Installation guide

Large CO_2 Ejector

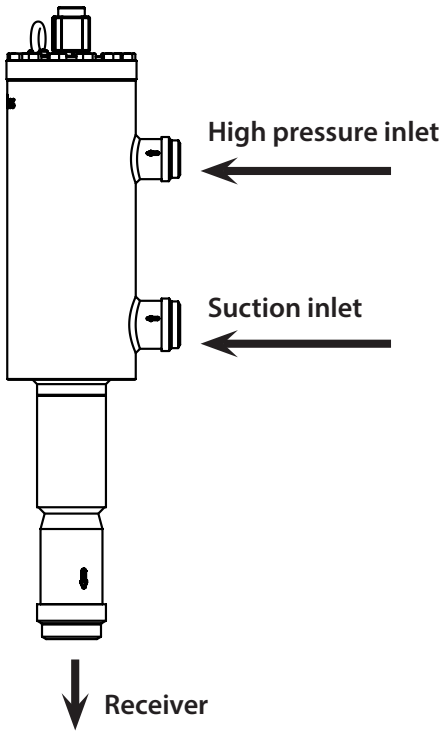
Type LP and HP

089

032R9789

Refrigerant: R744 with POE or PAG oil	**Max. Working Pressure:** 140 bar / 2031 psi	**Media temp. range:** -30 °C – +50 °C / -22 °F – 122 °F
Ambient temp. range: -30 °C – +50 °C / -22 °F – 122 °F		**Max. OPD:** 90 bar / 1305 psi **Min. OPD:** 1 bar / 14.5 psi

Connector positions



WARNING!

Large Ejector is approved for use only with Danfoss EKE 80 Ejector controller.

DISCLAIMER

Danfoss expressly disclaims any responsibility or liability, whether based on contract, breach of warranty, tort, statute or otherwise, shall be excluded, if the HP/LP ejector is used with any controller other than the Danfoss EKE 80 Ejector controller**.**

For further information on EKE 80, please see separate document.

WARNING!

- **Do not disassemble / assemble the parts unnecessarily to avoid risk of breaking the O-ring, dirt in the valve etc.**
- **Avoid high mechanical stress in connection with tube mounting / welding**

General installation

- The ejector is designed to withstand a high internal pressure. However, the piping system should be designed to avoid liquid traps and reduce the risk of hydraulic pressure caused by thermal expansion. It must be ensured that the valve is protected from pressure transients like "liquid hammer" in the system
- Avoid that the ejector is exposed to dynamic stresses from vibrations and thermal loads
- It is recommended to place shut-off valves on all 3 connections and a filter before the suction inlet
- The ejector is foreseen with a built-in motive flow filter to catch dirt particles from the high-pressure side
- When handling the product, precautions must be taken to ensure that the armature tube is protected from shock, impact, etc. The armature tube must be inspected before installation. If it is damaged, please replace with a new one
- Use only original Danfoss parts, including O-rings and gaskets for replacement. The materials of new parts are certified for the relevant refrigerant. In cases of doubt, please contact Danfoss
- Drawings are for illustration purposes only must not be used for dimensioning or construction

Follow the steps below before starting up the ejector:

1. Weld the ejector housing connections into the system piping
2. Install the top cover if it was not installed before welding. Do not install the cartridge yet
3. Pressurize the ejector housing with inert gas to perform a pressure strength and leak-tightness test of the system
4. Release the pressure after the test and open the top cover
5. Install the cartridge and reinstall the top cover
6. Energize the coil to open the solenoid valve
7. Evacuate (vacuum) the system
8. Pressurize the ejector from the suction side first (suction inlet). The suction pressure will be present at all inlets. Next, open the outlet to allow receiver pressure to build up in the entire ejector

Evacuating the ejector is recommended to do on the outlet side and the high-pressure side. In case it is done at the high-pressure side, please keep the solenoid valve open. Alternative also on the suction inlet.

Mounting

The top cover of Large Ejector can be turned 90° in any direction (*See Fig. 2*) without any influence on the valve function. There are no requirements for the position of high pressure inlet and suction inlet.

