ENGINEERING
TOMORROW

Data sheet

PAHT C pumps

PAHT C 2 - 6.3
ATEX PAHT C pumps



hpp.danfoss.com

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1. Introduction

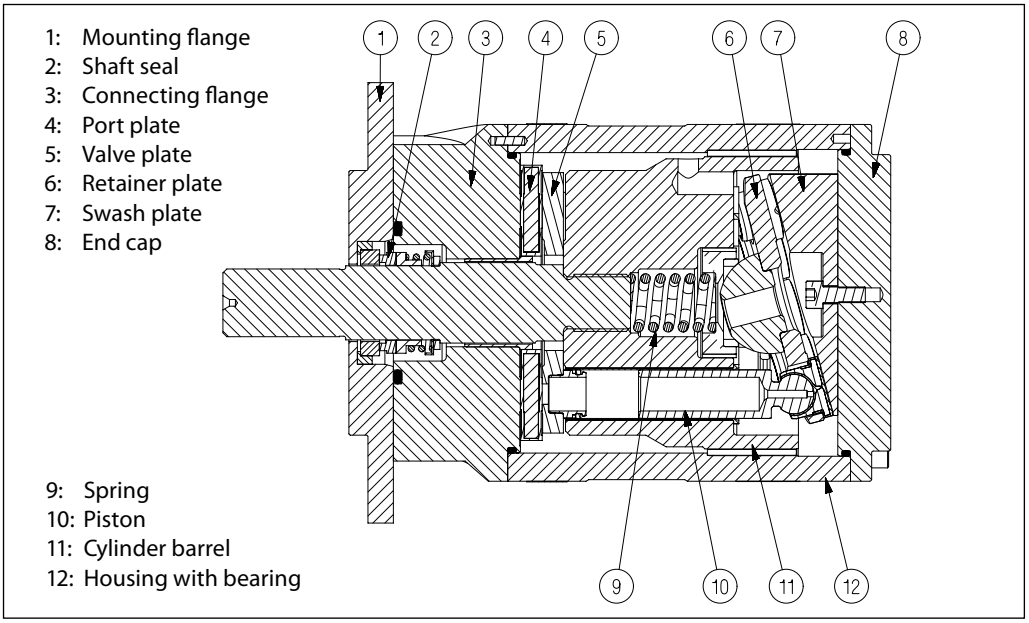
The Danfoss range of PAHT C is specifically designed for use with technical water mixed with chemicals or media other than water with low viscosity.

Danfoss PAHT pumps are positive displacement pumps, with axial pistons that move a fixed amount of water in each cycle. Flow is proportional to the number of input shaft revolutions (rpm). Unlike centrifugal pumps, they produce the same flow at a given speed independently of the discharge pressure.

The range of PAHT C pumps is based on the standard PAHT pump series. The PAHT C pumps are made with more resistant sealing. These pumps are primarily used in gas turbine water wash applications or other cleaning applications.

This data sheet is valid for PAHT C pumps both non ATEX and ATEX certified. ATEX certified pumps are indicated by Ex in the type designation example PAHT C 2 Ex.

Below sectional drawing is an example of a PAHT pump.



2. Benefits

- **Zero risk of lubricant contamination:**
  - Oil lubricants are replaced with the pumped medium, water, so there is no contamination risk from the pump.
- **Low maintenance costs:**
  - Efficient design and all-stainless steel construction ensure exceptionally long lifetime. When Danfoss specifications are met, service intervals of up to 8,000 hours can be expected. Service is easy, and can be carried out on site due to the simple design and few parts.
- **Low energy costs:**
  - The highly efficient axial piston design provides the lowest energy consumption of any comparable pump on the market.
- **Easy installation:**
  - The lightest and most compact design available.
  - High resistant sealing material available
  - Pump can be installed horizontally or vertically.
  - No pulsation dampeners necessary due to extremely low-pressure pulsation.
  - Powered by electric motors or combustion engines.
  - Suitable for both boosted inlet pressure and water supply from a tank.
  - No need for cooling circuits due to very high mechanical efficiency.
- **Certified quality:**
  - Fulfills the stringent hygiene requirements, VDI 6022, HACCP.
  - Certificates:
    ISO 9001, ISO 14001
    ATEX available on PAHT C,
    API available on request

3. Application examples

- High-pressure cleaning as used in the manufacturing of flat-panel displays and many other electronic products.
- High-pressure cleaning as used in the manufacturing of parts for the automobile industry.
- Reduction of NOx emissions in gas turbines by cleaning with water wash.

