

Safety recommendations for installation

Take all possible precautions to allow the pump to be installed in a safe, risk-free manner.

All installation phases must be taken into consideration when designing the machinery or plant in which the pump is to be installed.

The design must consider all mounting points, the means of transmission of the energy sources, and the protective and safety devices required by the relevant regulations to prevent the risk of injury.

Installation

The mechanical connection between the pump and the motive power source may be made by means of a pulley and belt, or a flexible coupling, or through a direct flanged connection to the motive power source.

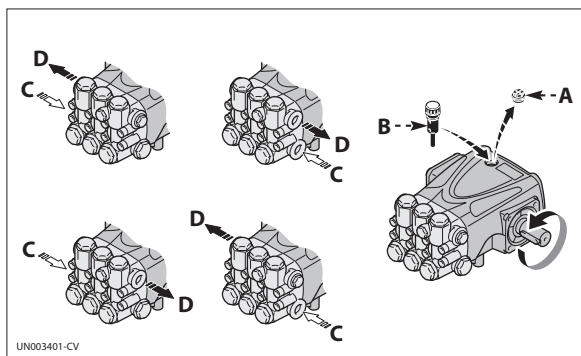
The crankshaft may turn in either direction.

The water supply connection can be made equally well to the intakes on the right or left of the pump (see diagram).

Only connect the pump to filtered, clean water sources.

Unscrew the plugs fitted on the various ports in the factory by the manufacturer, and screw the plugs onto the ports not used, depending on connection requirements.

Replace the oil plug (A), used for shipment with the breather plug (B) supplied.



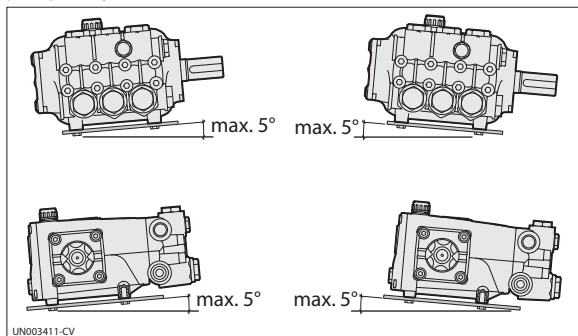
- A) Temporary oil plug
- B) Oil plug with breather
- C) Intake port
- D) Delivery port

Mounting the pump

The pump must be installed on a horizontal surface with no flexible components between it and the mounting surface.

The illustration shows the maximum permitted pump installation angle beyond which proper lubrication of the crank mechanism is not ensured.

Secure the pump with screws of suitable diameter and length, fixing them through the holes provided in the pump body.



General guidelines on water supply connection

The pump's water supply connection can be made in one of the ways listed below.

- Connection to the mains water supply.
- Connection to a tank (gravity-feed).
- Connection to an external pump (force-feed).

The following requirements must be met for all types of connection.

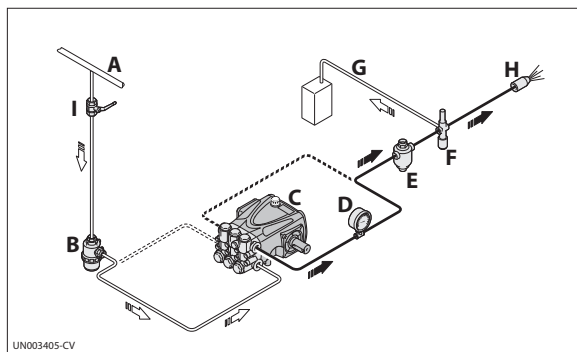
- 1) The pump must be supplied by means of a crush-proof hose of suitable diameter for the pump's intake connection (see "Technical Data").
- 2) There must be no restrictions or kinks in the hose.
- 3) A suitable filter must be installed at the pump intake (see "Technical Data").
- 4) All connections between the unions and the intake line must be sealed to prevent the pump from sucking in air.
- 5) The connections and pipes must be suitable for the operating pressure and the pump delivery rate, and must comply with the relevant regulations.
- 6) To ensure operating safety install a relief valve (by-pass valve) suitable for the pump's technical data and with a suitable setting downstream of the pump.
- 7) The relief valve dump line must never be connected to the pump intake line.
- 8) Install a pressure damper downstream of the pump to minimise the water hammer effect in the delivery pipeline.

