

Operating and maintenance norms for pumps type PFE(A), PVPC(A)

These operating and maintenance norms are valid for ATOS pumps type PFE, PFEA, PVPC, PVPCA and are intended to provide useful information to avoid risks when the pumps are installed in a system.

Information and notes on the transport and storage of the pumps are also provided.

These norms must be strictly observed to avoid damages and to ensure trouble-free operation. The respect of these operating and maintenance norms grant an increased working life and thus reduced repairing costs of the hydraulic pump and system.

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1 SYMBOLS CONVENTIONS



This symbol refers to the mandatory notes for ATEX pumps in potentially explosive atmospheres, see **tab. A300**



This symbol refers to possible dangers which can cause serious injuries

2 GENERAL NOTES



The PFE(A) and PVPC(A) operating instructions are a part of the operating instructions for the complete machine but they cannot replace it



These operating instructions must always be kept near the machine where the pump is installed to ensure an easy and fast consultation

Atos is not liable for damages resulting from an incorrect observance of these instructions.

All the hydraulic pumps have 1 year warranty; the expiration of warranty results from the following operations:

- Unauthorized mechanical or electronic interventions
- The hydraulic pumps are not used exclusively for their intended purpose as defined in these operating and maintenance instructions
- Respect the working limits indicated on nameplate and on technical tables:

A005 for PFE(A)-*1, **A007** for PFE(A)-*2, **A160** for PVPC(A)-* with mechanical controls

3 HARMONIZED STANDARDS

The **PFEA** and **PVPCA** pumps are suitable for using in environments where the possible risk of explosion comes from the surrounding area for the presence of flammable substances such as gas, vapor and dust.

Atos PFEA*, PVPCA* pumps are manufactured in accordance with Directive 94/9/CE (explosive atmosphere directive) in the valid issue and associated technical rules.

For an overall view relevant to application of the European directive in electrohydraulics, see **tab. P004**



PFEA and PVPCA pumps meet the requirements defined in the explosive atmosphere directive 94/9/CE with reference to following European standards:

- EN 13463-1 "Non electrical equipment for potentially explosive atmospheres - Basic method and requirements"
- EN 13463-5 "Non electrical equipment for potentially explosive atmospheres - Protection by constructional safety" -c
- EN 13463-5 "Non electrical equipment for potentially explosive atmospheres - Protection by control of ignition source" -b
- EN 13463-8 "Non electrical equipment for potentially explosive atmospheres - Protection by liquid immersion" -k

The pumps may exclusively be used in areas and zones assigned to the equipments group and category. Also observe the other details about explosion protection given as follow sections. See section 6 for zones in relation to equipment groups and category.





Check the code in the nameplate to ensure that the pump is suitable for the installation area

4 WORKING CONDITIONS



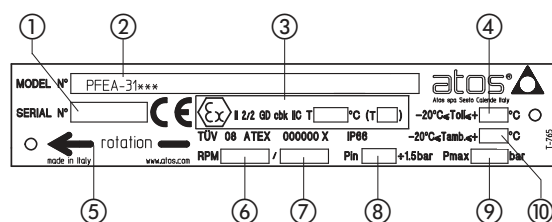
The operation of hydraulic pumps is not permitted for operating and environmental conditions different than those below specified

Pumps type	PFE		PFEA 		PVPC		PVPCA 	
Pumps version	STD	/PE	STD, /PE	/ / PE	STD	/PE	STD, /PE	/ / PE
Ambient temperature [°C]	-20 ÷ +70		-20 ÷ +60	-20÷+70	-20 ÷ +70		-20 ÷ +60	-20÷+70
Max inlet fluid temperature [°C]	+60	+80	+60	+80	+60	+80	+60	+80
Surface temperature [°C] / Temperature class	-		≤ 85 / T6	≤100 / T5	-		≤ 100 / T5	≤135 / T4
Protection degree	IP 66							
Max working pressure (1)	PFE(A)*-1: 210 bar, PFE(A)*-2: from 210 to 300 bar				250 bar for size 90, 280 bar for all other sizes			
Recommended viscosity	max at cold start 800 mm²/s; max at full power 100 mm²/s; during operation 24 mm²/s; min at full power 10 mm²/s				max at cold start 1000 mm²/s; during operation 15-100 mm²/s			
Fluid contamination class (see sect. 7.6, 7.7)	ISO 19/16, Filters at 25 µm value with β25 ≥ 75 recommended				ISO 16/13 Filters at 10 µm value with β10 ≥ 75 recommended			
Recommended pressure at inlet port	PFE(A)*-1: from -0,15 to +1,5 bar for speed up to 1800 rpm; from 0 to +1,5 bar for speed over 1800 rpm PFE(A)*-2: from 0 to +1,5 bar				from -0,2 to +24 bar			
Speed range (1) [rpm]	PFE(A)*-1: from 800 to 2800 rpm, depending to the size PFE(A)*-2: from 800 to 2500 rpm, depending to the size				from 600 to 3000 rpm, depending to the size			

