Danfoss PMC 1,PMC 3 Pilot Operated Servo Valve Installation Guide

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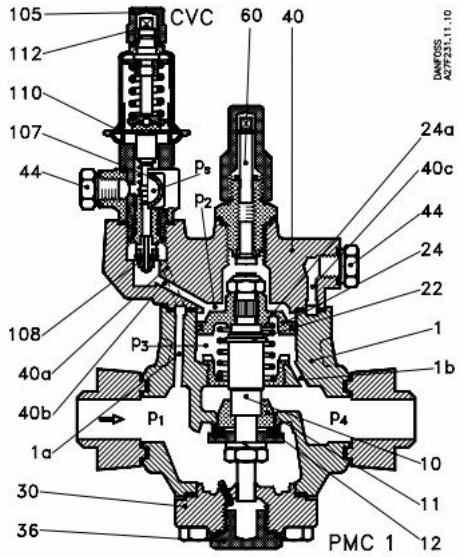
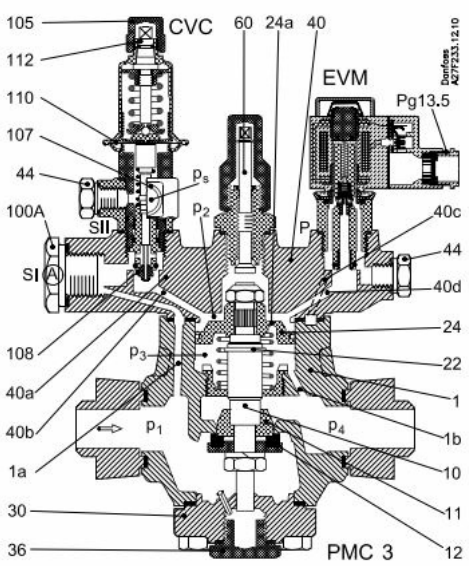
Installation Guide

Pilot operated servo valve PMC 1 / PMC 3



1 PMC 1 + CVC



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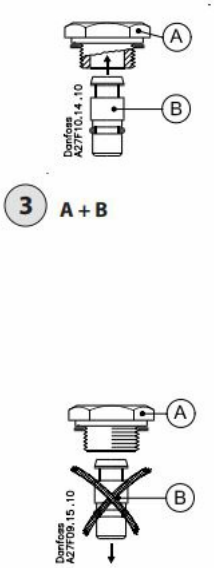

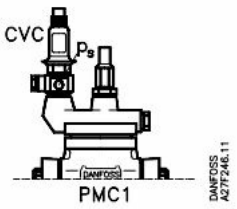

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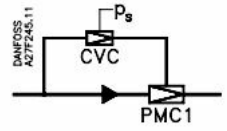

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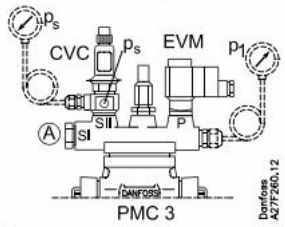
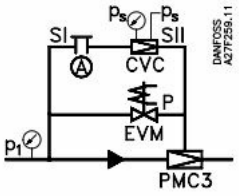


7 PMC 3 + A + CVC + EVM



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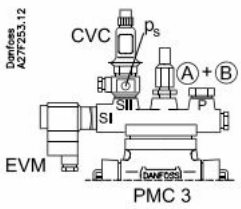

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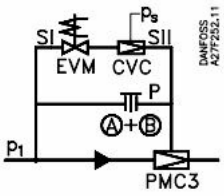
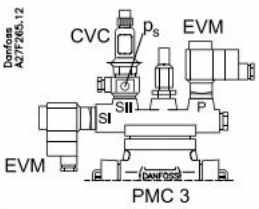


10 PMC 3 + EVM + CVC + A + B



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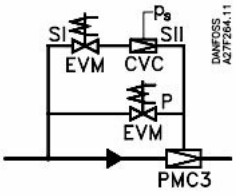
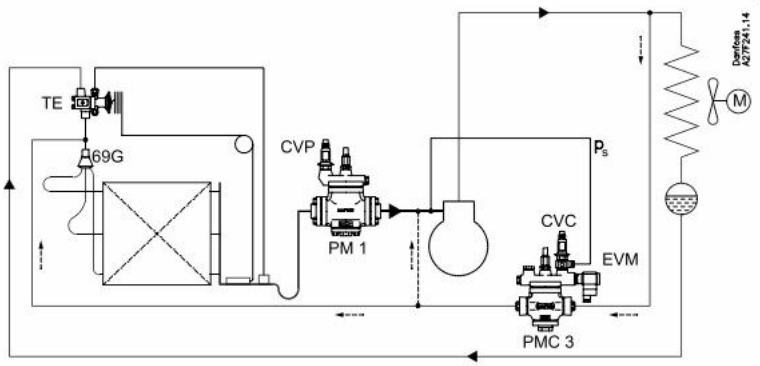