4. Technical data

4.1 PAHT C 2-6.3

Pump size		2	3.2	4	6.3
Code number PAHT C		180B1030	180B1031	180B1032	180B1033
Code number ATEX PAHT C		180B1130	180B1131	180B1132	180B1133
Housing material		AISI 304	AISI 304	AISI 304	AISI 304
Sealing material		FFKM	FFKM	FFKM	FFKM
Geometric displacement	cm^3/rev	2	3.2	4	6.3
	in^3/rev	0.12	0.20	0.24	0.38
Pressure					
Min. outlet pressure	barg	30	30	30	30
	psig	435	435	435	435
Max. outlet pressure	barg	100	100	100	100
	psig	1450	1450	1450	1450
Inlet pressure, continuous	barg	0-4	0-4	0-4	0-4
	psig	0-58	0-58	0-58	0-58
Max. inlet [1] pressure, peak	barg	4	4	4	4
	psig	58	58	58	58
Speed					
Min. speed	rpm	1000	1000	1000	1000
Min. speed, continuous	rpm	1000	1000	1000	1000
Max. speed	rpm	3000	3000	3000	3000
Typical flow - Flow curves available in section 5 [2]					
1000 rpm at max. pressure	l/min	0.7	2.0	3.0	5.5
1500 rpm at max. pressure	l/min	1.7	3.6	5.0	8.6
1200 rpm at max. pressure	gpm	0.3	0.7	1.0	1.8
1800 rpm at max. pressure	gpm	0.6	1.2	1.6	2.7
Typical motor size					
1500 rpm at max. pressure	kW 50 Hz	0.75	1.1	1.5	2.2
1800 rpm at max. pressure	hp 60 Hz	1.0	1.5	2.0	3.0
Torque at max. outlet pressure	Nm	4.4	6.7	8.1	12.4
	lbf-ft	3.2	4.9	6.0	9.2
Media temperature	°C	2-50	2-50	2-50	2-50
	°F	37-122	37-122	37-122	37-122
Ambient temperature	°C	0-50	0-50	0-50	0-50
	°F	32-122	32-122	32-122	32-122
Sound pressure level [3]	dB(A)	76	76	76	76
Weight	kg	4.4	4.4	4.4	4.4
	lbs	9.7	9.7	9.7	9.7

[1] 1% per minute peak, 10% per minute during start up.
[2] Values measured in water, might differ in other media.
[3] Measurements according to EN ISO 3744: 2010 / dB(A) [$L_{PA,\,1m}$] values are calculated. Measured at max pressure and rpm for a motor pump unit.

5. Flow

The flow (Q_{eff}) at various pressure (p_{max}) can be calculated with the following equation:

$$Q_{eff} = Q_{(th)} - [(Q_{(th)} - Q(p_{max})) \times (p / p_{max})]$$

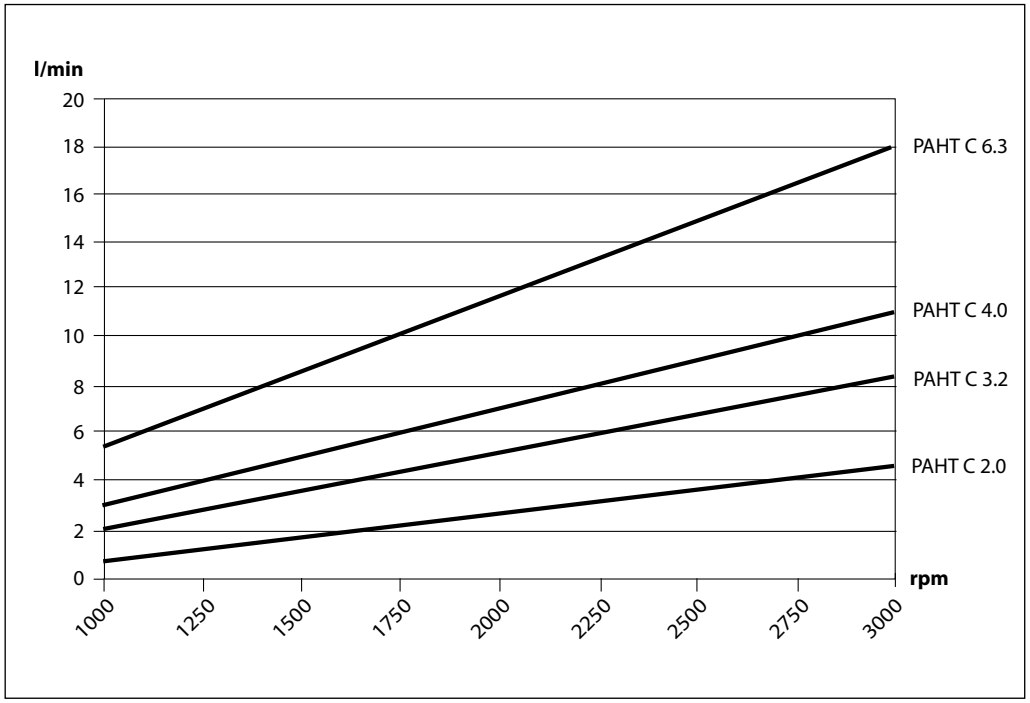
The theoretical flow can be calculated with the following equation:

