MAKING MODERN LIVING POSSIBLE

Collection of Instructions

Instructions for Danfoss
Refrigeration & Air conditioning Controls

REFRIGERATION &
AIR CONDITIONING DIVISION

Catalogue

Contents

Pressure and temperature regulators & water valves

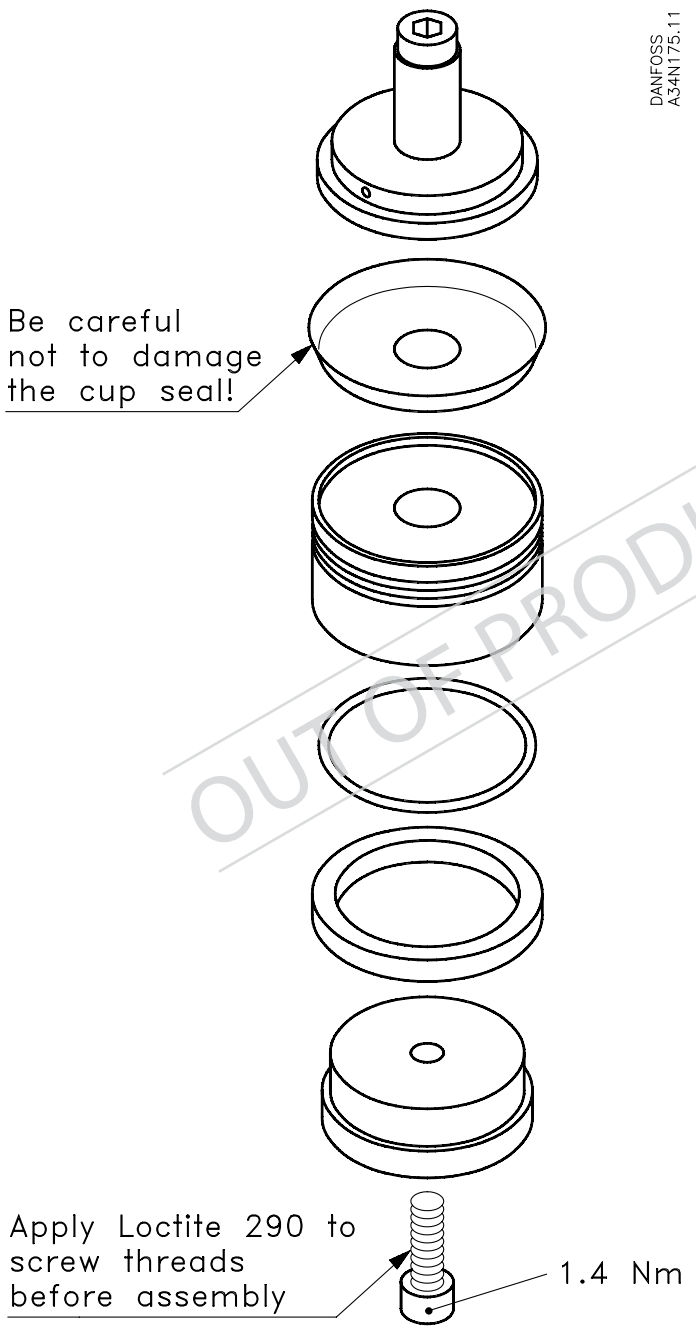
Instructions

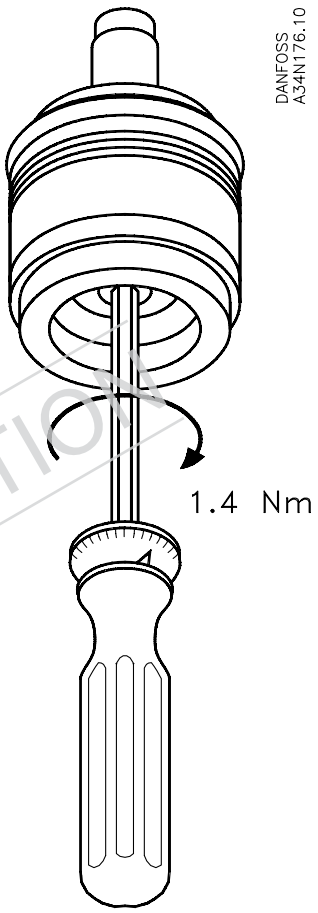
PKV, PKVS, PKVD

Cup seal

034R9503

034R9503



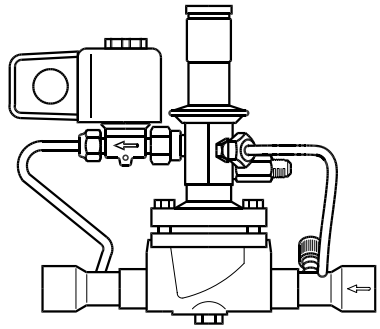


Instructions

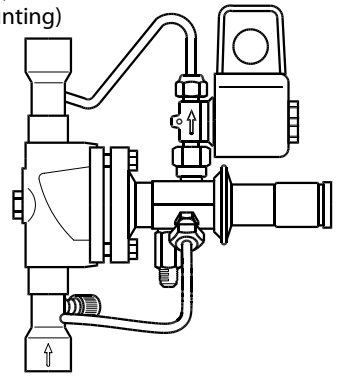
Evaporating pressure regulator PKV, PKVS

034R9774

Identification
(Horizontal mounting)

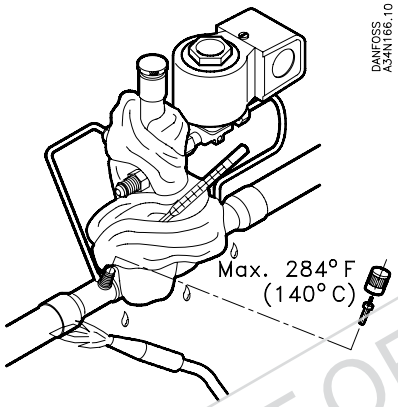


Identification
(Vertical mounting)



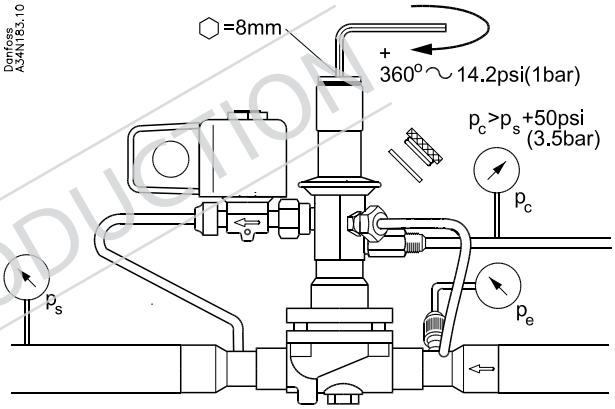
034R9774

Mounting

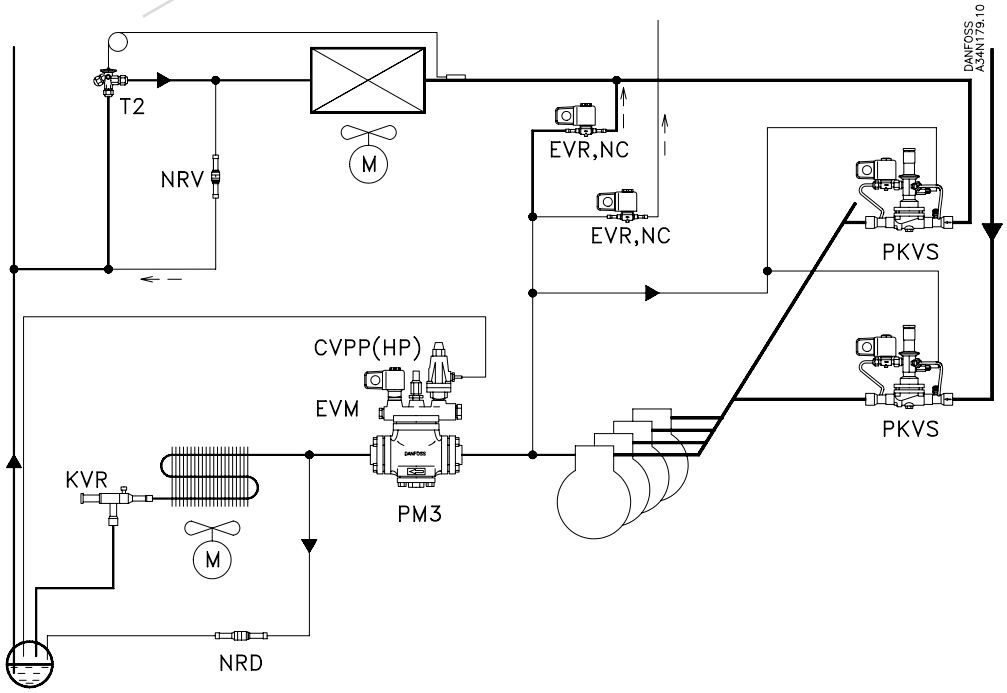


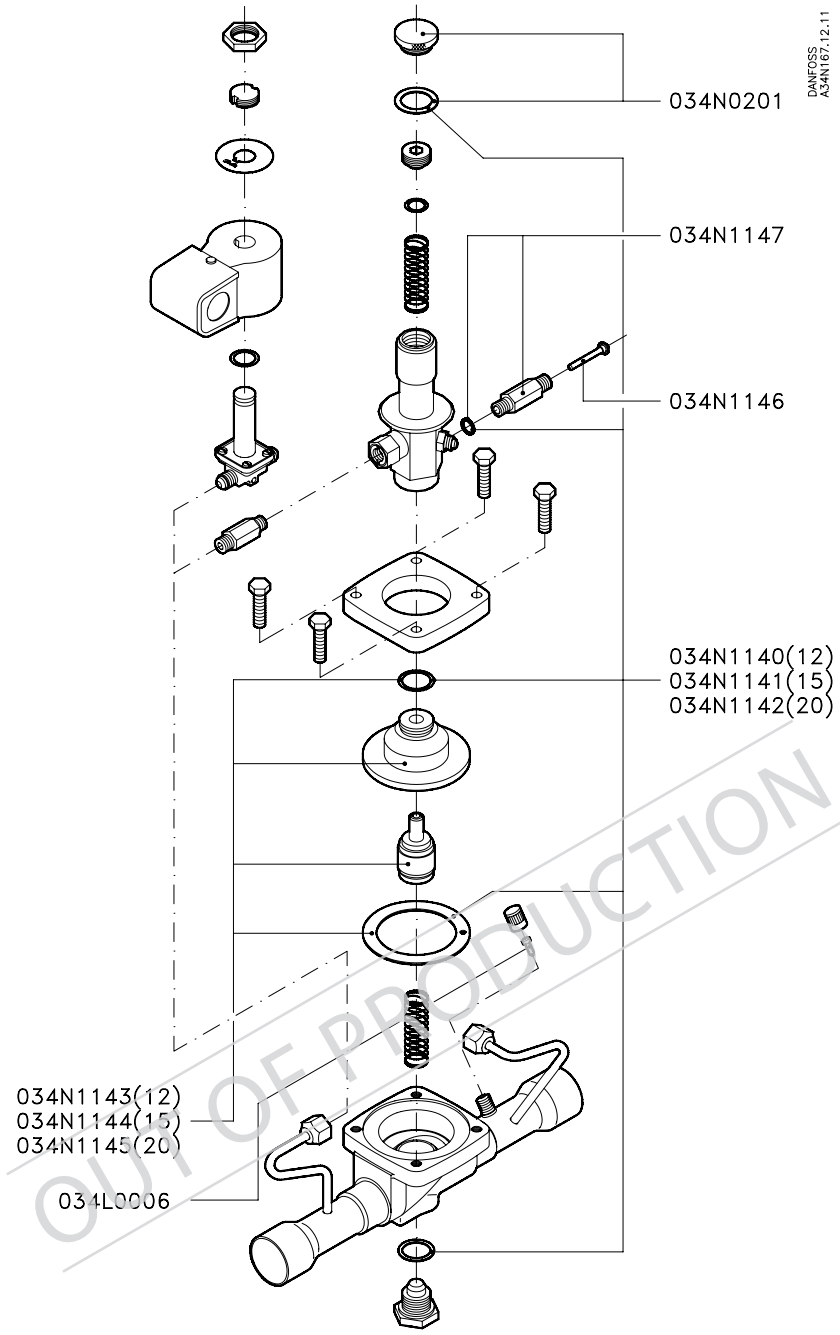
The Schräder valve is to be installed after mounting

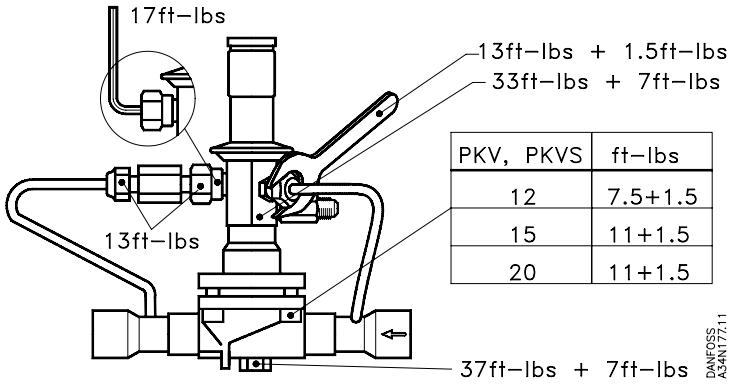
Adjusting



Application



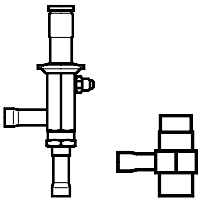




PKV, PKVS	ft–lbs
12	7.5+1.5
15	11+1.5
20	11+1.5

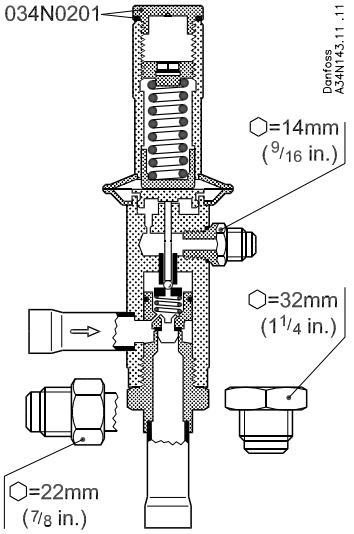
Instructions

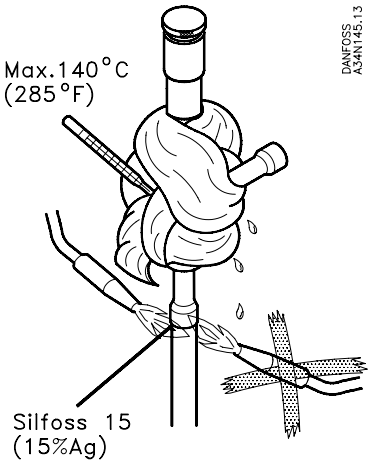
CPCE + LG

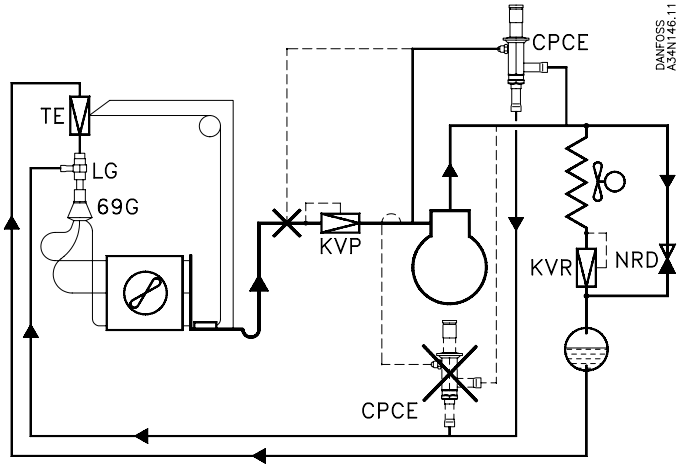


034R9507

CFC, HCFC, HFC





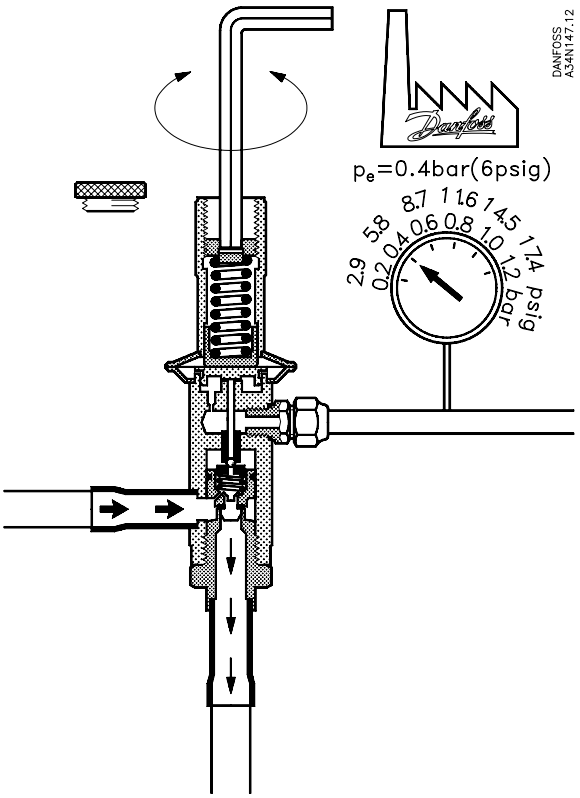


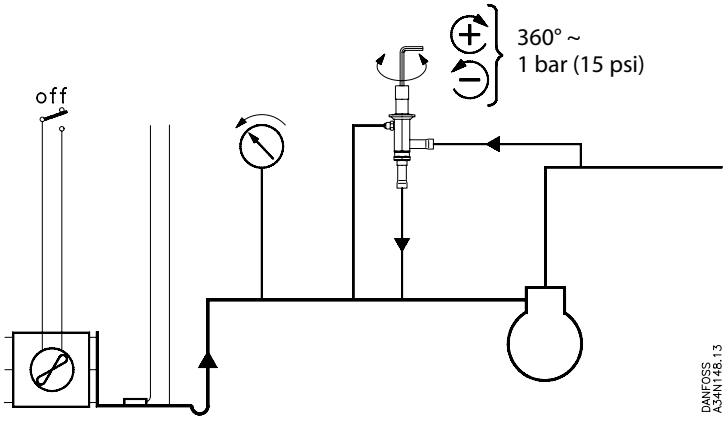
$t_{max.}$ = +140°C (285°F)

$t_{min.}$ = –50°C (–60°F)

PS (MWP) = 28 bar p_e (400 psig)

$p_{test, max.}$ = 31.5 bar p_e (450 psig)





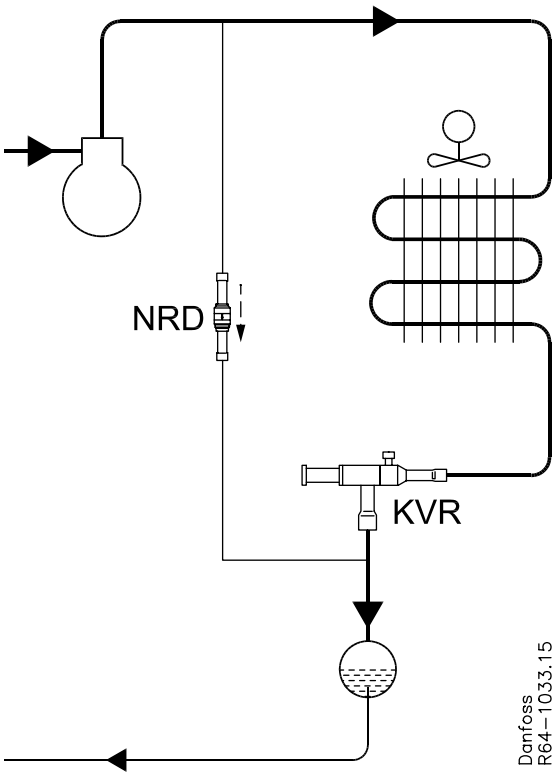
034R9507

Instructions

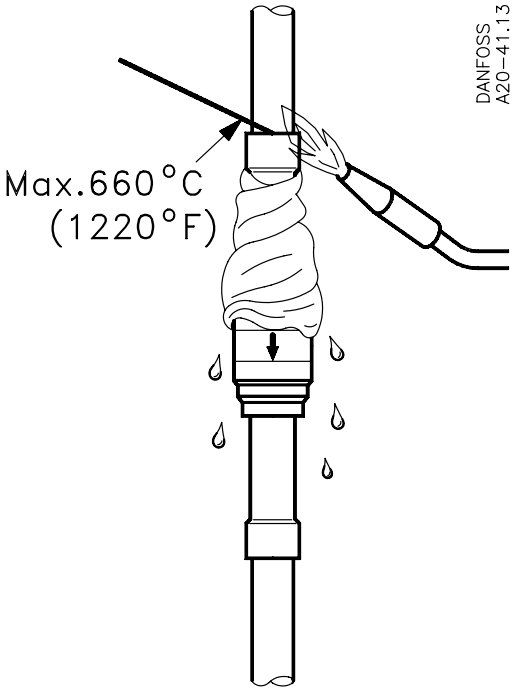
NRD

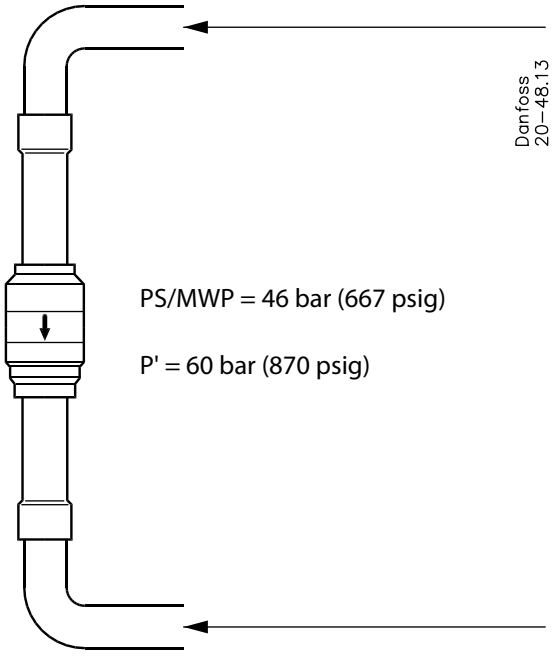
020R9622

CFC, HFC, HCFC



020R9622





PS/MWP = 46 bar (667 psig)

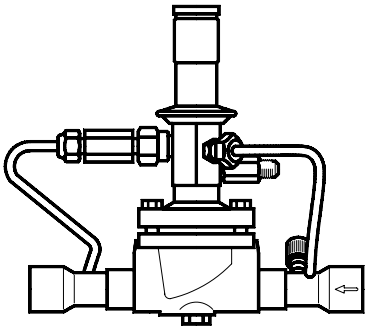
P' = 60 bar (870 psig)

