Installation, Maintenance and
Operation Instruction

Industrial pump series - PON

hp-TECHNIK GmbH Industriepumpen-Förderaggregate und Anlagenbau

Gablonzer Straße 21 D-76185 Karlsruhe Germany Tel.: 0721/ 9 56 18 – 0
Postfach 21 10 10 D-76160 Karlsruhe Germany FAX: 0721/ 9 56 18 – 28
home: http://www.hptechnik.com : info@hptechnik.com

Contents

1 General Safety Notes

⚠ CAUTION	Indicates a potentially dangerous situation. If this is not avoided, small or light injury may result.
NOTICE	Indicates general information on a danger of property damage. Indicates general information on a danger of personal injury.

The notes for installation and maintenance are intended for a specialist!

Pursuant to DIN EN 12514-1 section 4.3.3., the operator of the complete system must provide a pressure controller, e.g. a pressure control device.

The operator shall responsible for complying with general accident prevention, safety and operating provisions.

1.1 Intended Use

In spite of careful safety optimization being performed, there is still some residual danger from operating the pump. The safety notes explained above and in the following must be observed under any case to prevent personal injury and / or damage to the pump. By complying with the instructions at all times, you will increase your pump's service life and retain full warranty claims towards the manufacturer in the case of damage.
Any pumps are subjected to a performance test after manufacture and are equipped with a test card.

2 General Information

2.1 hp-Industrial pump series PON

The PON series pumps are internal gear pumps. They have an integrated overflow valve a filter element integrated into the pump housing and a return port. The flow rate for normal fuel oil at 20 °C (6 cSt) and motor speed of 2800 min^{-1} is 90 to 320 l/h. The pressure range where the pump works depends on the chosen pressure stage (see chapter 4). It ranges between 1 – 40 bar. The delivered pump is intended for two-pipe system ex works. For switching from two- to one-pipe- system, unscrew a threaded pin (chapter 3).
An internal geared rotor drives an eccentric mounted outer geared pinion. The pumping medium will conveyed between the tooth gaps of the two gears. For this purpose the conveyor rooms are sealed by a cap with an integrated crescent. The direction of rotation is independent of the nozzle port side.
The PON series pumps are intended for transporting heating oils (see chapter 8.2). Where other media has to be transported, this must be verified by the manufacturer. Otherwise, the pump's service life may be decreased.

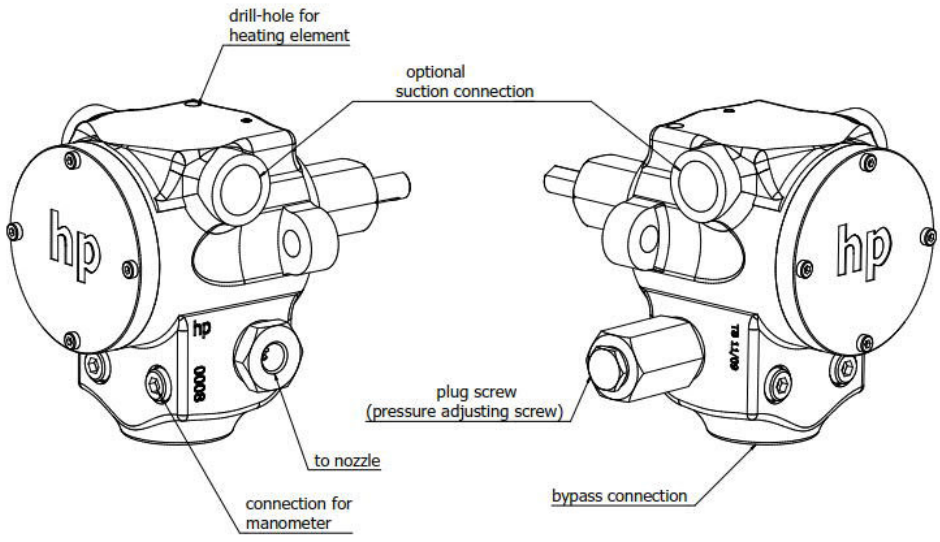


Fig. 1. Nozzle port on the left side "L"