The valve must be installed with the arrow in the direction of the flow. Minimum 370 mm of free space should be left for service on the cartridge (*See Fig .1*).

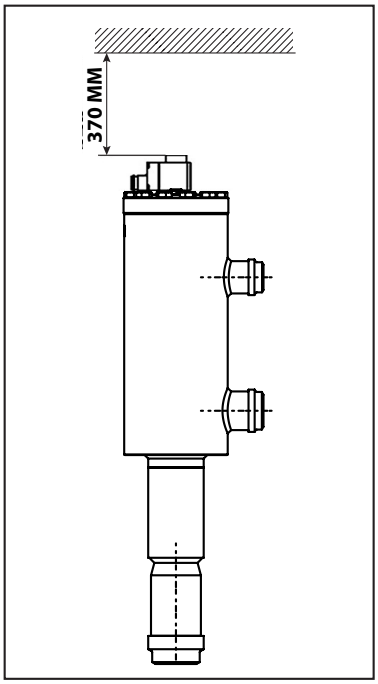


Fig. 1: Service on the cartridge

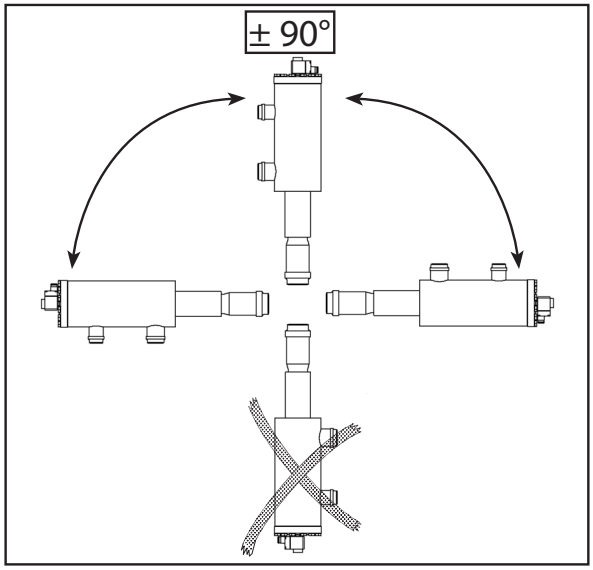


Fig. 2: Mounting position

Welding

Internal parts of the ejector should not be assembled prior welding. Make sure that no dirt and welding debris get into the valve during the welding procedure. The valve should be cleaned internally to remove welding debris on completion of welding and before the valve is reassembled. Avoid welding debris and dirt in the threads of the housing and the bonnet. The valve housing and connectors must be free of stresses (external loads) after installation.

Ejector connections are designed for butt weld.

Only materials and welding methods, compatible with the valve body material, can be welded to the valve housing.

The ejectors must not be mounted in systems where any of the connections stay open to the atmosphere. The outlet side of the valve must always be connected to the system or properly plugged, for example with a welded-on end plate.

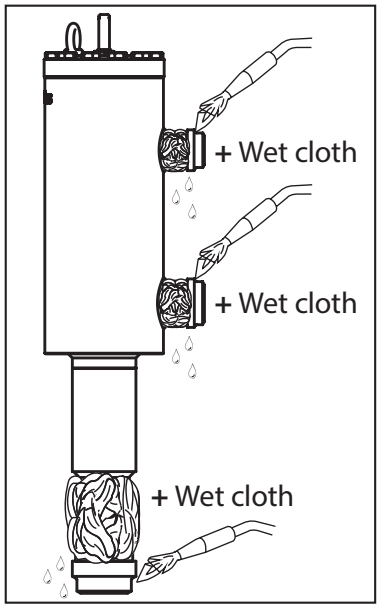


Fig. 3: Butt weld connections

Removing the top cover

1. Make sure all pressure inside the ejector is released prior to opening the ejector
2. Loosen the 12 bolts but leave minimum 2 bolt engaged with minimum 10 mm thread, since a spring will try to push out the top cover (1)
3. If the top cover for some reason is not loose by now, the top cover (1) can now be loosened from the valve body (3) by the careful use of 2 screwdrivers
4. Check that the top cover is fully loosened from the valve body, which ensures that any residual pressure has been relieved
5. The remaining engaged bolts can now be unscrewed fully
6. The top cover (1) can now be lifted out and removed from the ejector valve body (3). The top cover should be stored at a safe place, to prevent the armature assembly (4) from being damaged. Ensure two o-rings (2a and 2b) stay in the top of the valve body (3) and they are protected from being damaged or contaminated. If the Ejector was exposed to CO_2 refrigerant, the O-rings should be replaced with new ones

