit breaker	20 - 30	Thermal box	Manual
2	Winding protection	-20 - 50	Motor winding	Automatic

Please contact your supplier for more detailed information about your motor protection.

2.4 Supplementary documentation

Apart from this manual, the documentation given below is also available:

Table 3: Supplementary documentation

Document	Code
General terms of delivery	119 / 1998
DPHM(C) 2/4/6	
Technical Data 50/60 Hz Version B	97004494
See also www.dp-pumps.com	

3 Warranty

3.1 Terms of warranty

The warranty period is settled by the terms of your contract or at least by the general terms and conditions of sales.



ATTENTION

Modifications or alterations of the product supplied are only permitted after consultation with the manufacturer. Original spare parts and accessories authorized by the manufacturer ensure safety. The use of other parts can invalidate any liability of the manufacturer for consequential damage.



ATTENTION

The warranty relating to the operating reliability and safety of the product supplied is only valid if the product is used in accordance with its designated use as described in the following sections of this manual. The limits stated in the data sheet must not be exceeded under any circumstances.

The warranty becomes invalid if one or more of the points below occur.

- The buyer makes modifications himself.
- The buyer carries out repairs himself or has these carried out by a third party.
- The product has been handled or maintained improperly.
- The product has non original DP-Pumps spare parts fitted.

DP-Pumps repairs defects under warranty when:

- They are caused by flaws in the design, the material or the production.
- They are reported within the warranty period.

Other terms of warranty have been included in the general terms of delivery, which are available upon request.

4 Safety and environment

4.1 General

This DP-Pumps product has been developed using state-of-the-art technology; it is manufactured with utmost care and subject to continuous quality control. DP-Pumps does not accept any liability for damage and injury caused by not observing the directions and instructions in this manual, or in cases of carelessness during the installation procedure, use and maintenance of the product.

Non-compliance with safety instructions can jeopardize the safety of personnel, the environment and the product itself. Non-compliance with these safety instructions will also lead to forfeiture of any and all rights to claims for damages.

For example, in particular non-compliance can result in:

- failure of important pump/system functions,
- failure of prescribed maintenance and servicing practices,
- injury to persons by electrical, mechanical and chemical effects,
- hazard of the environment due to leakage of hazardous substances,
- explosions.

Depending on specific activities, extra safety measures may be required. Contact DP-Pumps if a potential danger arises during use.



ATTENTION

The owner of the product is responsible for compliance with the local safety regulations and internal company guidelines.



ATTENTION

Not only must the general safety instructions laid down in this chapter on "Safety" be complied with, but also the safety instructions outlined under specific headings.

4.2 Users

All personnel involved in the operation, maintenance, inspection and installation of the product must be fully qualified to carry out the work involved and be aware

of all applicable responsibilities, authorisations and super visions. If the personnel in question is not already in possession of the required know-how, appropriate training and instruction must be provided. If required, the operator may commission the manufacturer / supplier to take care of such training. In addition, the operator is responsible for ensuring that the contents of the operating instructions are fully understood by the responsible personnel.

4.3 Safety provisions

The product has been designed with the greatest possible care. Original parts and accessories meet the safety regulations. Modifications in the construction or the use of non-original parts may lead to a safety risk.



ATTENTION

Make sure that the product operates within its working range. Only then the product performance is guaranteed.

4.3.1 Labels on the product

The icons, warnings and instructions applied to the product are part of the safety provisions. The labels may not be removed or covered. Labels must remain legible during the entire life of the product. Replace damaged labels immediately.

4.4 Safety precautions

4.4.1 During normal use

- Contact the local electricity company for questions about the power supply.
- Protect the parts that can become hot, making direct contact impossible.
- When applicable, always place undeformed coupling guards to protect the coupling, before putting the pump into use. Make sure that the coupling guards are never in contact with the rotating coupling.
- Always close the terminal box of the motor.
- Always close the control panel where applicable

4.4.2 During installation, maintenance and repair

Only authorised personnel may install, maintain and inspect the product and repair electrical components. Observe the local safety regulations.



