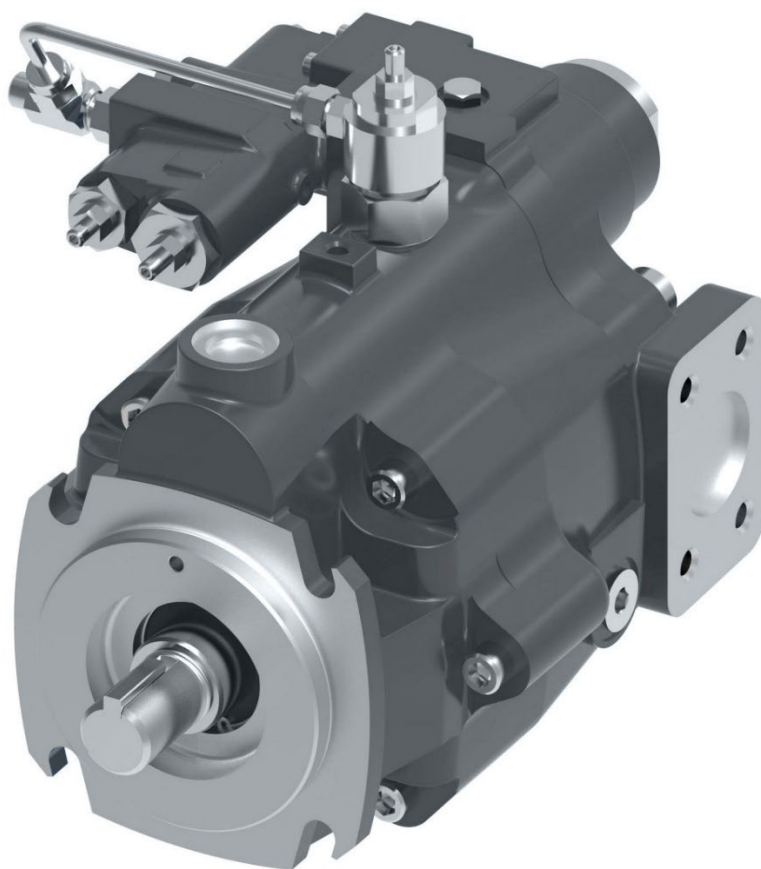


Vickers® by Danfoss **PVM Piston Pump ATEX User Guide**

ATEX / UKEX Certified
PVM Code A & B, 18 – 141 cc



ATEX Directive 2014/34/EU

UKEX SI 2016 No. 1107

CE  II 2G Ex h IIC T4-T1 Gb X

UK  II 2G Ex h IIC T4-T1 Gb X





Revision History

Table of Revisions

Date	Changed	Rev
Feb 2024	First edition	0101
Jul 2024	Certification level changed from Zone 2 to Zone 1, minor changes in viscosity/temp. ratings, Added warnings regarding shaft seal lub. & case pressure, New nameplate & marking	0102

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Introduction

General Information

Purpose of this Document

This User Manual has been prepared by the manufacturer in order to provide important information regarding the safe installation, operation and maintenance of ATEX / UKEX certified pumps. The items set out within this document are mandatory unless stated otherwise.

This User Manual is a supplement to existing product instruction as ATEX / UKEX components are subjected to some limitations compared to standard components. The limitations are described in this instruction. Items or limitations within this document override any contradictory information which may be found in the product catalog.

It is intended for machine/system manufacturers, fitters and service technicians. Please read this User Manual carefully before you work with and start-up the pumps.

This User Manual must be stored in close proximity to the pumps.

Product Description

PVM pumps are a range of variable displacement, high power open circuit pumps designed for industrial applications. They feature a swashplate design with a maximum continuous working pressure of 315 or 230 bar. They can be supplied in "higher speed" or "quiet" versions.

Manufacturer Responsibility

The manufacturer declines any responsibility in case of:

- Use of the product not according to safety regulations and legislation valid in the user's country.
- Use of the product in operating conditions not allowed according to the product technical information.
- Improper installation: the instructions given in this User Manual are not followed or not properly followed.
- Hydraulic system problems.
- Modification of the product.
- Operations executed by personnel not properly trained or not assigned to such a kind of operations.

Product Safety

The safety of the product depends upon the strict observation of the indications given in this User Manual: in particular, it is necessary to:

- Always operate within allowed product working operating conditions (please refer to the Technical Information of the pumps in usage).
- Always perform an accurate ordinary maintenance activity.
- Assign the inspection activity as well as maintenance activity to duly trained personnel.
- Only use original spares.
- Always use the product according to the indications you find in this manual.

Intended Use

Hydraulic pumps convert mechanical energy (torque and speed) into hydraulic energy (pressure, oil flow). PVM pumps are designed for industrial applications.

The pumps fulfill the explosion requirements of the Directive 2014/34/EU and UKEX SI 2016 No. 1107 for the category shown on the name plate within the limiting conditions mentioned within this user manual or product catalog/ technical information.

PVM pumps have an identifying name plate. The name plate provides essential information and specification for correct and safe use.

This identifying plate has to be maintained so that the data can be clearly read; consequently, a periodic cleaning of the plate is required. If the nameplate or other labels need to be removed for maintenance or service, they need to be reinstalled before the pump is being recommissioned.

Marking of Vickers by Danfoss PVM Pumps

The PVM hydraulic pumps are marked as equipment for Group II, category 2 for gas environment and with ignition protection **constructional safety** and **liquid immersion**.

Temperature class/Maximum surface temperature depends on the operating conditions (ambient and fluid temperature) as well as application duty cycles.

Marking	For model code option
Ex II 2G Ex h IIC T4-T1 Gb X	G (see Table 1 , page 7 for requirements)

For detailed information on selecting the appropriate T-Codes as well as fluid viscosity and temperature requirements, please see Chapter "[T-Codes and Maximum Surface Temperature](#)" on page 7.

X-Marking: Special Conditions to Use

The unit's ATEX / UKEX certificate is only valid if the operation limits, warnings and guidelines stated within this manual are followed by the customer. Fluid type, viscosity, cleanliness and temperatures as per chapter "X-Conditions (1): Technical Information" must therefore be adhered to.

The installation and system conditions stated in chapter "X-Conditions (2): Installation, Commissioning and General Operation of ATEX / UKEX PVM Pumps" must be maintained.

Pump Label and EX Code

The production location is shown on the pump label as pictured below. The date of the pumps is not shown on the pump label; however it can be determined by contacting Danfoss and providing the serial number.

The ATEX certification of the units are done under the scope of:

"Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres."

And UKEX Statutory Instruments:

"2016 No. 1107 HEALTH AND SAFETY The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016"

With following parameters:

- Equipment group: II, non-mining equipment
- Equipment Category: 2G
- Temperature class: T4...T1
- Gas Group: IIC
- Equipment protection level (EPL): Gb
- Resulting Zone: 1 (Gas Environment)

The Conformity Assessment Procedure must be executed according to:

- /1/ Directive 2014/34/EU, annex VIII, Modul A: Internal Production Control (see article 13, section 1 (b)(ii))
- /2/ UKEX SI 2016 No. 1107 Schedule 3A, Part 6: Internal Production control (see Part 3, article 39 (1)(b)(ii))

The EU declaration of conformity has to be prepared and issued with regard to annex X of /1/. The "Essential Health and Safety Requirements" defined by /1/, annex II, have to be considered.

The UK declaration of conformity has to be prepared and issued with regard to schedule 6 of /2/. The "Essential Health and Safety Requirements" defined by /2/, schedule 1, have to be considered.

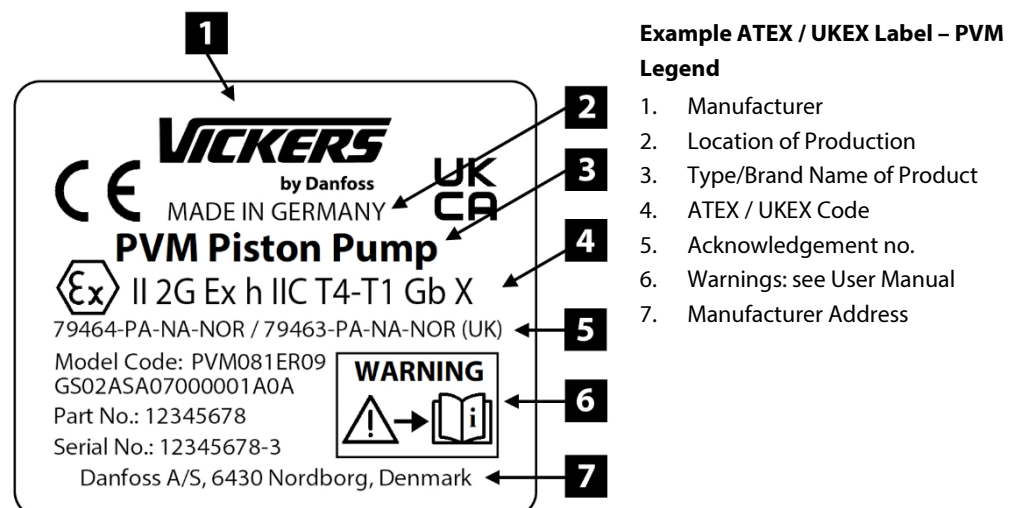
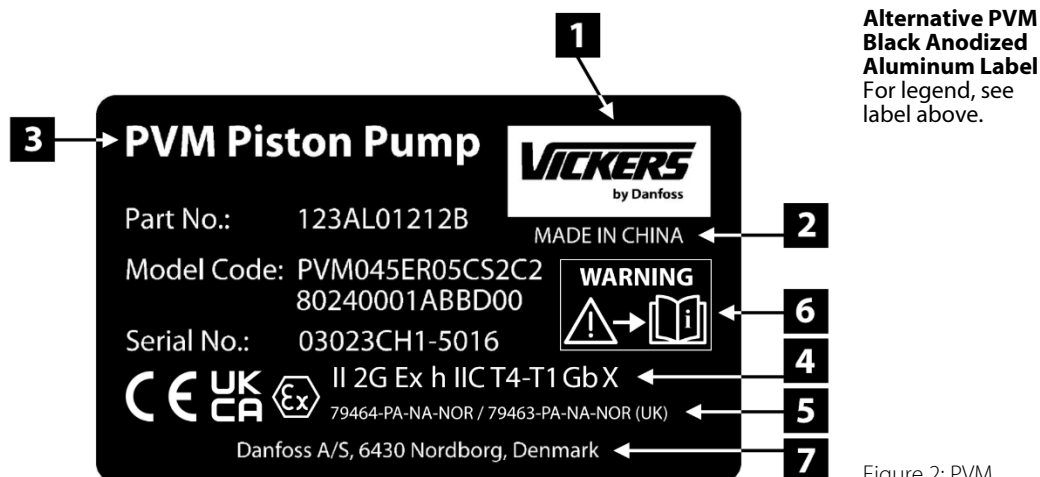


Figure 1: PVM Sticker Label Example



Anodized Aluminum Label Example

Figure 2: PVM

Warning

Ignition Risk of Explosive Gas Atmospheres or Flammable Dust due to sparks generated by single impacts!

Avoid impact on the aluminum nameplate material to eliminate thermite sparks

Warning

PVM Plastic sticker labels are protected by a UV- and chemically resistant protective laminate. However, it shall not be permanently exposed to UV light to ensure long life and ensure label readability throughout the unit lifetime. If the label has been damaged beyond readability, reach out to Danfoss support.

Some additives and fluids might be able to degrade the label adhesive or plastic. Keep the label clean from hydraulic fluid and other aggressive chemicals.

X-Conditions (1): Technical Information

ATEX / UKEX Technical Specifications

The technical specifications in this chapter are supplemental for ATEX / UKEX systems only. For comprehensive technical specifications, including maximum pressure rating, maximum flow, etc. please refer to the standard PVM Technical Information and Technical Catalog documents.

Danfoss does not claim responsibility for the use of the pumps in operating conditions not allowed according to the information shown in this document and the standard PVM Technical Information documents.

Painting or coating can be an electric insulator if a thickness greater than 200 µm is applied. The thickness of the painting of original DPS paint is less than 200 µm. If the customer chooses to add an additional layer of paint, the total layer thickness cannot exceed 200 µm.

The pumps are approved only for correct and proper use in accordance with their designated purpose, in standard industrial atmospheres. Contravention of such conditions voids any warranty claims and any responsibility on the part of the manufacturer.

T-Codes and Maximum Surface Temperature

Gaseous Environment (G)

Table 1: Temperature Classes at Maximum Ambient and Oil Temperatures

Maximum Inlet Oil Temperature (max. 30 cm from Inlet)	Max. Ambient Temperature	
	≤ 40 °C ≤ 104 °F	≤ 60 °C ≤ 140 °F
≤ 20 °C [68 °F]	T4	T4
≤ 40 °C [104 °F]	T4	T4
≤ 60 °C [140 °F]	T4	T4
≤ 80 °C [176 °F]	T4	T3

Table 2: T-Codes with respective Maximum Surface Temperature

T-Code / Temperature Class	Maximum Surface Temperature	
	°C	°F
T3	200	392
T4	135	275

To ensure that the surface temperature will not exceed the allowed value according to the used temperature class, it is recommended (but not required) to attach a suitable temperature sensor to the pumps in the shown area on one of the top surfaces on either left or right side of the pumps.

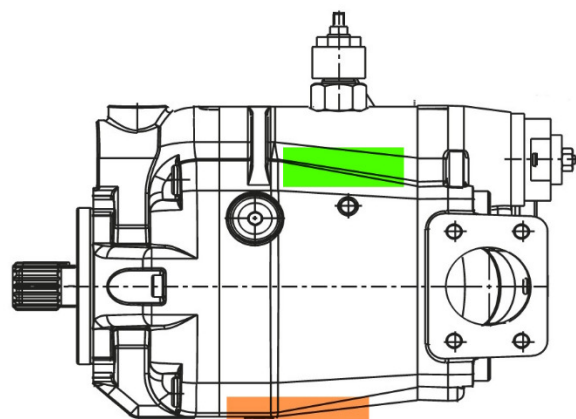


Figure 3: Recommended location to attach temperature sensor; green top area preferred.

Oil Types / Operating Fluids

In a hydraulic system the most important task of the oil is to transfer energy. At the same time the oil must lubricate moving parts in hydraulic components, protect them from corrosion, and transport dirt particles and heat out of the system. To ensure that hydraulic components operate without problems and have long operating life, it is therefore vital to select the correct oil type with the necessary additives.

Ratings and performance data are based on operating with hydraulic fluids containing oxidation, rust and foam inhibitors. These fluids must possess good thermal and hydrolytic stability to prevent wear, erosion and corrosion of pump components. For general guidance on fluid options, consult the catalogs or a Danfoss representative.

Warning

It is compulsory to use oils whose inflammable degree is at least 50K above the maximum surface temperature of the pump. Maximum surface temperature for Group IIG can be found under [Table 2: T-Codes with respective Maximum Surface Temperature on page 7](#).

Fluid Viscosity and Temperature for ATEX / UKEX PVM Pumps

Table 3: Fluid Viscosity and Temperature Rating of PVM ATEX / UKEX Units

Features		Data
Viscosity	Minimum Intermittent ¹⁾	10 mm ² /s [59 SUS]
	Recommended Range	16 – 40 mm ² /s [83 – 187 SUS]
	Maximum (Cold Start) ²⁾	1000 mm ² /s [4550 SUS]
Inlet Temperature	Minimum (Cold Start) ²⁾	-28 °C [-18 °F]
	Maximum Rated	80 °C [176 °F]
	Maximum Intermittent ¹⁾	104 °C [219 °F]
Case Drain Temperature	Maximum Rated	94 °C [201 °F] ³⁾
	Maximum Intermittent ¹⁾	110 °C [230 °F] ³⁾

¹⁾ Intermittent = Short term t < 3 min per incident.

²⁾ Cold start = Short term t < 3 min; p ≥ 50 bar; n ≤ 1000 min⁻¹ (rpm); please contact Danfoss Power Solutions especially when the temperature is below -25 °C [-13 °F].

³⁾ Must not be exceeded locally either (e.g. in the bearing area) . The temperature in the bearing area is (depending on pressure and speed) up to 5 °C [41 °F] higher than the average case drain temperature.

Above maximum surface temperatures are without any deposited dust on the product. The possible insulation effect of a dust layer on the surface has to be taken into account by the safety margin to the minimum ignition temperature of the dust concerned. For up to 5 mm [1.97 in] layer thickness the safety margin is 75 °C [167 °F]. For further information please see IEC 60079-14.

Warning

The above operating temperatures (ambient and oil) of the pump must be guaranteed by the end user.

Ambient Temperature

Maximum ambient temperature depends on the requested protection class needed. Refer to [Table 1: Temperature Classes at Maximum Ambient and Oil Temperatures](#) on page 7.

In general, the ambient temperature should lie between -25° C [-13° F] and +60° C [140 °F] to ensure that the shaft seal retains its sealing capacity.

Oil Temperature

Maximum oil temperature depends on the requested protection class needed. Refer to [Table 1: Temperature Classes at Maximum Ambient and Oil Temperatures](#) on page 7.

Under normal operating conditions it is recommended to keep the temperature in the range of 30 °C [86 °F] to 60 °C [140 °F] to achieve the expected unit lifetime

Viscosity

Maintain fluid viscosity within the recommended range for maximum efficiency and bearing life.

Minimum viscosity should only occur during brief occasions of maximum ambient temperature and severe duty cycle operation. Maximum viscosity should only occur at cold start. Limit speeds until the system warms up.

See [Table 3: Fluid Viscosity and Temperature Rating of PVM ATEX / UKEX Units](#) on page 8 for viscosity rating and limitations.

We recommend the use of an oil type having a viscosity of 16 – 40 mm²/s [83 – 187 SUS] at the actual operating temperature.

Filtering

It is necessary to keep the level of oil contamination at an acceptable level to ensure problem-free operation. The recommended maximum level of contamination in systems in the hydraulic pumps is 20/18/13 (ISO 4406-1999). Further information can be found in the pump's technical catalog.

Installation, Operation and Maintenance

X-Conditions (2): Installation, Commissioning and General Operation of ATEX / UKEX PVM Pumps

When assembling the pump in the machine/system it is the builder's responsibility that the parts used conform to the ATEX directive or UKEX statutory instruments and that the components are assembled and running according to the operational data/design found in product data sheets and instructions.

Only use the pump as required by the explosion protection shown on the name plate.

Always ensure that the following is maintained:

- The ambient conditions specified in this manual are maintained.
 - The pump may only be operated with the housing fully mounted, filled with fluid, unopened and in an undamaged condition. Dry run is prohibited after supervised initial priming.
 - The pump must be installed per specific orientation as specified within the pump catalog. The pump shall be mounted in such a way, so that the case drain port is on the uppermost position of the pump.
 - The supporting frame, chassis, or structure of equipment containing the pump shall be constructed of electrically conducting material and shall be so arranged as to provide a leakage path to earth (ground) for any static electricity which occurs on the pump.
- If this is not possible, a grounding wire needs to be attached to the pump housing. Consult Danfoss for recommendations on connection placement.
- The pump is approved for operation with the selected hydraulic fluid.
 - It is compulsory to use oils whose inflammable degree is at least 50K above the maximum surface temperature of the pump according to the temperature classification (T4, T3...).
 - All types of accessories installed on the pump are ATEX / UKEX specified and have been installed in accordance with ATEX / UKEX requirements.
 - There are no creeping metal elements external to the pump.
 - There are no plastic parts that might accumulate electrostatic; or they are shielded.
 - The **inlet** and **case drain oil** and **ambient temperature** is **monitored** in close proximity to the pump to not exceed the maximum permissible for the category and temperature class of the associated zone. The sensors shall have an accuracy of at least ± 1 K. The system must automatically shut down within 30 seconds if the case drain oil temperature or inlet temperatures exceed the limits stated within this manual. Case drain temperatures must be measured max. 30 cm from the case drain port with no additional fluid sources that might impact the temperature measurement.
 - The pump may only be operated when **fully primed and filled with oil**. An active oil level alarm shall be used. The system should safely shut down within 30 seconds after the event of a low oil alarm. The minimum oil level shall be sufficient to ensure proper function and lubrication of the unit.
 - To avoid excessive heating of the shaft seal, the **case pressure** shall never exceed the limits stated in the catalog. Appropriate measures shall be taken to ensure this.
 - The pump must be protected against overloading and over-speeding using suitable measures. This includes the installation of pressure-relief valves to prevent the pump from exceeding the maximum allowable pressures as given by the catalog.
 - For applications where running the pump for extended periods (>3 min) at "high-pressure – low flow" (e.g. pressure compensated stand-by) conditions cannot be avoided, it is highly recommended to install case flushing. Consult Danfoss representative for advice.
 - For units with double shaft seal (code AB), the system operator must ensure that the outer shaft seal has sufficient presence of lubricant or is protected by one of the means stated in ISO 80079-37 clause 5.3.3.
 - Operational checks of the ignition protection devices must be performed according to "Operational Checks for Operation in Explosive Atmospheres", page 12. If sensors/devices that are part of the ignition protection fail, the system shall shut down within 60 seconds. A single fault occurring in the ignition protection system shall not lead to loss of the protection system safety function (fail-safe).

Manufacture the assembly flange on the machine/system where the pump has to be installed: the relevant surface has to be perfectly smooth, completely de-greased and non-deforming. Coupling and protection elements shall meet the material requirements relevant to the respective ATEX / UKEX requirements (e.g. avoiding magnesium, titanium, zirconium). Impacts can damage the pump or create sparks. Especially avoid impacts on shaft, coupling, seals and sensitively installed parts.

It is necessary to verify the perfect alignment between the prime mover (e.g. engine/ e-motor) output shaft and the pump – the fitment between pump shaft and prime mover shaft must be executed so that no radial or axial pre-load is generated – these extra loads reduce the bearings expected lifetime and can increase heat generation.

Start-Up Procedure

The purpose of this section is to indicate the necessary procedures to perform the pump start-up.

Pre-Start-Up Controls for PVM Pump

Before performing the first pump start up, the following points have to be checked.

Hydraulic components must be installed in accordance with their individual instruction.

1. To avoid contamination, plastic plugs in connection ports must not be removed until just before connections are made. All inlet connections must be tight to prevent air leaks.
2. Select the hydraulic fluid as specified in the product catalog.
3. Make sure the reservoir and circuit are clean and free of dirt/debris prior to filling with hydraulic fluid. Fill the reservoir with filtered oil to a sufficient level to prevent vortexing at suction connection to pump inlet. (It is good practice to clean the system by flushing and filtering using an external pump prior to first start-up)
4. Make sure the pumps hydraulic connections allow the pumps to rotate in the desired direction. For pumps with direction of rotation:

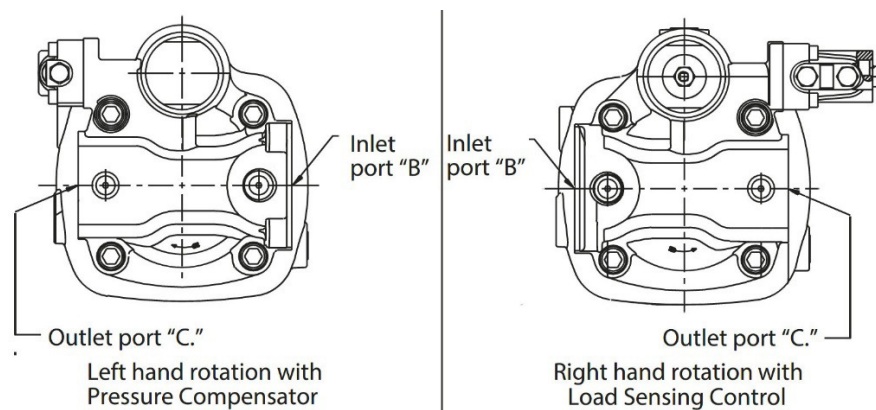


Figure 4: PVM (side-ported) Back View, Port Configuration LH/RH

Generic illustration shown (here PVM131/141 side-ported)

5. Ensure full contact between pump mounting flange and prime mover.

Avoid pressing the pumps into place by tightening the fixing bolts. Avoid unsuitable seal materials, for example, twine and Teflon, on threaded unions. Use only the seals supplied, such as O-rings, steel washers.

6. Make sure that all couplings are completely tightened to prevent leakage.
Do not use more torque than the maximum values given in the instructions.
7. Before the pump is started, **fill the case through the uppermost drain port with hydraulic fluid** of the type to be used. The case drain line must be connected directly to the reservoir and must terminate below the oil level.
8. Check to make sure the purity of the oil is greater than 20/18/13 (ISO 4406-1999) and always use a filter when replenishing the system.

⚠ Warning

Ignition Risk of Explosive Gas Atmospheres or Flammable Dust due to Hot Surface

Running the pump dry (without filling/ properly bleeding air from the housing) will cause overheating of the shaft seal surface due to missing lubrication and cooling as well as permanent damage of the pump internal components. This can lead to overheating and ignite explosive atmospheres. Severe injuries due to explosion pressure and fire can follow.

- Always ensure that housing and inlet/outlet lines are filled before operation.
- Make sure that in the case of “over tank installation” or any installation orientation with “shaft up” (e.g. vertical) the shaft seal area is always filled with fluid and there are no air inclusions.
- Always connect the uppermost drain port as leakage path.
- Do not exceed the maximum case pressure or maximum case drain temperature stated within this manual.
- Confirm that the fluid is compatible with the shaft seal material.
- Do not exceed the maximum speed.
- Remove any accumulating dust and debris in a timely manner, especially near/under the dust lip.
- Monitor reservoir level and immediately switch off system if the level falls below minimum value.
- Regularly check the housing oil level (especially in “negative head” over-tank installation) and confirm that no air is trapped, causing insufficient bearing or shaft seal lubrication

First Start-Up

1. Make sure the reservoir and pump housing are filled with fluid and the inlet and outlet lines are open and unobstructed.
2. Start the prime mover at reduced speed. Once the pump is started it should prime within a few seconds. If the pump does not prime, check to make sure that there are no restrictions between the reservoir and the inlet to the pump, that the pump is being rotated in the proper direction, and that there are no air leaks in the inlet line and connections. Also check to make sure that trapped air can escape at the pump outlet.
3. After the pump is primed, operate for five to ten minutes (unloaded) to remove all trapped air from the circuit.
If the reservoir has a sight gage, make sure the fluid is clear – not milky.
4. To assure best pump performance, run the pump for approximately one hour at 30% of rated pressure and speed before running at full load.
When running make sure the pump and oil temperature and noise level are sufficiently low. High temperature or noise level might be symptoms of unforeseen operation conditions that have to be analyzed and cleared.
5. Check for system leakage and make sure the system is operating satisfactorily.
6. To ensure that the contamination in the hydraulic system does not damage the pump; the following procedure is recommended after a brief period in operation:
 - a. After a brief period in operation, have a hydraulic fluid specimen analyzed for the required cleanliness level.
 - b. Replace oil filter or change the hydraulic fluid if the required cleanliness level is not reached.

Operational Checks for Operation in Explosive Atmospheres

The product is an equipment which requires no settings or changes during operation.

The machine/system manufacturer is responsible for the proper project planning of the hydraulic system and its control.

The following checks must be performed to comply with ATEX directive:

- Perform a “function and accuracy check of the ignition protection system” according to ISO 80079-39 clause 8.2.2:
 - a. Check the sensors to ensure they produce the correct output signal in response to the characteristic being monitored and their accuracy is within the range described in this document. Calibration shall be performed according to the sensor supplier recommendations.
 - b. Check the ignition protection systems for correct operation as written within this document.
 - c. Check if the ignition protection systems indicate a “fault” condition when defective or if a signal outside of the limits of the pre-determined maximum/minimum range is applied to it.

System lockout: If a potential ignition source is prevented from becoming effective by means of stopping the equipment (see page 10), e.g. shutdown due to exceeding case drain temperature, the system shall be arranged so that the stop function locks out. The equipment shall not be able to be re-started without re-setting of the devices.

Operator intervention: The warning or display of the ignition protection system/device shall be designed to avoid operator confusion or misunderstanding with regard to the action required (e.g. low oil alarm or temporary increase in case oil temperature)

Danfoss recommends ongoing tests for optimal pump performance:

- Continuously verify that the temperature of the ambient and the operating oil are those initially determined and do not change rapidly.
- Do not subject the pumps to pressure, pressure drop or speeds exceeding the maximum values stated in the appropriate catalogs.
- Filter the oil to maintain the grade of contamination at 20/18/13 (ISO 4406-1999) or better.

Maintenance

Warning

If maintenance has to be performed in an explosive and hazardous atmosphere, an anti-sparking safety tool must be used.

Maintenance measures involving disassembly or opening of the pump must only be carried out in non-explosive atmospheres.

Prior to loosening any connection of the hydraulic system, ensure the residual pressure has been removed from the system in a safe manner.

With hydraulic systems the main criterion for reliability and operating life is very thorough regular maintenance.

Regularly check the system for presence of leakage and the oil level. The equipment must be regularly serviced and cleaned in the explosive atmosphere. The intervals are specified by the operator on-site in accordance with the environmental impact to which the equipment is exposed.

During system's function, it is necessary regularly to verify that the temperature of the ambient and the operating oil are those initially determined. Replenish and change the oil, the oil and air filters as stated in the respective instructions.

Regularly check the condition of the oil – viscosity, oxidation, filtration level etc:

Viscosity	Verify that the viscosity level is within the recommended values as indicated in Table 3: Fluid Viscosity and Temperature Rating of PVM ATEX / UKEX Units on page 8.
Oxidation	Mineral oil gets oxidized proportional to the usage degree and operating temperature. The oxidation of oil is evident because of its change of color, bad smell, acidity increase and because of the generation of sludge inside the tank. In case symptoms of this kind are detected, the system oil must be immediately changed.
Water presence	The presence of water inside oil can be determined by taking oil samples from the bed of the oil tank: oil floats on water, if present, water tends to stay on the tank's bed. If its presence is determined, water must be regularly purged. Presence of water in the hydraulic system can severely damage the pump.
Degree of contamination	A high degree of contamination of the operating oil causes a severe wear of all hydraulic components: for this reason, the cause of the contamination must be identified and eliminated. In order to avoid mixing of different oils, when replacing the operating fluid. It is necessary to empty all the machinery and pipes, clean them carefully and clean the tank.

Recommended Check Activities

Activity	Visual Check ¹⁾ Monthly	Close-Up Check ¹⁾ Every 6 Months or 4000hr	Detailed Check ¹⁾ Every 12 Months or 8000hr
Visual check pump for leaks, remove dust/dirt/debris deposits, check state of grease deposit at shaft seal (dust lip lubrication), check shaft seal & contact surface condition	●	●	N/A
Check external temperature of the pump using suitable measuring aids to ensure it is below 125°C [257°F] when pump is operating at cut-off		● ²⁾	N/A
Perform the operational checks of the sensors/devices which are part of the ignition protection system (see page 12). Check label readability.			●

¹⁾ Definitions of terms as per IEC 60079-17

²⁾ Not necessary if monitored by recommended surface temperature sensor

Service and Repair

[Only Authorized Service Centers or Danfoss Technicians may perform repairs specified in the Service Manual.](#)

The pump shall be overhauled or replaced prior to reaching the anticipated operating life as specified within the product catalog. For specific application inquiries contact Danfoss Technical Support.

Pump components may only be replaced by genuine original Danfoss service parts which are also approved for use in explosive atmospheres. This also applies to the lubricants and service products used.

In case a service or repair intervention on the pumps is required, it must be performed according to the information shown in below mentioned Service Manual.

The Service Manual includes the spare part list and information about how dismantling and assembling of the pumps is done properly.

See *PVM Piston Pumps Service Manual*; Literature Number: AX445454003735en-000101

CAUTION: Striking or impact forces could damage the axial piston unit. Do not strike the coupling or drive shaft. Do not set/place the unit on its drive shaft. Do not strike sensitive assembled parts or sealing surfaces.

Safety Precautions

Always consider safety precautions before beginning a service procedure. Protect yourself and others from injury. Take the following general precautions whenever servicing a hydraulic system.

Tools

Warning

It is compulsory to use anti sparking safety tools in case the service/repair activity has to be performed in explosive hazardous atmosphere.

Sparking from External Impacts

Warning

Avoid impact on the aluminum nameplate material to eliminate risk of thermite sparks. Only applicable if aluminum nameplate is used. Avoid impact with light or hard metals on external surfaces.

Unintended Machine Movement

Warning

Unintended movement of the machine or mechanism may cause injury to the technician or bystanders. To protect against unintended movement, secure the machine or disable/disconnect the mechanism while servicing. Follow the manufacturers instructions for securing the machine.

Personal Safety

Warning

Protect yourself from injury. Use proper safety equipment, including safety glasses, at all times.

Hot Surfaces

Warning

The pump surface temperature may exceed 70°C [158°F] during operation and after system power-down. Precautions should be taken to prevent accidental skin contact.

Flammable Cleaning Solvents

Warning

Some cleaning solvents are flammable. To avoid possible fire, do not use cleaning solvents in an area where a source of ignition may be present

Fluid Under Pressure

Warning

Escaping hydraulic fluid under pressure can have sufficient force to penetrate your skin causing serious injury and/or infection. This fluid may also be hot enough to cause burns. Use caution when dealing with hydraulic fluid under pressure. Relieve pressure in the system before removing hoses, fittings, gauges, or components. Never use your hand or any other body part to check for leaks in a pressurized line. Seek medical attention immediately if you are cut by hydraulic fluid.



Summary of identified potential Ignition Hazards and Protective Means

Ignition Hazard	Protective Means
Hot surface (Due to excessive leakage)	Operate within X-conditions and limitations given within this manual and catalog. Install temperature probes and low-oil alarm and automatic shut-off. Never run pump dry. Impact resistance of housing is within compliance criteria. Replace shaft seal if it leaks.
Hot Surface (Housing)	Operate within X-conditions and limitations given within this manual and catalog. Follow installation, operation, and maintenance guidelines. Automatic shut-off required if monitored process temperature limits within manual are exceeded.
Hot Surface (Shaft Seal Friction)	Operate within X-conditions, and limitations given within this manual and catalog. Run pump with properly filled housing at all times. Only use fluids chemically compatible with equipped elastomers. Install flushing if recommended by this manual (e.g. due to orientation).
Mechanical Sparks (single manual impact)	Construction avoided exposed light metals wherever possible. Warning added to avoid impact on aluminum surfaces (e.g. nameplate) or striking with light or hard metals.
Static electricity (non-conductive surfaces)	Exposed areas within compliance criteria. Paint thickness is within compliance criteria. Thickness shall not exceed 200µm if painted by customer. Grounding of unit necessary.
Static electricity (conductive surfaces)	Metallic Labels attached to housing via conductive mechanisms to avoid buildup of capacitance. Grounding of unit necessary.

Products we offer:

- Cartridge valves
- DCV directional control valves
- Electric converters
- Electric machines
- Electric motors
- Gear motors
- Gear pumps
- Hydraulic integrated circuits (HICs)
- Hydrostatic motors
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