~~RI4BD100~~ → DKRCC.PI.HD0.A1.00 / 520H0780

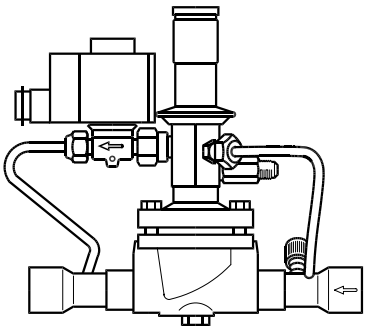
Instructions

PKV, PKVS

034R9761

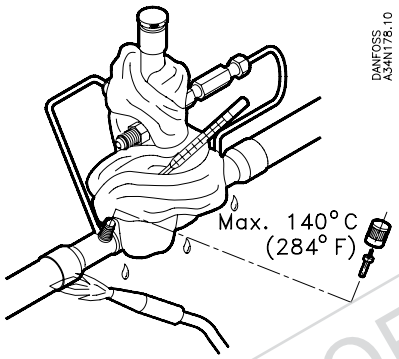


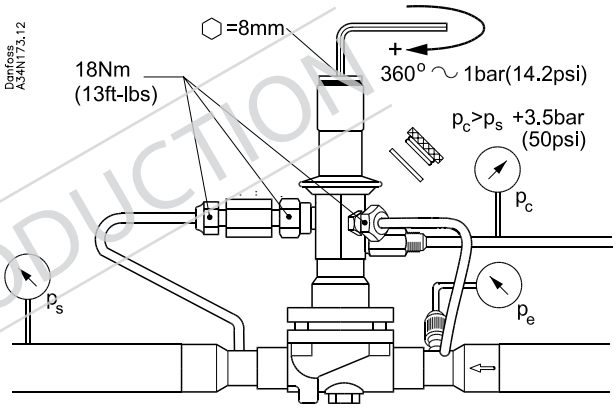
PKV

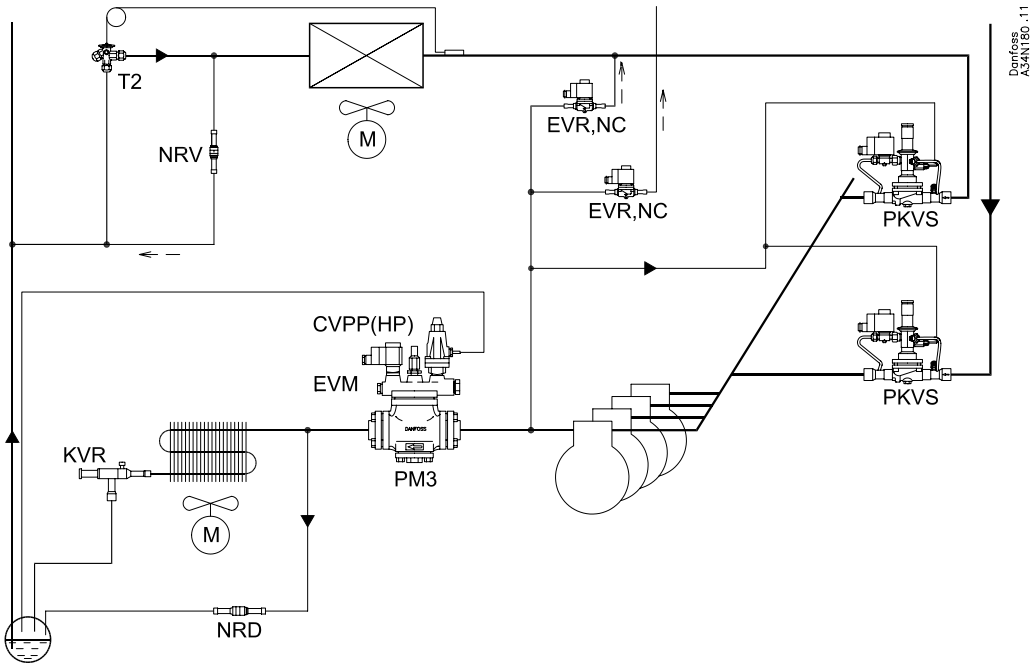


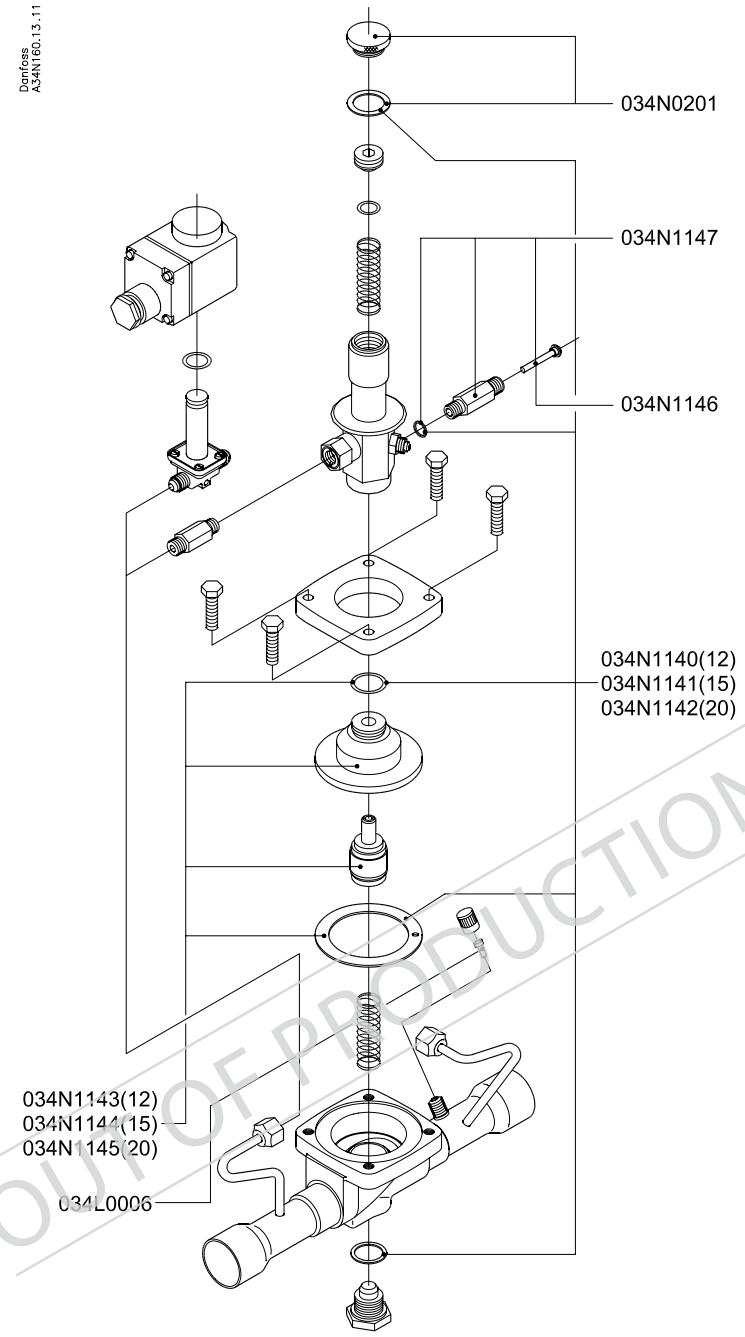
PKVS

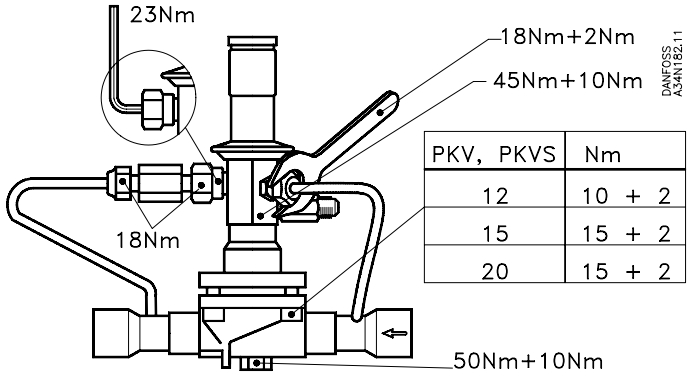
Application











PKV, PKVS	Nm
12	10 + 2
15	15 + 2
20	15 + 2

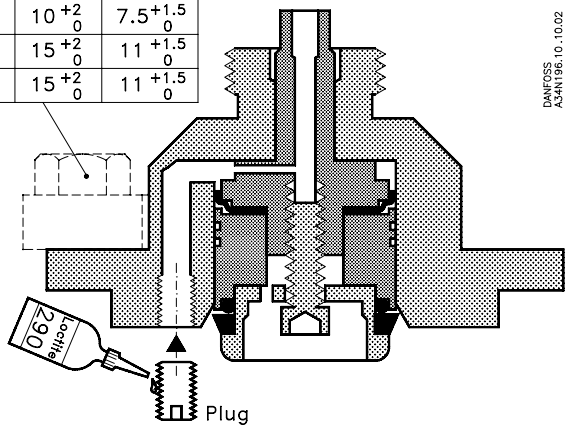
INSTRUCTIONS

Spare parts for PKV, PKVS, PKVD

034R9505

PKV, PKVS

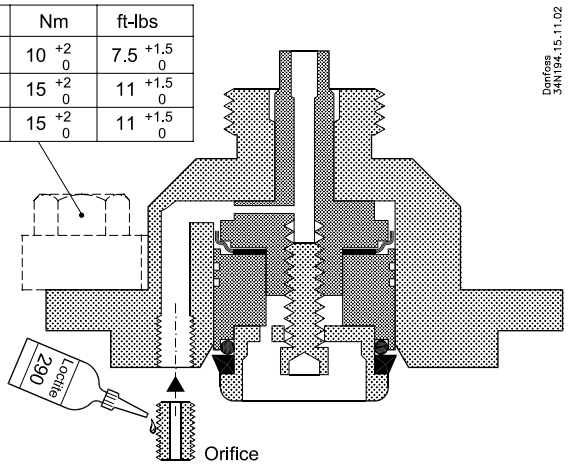
PKV	Nm	ft–lbs
12	10^{+2}_{0}	$7.5^{+1.5}_{0}$
15	15^{+2}_{0}	$11^{+1.5}_{0}$
20	15^{+2}_{0}	$11^{+1.5}_{0}$



Piston, cylinder, plug kit	
PKV 12, PKVS 12	**034N1143**
PKV 15, PKVS 15	**034N1144**
PKV 20, PKVS 20	**034N1145**

PKVD

PKV	Nm	ft-lbs
12	10^{+2}_{0}	$7.5^{+1.5}_{0}$
15	15^{+2}_{0}	$11^{+1.5}_{0}$
20	15^{+2}_{0}	$11^{+1.5}_{0}$



Piston, cylinder, plug kit	
PKVD 12	**034N1143**
PKVD 15	**034N1144**
PKVD 20	**034N1145**

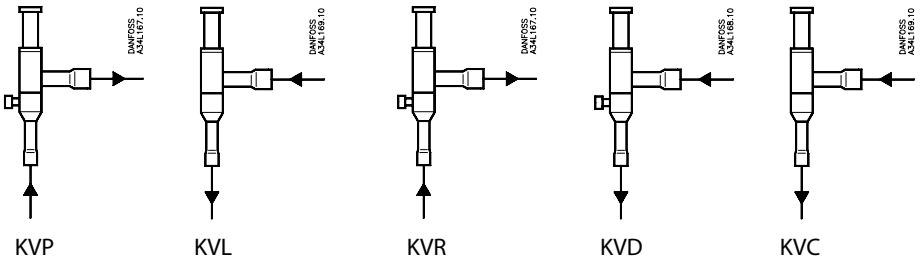
034R9505

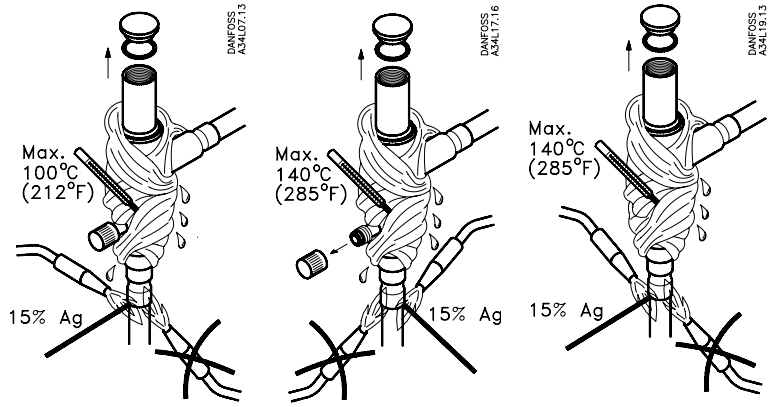
RI4AD402

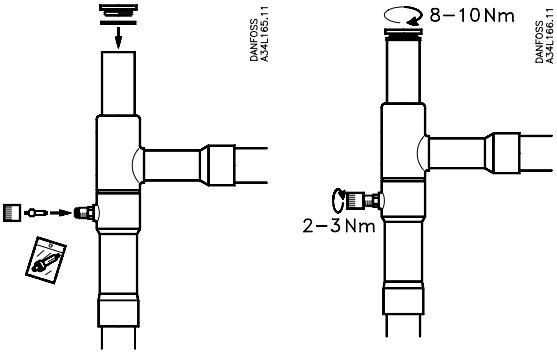
Type KVP, KVL, KVR, KVD, KVC

034R9506

CFC, HCFC, HFC







~~RI4XF100~~ ~~RI4XA100~~ ~~RI08S200~~ → **RI4XG400** 11-2003

KVP

t_{max} = +130°C (266°F)
t_{min} = –45°C (–50°F)

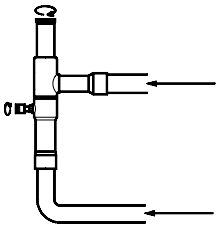
KVL

t_{max} = +130°C (266°F)
t_{min} = –60°C (–76°F)

PS / MWP = 18 bar (260 psig)

p_{test} KVP / KVL 12, 15, 22:
p' = max. 28 bar (400 psig)

KVP / KVL 28, 35:
p' = max. 25.6 bar (370 psig)



KVR/KVD/KVC

t_{max} = +130°C (266°F)
t_{min} = –45°C (–50°F)

PS / MWP = 28 bar (400 psig)

p_{test} p' = max. 31 bar (440 psig)

KVP/KVL

KVP / KVL 12, 15, 22:
360° ~ 0.45 bar (6 psi)
KVP / KVL 28, 35:
360° ~ 0.3 bar (4 psi)

p_e = 2 bar

KVR/KVD

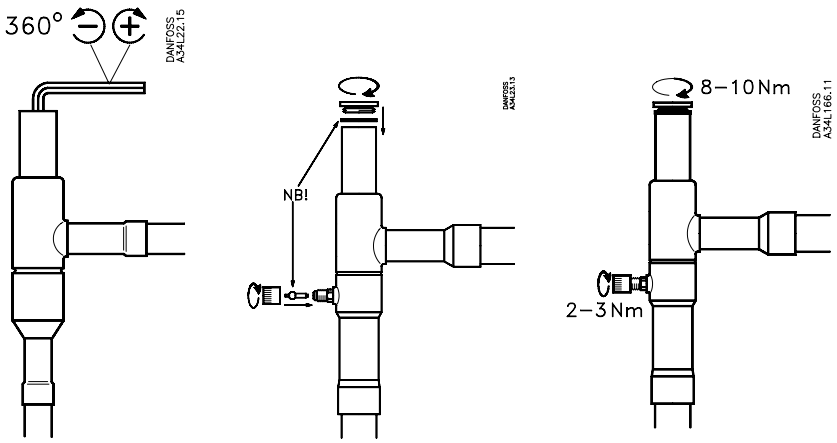
KVR / KVD 12, 15, 22:
360° ~ 2.5 bar (36 psi)
KVR 28, 35:
360° ~ 1.5 bar (22 psi)

p_e = 10 bar

KVC

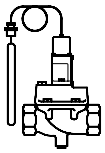
KVC 12, 15, 22:
360° ~ 0.45 bar (6 psi)

p_e = 2 bar



INSTRUCTIONS

WVTS



016R9557

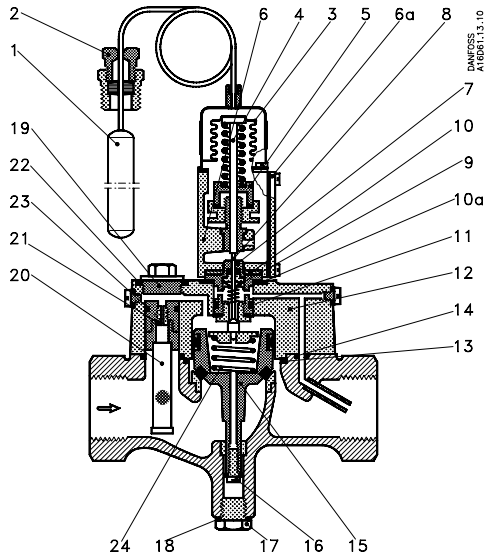


Fig. 1. WVTS 40

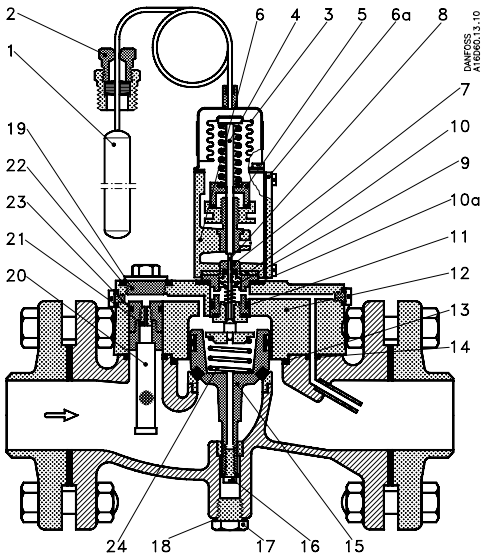


Fig. 2. WVTS 50-100

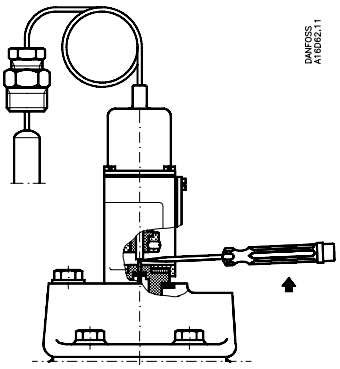


Fig. 4

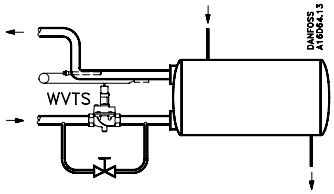


Fig. 3

Type	Fjeder/Spring/Feder/Ressort 1 - 10 bar (100 - 1000 kPa)
WVTS 32	**016D1327**
WVTS 40	**016D0575**
WVTS 50	**016D0576**
WVTS 65	**016D0577**
WVTS 80	**016D0578**
WVTS 100	**016D0579**

Fig. 5

DANSK

Termostatiske vandventiler

Tekniske data

1. Føler
2. Pakdåse
3. Bælgelement
4. Trykstang
5. Reguleringsmøtrik
6. Indstillingshus
6a. Dæksel
7. Pilotindsats
8. Pilotkegle
9. Teflonmanchetter
10. Isolationsskive
10a. Pakning for pilotindsats
11. O-ring for pilotindsats
12. Dæksel
13. O-ring for dæksel
14. O-ring for pilotkanal
15. Servostempel
16. Bundskrue for servostempel
17. Bundprop
18. Pakning for bundprop
19. Komplet filterindsats
20. Selvrensende filter
21. Pilotdyse
22. Pakning
23. O-ring
24. Servofjeder

* Angiv ventilstørrelsen.

** Se tabellen fig. 5.

Maks. prøvningstryk
16 ato (P_e = 16 bar = 1600 kPa).

Åbningsdifferenstryk
WVTS 32-40: min. 0.5 at (0.5 bar = 50 kPa); maks. 4 at (4 bar = 400 kPa).
WVTS 50-100: min. 0.3 at (0.3 bar = 30 kPa); maks. 4 at (4 bar = 400 kPa).
Hvis WVTS ønskes med et differenstryk på 1 - 10 at (1 - 10 bar, 100 - 1000 kPa), udskiftes servofjederen (24). Se bestillingstabellen, fig. 5.

Tilladelig medietemperatur
For vand: maks. +90°C
For brine: min. –25°C.

Maks. følertemperatur
57°C for området –15°C til +10°C og 0°C til + 30°C.
* 90°C for området +25°C til +65°C.

* **Montering**
WVTS monteres i kølevandstilgangen med gennemstrømning i pilens retning og med bælgelementet opad. Det anbefales at montere et
* smudsfilter foran ventilen.
Føleren anbringes, hvor den ønskede vandtemperatur skal overholdes.
Føleren kan uden indvirkning på regule-ringsevnen anbringes varmere eller koldere end ventilhuset.
** For ventiler med området –15°C til +10°C kan føleren monteres i vilkårlig stilling.
For ventiler med de øvrige områder skal føleren monteres vandret eller med følerens frie ende lavest.
Bogstaverne UP og den røde streg på føleren skal vende opad ved vandret eller skrå montering.
På kondensatorer (fig. 3) kan føleren enten fastgøres til afgangsrøret med spændebånd, monteres i en følerlomme i afgangsrøret eller anbringes i direkte kontakt med kølevandet.
Ved anlæggets start skal føleren straks kunne påvirkes af det strømmende kølevands temperaturvariationer. Derfor kan et omløb med en afspærringsventil være nødvendigt for at sikre en kølevandsstrøm under opstart.
Monteres føleren i direkte kontakt med kølevandet, fastgøres den, så pulsationer ikke kan påvirke føleren og derved ødelægge kapillarrøret.
Anvendes følerlomme, opnås en god varmeovergang, når lommen fyldes med kobberpasta.
På luftkompressorer og lignende monteres føleren i den vandfyldte kølekappe. Et omløb er ikke nødvendigt her. Opvarmningen af vandet ved kompressorens start giver altid tilstrækkelig impuls til føleren.

Indstilling
Anbring et termometer på det sted, hvor føleren er placeret.
Fjern dækslet (6a). Med reguleringsmøtrikken (5) reguleres mediets gennemstrømning, indtil termometeret viser den ønskede temperatur på afgangssiden.
Lavere temperatur opnås ved at dreje reguleringsmøtrikken (5) mod venstre (reguleringsfjederen slækkes) – og omvendt.

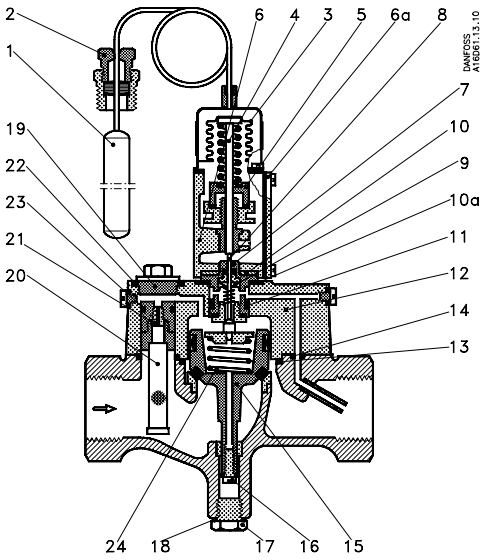


Fig. 1. WVTS 40

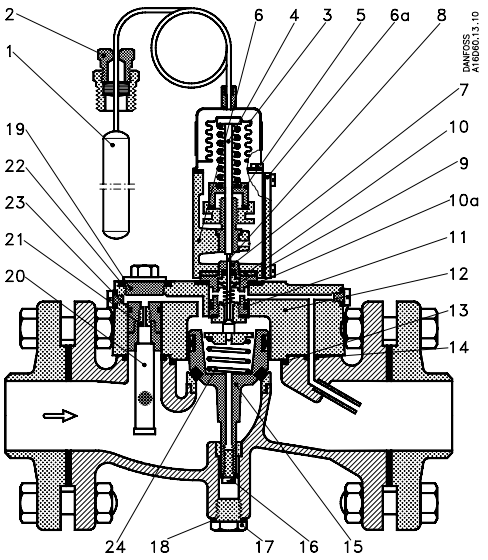


Fig. 2. WVTS 50-100

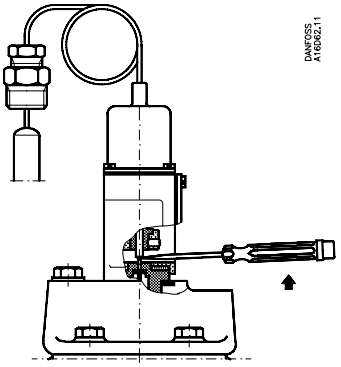


Fig. 4

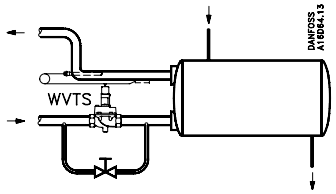


Fig. 3

Type	Fjeder/Spring/Feder/Ressort 1 - 10 bar (100 - 1000 kPa)
WVTS 32	**016D1327**
WVTS 40	**016D0575**
WVTS 50	**016D0576**
WVTS 65	**016D0577**
WVTS 80	**016D0578**
WVTS 100	**016D0579**

Fig. 5

Når køleanlægget stopper, falder temperaturen ved føleren, og WVTS vil derfor lukke.

Service

Vandventilen skal lukke tæt for kølevandet, når køleanlægget er stoppet. Hvis den ikke gør det, kan årsagen muligvis være, at større snavs-partikler har sat sig fast på servostemplets eller pilotkeglens ventilsæde. Måske er filteret (20) eller pilotdysen (21) tilstoppet.

Snavspartikler kan man forsøge at fjerne som vist på fig. 4. Stik en skruetrækker ind mellem pilotkeglens spindel (8) og trykstangen (4). Når skruetrækkeren vippes, presses pilotkeglen nedad, og ventilen åbner for fuld kølevands-gennemstrømning gennem ventilen.

Hvis vandventilen stadig ikke lukker tæt luk da for kølevandet til vandventilen. Skru filterindsatsen (19) af, og rens både filteret og pilotdysen.

Er filteret eller pilotdysen ikke tilstoppet afmontér topstykket (6) og ventildækslet (12). Topstykket og ventildækslet kan afmonteres, uden at det er nødvendigt at tage trykket af anlægget. Tag pilotindsatsen ud af ventildækslet, rens den og smør den ind i vandfast syrefrit fedtstof. Fyld rummet over teflonmanchetterne (9) med samme fedtstof. Måske er det nødvendigt at indslibe pilotkeglen i pilotsædet.

Rens servostemplet og ventilsædet og smør servocylinderen og servostemplets styr med vandfast, syrefrit fedtstof.

Pilotkanalerne i ventildækslet kan renses efter at skruerne i ventildækslets sider er fjernet.

Undersøg om O-ringene trænger til at skiftes ud.

Efter montéringen eller efter et eftersyn skal vandventilen skylles kraftigt igennem i nogle minutter for at fjerne evt. snavs fra rørledninger m.v. Se fig. 4.

Er der fare for frostsprængning af ventilen i stilstandsperioder, bør den tømmes for vand. Det gøres ved at fjerne bundproppen (17) og skruen (16).

ENGLISH

Thermostatic Water Valves

Technical data

1. Bulb
2. Stuffing box
3. Bellows element
4. Push rod
5. Regulating nut
6. Top part

6a. Cover

7. Pilot insert
8. Pilot cone
9. Teflon sleeves
10. Insulating disc

10a. Pilot insert seal

11. Pilot insert O-ring
12. Cover
13. O-ring for cover
14. O-ring for pilot channel
15. Servo piston *
16. Servo piston button screw
17. Drain plug
18. Drain plug gasket
19. Strainer assembly, complete *
20. Self-cleaning strainer
21. Pilot nozzle
22. Gasket
23. O-ring
24. Servo spring **

* Please state valve size.