Connection to the mains water supply

The connection must comply with the recommendations provided.

- 1) The mains water system must have a flow rate twice the pump's rated delivery rate and a pressure of 2 - 3 bar.
- 2) Adopt all the precautions described in the "General Guidelines on Water Connections" section.

The following is a simplified illustration of the layout for connection of the pump to the mains water supply.



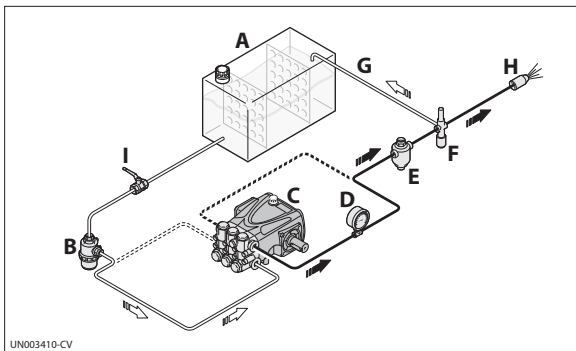
- A)** Mains water supply
- B)** Intake filter
- C)** High pressure pump
- D)** Pressure gauge
- E)** Pressure damper
- F)** Relief valve (by-pass valve)
- G)** Dump pipeline
- H)** Nozzle
- I)** Shut-off valve

Connection to a tank (gravity-feed)

The connection must comply with the recommendations provided.

- 1) The pump must be installed in a position below the tank intake (with positive head).
- 2) The tank must have baffles to prevent water splashes and its capacity must be at least 10 times greater than the pump's rated displacement.
- 3) The vacuum measured directly at the pump intake port must not exceed 0.1 bar and the water temperature must not be above 30 °C.
- 4) Adopt all the precautions described in the "General Guidelines on Water Connections" section.

The following is a simplified illustration of the layout for connection of the pump to a tank.



- A) Tank
- B) Intake filter
- C) High pressure pump
- D) Pressure gauge
- E) Pressure damper
- F) Relief valve (by-pass valve)
- G) Dump pipeline
- H) Nozzle
- I) Shut-off valve

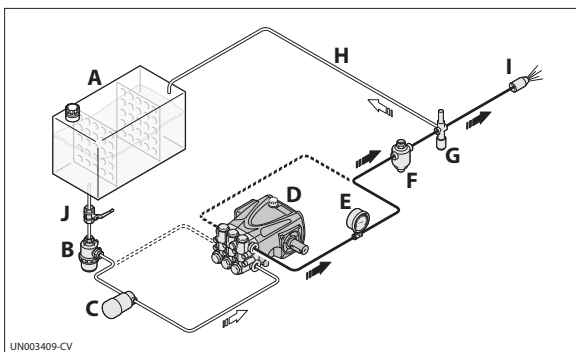
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Connection to an auxiliary pump (force-feed)

The connection must comply with the recommendations provided.

- 1) The auxiliary pump must have a flow rate twice the high pressure pump's rated delivery rate and an operating pressure of 2 - 3 bar.
- 2) Adopt all the precautions described in the "General Guidelines on Water Connections" section.

The following is a simplified illustration of the layout for connection of the pump to an auxiliary pump.



- A) Tank
- B) Intake filter
- C) Auxiliary pump
- D) High pressure pump
- E) Pressure gauge
- F) Pressure damper
- G) Relief valve (by-pass valve)
- H) Dump pipeline
- I) Nozzle
- J) Shut-off valve

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Safety recommendations for use

Before start-up, the operator must perform the necessary safety checks.

In the event of leaks from the pressurised pipes, stop the pump at once and remove the cause of the leak.

Do not operate the pump above the limits set by the manufacturer to increase its performance.

If the system is to be shut down with ambient temperatures close to 0 °C, run the pump without water for 10 seconds with the end of the delivery pipeline open to empty the system and pump of water and prevent ice from forming.