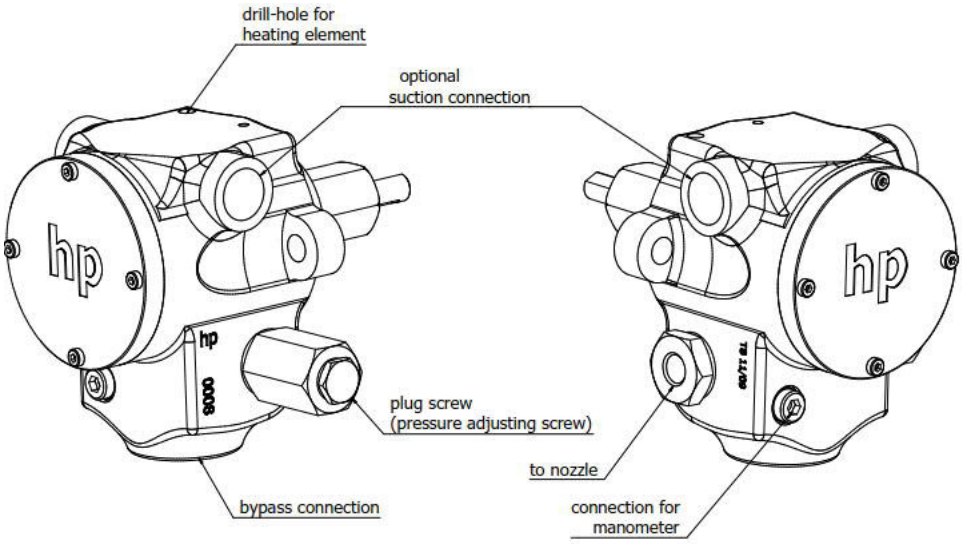
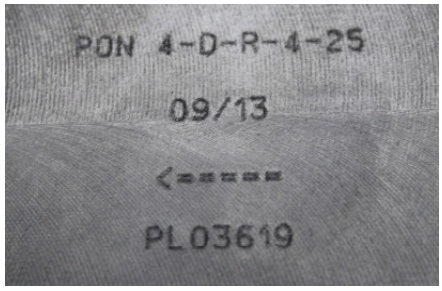


Fig. 2. Nozzle port on the right side "R"

For use with pre-heated media - which have a higher viscosity when cooled - the manufacturer recommends the use of an electrical standby and companion heating system H3 without thermostat (see Fig. 5). It is available as an accessory.

The following information is engraved into the pump body:

- Exact description of the pump type
- manufacturing date – MM/YY
- Rotational direction arrow (corresponding to order)
- Manufacturer's pump number



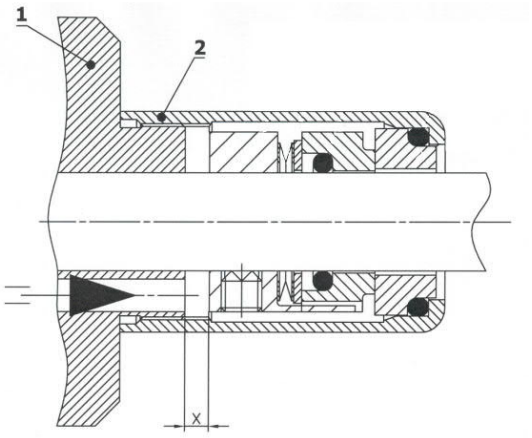
2.2 Operational Limits

Flow	max. 320 l/h
Max. pressure (adjustable with integrated overflow valve)	40 bar
Min. permitted pre-pressure	- 0,2 bar.
Max. permitted pre-pressure	5,0 bar
Max. allowed pump RPM	2800 min^{-1} at 50 Hz
Temperature	Up to 150 °C
Permitted test pressure for approvals	Max. 60 bar with removed mech. seal (Sealing area closed by jack)

2.3 Materials used

Pump housing	EN-GJL-250
Rotor	EGT 88
Pinion gear	16MnCr5
Cover	EN-GJL-250
Lower bearing	EN-GJL-250
Mechanical seal	Carbon/ SiC- Viton – CrNiMo-steel
Valve parts	Spring wire steel, 11SMnPb30+C, 16MnCrS5

2.4 Mechanical seal



1. Pump housing
2. Mechanical seal

X Installation size*

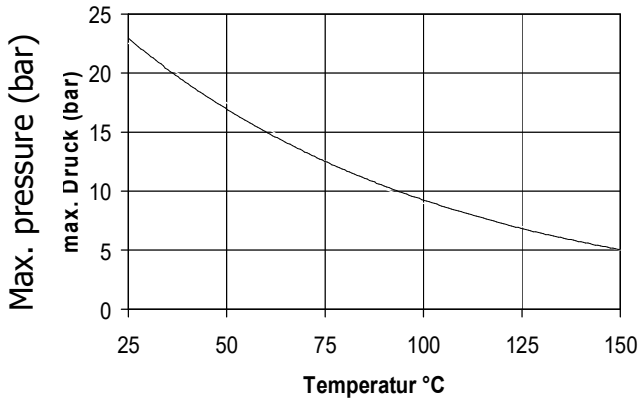
* - In case of replacement can be found in the documents accompanying the valid installation dimension

Item no. : 0190015

All hp pumps are equipped with axial face seals. They are temperature-resistant up to 150°C.
These axial face seals are relieved at the pump's suction side.
Maximum pressure load on the GLRD, i.e. suction side, against temperature (see adjacent figure).

