



USER MANUAL
MULTI-STAGE CENTRIFUGAL
IMPELLER PUMPS
TYPE **OPF**
(for all constructional execution)

**This manual
shall be delivered to the end-user,
which has to place it nearby
the place where the pump is operating!**

1. General information

Pumps manufactured by Hydro-Vacuum S.A are made with highest carefulness, with permanent control of the manufacturing process in accordance with ISO 9001, to assure their quality and performance. If proper installed, operated and maintained, they will serve trouble-free.

This manual contains important advices concerning safe, proper and economical operating. We recommend to become acquainted with the content of this manual and carefully execute all recommendations and directions for use. This will give you full satisfaction and secures proper pump operating for a long period.

The manual does not contain obligatory local regulations concerning required authorization for the installing and servicing staff. The observance of these regulations belongs to the pump user.

The pumping set shall be exploited only for its intended use as described in the User Manual or in the offer. This belongs especially to following parameters: allowed physical and chemical properties of the handled liquid and the operating conditions, i.e. the liquid temperature, density, viscosity, and abrasiveness, as well as the pump rate of delivery and pressure. Of high importance is to ascertain, if the chemical aggressiveness of the handled liquid does not exceed the corrosive resistance of the material used for the pump parts which contact with the liquid. Serious consequence for the pump will cause incorrect sense of rotation and/or rotational speed.

The name plate contains the essential data of the pump, like type-size, the mean operating parameters and the serial number. Impart this data in any correspondence relating this pump, especially when ordering spare parts. Compare this data with the data given in your order and in our quotation.

Hydro-Vacuum S.A. covers the pump by warranty, according to the conditions given in the "Warranty Certificate".

The warranty expires when:

- the pump has been damaged during transportation, by badly storage or incorrect installation;
- the pump is installed or operated against instruction given in this manual;
- the pump was used for handling liquid other than specified in its User Manual, ie. aggressiveness of handled liquid exceeds corrosion resistance of materials used in the pump;
- pump was disassembled in the warranty period without manufacturer's permission.

Any impairments and abnormalities occurring, notify to the nearest authorized service station or commercial representative of Hydro-Vacuum S.A.

CAUTION!

Non-observance of the instructions given in this manual by the user of this pumping assembly, releases the producer of any obligations and warranty!

2. Safety Instruction

Before installing and starting this pump for the first time, read carefully this manual, because it contains essential information for proper installation and exploitation of pumps type OPF.

2.1. Warning signs used in this manual



General warning



Warning of electric shock

CAUTION!

Calls for attention on other causes which can affect the safety

All warning signs placed direct on the pump (name plate) must be strictly observed! The warning signs and the name plate must all the time be kept absolute clean and good readable.

2.2. Competence level of the service staff

Each employee engaged for servicing, maintenance and installation of these pumps must be verified, if they are duly qualified for such job.

2.3. Hazard occurring due to non-observance of safety rules

Non-observance of safety rules can result in following hazard to persons, environment, pumping engine and to the connected piping system:

- contamination of the natural environment by leakages of poisonous liquids;
- breakdown of the pumping engine;
- menace to persons caused by electricity or mechanical forces;

2.4. Safety rules for installing and inspection

The employer has to take care, that all activities connected with pump installation and inspection shall be realized by adequately qualified and authorized personnel. He shall also to check, if the involved persons understand the instructions and advices given in this manual. All activities should be performed while the pump and connected piping system are not operating.

Pumps used for transportation of harmful liquids must be carefully cleaned and neutralized.

Immediately after all activities are finished, before starting the pump, must all safety devices and safeguards be refitted or started. Basic safety precautions should always be followed.

2.5. Unauthorized alterations and usage of self-made spare parts

It is not allowed to change anything in your pump without prior producer's acceptance. For repairs only original spare parts from pump producer shall be used. The non-observance of upper directions releases the producer of warranty.

2.6. Not allowed modes of operation

The use of this pump for other purposes than recommended in this manual are not covered by producers guarantee. In no case exceed the boundary operating parameters specified in the "Technical Data Sheet" of OPF pump.

3. Transportation and storage

After receipt should the pumping engine be checked, did it in the time of transportation not undergo damage. If any faults were detected, notify this fact immediately to the carrier.