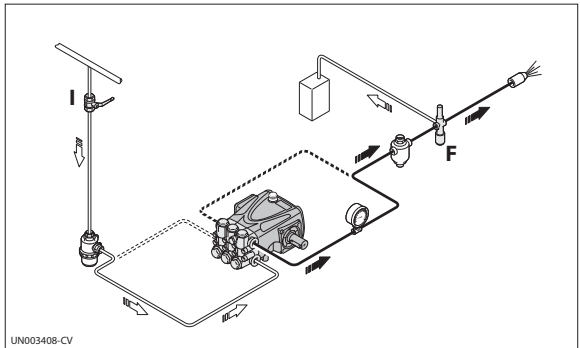
Starting and stopping the pump when supplied by the mains water system

To start the pump, proceed as described below.

- 1) Open the shut-off valve (I).
- 2) Open the by-pass valve (F) to depressurise the delivery pipeline.
- 3) Start the pump and run it for a few minutes with no pressure.
- 4) Adjust the by-pass valve (F) to obtain the pump's operating pressure.

To stop the pump, proceed as described below.

- 1) Open the by-pass valve (F) to discharge the pressure.
- 2) Stop the pump.
- 3) Close the shut-off valve (I).

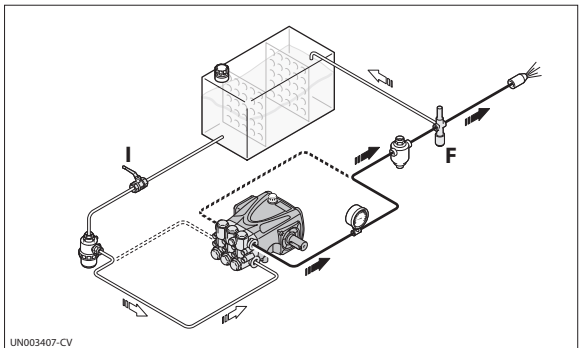

Starting and stopping the pump when supplied by gravity-feed

To start the pump, proceed as described below.

- 1) Open the shut-off valve (I).
- 2) Open the by-pass valve (F) to depressurise the delivery pipeline.
- 3) Start the pump and run it for a few minutes with no pressure.
- 4) Adjust the by-pass valve (F) to obtain the pump's operating pressure.

To stop the pump, proceed as described below.

- 1) Open the by-pass valve (F) to discharge the pressure.
- 2) Stop the pump.
- 3) Close the shut-off valve (I).



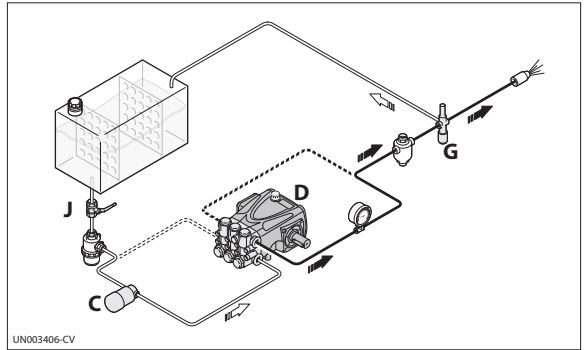
Starting and stopping the pump when supplied by an auxiliary pump

To start the pump, proceed as described below.

- 1) Open the shut-off valve (**J**).
- 2) Open the by-pass valve (**G**) to depressurise the delivery pipeline.
- 3) Start the auxiliary pump (**C**).
- 4) Start the pump (**D**) and run it for a few minutes with no pressure.
- 5) Adjust the by-pass valve (**G**) to obtain the pump's operating pressure.

To stop the pump, proceed as described below.

- 1) Open the by-pass valve (**G**) to discharge the pressure.
- 2) Stop the pump (**D**).
- 3) Stop the auxiliary pump (**C**).
- 4) Close the shut-off valve (**J**).





Safety recommendations for maintenance

Before doing any maintenance work, depressurise the water system and isolate the pump from all energy sources.

When the jobs are done, before restarting the pump, check that no tools, rags or other materials have been left close to moving parts or in hazardous zones.

Replace any excessively worn components with original parts and use the lubricants recommended by the manufacturer.

Dispose of the worn-out components and lubricants in accordance with the relevant statutory requirements.

Carry out the routine maintenance procedures specified by the manufacturer to keep the pump safe and performing well.