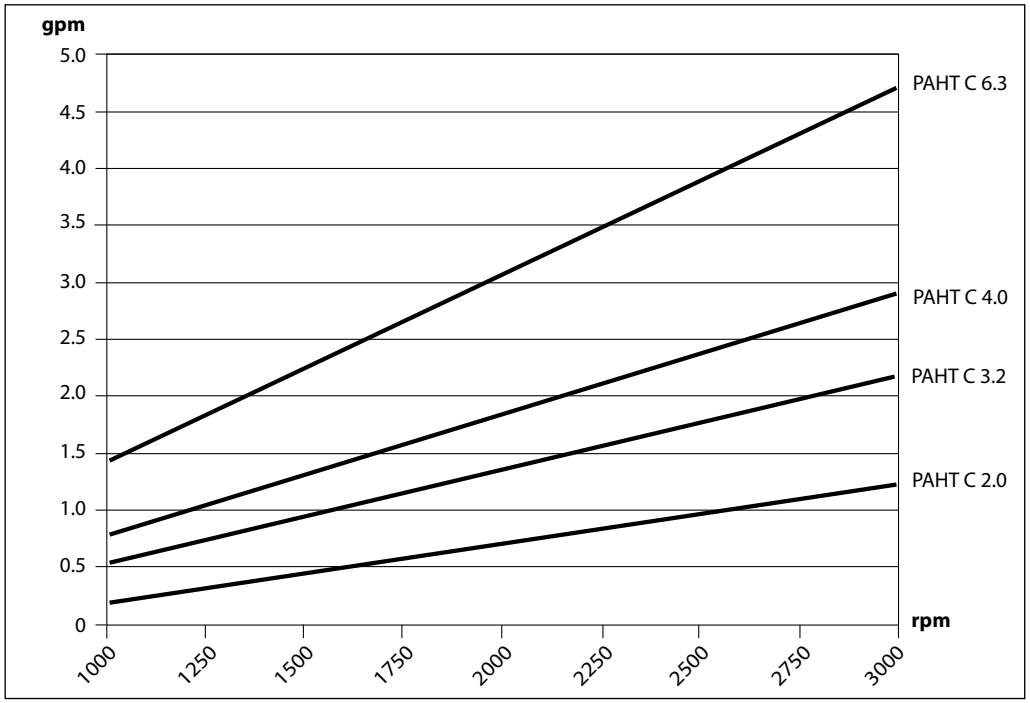
$$Q_{(th)} = \frac{V \times n}{1000}$$

At zero pressure the true flow equals the theoretical flow $Q_{(th)}$.

$Q_{(th)}$:	Theoretical flow (l/min / gpm)
$Q(p_{max})$:	Flows at max. pressure (l/min and gpm), see 4.1-4.4
p_{max}:	Max pressure (barg / psig)
p:	Pressure (barg / psig)
V:	Displacement (cm^3 / rev.)
n:	Motor speed (rpm)

5.1 PAHT C 2-6.3 typical flow curves at max pressure (measured in water)





6. Motor requirements

The required motor power can be calculated by using the following equation:

$$P = \frac{n \times V \times p}{600.000 \times \eta}$$

P:	Power (kW)
M:	Torque (Nm)
η:	Mechanical efficiency
p:	Pressure (barg)
n:	Motor speed (rpm)
V:	Displacement (cm^3/rev.)