For a new pump a max. leakage of 1 cm3/day is regular.

Fig. 3.



3 Installation

- Installation must be performed so that the pump shaft and drive shaft are perfectly aligned in axial direction and so that there is no radial force. Furthermore, a coupling appropriate for the pump shaft in size and weight and not transferring any imbalances to the pump must be used.
- The axial clearance between the coupling halves should be max. 1,5 mm. Rotation coupling parts must not touch any fixed pump or engine parts axially!
- Before connecting the lines, all plastic caps must be removed.
- All connections and lines must be installed free of tension and tight. We recommend only using sealing rings made of copper or aluminium. Never use hemp or similar materials. The pipes must be cleaned from any dirt and metal particles before the pump is connected.
- In two-pipe-system, the return flow line must be led back to the tank and must never be closed off. Otherwise, the pump's overpressure protection will no longer work.
- The suction connection (see Fig. 1) of the pump is filled with oil. Then the suction line is connected to thread suction connection.
- The pressure/delivery line connect to nozzle connection and connect the bypass connection (see Fig. 1 and Fig. 2).
- Remove the screw plug for connecting the manometer (Fig. 1 and Fig. 2). The pressure gauge shows the delivery pressure. Observe using manometers with the right pressure range (according to the pump's pressure range).
- Before switching on the pump, check that all locking valves in the pipes and check whether the pump has sufficient medium is available.
- Ensure that the pump is operated in the intended rotational direction (engraved arrow). Connect the motor according to the information on the type plate and switch it on. Preventively provide a motor protection switch with overload function!

- The pump shaft is sealed to the outside with a mechanical seal.
- The free shaft end has a diameter of 11 mm and is equipped with a groove and spring pursuant to DIN 6885-A-4x4x14.
- The pump has a bypass plug ex works and is thus defined for two-pipe-system (Fig. 4). A return flow connection to the tank is required for two-pipe-system.
- The bypass plug for switching from one to two-pipe-system is a threaded pin with a hexagon socket (size: 2mm). For one-pipe-system, the bypass plug is removed by unscrewing the threaded pin and the return flow connection is closed off tightly with a sealing ring and plug.
- Either of the two suction connections can be selected for the suction side (Fig. 1). Where required, a manometer can be connected to the second suction connection to measure the suction pressure. Otherwise, the unused suction connection is closed off with a sealing ring and plug screw.
- Before connecting the pressure line, the plug screw on the nozzle ejection side must be removed.

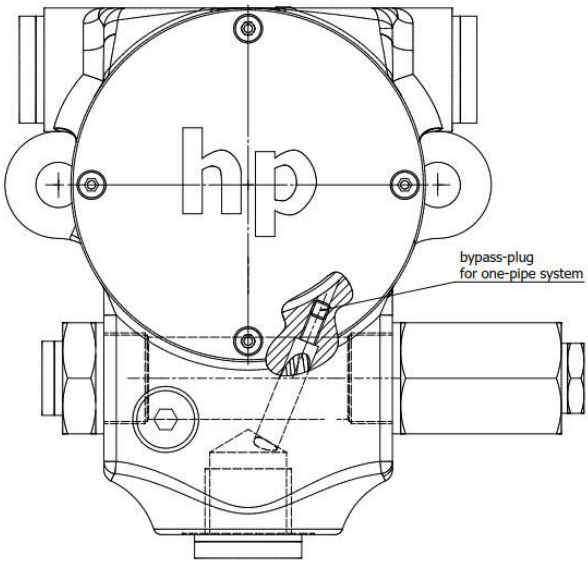


Fig. 4. Bypass plug for switching from two to one-pipe-system

Pumps must never be used as a fix point for the connected pipes. Any forces and moments appearing, e.g.

- Tensions
- Expansion of pipe lines due to temperature influence or reaction forces must be avoided.
- To prevent possible heat expansion of pipe lines, we recommend installing compensators.
- The suction line must be designed so that the flow speed is between 0.5 und max. 1.0 m/sec.
- The pressure line must only reach a maximum of 2 – 2.5 m/sec.
- The suction line must be vacuum-tight and placed in a rising fashion.
- Ensure that the pump and pipe system is not contaminated, e.g. by purging.
- When testing the pipe system for tightness, the max. permissible shaft sealing supply pressure must not be exceeded.

