Operating and maintenance information for servopumps

conforming to Machine Directive 2006/42/EC

This operating and maintenance information applies to Atos Smart ServoPumps - SSP.
It is intended to provide useful guidelines to avoid risks when the servopumps are installed in the hydraulic system.
It contains important information on the safe and proper installation, commissioning, operation transport and maintenance of the products.
Atos disclaims any liability for damage and / or injury to persons, animals or property resulting from the requirements contained in this document.
The prescriptions included in this document must be strictly observed to avoid damages and injury.
The respect of this operating and maintenance information grants an increased working life, trouble-free operation and thus reduced repairing costs.

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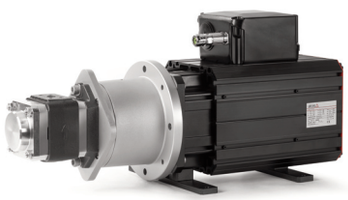


1 SYMBOL CONVENTIONS

Following symbols are used in this documentation to evidence particular risks to be carefully avoided.
In the following are listed the symbol conventions with their meaning, in case of non-compliance with this operating and maintenance information.

⚠ **WARNING**	Death or serious injury could occur	risk classes to ANSI Z535.6 / ISO 3864
⚠ **CAUTION**	Minor or moderate injury could occur	
NOTICE	Property damage could occur	
⚠	Information to be observed	

2 GENERAL NOTES

This document is intended for machine manufacturers, assemblers and system end-users.

⚠ **WARNING**
Personal injury and property damage may be caused by incorrect use of the products!
The products have been designed for use in industrial environments and may only be used in the appropriate way.

Before using Atos servopumps, the following requisites must be met to ensure appropriate use of the products:
- personnel who uses Atos servopumps must first read and understand the operating and maintenance information, particularly the Safety Notes in section 5.
- the products must remain in their original state, no modifications are permitted
- it is not permitted to decompile software products or alter source codes
- damaged or faulty servopumps must not be installed or put into operation
- make sure that the products have been installed as described in section 6 and 7

3 CERTIFICATION

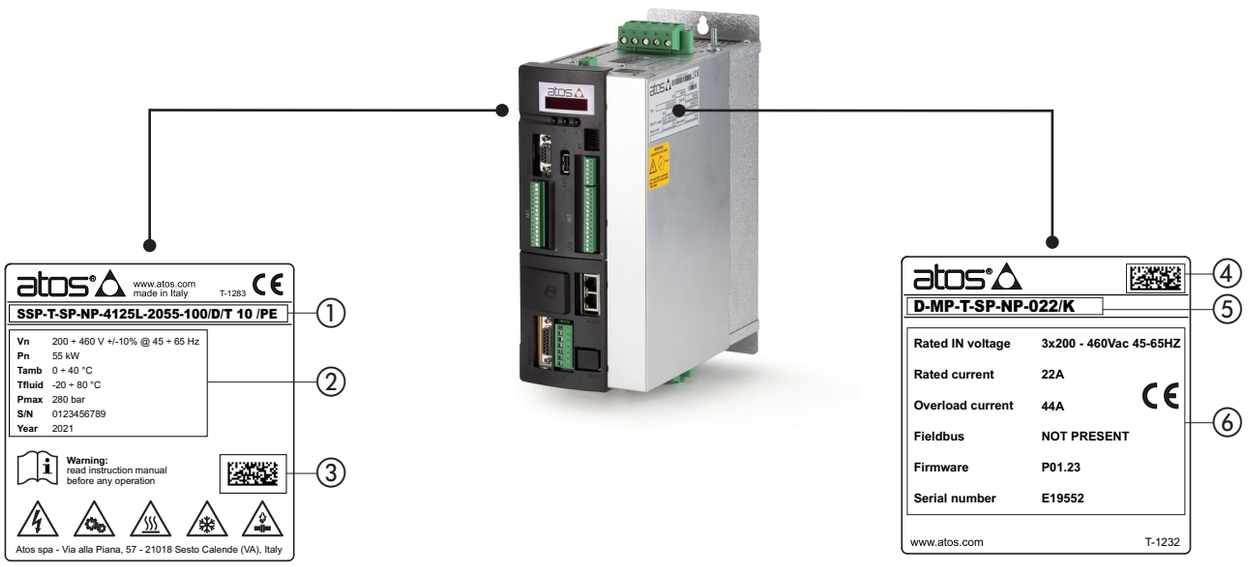
The servopump falls within the scope of Directive 2006/42/EC and it has been assessed to comply with the requirements set forth in Annex I of the Directive itself proceeding in accordance with Annex VIII implementing the provisions in the procedure "Internal control of production" by Atos.
The reference standards used in the performance of the verification of compliance are as follows:

Machinery Directive (2006/42/EC)
EN60204-1: 2018 - Safety of machinery. Electrical equipment of machines. General requirements
EN12100: 2010 - Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 809:1998+A1:2009/AC:2010 - Pumps and pump units for liquids — Common safety requirements

EMC Directive (2014/30/EU)
EN61000-6-2: 2005 + AC:2005 - Electromagnetic compatibility - Part 6-2: generic standards - Immunity for industrial environment
EN61000-6-4: 2007 + A1:2011 - Electromagnetic compatibility - Part 6-4: generic standards - Emission for industrial environment

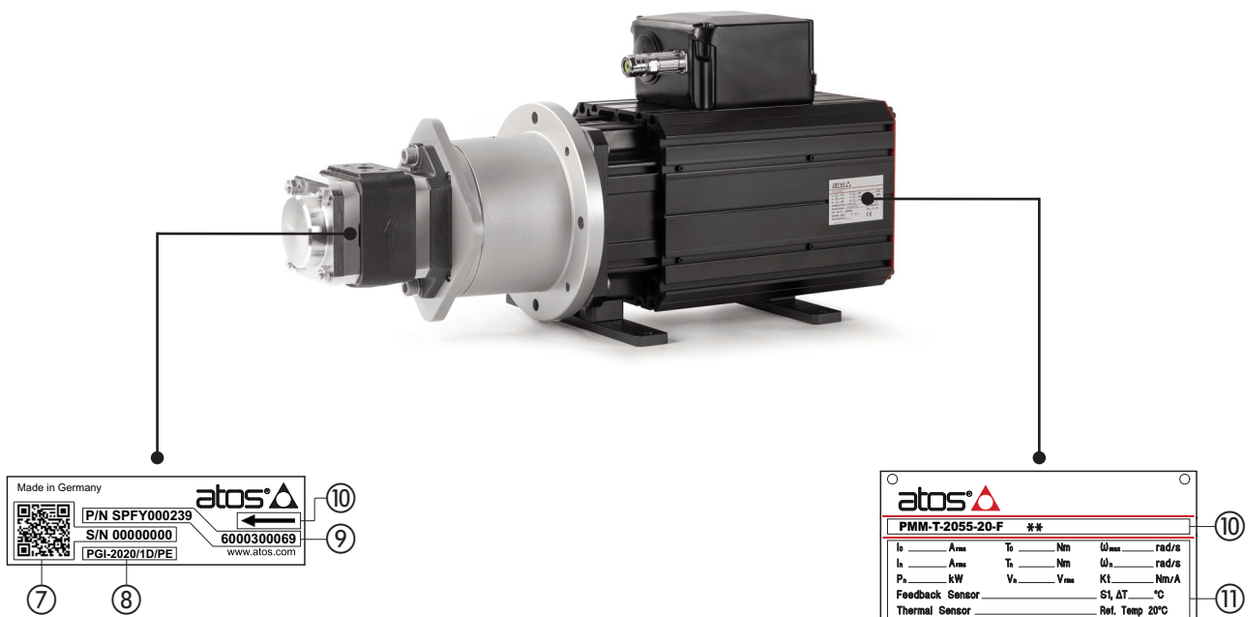
PED Directive (2014/68/EU)
Developed according clause 4.3 which applies to pressure equipment and assemblies below or equal to the limits set out in points (a), (b) and (c) of paragraph 1 and in paragraph 2 respectively, then designed and manufactured in accordance with the sound engineering practice of a Member State in order to ensure safe use.