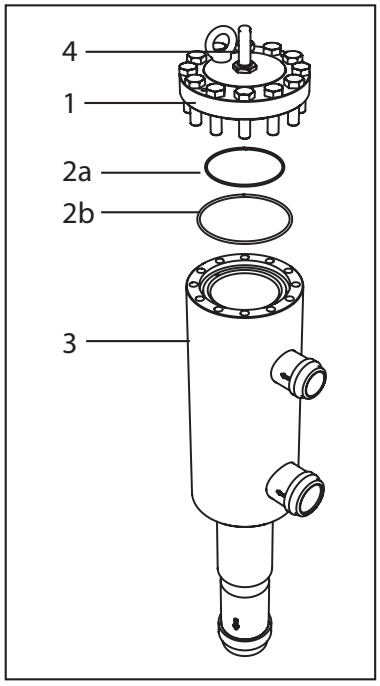
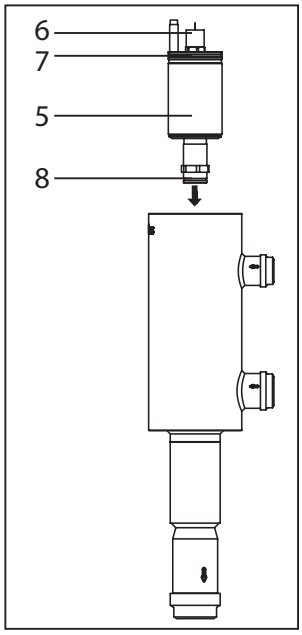


Fig. 4: Removing the top cover

Assembly of cartridge into the ejector valve body

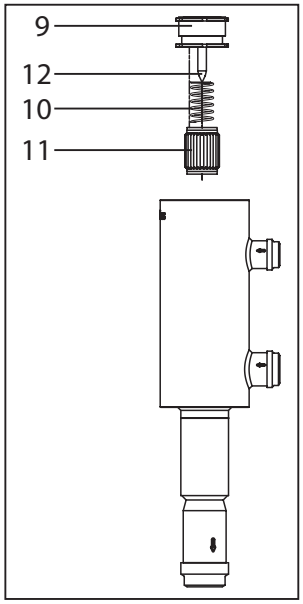


Remove welding debris and any dirt from pipes and valve body before assembly. Check that the external O-rings of the ejector cartridge (7 and 8) are intact before replacing the cartridge (5). If they are damaged, they must be replaced. Apply some PAG or POE refrigeration oil to ease the insertion and to protect the O-rings.

Take the cartridge and be sure the O-rings (7 and 8) are aligned to the ejector valve body. Then carefully push the cartridge into the valve body. Please make sure the cartridge is moved into position and be careful to keep the cartridge centred into the valve body to avoid the O-ring being scratched or damaged.

Fig. 5: Assembly of the cartridge into the HP/LP valve body

Assembly of needle piston assembly and filter into the ejector valve body



Place the spring (10) and the filter insert (11) into the ejector valve body. Welding line of the filter strainer must match with the cartridge pin, as shown on Fig. 7. Apply some refrigeration oil into the ejector valve body to ease the insertion of the needle piston assembly.
Carefully slide the needle piston assembly (9) into the valve housing and push it carefully inside the ejector valve body until it cannot slide further.

Note: make sure, the needle (12) is not scratched or damaged during mounting. Don't push the piston itself but only the cylinder. If the piston itself is used for pushing the needle piston assembly into the valve body, the needle is extracted and can be damaged when it's hitting the orifice (6 - *See Fig. 5*).