WARNING
Always disconnect the energy supply to the product first, before installation, maintenance and repairs. Secure this disconnection.



WARNING
Surfaces of a pump can be hot after continuous operation.



WARNING
Make sure that no one can be near rotating components when starting a pump.



WARNING
Handle a pump with dangerous liquids with the utmost care. Avoid danger for persons or the environment when repairing leakages, draining liquids and venting. It is strongly recommended to place a leakage tray under the pump.



WARNING
Immediately following completion of the work, all safety-relevant and protective devices must be re-installed and / or re-activated.



WARNING
Please observe all instructions set out in the chapter "Commissioning/Start-up" before returning the product to service.



ENVIRONMENTAL INSTRUCTION

Always act according to the laws, by-laws regulations and instructions with respect to health, safety and the environment.

4.5.2 Dismantling

The owner is responsible for the dismantling and environmentally friendly disposal of the product.



ENVIRONMENTAL INSTRUCTION

Ask at the local government about the re-use or the environmentally friendly processing of discarded materials.

4.5 Environmental aspects

4.5.1 General

The products of DP-Pumps are designed to function in an environmentally friendly way during their entire lifetime. Therefore, when applicable, always use biodegradable lubricants for maintenance.

5 Pump Introduction

5.1 Model key

Table 4: Model key Example

	DP	H	M	C	2	/2	B	
Label	DP							Product Label
Material/ Construction		H						Horizontal
			M					All hydraulic parts Stainless Steel 1.4301 / AISI 304 with close coupled motor
				C				Cast Iron pump casing
Connections								DIN connection size: suction G 5/4 - discharge G 1
					2			Size (Capacity in m ³ /h at Q _{opt})
						/2		Number of stages
							B	Design version B

5.2 Description of the product

The horizontal multi-stage centrifugal pump is designed for pumping clean, or slightly aggressive, watery mediums. The pump is easy to install, commission and operate.

The hydraulic assembly is driven by an electric motor. All hydraulic parts of the pump are made of stainless steel. Pump casings are available in stainless steel or cast-iron.

5.3 Intended use

The pumps DPHM are suitable to transport and increase the pressure of cold and hot water without wear to parts within the indicated working range. The transport of liquids with a different viscosity or density than water is possible as well. For this a motor with an adjusted power could be required. Ask DP-Pumps or your distributor for advice.

Any other or further use of the pump is not in conformity with its intended use. DP-Pumps does not accept any liability for any damage or injury that results from this. The pump is produced in accordance with the current standards and guidelines. Use the pump only in a perfect technical state, in conformance with the intended use described below.

The *Intended use* as laid down in ISO 12100:2010 is the use for which the technical product is intended according to the specifications of the manufacturer. The use of the product has been described in the sales brochure and in the user manual. Always

observe the instructions given in the user manual. When in doubt the product must be used as becomes evident from its construction, version and function.

5.4 Operation

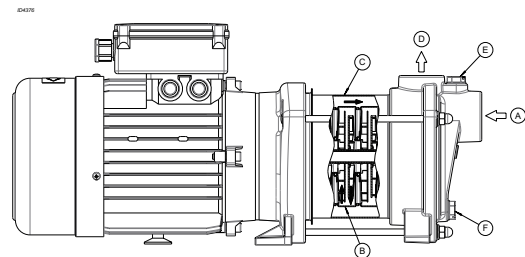


Figure 3: DPHM(C) 2/4/6

The rotating impeller causes the pressure at the inlet of the impeller to drop. This decrease in pressure creates the flow through the suction connection (A). Every stage (B) consists of an impeller and a diffuser. The capacity of the pump is determined by the size of the passageway of the stage. The pressure of the stage is determined by the diameter of the impeller. Because of the modular type of construction it is possible to choose the number of impellers most suited to the required duty point. After leaving the last impeller the medium flows between the pump stages and the outer sleeve (C) and exits the pump at the discharge connection (D).