4 PRODUCT IDENTIFICATION EXAMPLES - nameplates



① Smart Servopump system code
② Smart Servopump system main data
③ Smart Servopump system serial number

④ Digital electronic drive code
⑤ Digital electronic main data
⑥ Digital electronic drive serial number



⑦ Pump serial number
⑧ Pump code
⑨ Pump internal code Atos
⑩ Pump rotation direction

⑩ Synchronous servomotor code
⑪ Synchronous servomotor main data

5 SAFETY NOTES

5.1 Intended use

Atos servopumps may only be operated under the environmental and operating conditions described in the servopumps technical tables.

5.2 Improper use

Any improper use of the components is not admissible.

Improper use of the product includes:

- use in explosive environments
- incorrect storage
- incorrect transport
- lack of cleanliness during storage and installation
- incorrect installation
- use of inappropriate or non-admissible fluids
- operation outside the specified performance limits
- operation outside the approved temperature range

Atos spa does not assume any liability for damage caused by improper use. The user assumes all risks involved with improper use.

5.3 Installation

Installation must be performed following the recommendations contained in the S-MAN-HW installation manual.
The personnel operating in places with a number knowns risks shall be trained and instructed in relations with the precautions, the behaviour, the operating procedures which are regulated by the law.

WARNING: electrocution
Install appropriate differential protection device upstream of the electrical panel.
It is forbidden to remove or tamper the guards and safety devices installed on the machine.
Do not use or do not open the machine, in the presence of water, before removing the power supply and liberated the area from the water. Do not use or do not open the machine, in the presence of flammable substance, before removing the power supply and liberated the area from the flammable substance.

WARNING: emergency stop
As a result of the risk analysis, the system shall be equipped with devices and guards to minimize possible risks to persons who may be in the vicinity of the equipment, that taking into account the reasonably foreseeable conditions of use.

Minimum requirements:

- Emergency pushbutton
  - it must be proof tested not less than 1 per year
  - it must not be muted
  - it must not be altered of modified

In case of emergency and only if the conditions let the operation to be safe, it is possible to obtain the arrest of the machinery by pressing the emergency stop button (design, erection and installation of the entire safety instrumented systems making emergency stop operations, as described below, is on charge to the user).

Pressing the button by the operator results in the immediate shutdown and isolation of the machinery. Activate the emergency button in all foreseeable conditions of risk (machine malfunctions, emergencies or accidents in the workplace).

In the event of activation of the emergency stop, before restoring the function of the system, check that:

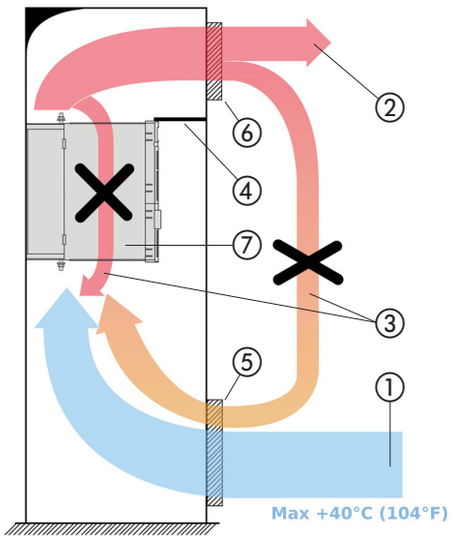
- the emergency situation has been removed
- whether to ensure the integrity of the mixer
- the safety devices are in proper working

WARNING: hot surface
The electrical motor and drive considerably heats up during operation. Allow the electrical motor and drive to cool down sufficiently before touching it. During operation, touch the electrical motor and drive only by using protective gloves.
Please also observe ISO 13732-1 and EN 982.

CAUTION:
Use of the servopump outside the approved temperature range may lead to functional failures like overheating of the pump/electrical motor/drive. Only use the servopump within the specified ambient and fluid temperature range.

CAUTION: pressurized systems
When working at hydraulic systems with stored energy (accumulator or cylinders working under gravity), servopump may even be pressurized after the hydraulic power supply has been switched off.
During assembly and disassembly works, serious injury may be caused by a powerful leaking of hydraulic fluid jet.
Ensure that the whole hydraulic system is depressurized and the electrical control is de-energized.

WARNING: drive cooling
Provide sufficient air ventilation to remove the heat generated by the drive and by other components as reported in the user manual.



1. Cabinet input air flow
2. Cabinet output air flow
3. Unattended air flow
4. Air baffle
5. Cabinet input air cooling filter
6. Cabinet output air cooling filter
7. Drive

WARNING: motor cooling
The motor must be fitted in such a way that heat loss can be adequately dissipated. Do not impede free ventilation of motors.

NOTICE: disconnection and connection of plug-in connectors
Do not plug-in or disconnect the electric connector as long as the voltage supply is ON.

NOTICE: impact
Impact or shock may damage the servopumps. Never use the servopumps as step.

NOTICE: dirt and foreign particles
Penetrating dirt and foreign particles lead to wear and malfunctions of the servopumps.
During assembly, be careful to prevent foreign particles such as metal chips getting into the pump or into the hydraulic system.

Environmental protection
Hydraulic fluids are harmful to the environment.
Leaking hydraulic fluid may leads to environmental pollution.
In case of fluid leakage immediately act to contain the problem.
Dispose of the hydraulic fluid in accordance with the currently applicable national regulations in your country.