Scheduled service table			
Frequency	Component	Procedure	Reference
Every working day	Filter	Inspect filter cartridge	See "Inspecting the filter"
	Pump	Oil level check	See "Checking the oil level"
Every 50 working hours	Connection of pump to power source (pulley, belt, coupling)	Inspection	-
	Pump	Inspect mounting	See "Inspecting the pump mounting"
	Pipes and connections	Inspection	See "Inspecting the connections and pipes"
	Pump	Oil change (1)	See "Changing the oil"
Every 500 working hours or every year	Pump	Oil change	See "Changing the oil"
Every 1000 working hours	Pump gaskets	Replacement	Contact an authorised service centre
	Valves	Replacement	Contact an authorised service centre

(1) This interval refers to the first oil change only



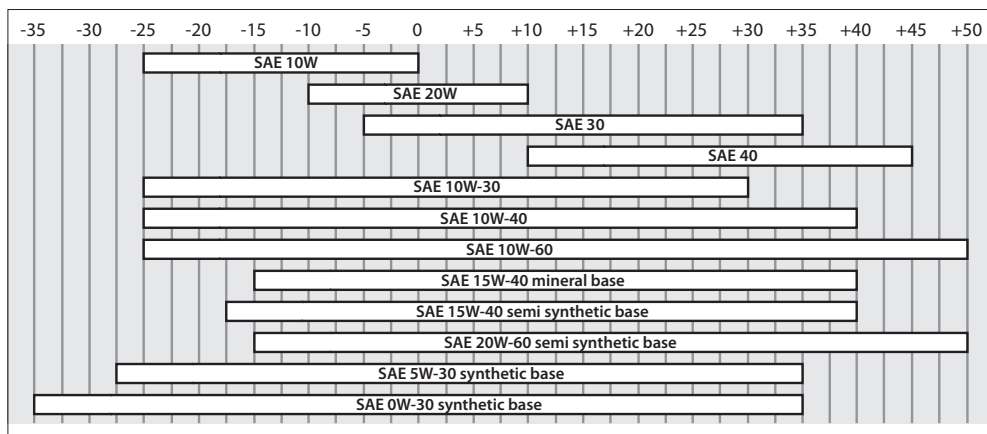
Table of lubricants

The pump is delivered complete with oil, with the characteristics stated on the data plate.

When changing the oil, use an oil suitable for conditions in the operating environment (see recommendations provided in the annexes and see "Environmental operating limits").

The correct lubricating oil viscosity depends on the external temperature.

Use the graph to select the degree of viscosity best suited to the temperatures of use.



Inspecting the pump mounting

Check that the pump's fixing screws have not become loose.

If necessary, tighten them with the driving torque stated in the installation design.

Inspecting the connections and pipes

- Inspect the connections for leaks.

Leaks can normally be dealt with by tightening the connections properly.

If leaks from the intake pipeline connections are noticed, the seals must be repaired.

- Inspect the hoses.

If the pipes show signs of aging, breakage, swelling, rubbing, etc., they must be replaced.

Inspecting the Filter

- Inspect the filter cartridge.

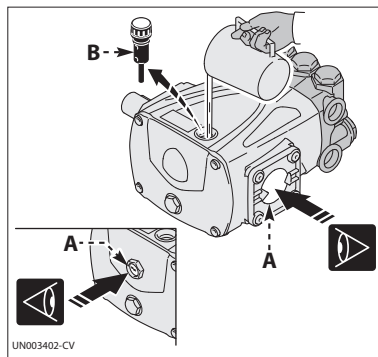
If the filter cartridge is fouled or damaged, refer to the filter manufacturer's instructions for details of how to restore the filter cartridge to its original filtering condition.

Checking the oil level

- Check the oil with the pump level and cold.
- Check the amount of oil through the level gauge (A).
- If necessary, top up with oil with the characteristics specified in the "Lubricants table".

To top up with oil proceed as described below.

- 1) Unscrew the plug (B) and pour oil in until it is halfway up the level gauge (A).
- 2) Screw on the plug (B).



Changing the oil

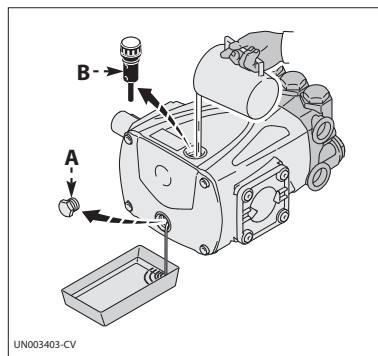
Position the machine in which the pump is incorporated perfectly level, with the pump slightly warm.