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5.5 Measuring, draining and venting

The pump is provided with plugs for measuring, draining and venting.

Connection (E) is meant to fill and vent the pump, or to measure the inlet / suction pressure using a G ¼ connection.

Connection (F) is meant to drain the pump, or to measure the discharge pressure using a G ¼ connection.

5.6 Working range

Table 5: General working range specification

Pump type	DPHM	note
Ambient temperature [°C]	-20 up to 30 (50)	1, 2, 3
Medium temperature [°C]	-10 up to 60	
Minimum inlet pressure	NPSH _{req.} + 1 m	
Viscosity [cSt]	1-100	4
Density [kg/m ³]	1000-2500	2
Cooling	forced motor cooling	
Minimum frequency [Hz]	30	
Maximum frequency [Hz]	60	5
Maximum number of starts	see motor data sheet	6
Noise emission	see motor data sheet	7
Allowable size of solids pumped	5 µm to 1 mm	

- Avoid freezing the pump.
- If the ambient temperature exceeds the above value or the motor is located more than 1000 m above sea level, the motor cooling is less effective and could require an adapted motor power. Please contact your supplier for more detailed advice.
- Single phase motors are equipped either with a thermal circuit breaker or motor winding protection (see 2.3.2 Motor protection). Please contact your supplier for more detailed information about your motor protection.
- Deviation in viscosity and/or density could require an adapted motor power. Please contact your supplier for more detailed advice.
- Pumps that are intended for 50 Hz operation, may not be connected to 60 Hz power supply.
- Frequent start/stops, in particular in combination with higher pressure differences (Δp) may result in a shortened product lifetime. Consult your supplier for such applications.
- Only the noise emission of the motor is documented.



ATTENTION

The temperature difference between the medium and the pump should never exceed 60 °C. The pump must be filled / heated-up slowly in any case where the difference between pump and medium is more than 30 °C to avoid any chance of a thermal shock.

For minimum/maximum flow at medium temperature of 20 °C see table 6: Minimum/maximum capacity (Q_{min/max}); for higher temperatures see figure 4: Minimum capacity vs. temperature (in % of Q optimum)

Table 6: Minimum/maximum capacity (Q_{min/max})

size	Q _{min/max} [m ³ /h]			
	2 pole			
	50 Hz		60 Hz	
	Min.	Max.	Min.	Max.
2	0.2	3.3	0.2	4.0
4	0.4	6.5	0.5	7.8
6	0.6	9.0	0.8	10.8

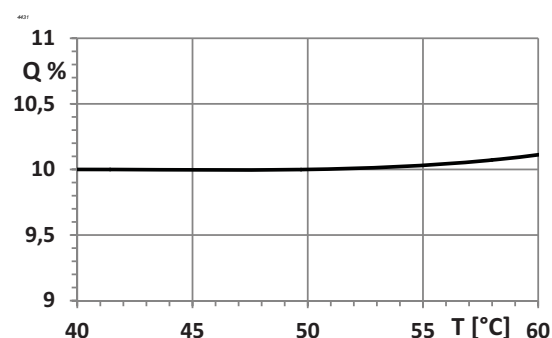


Figure 4: Minimum capacity vs. temperature (in % of Q optimum)

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6 Transport

6.1 Transport

Always observe the directions as indicated on the installation by means of stickers.

1. Transport the installation in the position as indicated on the pallet or packaging.
2. Make sure that the installation is stable.
3. Observe the instructions on the packaging (if present).

6.2 Storage

Fill the pump with glycol in order to protect it against the risk of frost.

Table 7: Storage

Storage	
t _{ambient} [°C]	-10/+40
Max. rel. humidity	80% at 20 °C not condensing

6.2.1 Inspection during storage

1. Turn the shaft every three months and just before putting into operation.

7 Installation instructions

7.1 Setting up the pump



ATTENTION

Avoid stress in the pump casing caused by misalignment in the piping system. Please see table below.