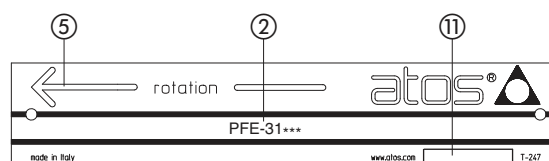
(1) max working pressure and speed range must be reduced for /PE versions, see tab. **A005** for PFE(A)-*1, **A007** for PFE(A)-*2, **A160** for PVPC(A)-*



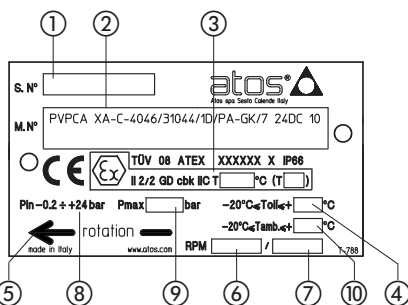
Nameplate for PFEA



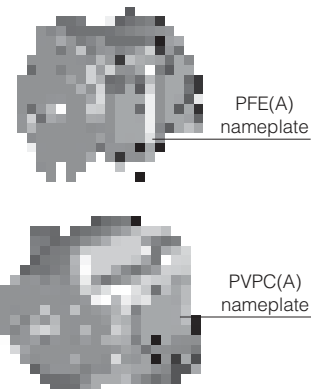
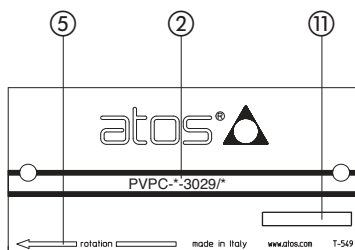
Nameplate for PFE



Nameplate for PVPCA



Nameplate for PVPC



Description

- ① Serial number
 ② Pump code
 ③ Ex II 2/2 GD cbk IIC T...°C (T...°C) -see sect. 6
 ④ Maximum inlet fluid temperature
 ⑤ Pump shaft rotation direction: clockwise or counterclockwise

- ⑥ Minimum pump rotation speed in RPM = revolution/min
 ⑦ Maximum pump rotation speed in RPM = revolution/min
 ⑧ Minimum inlet pressure (PFEA), range inlet pressure (PVPCA)
 ⑨ Maximum working pressure
 ⑩ Maximum ambient temperature
 ⑪ Delivery date

ATEX pumps are **CE** marked according to ATEX directive (94/9/CE).

6 ATEX CERTIFICATION



The user must define the overall areas of the system into different explosive atmospheres zones in accordance with directive 1999/92/CE. The table below shows the available installation zones related to the equipment group and category.

Equipment group to 94/9/CE	Category to 94/9/CE	Application, properties (excerpt from Directives)	Zones to 1999/92/CE
II	1G	Potentially explosive atmospheres, in which explosive gases, mists or vapors are likely to be present continuously, for long periods or frequently. Very high level of protection	0, 1, 2
II	2G	Potentially explosive atmospheres, in which explosive gases, mists or vapors are likely to occur occasionally. High level of protection	1, 2
II	3G	Potentially explosive atmospheres, in which explosive gases, mists or vapors are likely to occur for short periods. Normal level of protection	2
II	1D	Potentially explosive atmospheres, in which explosive dust/air mixtures are likely to be present continuously, for long periods or frequently. Very high level of protection	20, 21, 22
II	2D	Potentially explosive atmospheres, in which explosive dust/air mixtures are likely to occur occasionally. High level of protection	21, 22
II	3D	Potentially explosive atmospheres, in which explosive dust/air mixtures are likely to occur rarely or for short periods. Normal level of protection	22