NOTICE

Never use water as purging liquid!
Danger of corrosion!

4 Commissioning

⚠ CAUTION

Ensure that the pump does not start up dry. It must be filled with oil.

The return flow line must never be closed off. Otherwise, the pump's overpressure protection will no longer work.

Mechanically abrasive and chemically aggressive components in the medium reduce the pump service life.

Clear your pipe lines from any dirt or metal particles before connecting it to the pump.

Ensure correct rotational direction (see engraved arrow).

Only perform the basic settings or adjustment of the pump pressure when the pressure line is closed.

- Before switching on the pump, check that all locking valves in the pipes and check whether the pump has sufficient medium is available.
- For pressure regulation, the plug screw (see Fig. 1) must be removed.
- After removing the cover screw, the pressure regulating screw with hexagon socket (6mm size) is visible. Use a hexagon wrench to:

  - **Turn the setting screw to the right (clockwise) to increase the pressure**
  - **Turn the setting screw to the left (counterclockwise) to decrease the pressure**

- When adjusting the desired operational pressure, observe that it may only be set within the permissible pressure range of the included pressure spring (pressure level 1 to 4).

Pressure level	Pressure range	Factory settings
1	from 1 - 4 bar	2 bar
2	from 2 - 9 bar	6 bar
3	from 6 - 25 bar	15 bar
4	from 15 - 40 bar	15 bar

Attention! **Setting an operational pressure exceeding the pressure range will cause the spring to lock and lead to pressure surges and thus to pump outage after a short time.**

For oil-burning applications, close the burner's solenoid valve before setting or resetting pump pressure.

- When the pressure is set, the pressure adjustment cover screw and its sealing must be replaced oil-tight.

NOTICE

Non-compliance with the max. pressure range may cause spring blockage. These in turn causes pressure surges and thus pump outage after a short time.

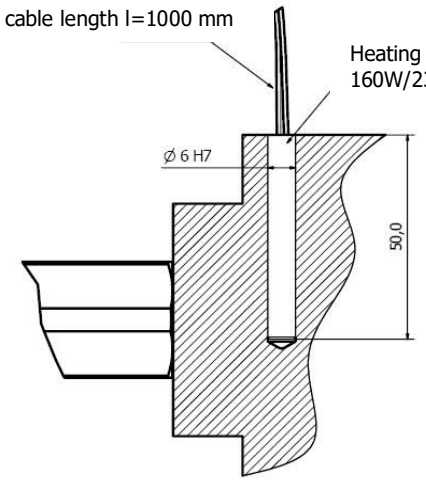
If the medium rotates within the pump for too long, this may cause damage to the valve, overheating and, as a result, mechanical damage.

For highly viscous media, a pump heating is prerequisite. To avoid cavitations and damage to the shaft sealings, the heating times must be observed under any circumstances. (abaut 30min starting from 20°C)

Because of heat expansion, all valves must be open when heating.

5 Accessories

5.1 hp-Electrical standby and companion heater



hp- Electrical standby and companion heaters

All hp-Pumps series PON can be equipped with electrical heating system H3 without thermostat at the factory.

Using this option is strictly recommend for using the pumps with "heavy fuel oil"!

Artikel-Nummer: 0190054/62

Fig. 5.

6 Operation

6.1 Inspection and Maintenance

6.1.1 hp-Electrical standby and companion heaters

When replacing a defect electrical heater it is strongly recommended to insert only electrical heaters designed by the manufacturer. Otherwise:

- The medium can be heated to excessively high temperatures. Consequence thereof is e.g. gas release of the medium.
- The required operating temperature cannot be reached. Consequence thereof is e.g. the required engine power is greater than the available maximum engine power.
- Result of the too low or too high a temperature is, e.g. outage of the mechanical seal after a shorter time.

6.1.2 Oil filter

The pump is provided with a suction filter integrated in the suction line. The filter must be checked for dirt regularly and replaced if required. The mesh width of the filter element depends on the viscosity of the transported medium. Transported media with a high viscosity (heavy heating oil) require a filter element with a mesh width of 500 µm and alternative for media with a low viscosity a filter element with mesh width 100 µm is recommend. The pump supply must be within a pressure range of -0.2 to 5 bar.