ATTENTION

Pumps which do not stand steady or stable on their own, should be mounted on a rigid and stable base.



ATTENTION

Locate the pump at the place with the lowest risk for noise nuisance.

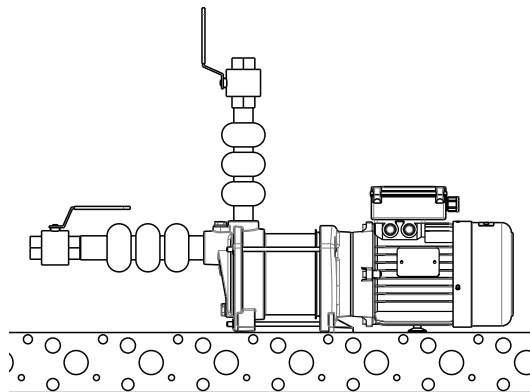


Figure 5: DPHM(C) not connected

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1. Place and install the pump on a level, stable surface in a dry and frost-proof room.
2. Place the pump as close to the source/tank as possible.
3. Make sure that sufficient air can reach the cooling fan of the motor. For this purpose the free space above the cooling fan should be at least 1/4 of the diameter of the fan hood air intake.
4. It is advised to install a shut off valve on the supply and on the delivery connection of the pump.
5. To avoid medium flowing back through the pump, when idle, make sure a non-return valve is installed.

6. To the suction line should apply:
 1. 100% airtight.
 2. No camber.
 3. Running from the lowest point in the tank straight to the pump.
 4. Provided with a foot valve that shuts off well, making sure that the suction line is always filled with water.
 5. If the diameter of the suction line is larger than the pump-suction connection, then install an eccentric adapter in order to prevent air pockets and swirling.

7.1.1 Indicators

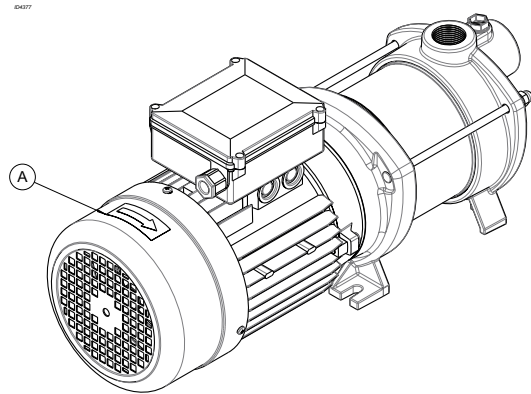


Figure 6: Terminal box and fan hood sticker

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The arrow (A) on the fan hood indicates the rotating direction of the motor in case of a 3 phase motor.

7.1.2 Install bypass

Install a bypass if the pump may operate against a closed valve for a long period. The required capacity of the bypass is at least 10% of the maximum volume flow. At high operating temperatures a higher volume flow is required. With temperatures above 60°C the required capacity is more than 10%.



ATTENTION

Do not make use of quick-closing valves and/or shut-off valves to prevent pressure impulses in the pump and in the lines as a result of changes in the flow rate

7.2 Electrical installation



WARNING

In accordance with the local regulations only authorised personnel is allowed to make electrical connections to the motor.



ATTENTION

Connect the motor according to figure 7: Motor connections and always check the rotation direction.

Electrical connections:

- Make sure that the motor specifications correspond with the power supply to which the pump motor is connected. Consult "Electrical diagrams" for the correct connection diagram.
- Connect the motor using a motor safety switch.