** See table Fig. 5.

Max. test pressure
16 atm.g (p_e = 16 bar = 1600 kPa).

Opening differential pressure
WVTS 32-40: Min. 0.5 atm. (0.5 bar = 50 kPa)
Max. 4 atm. (4 bar = 400 kPa).
WVTS 50-100: Min. 0.3 atm. (0.3 bar = 30 kPa)
Max. 4 atm. (4 bar = 400 kPa).

If WVTS is required with a differential pressure of 1 - 10 atm. (1 - 10 bar; 100 - 1000 kPa), the servo spring (24) is to be replaced. See ordering table, Fig. 5.

Permissible temperature of medium
For water: Max. +90°C
For brine: Min. –25°C

Max. bulb temperature
57°C for the ranges of –15°C to +10°C
and 0°C to +30°C.
90°C for the range of +25°C to +65°C.

Fitting
WVTS is to be fitted in the cooling water inlet with flow in the direction of the arrow and with the bellows element facing upwards.
It is recommended that a strainer should be inserted before the valve.
The bulb is to be fitted where it is required to maintain or control the water temperature.
The bulb can be fitted warmer or colder than the valve body, with no effect on the regulating capacity.
For valves in the range from –15°C to +10°C the bulb can be fitted in any position.
For valves with other ranges the bulb must be fitted horizontally or with the blank end of the bulb at the lowest level.
The capitals UP and the red line on the bulb must face upwards at horizontal or inclined fitting.
On condensers (Fig. 3) the bulb can either be fixed to the discharge pipe by means of a clip, be inserted in a pocket or placed in direct contact with the cooling water.
When the plant is started, the bulb must be affected at once by the temperature variations of the cooling water flow. A bypass with a shut-off valve can, therefore, be necessary in order to ensure a cooling water flow during start-up.
If the bulb is fitted in direct contact with the cooling water, it must be fixed so that pulsations cannot affect the bulb and thus destroy the capillary tube.
If a bulb pocket is used, good heat transmission is obtained by filling the pocket with heat-conductive compound.
On air compressors and similar equipment the bulb is fitted in the water-filled cooling jacket. No bypass is required. The heating of the water at the start of the compressor always ensures a suitable impulse to the bulb.

Setting
Place a thermometer at the point where the bulb is fitted.
Remove the cover (6a). Turn the regulating nut (5) to adjust the medium flow until the thermometer shows the required temperature on the discharge side. A lower temperature can be obtained by turning the regulating nut (5) anti-clockwise (to slacken the regulating spring) – and vice versa.
When the refrigeration system stops, the temperature drops at the bulb, and so WVTS closes.

Service
The water valve must close tightly when the refrigeration system is stopped. If not, it may be due to the fact that large impurities have settled on the valve seat of the servo piston of pilot cone. The strainer (20) or the pilot nozzle (21) may be clogged up.
Impurities can be removed as shown in Fig. 4. Insert a screwdriver between the pilot cone spindle (8) and the push rod (4). Tilting the screwdriver forces the pilot cone down, and the valve opens to full cooling water flow.
If still the water valve does not close tightly, shut off the cooling water supply to the water valve. Unscrew the strainer assembly (19) and clean both the strainer and the pilot nozzle.
If the strainer or pilot nozzle is not clogged up, dismount the top part (6) and the valve cover (12), which can be done without relieving the system of its pressure. Remove the strainer assembly from the valve cover, clean it, and apply a coat of water-resistant, acid-free grease to it. Fill the same kind of grease into the space over the Teflon sleeves (9). It may be necessary to grind the pilot cone in its seat.
Clean the servo piston and valve seat and apply a coat of water-resistant, acid-free grease to the servo cylinder and the servo piston guide.
The pilot channels in the valve cover can be cleaned after the screws have been unscrewed from the sides of the valve cover.
Check whether the O-rings need replacement.
After fitting or overhaul the water valve must be flushed vigorously for some minutes in order to remove any impurities from pipelines, etc. See Fig. 4.
If there is any risk of the valve bursting due to frost during standstill periods, it should be drained of water. It can be done by unscrewing the drain plug (17) and the bottom screw (16).

DEUTSCH

Thermostatische Wasserventile

Technische Daten

1. Fühler
2. Stopfbüchse
3. Wellrohrelement
4. Druckbolzen
5. Regelmutter
6. Einstellgehäuse
6a. Deckel
7. Piloteinsatz
8. Pilotkegel
9. Teflonmanschetten
10. Isolierscheibe
10a. Dichtung f. Piloteinsatz
11. O-Ring f. Piloteinsatz
12. Deckel
13. O-ring f. Deckel *
14. O-Ring f. Pilotkanal
15. Servokolben
16. Bodenschraube f. Servokolben
17. Bodenstopfen
18. Dichtung f. Bodenstopfen
19. Filtereinsatz, komplett
20. Selbstreinigendes Filter
21. Pilotdüse
22. Dichtung
23. O-Ring
24. Servofeder **

* Ventilgrösse angeben
** Siehe Tabelle, Abb. 5.

Max. Prüfdruck
16 atü (p_e = 16 bar)

Öffnungsdifferenzdruck
WVTS 32-40: min. 0.5 at (0.5 bar)
max. 4 atm. (4 ba).
WVTS 50-100: min. 0.3 atm. (0.3 bar)
max. 4 atm. (4 bar).

Wenn das Ventil WVTS mit einem Differenz-druck von 1 - 10 at (1 - 10 bar) gewünscht wird, so ist die Servofeder (24) auszuwechseln. Siehe Bestelltabelle, Abb. 5.

Zulässige Medientemperaturen
Wasser: max. +90°C
Sole: min. –25°C

Max. Fühlertemperaturen
57°C in den Bereichen –15°C bis +10°C
und 0°C bis +30°C.
90°C im Bereich +25°C bis +65°C.

Montage
WVTS wird mit nach oben gerichtetem Well-rohrelement und mit Durchfluss in Pfeilrichtung in den Kühlwassereintritt eingebaut. Es emp-fiehlt sich, vor dem Ventil ein Schmutzfilter einzubauen.
Der Fühler ist an der Stelle anzuordnen, wo man die Sollwerttemperatur des Wassers einzuhalten wünscht. Der Fühler kann ohne Beeinträchtigung der Regelfähigkeit beliebig wärmer oder kälter als das Ventilgehäuse angebracht werden.
Bei Ventilen mit dem Bereich –15°C bis +10°C kann der Fühler in beliebiger Lage angeordnet werden.
Bei Ventilen mit den übrigen Bereichen ist der Fühler waagerecht oder mit dem freien Fühlerende zuunterst zu montieren. Bei einem waagerechten oder schrägen Fühlereinbau müssen die am Fühler angebrachten Buchstaben UP sowie der rote Strich nach oben zeigen.
An Verflüssigern (Abb. 3) kann der Fühler ent-weder mittels Schellen an der Austrittleitung befestigt, in eine Fühlerhülse des Austritts ein-geführt oder auch in direktem Kontakt mit dem Kühlwasser angebracht werden. Bei der Inbe-triebsetzung der Anlage muss der Fühler sofort auf Temperatur-schwankungen im durchströ-menden Kühlwasser ansprechen können. Daher kann zur Sicherung eines Kühlwasserdurch-flusses in der Anlaufphase eine absperrbare Umlaufleitung erforderlich sein.
Bei einer Fühler-montage in direktem Kontakt mit dem Kühlwasser ist der Fühler so zu befestigen, dass er nicht durch Pulsationen gelockert werden kann, weil dabei das Kapillarrohr zerstört werden könnte. Bei Verwendung einer Fühlerhülse ergibt sich eine gute Wärmeübertragung, wenn man den Zwischenraum zwischen Fühler und Hülse mit Kupferpaste ausfüllt. Bei Luftkompressoren u. dergl. ist der Fühler im Kühlwassermantel anzu-ordnen. Dabei erübrigt sich eine Umlaufleitung, weil die beim Kompressoranlauf entstehende Erwärmung des Wassers einen ausreichenden Impuls an den Fühler abgibt.

Einstellung
An der Montagestelle des Fühlers ist ein Thermometer anzubringen.
Deckel (6a) entfernen. Mit Hilfe der Regelmutter (5) wird nun der Mediendurchfluss eingeregelt, bis das Thermometer die an der Austrittseite ge-wünschte Temperatur anzeigt. Durch Links-drehen der Regel-mutter (5) (Lockern der Regel-feder) ergibt sich eine niedrigere Temperatur- und umgekehrt.
Sobald die Kälteanlage ausschaltet, geht die Temperatur am Fühler zurück und das Ventil WVTS wird schliessen.

Wartung
Bei stillgesetzter Kälteanlage muss das Was-serventil die Kühlwasserzufuhr völlig absperren. Ist dies nicht der Fall, können sich möglicher-weise an den Ventilsitzen des Servokolbens oder des Pilotkegels grössere Schmutzteilchen festgesetzt haben. Vielleicht sind auch das Filter (20) oder die Pilotdüse (21) verstopft.

Abb. 4 zeigt, wie man möglicherweise Schmutzteilchen entfernen kann. Zwischen die Spindel des Pilotkegels (8) und den Druckbolzen (4) steckt man einen Schraubenzieher und drückt damit den Pilotkegel nach unten, sodass dabei das Ventil den vollen Kühlwasserdurchfluss freigibt.
Wenn danach das Ventil immer noch nicht völlig dicht absperrt, so muss die Kühlwasserzufuhr unterbrochen werden. Darauf sind der Filter-einsatz (19) auszuschrauben und Filter und Pilotdüse zu reinigen.
Wenn keine Verstopfung des Filters oder der Pilotdüse festgestellt werden konnte, müssen das Einstellgehäuse (6) und der Ventildeckel (12) ausgebaut werden.
Dieser Ausbau kann bei unter Druck stehender Anlage erfolgen. Piloteneinsatz aus dem Ventildeckel herausnehmen, reinigen und mit einem wasserbeständigen säurefreien Fett schmieren. Der Raum über den Teflon-manschetten (9) ist mit dem gleichen Schmierfett zu füllen. Unter Umständen muss der Pilotkegel neu in den Pilot-sitz eingeschliffen werden.
Servokolben und Ventilsitz reinigen. Servo-zylinder und Führung des Servokolbens mit wasserfestem, säuerfreiem Fett schmieren.
Die Pilotkanäle im Ventildeckel lassen sich nach Entfernung der Schrauben aus den Deckelseiten reinigen.
Prüfen, ob eine Auswechslung der O-Ringe erforderlich ist.
Nach dem erneuten Zusammenbau - und überhaupt nach jeder Inspektion - muss das Ventil einige Minuten lang gründlich durchgespült werden, um etwaige Schmutzteilchen aus Rohr-leitungen usw. zu entfernen. Siehe Abb. 4.
Wenn in Standzeiten die Gefahr einer Frostsprengung des Ventils besteht, so sollte man das Wasser daraus ablassen. Zu diesem Zweck sind der Bodenstopfen (17) und die Schraube (16) zu enffernen.

FRANÇAIS

Vannes thermostatiques à eau

Caractéristiques techniques

1. Bulbe
2. Presse-êtoupe
3. Elément du soufflet
4. Tige de pression
5. Ecrou de réglage
6. Boîtier de réglage
6a. Couvercle
7. Cartouche pilote
8. Cône pilote
9. Manchons en téflon
10. Disque isolant
10a. Joint pour cartouche pilote
11. Bague torique pour cartouche pilote
12. Couvercle
13. Bague torique pour couvercle *
14. Bague torique pour canal pilote
15. Servo-piston *
16. Vis de fond pour servo-piston
17. Bouchon de fond
18. Joint pour bouchon de fond
19. Cartouche de filtre, complète *
20. Filtre autonettoyant
21. Orifice pilote
22. Joint
23. Bague torique
24. Servo-ressort **

* Indiquer la dimension de la vanne
** Voir le tableau, fig. 5

Pression d'essai max.
16 atm.eff. (p_e = 16 bar = 1600 kPa).

Pression différentielle d'ouverture
WVTS 32-40: min. 0.5 atm. (0.5 bar = 50 kPa); max. 4 atm. (4 bar = 400 kPa).
WVTS 50-100: min. 0.3 atm. (0.3 bar = 30 kPa); max. 4 atm. (4 bar = 400 kPa).
Si l'on désire une WVTS avec une pression différentielle de 1 - 10 atm. (1 - 10 bar; 100 - 1000 kPa), le servo-ressort (24) doit être remplacé. Voir le tableau de commande, fig. 5.

Température admissible du médium
Pour eau: max. +90°C
Pour saumure: min: –25°C.

Température max. du bulbe
57°C pour la plage: –15°C à +10°C et 0°C à +30°C.
90°C pour la plage: +25°C à +65°C.

Montage
Monter la WVTS dans l'entrée de l'eau de refroidissement, pour passage du liquide dans le sens de la flèche et l'élément de soufflet orienté vers le haut. Il est recommandé de monter un filtre à saletés en amont de la vanne.
Monter le bulbe à l'endroit où l'on désire maintenir l'eau à la température désirée. Sans influencer la capacité de régulation, le bulbe peut être placé dans une ambiance plus chaude ou plus froide que celle du corps de vanne.
Pour les vannes de la plage allant de –15°C à +10°C, le bulbe peut être monté dans une position quelconque.
Pour les vannes des autres plages, le bulbe doit être monté horizontalement ou avec son extrémité libre placée au niveau le plus bas.
En cas d'un montage horizontal ou oblique, les lettres UP ainsi que le trait rouge sur le bulbe doivent tourner vers le haut. Sur les condenseurs (fig. 3), le bulbe peut être soit fixé sur la conduite de sortie au moyen d'un collier de serrage, soit monté dans une poche à bulbe sur la conduite de sortie, soit placé en contact direct avec l'eau de refroidissement.
Au démarrage de l'installation, le bulbe doit pouvoir être exposé immédiatement à l'influence des variations de température de l'eau de refroidissement en circulation. Par conséquent, il peut être nécessaire de prévoir un by-pass avec vanne d'arrêt pour assurer un courant d'eau de refroidissement à la mise en marche.
Si le bulbe est monté en contact direct avec l'eau de refroidissement, le fixer de sorte que des impulsions ne puissent pas l'influencer et détériorer le tube capillaire de ce fait.
En cas d'utilisation d'une poche à bulbe on obtient une bonne transmission dé chaleur si la poche est bourrée de pâte de cuivre.
Sur les compresseurs d'air et machines ana-logues, monter le bulbe dans la chemise remplie d'eau de refroidissement. Dans ce cas-là, un by-pass n'est pas nécessaire. Le réchauffage de l'eau à la mise en marche du compresseur assure toujours une impulsion suffisante au bulbe.

Réglage
Placer un thermomètre à l'endroit où est monté le bulbe.
Enlever le couvercle (6a). Au moyen de l'écrou de réglage (5), régler le passage du médium jusqu'à ce que le thermomètre indique la température désirée du côté sortie.
Une température plus basse est obtenue en tournant l'écrou de réglage (5) vers la
gauche (le ressort de réglage est déchargé) – et inversement.
A l'arrêt de l'installation frigorifique, la température au bulbe baisse et, par conséquent, la WVTS se ferme.

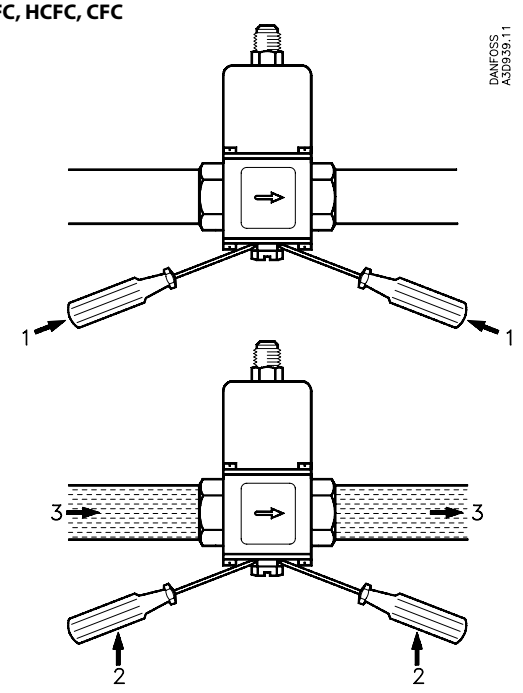
Entretien
A l'arrêt de l'installation frigorifique, la vanne doit couper totalement le passage de l'eau de refroidissement. Si ce n'est pas le cas, cela peut être dû à ce que des particules de saleté assez grosses se sont fixées sur le siège du servo- piston ou du cône pilote. Le filtre (20) ou l'orifice pilote (21) sont peut-être bouchés.
On peut essayer d'enlever les saletés comme montré fig. 4. Introduire un tournevis entre la tige (8) du cône pilote et la tige de pression (4). En basculant le tournevis, le cône pilote est pressé vers le bas et la vanne s'ouvre pour le plein passage de l'eau de refroidissement.
Dans le cas ou la vanne à eau ne ferme toujours pas hermétiquement, couper l'accès d'eau de refroidissement à la vanne. Dévisser la cartouche de filtre (19) et nettoyer tant le filtre que l'orifice pilote. Si ni le filtre ni l'orifice pilote ne sont bouchés, démonter la partie supérieure (6) et le couvercle (12) de la vanne. La partie supérieure et le couvercle de la vanne peuvent être démontés sans décharger l'installation. Sortir la cartouche pilote du couvercle de la vanne, la nettoyer et la graisser avec une graisse non acide résistante à l'eau. Remplir l'espace au- dessus des manchons en téflon (9) de la même graisse. Peut-être faut-il roder le cône pilote dans le siège pilote.
Nettoyer le servo-piston et le siège de la vanne et enduire le servo-cylindre et le guide du servo- piston d'une graisse non acide résistante à l'eau.
Les canaux pilotes du couvercle de la vanne peuvent être nettoyés après avoir dévissé les vis des côtés du couvercle de la vanne.
Examiner si les bagues toriques doivent être remplacées.
Après le montage ou après un entretien il est nécessaire, pendant quelques minutes, de purger énergiquement la vanne afin éliminer des conduites etc. d'éventuelles saletés. Voir fig. 4.
En cas de risque d'éclatement par le gel de la vanne pendant les périodes d'arrêt, celle-ci doit être vidée. A cet effet, enlever le bouchon de fond (17) et la vis (16).

INSTRUCTIONS

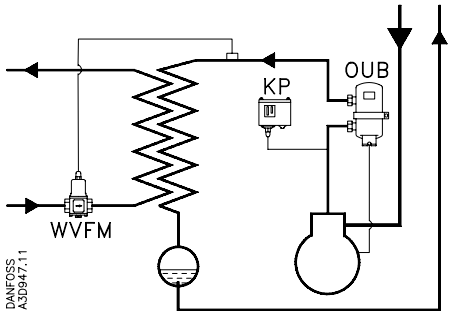
WVFM 10-16

003R9555

HFC, HCFC, CFC



Capillary tube



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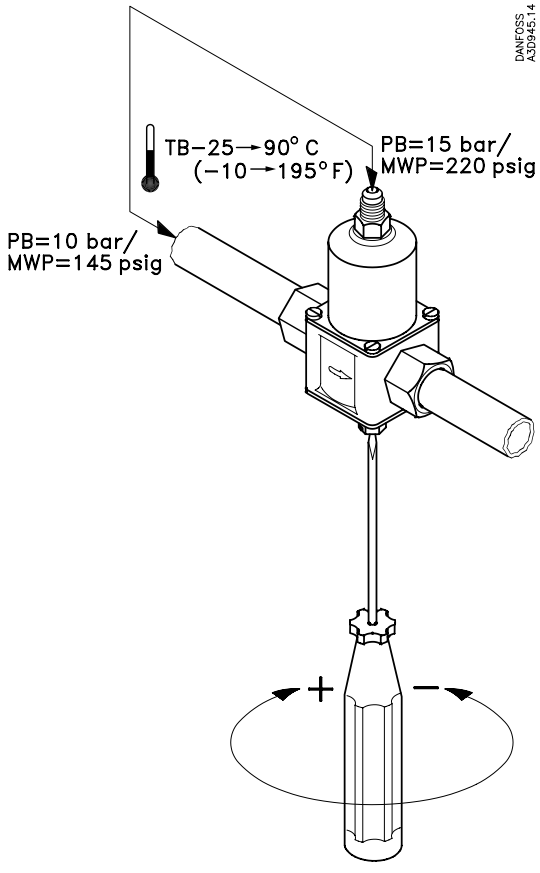
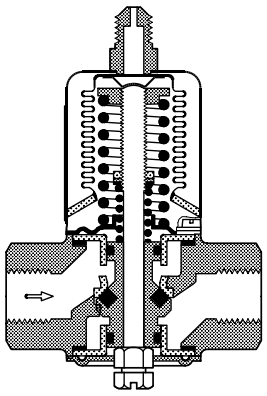
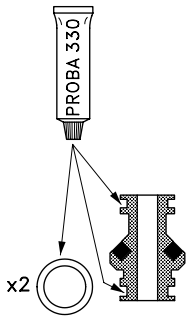






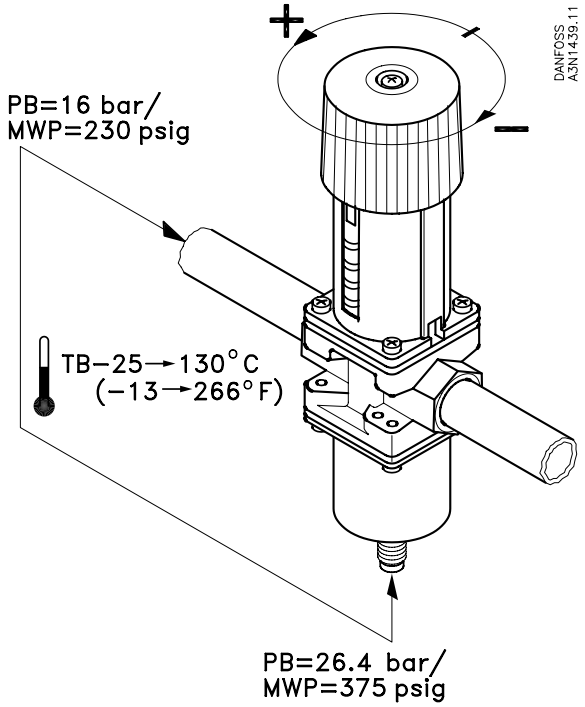
Repair kit:
See Spare Parts Catalogue

Instruction

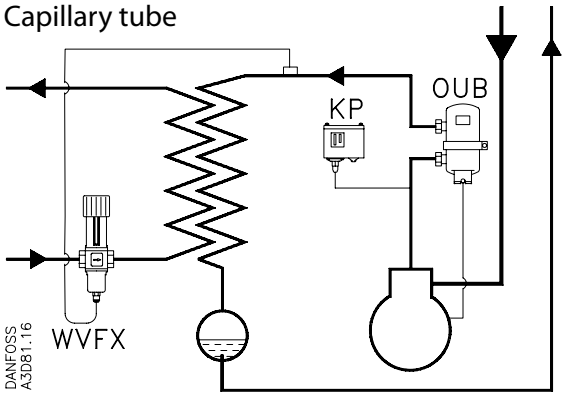
WVFX 10 - 25

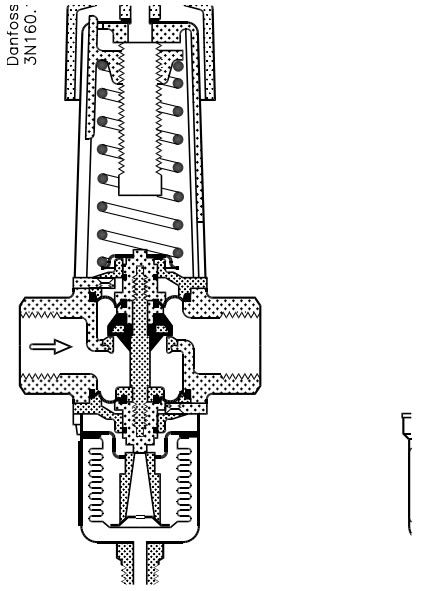
003R9743

HFC, HCFC, CFC

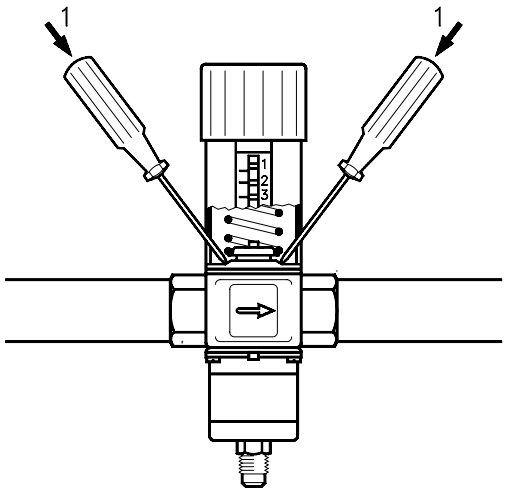


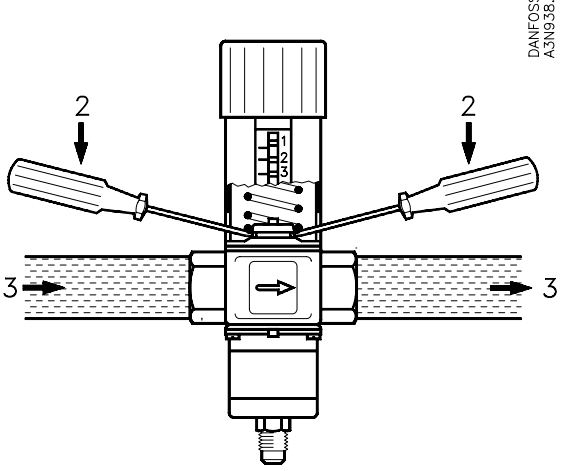
Capillary tube



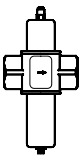


Spare parts: See Spare Parts catalogue





INSTRUCTIONS



WVFX 32-40

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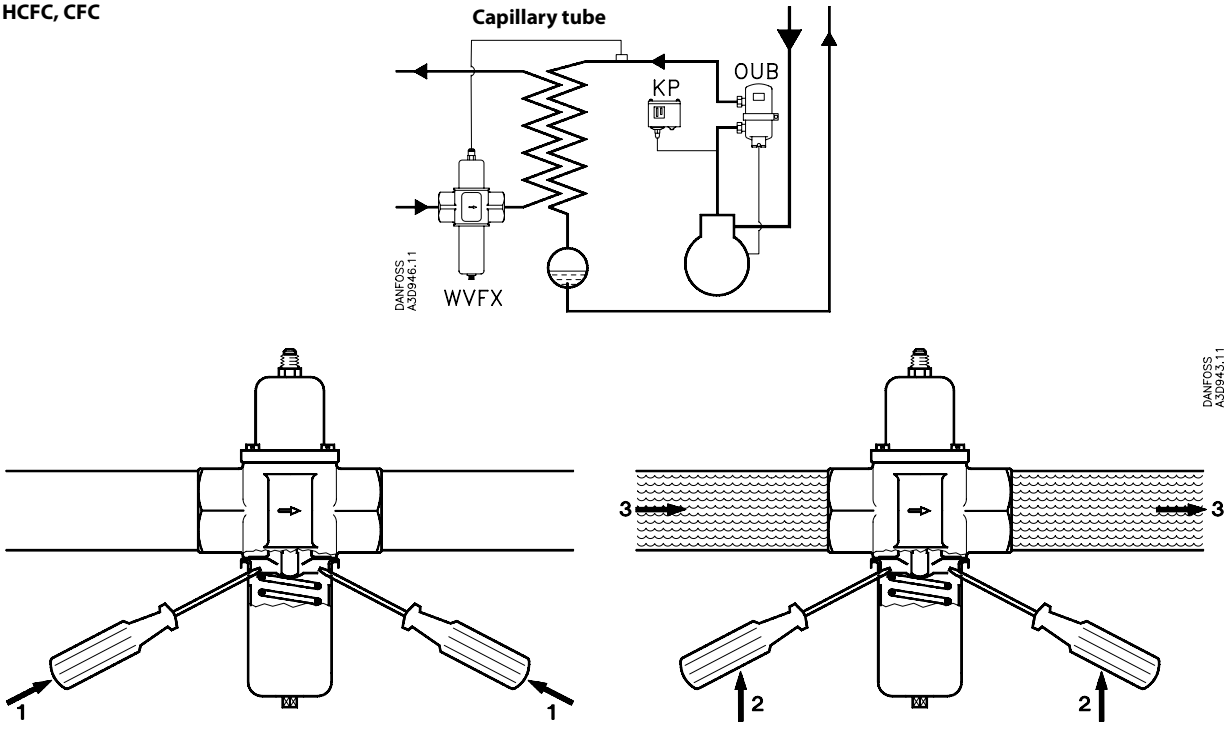