12 PMC 3 + EVM + CVC + EVM



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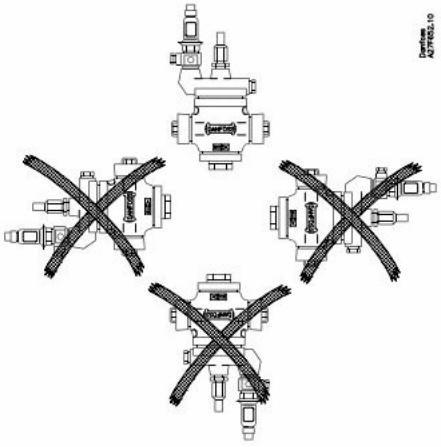

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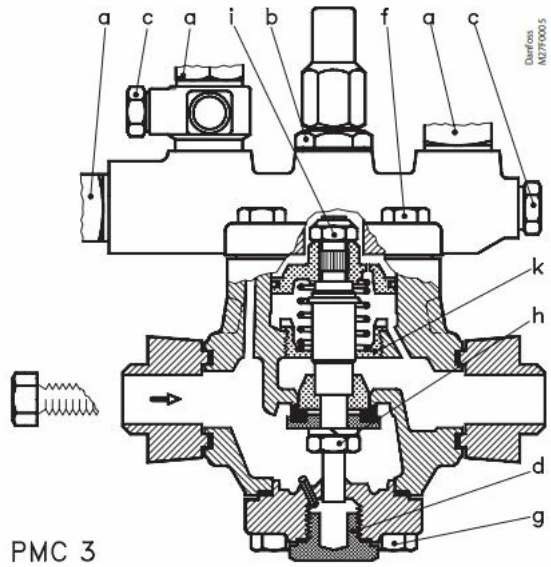

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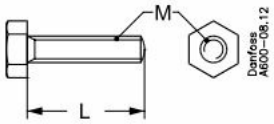

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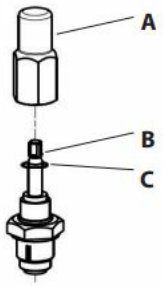

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Pos. Item	Tightening Torque in Nm (1 Nm = 0.74 lb force ft)			
	PMC 1/PMC 3 Size			
	5	8	12	20
a	50			
b	50			
c	30			
d	50			
f	40			
g	40			
h	35			
i	30			
k	60			

Table 1

Pilot-controlled capacity regulators Main valves

Contents

Design

See figs. 1 and 2.

- 1. Valve body
- 1a. and 1 b. Channels in valve body (1)
- 10. Pressure rod
- 11. Throttle cone
- 12. Valve seat
- 22. Locking ring
- 24. Servo piston
- 24a. Equalising hole in servo piston
- 30. Bottom cover
- 36. Drain plug
- 40. Cover
- 40a. b, c and d. Channels in cover (40)
- 44. Seal plug for manometer connection
- 60. Manual operating spindle
- 100. Seal plug
- 105. Seal cap
- 107. Signal line connection
- 108. Pilot or ice
- 110. Diaphragm
- 112. Setting spindle

Refrigerants

Applicable to HCFC, HFC and R717 (Ammonia). Flammable hydrocarbons are not recommended. The valve is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range

PMC 1/PMC 3: 60/+120°C (76/+248°F)

Pressure range

PMC 1/PMC 3: The valves are designed for a max. working pressure of 28 bar g (406 psi g).

Technical data

PMC 1 and PMC 3 are used in hot-gas lines. PMC 1 controls the capacity with modulation depending on the control impulse of the connected CVC pilot valve. See figs. 1, 5 and 6. At a drop in pressure ps in the signal line the diaphragm, 110, activates the pressure pin in the pilot orifice, 108, which opens. This results in a rise in pressure across the servopiston, 24, and PMC 1 opens. At a rise in pressure ps in the signal line PMC 1 closes. It must not be possible to block the signal line. PMC 3 controls the capacity with modulation depending on the control impulses of the connected pilot valves. See figs. 2 and 7 through 12. The CVC pilot valve must always be fitted in SII. Depending on where the EVM pilot valves are fitted, the following three functions can be obtained:

1. Plug A in SI, CVC in SII, EVM in P: Modulating capacity control combined with valve open override. See figs. 7

and 8.

2. EVM in SI, CVC in SII, plug A+B in P: Modulating capacity control combined with valve closed override. See figs. 9 and 10.
3. EVM in both SI and P, CVC in SII: Modulating capacity control combined with valve open and valve closed override. See figs. 11 and 12.

The PMC 1/PMC 3 has three connections for pilot valves: two in series, marked “S I” and “S II”, and one in parallel with these two, marked “P”, see figs. 1 and 2.

Schematic examples of pilot valves connected to the PMC 1/PMC 3 can be seen in figures 6, 8, 10, and 12.

If only two pilot valves are necessary for the function required, the third pilot connection must be sealed with a blanking plug (see fig. 5 and 7). A blanking plug is supplied with the valve.