Note: the permitted areas for PFEA and PVPCA pumps are evidenced in shaded area

These pumps are suitable for functioning with Hydraulic oil DIN 52524...535, Water glycol, Phosphate esters

PUMP VERSION	Group	Equipment category	Gas group	Temperature class	Zone
PFEA and PVPCA	II	2 GD	II C	PFEA T6, PVPCA T5	1, 2, 21, 22
PFEA* /7 /PE and PVPCA* /7 /PE	II	2 GD	II C	PFEA* T5, PVPCA* T4	1, 2, 21, 22

Ex II 2/2 GD cbk IIC T...°C (T...°C)

GROUP II, ATEX certification

Ex = Specific marking for explosion protection

II = Equipment group (II = two)

2/2 = Pump category

GD = Explosive atmosphere due to gas vapours and dust

c = Protection by constructional safety

b = Protection by control of ignition source

k = Protection by liquid immersion

IIC = Gas group

T...°C = Max pump surface temperature (+100= T5, +135= T4)

(T*) = Class temperature (T5= +100°C, T4= +135°C)

7 SAFETY NOTES

- General:

- Before start up make sure that pump is always filled with the working fluid. See section 7.4.
- The pump must not be used with "OUT" port closed; in order to limit the maximum working pressure a relief valve must be installed on the pressure line.
- Make sure that the maximum working conditions shown in section 4 are not exceeded

Consult table P002 for installation commissioning and maintenance of electrohydraulic system

7.1 Installation position and port orientation

The installation must ensure that the pump remains always filled with the working fluid.

- For **PFE(A)**: The pump can operate in any position, the available orientation of the oil ports is according to the below picture. At the ordering must be specified the selected orientation.



-For **PVPC(A)**:

- The pumps can be installed in horizontal or in vertical position. In case of vertical position the pump shaft must be oriented upward.
- The drain pipe must be oriented so that the pump body always remains filled with the fluid, specially when not working. For this reason the pump is provided with 2 drain connections located in opposite side of the body, so that, depending to the pump orientation, the optimal drain piping can be arranged.
- Before the commissioning the pump body must be filled with the working fluid through one of the drain connections.
- The connection with the electric motor must be realized by means of proper elastic coupling.

7.2 Shaft loads

PFE(A): axial and radial loads acting on shaft are not permitted.

PVPC(A): axial and radial loads acting on shaft are permitted, max permissible loads are indicated in the table A160, section 2.

The coupling with the electric motor must be sized to absorb the power peaks.

It is therefore important that the installer / end user takes great care to ensure in the coupling the alignment between the motor and pump shaft

7.3 Shaft rotation

Check direction of shaft rotation (D = clockwise, S = counterclockwise, viewed from the shaft end) will be the same of the arrow on the nameplate.

7.4 Oil level

Make sure that the pump is always filled with fluid, therefore, the installer / end user has to provide a level meter to verify the presence of fluid inside the tank. The compliance with this condition implies that the instrument is installed on the tank / pump suction tank and it is always under level.



The monitoring of the inlet fluid temperature it is required only when it can reach critical values.

This monitoring should be performed on the surface of the fluid inlet pipe in the immediate proximity of the pump's suction flange and anyway not more than one meter far from the flange itself. The monitoring system must operating with a tolerance of -5 °C of the maximum declared value. For example, if the maximum inlet fluid temperature is 60 °C, the control system must be operating between + 55 °C and + 60 °C.

The sensor used for monitoring the fluid level and the temperature must be ATEX certified and conform to the installation area: the control unit (PLC) must be certified IPL1 or SIL 1 also.

7.5 Important notes

- A pressure relief valve must be installed on the pressure line near the pump outlet port.



- The electric motor to be used for the pump operation must be also certified in compliance with installation zone. The compliance with applicable norms is extended to all electrical components connected with the installed pump.

- The piping have to be dimensioned according to the max pressure and max flow rate required
- All pipes and surfaces must be cleaned from dirt before mounting
- Make sure that connections are sealed before giving pressure to the system
- Ensure to not exchange the pipe ports when connecting the system
- Ensure that the pump installation allows an easy acces for maintenance purpose



- According to EN 1127-1:2008, the maximum surface temperature indicated in the nameplate must be lower than the following Tmax values:

Gas - Tmax= max value (80% of gas ignition temperature)

Dust - Tmax = dust ignition tempeature - 75°C

- Make sure that the pump is suitable for the use in the designated installation area, on the base of the zone classification according to the Directive 1999/92/CE and to the type of flammable atmosphere (gas, vapor, dust).