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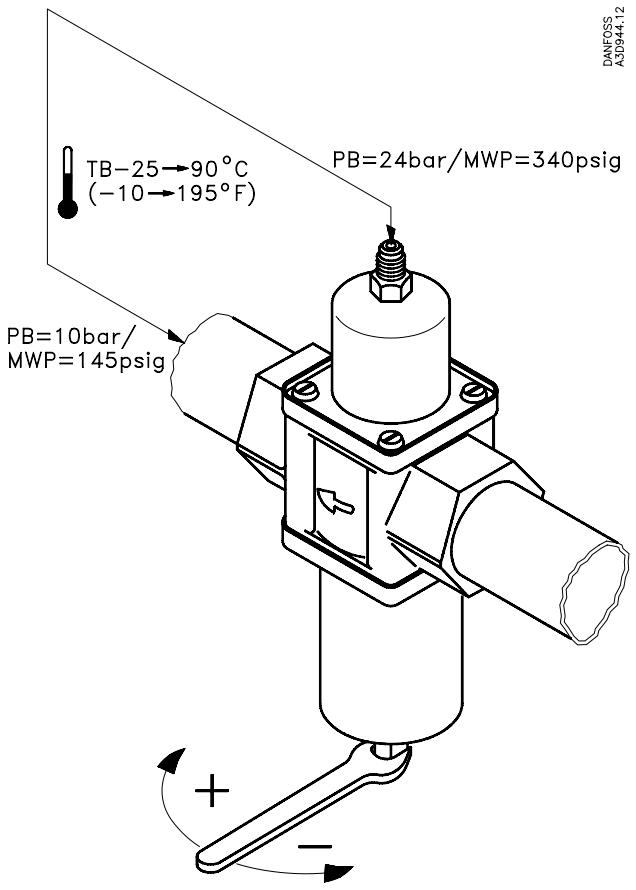
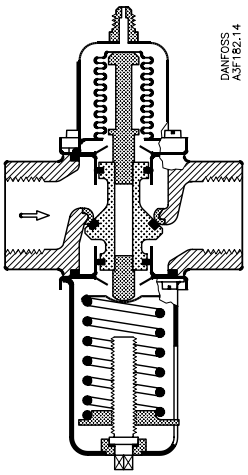
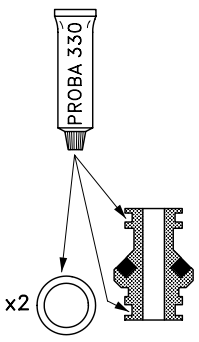




Repair kit:
See Spare Parts Catalogue



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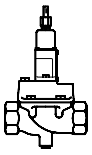
INSTRUCTIONS



WVS 32-100

016R9556

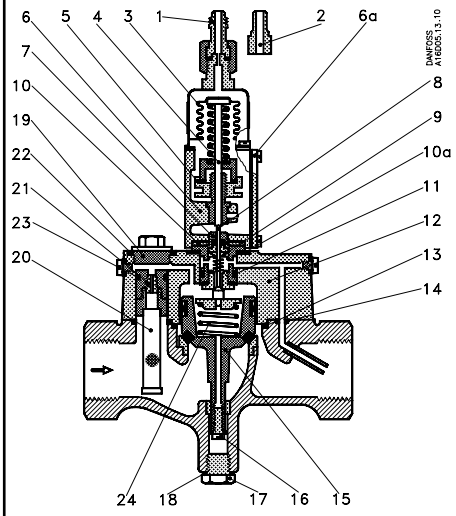


Fig. 1. WVS 40

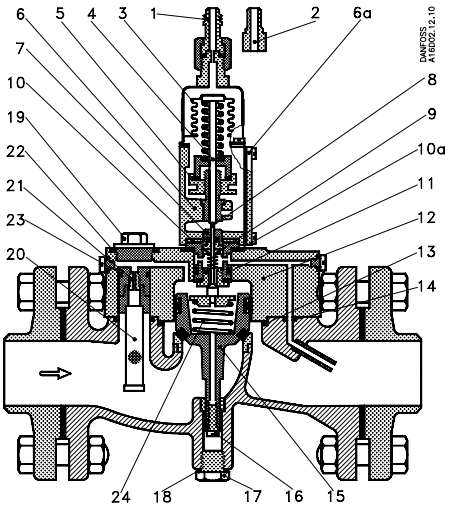


Fig. 2. WVS 50-100

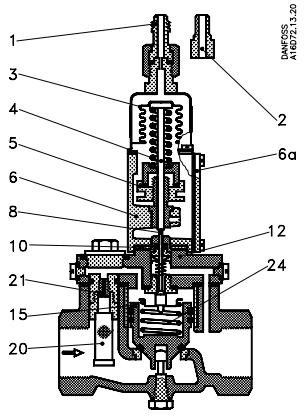


Fig. 6. WVS 32

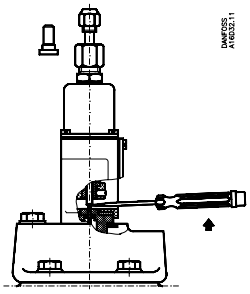


Fig. 4

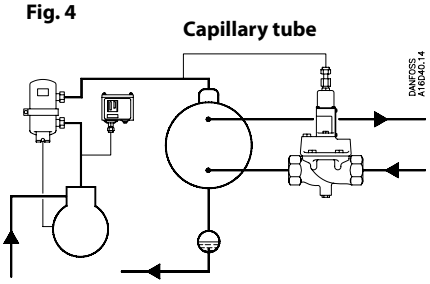


Fig. 3

Type/Typ	Fjeder/Spring/Feder/Ressort 1 - 10 bar (100 - 1000 kPa)
WVS 32	016D1327
WVS 40	016D0575
WVS 50	016D0576
WVS 65	016D0577
WVS 80	016D0578
WVS 100	016D0579

Fig. 5

DANSK

Automatiske vandventiler

Tekniske data

Positionsliste

1. Flaretilslutning
2. Svejsenippel
3. Bælgelement
4. Trykstang
5. Reguleringsmøtrik
6. Topstykke
6a. Dæksel
7. Pilotindsats
8. Spindel
9. Teflonmanchetter
10. Isolationsskive
10a. Pakning
11. O-ring
12. Ventildæksel
13. O-ring *
14. O-ring
15. Servostempel *
16. Bundskrue
17. Bundprop
18. Pakning
19. Komplet filterindsats
20. Selvrensende filter
21. Pilotdyse
22. Pakning
23. O-ring
24. Servofjeder **

* Angiv ventilstørrelsen

** Se tabellen fig. 5.

Medier

Kølemiddelside: HFC, HCFC, CFC og R 717 (NH_3)

Vandside: Ferskvand og brine

Maks. prøvetryk

Kølemiddelside: P' = 29 bar = 2900 kPa

Vandside: •P' = 16 bar = 1600 kPa

Åbningsdifferenstryk

WVS 32-40: min. 0.5 bar = 50 kPa
maks. 4 bar = 400 kPa

WVS 50-100: min. 0.3 bar = 30 kPa
maks. 4 bar = 400 kPa

Hvis WVS ønskes med et differenstryk på 1 - 10 bar = 100 - 1000 kPa, udskiftes servofjederen (24). Se bestillingstabellen, fig. 5.

Montering

WVS monteres i kølevandstilgangen med gennemstrømning i pilens retning og med bælgelementet opad. Det anbefales at montere et smudsfilter foran ventilen.

Bælgelementet tilsluttes køleanlæggets trykside et sted, hvor trykpulsationer fra kompressoren ikke vil få nogen indvirkning på ventilen, f. eks. på toppen af kondensatoren eller efter olieudskilleren. Trykrøret skal tilsluttes sådan, at eventuelle urenheder ikke kan løbe ind i røret. Se fig. 3.

Indstilling

Fjern dækslet (6a).

WVS kan indstilles til at begynde at åbne ved et kondenseringstryk på min. 2 bar = 200 kPa og maks. 19 bar = 1900 kPa.

Ventilen er helt åben, når kondenseringstrykket er steget 1 bar = 100 kPa over det indstillede åbningstryk.

Lavere kondenseringstryk opnås ved at dreje reguleringsmøtrikken (5) mod venstre (reguleringsfjederen slækkes) – og omvendt. Når køleanlægget stopper, falder kondenseringstrykket, og WVS vil derfor lukke.

Service

Vandventilen skal lukke tæt for kølevandet når køleanlægget er stoppet. Hvis den ikke gør det, kan årsagen muligvis være, at større snavs-partikler har sat sig fast på servostemplets eller pilotkeglens ventilsæde. Måske er filteret (20) eller pilotdysen (21) tilstoppet.

Snavspartikler kan man forsøge at fjerne som vist på fig. 4. Stik en skruetrækker ind mellem pilotkeglens spindel (8) og trykstangen (4) Når skruetrækkeren vippes, presses pilotkeglen nedad, og ventilen åbner for fuld kølevandsgennemstrømning gennem ventilen.

Hvis vandventilen stadig ikke lukker tæt luk da for kølevandet til vandventilen. Skru filter-indsatsen (19) af og rens både filteret og pilotdysen.

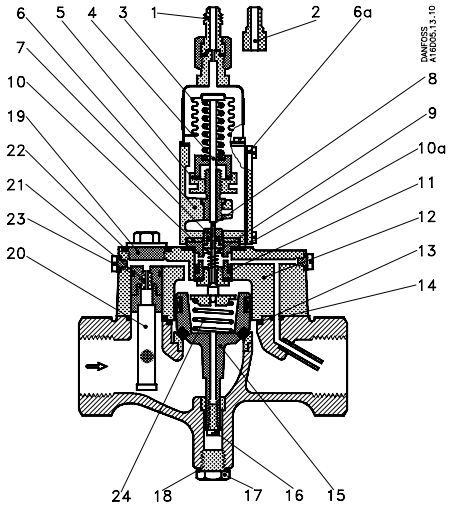


Fig. 1. WVS 40

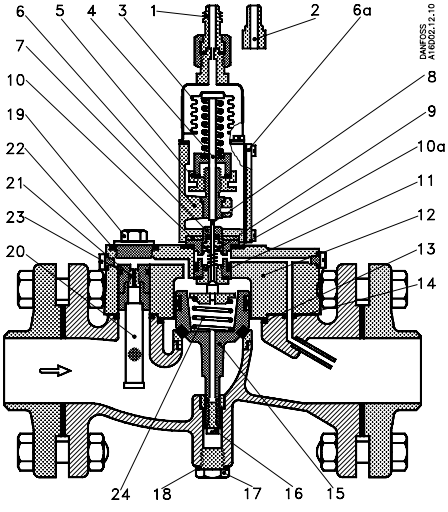


Fig. 2. WVS 50-100

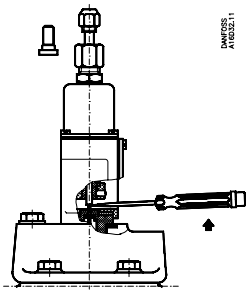


Fig. 4

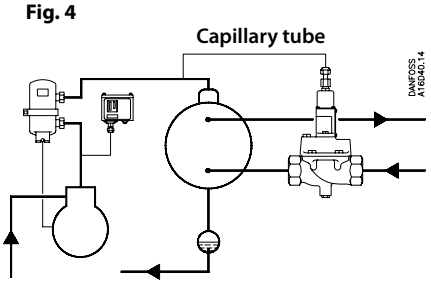


Fig. 3

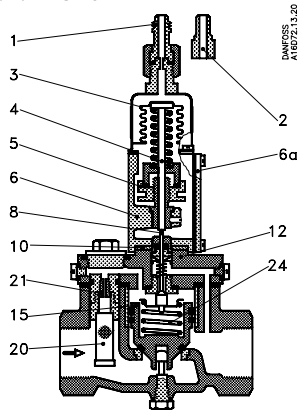


Fig. 6. WVS 32

Type/Typ	Fjeder/Spring/Feder/Ressort 1 - 10 bar (100 - 1000 kPa)
WVS 32	016D1327
WVS 40	016D0575
WVS 50	016D0576
WVS 65	016D0577
WVS 80	016D0578
WVS 100	016D0579

Fig. 5

Er filteret eller pilotdysen ikke tilstoppet, afmontér så topstykket (6) og ventildækslet (12). Topstykket og ventildækslet kan afmonteres, uden at det er nødvendigt at tage trykket af anlægget. Tag pilotindsatsen ud af ventildækslet, rens den og smør den ind i vandfast, syrefrit fedtstof. Fyld rummet over teflonmanchetterne (9) med samme fedtstof. Måske er det nødvendigt at indslibe pilotkeglen i pilotsædet.
Rens servostemplet og ventilsædet og smør servocylinderen og servostemplets styr med vandfast, syrefrit fedtstof.
Pilotkanalerne i ventildækslet kan renses, efter at skruerne i ventildækslets sider er fjernet.
Undersøg om O-ringene trænger til at skiftes ud.
Efter monteringen eller efter et eftersyn skal vandventilen skylles kraftigt igennem i nogle minutter for at fjerne evt. snavs fra rørledninger m.v. Se fig. 4.
Er der fare for frostsprængning af ventilen i stilstandsperioder, bør den tømmes for vand. Det gøres ved at fjerne bundproppen (17) og skruen (16).

ENGLISH

Automatic Water Valves

Technical data

Reference list

1. Flare connection
2. Weld nipple
3. Bellows element
4. Push rod
5. Regulating nut
6. Top part
6a. Cover
7. Pilot insert
8. Spindle
9. Teflon sleeves
10. Insulating disc
10a. Gasket
1 1. O-ring
12. Valve cover
13. O-ring *
14. O-ring
15. Servo piston *
16. Bottom screw
17. Drain plug
18. Gasket
19. Strainer assembly, complete
20. Self-cleaning strainer
21. Pilot nozzle
22. Gasket
23. O-ring
24. Servo spring **

* Please state valve size.
** See table Fig. 5

Media

Refrigerant side: HFC, HCFC, CFC and R 717 (NH_3)
Water side: Fresh water and brine

Max. test pressure

Refrigerant side: P' = 29 bar = 2900 kPa
Water side: P' = 16 bar = 1600 kPa)

Opening differential pressure

WVS 32-40: Min. 0.5 bar = 50 kPa
Max. 4 bar = 400 kPa
WVS 50-100: Min. 0.3 bar = 30 kPa
Max. 4 bar = 400 kPa

If WVS is required with a differential pressure of 1 - 10 bar = 100 - 1000 kPa, the servo spring (24) is to be replaced.
See ordering table, Fig. 5.

Fitting

WVS is to be fitted in the cooling water inlet with flow in the direction of the arrow and with the bellows element facing upwards. It is recommended that a strainer should be inserted before the valve.
The bellows element is to be connected to the pressure side of the refrigeration system at a point where pressure pulsations from the compressor do not affect the valve, e.g. on the top of the condenser or after the oil separator. The pressure line must be connected so that impurities cannot enter it. See Fig. 3.

Setting
Remove the cover (6a).
WVS can be set to begin opening at a condensing pressure of min. 2 bar = 200 kPa and max. 19 bar = 1900 kPa.
The valve is completely open when the condensing pressure has increased by 1 bar = 100 kPa above the preset opening pressure. A lower condensing pressure is obtained by turning the regulating nut (5) anticlockwise (to slacken the regulating spring) – and vice versa. When the refrigerating system stops, the condensing pressure falls, and so the WVS closes.

Service
The water valve must shut off the cooling water when the refrigeration system is stopped. If not, it may be due to the fact that large impurities have settled on the valve seat of the servo piston or pilot cone. The strainer (20) or the pilot nozzle (21) may be clogged up.
Impurities can be removed as shown in Fig. 4. Insert a screwdriver between the pilot cone spindle (8) and the push rod (4). Tilting the screwdriver forces the pilot cone down, and the valve opens to full cooling water flow.
If still the valve does not close tightly, shut off the cooling water supply to the water valve. Unscrew the strainer assembly (19) and clean both the strainer and the pilot nozzle.
If the strainer or pilot nozzle is not clogged up, dismount the top part (6) and the valve cover (12), which can be done without relieving the system of its pressure. Remove the strainer assembly from the valve cover, clean it, and apply a coat of water-resistant, acid-free grease to it. Fill the same kind of grease into the space over the Teflon sleeves (9). It may be necessary to grind the pilot cone in its seat. Clean the servo piston and valve seat and apply a coat of water- resistant, acid-free grease to the servo cylinder and the servo piston guide.
The pilot channels in the valve cover can be cleaned after the screws have been unscrewed from the sides of the valve cover.
Check whether the O-rings need replacement.
After fitting or overhaul the water valve must be flushed vigorously for some minutes in order to remove any impurities from pipelines, etc. See Fig. 4.
If there is any risk of the valve bursting due to frost during standstill periods, it should be drained of water. It can be done unscrewing the drain plug (17) and the bottom screw (16).

DEUTSCH

Automatische Wasserventile
Technische Daten
Positionsliste

1. Bördelanschluß
2. Schweissnippel
3. Wellrohrelement
4. Druckbolzen
5. Regelmutter
6. Einstellgehäuse
6a. Deckel
7. Piloteinsatz
8. Spindel
9. Teflonmanschetten
10. Isolierscheibe
10a. Dichtung
11. O-Ring
12. Ventildeckel
13. O-Ring *
14. O-Ring
15. Servokolben *
16. Bodenschraube
17. Bodenstopfen
18. Dichtung *
19. Filtereinsatz, komplett
20. Selbstreinigendes Filter
21. Pilotdüse
22. Dichtung
23. O-Ring
24. Servofeder **

* Ventilgröße angeben.
** Siehe Tabelle, Abb. 5.

Medien
Kältemittelseite: HFC, HCFC, CFC und R 717 (NH_3)
Wasserseite: Frischwasser und Sole

Max. Prüfdruck
Kältemittelseite: P' = 29 bar
Wasserseite: P' = 16 bar

Öffnungsdifferenzdruck
WVS 32 40: min. 0.5 bar, max. 4 bar
WVS 50-100: min. 0.3 bar, max. 4 bar
Wenn das Ventil WVS mit einem Differenzdruck von 1 - 10 bar gewünscht wird, so ist die Servofeder (24) auszuwechseln. Siehe Bestelltabelle, Abb. 5.

Montage
WVS wird mit nach oben gerichtetem Wellrohrelement und mit Durchfluß in Pfeilrichtung in den Kühlwassereintritt eingebaut. Es empfiehlt sich, vor dem Ventil ein Schmutzfilter einzubauen.
Das Wellrohrelement wird an der Druckseite der Kälteanlage angeschlossen, wo vom Kompressor herrührende Druckpulsationen das Ventil nicht beeinflussen können, z.B. zuoberst am Verflüssiger oder hinter dem Ölabscheider. Das Druckrohr ist so anzuschliessen, daß etwaige Schmutzteilchen nicht in das Rohr gelangen können. Siehe Abb. 3.

Einstellung
Deckel (6a) entfernen.
WVS kann so eingesteilt werden, daß es bei einem Verflüssigungsdruck von min. 2 bar und max. 19 bar zu öffnen beginnt.
Das Ventil ist völlig geöffnet, wenn der Verflüssigungsdruck um 1 bar über den eingestellten Öffnungsdruck gestiegen ist.
Durch Linksdrehen der Regelmutter (5) (Lockern der Regelfeder) ergibt sich ein niedrigerer Verflüssigungsdruck- und umgekehrt. Sobald die Kälteanlage ausschaltet, geht der Verflüssigungsdruck zurück und das Ventil WVS wird daher schließen.

Wartung
Bei stillgesetzter Kälteanlage muß das Wasserventil die Kühlwasserzufuhr völlig absperren. Ist dies nicht der Fall, können sich möglicherweise an den Ventilsitzen des Servokolbens oder des Pilotkegels grössere Schmutzteilchen festgesetzt haben. Vielleicht sind auch das Filter (20) oder die Pilotdüse (21) verstopft.
Abb. 4 zeigt, wie man möglicherweise Schmutzteilchen entfernen kann. Zwischen die Spindel des Pilotkegels (8) und den Druckbolzen (4) steckt man einen Schraubenzieher und drückt damit den Pilotkegel nach unten, so daß dabei das Ventil den vollen Kühlwasserdurchfluß freigibt.
Wenn danach das Ventil immer noch nicht völlig dicht absperrt, so muß die Kühlwasserzufuhr unterbrochen werden. Darauf sind der Filter-einsatz (19) auszuschrauben und Filter und Pilotdüse zu reinigen.
Wenn keine Verstopfung des Filters oder der Pilotdüse festgestellt werden konnte, müssen das Einstellgehäuse (6) und der Ventildeckel (12) ausgebaut werden. Dieser Ausbau kann bei unter Druck stehender Anlage erfolgen. Piloteinsatz aus dem Ventildeckel herausnehmen, reinigen und mit einem wasserbeständigen säurefreien Fett schmieren.

Der Raum über den Teflon-manschetten (9) ist mit dem gleichen Schmierfett zu füllen. Unter Umständen muß der Pilotkegel neu in den Pilotsitz eingeschliffen werden.
Servokolben und Ventilsitz reinigen. Servozylinder und Führung des Servokolbens mit wasserfestem säurefreiem Fett schmieren.
Die Pilotkanäle im Ventildeckel lassen sich nach Enffernung der Schrauben aus den Deckelseiten reinigen.
Prüfen Sie, ob eine Auswechslung der O-Ringe erforderlich ist.
Nach dem erneuten Zusammenbau – und überhaupt nach jeder Inspektion – muß das Ventil einige Minuten lang gründlich durchgespült werden, um etwaige Schmutzteilchen aus Rohrleitungen u.s.w. zu entfernen. Siehe Abb. 4.
Wenn in Standzeiten die Gefahr einer Frostsprengung des Ventils besteht, so sollte man das Wasser daraus ablassen. Zu diesem Zweck sind der Bodenstopfen (17) und die Schraube (16) zu entfernen.