Fig. 6: Assembly of needle piston assembly and filter

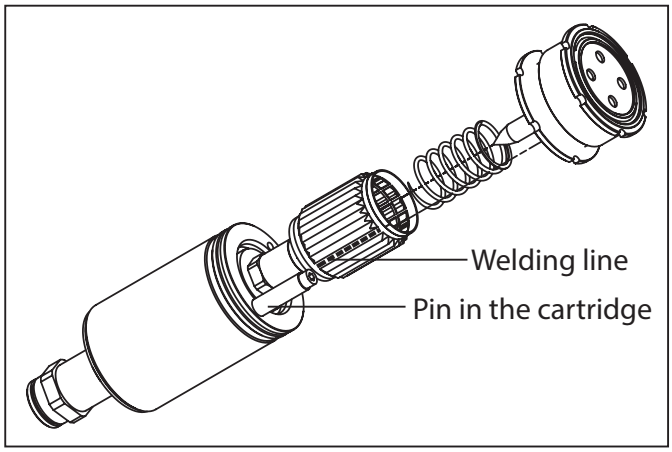


Fig. 7: Filter assembly in valve body with cartridge

Assembly of top cover

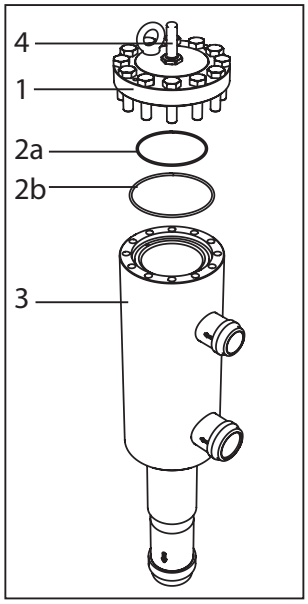


Fig. 8: Assembly of top cover

Check that the two O-rings (2a and 2b) of the top cover (1) are intact. If possible, apply some refrigeration oil to ease the insertion and to protect the O-rings. If the O-rings are damaged, they must be replaced. Place the 2 O-rings into the grooves of valve house top and push the top cover into the valve body. The top cover can be pushed further into the valve body while tightening the bolts.

Tightening

Tighten the bolts cross wise to enable a smooth vertical push of the top cover until the topcover is fully attached, then apply 100 Nm to the bolts. Tighten the bolts cross wise / diagonally.

Colours and identification

The HP/LP housing is painted with a green primer and the top cover is Zinc-Chromated from factory.
The Zinc-Chromatization does not cover the welding connections. If further corrosion protection is required, the valves can be painted.

The external surface of the valve housing must be protected against corrosion with a suitable top coating after installation involving welding and consequent assembly. Protection of the ID plate when painting the valve is recommended.

Maintenance

Do not open the ejector while the valve is still under pressure.

The filter of the ejector, the needle piston assembly and the armature tube can be cleaned or replaced. The cartridge and the needle piston assembly can be disassembled for service purposes. Only skilled and trained refrigeration engineers are allowed to service the HP/LP valves.

De-energize the coil and close the high-pressure inlet line from the gas cooler with a stop valve (1) Then close the stop valve (2) on the suction port. Pressure relief can be done by energizing the coil or using a manual hand magnet. The motive pressure from the inlet will be released to the outlet pressure. The ejector now is under intermediate pressure (outlet pressure). Close the stop valve on the outlet side (3) and evacuate the pressure with service valves (4 and 5) as indicated.

Make sure only gas is inside the ejector when putting out the CO_2, otherwise, dry ice will occur.

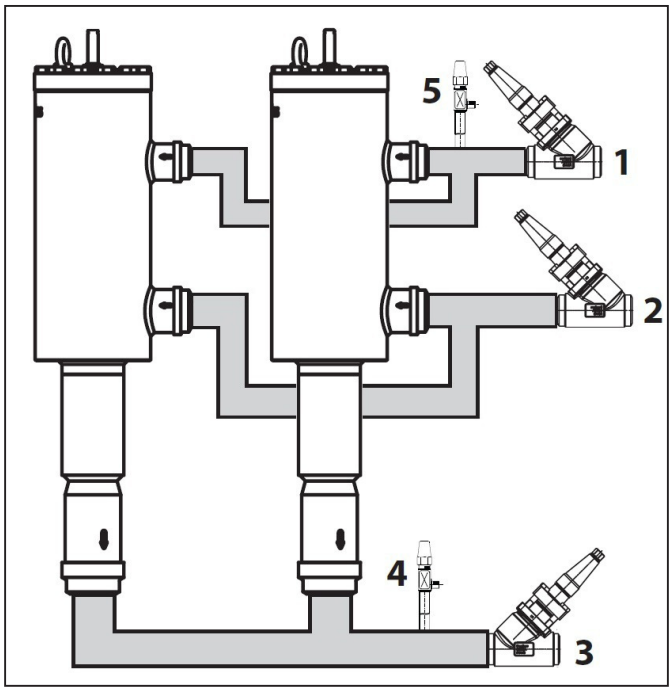


Fig. 9: Large Ejector maintanance. Application example with two ejectors in parallel

WARNING! **Do not disassemble / assemble the parts unnecessarily to avoid risk of breaking the O-ring, dirt in the valve etc.**

Removing the internal parts: the cartridge, the needle piston assembly and the filter

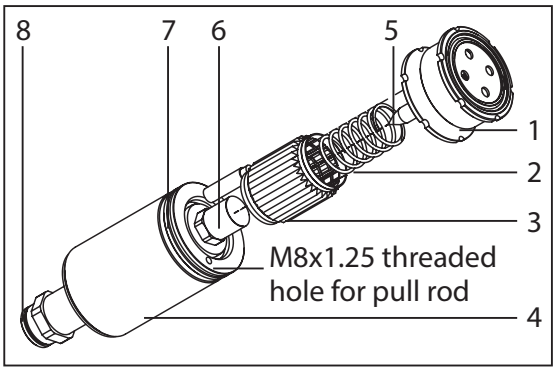


Fig. 10: Internal parts of the HP/LP Large Ejector

To remove the top cover, follow the disassembly procedure on page 3 ("Removing the top cover").
Carefully pull out the complete needle piston assembly from the ejector valve body.
The needle (5) of the needle piston assembly (1) is fitting the orifice (6). Both the needle and the orifice need to be protected from damage during dismounting the ejector and during storage while servicing. The needle must not touch any surface and must be protected from being scratched or damaged.
Then remove the replaceable filter (3) and the spring (2).
The cartridge (4) can now be removed. Carefully grab the orifice (6) and firmly pull the cartridge in a straight line out of the valve body. Don't use a spanner to grab the orifice because it could be damaged. Some friction might be felt due to the O-rings (7 and 8).

Optionally: In case the cartridge cannot be taken out with a hand, it can also be pulled out from the valve body by screwing a long M8x1,25 bolt or threaded rod in the cartridge (4) top. The other side of the M8x1.25 pull rod can be carefully propped up with a flat plate and nut against top of the valve body. Then lifted up by screwing in the nut.

If the cartridge is to be left disassembled for even a short period, please ensure that they are further protected by placing in a polyethylene bag or by applying a rust protection agent (e.g. PAG or POE refrigeration oil on the surfaces).

IMPORTANT

The HP/LP ejector works with the servo valve principle. When the coil is energized, the anker inside the armature is lifted. The pressure above the main piston will be equalized to the outlet pressure and the main piston is moving upwards, the ejector is open. This takes 1 – 3 seconds depending on the system condition. When the coil is de energized the anker will drop and the pressure above the piston is equalized to the pressure under the piston, the piston will move down, the ejector is closed. This takes 1 – 3 seconds depending on the system condition.

It's important that the opening and closing of the ejector piston is taking place slowly to avoid possible liquid hammer. The mechanical dampening during opening can be enlarged by using the Danfoss EKE 80 Ejector controller.

The power signal to the coil can be electronically manipulated, so there is extra delay possible during opening and closing.

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