From the flow curves in item 5, you can determine the rpm of the pump at the desired flow.

The required torque is calculated as follows:

$$M = \frac{V \times p}{62.8 \times \eta}$$

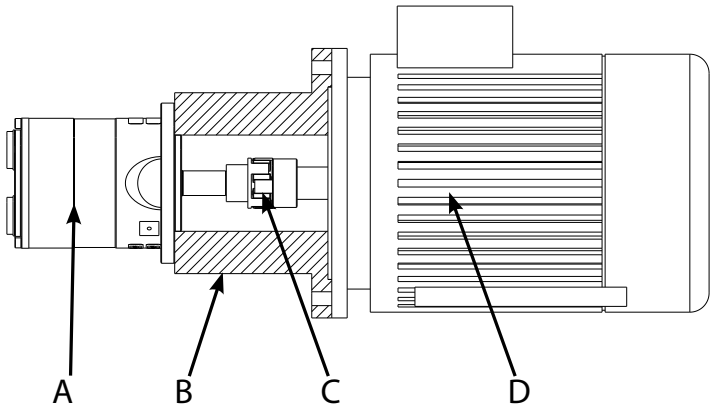
To determine the correct motor size, both the power and torque requirement must be verified.

The mechanical efficiency of the pump, at max pressure, is as follows:

PAHT C 2, 3.2, 4, 6.3	0.8

7. Installation

See the figure below for instructions on how to mount the pump and connect it to an electric motor or combustion engine.



A: Pump
B: Bell housing
C: Coupling
D: Motor

If alternative mounting is required, please contact your Danfoss sales representative for further information.

Note: Do not add any axial or radial loads to the pump shaft.

7.1 Filtration

Proper filtration is crucial for the performance, maintenance and warranty of your pump.

Protect your pump, and the application in which it is installed, by always ensuring that filtration specifications are met, and by always changing filter cartridges according to schedule.

Since water has very low viscosity, Danfoss PAHT pumps have been designed with very narrow clearances in order to control internal leakage rates and improve component performance. **To minimize wear on the pump, it is therefore essential to filter inlet water properly.**

The main filter must have a filtration efficiency of 99.98% at 10 µm. We strongly recommend that you always use precision depth filter cartridges rated 10 µm abs. $\beta_{10} \geq 5{,}000$.

Please note that **we do not recommend bag filters or string-wound filter cartridges**, which typically have only 50% filtration efficiency. This means that out of 100,000 particles that enter such filters, 50,000 particles pass right through them; compare this to precision depth filters that are 99.98% efficient, and only allow 20 of the same 100,000 particles to pass through.

For more information on the importance of proper filtration, including explanation of filtration principles, definitions, and guidance on how to select the right filter for your pump, please consult our **Filtration** information and specifications (Danfoss document number 521B1009).

7.2 Noise

Since the pump unit is mounted on a frame, the overall noise level can only be determined for a complete system. To minimize vibrations and noise throughout the system, it is therefore very important to mount the pump unit correctly on a frame with dampers and to use flexible hoses rather than metal pipes where possible.

The noise level is influenced by:

- **Pump speed:**
  High rpm makes more fluid/structure-borne pulsations/vibrations than low rpm.
- **Discharge pressure:**
  High pressures make more noise than low pressures.
- **Pump mounting:**
  Rigid mounting makes more noise than flexible mounting because of the structure-borne vibrations. Be sure to use dampers when mounting.
- **Connections to pump:**
  Pipes connected directly to the pump make more noise than flexible hoses because of structure-borne vibrations.
- **Variable frequency drives (VFDs):**
  Motors regulated by VFDs can produce more noise if the VFD does not have the right settings.

7.3 Open-system design

A **Inlet line:**
Dimension the inlet line to obtain minimum pressure loss (large flow, minimum pipe length, minimum number of bends/connections, fittings with small pressure losses and restrictions).

B **Inlet filter:**
Install the inlet filter (1) in front of the PAHT pump (2). Please consult the Danfoss filter data sheet for guidance on how to select the right filter.