6.1.3 Strainer

The pump is provided with a suction filter integrated in the pump casing. The filter must be checked for dirt regularly and replaced if required. The mesh width of the strainer depends on the viscosity of the transported medium. Transported media with a high viscosity (heavy heating oil) require a filter element with a mesh width of 630 µm **(item number: 082.0941)** and transported media with a low viscosity a filter element with 160 µm respectively **(item number: 082.0940)**.
To exchange the filter element, remove the cover lid.

NOTICE

Filter elements must be disposed of under environmental considerations.

6.2 Preservation

After the test run, testing oil remains in the pump to preserve it. The parts not treated ex works must be re-treated by the operator according to the local conditions.
If the pump is inactive for an extended period or stored, it must be preserved with acid-free non-resinous oil and stored dryly.

6.3 Troubleshooting

Errors appearing		Possible cause
The pump does not prime		1, 2, 3, 4, 5, 12, 19, 20, 22
The pump does not work at full capacity		3, 4, 5, 8, 9, 10, 11, 17, 18, 19, 20, 21, 22, 24
The pump is operating noisily		3, 4, 5, 6, 7, 10, 11, 13, 17, 19, 20, 22
The motor heats up		9, 10, 13
Uneven transport		3, 5, 8, 10, 11, 20, 22
Shaft seal is not tight		7, 10, 14, 15, 16, 23
No.	**Possible cause**	**Removal**
1.	No medium in the pump	Fill pump with medium
2.	Pump has the wrong rotational direction	Set rotational direction according to the engraved arrow
3.	Filter element, valve or lines are clogged	Check and clean parts
4.	Suction line or shaft seal are leaking	Check suction line, connection points and valves or shaft face seal
5.	Suction head too large	- Decrease height difference - Shorten line - Increase line diameter - Decrease medium viscosity by heating
6.	Axis error	Pump, coupling and motor: - Align shaft end precisely - Balance coupling
7.	Vibrations and pulsations in the system	- Use elastic bearings for the aggregate - Use hoses for connections
8.	The overflow valve is jammed or set too low	Check or adjust valve
9.	Wrong speed	- Check motor speed and power consumption - Compare voltage and frequency to the type plate
10.	Medium too viscous	- Increase medium temperature - Lower speed
11.	Air inclusions or gas formation in the medium	- Remove leakages - Decrease suction height - Increase feed pressure
12.	Pump does not vent	Vent pressure line at the highest point
13.	Motor bearing damaged	Renew motor bearings
14.	Shaft seal damaged	Replace shaft seal
15.	Feed pressure too high or too low	- Decrease feed pressure in the system - Insert check valve on the pressure side
16.	Cold start when transporting heavy oil	Install pump heating and observe pre-heating time
17.	Overflow valve fluttering	Set opening pressure higher by turning the setting screw clockwise.
18.	Overflow valve leaking	Clean overflow valve
19.	Inlet suction line of the pump unit is closed	- Check the valves at the pump unit inlet - Open the valves at the pump unit inlet
20.	Medium level in the tank too low.	- Refill medium
21.	Medium viscosity too low	Reduce temperature of the medium
22.	Flow speed in the suction line or pressure line is excessive	- The flow speed in the suction line must be max.1m/s - The flow speed in the pressure line must be max. 2,5m/s
23.	Max. permitted pressure during heating exceeded	- Open the valves in the suction inlet line to ensure the pressure relief during heating - Install pressure relief devices according to DIN EN 12514-2
24.	Wear of the pump	Replace the pump

NOTICE

For economic reasons, we recommend providing a reserve pump right at the burner.

7 Environment

Of course, hp-TECHNIK focuses on **Environmental protection** for its development work! To ensure that the environment does not take damage from our products - caused, e.g. by environmentally harmful media escaping unnoticed - we will even increase our efforts for the further development of our **hp- Program**.
We are continuously working to decrease effects on the environment as well as energy and resource consumption - far exceeding the measure required for compliance with environmental protection laws and regulations.
Environmentally compatible actions are not only a task for each and every employee, but must also be supported continuously by the management. We ensure that our environmental policy is effectively implemented. The technical and organizational procedures required for this are inspected regularly and continuously developed.
We support our customers in the environmentally compatible use of our products.

8 General Information

8.1 Application Risk

In case of failure or leakage may occur hazards to humans and the environment.