6 HYDRAULIC AND MECHANICAL INSTALLATION

6.1 Commissioning

It must be possible for the pump to be started without load.
During initial system checkout, it is absolutely necessary to bleed the pressure line.
After bleeding the pump, the pressure control valve (present on the optional manifold available with options /C or /D, otherwise it's on customer behalf) must be secured against being readjusted.
Prior to switching off the pump, the load must be unpressurized.
After some operating hours, check the filter and oil temperature.

6.2 Fluid conditioning

A high-performance system must be thermally conditioned to ensure a limited fluid temperature excursion (generically between 40 and 50°C) so that the fluid viscosity remains constant during operation.
The machine working cycle should start after the prescribed temperature has been reached.

6.3 Air bleeds

On commissioning the pump, it is absolutely necessary to carry out sufficient bleeding of pressure control valves so that the pump does not run dry, get overheated or breaks down early due to lack of oil. The system has to be bled until no cracking noise or formation of foam can be determined any more.

6.4 System flushing

In order to obtain the required minimum cleanliness level, the hydraulic system must be flushed for a sufficient time.
A decisive factor for the flushing time is the contamination level of the hydraulic fluid which can only be determined by means of a particle counter. During the flushing procedure, perform a frequent monitor of the filters clogging indicator, replacing the filter elements when required.

6.5 Hydraulic fluids and operating viscosity range

Mineral oils type HLP having high viscosity index are recommended.
The hydraulic fluids must be compatible with the selected seals.
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.

Hydraulic fluid	Classification	Ref. Standard
Mineral oils	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524

Fluid viscosity: 20 ÷ 100 mm^2/s - max allowed range 15 ÷ 380 mm^2/s

CAUTION: easily inflammable hydraulic fluid
In connection with fire or other hot sources, leaking hydraulic fluid may lead to fire or explosions.

6.6 Filtration

The correct fluid filtration ensures a long service life of the pumps and it prevent anomalous wearing or sticking.

CAUTION
Contamination in the hydraulic fluid may cause functional failures e.g. jamming or blocking of the pump.
Ensure adequate hydraulic fluid cleanliness according to the cleanliness class required for the pump.

Max fluid contamination level, see also filter section at www.atos.com or KTF catalog:

- normal operation: ISO4406 class 20/18/15 NAS1638 class 9
- longer life: ISO4406 class 18/16/13 NAS1638 class 7

6.7 Drive fastening

Proceed with the drive installation observing the minimum distances around it.
Fix the drive to the wall by means of fixing screws (for screws size see related technical table).

6.8 Motorpump group fastening

Fix the motorpump group using the motor's feet (for screws size see related technical table).
Use vibration Dampers to absorb rotational vibrations.
Install the motorpump in horizontal position only, possibility with pump inlet under the oil level.

7 ELECTRICAL INSTALLATION

7.1 Power supply

Following additional notes have to be considered:

- Remove the D-MP drive from its packaging only in a protected working area
- Switch-off power supply before any wirings operation (wait at least 8 minutes for the capacitors to discharge)
- During the system start-up, verify electrical noise level and apply protection to avoid reference signals interference from electrical noise
- Use protection fuse on power supply line: see user-manual for fuses size
- Use inductance on power supply line. The 3-phase inductance is used to reduce the current peaks on the diode bridge DB and the effective value of the current through the capacitors. It is also used to reduce interference from the supply line to the drive and from the drive to the line: see user-manual for inductance type
- The power mains to which the drive is connected must meet the technical specifications (see technical specifications data) and fulfill the requirements of the laws in force in the country of use
- The manufacturer disclaims all liability for faults or malfunctions of the Atos drive due to voltage fluctuations beyond the tolerances specified by the electricity distribution authority (voltage ±10%).

Drive power supply (L1, L2, L3)

The drive must be connected to the main power supply trought terminals L1, L2, L3 and with the ground cable connected to the PE stud.
The drive must be wired steadily through appropriately sized cables: see the relevant technical table for wize size.

Motor power supply (U, V, W)

The PMM motor must be connected to terminals U, V, W of the drive with the ground cable connected to the PE stud. In sizes from 090 to 140 pass the motor three-phase through the present toroid inside, without shield and ground. Always use cables of appropriate size.
Atos recommends to use an inductance between the drive and the motor. With cables longer than 50 meters, the inductance is obligatory.

7.2 Electrical wiring

Any type of electrical material (cables, sockets, plugs and so on…) used to make the connections must be suitable for use, must bear the "CE" marking if it is subject to the low voltage directive 2014/35/EU and must comply with the requirements of the laws in force in the country where the drive is used.

Connect the motor by means of shielded or armored cables only and ground the shield on the drive side as well as on motor side. If shielded cables cannot be used, the motor cables should be placed in a metallic raceway connected to ground.

Use recommended shielded cable size for logic connection:
1,5 mm^2 max 30m for 24VDC power supply and relay digital output; 0.75 mm^2 max 30 m for logic

7.3 Ground connection

All conductive parts of the servopump assembly are equipotential: in case they are adopted, do not remove any wire intended to equalize the conductive parts (for example do not remove wires connecting metalling parts of the assembly, if any screw, bolts, etc). If necessary, in ordere to bond the assembly to the local structures, installe and user shall adopt technique to equalize potentials of all conductive parts.

Drive type	Servomotor type (1)	Power Cables (mm^2)		Protection Cables (mm^2)		Max length [m]
		drive **L1 - L2 - L3**	servomotor **U - V - W**	drive **PE**	servomotor **PE**	drive and servomotor
D-MP-*-022	PMM-*009	6	6	6	6	20
D-MP-*-032	PMM-*015	10	10	10	10	
D-MP-*-046	PMM-*024	16	25	16	25	
D-MP-*-060	PMM-*032	25	25	25	25	
D-MP-*-090	PMM-*042	35	35	25	25	
D-MP-*-100	PMM-*055	50	70	35	35	
D-MP-*-140		70	70	50	35	
D-MP-*-165	PMM-*080	120	120	70	70	
D-MP-*-210	PMM-*100					

Grounding the drive

The leakage current is the current that the drive discharges towards the ground (earth) connection.
The amount of such current depends on the voltage, the PWM frequency and the parasitic capacity to ground the motor and connection cable. Also the noise filters, if any, are likely to increase the amount of leakage current.

If an RDC (Residual Current Device) is installed, the drive will work without false input as long as:

- a type B RDC is being used
- the RDC release limit is 300 mA (TT or TN systems)
- each RDC powers only one drive
- the output cables are shorter than 50 m (screened) or 100 m (unscreened)

The RDC used must supply protection from the direct current components present in the fault current and must be suitable for suppressing current peaks quickly. We reccommend protecting the drive separately using fuses, and observing the regulations of the individual user countries.

Always make sure that the Atos drive is disabled before disconnection from the motor.