FRANÇAIS

Vannes automatiques à eau
Caractéristiques techniques
Liste de repères

1. Raccord flare
2. Tubulure à souder
3. Elément du soufflet
4. Tige de pression
5. Ecrou de réglage
6. Partie supérieure
6a. Couvercle
7. Cartouche pilote
8. Tige
9. Manchons en téflon
10. Disque isolant
10a. Joint
11. Bague torique
12. Couvercle de vanne
13. Bague torique *
14. Bague torique
15. Servo-piston *
16. Vis de fond
17. Bouchon de fond
18. Joint
19. Cartouche de filtre, complète *
20. Filtre auto-nettoyant
21. Orifice pilote
22. Joint
23. Bague torique
24. Servo-ressort **

* Indiquer la dimension de la vanne
** Voir le tableau, fig. 5.

Médiums
Côté fluide frigorigène: HFC, HCFC, CFC et R 717 (NH_3).
Cote eau: Eau douce et saumure.

Pression d'essai max.
Côté fluide frigorigène: P' = 29 bar = 2900 kPa
Côté eau: P' = 16 bar = 1600 kPa

Pression différentielle d'ouverture
WVS 32-40: min. 0.5 bar = 50 kPa, max. 4 bar = 400 kPa
WVS 50-100: min. 0.3 bar = 30 kPa, max. 4 bar = 400 kPa
Si l'on désire une WVS avec une pression différentielle de 1 - 10 bar = 100 - 1000 kPa, le servo-ressort (24) doit être remplacé. Voir le tableau de commande, fig. 5.

Montage
Monter la WVS dans l'entrée de l'eau de refroidissement, pour passage du liquide dans le sens de la flèche et l'élément du soufflet orienté vers le haut. Il est recommandé de monter un filtre saletés en amont de la vanne.
Raccorder l'élément du soufflet. sur le côté refoulement de l'installation frigorifique, en un endroit où les pulsations de pression dues au compresseur n'influent pas sur la vanne, p.ex., au sommet du condenseur ou en aval du séparateur d'huile. La conduite de refoulement doit être reliée d'une telle façon que d'éventuelles saletés ne puissent y pénétrer. Voir fig. 3.

Réglage
Enlever le couvercle (6a).
La WVS peut être réglée pour commencer à s'ouvrir à une pression de condensation de min. 2 bar = 200 kPa et de max. 19 bar = 1900 kPa.
La vanne est complètement ouverte quand la pression de condensation s'est élevée de 1 bar = 100 kPa au-dessus de la pression d'ouverture de réglage.
Une pression de condensation plus basse est obtenue en tournant l'écrou de réglage (5) vers la gauche (le ressort de réglage est déchargé) – et inversement.
A l'arrêt de l'installation frigorifique, la pression de condensation tombe et, par conséquent, la WVS se ferme.

Entretien
A l'arrêt de l'installation frigorifique, la vanne doit couper totalement le passage de l'eau de refroidissement. Si se n'est pas le cas, cela peut être dû à ce que des particules de saleté assez grosses se sont fixées sur le siège du servo- piston ou du cône pilote. Le filtre (20) ou l'orifice pilote (21) sont peut-être bouchés.
On peut essayer d'enlever les saletés comme montré fig. 4. Introduire un tournevis entre la tige (8) du cône pilote et la tige de pression (4). En basculant le tournevis, le cône pilote est pressé vers le bas et la vanne s'ouvre pour le plein passage de l'eau de refroidissement.
Dans le cas où la vanne à eau ne ferme toujours pas hermétiquement, couper l'accès d'eau de refroidissement à la vanne. Dévisser la cartouche de filtre (19) et nettoyer tant le filtre que l'orifice pilote.
Si ni le filtre ni l'orifice pilote ne sont bouchés, démonter la partie supérieure (6) et le couvercle (12) de la vanne. La partie supérieure et le couvercle de la vanne peuvent être démontés sans décharger l'installation.
Sortir la cartouche pilote du couvercle de la vanne, la nettoyer et la graisser avec une graisse non acide résistante à l'eau. Remplir l'espace au-dessus des manchons en téflon (9) de la même graisse. Peut-être faut-il roder le cône pilote dans le siège pilote.
Nettoyer le servo-piston et le siège de la vanne et enduire le servo-cylindre et le guide du servo-piston d'une graisse non acide résistante à l'eau.
Les canaux pilotes du couvercle de la vanne peuvent être nettoyés après avoir dévissé les vis des côtés du couvercle de la vanne.
Examiner si les bagues toriques doivent être remplacées.
Apres le montage ou oprès un entretien, il est nécessaire, pendant quelques minutes, de purger énergiquement la vanne afin d'éliminer des conduites, etc. d'éventuelles salétes. Voir fig. 4.
En cas de risque d'éclatement par le gel de la vanne pendant les périodes d'arrêt, celle-ci doit être vidée. A cet effet, enlever le bouchon de fond (17) et la vis (16).

Instructions

003R9301

Thermostatically operated cooling water valves

003R9301

AVTA

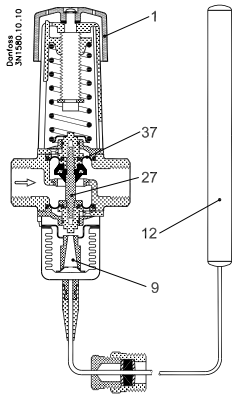


Fig. 1

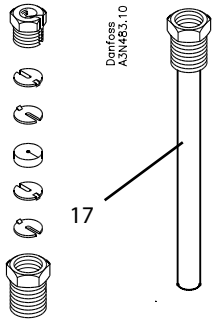


Fig. 2

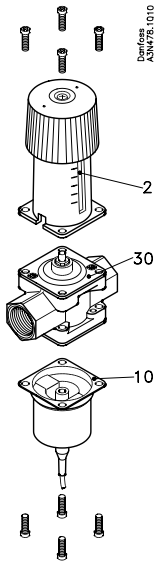


Fig. 3

Fig. 4

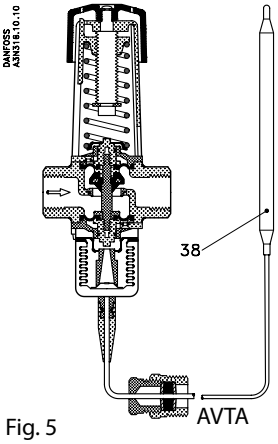


Fig. 5 AVTA

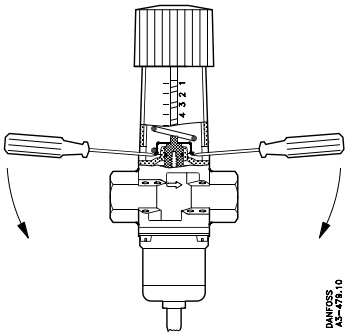


Fig. 6

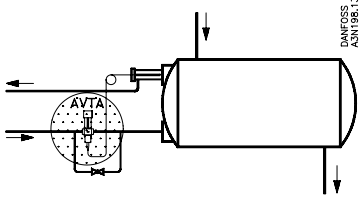


Fig. 7

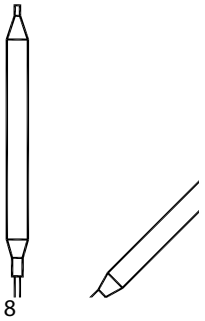


Fig. 8

DANSK

Fig. 1
pos. 1 Håndgreb
pos. 37 Fjederskål
pos. 27 Spindel
pos. 9 Trykfod
pos. 12 Stor føler

Fig. 2
pos. 17 Følerlomme

Fig. 3
pos. 2 Indstilingsdel
pos. 18 Monteringskonsol
pos. 30 Ventilhus
pos. 9 Trykfod
pos. 10 Bælgelement

Fig. 4
Stor føler (anbringelse)

Fig. 5
pos. 38 Lille føler

Fig. 6
Tvangsåbning af ventilen

Fig. 7
AVTA på kondensator (by-pass)

Fig.8
Lille føler (anbringelse)

Montering

1. Ventil

Monter ventilen så gennemstrømning sker i pilens retning på ventilhuset. Ventilhuset kan monteres i vilkårling stilling.
Indskyd et smudsfilter i rørsystemet før ventilen – fx Danfoss type FV.
Ønsker man at anvende en monteringskonsol (figur 3 pos. 18 best. nr 003N0388) skal den anbringes mellem indstillingsdel og ventilhus – aldrig mellem ventilhus og bælgelement.

2. Føler

Anbring føleren så hele føleroverfladen er i berøring med mediet – en betingelse for at få en hurtig og præcis regulering.
(Føleren kan fastgøres med spændebånd på en overfalde, men regulerer da langsommere).
Fyld eventuelt følerlommen (figur 2 pos. 17, best. nr 003N0050) med kobberpasta (best. nr. 041E0110) for at forbedre varmeovergangen.

Anbring den store føler (figur 4) så den fri ende er lavere, eller højst i niveau med den ende, hvor kapillarrøret er tilsluttet.
Sørg for at dreje føleren, så ordet UP kommer til at vende opad ved montage afvigende fra lodret.
Anbring den lille føler (figur 8), så den fri ende er højere end den ende, hvor kapillarrøret er tilsluttet. Føleren skal anbringes varmere end det medie der gennemstrømmer ventilen.
For elementer med adsorbtionsfyldning gælder disse begrænsninger dog ikke. Det betyder, at følerens monteringsretning kan vælges frit, og at der ved indbygning af føleren ikke skal tages særlige hensyn til temperaturforholdene.

3. Kapillarrør

Fremfør kapillarrøret uden skarpe knæk. Aflast kapillarrøret i enderne. Aflastning er især vigtig hvor der kan forekomme vibrationer.

BEMÆRK

Føleren skal ved anlæggets opstart kunne påvirkes af kølevandets temperaturvariationer.
Derfor kan en by-pass ledning med afspærringsventil være nødvendig for at sikre en gennemstrømning ved føleren under opstart, hvor ventilen kan være lukket (se figur 7).

Indstilling

Med håndgrebet indstilles ventilgennemstrømningen, så den ønskede temperatur opnås ved føleren. Temperaturen kontrolleres med et termometer ved føleren.
(Ved køleanlæg indstilles gennemstrømningen efter ønsket kondenseringstryk).
Drejning af håndgrebet mod uret hæver temperaturen og drejning med uret sænker temperaturen.

Service
Efter montering gennemskylles rørledningen, så eventuelle urenheder og snavs fjernes.
Gennemskylning foretages ved tvangsåbning af ventilen.
Før to skruetrækkere ind gennem de to huller i ventilens indstillingsdel. Tryk fjederskålen opad og ventilen åbner for gennemstrømning (se figur 6).

Udskiftning af bælgelement (figur 3)
Indstil ventilen på 1. Frigør de fire skruer, der sammenholder bælgelement og ventilhus og fjern bælgelementet.
Sørg for ved montering af det nye element at trykfoden centrerer med ventilspindelen.
Udskiftning af bælgelement og indstillingsdel kan udføres med vand på anlægget.

Tryk og temperaturforhold

Arbejdstryk	Max. 16 bar (p_e)
Differenstryk	Max. 10 bar
Prøvetryk	Max. 25 bar (p_e)
Tryk pa føler/	Max. 25 bar (p_e)
følerlomme	Max. 50 bar (p_e)
Følertemp.	Max. område-temp. + 20ºC
Vandtemp.	Max. 130ºC

(p_e = effektivt tryk)

ENGLISH

Fig. 1
pos. 1 Knob
pos. 37 Spring retainer
pos. 27 Spindle
pos. 9 Pressure stem
pos. 12 Large sensor

Fig. 2
pos. 17 Sensor pocket

Fig.3
pos. 2 Setting unit
pos. 18 Mounting bracket
pos. 30 Valve body
pos. 9 Pressure stem
pos. 10 Bellows element

Fig. 4
Large sensor (location)

Fig. 5
pos. 38 Small sensor

Fig. 6
Force opening of valve
Fig. 7
AVTA on condenser (by-pass)

Fig. 8
Small sensor (location)

Mounting
1. Valve
Mount the valve in such a way that flowis in the direction indicated by the arrowon the valve body. The valve body can be mounted in any position.
Insert a dirt filter in the pipe system ahead of the valve, e.g. Danfoss type FV. If it is desired to use a mounting bracket (fig. 3 pos. 18, code no. 003N0388) this must be located between the setting unit and the valve body – never between valve body and bellows element.

2. Sensor
Place the sensor in such a way that the whole of its surface is in contact with the medium – to ensure quick and precise regulation. (The sensor can be fastened by a clamp to a surface, but in this case regulation is slower). Filling the sensor pocket (fig. 2 pos. 17, code No. 003N0050) with copper paste (code no. 041E0110) improves heat transfer.
Place the large sensor (fig. 4) in such a way that the free end is lower, or at most on a level with the end to which the capillary tube is connected. Be sure to rotate the sensor so that the word "UP" faces upwards if the sensor is placed in a horizontal position. The small sensor however (fig. 8) should be fitted so that the free end is higher than the end to which the capillary tube is connected.
This sensor must be placed in a position where it is warmer than the medium flowing through the valve. These limitations do not apply to elements with an adsorption charge. This means that the sensor can be orientated in any direction, and that when determine the sensor position no special account need be taken of the temperature conditions just mentioned.

3. Capillary tube
Install the capillary tube without sharp ends. Relieve the capillary tube at the ends.
Relief is especially important where vibration can occur.

NOTE
The sensor must, when the plant is started, be able to sense variations i n the temperature of the coolingwater. Therefore a by-pass line with shut-off valve may be necessary to ensure a flow at the sensor during start up, when the valve may be closed (see fig. 7).

Setting
Using the adjustment knob, the valve can be set so that the desired temperature is obtained at the sensor. The temperature is controlled with a thermometer at the sensor. (In the case of refrigeration plant, the flow is set according to the desired condensing pressure). Turning the knob in an anticlockwise direction raises the temperature while turning it in a clockwise direction lowers the temperature.

Service
After mounting, rinse out the pipeline to remove any impurities and dirt. Rinsing is carried out by means of forced opening of the valve.
Insert two screwdrivers in through the two holes in the setting unit of the valve. Press the spring retainer upwards and the valve will open to flow (see fig. 6).

Replacement of bellows element (fig.3)
Set the valve to 1. Loosen the four screws holding bellows element and valve body together and remove the bellows element. When mounting the new element, make sure that the pressure stem centres on the valve spindle. Bellows element and setting unit can be replaced with water in the system.

Pressure and temperatures
Working pressure
Max. 16 bar (p_e)

Differential pressure
Max. 10 bar

Test pressure
Max. 25 bar (p_e)

Pressure on sensor
Max. 25 bar (p_e)

Sensor pocket
Max. 50 bar (p_e)

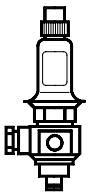
Sensor temperature
Max. range temp. +20ºC

Water temperature
Max. 130ºC

(p_e = effective pressure)

Instructions

CVC



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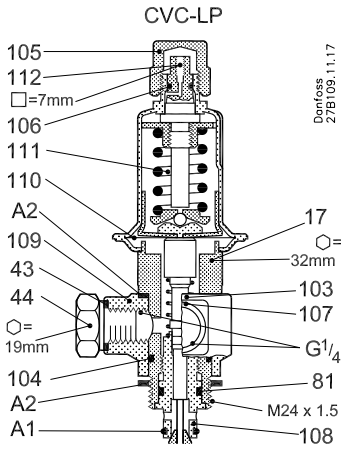


Fig. 1. CVC

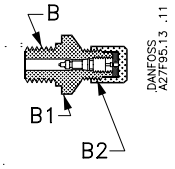


Fig. 2

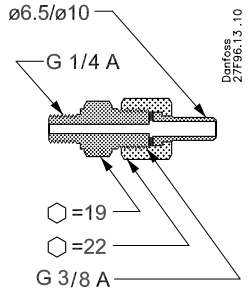


Fig. 3

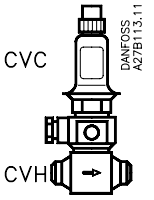


Fig. 4. CVC - CHV

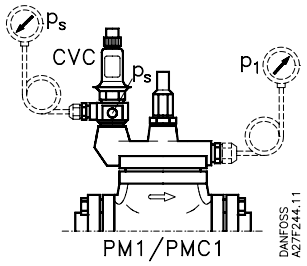


Fig. 5. PM 1/PMC 1 + CVC

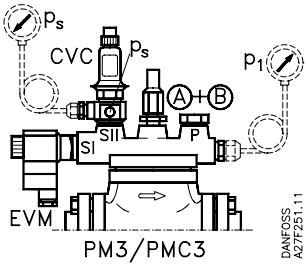


Fig. 7. PM 3/PMC 3 + EVM + CVC + A + B

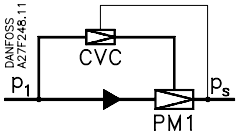


Fig. 6. PM 1 + CVC

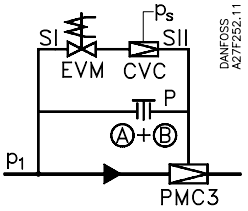


Fig. 8. PMC 3 + EVM + CVC + A + B

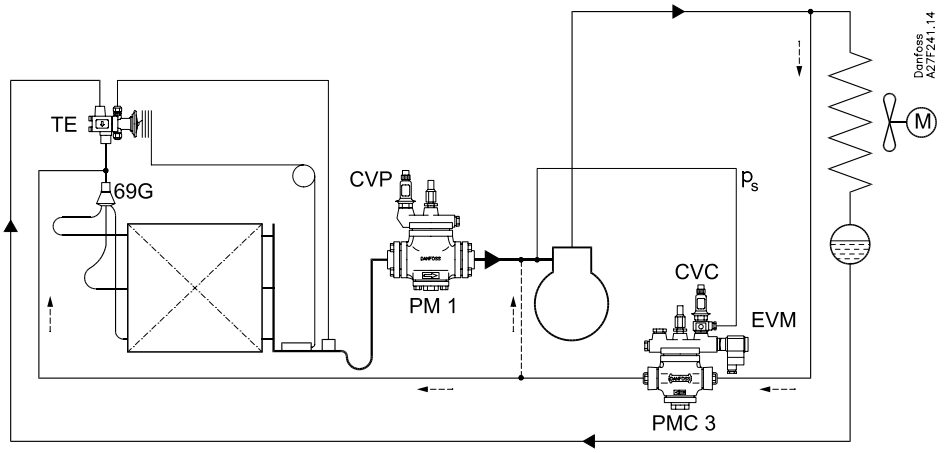


Fig. 9

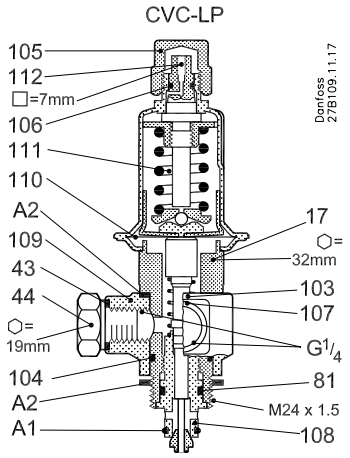


Fig. 1. CVC

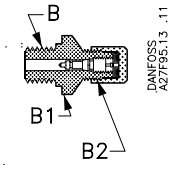


Fig. 2

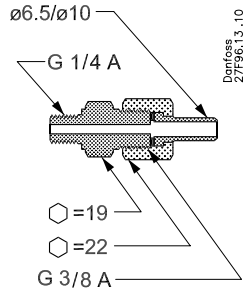


Fig. 3

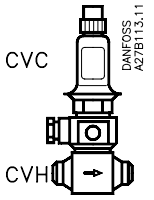


Fig. 4. CVC - CHV

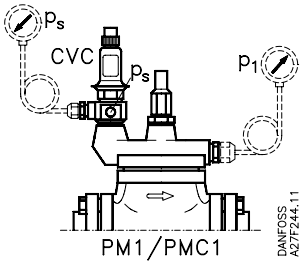


Fig. 5. PM 1/PMC 1 + CVC

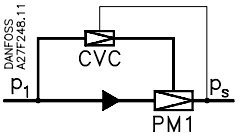


Fig. 6. PM 1 + CVC

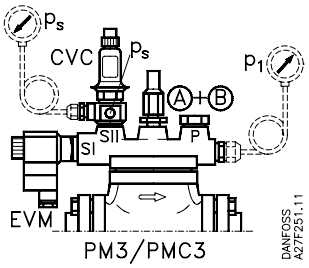


Fig. 7. PM 3/PMC 3 + EVM + CVC + A + B

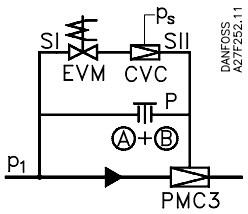


Fig. 8. PMC 3 + EVM + CVC + A + B

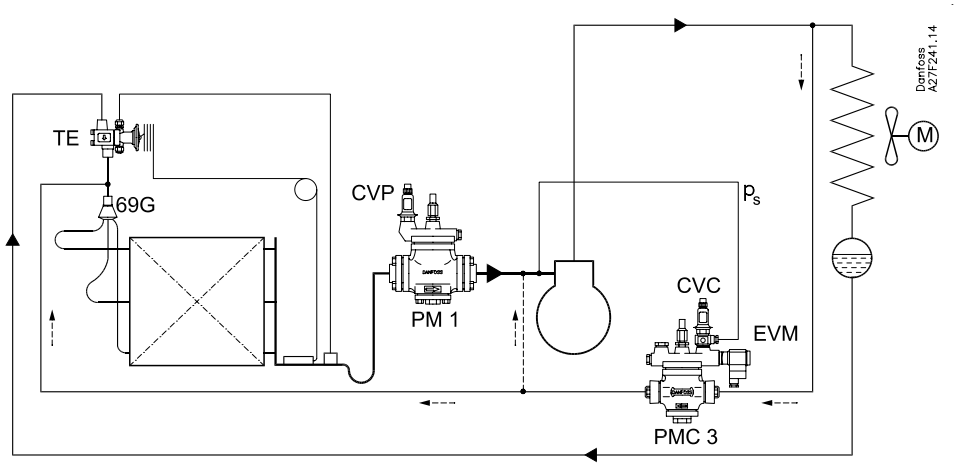


Fig. 9

DANSK

Trykstyret pilotventil

Konstruktion
Se fig. 1, 2 og 3.

43. Pakning
44. Blændprop for manometertilslutning
81. Pakning
82. O-ring
103. Banjofitting
104. O-ring
105. Dækhætte
106. O-ring
107. Signaltilslutning
108. Pilotdyse
109. Studs på banjofitting
110. Membran
111. Fjeder
112. Indstillingsspindel

Tekniske data

Kølemidler	CFC, HFC, HCFC og R 717 (NH_3)
Reguleringsområde	–0.45 bar g til 7 bar g (13.3 in. Hg til 102 psig)
Fabriksindstilling	Helt slap fjeder
Medietemperaturområde	–50°C til +120°C (–58°F til 248°F)
Maks. driftstryk	17 bar g (247 psig)
Maks. prøvetryk	28 bar g (406 psig)

Montering
CVC monteres i PM/PMC hovedventilens topdæksel; se fig. 5 og 7. Kontrollér, at pakningen (81) og O-ringene (82 og 104) er på plads og i orden – O-ringen (82) smøres med fryseolie; se fig. 1.
NB! Hvis O-ringen (82) er utæt eller mangler helt, vil hovedventilen få signal til at åbne.
Banjofittingen (103) kan drejes. Tilspændingen bør ske med et moment på 50 Nm (5 kpm). Nøglevidden er 32 mm.
Banjofittingen er forsynet med to ens tilslutnings-huller.
I det ene hul monteres signalledningen ved hjælp af tilslutningen fig. 3. Signalledningen fra CVC skal tilsluttes der hvor trykket ønskes reguleret, f.eks. umiddelbart før kompressoren, hvis der ønskes en startregulatorfunktion.
Signalledningen må ikke kunne afspærres.
I det andet hul på banjofittingen er det muligt at tilslutte et manometer, der kan anvendes ved indstillingen af CVC. Manometeret måler trykket P_s i signalledningen. I stedet for blændproppen (44) skal der så iskrues en manometertilslutning, fig. 2 eller 3; se »Tilbehør«.
Hvis kun den ene af banjofittingens to tilslutnings-huller bruges, skal det andet blændes af med blændproppen (44).
CVC kan desuden monteres i ventilhuset CVH og anvendes som separat pilotventil eller selvstændig ventil; se fig. 4.
Anvendes CVC-CVH som separat pilotventil, skal enheden monteres i pilotledningen med gennem-strømning imod hovedventilen.

Indstilling
Pilotventilen åbner ved faldende tryk p_s i signal-ledningen.
Drejes indstillingsspindelen (112) med uret (højre om), hæves åbningstrykket – og omvendt.
En omdrejning af indstillingsspindelen ændrer åbningstrykket ca. 1.5 bar.

Grovindstilling
Drej spindelen (112) mod uret til stop. Drej derefter med uret det antal omdrejninger, der svarer til det ønskede åbningstryk.

Finindstilling
Indstil ved hjælp af manometer.