8.2 Usable fuel

Liquid fuels, mainly fuel oils derived from crude oil distillation, qualities according to DIN 51603 Part 1 – 5.
FAME – mix with fuel oil according to DIN 51603 Part 6 (FAME = Fatty Acid Methyl Ester)
FAME 100% DIN EN 14214 respectively EN 14213
Crude oils (max. fluid temperature 90°C)
Marine fuel ISO 8217 (HFO, MDF Kategorie ISO-F-DMX, DMA, DMB)
Cold-pressed bio fuel according to DIN V 51605

Characteristics for different fuels (reference value)

Fuel	Density (at 20 °C)	Kin. viscosity (at 40°C)	Max. temperature at spraying viscosity *)
Unit	**[kg/m³]**	**[mm²/s]**	**[°C]**
Fuel oil (DIN 51603-1)	max. 856	max. 3,6	15
Havy fuel oil (DIN 51603-3)		max. 1150	160
Re – raffinate (DIN 51603-4)		<45	90
Fuel oil (DIN 51603-6)	max. 860	max. 3,6	15
Marine Fuels (ISO 8217)	890 (15°C)	min: 1,4; max. 11	80
RME (DIN EN 14213)	856,6-896,6	3,5 – 5,0	28
Rape oil (DIN V 51605)	896,6-926,6	max. 36,0	85
Ecoil (Basis Rapsöl)	923,3	39,3	85 – 90
Palm oil	947,6	85,9	100 – 105

*) temperature values are approximate
Chemical resistance of all parts for specified types of fuel. Non-standard fuels are excluded from the warranty.

8.3 Painting

black RAL 9005.
temperature resistant to 150 °C, coating thickness min. 2µm

According to the requisitions, the executed painting may vary from the standard paint.

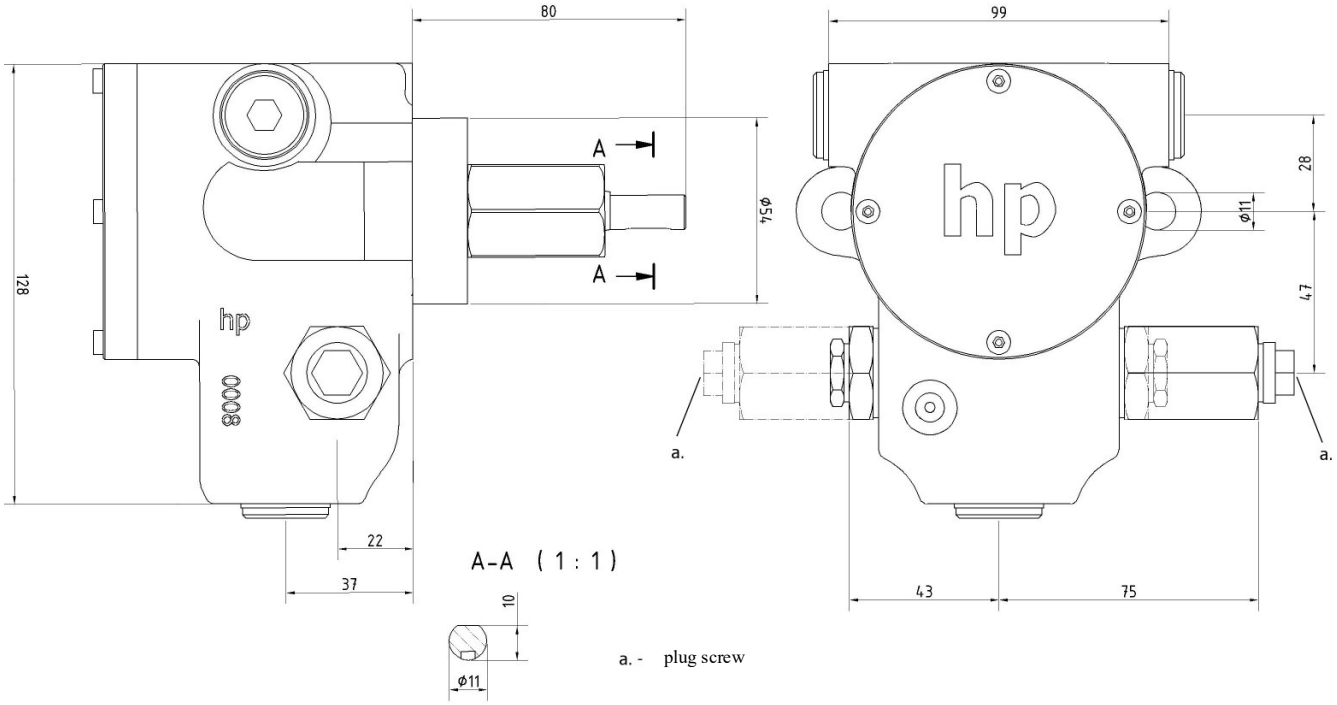
8.4 Directives

PED 97/23/EG
MD 2006/42/EG
EMC 2004/108/EG (89/336/EWG)
LVD 2006/95/EG (73/23/EWG)
ROHS 2000/53/EG
EU MEPS
WEEE 2002/95/EC
Observe the relevant national regulations.