This drive cannot work unless the protection conductor is steadily grounded (earthed).

7.3 Suppression of interferences by electrical noise

When starting the system, it is always advisable to check that feedback, references signal are free from interferences and electrical noise which can affect the characteristics of the signals and generate instability in the whole system.

Electrical noises can be suppressed by shielding and grounding the signal cables, see section 8.

Most of electrical noises are due to external magnetic fields generated by transformers, electric motors, switchboards, etc.

8 SHIELD CONNECTION

The correct shielding of signal cables has to be provided to protect the electronics from electrical noise disturbances, which could affect the servo-pumps functioning.
In general following basic rules should be observed:

- use shielded wirings to avoid electromagnetic noise: it is an essential part of the EMC protection from the noises that could otherwise bring disturbance through the signal and power supply connections.
- power supply cables and signal cables should be routed in separate cable conduits.
- connect cable shield at PLC/machine side and leave the other end (drive side) open to prevent ground loops
- if possible, connect shields to a protected earth (a noise-free connection with a different path from safety earth and power supply ground); it is just designed to connect command signals ground, cables shields and all other noise sensitive devices
- verify that all the ground/earth points are equipotential otherwise position and dimension of the connections must be checked
- earth connection of the drives is available on drive case; take care to the correct earthing also of the motor
- in case of high noise levels, use additional shields and filters to allow the correct working of the electronic drive

Refer to the applicable international standards for details about the shielding criteria.

9 MAINTENANCE

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

9.1 Ordinary maintenance

- If Atos pumps are operated properly according to the permissible technical specifications and the operating fluid is properly filter within the max contamination level, they excel by an extremely long operating life.
- To intercept any sign of incipient wear, it must be monitored: increase the pump's running noise, increase of temperature differences of operating fluid between the pump's inlet and outlet with determined amount of cooling water
- Results of maintenance and inspection must be planned and documented
- Follow the maintenance instructions of the fluid manufacturer
- Atos Electrical motors are foreseen with ball bearings prelubricated for their life with maintenance free. Check anyway their temperature and vibrations every 2000 hours operation.
- Cleaning the external surfaces using a wet cloth to avoid accumulation of dust layer
- 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

9.2 Repairing

In case of incorrect functioning or beak-down it is recommended to send the servopumps back to Atos or to Atos authorized service centers which will provide for the reparation.
Unauthorized opening of the servopumps during the warranty period invalidates the warranty.

9.3 Transport

Check the motor-pump unit carefully to make sure it has not undergone any damage during transport. For transport, use only lifting eyes if they are present on the motor pump.

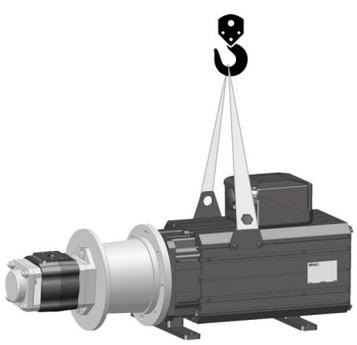
Do not use lifting eyes if the temperature is lower than -20°C .

Do not add any additional load.

As motors contain permanent magnets, avoid closeness to people who have internal medical devices (e.g. pace-maker) or to material that can be damaged by magnetic fields.
If motor pumps are stored, make sure that they are kept in a dry, dustfree and without vibrations environment. Measure the insulation resistance before putting the motors into operation for the first time. Dry out the winding if the insulation resistance is lower than 2MΩ.

The packaging that contains the drive shuld be lifted with utmost care.

Manual handling of the package must be carried out in compliance with the regulations on "manual handling of loads", to avoid unfavourable ergonomic conditions that involve risks of back or lumbar injury.



9.4 Storage

Servopumps are boxed using a VpCi protective packing system, offering best protection to oxidation during components sea transport or long storage in humid environments. For the servopump transporting and storing always observe the environmental conditions specified in the relevant technical tables. Improper storage may damage the product.

The servopump can be stored for up to 12 months under the following conditions:

	Motorpump group	**Drive**
Temperature	0°C ÷ +40°C	-10°C ÷ +60°C
Humidity	+5°C ÷ +95°C	+5 ÷ +95 %
Condensation	NO	NO

- Do not store the servopumps outdoors
- Protect the servopumps against water and humidity in case of storage in open air
- Store the servopumps in the shelf or on a pallet
- Store the servopumps in the original packaging or comparable packaging in order to protect them from dust and dirt
- Remove the plastic covers from the pump pressure and suction connectors only before the assembly

Every 6 months or 1 year the regeneration of Drive is necessary: see the user manual for the complete procedure

Operating and maintenance information for pumps

fixed and variable displacement

This operating and maintenance information apply to ATOS fixed vane, fixed piston and variable piston pumps, is intended to provide useful guidelines to avoid risks when the pumps are installed in a system.
It contains important information on the safe and proper installation, transport, commissioning, operation and maintenance of the products.
The prescriptions included in this document must be strictly observed to avoid damages and injury.
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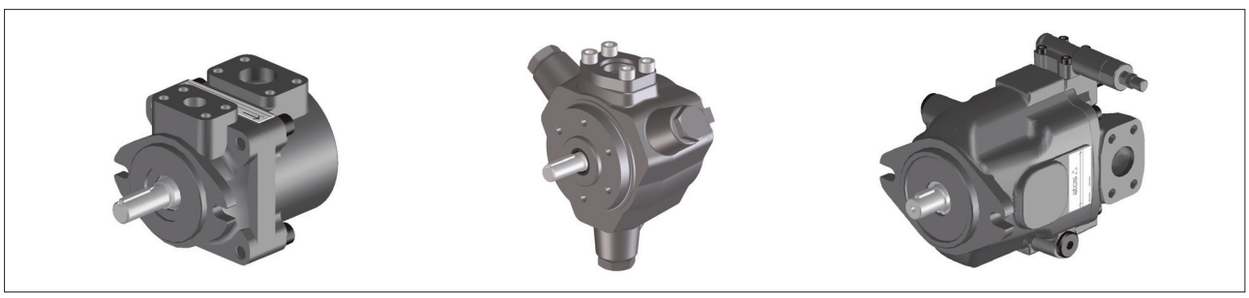

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⚠ **CAUTION**	Minor or moderate injury could occur	
NOTICE	Property damage could occur	
⚠	Information to be observed	

2 GENERAL NOTES

This document is intended for machine manufacturers, assemblers and system end-users.

⚠ **WARNING**
Personal injury and property damage caused by incorrect use of the products!
The products have been designed for use in industrial environments and may only be used in the appropriate way.