Service
Dysen i CVC kan renses med trykluft. Skru CVC af og træk reguleringsdelen ud af banjofittingen (103). Drej spindelen (112) med uret, indtil pilotventilen er helt åben. Gennemblæs dysen (108) med trykluft imod normal gennemstrømn ingsretning.
Undersøg og udskift eventuelt O-ringene (82 og 104).

Reservedele
Se Spare Parts katalog.

Tilbehør
Manometertilslutning
for fluorerede kølemidler: selvlukkende ventil med flaretilslutning (fig. 2) bestillingsnr. 027B2041; for ammoniak: ∅6.5 / ∅10 mm svejsestuds (fig. 3) bestillingsnr. 027B2035.

CVH pilotventilhus
Se hovedkataloget.

ENGLISH

Pressure-controlled pilot valves

Design
See fig. 1, 2 and 3.

43. Gasket
44. Blanking plug for manometer connection
81. Gasket
82. O-ring
103. Banjo fitting
104. O-ring
105. Seal cap
106. O-ring
107. Signal connection
108. Pilot orifice
109. Connector on banjo fitting 103
110. Diaphragm
111. Spring
112. Setting spindle

Technical data

Refrigerants	CFC, HFC, HCFC and R 717 (NH_3)
Regulating range	–0.45 bar g to 7 bar g (13.3 in. Hg to 102 psig)
Factory setting	Completely slack spring
Media temperature range	–50°C to +120°C (–58°F to 248°F)
Max. working pressure	17 bar g (247 psig)
Max. test pressure	28 bar g (406 psig)

Fitting
CVC is fitted in the top cover of the PM/PMC main valve, see figs. 5 and 7. Check that gasket (81) and O-rings (82 and 104) are in place and in order – the O-ring (82) must be lubricated with refrigeration oil, see fig. 1.
NB: If O-ring (82) is leaking or missing, the main valve will receive a signal to open.
Banjo fitting (103) can be turned. Tightening should be made to a torque of 50 Nm (37 lb force ft) with a 32 mm wrench.
The banjo fitting has two identical connection holes.
In the one hole the signal line is fitted with the connection shown in fig. 3. The signal line from the CVC must be connected at the point where the pressure is to be regulated, e.g. immediately in front of the compressor if crankcase pressure regulator function is required.
It must not be possible to block the signal line.
In the other hole in the banjo fitting a manometer can be fitted for use when setting CVC. The manometer measures the pressure p_s in the signal line. Instead of blanking plug (44) a manometer connection, fig. 2 or 3, must be screwed in, see „Accessories".
If only one of the two connection holes in the banjo fitting is used the other must be blanked off with blanking plug (44).
CVC can also be fitted in valve body CVH and be as a separate pilot valve or independent valve, see fig. 4.
If CVC-CVH is used as a separate pilot valve the unit must be fitted in the pilot line with flow towards the main valve.

Setting
The pilot valve opens at a fall in pressure p_s in the signal line.
Turning the setting spindle (112) clockwise raises the opening pressure and vice-versa.
One turn of the setting spindle changes the opening pressure by approx. 1.5 bar (21.8 psi).

Rough setting
Turn the spindle (112) counterclockwise to stop. Then turn it clockwise for the number of turns corre-sponding to the desired opening pressure.

Fine setting
Set with the aid of a manometer.

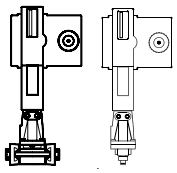
Service
The orifice in CVC can be cleaned with compressed air. Screw off the CVC and draw the regulation part out of the banjo fitting (103). Turn spindle (112) clockwise until the pilot valve is fully open. Blow compressed air through orifice (108) in the opposite direction to normal flow.
Examine O-rings (82 and 104) and replace if necessary.

Spare parts
See Spare Parts catalogue.

Accessories
Manometer connection
For fluorinated refrigerants: self-closing valve with flare connections (fig. 2) code no. 027B2041;
for ammonia: ∅6.5 / ∅10 mm welding connectors (fig. 3) code no. 027B2035.

CHV pilot valve body
See Main Catalogue.

INSTRUCTIONS

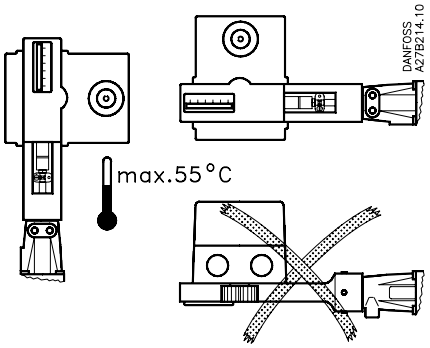


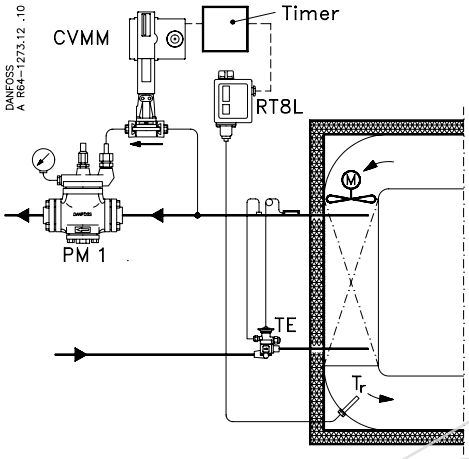
CVMM, CVPM

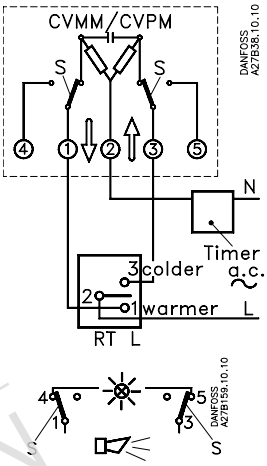
027R9502

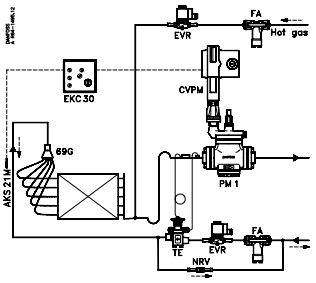
CHC, HFC, HCFC, R 717 (NH_3)
–0.66 → 7 bar
–50 → +140°C
PB / MWP = 28 bar
p^I = 42 bar

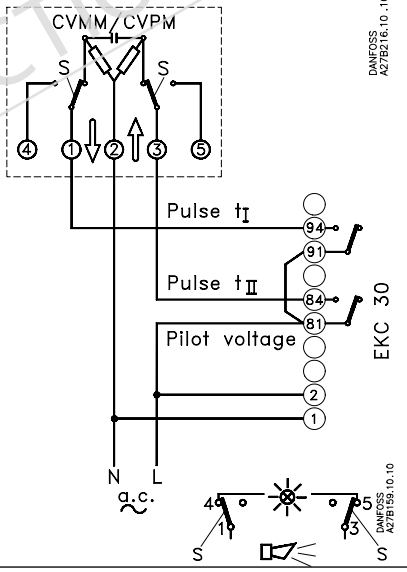
AMV 523 motor:
220, 24V a.c. +10 → –15%, 50/60 Hz
10 VA
IP 44 (IEC 529)



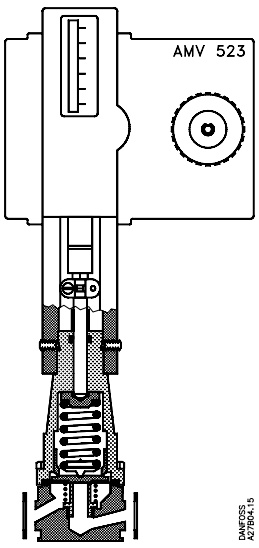




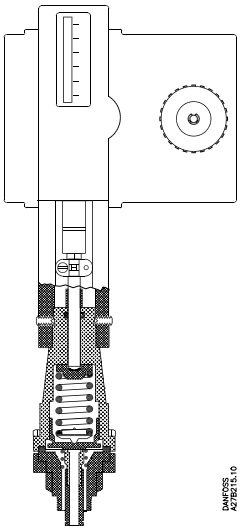


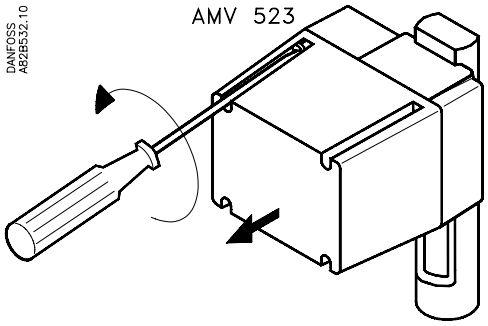


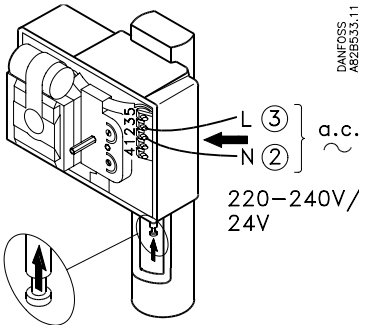
CVMM

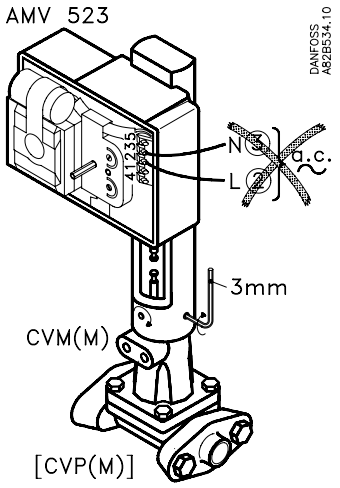


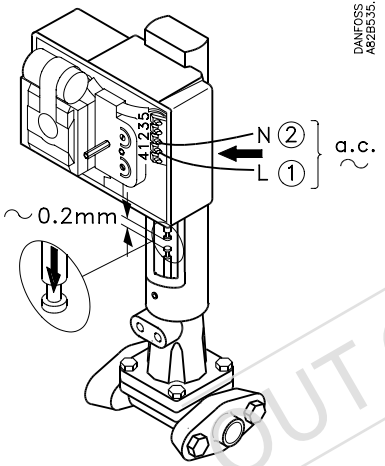
CVPM

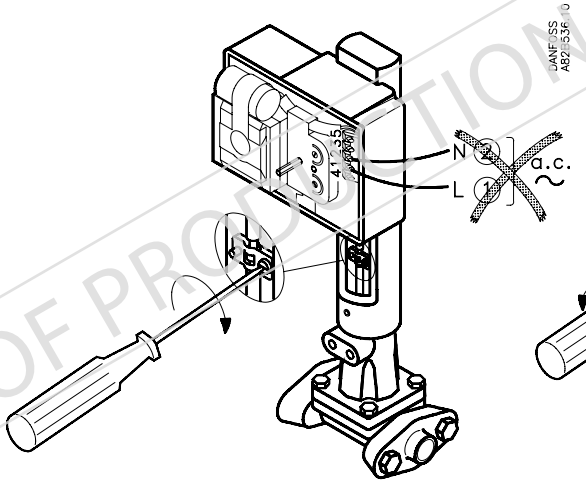


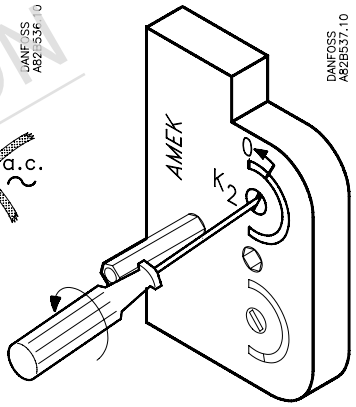


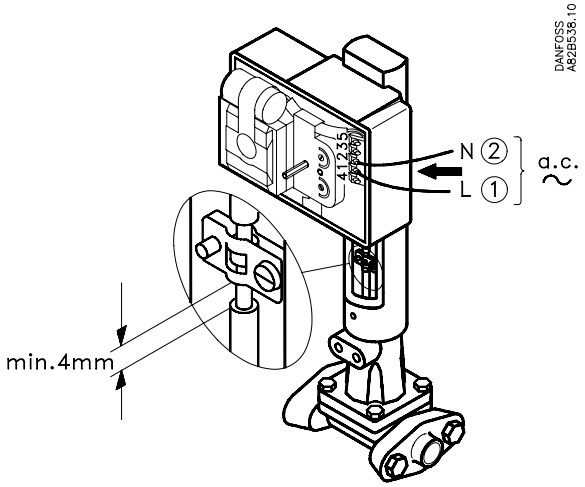


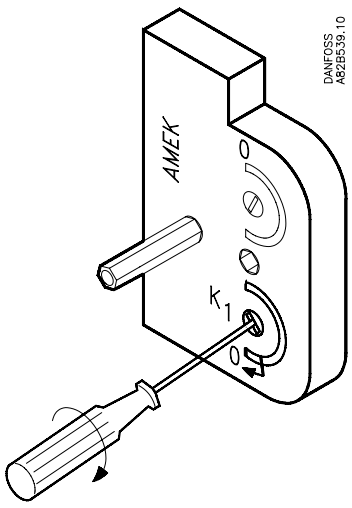


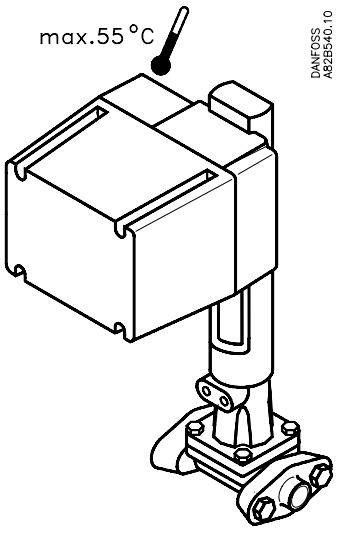






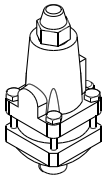






Instruction

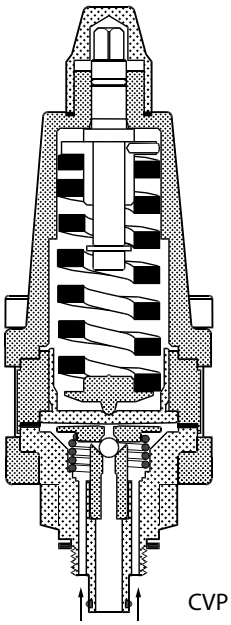
CVP (XP)



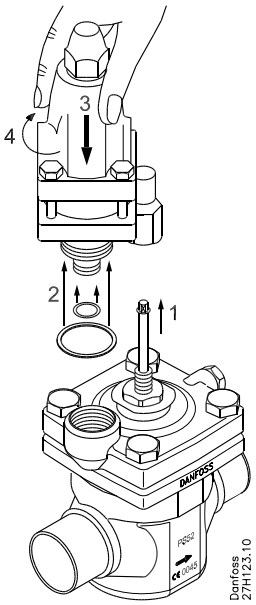
027R9780

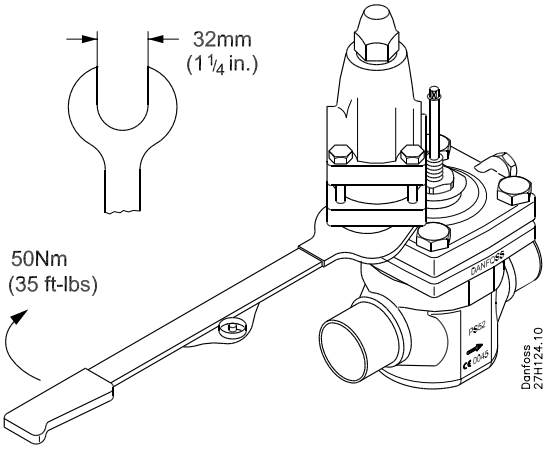
027R9780

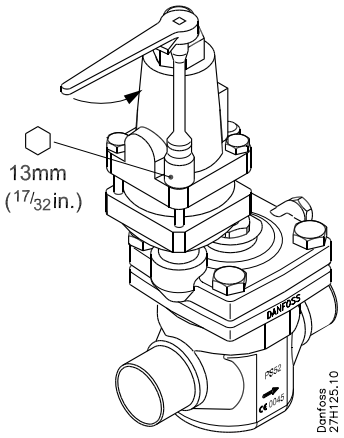
CFC, HFC, HCFC, R 717 (NH_3), CO_2

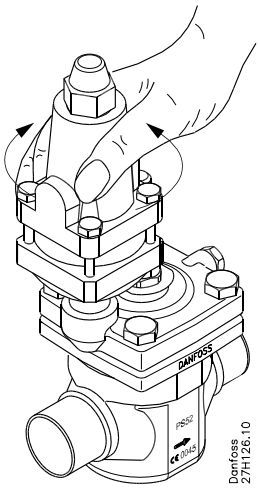


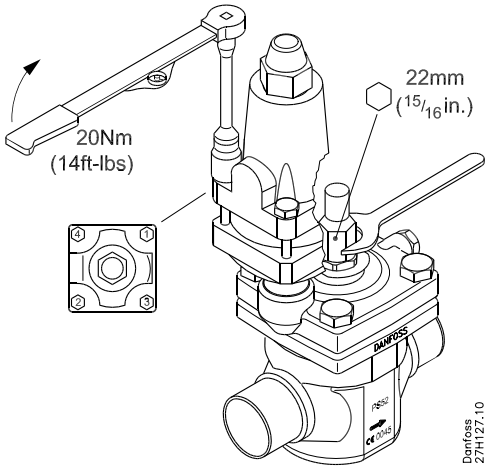
CVP (XP)

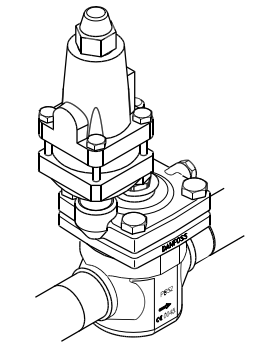


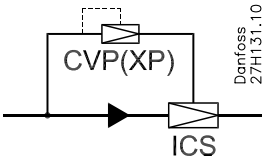


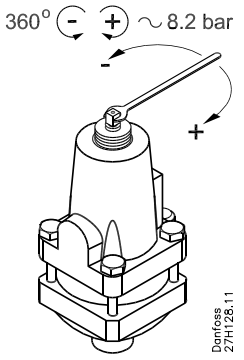


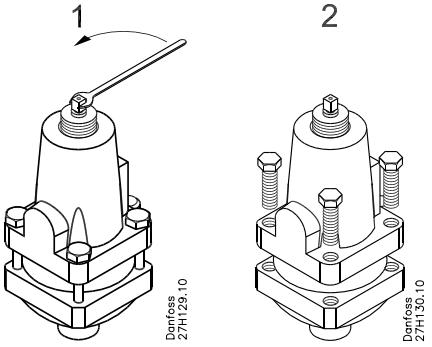






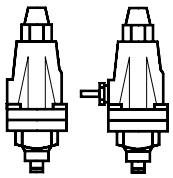




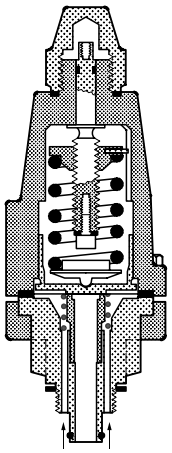


Instructions

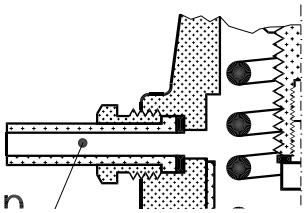
CVP, CVPP
(High Pressure)



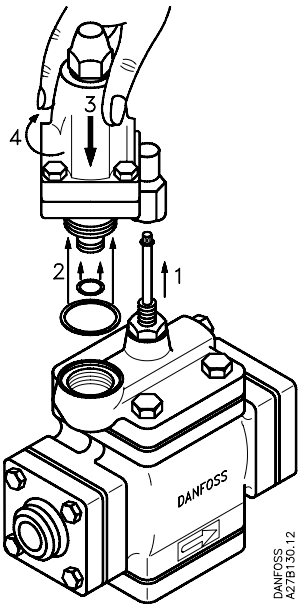
027R9632

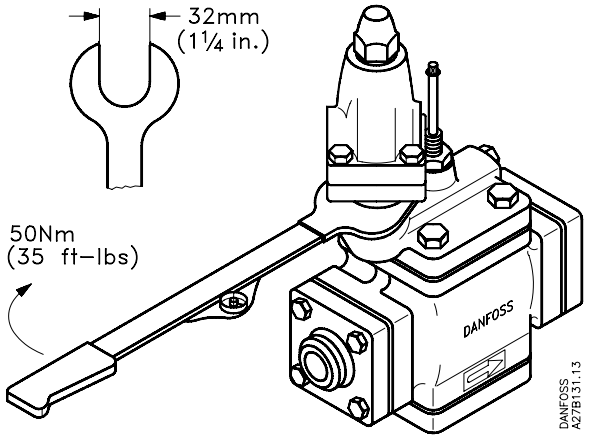


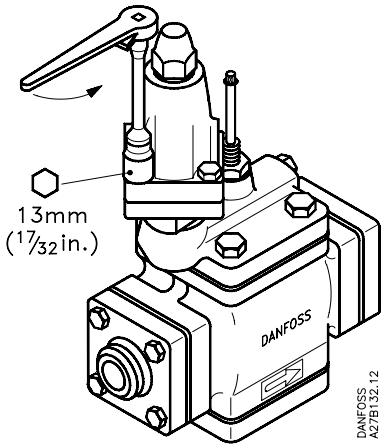
CVP (HP/HD)

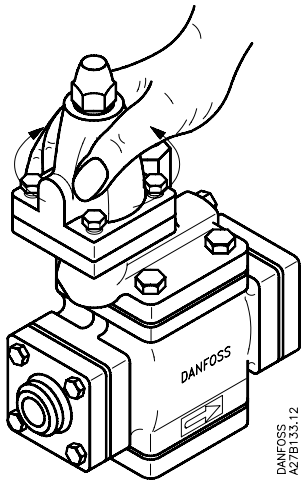


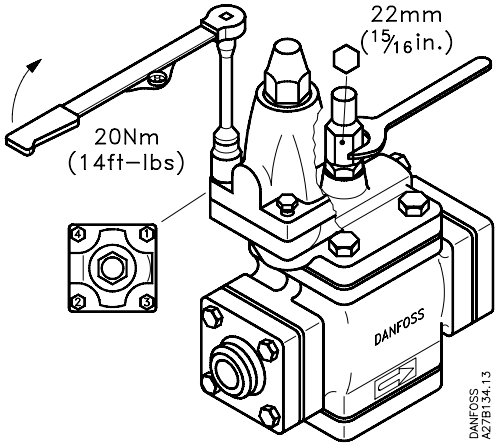
CFC, HFC, HCFC, R 717 (NH_3)

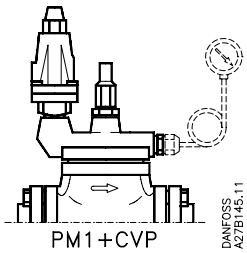


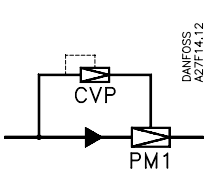


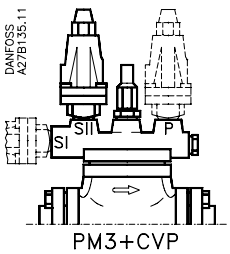


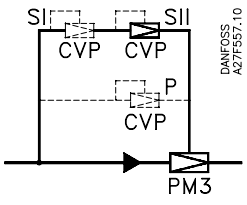


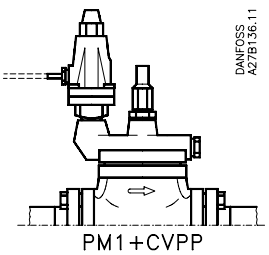


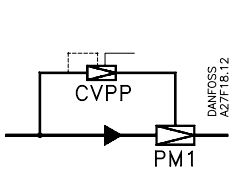


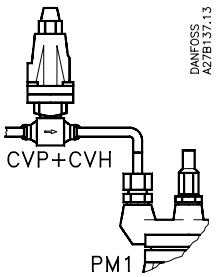


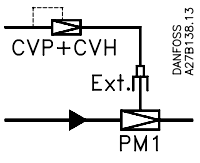


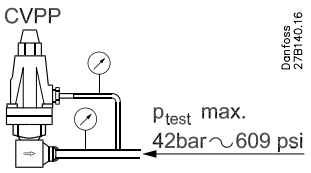


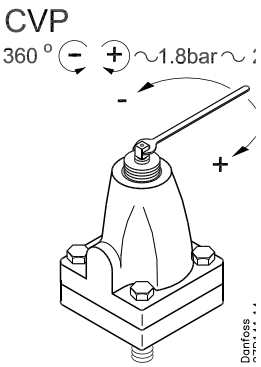




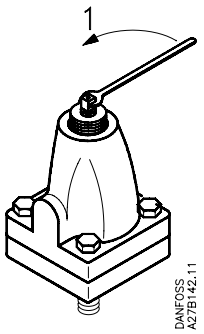


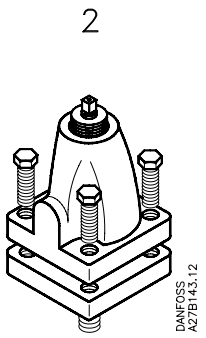


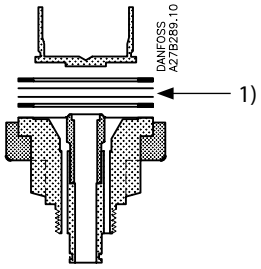




Range bar	1 turn 360° Δ
–0.66 → 7 bar	0.45 bar
4 → 22 bar	1.4 bar
4 → 28 bar	2 bar





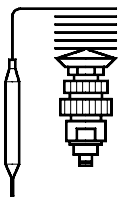


Range bar	[1]) Pcs.
–0.66 → 7 bar	1
4 → 22 bar	2
4 → 28 bar	2

Spare Parts
Please see Spare Parts Catalogue.

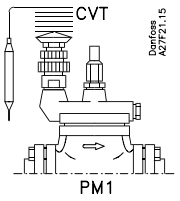
Instructions

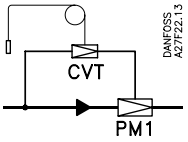
CVT, CVTO

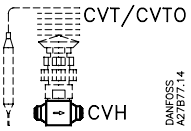


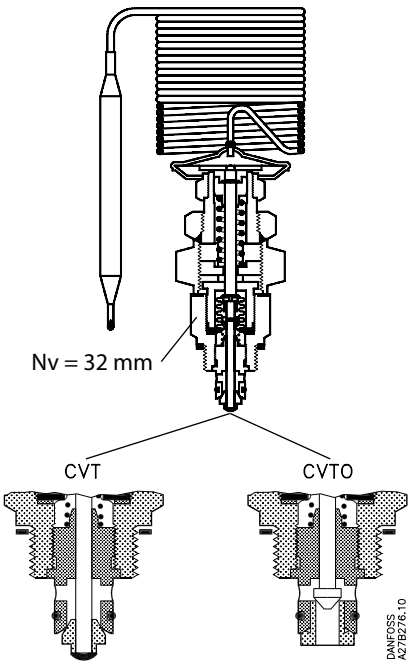
027R9590

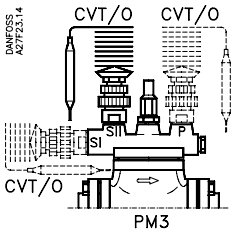
R 717, R 22, R 134a, R 404A etc.
Range:
−40 → 0°C
−10 → 25°C
20 → 60°C
80 → 140°C

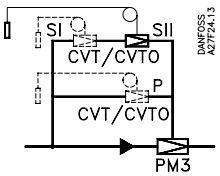


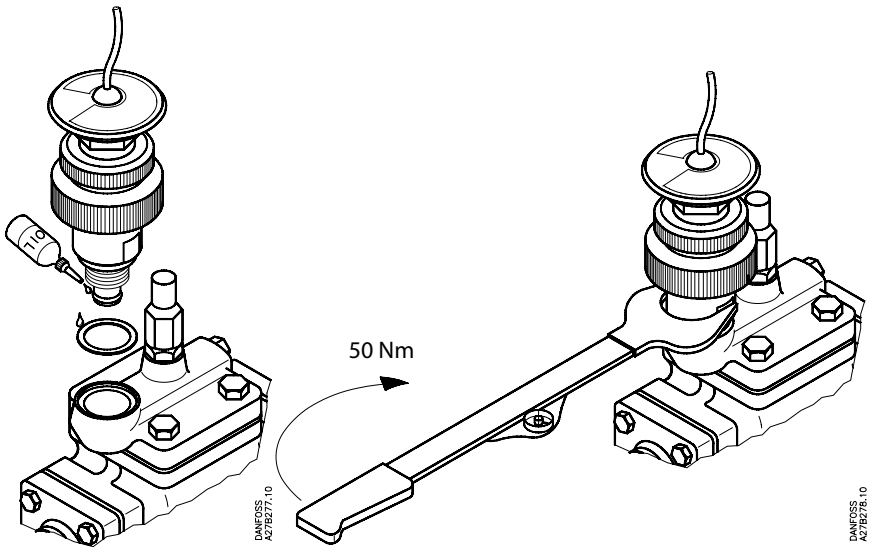






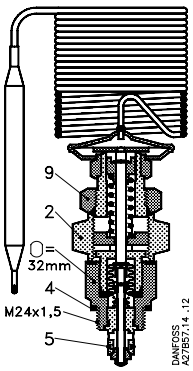


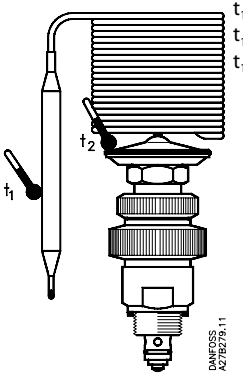




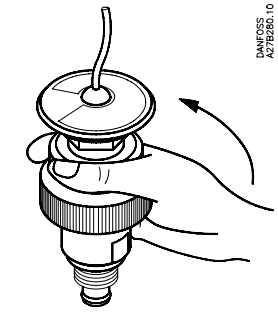
Range			
−40	→	0 °C	−30 °C
−10	→	25 °C	0 °C
20	→	60°C	30 °C
80	→	140 °C	90 °C

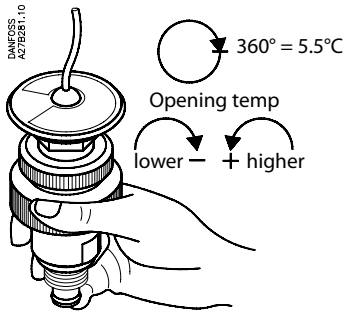
PB/MWP
= 19 bar
$\Delta p = P_1 - P_2$
= max. 8 bar

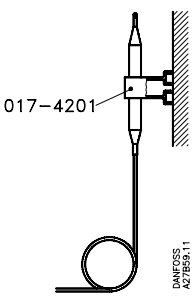


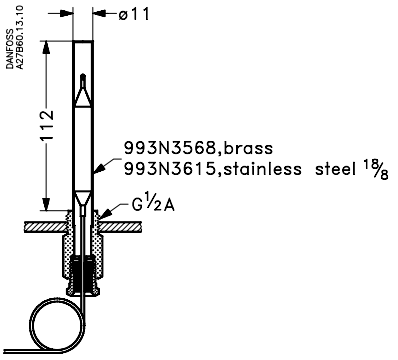


$t_1 > t_2$
$t_1 = t_2$ { Permitted
$t_1 < t_2$





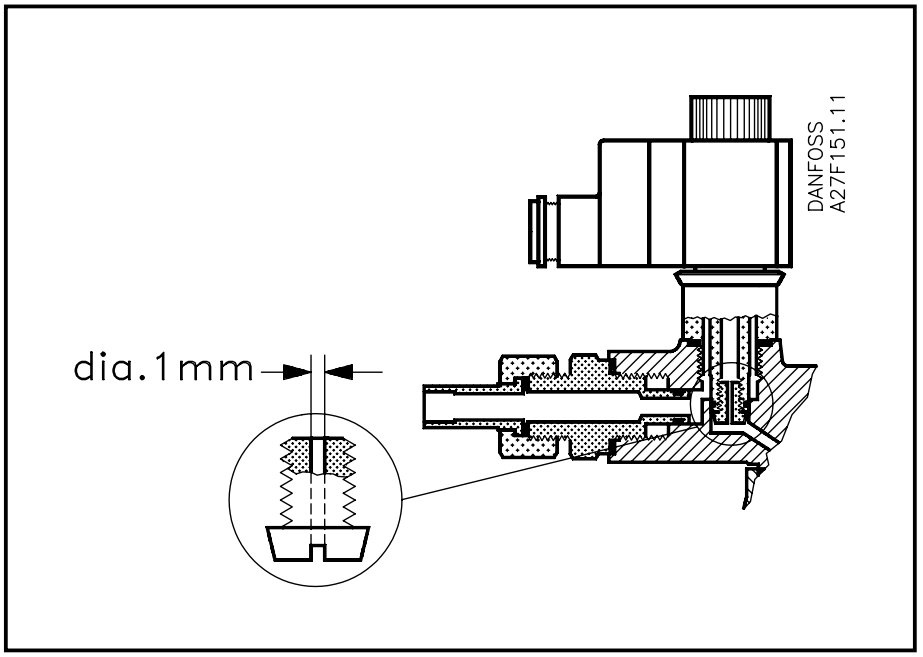




Instructions

Damping orifice for PM, PML and PMLX

027R9620



027R9620

DANSK

Dæmpedyse til PM / PML / PMLX
Anvendes ekstern pilottilslutning i serie med en EVM magnetpilotventil i PM 5-65, gælder følgende: Hvis det eksterne styretryk, f.eks. med varm -gas, er mere end 6 bar højere end hovedventilens tilgangstryk, skal dæmpedysen monteres i EVM som vist på tegningen.

NB! Dæmpedysen skal altid monteres i PML/PMLX 32-65 som vist på tegningen.

 RI3XC352

ENGLISH

Damping orifice for PM / PML / PMLX
If an external pilot connection is used in series with an EVM solenoid valve in
PM 5 - 65, the following applies: If the external control pressure, e.g. with hot gas, is more than 6 bar higher than the inlet pressure of the main valve, the damping orifice must be fitted in the EVM, as shown on the drawing.

Note! The damping orifice must always be fitted in PML/PMLX 32-65 as shown on the drawing.

DEUTSCH

Dämpfungsdüse für PM / PML / PMLX
Bei Verwendung eines externen Pilotanschlusses in Serie mit einem EVM Magnetpilotventil im PM 5-65 gilt folgendes: Wenn der externe Steuerdruck, z.B. mit Heißgas, mehr als um 6 bar höher ist als der Eintrittsdruck des Hauptventils, so ist die Dämpfungsdüse der Zeichnung entsprechend im EVM zu montieren.

NB! Im PML/PMLX 32-65 ist die Dämpfungsdüse immer der Zeichnung entsprechend zu montieren.

FRANÇAIS

Orifice amortisseur pour PM / PML / PMLX
Au cas où l'on utilise un raccordement pilote externe en série avec une électrovanne pilote EVM dans PM 5-65, suivre les instructions ci-après: Si la pression externe de commande, p.ex. par gaz chaud, est plus de 6 bars supérieure à la pression d'entrée de la vanne principale, il faut placer l'orifice amortisseur dans la vanne EVM comme montré sur le dessin.

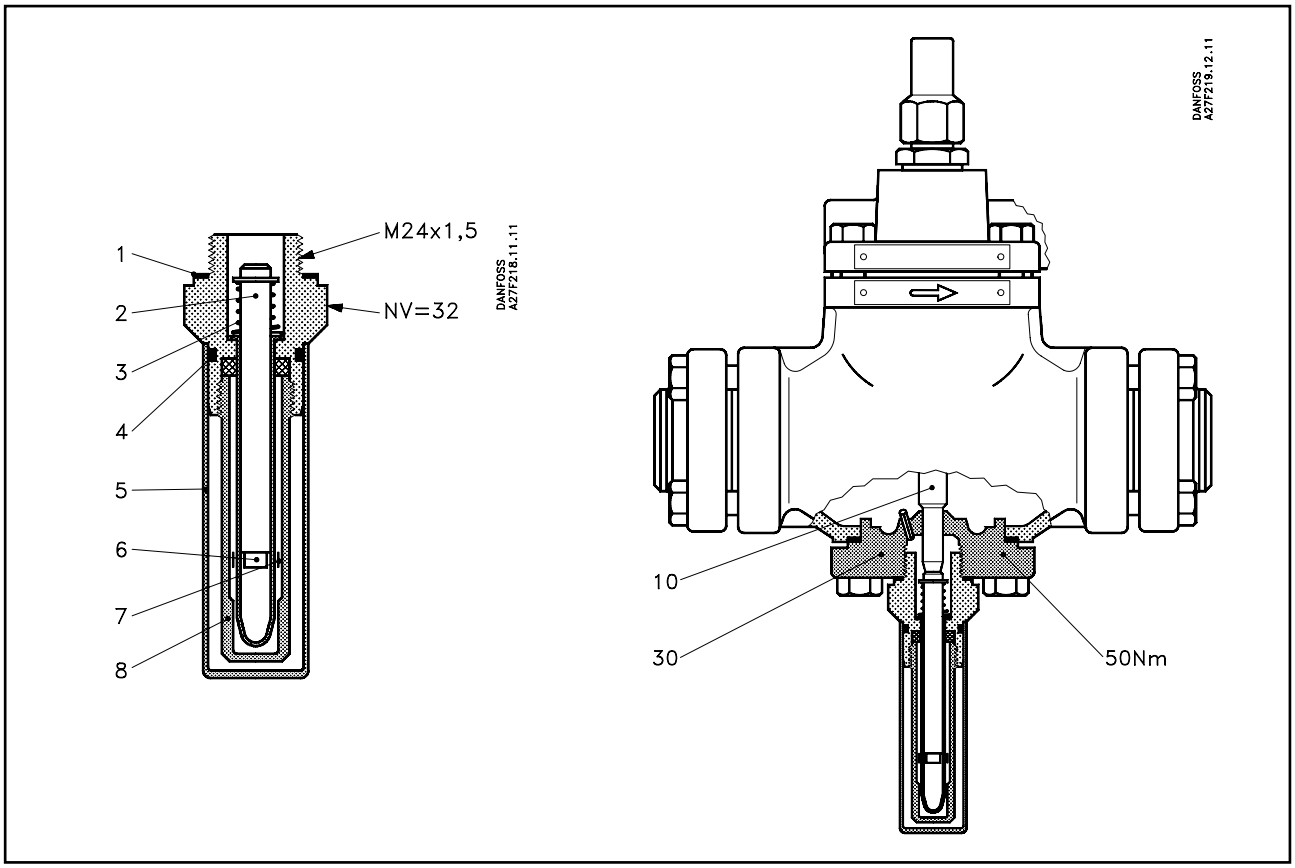
N.B.: L'orifice amortisseur doit toujours être monté dans PML/PMLX 32-65 comme montré sur le dessin.

 RI3XC352

Instructions

Indicator, 027F0085

027R9618



027R9618

DANSK

Funktionsindikator

Tekniske data
Kølemidler
R 12, R 22, R 502 etc. og R 717 (NH_3)

Driftstryk
Maks. 28 bar (p_e)

Prøvetryk
Maks. 42 bar (p_e)

Konstruktion
1. Pakning
2. Spindel
3. Fjeder
4. O-ring
5. Beskyttelseshætte
6. Magnet
7. Viser (markeringsring)
8. Indikatorglas

Montering
Indikatoren monteres i bunddækslet 30, fig. 2 i stedet for regulatorens bundprop. Når indikatorens beskyttelseshætte 5, fig. 1 er fjernet, kan regulatorens åbningsgrad følges.

ENGLISH

Function indicator
Technical data

Refrigerants
R 12, R 22, R 502 etc. and R 717 (NH_3)

Operating pressure
MWP 28 bar (p_e)

Test pressure
Max. 42 bar (p_e)

Design
1. Gasket
2. Spindle
3. Spring
4. O-ring
5. Protective cap
6. Magnet
7. Indicator (marking ring)
8. Indicator glass

Fitting
The indicator is to be fitted in the bottom cover 30, fig. 2, in place of the regulator bottom plug. When the indicator protective cap 5, fig. 1, is removed, the degree of opering of the regulator can be followed.

DEUTSCH

Funktionsindikator
Technische Daten

Kältemittel
R 12, R 22, R 502 etc. und R 717 (NH_3)

Betriebsdruck
Max. PB 28 bar (p_e)

Prüfdruck
Max. 42 bar (p_e)

Konstruktion
1. Dichtung
2. Spindel
3. Feder
4. O-ring
5. Schutzkappe
6. Magnet
7. Zeiger (Anzeigering)
8. Indikatorglas

Montage
Der Indikator wird anstelle des Reglerbodenstopfens im Bodenstück 30, Fig. 2, montiert. Wenn die Schutzkappe 4, Fig. 1, des Indikators entfernt wird, kann der Öffnungsgrad des Reglers beobachtet werden.

FRANÇAIS

Indicateur de fonctionnement
Caractéristiques techniques

Fluides frigorigènes
R 12, R 22, R 502 etc. et R 717 (NH_3)

Pression de service
Max. 28 bar (p_e)

Pression d'essai
Max. 42 bar (p_e)

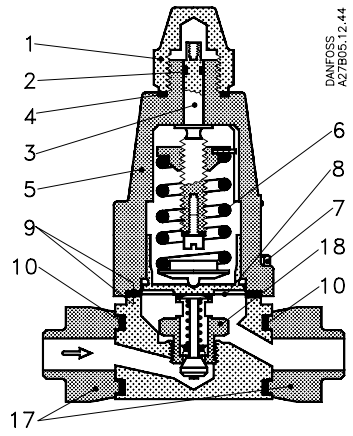
Construction
1. Joint
2. Tige
3. Ressort
4. Bague torique
5. Capuchon protecteur
6. Aimant
7. Indicateur (bague indicatrice)
8. Voyant

Montage
Monter l'indicateur dans le couvercle de fond 30, fig. 2, à la place du bouchon de fond du régulateur. Aprés avoir enlevé le capuchon protecteur 5, fig. 1, de l'indicateur, on pourra suivre le degré d'ouverture du régulateur.

Instructions

CVK

027R9575



1. Dækhætte
2. O-ring
3. Indstillingsspindel
4. Pakning
5. Dæksel
6. Fjeder
7. Skrue
8. Membran
9. Pakning (2 stk.)
10. Pakning (2 stk.)
17. Flanger (2 stk.)
18. Samlet dyseindsats

1. Seal cap
2. O-ring
3. Adjusting spindle
4. Gasket
5. Cover
6. Spring
7. Screw
8. Diaphragm
9. Gasket (2 pieces)
10. Gasket (2 pieces)
17. Flanges (2 pieces)
18. Orifice assembly

027R9575

DANSK

Pilotventil

Tekniske data
Reguleringsområde
–0.5 bar til 6 bar (p_e)

Kølemidler
CFC, HFC, HCFC, R 717 (NH_3)

Medietemperaturområde
min. –60°C
maks. +140°C

Maks. prøvetryk: p' = 42 bar
Maks. driftstryk: PB = 28 bar (p_e)

Montering
Pilotventilen CVK monteres i en pilotledning mellem pilotflangen på hovedventilen og rørledningen på hovedventilens afgangsside. Pilotventilen monteres med indstillingsspindlen opad og således, at pilen på ventilhuset peger væk fra hovedventilen.

Maks. moment ved fastspænding af CVK indsatsen, pos. 18, i ventilhuset: 6 ±1 Nm (0.6 ±0.1 Kpm).

Indstilling
Ønskes højere reguleringstryk på ventilens afgangsside, drejes indstillingsspindlen højre om – og omvendt.

ENGLISH

Pilot valve

Technical data
Range
–0.5 bar to 6 bar (p_e)
(14 in Hg to 85 psig)

Refrigerants
CFC, HFC, HCFC, R 717 (NH_3)

Media temperatures
min. –60°C (–76°F)
max. +140°C (284°F)

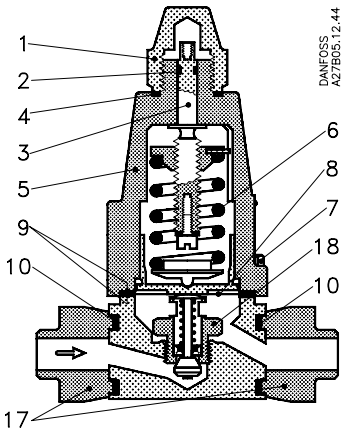
Max. test pressure:
p' = 42 bar (596 psig)

Max. working pressure:
PB = 28 bar (398 psig) (p_e)

Mounting
The pilot valve type CVK should be inserted in a pilot line between the pilot flange on the main valve and the main valve outlet pipe. The pilot valve should be mounted in such a way that the adjusting spindle faces upwards and so that the arrow on the valve body points away from the main valve.

Max. torque when fastening CVK insert (item 18) in valve body: 6 ±1 Nm (4.5 ±0.7 lb force ft).

Setting
If a higher regulating pressure is required at the valve outlet in adjusting spindle should be turned to the right, and vice versa.



1. Deckkappe
2. O-ring
3. Einstellspindel
4. Dichtung
5. Deckel
6. Feder
7. Schraube
8. Membrane
9. Dichtung (2 Stck.)
10. Dichtung (2 Stck.)
17. Flansche (2 Stck.)
18. Kompl. Düseneinsatz

DEUTSCH

Pilotventil

Technische Daten
Einstellbereich
–0.5 bar bis 6 bar (p_e)
(35 cm Hg bis 6 bar (p_e))

Kältemittel
CFC, HFC, HCFC, R 717 (NH_3)

Medientemperatur
Min. –60°C
Max. +140°C

Max. Prüfdruck:
p' = 42 bar

Max. Betriebsdruck:
PB = 28 bar (p_e)

Montage
Das Pilotventil CVK ist in eine Pilotleitung zwischen dem Pilotflansch am Hauptventil und der Rohrleitung auf der Austrittseite des Hauptventils zu montieren. Das Pilotventil ist mit der Einstellspindel nach oben so zu montieren, daß der Pfeil auf dem Ventilgehäuse vom Hauptventil wegzeigt.
Max. Anzugsmoment des CVK-Einsatzes, Pos. 18, im Ventilgehäuse: 6 ±1 Nm (0.6 ±0.1 Kpm).

Einstellung
Wenn man einen höheren Regeldruck auf der Austrittseite des Ventils wünscht, ist die Einstellspindel rechts herum zu drehen – und umgekehrt.

~~KI30H251~~ → RI4KB151
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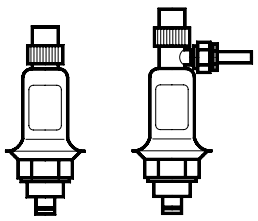
Instructions

CVP (LP), CVPP (LP)



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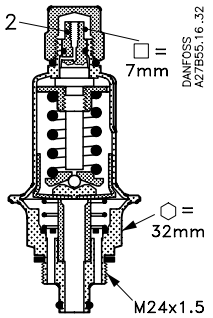

Fig. 1. CVP (LP)

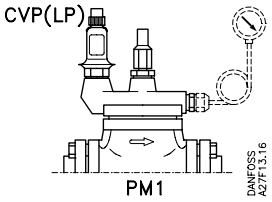

Fig. 2. PM 1 + CVP (LP)

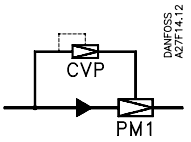

Fig. 3. PM 1 + CVP

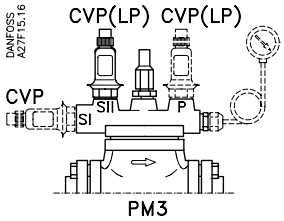

Fig. 4. PM 3 + CVP

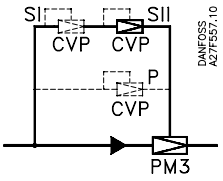

Fig. 5. PM 3 + CVP

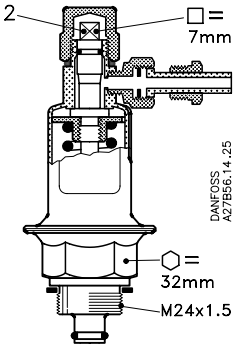

Fig. 6. CVPP (LP)

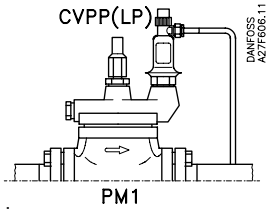

Fig. 7. PM 1 + CVPP (LP)

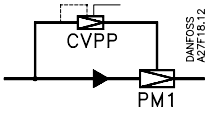

Fig. 8. PM 1 + CVPP

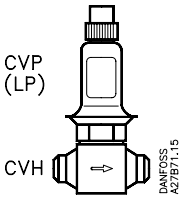

Fig. 9

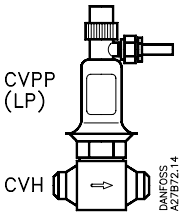

Fig. 10

027R9589

DANSK

Trykstyrede pilotventiler

Tekniske data

Reguleringsområder	*CVP (LP)* 0 bar → 7 bar (Pe) eller –0.66 bar → 2 bar *CVPP (LP)* Δp = 0 bar → 7 bar Styretrykket må maks. være 3 bar højere end medietrykket
Fabriksindstilling	= laveste reguleringsindstilling (slap fjeder)
Kølemidler	CFC, HFC, HCFC og R 717 (NH_3)
Medietemperaturområde	–60°C → +120°C
Maks. driftstryk	PB = 17 bar (Pe)
Maks. prøvetryk	p' = 26.5 bar (Pe)

Montering
CVP eller CVPP monteres i PM-hovedventilens topdæksel. Se fig. 2, 4 og 7.
De medfølgende pakninger til CVP eller CVPP påsættes før montering, og O-ringen smøres med fryseolie.
Pilotventilen har nøglevidden 32 mm og bør tilspændes med et moment på 50 Nm (5 kpm).
CVP eller CVPP kan desuden monteres separat i et ventilhus, og anvendes som pilotventil eller selvstændig ventil. Se fig. 9 og 10.
Anvendes CVP/CVPP + ventilhus CVH som pilotventil, monteres enheden i en pilotledning med gennemstrømning imod hovedventilen.
Nippelen (6) på CVPP tilsluttes et eksternt styretryk.
CVP/CVP (LP) må ikke udsættes for trykpulsationer fra kompressorens side.