- The fluid ignition temperature must be 50K greater than the maximum surface temperature indicated in the nameplate

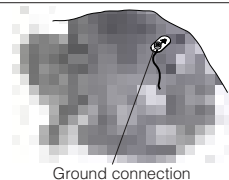
- The maximum operating pressure and minimum inlet pressure are indicated on pump's nameplate

- The pump must be connected to ground using the ground facility (screw M3x5) provided on the pump body and evidenced with grounding nameplate.

- The pump's body and the electric motor, or other devices used to driving the pump, must be connected at the same electric equipotential level.

- Pumps PVPCA with control devices type CH are equipped with Explosion-proof solenoid valves (assembled to the pump body certified according to ATEX 94/9/CE.

- Pumps PVPCA with control devices type LW are equipped with a device to achieve a constant power set in the factory at a specific power value required by customer. To avoid a changing of the control setting the regulating screw will be protected with red paint and this operation (carried out in a factory) will be indicates in the maintenance and using manual also.



7.6 Hydraulic fluids and operating viscosity range

Recommended mineral oils type HLP having high viscosity index.



Ensure to use hydraulic fluids compatible with the selected seals

Make sure that the hydraulic fluid is compatible with gas and dust present in the application: in case of doubts contact ATOS.

The type of fluid has to be selected in consideration of the effective working temperature range, so that the fluid viscosity remains at the optimal level. To ensure the best efficiency and working life, the fluid viscosity should be selected in the range 15 to 36 mm²/s at the effective working temperature.

Note: the temperature of the fluid contained in the pump body (drain line) is always higher than the tank temperature, specially if the pump is working for long time in null flow conditions and at high pressure

Fluid viscosity limits:

- 10 mm²/s for short periods at max fluid temperature on drain line
- 1000 mm²/s for short period at cold start-up (800 mm²/sec for PVPC(A))

7.7 Filtration

The correct fluid filtration ensures a long service life of the pump and it prevent anomalous wearing which can cause loss of efficiency and increment of noise level.

The recommended class for the best pump operation and endurance should be equal or better than ISO 19/16 (NAS 1638 class 10) for PFE(A) and ISO 16/13 (NAS 1638 class 7) for PVPC(A)

A 150 microns suction filter is suggested on the pumps inlet port to avoid that big contaminants as part of rubber pips, metallic burrs, etc, can be get into the pump.

8 MAINTENANCE

⚠ Maintenance must be carried out only by qualified personnel with a specific knowledge of hydraulics and electrohydraulics

8.1 Ordinary Maintenance

- The pump does not require other maintenance operations except for bearing and front shaft seal, according to the following schedule which is strictly mandatory for PFEA and PVPCA, and suggested for PFE and PVPC:

PFE(A) must be replaced after reaching **58000 working hours**.

PVPC(A) without radial loads must be replaced after reaching **58000 working hours**.

In presence of radial loads (permitted only for PVPC(A)) the following maintenance schedule must be considered:

PVPC(A)-3029 must be replaced after reaching **4100 working hours**.

PVPC(A)-4046 must be replaced after reaching **6500 working hours**.