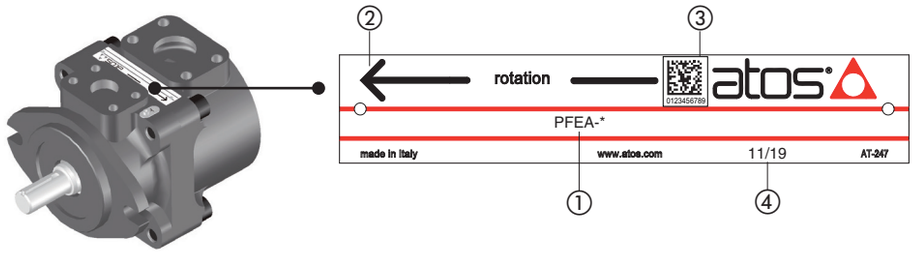
Before using Atos pumps, the following requisites must be met to ensure appropriate use of the products:
- personnel who uses Atos pumps must first read and understand the operating and maintenance information, particularly the Safety Notes in section 4.
- the products must remain in their original state, no modifications are permitted
- damaged or faulty pumps must not be installed or put into operation
- make sure that the products have been installed as described in the relevant documentation

2.1 Warranty

The expiration of warranty results from the following operations:
- incorrect assembly and commissioning
- improper use, see 4.2
- improper handling and storage, see 6.4
- modification of the original condition

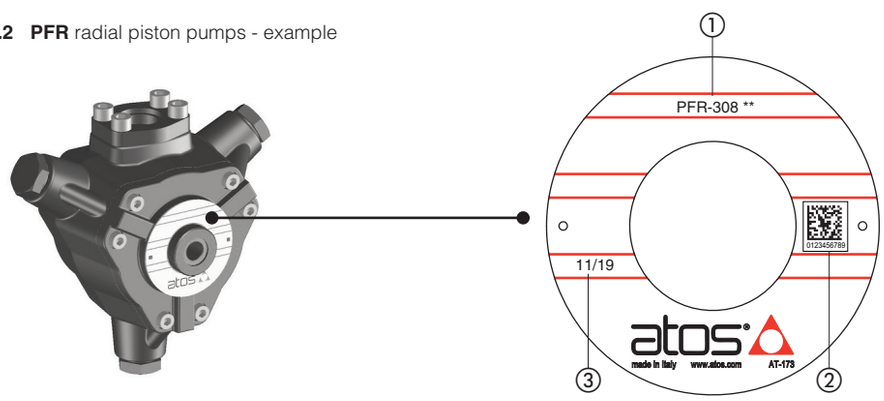
3 PRODUCT IDENTIFICATION EXAMPLES - nameplates

3.1 **PFE** vane pumps - example



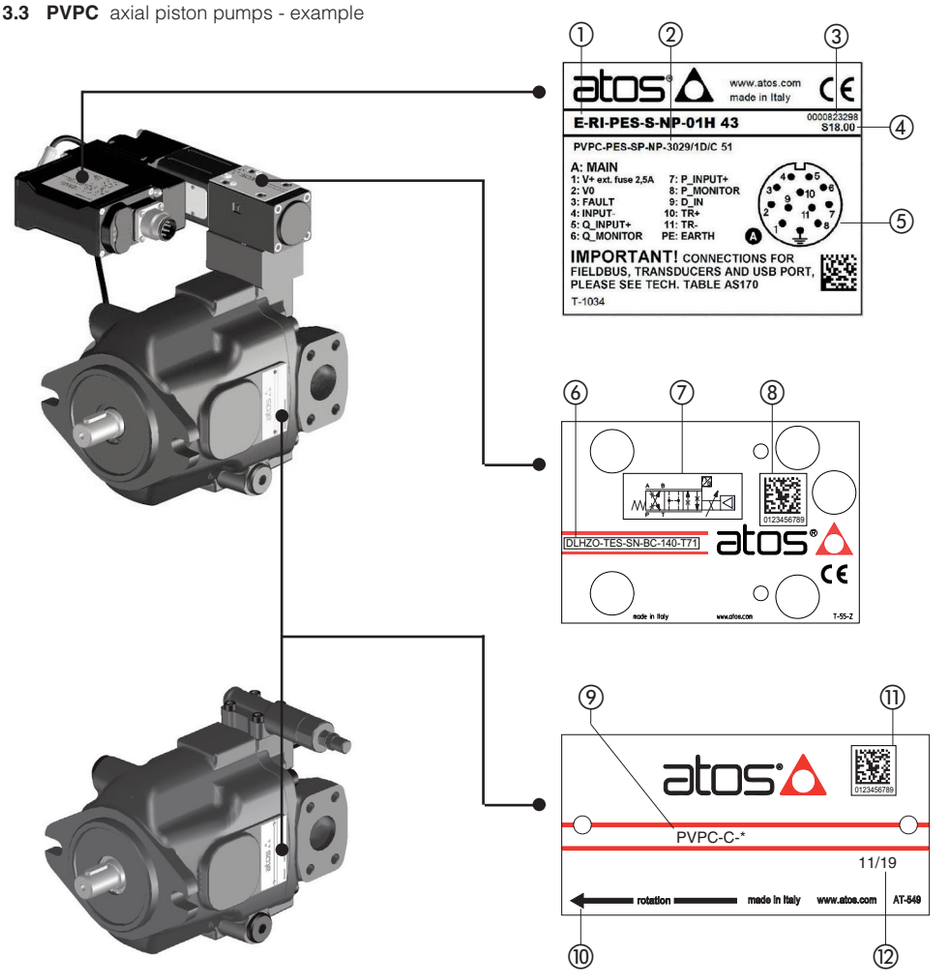
① Pump code
② Pump shaft rotation direction
③ Pump serial number
④ Delivery date

3.2 **PFR** radial piston pumps - example



① Pump code
② Pump serial number
③ Delivery date

3.3 **PVPC** axial piston pumps - example



① Digital driver code
② Pump code
③ Digital driver serial number
④ Digital driver factory firmware version
⑤ Connectors pinout

⑥ Pilot valve code
⑦ Hydraulic symbol (simplified)
⑧ Pilot valve serial number

⑨ Pump code
⑩ Pump shaft rotation direction
⑪ Pump serial number
⑫ Delivery date

4 SAFETY NOTES

4.1 Intended use

Atos pumps are intended for integration in industrial systems and machines or for the assembly with other components to form a machine or a system.
They may only be operated under the operating condition described in the relevant technical table.

Pumps must be used observing following prescriptions:

- complying with the application and environmental conditions according to the relevat technical tables
- complying with operating conditions and performance limits specified in the relevant technical tables
- use in the original condition, without damage

4.2 Improper use

Any improper use of the pumps is not admissible.
Improper use of the product includes:

- use in explosive environments
- incorrect storage
- incorrect transport
- lack of cleanliness during storage and assembly
- incorrect installation
- use of inappropriate or non-admissible fluids
- operation outside the specified performance limits
- operation outside the approved temperature range

Atos spa does not assume any liability for damage caused by improper use.
The user assumes all risks involved with improper use.