Example may differ upon chosen motor

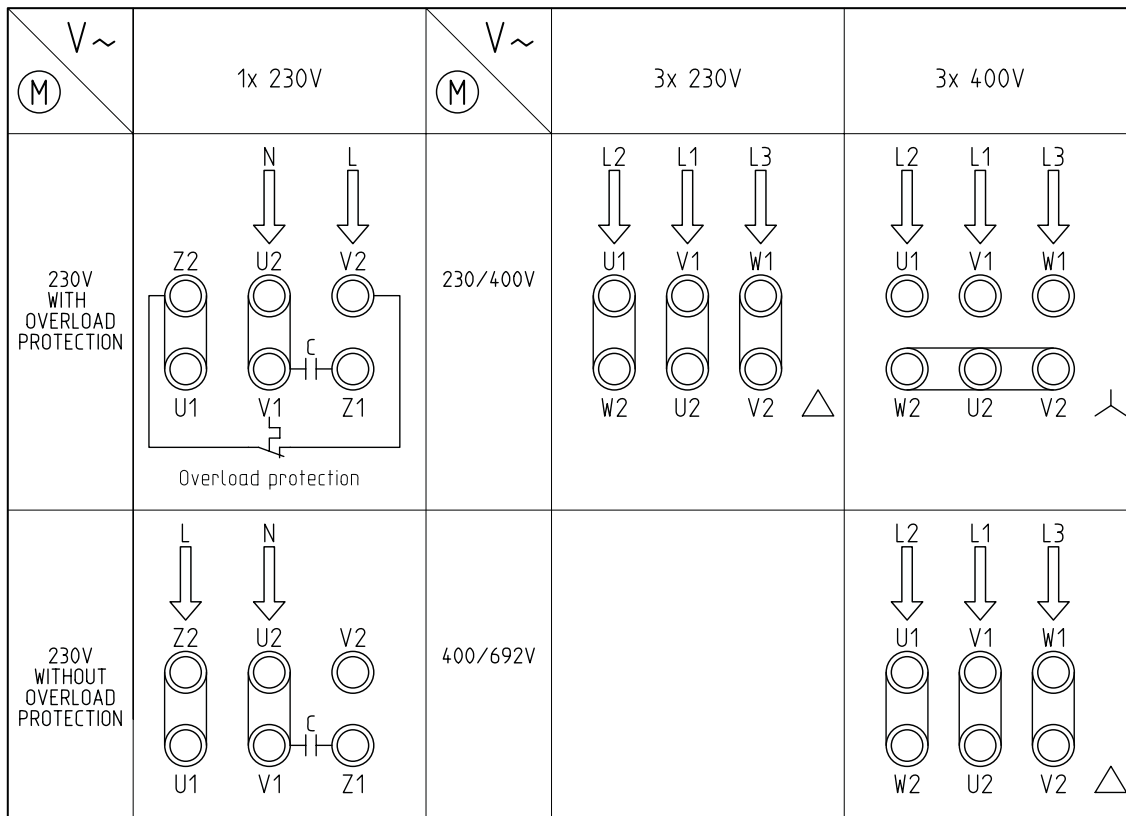


Figure 7: Motor connections

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7.3 Commissioning



WARNING

The pump must be switched off when it is not completely filled up.



ATTENTION

Check the direction of rotation according to fig. 6: Terminal box and fan hood sticker. In case of a 3-phase motor the rotation direction can be changed by exchanging two of the 3 phases.

7.3.1 Prime the pump

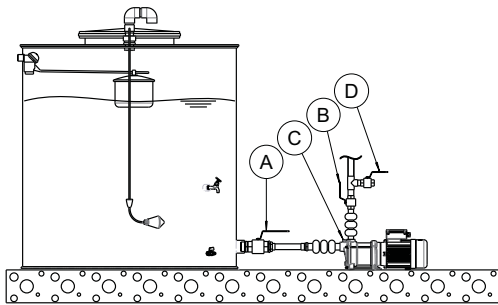


Figure 8: Example: installation of a pump under pressure operation

- Close the discharge shut-off valve (B);
- Close the suction shut-off valve (A);
- Unscrew the fill plug (C);
- Gradually open the suction shut-off valve (A) until the liquid flows from the fill plug (C);
- Close the fill plug (C);
- Open shut-off valve (B);
- Vent the pump on discharge side for example via a venting valve (D) on discharge side (see Figure 8: Example: installation of a pump under pressure operation);
- Close the venting option on discharge side;
 - Close the discharge shut-off valve (B);
- repeat these steps until all air is removed from the pump;
- Make sure that the suction shut-off valve is entirely open.