C **Monitoring pressure switch:**
Install the monitoring pressure switch (3) between the filter and the pump inlet. Set the minimum inlet pressure according to specifications described in item 4, technical data. The monitoring pressure switch stops the pump if inlet pressure is lower than the set minimum pressure.

D **Monitoring temperature switch:**
Install the monitoring temperature switch (4) between the filter and the pump, on either side of the monitoring pressure switch. Set the temperature value according to technical data, item 4. The monitoring temperature switch stops the pump if inlet temperature is higher than the set value.

E **Hoses:**
Always use flexible hoses (5) to minimize vibrations and noise.

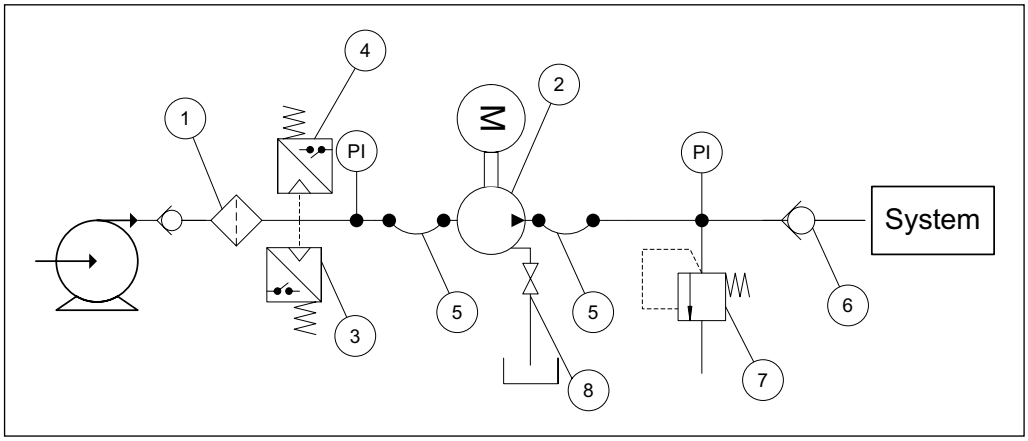
F **Inlet pressure:**
In order to eliminate the risk of cavitation and other pump damage, pump inlet pressure must be maintained according to specifications described in item 4, technical data.

G **Non-return valve (6):**
Should be installed after the outlet to prevent pump backspin, which may ruin the pump.

H **Pressure relief valve:**
As the Danfoss PAHT pump begins to create pressure and flow immediately after start-up regardless of any counter pressure, a pressure relief valve (7) should be installed to prevent system damage.

I **Drain:**
Always install a proper drain (8) in order to safely drain the fluid to avoid vaporization and to ensure a safe drain, without human contact before inspection and/or service.

Note: If a non-return valve is mounted in the inlet line, a low-pressure relief valve is also recommended between the non-return valve and the pump to protect against high-pressure peaks.



7.4 Closed-system design

A **Inlet line:**
Dimension the inlet line to obtain minimum pressure loss (large flow, minimum pipe length, minimum number of bends/connections, fittings with small pressure losses and restrictions).

B **Inlet filter:**
Install the filter (1) in front of the tank (2). Please consult the Danfoss filter data sheet for guidance on how to select the right filter.

C **Monitoring pressure switch:**
Install the monitoring pressure switch (3) in front of the filter (1). Set the maximum inlet pressure to 2 barg (29.0 psig). The monitoring pressure switch will stop the pump (5) if inlet pressure is higher than 2 barg (29.0 psig), indicating that the filter element must be changed.

D **Monitoring temperature switch:**
Install the monitoring temperature switch (4) in the tank. Set the temperature value according to technical data, item 4. The monitoring temperature stops the pump if inlet temperature is higher than the set value.

E **Hoses:**
Always use flexible hoses (6) to minimize vibrations and noise.

F **Inlet pressure:**
In order to eliminate the risk of cavitation and other pump damage, pump inlet pressure must be maintained according to specifications described in item 4, technical data.

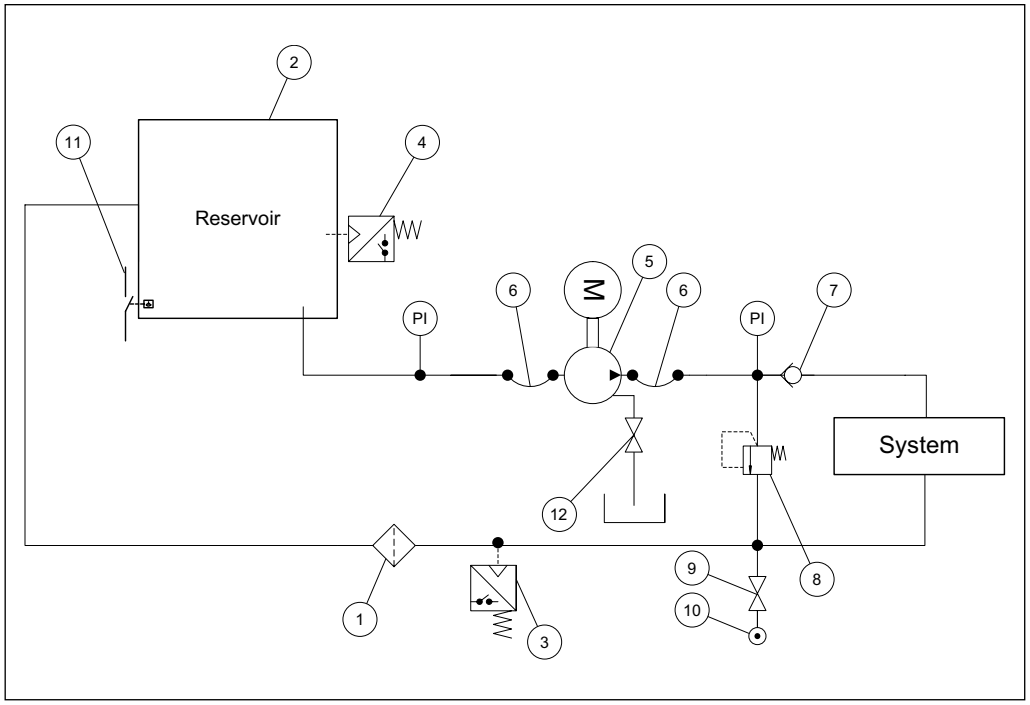
G **Non-return valve (7):**
Should be installed after the outlet to prevent pump backspin, which may ruin the pump.

H **Pressure relief valve:**
As the Danfoss PAHT pump begins to create pressure and flow immediately after start-up regardless of any counter pressure, a pressure relief valve (8) should be installed to prevent system damage.

I **System water filling:**
To ensure proper filtration of new water (10) supplied to the system, always use the filling valve (9).