4.3 Installation

Installation must be performed following the recommendations contained in the relevant technical tables and in section 5 of this document.

WARNING: hot surface
The pumps may heats up during operation.
Allow the pump to cool down sufficiently before touching it.
During operation, touch the valve solenoid only by using protective gloves.
Please also observe ISO 13732-1 and EN 982.

CAUTION
Use of the pumps outside the approved temperature range may lead to functional failures like overheating and seizure.
Only use the valve within the specified fluid temperature range.

CAUTION: penetrating water and humidity - for PVPC pumps with proportional controls
In case of use in humid or wet environments, water or humidity may penetrate at electrical connectors or into the valve electronics.
This may lead to malfunctions at the pump and to unexpected movements in the hydraulic system which may result in personal injury and damage to property:

- only use the pumps within the intended IP protection class
- ensure that all seals and caps of the plug-in connections are tight and intact

NOTICE: impact
Impact or shock may damage the pumps. Never use the pump as step.

NOTICE: dirt and foreign particles
Penetrating dirt and foreign particles lead to wear, malfunction and seizure
During assembly, be careful to prevent foreign particles such as metal chips getting into the pump or into the hydraulic system
Do not use linting fabric for cleaning, it may release contamination.

Environmental protection
Hydraulic fluids are harmful to the environment.
Leaking hydraulic fluid may leads to environmental pollution.
In case of fluid leakage immediately act to contain the problem.
Dispose of the hydraulic fluid in accordance with the currently applicable national regulations in your country.

Atos components do not contain substances hazardous for the environment.
The materials contained in Atos components are mainly: Copper, Steel, Aluminium, Electronic components, Rubber
Due to the high content of reusable metals, the main components of Atos can be completely recycled after disassembling of the relevant parts.

5 HYDRAULIC AND MECHANIC INSTALLATION

General:

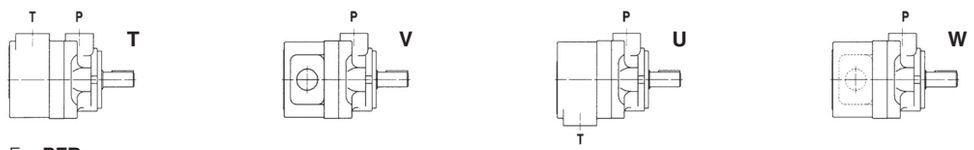
- Before start up make sure that the pump is always filled with the working fluid.
- The pump must never be operated with "OUT" port closed; in order to limit the maximum working pressure a relief valve must be installed on the pressure line.
- Make sure that the maximum working conditions shown in relevant technical tables are not exceed

5.1 Installation position and port orientation

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

- For **PFE:**

the pump can operate in any position, the available orientation of the oil ports is according to the below pictures. In the ordering code must be specified the selected orientation.



- For **PFR:**

- The pumps can be installed in horizontal or in vertical position. In case of vertical position it is advisable to install on the outlet pipe a proper valve for air bleeding (consult our technical dept.).
- These pumps are not self-priming therefore their installation under oil level is recommended. Installation above oil level requires foot valve on inlet line and pump central point located no more than 150 mm above minimum oil level.
- The shaft of the pump has an eccentric cam which rotates with the shaft generating the stroke of the pistons and thus generating the flow rate. For best functioning a balanced coupling should be provided between the shaft of the motor and the shaft of the pump.

- For **PVPC:**

- 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 performed by means of proper elastic coupling.

5.2 Shaft loads

PFE, PFR: axial and radial loads acting on shaft are not permitted.
PVPC: 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.
The coupling alignment between the motor and pump shaft must ensured

5.3 Shaft rotation

The direction of shaft rotation (D = clockwise, S = counterclockwaise, viewed from the shaft end) must be the same of the arrow on the nameplate.

5.4 Oil level

Make sure that the pump is always filled with flui. The installer / end user has to provide a level meter to verify the presence of fluid inside the power unit tank.

5.5 Important notes

- A pressure relief valve must be installed on the pressure line near the pump outlet port.
- The piping have to be sized according to the max pressure and max flow rate
- 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 pump IN/OUT ports when connecting the pipes
- Ensure that the pump installation allows an easy acces for maintenance purpose

5.6 Hydraulic fluids and operating viscosity range

Mineral oils type HLP having high viscosity index are recommended.
The hydraulic fluids must be compatible with the selected seals.
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.

Note: for PVPC 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: 10 mm^2/s for short periods at max fluid temperature on drain line
24 to 100 mm^2/s during normal operation
1000 mm^2/s for short periods at cold start-up (800 mm^2/s for PVPC)

Hydraulic fluid	Suitable seals type	Classification	Ref. Standard
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

Fluid viscosity: 15 ÷ 100 mm^2/s - max allowed range 2,8 ÷ 500 mm^2/s

CAUTION: easily inflammable hydraulic fluid
In connection with fire or other hot sources, leaking hydraulic fluid may lead to fire or explosions.

5.7 Filtration

The correct fluid filtration ensures a long service life of the pumps and it prevent anomalous wearing or sticking.
Contamination in the hydraulic fluid may cause functional failures e.g. loss of efficiency and increased noise level.
In the worst case, this may result in heavy damages and breakages.
Ensure adequate hydraulic fluid cleanliness according to the cleanliness classes of the pumps over the entire operating range.

Max fluid contamination level:

- normal operation: **PFE, PFR** = ISO4406 class 21/19/16 NAS1638 class 10; **PVPC** = ISO4406 class 20/18/15 NAS1638 class 9
- longer life: **PFE, PFR** = ISO4406 class 19/17/14 NAS1638 class 8; **PVPC** = ISO4406 class 18/16/13 NAS1638 class 7

Note: see also filter section at www.atos.com or KTF catalog

6 MAINTENANCE

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

6.1 Ordinary Maintenance

Service work perfomed on the valve by end user or not qualified personnel invalidates the certification

- 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
- The pump does not require other maintenance operations except for front shaft seal, and vane cartridge (for PFE)

6.2 Repairing

In case of incorrect functioning or beak-down it is recommended to send the valve back to Atos or to Atos authorized service centers which will provide for the reparation.
Unauthorized opening of the valves during the warranty period invalidates the warranty.

6.3 Transport

Observe the following guidelines for transportation of pumps:

- 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 in the rilevant technical table

WARNING
The valve may fall down and cause damage and injuries, if transported improperly.
Use personal protective equipment, such as: gloves, working shoes, safety goggles, working clothes, etc.

6.4 Storage

Valves are boxed using a VpCi protective packing system, offering best protection to oxidation during components sea transport or long storage in humid environments.
PFE and PFR surface is protected with zinc coating whish guarantees a corrosion resistance over 200h in salt spry test.
PVPC corrosion protection is achieved with surface painting.
Additionally all pumps are tested with mineral oil OSO 46; the oil film left after testing ensure the internal corrosion protection.