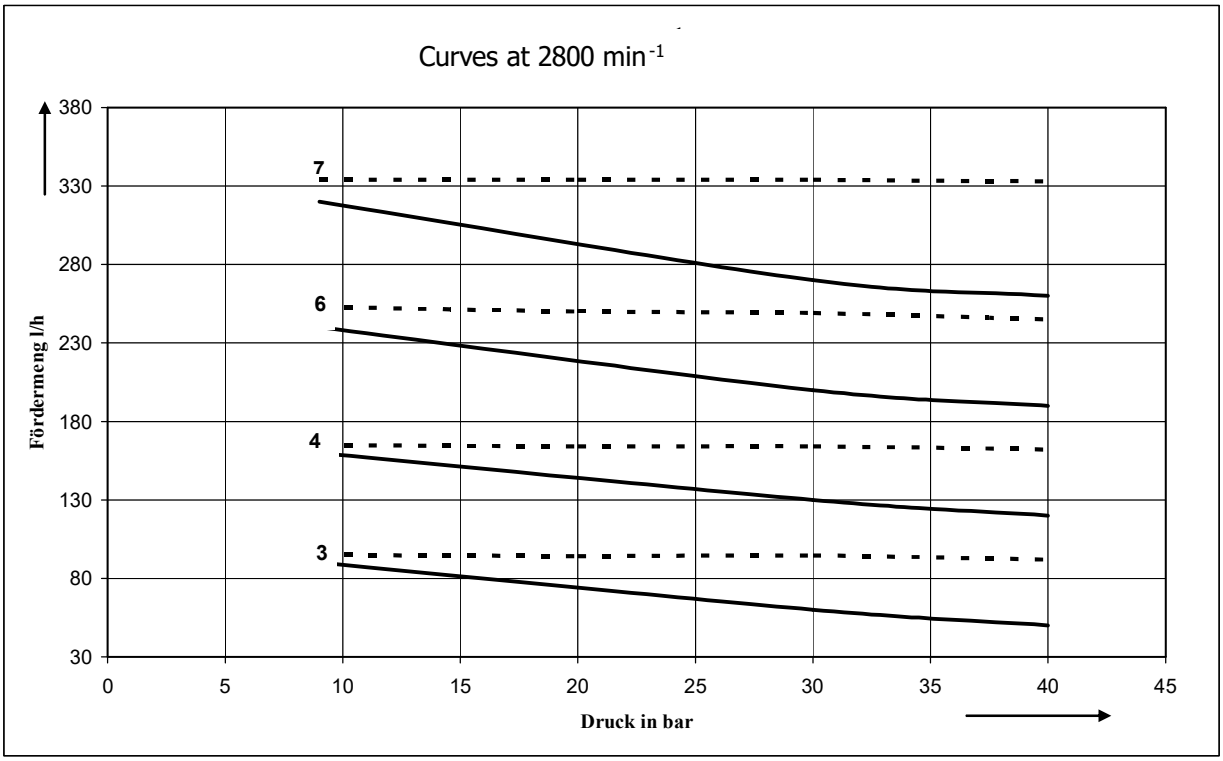
8.5 Documentation

Test report on leak and functional testing
Installation, maintenance and operating instructions with dimensional drawing and flow characteristics