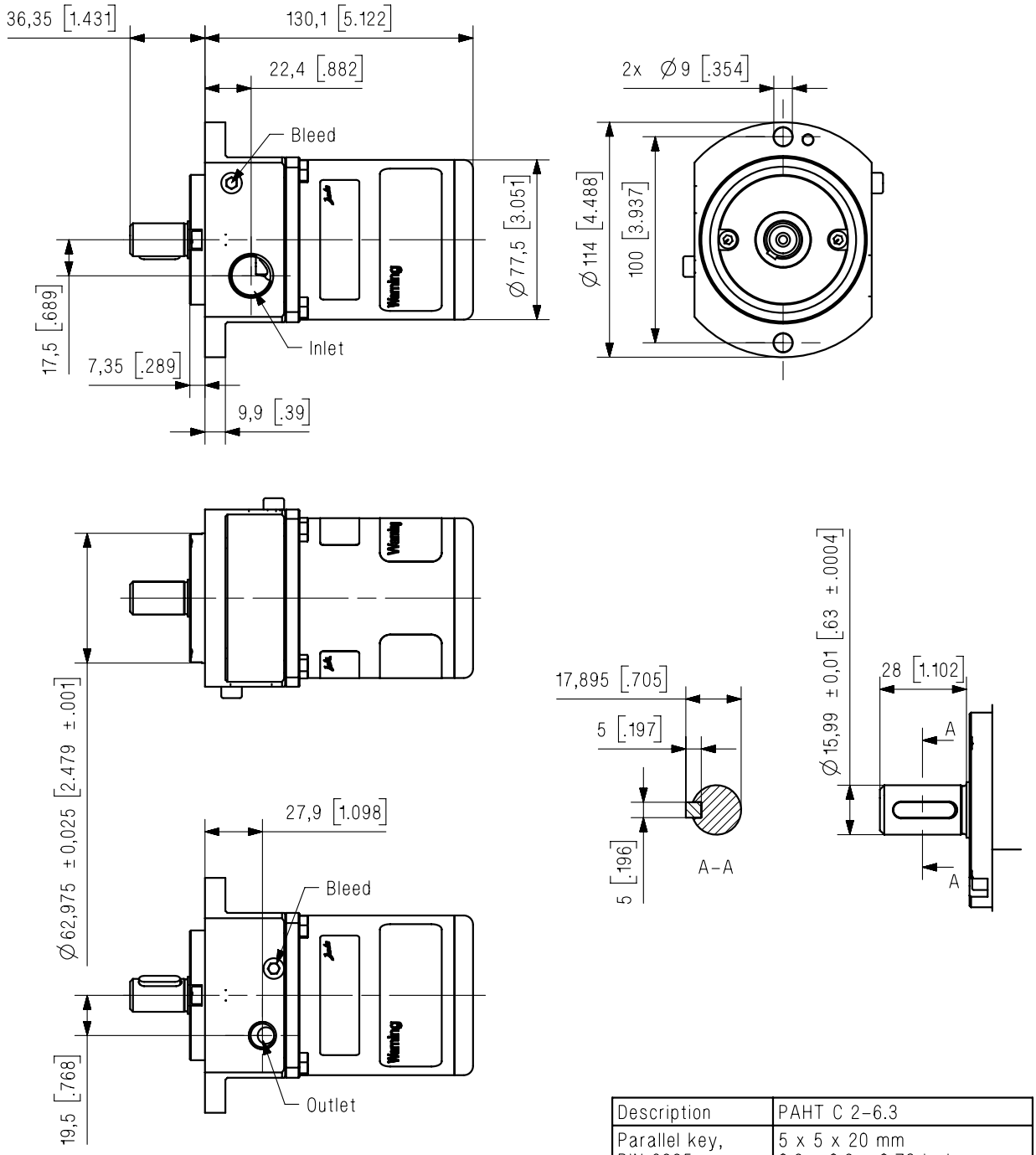
J **Minimum level switch:**
Install the minimum level switch (11) above the outlet of the reservoir. The level switch must stop the pump if the water in the reservoir is below the switch, which indicates that the reservoir is empty.

K **Drain:**
Always install a proper drain (12) in order to safely drain the fluid to avoid vaporization and to ensure a safe drain, without human contact before inspection and/or service.



8. Dimensions and connections

8.1 PAHT C 2-6.3



Dimensions without tolerances acc. to ISO 2768–1 designation C.

Description	PAHT C 2–6.3
Parallel key, DIN 6885	5 x 5 x 20 mm 0.2 x 0.2 x 0.79 inch
Bleed	M6; hex key 4 mm M6; hex key 5 mm
Inlet port	G 1/2" BSPP; depth 15 mm
Outlet port	G 1/4" BSPP; depth 11 mm
Mounting flange	ISO 3019–2 63A2HW

9. Service

Danfoss PAHT C pumps are designed for long periods of service-free operation to ensure low maintenance and life cycle costs. Provided that the pump is installed and operated according to Danfoss specifications, Danfoss PAHT C pumps typically run 8,000 hours between service (Validated in water). However, the service schedule for your PAHT C pump may vary according to the application and other factors. Some chemicals might change the surface tension which the pumps are relying on and therefore decrease the service intervals.

The life of a pump may be greatly shortened if Danfoss recommendations concerning system design and operation are not followed.

In our experience, poor filtration is the number one cause of pump damage.

Other factors that affect the pump performance and lifetime include:

- Running the pump speeds outside specifications
- Supplying the pump with temperatures higher than recommended
- Running the pump at inlet pressures outside specifications
- Running the pump at outlet pressures outside the specifications

We recommend that you inspect your pump after 8,000 hours of operation even if it is running without any noticeable problems. Replace any worn parts if necessary, including pistons and shaft seals, to keep your pump running efficiently and to prevent breakdown. If worn parts are not replaced, then our guidelines recommend more frequent inspection.

Make sure to install a proper drain to avoid any spill of fluid into the surroundings, drain the whole pump before servicing and wear necessary safety equipment.

Read the Service Instruction before servicing the pump.

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Danfoss A/S
High Pressure Pumps
Nordborgvej 81
DK-6430 Nordborg
Denmark

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