For the pumps transporting and storing always observe the environmental conditions specified in the relevant technical tables.
Improper storage may damage the product.

The pumps can be stored for up to 12 months under the following conditions:

- If there is no specific information in the components technical tables, comply with a storage temperature of –20 °C to +50 °C
- Do not store the pumps outdoors
- Protect the pumps against water and humidity in case of storage in open air
- Store the pumps in the shelf or on a pallet
- Store the pumps in the original packaging or comparable packaging in order to protect them from dust and dirt
- Remove the plastic covers from the valves mounting surface only before the assembly

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

Table **AX900-1/E**

Operating and maintenance information for ex-proof pumps

fixed and variable displacement

This operating and maintenance information apply to ATOS ex-proof pumps and is intended to provide useful guidelines to avoid risks when the pumps are installed in a system.
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, trouble-free operation and thus reduced repairing costs.
Information and notes on the transport and storage of the pumps are also provided.

1 SYMBOLS CONVENTIONS

This symbol refers to possible dangers which can cause serious injuries

2 GENERAL NOTES

The operating and maintenance information are part of the operating instructions for the complete machine but thay cannot replace them

This document is relevant to the installation, use and maintenance of ex-proof fixed displacement vane pumps and ex-proof variable displacement piston pumps for application in explosive hazardous environments.

2.1 Warranty

All the hydraulic pumps have 1 year warranty; the expiration of warranty results from the following operations:
- Unauthorized mechanical interventions
- The hydraulic pumps are not used exclusively for their intended porpose as defined in these operating and maintenance information
- Respect the working limits indicated on nameplate and on technical tables: AX010 for PFEA and AX050 for PVPCA

3 CERTIFICATIONS AND PROTECTION MODE

The ex-proof pumps subject of this operating and maintenance information are certified ATEX and EAC
They are in compliance with following protection mode:

II 2/2 G Ex h IIC T5 Gb **II 2/2 D Ex h IIIC T100°C Db**

4 HARMONIZED STANDARDS

The Essential Health and Safety Requirements are assured by compliance to the following standards:

EN ISO 80079-36 Explosive atmospheres – Part 36: Non-electrical equipment for explosive atmospheres – Basic method and requirements
EN ISO 80079-37 Explosive atmospheres – Part 37: Non-electrical equipment for explosive atmospheres – Non electrical type of protection constructional safety “c”, control of ignition source “b”, liquid immersion “k”

The pumps may exclusively be used in areas and zones assigned to the equipments group and category. See section 6 for zones in relation to equipment groups and category.

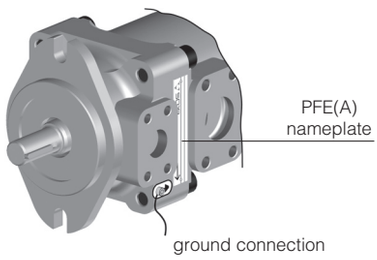
Check the code in the nameplate to ensure that the pump is suitable for the installation area.

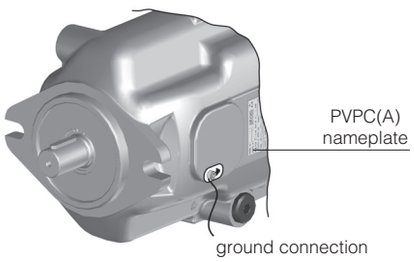
5 WORKING CONDITIONS

Pumps type		**PFEA**		**PVPCA**	
Pumps version		**STD, /PE**	**/7 /PE**	**STD, /PE**	**/7 /PE**
Ambient temperature	[°C]	-20 ÷ +60	-20÷+70	-20 ÷ +60	-20÷+70
Max inlet fluid temperature	[°C]	+60	+80	+60	+80
Protection degree		IP 66			
Max working pressure (1)		**PFEA*-*1**: from 160 to 210 bar, **PFEA*-*2**: from 210 to 300 bar		280 bar for size 29, 46, 73 250 bar for size 90	
Recommended pressure at inlet port		**PFEA*-*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 **PFEA*-*2**: from 0 to +1,5 bar		from -0,2 to +24 bar	
Speed range (1)	[rpm]	from 800 to 2800 rpm, depending to the size		from 600 to 3000 rpm, depending to the size	

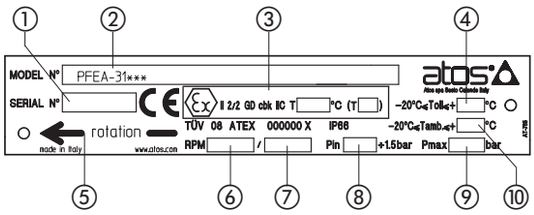
(1) Max working pressure and speed range must be reduced for HFDU, HFDR and HFC fluids, see tab. **AX10** for PFEA and **AX050** for PVPCA-*

5 NAMEPLATES

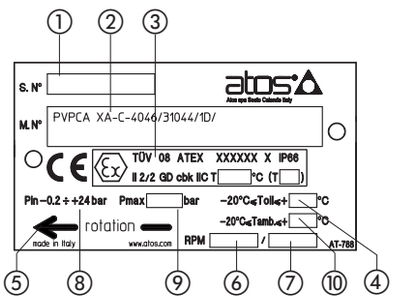




Nameplate for PFEA



Nameplate for PVPCA



Description

① Serial number
② Pump code
③ Marking according to ATEX
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 Mimimun inlet pressure (PFEA), range inlet pressure (PVPCA)
⑨ Maximum working pressure
⑩ Maximum ambient temperature
⑪ Delivery date

Ex II 2/2G Ex h IIC T(*) Gb or **Ex II 2/2D Ex h IIIC T(**)°C Db**

Ex = Equipment for explosive atmospheres
II = Group II for surfaces plants
2/2 = Pump category
G or **D** = **G** for gas and vapours, **D** for dust
h = Marking includes one on more of the following types of protection (“c”, “b”, “k”)
IIC = Gas group (acetylene, hydrogen)
IIIC = Conduictive dust
T* = Temperature class (T6, T5, T4)
T°C** = Max surface temperature (85, 100, 135)

6 EQUIPMENT GROUP, CATEGORY AND INSTALLATION ZONE

The user must define the overall areas of the system into different explosive atmospheres zones in accordance with directive 99/92/CE.
The table below shows the available installation zones related to the equipment group and category.