If the pump has to be installed later, one should keep her in a dry room, and protect against such influence of external conditions like moisture, freezing as well as mechanical shocks.

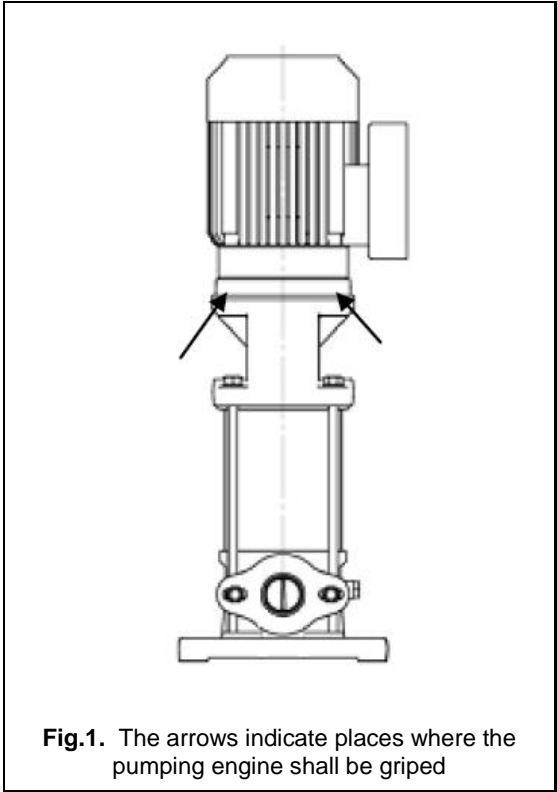
In time of longer stop, remove the liquid from pump and dry it to protect against corrosion. Pumps used for transporting liquids which create crystals in time of coagulation should after disconnection be rinsed up. If possibility of freezing of stopped pump exists, disconnect her from installation and keep in a heated room.

After longer storing in front of first starting, check whether rotating arrangement is not blocked. In this of aim one should turn the shaft by hand, gripping the clutch or shaft end, after taking away the motor ventilator cover.



It is not allowed to use special tools (like chain wrench) for pump unblocking. This can result in damaging of the rotating set and/or seal.

Transport the pump to the place of installation in the original package. Using for lifting a chain block, fasten the pump as shown on Fig.1. If the motor is equipped with two lifting eyes, they can be used for transportation of the whole aggregate. The unit's mount must be reliable and guarantee personnel and equipment safety.



4. Pumping unit description

Before starting to install the pumping engine, check if the pump parameters on the name plate comply with the data in your order supplied with this manual. Read carefully this manual, because it contains essential information for proper installation and exploitation, relative to this pump-motor set.

Example of pump specification:

OPF.1.05.1.1110

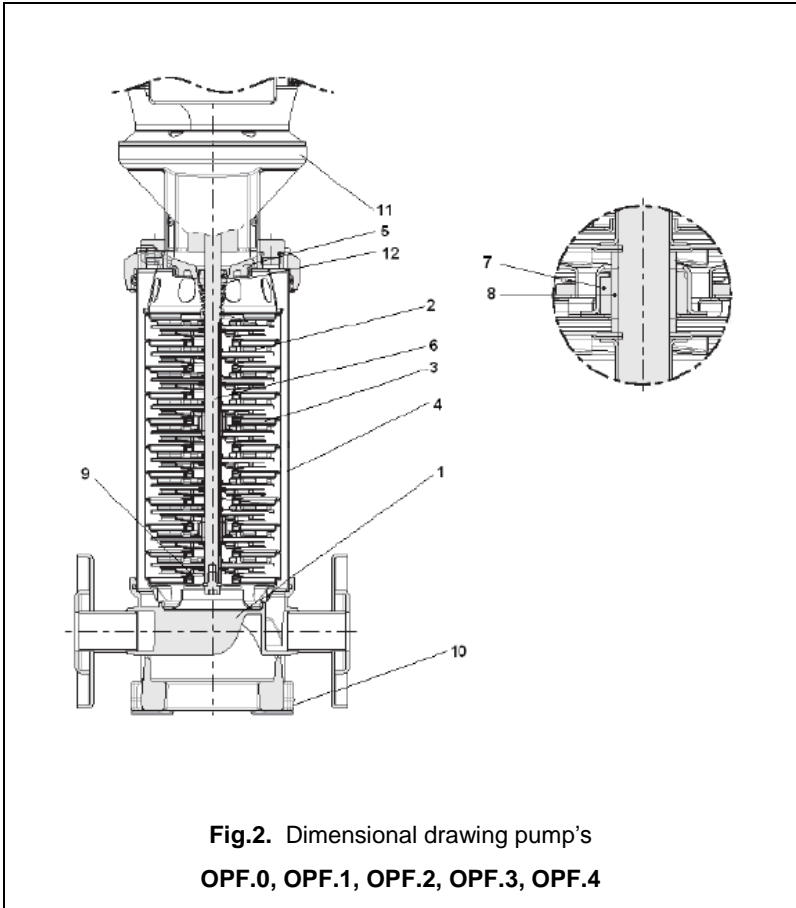
OPF	product name
1	type size
05	type dimension
1	material execution
1110	constructional execution

4.1. Pump

This device is a centrifugal, vertical pump, which can be fitted with 1 to 22 stages. This pump consists of the following parts: the lower casing with the inlet and outlet stubs (in line), upper casing with rolling bearing, middle casings, rotors, shaft and jacket. The power is transmitted from a standard flange-mounted motor via a two-piece split coupling. The liquid enters into the pump through the suction stub. Next it is transported under the influence of the rotating impellers up, from where it is directed through the space between the casing and the jacket down to the outlet stub.

Cross-section of pump is given on Fig.2

The dimensions of pipe flanges are given on Fig. 5, 6



PART'S LIST

Table 1

Item no. on fig.2	Part's name	Material execution	
		d=1	d=2
1	Lower casing	AISI 304	AISI 316
2	Impeller	AISI 304	AISI 316
3	Guide casing	AISI 304	AISI 316
4	Jacket	AISI 304	AISI 316
5	Seal casing	AISI 304	AISI 316
6	Shaft	AISI 304	AISI 316
7	Slide Bearing	tungsten carbide	
8	Bearing Bush	stainless steel	
9	Diaphragm Gland	Teflon/ stainless steel	
10	Pump basis	grey cast-iron 250	
11	Engine cantilever casing	grey cast-iron 250	
12	Mechanical seal	tungsten carbide / graphite	

* - Ordering spares apart from the name of the part, indicate as well full pump data as on the name plate, as the handled medium.

p - parts material execution

4.2. Motor

These pumps are driven by standard flange-type motors, coupled with the pump by a split-muff coupling. The rotor is based on both ends in ball bearings.

A standard motor has following parameters:

Frequency: 50 Hz
 Rotational speed : 2900 rpm
 Insulation grade: F
 Safety grade: IP54
 Windings: tree-phase 400V

5. Setting-up



Before starting to installing, always disconnect the power supply and protect against unintentional starting!

5.1. Checking proper selection

CAUTION!

Before starting to installing, check if the pump parameters on the name plate comply as well with the data in your order as with the data arranged in the “Technical Data Sheet” supplied with this manual.

5.2. Installation

CAUTION!

Before starting to installing, verify the pipeline thoroughly. Check the correctness of all welded joints and all other pipe connections. The whole piping system must be thoroughly cleaned up from rust, scale, chipping and other dirt. Any solid matter getting into the pump may cause heavy damage.



Pumps installed in rooms where the environment is polluted by chemical, aggressive or inflammable vapors or dust, special motor options with adequate encapsulation shall be used.

- The pump shall be installed in closed or at least roofed accommodations. The ambient temperature must be higher than the solidification temperature of the handled fluid.
- The pump should be set on a foundation or a rigid base and fitted. The pump shall be positioned exactly vertically.
- The inlet and outlet pipes should be fitted without deforming forces. The piping system must be equipped with adequate tube compensating pieces. The pipes must be supported by pipe bearers, to prevent any influence of forces onto the pump (see Fig. 3, 4).

CAUTION!

The pipefitter shall take into consideration that the forces acting onto the pump must not overstep values given in the standard PN-ISO 9905.

- It is recommended to use for the piping system, collaborating with this pump, pipes with one step greater diameter than the diameter of the pump in-/outlets.
- The direction of flow is marked by an arrow on the pump casing.
- For enabling to remove the pump for repairs without evacuating the liquid of the whole piping system, we recommend to insert cut-off valves at the pump inlet and outlet.

- Direct prior to the inlet to the pump shall be inserted a straight pipe section. The length of this section shall be at least equal two diameters of the inlet diameter.
- Into the outlet pipe shall a non-return valve be inserted (see Fig.3, 4).
- If the pump inlet will be connected to an open container, must the suction pipe be fitted with a strainer (see Fig.3, 4).
- The aggregate area of the openings in the strainer shall be at least three times greater than the pipe opening area.

5.3. Wiring



Electric installation should be executed in accordance to valid regulations by electrician possessing suitable authorization.

- Connecting the motor to electric power, make it so, in order to get sense of rotation corresponding with the arrow, placed on the pump casing (right direction looking from side of motor).

CAUTION!

At wrong sense of rotation the pump will not reach proper parameters (Q and H), and the pumping engine will suffer damage..

- The motor shall be protected by a circuit-breaker, protecting it against:
 - overloading
 or by thermal overcurrent relay protecting the motor against:
 - phase waste
 - to low voltage

Table 2

Motor					
mechanical size	power [kW]	voltage 3~ ; 50Hz	rev. [rpm]	cos φ	current [A]
71	0,37	400V	2820	0,78	1,0
71	0,55		2830	0,77	1,5
80	0,75		2825	0,74	1,9
80	1,1		2820	0,78	2,5
90	1,5		2850	0,80	3,4
90	2,2		2870	0,81	4,7
100	3		2870	0,79	6,6
112	4		2910	0,83	8,0
132	5,5		2920	0,88	10,4
132	7,5		2900	0,92	13,2
132	11		2920	0,90	19,8
160	11		2920	0,90	19,8
160	15		2920	0,89	27,0
160	18,5		2930	0,81	36,4
180	22		2935	0,90	38,6
200	30		2930	0,88	53,3
200	37		2930	0,90	64,0
225	45		2940	0,89	78,3

CAUTION! DON'T FORGET THAT THE ENGINE MUST BE RELIABLE EARTHED!



Mistake of connecting can cause damage of the engine. The feeding cable shall not touch the pipe or pump and it has to be protected against moisture.

6. Start-up

CAUTION! Do not start the pump not filled up with medium (empty) even for a short time, because it will result in damage of the mechanical seal! Check first if the pump is totally filled up.

For that purpose you have to proceed as follows:

- In cases that the liquid is brought to the pump under pressure (Fig. 5), it suffices to screw off the drain plug from the upper pump stage casing and to wait, until effluent liquid will not contain blisters of air. Now screw the plug in, and the pump can be started.



If the handled liquid is very hot and the system is under pressure, ejaculation of even a small quantity of liquid can cause scald and carnal injuries!

- In case that the pump is operating with suction (see Fig. 3), shut off the outflow valve, remove the drain plug from the upper casing and fill up the pump through this opening with the handled liquid.
- If the system, in which the pump is installed, was for a longer period not operating, before starting up must the pump be de-aerated. Omission of this instruction threatens serious damage of pump.
- The pump must be protected against no-load operation (without liquid). Use for this reason a pressure pick-up or a liquid level signaling device.
- In the case of pumps working in a system which often undergoes aerating, we recommend installation of float signaling device in the place of one of the screw plugs.

CAUTION!

If the pump is used for the first time in installation for delivering drinking water, should the whole arrangement be exactly rinsed up.



The cut-off valve installed into the suction pipe shall not be used for controlling the pump output. When the pump is running, it must be entirely open.

- Switch the pump for a moment on for checking, if the sense of rotation is conformable to the arrow placed on the pump casing. If the sense of rotation is inappropriate, must two phase-conductors in the motor terminal box be exchanged.



The pump may reach a temperature of maybe to 120°C. Apply special safety resources, to take precautions against stinging (gloves, isolating protections).



Prolonged cycle of work at closed valve with lack of flow is forbidden for avoidance of handled liquid overheating, what can cause pump damage

7. Maintenance

During pump operating is maintenance not necessary. Keep pump as well as her ambience clean.

Expecting temperature drop below the freezing point whilst the pump is not running, must the pump be evacuated from water and filled up with no freezing liquid.

Service life of spare-parts depends from the temperature and pressure of the handled liquid, which is acting onto the mechanical seal.

Mechanical seal

The mechanical seal needs no maintenance. But in no case shall it run without liquid! In case of leakages across the mechanical seal, must it be exchanged by a new one. Seal exchange must be realized by a qualified mechanist.

Lubricating of bearings

The pump is equipped with plain and ball-bearings, which in normal operating conditions need not to be lubricated. The ball-bearing in the upper pump casing is from both sides sealed.

CAUTION!

The warranty will be invalidated, if unauthorized dismounting of pump and/or motor was made in the warranty period

Regarding the maintenance of the motor bearings, see in the technical documentation of the motor.

8. Troubleshooting

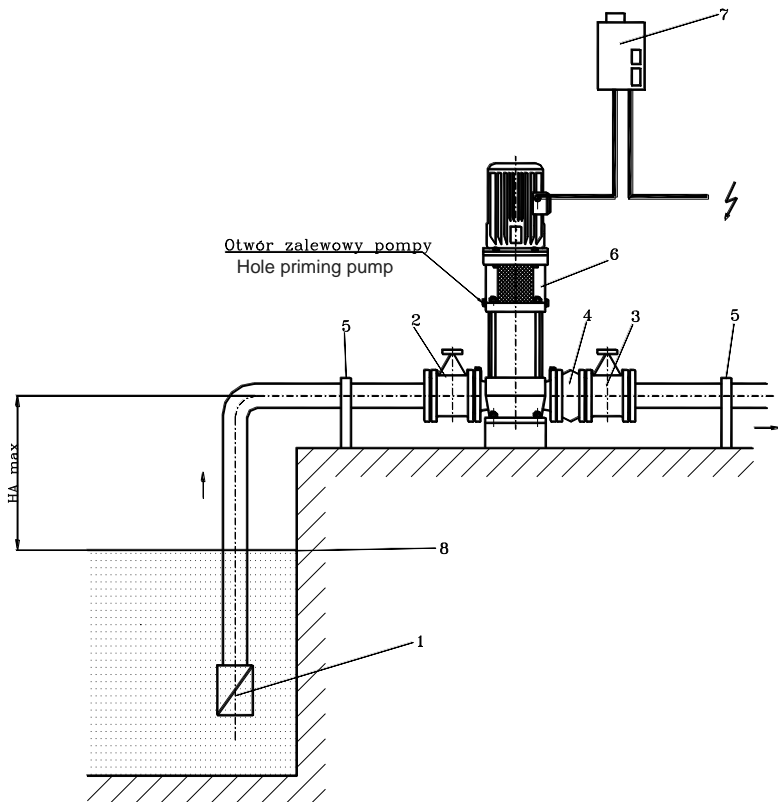
CAUTION!

Before starting always disconnect the power supply and protect against unintentional starting.

If the pump is not operating proper, look for causes in first order in the electric and hydraulic installation as well as in incorrect pump selection.

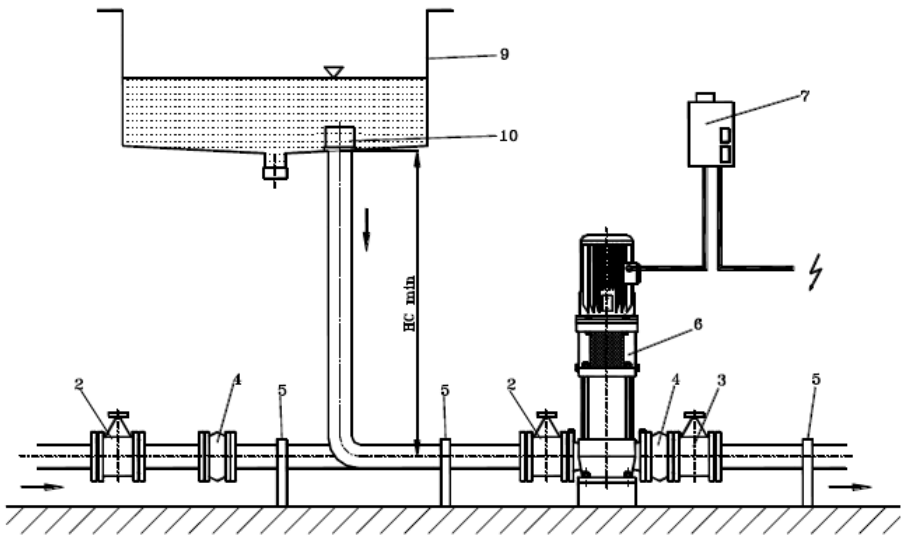
Table 3

Trouble	Cause	Remedy
1. Pump is running, but there is no output	<ul style="list-style-type: none"> a) too low pressure in the suction connector pipe. b) leak of liquid in the pump c) air sucked d) pump damaged e) clogged suction pipe 	<ul style="list-style-type: none"> a) suction lift to high, install the pump lower b) dismount and clean up the pump c) check tightness of suction pipe d) disassemble and exchange worn-out parts e) dismount and clean up the pump and suction pipe
2. Pump is vibrating	<ul style="list-style-type: none"> a) plain bearing and sliding rings worn out b) ball bearing worn out c) foreign matter in the impeller channels d) impeller defective or worn-out e) wrong sense of rotation f) pumping set not proper fixed 	<ul style="list-style-type: none"> a) replace worn-out parts b) replace worn-out parts c) dismount and clean up d) replace worn-out parts e) exchange 2 phase conductors in the motor terminal box f) put right
3. Electric motor overheated	<ul style="list-style-type: none"> a) power rating to low, or pump output higher then ordered b) consistence and/or viscosity of handled liquid higher then stated in the order c) voltage to low d) heavily to rotate due to worn-out parts 	<ul style="list-style-type: none"> exchange pump b) check data in the order; exchange motor c) check voltage d) replace worn-out parts
4. Output and pressure to low	<ul style="list-style-type: none"> a) not proper pump selected b) wrong sense of rotation c) sliding rings worn out d) pump is not filled up e) impeller channels clogged f) motor speed to slow g) diameter of suction and outflow pipe to small 	<ul style="list-style-type: none"> a) exchange pump b) exchange 2 wires in the motor's terminal box c) replace worn-out parts d) fill pump up e) clean up the hydraulic system of the pump f) check power voltage g) check resistance of flow of the piping system
5. Motor self-acting switches off	<ul style="list-style-type: none"> a) thermal relay setting to low b) thermal relay damaged c) voltage to low d) heavily to rotate 	<ul style="list-style-type: none"> a) measure the current and set the release value stated on the name plate b) exchange c) check cable sections d) check if it is possible to rotate manually
6. Irregular outflow	<ul style="list-style-type: none"> a) strainer and/or suction pipe partially blocked b) pump operating out of performance characteristic 	<ul style="list-style-type: none"> a) clean up b) check operating conditions



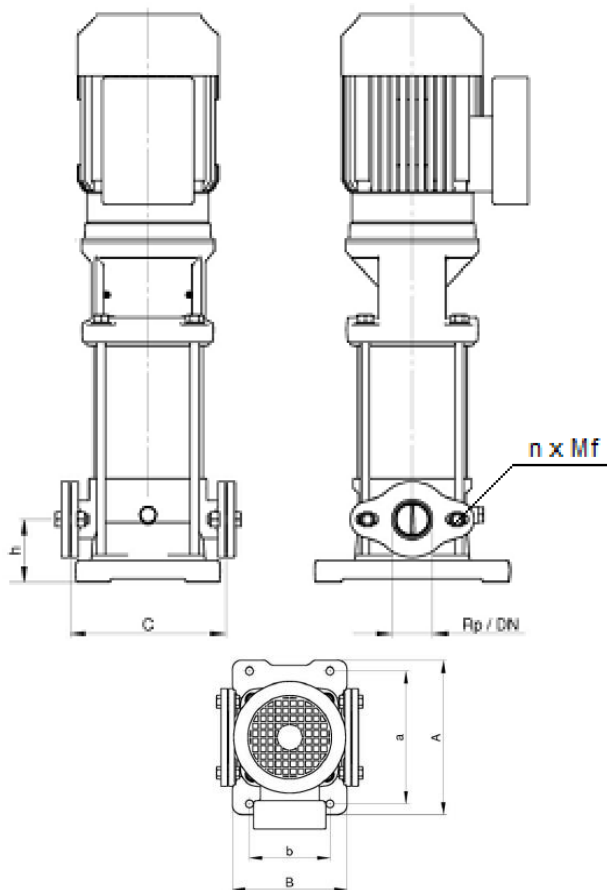
1. Sieve filter with non-return valve
2. Inlet valve
3. Outlet valve
4. Non-return valve
5. Pipe upholder
6. Pump
7. Motor protecting relay
8. Max. liquid level
- HA Max. elevation head (depends on pump)

Fig.3. Installation diagram of pump **OPF**



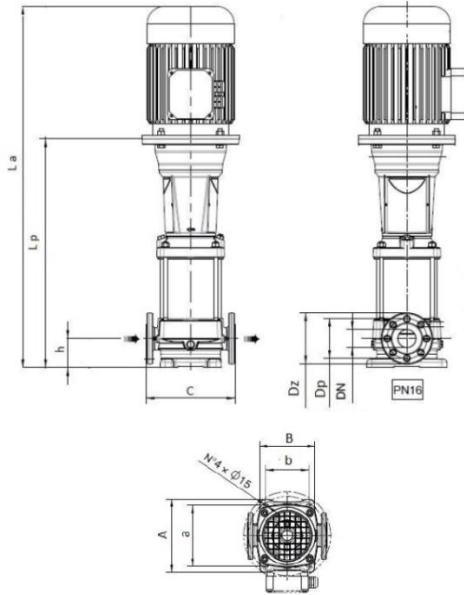
- 2. Inlet valve
- 3. Outlet valve
- 4. Non-return valve
- 5. Pipe upholder
- 6. Pump
- 7. Motor protecting relay
- 9. Storage container
- 10. Sieve filter
- HC Minimal inflow height

Fig.4. Installation diagram of pump OPF



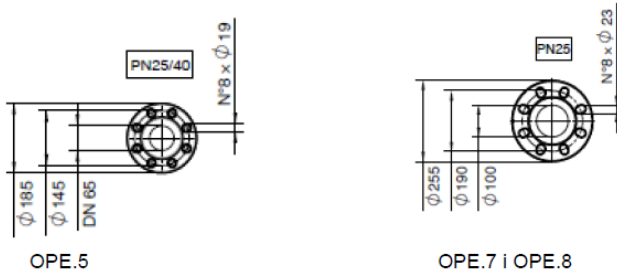
Typ pom- py	Wymiary [mm]								
	Rd/DN	h	A	a	B	b	C	nxMf	Nm
OPF.0	1 1/4" DN32	50	210	180	150	100	160	2xM10	30
OPF.1	1 1/4" DN32	50	210	180	150	100	160	2xM10	
OPF.2	1 1/4" DN32	50	210	180	150	100	160	2xM10	
OPF.3	1 1/2" DN40	80	250	215	185	130	200	2xM12	40
OPF.4	2" DN50	90	250	215	185	130	200	2xM12	
OPF.5	2" DN50	90	250	215	185	130	200	2xM12	

Fig.5. Pipe couplings of pump type **OPF**



Typ pompy	Wymiary [mm]										
	DN	Dz	Dp	h	A	a	B	b	C	nxMf	Mm
OPF.0	DN25	115	85	75	210	180	150	100	250	4xM12	50
OPF.1	DN25	115	85	75	210	180	150	100	250	4xM12	
OPF.2	DN32	140	100	75	210	180	150	100	250	4xM16	
OPF.3	DN40	150	110	80	250	215	185	130	280	4xM16	60
OPF.4	DN50	165	127	90	250	215	185	130	300	4xM16	
OPF.5	DN50	165	127	90	250	215	185	130	300	4xM16	
OPF.6	DN65	185	145	105	290	240	220	170	320	4xM16	70
OPF.7	DN80	200	160	140	316	265	240	190	365	8xM16	
OPF.8	DN100	230	180	140	316	265	240	190	365	8xM16	80
OPF.9	DN100	230	180	140	341	280	260	199	380	8xM16	

For higher pressures flange on PN25 or PN40:



OPE.5

OPE.7 | OPE.8

Fig.6. Pipe couplings of pump type OPF



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