- Open the discharge shut-off valve (B);
- Remove the fill plug (C);
- Put a funnel into the port (C) and completely fill the pump with the liquid to be pumped;
 - Vent the pump on discharge side for example via a venting valve (D) on discharge side (see Figure 9: Example: installation of a pump in suction-operation);
 - Make sure all air is removed from the pump;
 - Close the venting option on discharge side;
- Close the discharge shut-off valve (B);
- Close the fill plug (C).

7.3.2 Start the pump

- Start the motor;
- Gradually open the discharge shut-off valve (B);
- Make sure the pump started correctly within 20 seconds, if not then:
 - Switch off the motor;
 - Re-prime the pump;
 - Start the motor again;
- Switch the pump off and on for 2-3 times, after running continues for 30 seconds and make sure all air is removed from the pump.

7.3.3 After an extended period of non-operation or storage

During first start-up, check the mechanical seals for leakage due to seizure or dehydration of the lubricating film. If so, please proceed as following:

- 1 Turn shaft manually;
- 2 Check if the mechanical seal is still leaking.

If the mechanical seal is still leaking:

- 1 Disassemble the mechanical seal;
- 2 Thoroughly clean and degrease the running surfaces;
- 3 Assemble the mechanical seal again and retry start-up.

If this doesn't solve the shaft leakage, replacement of the mechanical seal is necessary.

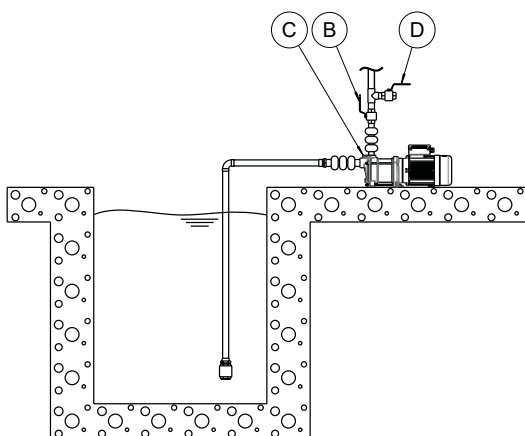


Figure 9: Example: installation of a pump in suction-operation

8 Operation

8.1 Operation

The pump is controlled externally and therefore does not need any operation guidance.



9 Maintenance

9.1 Introduction



WARNING

Observe the general safety precautions for installation, maintenance and repair.

Regular maintenance is necessary for the correct operation of a pump. Please contact your supplier for maintenance of the pump.

9.2 Maintaining the pump for an extended period of non-operation

Turn the shaft every three months¹. This protects the seals from seizure.

Protect the pump if there is a risk of frost. Proceed as follows:

1. Close all pump valves.
2. Drain each pump and/or the system.
3. Remove all plugs from the pump.
4. Open the shut-off and fill/air vent plug, if present.

1. period may vary per application or medium. Please consult your sales representative for application details.

10 Failures

10.1 Failure table



WARNING
Observe the general safety precautions before installation, maintenance and repair.