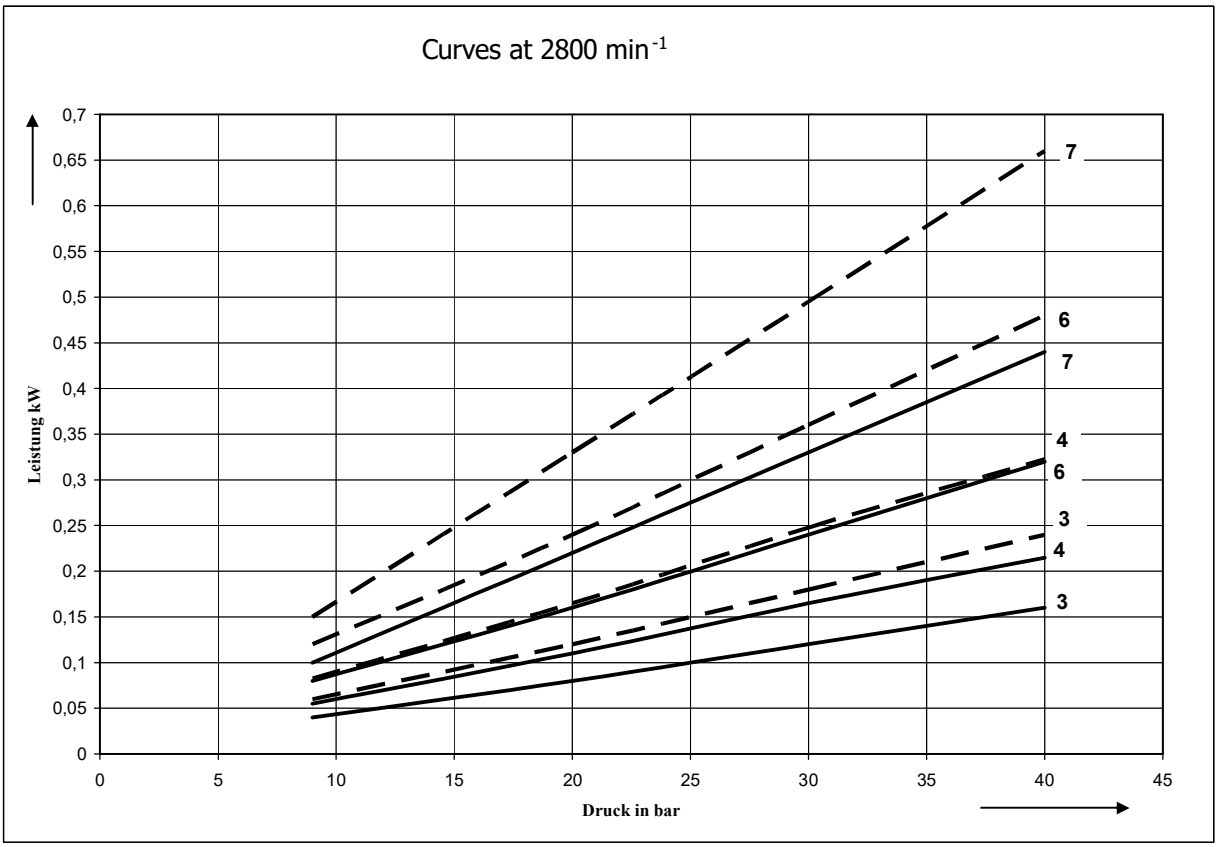
9 Dimensional drawing PON – Industrial pump



10 Flow characteristics for hp-pumps series PON



5 cSt. 200 cSt.



5 cSt. 200 cSt.

Technical Selection Chart

Direction of rotation — **I** = indirect – counterclockwise; **D**= direct – clockwise

Nozzle Port — **R**= on the right-hand side; **L=** on the left-hand side

The direction of rotation can only be changed in the factory. Therefore please assure that you state the desired direction of rotation and the direction of the nozzle port as per the size chart/ sheet when ordering! Standart design of the pump for two pipe installation, design for one pipe installation can be changed individually. (see operation installation and maintenance instructions)

hp-internal gear pump up to 40 bar

	capacity l/h at: n= 2800 min^{-1} viscosity 5 cSt.			direction of rotation	nozzle port	order number				max. allowed pump RPM (min^{-1})	gear rotor size Ø	initial pump breakaway touque	Net weight kg
	9 bar	30 bar	40 bar			I-L	I-R	D-L	D-R				
PON 3	90	60	50	D- direct – clockwise	R	0130601	0130611	0140601	0140611	3600	25	1,2 Nm	5,0
PON 4	160	130	120			0130602	0130612	0140602	0140612	3600	25	1,2 Nm	
PON 6	240	200	190	I = indirect– counter-	L	0130603	0130613	0140603	0140613	3600	25	1,2 Nm	
PON 7	320	270	260	clockwise		0130604	0130614	0140604	0140614	3600	25	1,2 Nm	

	capacity at 9 bar in l/h	connection				pressure range	RPM (min^{-1})	medium	accesories
		nozzle	suction side	bypass	manometer				
PON 3	90	1/4"	1/2"	1/2"	1/8"	1=1-4	1= 1400 min^{-1}	0= fuel oil EL+ L MGO/MDO	H3- heating element PON
PON 4	160	1/4"	1/2"	1/2"	1/8"	2=2-9			E- one pipe installation
PON 6	240	1/4"	1/2"	1/2"	1/8"	3=6-25	2= 2800 min^{-1}	5= fuel oil M+S	Z- two pipe installation
PON 7	320	1/4"	1/2"	1/2"	1/8"	4=15-40			

example for order numbers: