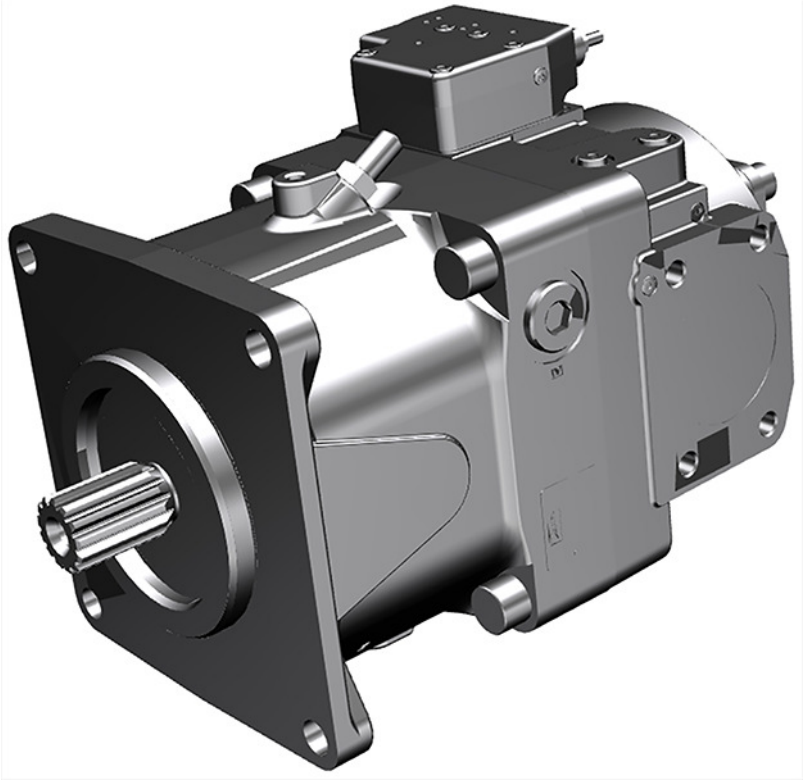
ENGINEERING
TOMORROW

User Manual

ATEX certified

Axial piston pump, variable displacement
D1P130/D1P145/193/260



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Revision history

Table of revisions

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August 2021	First edition	0101

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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 certified pumps.

This User Manual is a supplement to existing product instruction as ATEX components are subjected to some limitations compared to standard components. The limitations are described in this ATEX instruction.

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 pump.

This User Manual must lie close to the pump.

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 documentation.
- 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 pump 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 pump converts hydraulic energy (pressure, oil flow) into mechanical energy (torque and speed). They are designed for mobile and stationary applications.

The pumps fulfill the explosion requirements with the Directive 2014/34/EU for the category shown on the name plate.

The D1P 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.

Marking of Danfoss D1 pumps

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

Introduction

Temperature class/Maximum surface temperature depends on the operating conditions (ambient and fluid temperature).

ATEX marking

Marking	For model code option
CE Ex II 3G Ex h IIA T3 Gc	AN3 (temperature class T3)
CE Ex II 3G Ex h IIA T4 Gc	AN4 (temperature class T4)
CE Ex II 3G Ex h IIA T5 Gc	AN5 (temperature class T5)

See *Viscosity and temperature for D1P pump* on page 8 for more information about temperature classes.

Introduction

Production place and date of pump

The production location and date of the pump is shown at the first 5 digits of the serial no.

Example: Serial No: N191230941

Five first digits are N1912

N is the manufacturing location (N=Neumünster)

19 is the year (It stands for the last digit in the possible decade).

12 is the week

The last five digits are a consecutive 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."

With following parameters:

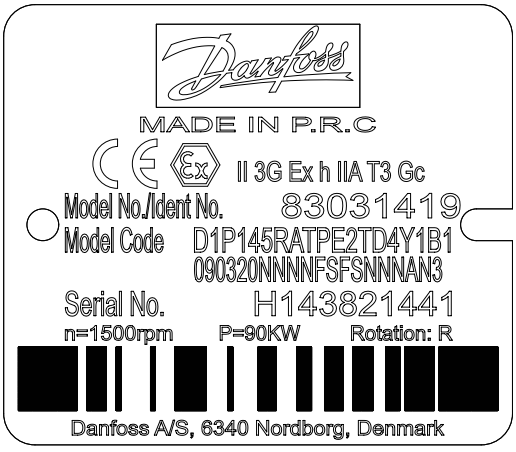
- Equipment group: II
- Zone: 2 (gas)
- Equipment Category: 3G
- Temperature class: T5...T3
- Explosion protection group: II A

The Conformity Assessment Procedure has to be executed according to Directive 2014/34/EU, annex VIII, Modul A: Internal Production Control (see article 13, section 1 (c)).

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.

Example ATEX label - D1P

Examples of ATEX pump labels – Pump produced in People's republic of China



1. Manufacturer
2. Location of production
3. ATEX code
4. Material number
5. Model code, including unit and displacement
6. Production code

Technical information

ATEX technical specifications

The technical specifications in this chapter are supplemental for ATEX systems only. For comprehensive technical specifications, including maximum pressure rating, maximum flow, etc. please refer to the standard D1P Technical Information document.

Danfoss does not claim responsibility for the use of the pump in operating conditions not allowed according to the information shown in this document and the standard D1P Technical Information document.

Painting or coating can be an electric insulator if a thickness greater than 200 um is applied. The thickness of the paining of original DPS paint is less than 200 um.

T-codes and maximum surface temperature

Gaseous environment (G)

Ambient oil temperature

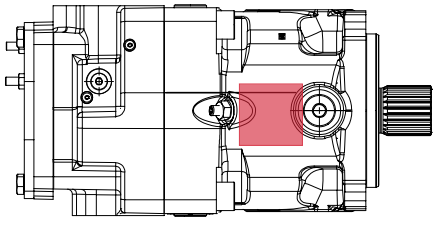
Maximum oil temperature	Maximum ambient temperature		
	≤ 20 °C [64 °F]	≤ 40 °C [104 °F]	≤ 60 °C [140 °F]
≤ 20 °C [68 °F]	T5	T5	T5
≤ 40 °C [104 °F]	T5	T5	T4
≤ 60 °C [140 °F]	T5	T4	T4
≤ 80 °C [176 °F]	T4	T4	T3
≤ 115 °C [239 °F]	T3	T3	T3

T-codes maximum surface temperature

Temperature class	Maximum surface temperature	
	°C	[°F]
T3	200	392
T4	135	275
T5	100	212

To ensure that the surface temperature will not exceed the allowed value according to the used temperature class, it is recommended to attach a temperature sensor to the pump in the shown area on one of the side surfaces near the maximum displacement limiter at the bottom side of the pump.

Location to attach temperature sensor



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.

Technical information

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.

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 and IID can be found under *Viscosity and temperature for D1P pump* on page 8.

Viscosity and temperature for D1P pump

Features		Data
Viscosity	Intermittent[1)]	5 mm^2/sec [42 SUS]
	Minimum	7 mm^2/sec [49 SUS]
	Recommended range	12 - 80 mm^2 [66 - 371 SUS]
	Maximum (cold start)[2)]	1600 mm^2/sec [7416 SUS]
Temperature	Minimum (cold start)[2)]	-40°C [-40°F]
	Maximum intermittent[1)]	115°C [239°F]

[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].

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.

Warning

It is compulsory to use oils whose inflammable degree is at least 50K above the maximum surface temperature of the pump. See also .

Ambient temperature

Maximum ambient temperature depends on the requested ATEX class needed.

In general the ambient temperature should lie between -40° C [-40° F] and +70° C [158 °F] to ensure that the shaft seal retains its sealing capacity.

Oil temperature

Maximum oil temperature depends on the requested ATEX class needed (in this case T3)..

Under normal operating conditions it is recommended to keep the temperature in the range of 60 °C [140 °F] to 85 °C [185 °F].

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.

Technical information

Fluid viscosity limits

Conditions	mm^2/s (cSt)	SUS
Minimum	5	42
Continuous	7	49
Maximum	1600	7416

We recommend the use of an oil type having a viscosity of 12 - 80mm^2/s [66 - 371 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 pump is 22/20/16 (ISO 4406-1999).

Installation, operation and maintenance

Assembly of D1 pump to the system

When assembling the pump in the machine/system it is the builder's responsibility that the parts used conform to the ATEX directive 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 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.
- It is compulsory to use oils whose inflammable degree is at least 50K above the maximum surface temperature of the pump. Maximum surface temperature is 200° C for Group 11G.
- Make sure that all type of accessory installed on the pump are ATEX specified and have been installed in accordance with ATEX 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 maximum permissible oil and ambient temperature is monitored and not exceeded for the category and temperature class of the associated zone.

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.

It is necessary to verify the perfect alignment between the pump input shaft and the counter part – the fitment between pump shaft and application's driven shaft must be executed so that no radial or axial pre-load is generated – these extra loads reduce the bearings expected lifetime.

Installation, operation and maintenance

Operation

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

Pre-start up controls for D1P pump

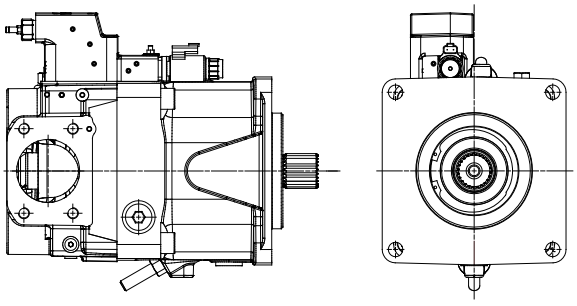
Before performing the first pump start up, the following points have to be checked.

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.
2. Make sure the pump hydraulic connections allow the pump to rotate in the desired direction. For pumps with standard direction of rotation:

   Clockwise rotation (viewed facing the output shaft) with inlet pressure in the front port.

   Counter-clockwise rotation (viewed facing the output shaft) with inlet pressure in the rear port.



Generic illustration shown.

3. Select the hydraulic fluid as specified in *Oil types / Operating fluids*.
4. Ensure full contact between pump mounting flange and connecting part.

   Avoid pressing the pump 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.

5. Make sure that all couplings are completely tightened to prevent leakage.

   Do not use more torque than the maximum values given in the instructions.

6. Check to make sure the purity of the oil is greater than 22/20/16 (ISO 4406-1999) and always use a filter when replenishing the system.

Warning

The pump must be filled with fluid prior to any load applications.

Installation, operation and maintenance

Start up

During and immediately after the pump start up, any hydraulic system must be closely and frequently checked.

1. 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.
2. Check for system leakage and make sure the system is operating satisfactorily.
3. 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

The product is a component 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.

Danfoss recommends ongoing tests for optimal pump performance.

1. Regularly verify that the temperature of the ambient and the operating oil are those initially determined.
2. Do not subject the pump to pressure, pressure drop or speeds exceeding the maximum values stated in the appropriate catalogs.
3. Filter the oil to maintain the grade of contamination at 22/20/16 (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.

Installation, operation and maintenance

- With hydraulic systems the main criterion for reliability and operating life is very thorough regularly maintenance.
- Regularly check the system for presence of leakage and the oil level.
- 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 *Viscosity and temperature for D1P pump* 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.

Installation, operation and maintenance

Service and repair of D1P pump

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

The Repair Instruction includes the spare part list and information about how dismantling and assembling of the pump is done properly.

Only Authorized Service Centers may perform repairs specified in the Repair Instructions.

- *D1 High Power Open Circuit Pumps Repair Instructions*: Literature number AX195286485156.

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.

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.

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.

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