Do not release oil into the environment.

Dispose of spent oil in accordance with statutory requirements.

To change the oil, proceed as described below.

- 1) Position a receptacle of suitable capacity to collect the spent oil.
- 2) Unscrew the drain plug (A) and allow all the oil to flow out.
- 3) Screw on the drain plug (A).
- 4) Unscrew the filler plug (B).
- 5) Pour in the fresh oil through the filler hole until the correct level is reached (see "Checking the oil level").
- 6) Screw on the filler plug (B).





Lengthy pump lay-offs

If the pump is to be unused for a long time, proceed as described below.

- 1) Run the pump with clean water for a few minutes.
 - 2) Operate the pump without water for 10 seconds with the end of the delivery pipeline open to empty the pump and the delivery circuit and prevent scaling.
 - 3) Flush the pump with water and solvents authorised by the relevant laws.
 - 4) Dry the pump with a pressurised air jet.
 - 5) Protect the pump from weather.
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Putting the pump back into service

Before putting the pump back into service after a long period out of use, check the oil level and the tightness of the mounting screws.

Scrapping the pump

The pump must be scrapped by skilled staff, in compliance with the statutory requirements on occupational safety.

The dismantled components must be sorted by the type of materials from which they are made. Do not dump pollutants such as seals and lubricants in the environment.

Dispose of them in accordance with statutory requirements with regard to waste disposal and recycling.



The information provided is intended to provide guidance on how to deal with malfunctions which may occur during use.

Some of these procedures may be carried out by skilled staff, while others have to be performed at specialised service centres since they require the use of specific equipment as well as detailed knowledge of repair operations.

Problem	Cause	Remedy
Pump does not reach the specified pressures	Pump sucking air	Restore the tightness of the intake line
	Intake flow rate insufficient	Increase the size of the intake pipelines
		Remove any kinks from the pipes
		Increase the filter capacity or clean the filter cartridge
		Increase the rpm to the rated speed
	Worn intake and delivery valves	Replace the valves (1)
	By-pass valve seat worn	Replace the valve
	Worn gaskets	Replace the gaskets(1)
Unsuitable, worn nozzle	Replace nozzle	
Irregular variations in pressure	Worn intake and delivery valves	Replace the valves (1)
	Valves blocked by dirt	Clean the valves (1)
	Air being sucked into system	Restore the tightness of the intake pipeline connections
	Worn gaskets	Replace the gaskets(1)
Vibrations on pipes	Valves jammed	Replace the valves (1)
	By-pass valve malfunction	Replace the by-pass valve
	By-pass valve dump line too small	Increase size of by-pass valve dump line
	Pressure damper flat	Restore pressure damper to correct inflation pressure
	Pump sucking air	Restore the tightness of the intake line
Pressure drop	Nozzle worn	Replace nozzle
	Worn intake and/or delivery valves	Replace the valves (1)
	Valves blocked by dirt	Clean the valves (1)
	By-pass valve seat worn	Replace the valve
	Worn gaskets	Replace the gaskets (1)

(1) Operations which must be carried out at an authorised service centre



Problem	Cause	Remedy
Pump noisy	Air being sucked into system	Restore the tightness of the intake pipeline connections
	Intake and/or delivery valve springs broken or collapsed	Replace the valves (1)
	Valves blocked by dirt	Clean the valves (1)
	Worn bearings	Replace the bearings(1)
	Intake liquid temperature too high	Reduce liquid temperature
Pump overheating	High pump operating pressure	Reduce the pressure to the rated values
	Drive belts too taut	Restore correct belt tension
	Pulley or drive coupling alignment poor	Restore the correct alignment
Water in oil	Guide piston gaskets worn	Replace the gaskets(1)
	High humidity percentage in air	Change the oil twice as often (than stated in "Routine Maintenance" table)
	Worn gaskets	Replace the gaskets(1)
Oil leaks from dump lines underneath the pump	Worn gaskets	Replace the gaskets(1)
	Worn pistons	Replace the pistons(1)
Oil leaks from dump lines underneath the pump	Guide piston gaskets worn	Replace the gaskets(1)

(1) Operations which must be carried out at an authorised service centre