Equipment group	Category	Application, properties	Zone
II	2/2G	Potentially explosive atmospheres, in which explosive gases, mists or vapors are likely to occur occasionally. **High level of protection**	1, 2
II	2/2D	Potentially explosive atmospheres, in which explosive dust/air mixtures are likely to occur occasionally. **High level of protection**	21, 22

PUMP VERSION	Equipment group	Category	Gas and Dust group	Temperature class	Zone
PFEA and PVPCA	II	2/2G and 2/2D	IIC and IIIC	PFEA T6 (T85°C), PVPCA T5 (T100°C)	1, 2, 21, 22
PFEA* /7 /PE and PVPCA* /7 /PE	II	2/2G and 2/2D	IIC and IIIC	PFEA* T5 (T100°C), PVPCA* T4 (T135°C)	1, 2, 21, 22

7 SAFETY NOTES

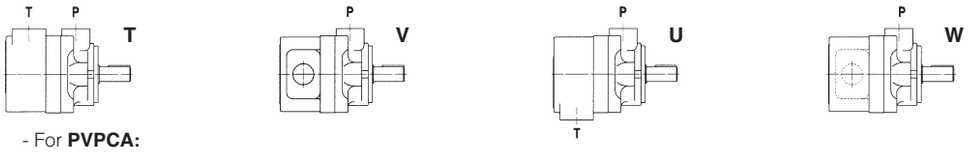
- General:

- Before start up make sure that the 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 5 are not exceeded

7.1 Installation position and port orientation

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

- For **PFEA:** the pump can operate in any position, the available orientation of the oil ports is according to the below picture. In the ordering code must be specified the selected orientation.



- For **PVPCA:**
  - 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

PFEA: axial and radial loads acting on shaft are not permitted.
PVPCA: axial and radial loads acting on shaft are permitted, max permissible loads are indicated in the table AX050, section 2 .
The coupling with the electric motor must be sized to absorb the power peaks.
The coupling alignment between the motor and pump shaft must ensured

7.3 Shaft rotation

The direction of shaft rotation (D = clockwise, S = counterclockwaise, viewed from the shaft end) must be the same of the arrow on the nameplate.

7.4 Oil level and temperature

Make sure that the pump is always filled with flui. The installer / end user has to provide a level meter to verify the presence of fluid inside the tank.

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, near the pump’s suction flange.
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
- 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 99/92/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 drive 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 and certified according to ATEX 2014/34/EU
- Pumps PVPCA with control devices type LW are equipped with a device to achieve a constant power, factory set at a specific power value required by customer

Ground connection

Grounding nameplate

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.
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.
Note: for PVPCA 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
- 24 to 100 mm²/sduring normal operation
- 1000 mm²/s for short period at cold start-up (800 mm2/sec for PVPCA)

7.7 Filtration

The correct fluid filtration ensures a long service life of the pumps and it prevent anomalous wearing or sticking.
Contamination in the hydraulic fluid may cause functional failures e.g. loss of efficiency and increased noise level.
In the worst case, this may result in heavy damages and breakages.
Ensure adequate hydraulic fluid cleanliness according to the cleanliness classes of the pumps over the entire operating range.

Max fluid contamination level:
- normal operation: **PFEA** = ISO4406 class 21/19/16 NAS1638 class 10; **PVPCA** = ISO4406 class 20/18/15 NAS1638 class 9
- longer life: **PFEA** = ISO4406 class 19/17/14 NAS1638 class 8; **PVPCA** = ISO4406 class 18/16/13 NAS1638 class 7

Note: see also filter section at www.atos.com or KTF catalog

8 MAINTENANCE

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

8.1 Ordinary Maintenance

- Service work perfomed on the valve by end user or not qualified personnel invalidates the certification
- 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
- The pump does not require other maintenance operations except for bearing and front shaft seal, according to the following schedule:
  PFEA must be replaced after reaching **20000 working hours**
  PVPCA without radial loads must be replaced after reaching **20000 working hours**

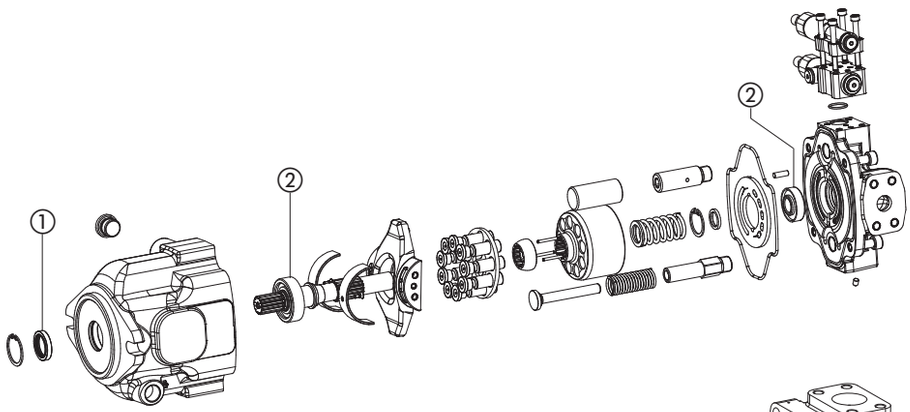
In presence of radial loads (permitted only for PVPCA) the following maintenance schedule must be considerated:

PVPCA-3029 must be replaced after reaching **1550 working hours**
PVPCA-4046 must be replaced after reaching **2600 working hours**
PVPCA-5073 must be replaced after reaching **5000 working hours**
PVPCA-5090 must be replaced after reaching **5000 working hours**

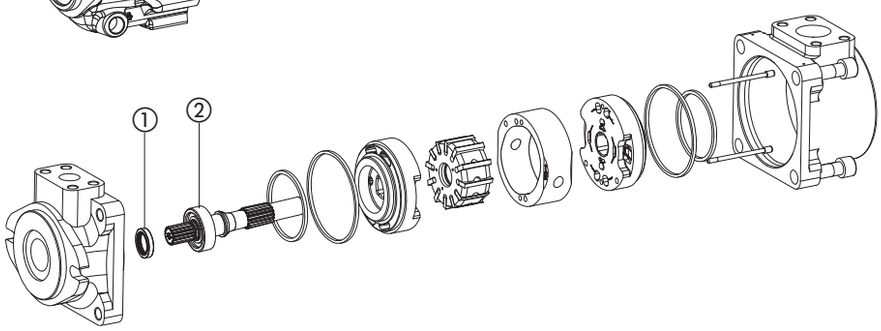
- When mounting bearings and front seal, observe the correct position as indicated in the drawing below: any incorrect positioning can result in oil leakages
- Results of maintenance and inspection must be planned and documented
- Follow the maintenance instructions of the fluid manufacturer

① Front seal
② Bearings

PVPCA



PFEA



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

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 in the rilevant technical tables AX010 and AX050

9.2 Storage

PFEA corrosion protection is achieved with zinc phosphating: this treatment protect the pump to grant a storage period up to 12 months.
PVPCA corrosion protection is achieved with trasparent 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.

Ensure that pumps are well protected against water and humidity in case of a storage in the open air.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