Problem	Possible cause	Possible solution	Checkpoints
Leakage along the shaft.	Running surfaces of the mechanical seal worn or damaged.	Replace the mechanical seal.	Check the pump for dirt / abrasive parts.
	New pump: seal stuck due to assembly.	Open and close the outlet shut-off valve quickly during operation.	
	Mechanical seal mounted incorrectly.	Install the mechanical seal correctly. Use water and soap as a lubricant.	
	Elastomers affected by medium.	Use the right rubber compound for the mechanical seal.	
	Pressure too high.	Use the right type of mechanical seal.	
	Shaft worn.	Replace shaft and mechanical seal.	
	Pump has been operating without water.	Replace the mechanical seal.	
Leakage along the shroud at the top bracket or at the pump casing.	O-ring worn	Replace the O-ring.	
	O-ring not resistant to the medium to be pumped	Replace O-ring by an O-ring with better resistance	
	Too much stress on the pump casing; it becomes oval.	Decrease stress on piping. Mount the pump casing without stress. Support the connections.	
Pump is vibrating or noisy.	Coupling mounted incorrectly.	Install the coupling in parallel.	
	Faulty setting of the hydraulic assembly.	Adjust the assembly according to the manual.	
	There is no water in the pump.	Fill and vent the pump.	
	No supply of medium.	Make sure there is sufficient supply. Check for blockages in the supply line.	
	Bearings of pump and/or motor worn.	Have the bearings replaced by a certified company.	
	Available NPSH too low (cavitation).	Improve suction condition.	

Problem	Possible cause	Possible solution	Checkpoints
Pump is vibrating or noisy.	Pump does not work in its working range.	Select another pump or adjust the system to work within its working range.	
	Pump is standing on an uneven surface.	Level the surface.	
Malfunction.	Internal blockage in the pump.	Have the pump inspected by a certified company.	
Pump does not start.	No voltage on the power terminal.	Check the power supply.	<ul style="list-style-type: none"> • Circuit • Main switch • Fuses
		Check the motor safety relay	<ul style="list-style-type: none"> • Earth leakage switch • Protective relay
	Thermal motor safety switch triggered.	Reset the thermal motor-safety. Contact the supplier, if this problem occurs more often.	Check if the correct value is set. Find the correct value (I_{nom}) on the motor type plate.
The motor is running, but the pump does not work.	The coupling between pump- and motor shaft is loose (when applicable).	Tighten the connecting screws to the required torque.	
	The pump shaft is broken.	Contact the supplier.	
Pump supplies insufficient capacity and/or pressure.	Outlet and/or inlet shut-off valve is closed.	Open both shut-off valves.	
	There is air in the pump.	Vent the pump.	
	The suction pressure is insufficient.	Increase the suction pressure.	
	Pump rotates in the wrong direction.	Change over L1 and L2 of the three phase supply.	
	The suction line has not been vented.	Vent the suction line.	
	Air bubble in the suction line.	Install the suction line with pump end higher than the other end.	
	Pump sucks air because of leakage in the suction line.	Repair the leakage.	
	Water flow too low. So air bubbles clog up in the pump.	Make sure the flow increases or use a smaller pump.	
	The diameter of the suction line is too small.	Increase the diameter of the suction line.	
	Capacity of water meter in the supply line is too small.	Increase the capacity of the water meter.	
	Foot valve blocked.	Clean the foot valve.	
	The impeller, the diffuser or stage is blocked.	Clean the inside of the pump.	
	O-ring between impeller and diffuser is gone.	Replace the O-rings.	
O-ring not resistant to the medium to be pumped.	Replace O-ring by an O-ring with better resistance.		

10.2 Torques of vent and draining plugs

Table 8: Torques

Material	Dimensions	Torques [Nm]	Figure
PEHD	G 1/4	3	Locations E and F in fig. 3: DPHM(C) 2/4/6

11 Annexes

11.1 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:
Horizontal multi-stage centrifugal pumps, series: DPHM(C)

Serial number: 18/2012 1000000-0001 [...] 52/2016 9999999-9999

to which this declaration refers, is in accordance with the following standard: **EN 809: 1998+A1:2009/AC:2010** 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**, in the most recent form

The pump is subject to this declaration of conformity as a stand alone product. Make sure the appliance or installation in which the pump is built in, has got a declaration of compliance with the directives listed above, for its complete assembly.



Alphen aan den Rijn
01/03/2014

Authorized representative
W. Ouwehand, technical director.





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