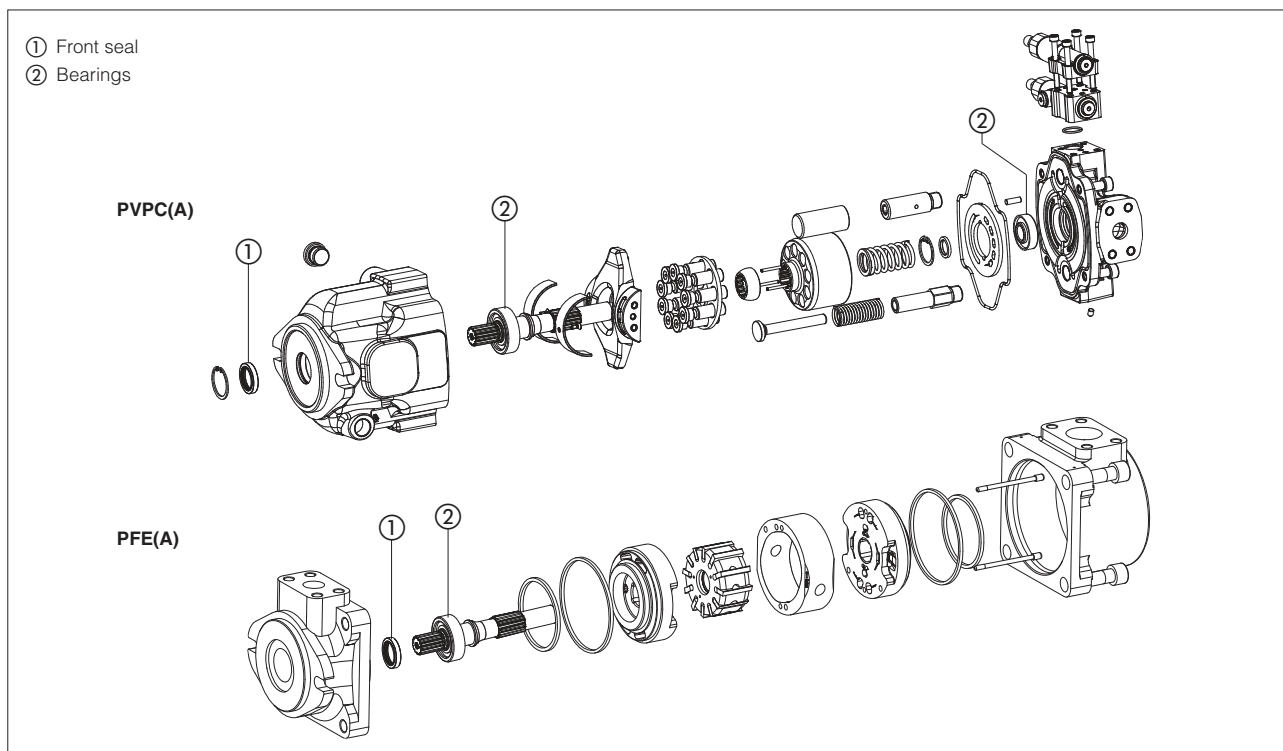
PVPC(A)-5073 must be replaced after reaching **8000 working hours**.

PVPC(A)-5090 must be replaced after reaching **4700 working hours**.

- When mounting bearings and front seal, observe the correct position as indicated in the drawing below. Any bad positioning can result in oil leakages
- Results of maintenance and inspection must be planned and documented
- Follow the maintenance instructions of the fluid manufacturer



- Any preventive maintenance should be performed only by experienced personnel authorized by ATOS.
- Cleaning the external surfaces using a wet cloth to avoid accumulation of dust layer over 5 mm
- Don't use compressed air for cleaning to avoid any dangerous dust dispersion on the surrounding atmosphere
- Any sudden increment in temperature requires the immediate stop of the system and the inspection of the relevant components



8.2 Repairing

Before beginning any repairing activity, the following guidelines must be observed:

- Unauthorized opening of the pump during the warranty period invalidates the warranty
- Be sure to use only original spare parts manufactured or supplied by ATOS factory
- Provide all the required tools to make the repair operations safely and to don't damage the components
- Read and follow all the safety notes given in section 7
- Ensure that the pump is well locked to the motors bell



- Any repairing must be performed only by experienced personnel authorized by ATOS.

9 TRANSPORT AND STORAGE

9.1 Transport

Observe the following guidelines for transportation of pumps:

- Hydraulic pumps should be transported using a forklift or a lifting gear ensuring a stable position of the pump
- Use soft lifting belts to move or lift the pumps in order to avoid damages
- Before any movement check the pumps weight specified on technical tables indicated in section 2 (due to tolerances, the weight may be 10% grater than the values specified in the technical table)

9.2 Storage

PFE(A) corrosion protection is achieved with zinc phosphating: this treatment protect the pump to grant a storage period up to 12 months.

PVPC(A) corrosion protection is achieved with transparent oil film

Additionally all pumps are tested with mineral oil OSO 46; the oil film left after testing ensure the internal corrosion protection.

⚠ In case of storage period longer than 12 months please contact our technical office

Anyway when a storage in the open air is foreseen, ensure that pumps are well protected against water and humidity