Regulation range

Regulation range	Depends on the pilot valve. The CVC pilot valve is supplied with the regulation range pe = 0.45 bar to +7 bar
Proportional band	Approx. 0.2 bar

Installation

Flange set for the PMC 1/PMC 3 is delivered separately. The valve must be installed with the arrow in the direction of the flow and the top cover upwards (fig. 14). The top cover can be rotated 4 × 90° in relation to the valve body. The accompanying gaskets for CVC must be fitted before mounting in SII. The O-ring must be lubricated with refrigeration oil. The valve is mounted in a bypass between the high and low-pressure sides of the compressor with flow in the direction of the arrow and the top cover facing upwards. See fig. 13. The signal line is connected to the suction line between evaporator and compressor. If an evaporating pressure regulator is used, the signal line is connected between regulator and compressor. If it is chosen to induce the hot gas into the suction line between evaporator and compressor it may be necessary to safeguard against excessive discharge tube temperatures by injecting liquid into the suction line, e.g. by means of the thermostatic injection valve type TEAT. Type PMC is equipped with a spindle, 60, for manual opening.

Setting

When the seal cap, 105, has been removed, the regulator can be set. Turning the setting spindle, 112, clockwise will tighten the spring and the regulator will begin to open at a higher suction pressure. One turn ~1.5 bar. The valve 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.

Mounting of valve flanges

When welding/soldering the flanges to the system piping use only materials and welding/soldering methods compatible with the flange material.

- Make sure that piping into which a valve/ flange is installed is properly supported and aligned square and plumb to the joining sections. · Ensure that the finalized valve assembly is free of any stresses from external

loads.

- Make certain that the heat affected zones (inside and outside) and the mating surfaces of gasketed joints are free of debris and rust and are in good condition.
- Use only new gaskets manufactured by Danfoss.
- Make sure that the bolts are adequately tightened in an alternating pattern.
- Use only original Danfoss stainless steel bolts provided with the valve. Stainless steel bolts offer corrosion protection and they ensure safe operation across the design operating range of the valve when installed properly.

  Note: Stainless steel bolts have a slightly lower yield strength compared to carbon steel bolts. Be careful not to over-tighten the bolts.
- Ensure that flanges / valves are properly pressure tested, leak tested, evacuated before charging with refrigerant in accordance with ANSI /IIAR 5, EN378-2 or ISO 5149-2.

PMC 1/PMC 3 valves must not be mounted in systems where the outlet side of the valve is open to atmosphere. The outlet side of the valve must always be connected to the system or properly capped off, for example with a welded-on end plate.

Colours and identification
The PMC 1/PMC 3 valves are ZincChromated in the factory. If further corrosion protection is required, the valves can be painted. Precise identification of the valve is made via the ID plate on the top cover. The external surface of the valve housing must be prevented against corrosion with a suitable protective coating after installation and assembly. Protection of the ID plate when repainting the valve is recommended.

Maintenance

Service
The PMC 1/PMC 3 valves are easy to dismantle and most of its parts are replaceable. Do not open the valve while the valve is still under pressure.
– Check that the O-ring has not been damaged.
– Check that the spindle is free of scratches and impact marks.
– If the Teflon ring has been damaged, the parts must be replaced.

Assembly
Remove any dirt from the body before the valve is assembled. Check that all channels in the valve are not blocked with articles or similar.

Tightening
Tightening torques See fig. 15 and table I.

Note: Always pay attention to the spindle during operation of the manual opener (see fig.17)

1. Make sure that the C-clip (C) is positioned on the spindle (B) and is intact. A new C-clip is available in the inspection kit for the valve.
2. Pay attention to the C-clip reaching the top nut of the packing gland when turning the manual stem clockwise for opening the valve. Never use excessive torque and stop turning when the C-clip gets in contact with the top nut.
3. When turning the spindle (B) anticlockwise, for deactivation of the manual opener, to the top point, tighten the spindle further anticlockwise to 8 Nm (5.9 lb/ft) torque.
4. Remount the cap (A) and tighten it clockwise to 8 Nm (5.9 lb/ft) torque.

Use only original Danfoss parts, including packing glands, O-rings and gaskets for replacement. Materials of new parts are certified for the relevant refrigerant.

In cases of doubt, please contact Danfoss.
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The following text is applicable to the UL listed products PMC 1 and PMC 3 Applicable to all common non-flammable refrigerants, including/excluding (+) R717 and to non-corrosive gases/ liquids dependent on sealing material compatibility (++). The design pressure shall not be less than the value outlined in Sec. 9.2 of ANSI/ASHRAE 15 for the refrigerant used in the system. (+++).

Danfoss can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without sub sequential changes being necessary in specifications already agreed.

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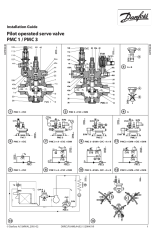
Documents / Resources

	Danfoss PMC 1,PMC 3 Pilot Operated Servo Valve [pdf] Installation Guide 027R9610, M27F0005, PMC 1 PMC 3 Pilot Operated Servo Valve, PMC 1 PMC 3, Pilot Operated Servo Valve, Operated Servo Valve, Servo Valve

References

- User Manual