Indstilling
CVP
Drejes indstillingsspindelen (2) højre om (med uret), opnås højere åbningstryk (højere fordampningstryk eller -temperatur) – og omvendt.
Én omdrejning svarer til en ændring på ca. 1 bar for ventiler med området 0 bar til 7 bar og ca. 0.5 bar for ventiler med området –0.66 bar til 2 bar.
Grovindstilling: Drej spindelen (2) venstre om (mod uret) indtil stop. Drej derefter så mange omdrejninger højre om (med uret), som svarer til det ønskede åbningstryk.
Finindstilling: Foretages ved hjælp af manometer efter at køleanlægget har kørt så længe at der er balance i systemet.

CVPP
Indstillingen foretages på samme måde som beskrevet for CVP.
Åbningstrykket er her lig med trykforskellen mel-lem tilgangstrykket og styretrykket.
En ændring af styretrykket giver en lige så stor ændring af hovedventilens tilgangstryk (= fordampnings-trykket).

Service
CVP eller CVPP kan renses med trykluft. Drej spindelen (2) helt til venstre (mod uret) og gennemblæs ventilen imod normal gennemstrømningsretning.

Reservedele og tilbehør
Se reservedelskatalog.

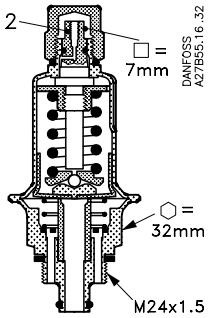

Fig. 1. CVP (LP)

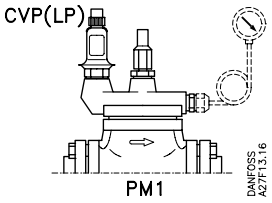

Fig. 2. PM 1 + CVP (LP)

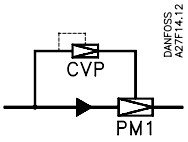

Fig. 3. PM 1 + CVP

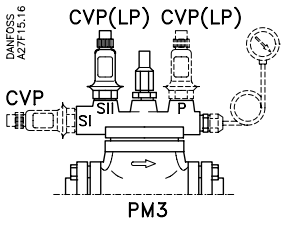

Fig. 4. PM 3 + CVP

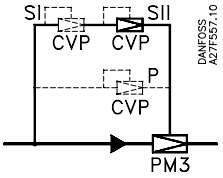

Fig. 5. PM 3 + CVP

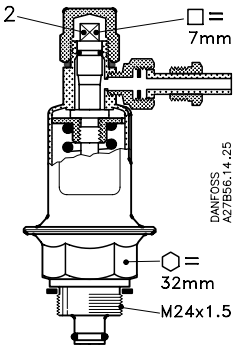

Fig. 6. CVPP (LP)

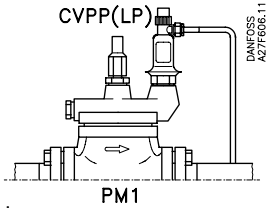

Fig. 7. PM 1 + CVPP (LP)

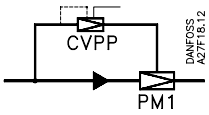

Fig. 8. PM 1 + CVPP

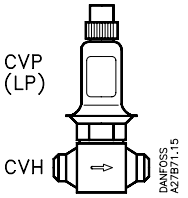

Fig. 9

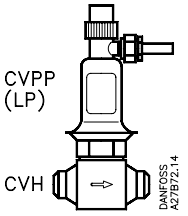

Fig. 10

ENGLISH

Pressure-controlled pilot valves

Technical data

Regulation ranges	*CVP (LP)* 0 bar → 7 bar (Pe) or (0 psig → 100 psig) or –0.66 bar → 2 bar (20 in Hg → 28 psig) *CVPP (LP)* Δp = 0 bar → 7 bar (0 psi → 100 psi) The control pressure must not exceed the pressure of the medium by more than 3 bar
Factory setting	= lowest control setting (slack spring)
Refrigerants	CFC, HFC, HCFC and R 717 (NH_3)
Temperature range of medium	–60°C → +120°C (–76°F → 248°F)
Max. working pressure	PB = 17.5 bar (Pe) (183 psig)
Max. test pressure	p' = 26.5 bar (Pe) (277 psig)

Mounting

Type CVP or CVPP is mounted in the top cover of the PM main valve. See figs. 2, 4 and 7.
The accompanying gaskets for CVP and CVPP must be fitted before mounting and the o-ring must be lubricated with refrigeration oil.
The pilot valve has a width across flats of 32 mm and should be tightened with a torque of 50 Nm (5 kpm).
Type CVP or CVPP can also be mounted separately in a valve housing, and used as a pilot valve or an independent valve. See figs. 9 and 10. If the CVP/CVPP + valve body CVH is used as a pilot valve the unit is mounted in a pilot line with flow towards the main valve.
The nipple (6) on the CVPP is connected to external control pressure.
CVP/CVP (LP) must not be exposed to pulsations from the discharge side of the compressor.

Setting

CVP

Turning the setting spindle (2) clockwise in-creases the opening pressure (higher evaporating pressure or temperature) and vice versa. One turn is equivalent to a change of 1 bar (14.2 psi) for valves with range 0 bar to 7 bar and approx. 0.5 bar (7.1 psi) for valves with range –0.66 bar to +2 bar.

Coarse setting: Turn the spindle (2) anticlockwise to stop. Then, turn it clockwise the number of turns corresponding to the required opening pressure.
Fine setting: This is done using a pressure gauge after the refrigeration plant has run long enough for the system to achieve balance.

CVPP

The method of setting is the same as described for the CVP.
Here, the opening pressure is equal to the difference between inlet and control pressures. A change of control pressure will produce a change of equal size in the main valve inlet pressure (= the evaporating pressure).

Service

The CVP or CVPP can be cleaned out with compressed air. Turn the spindle (2) completely anti-clockwise and blow through the valve against the normal direction of flow.

Spare parts and accessories

See Spare Parts catalogue.

Instructions

Plug 027F1046 for PM 3/PMC 3

027R9592

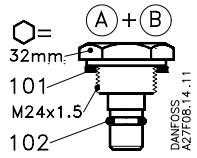

Fig. 1

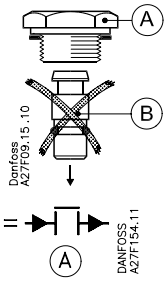

Fig. 2

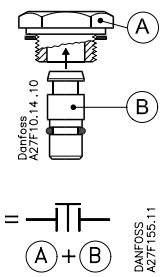

Fig. 3

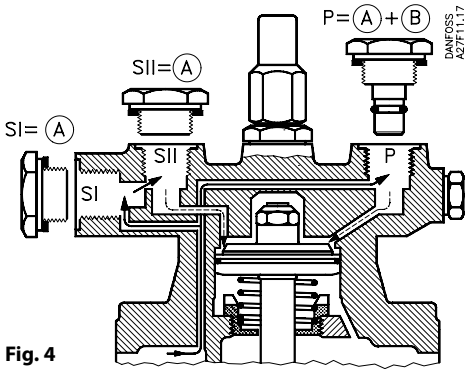

Fig. 4

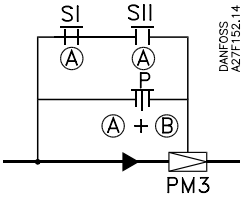

Fig. 5

DANSK

Blændprop til PM 3/PMC 3
Montering
Skal der være passage for styretryk igennem en tilslutning, anvendes prop A alene. Skal passagen lukkes for styretryk, anvendes prop A + B. Se fig. 1 - 4.
S = serie
P = parallel
Propperne har nøglevidden 32 mm og bør tilspændes med et moment på 50 Nm (5 kPm).

Reservedele
A+B+101+102. Best.nr. 027F1046

ENGLISH

Blanking plug for PM 3/PMC 3
Fitting
Use plug A in order to create passage for pilot pressure. Use plugs A and B to close a passage. See figs. 1 - 4.
S = series
P = parallel
The plugs are 32 mm across spanner flats and should be tightened to a torque of 50 Nm (37 lb force ft).

Spare parts
A+B+101+102. Code No. 027F1046

~~KI30B452~~ → RI4XK152

027R9592

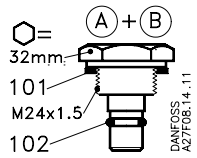

Fig. 1

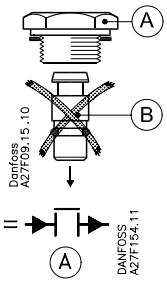

Fig. 2

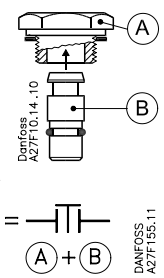

Fig. 3

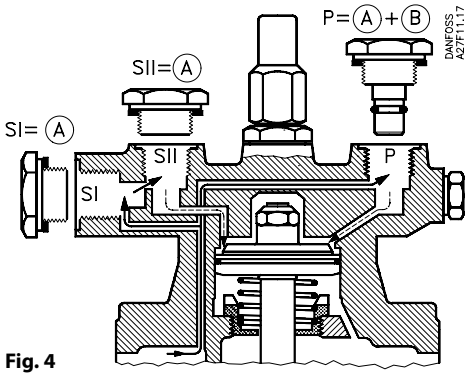

Fig. 4

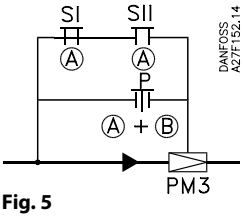

Fig. 5

DEUTSCH

Blendstopfen für PM 3/PMC 3
Montage
Für den Durchgang des Regeldrucks durch einen Anschluß verwendet man den Stopfen A allein. Zum Verschließen des Durchgangs für den Regeldruck, verwendet man die Stopfen A+B. Siehe Fig. 3 und 1.
S = Serie
P = Parallel
Die Stopfen haben eine Schlüsselweite von 32 mm und sollten mit einem Moment von 50 Nm (5 kpm) angezogen werden.

Ersatzteile
A+B+101+102. Artikel-Nr. 027F1046

FRANÇAIS

Bouchon d'obturation pour PM 3/PMC 3
Montage
Pour obtenir le passage d'une pression de commande, utiliser le bouchon A seul. Pour obturer le passage de la pression de commande, utiliser le bouchon A + B (voir fig. 1-4).
S = série
P = parallèle
Les bouchons d'une ouverture de clé de 32 mm doivent être serrés à un couple de 50 Nm (5 kgf.m.)

Pièces de rechange
A+B+101+102. N° de code 027F1046

~~KI30B452~~ → RI4XK152

Instructions

OFV, OFV-SS 20-25
(¾ - 1 in.)

Installation

148R9520

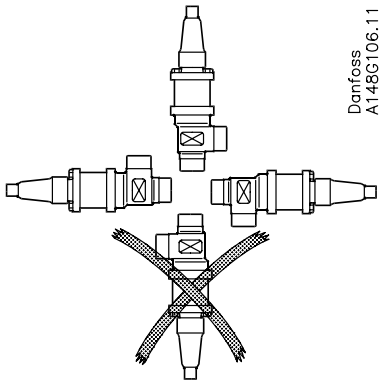

Fig. 1

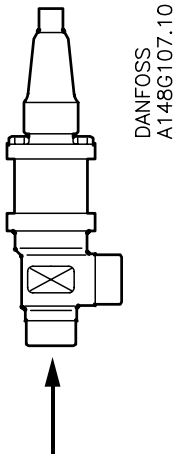

Fig. 2

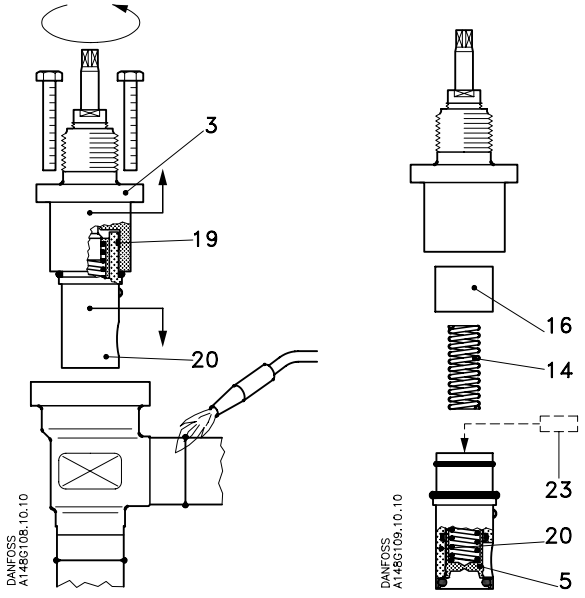

Fig. 3

	Nm	LB-feet
DN 20	18	13
DN 25	18	13

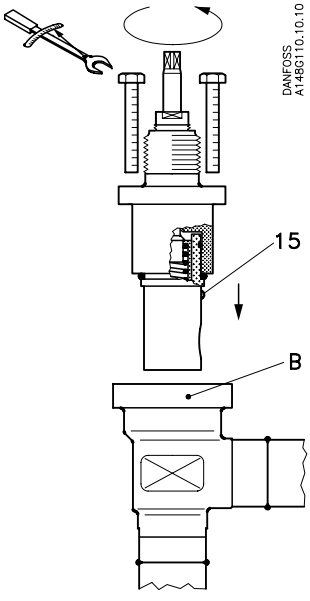

Fig. 4

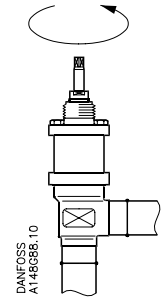

Fig. 5

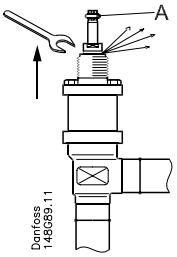

Fig. 6

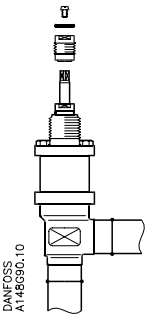

Fig. 7

	Nm	LB-feet
DN 20	50	37
DN 25	50	37

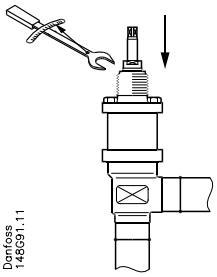

Fig. 8

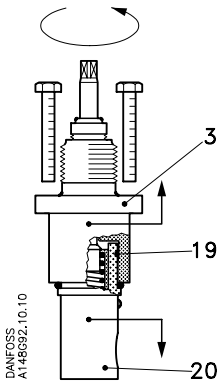

Fig. 9

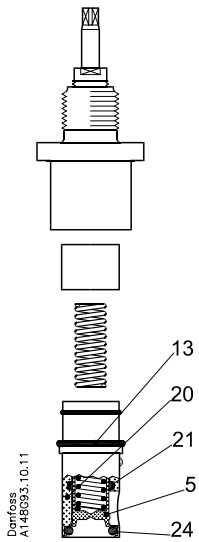

Fig. 10

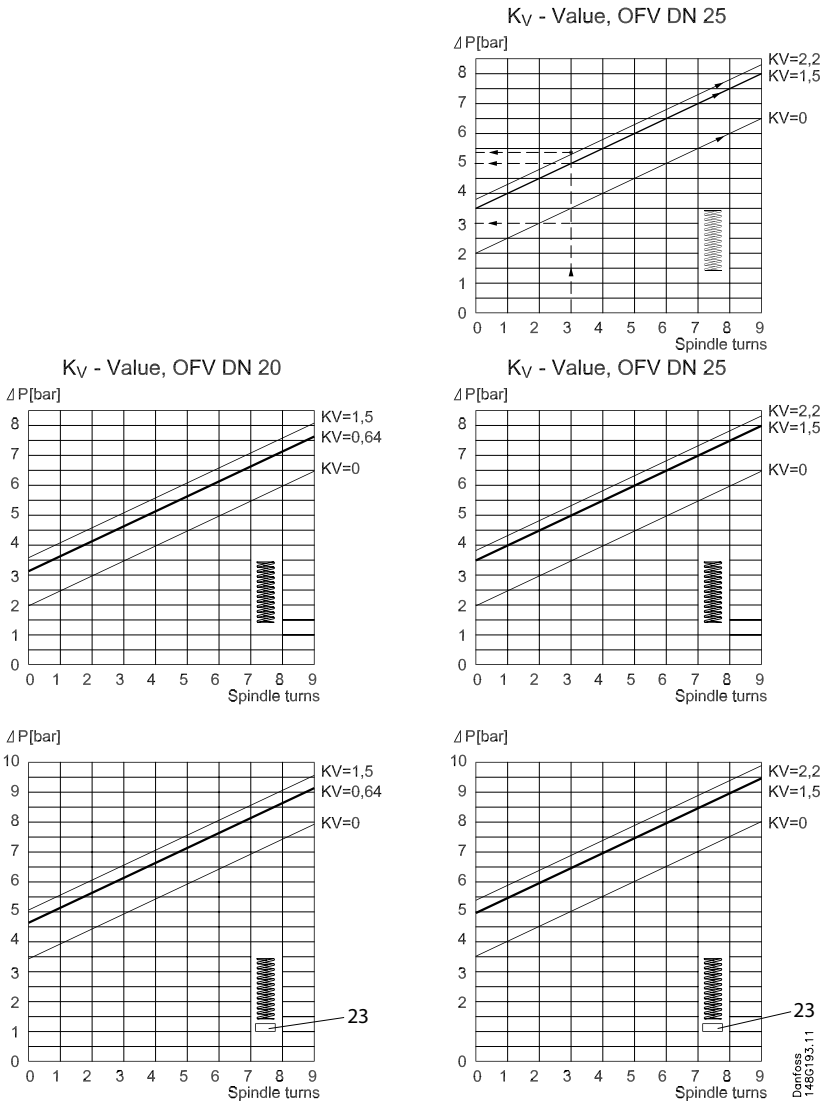

Fig. 11

Installation

Refrigerants
Applicable to all common non-flammable refrigerants, including R717 and non-corrosive gases/liquids dependent on sealing material compatability. Flammable hydrocarbons are not recommended. The valve is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range
OFV: –50/+150°C (–58/+302°F)
OFV-SS: –60/+150°C (–76/+302°F)

Pressure range
OFV: The valves are designed for a max. working pressure of 40 bar g (580 psi g).

Installation
The valve must be installed with the spindle vertically upwards or in horizontal position (fig. 1). Valves should be opened by hand according to the guidelines in the datasheet. 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.

Recommended flow direction
Direct the flow towards the cone as indicated by the arrow placed on the valve housing (fig. 2). The force used to open and close the valve must not exceed the force of an ordinary handwheel.

Welding
The bonnet should be removed before welding (fig. 3) to prevent damage to the O-rings in the packing gland and between the valve body and bonnet, as well as the teflon gasket in the valve seat. Only materials and welding methods, compatible with the valve housing material, must be welded to the valve housing. 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.

Removing the bonnet can be omitted provided that:
The temperature in the area between the valve body and bonnet during welding does not exceed +150°C/+302°F. This temperature depends on the welding method as well as on any cooling of the valve body during the welding itself. (Cooling can be ensured by, for example, wrapping a wet cloth around the valve body.)
Make sure that no dirt, welding debris etc. get into the valve during the welding procedure.
Be careful not to damage the teflon cone ring.
The valve housing must be free from stresses (external loads) after installation.

Opening pressure
From factory the OFV will be covering differential pressure (ΔP) 2-6.5 bar (29-94.3 psig).
Adjust the differential pressure by turning the spindle as shown in fig. 11. If the above range is satisfactory please continue with "Assembly".

Alternatively, by mounting the distance piece, (pos. 23) the following range can be obtained: ΔP = 3.5-8 bar (50.8-116 psig).

Mounting of distance piece (fig. 3)
Valve bonnet and guide are held together by O-ring (pos. 19). Separate the bonnet (pos. 3) and the guide (pos. 20) by pulling the pieces from each other. Now springshoe (pos. 16) and spring (pos. 14) can be removed. Then mount the distance piece (pos. 23), supplied separately together with the installation instruction, in the cone (pos. 5) at the bottom of the guide (pos. 20).
NB: Do not take cone and guide apart.

OFV 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.

Assembly
Remove welding debris and any dirt from pipes and valve body before assembly. Check that the cone has been fully screwed back towards the bonnet before it is replaced in the valve body (fig. 4).

Tightening
Tighten the bonnet with a torque wrench, to the values indicated in the table (fig. 4).

Colours and identification
The OFV valves are painted with a red oxide primer in the factory. Stainless steel valves are not painted. Precise identification of the valve is made via the ID ring at the top of the bonnet, as well as by the stamping on the valve body. The external surface of the painted OFV valve housing must be prevented against corrosion with a suitable protective coating after installation and assembly.

Protection of the ID ring when repainting the valve is recommended.

Maintenance

Packing gland
When performing service and maintenance, replace the complete packing gland only, which is available as a spare part.
As a general rule, the packing gland must not be removed if there is internal pressure in the valve.

However, if the following precautionary measures are taken, the packing gland can be removed with the valve still under pressure:

Backseating (fig. 5)
To backseat the valve, turn the spindle counter-clockwise until the valve is fully open.

Pressure equalization (fig. 6)
In some cases, pressure forms behind the packing gland. Hence a handwheel or similar should be fastened on top of the spindle (pos. A) while the pressure is equalized. The pressure can be equalized by slowly screwing out the gland.

Removal of packing gland (fig. 7)
Cap and packing gland can now be removed.

Dismantling the valve (fig. 10)
Do not remove the bonnet while the valve is still under pressure.

- Check that the O-rings (pos. 13 & 24) have not been damaged.
- Check that spindle and cone (pos. 5) are free of scratches and impact marks.
- If the sealing ring (pos. 21) has been damaged, the whole cone assembly must be inspected carefully and maybe replaced.

Replacement of O-ring (fig. 10)
O-ring (pos. 24) seals between seat and cone. Therefore, it has to be changed if the valve is leaking. Use a pointed tool to dismount the O-ring (pos. 24). Check that cone (pos. 5) and guide (pos. 20) are not worn out. If these parts are worn out it is necessary to change the complete guide which consists of all wearing parts.

Assembly
Remove any dirt from the body before the valve is assembled. Check that the cone has been screwed back towards the bonnet before it is replaced in the valve body (fig. 4).

Tightening
Tighten the bonnet with a torque wrench, to the values indicated in the table (fig. 4). Tighten the packing gland with a torque wrench, to the values indicated in the table (fig. 8).

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.

Danfoss accepts no responsibility for errors and omissions. Danfoss Industrial Refrigeration reserves the right to make changes to products and specifications without prior notice.

Instructions

OFV, OFV-SS 20-25 (¾ - 1 in.) (52 bar version)

Installation

148R9537

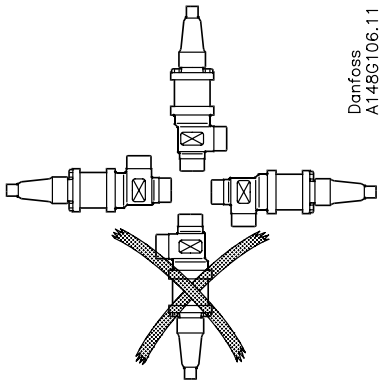

Fig. 1

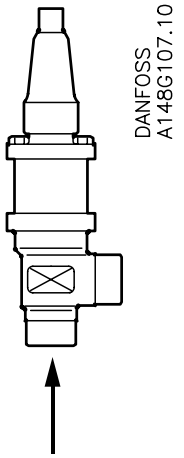

Fig. 2

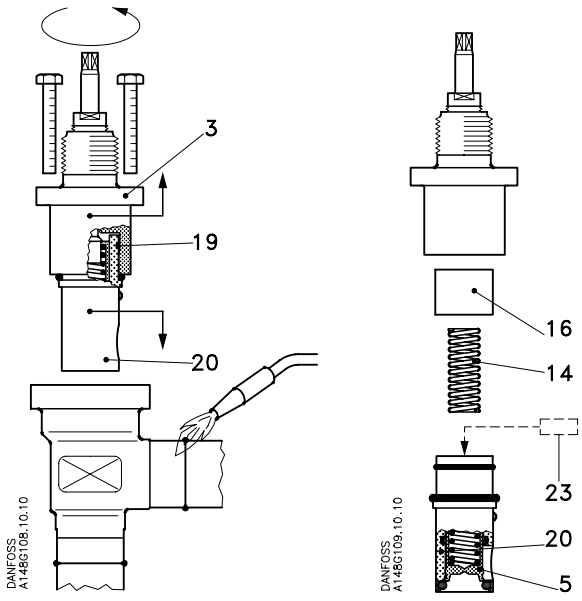

Fig. 3

	Nm	LB-feet
DN 20	18	13
DN 25	18	13

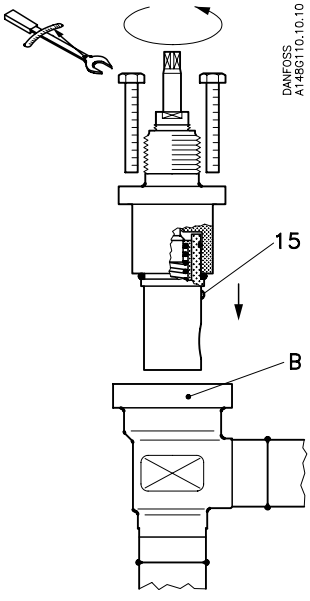

Fig. 4

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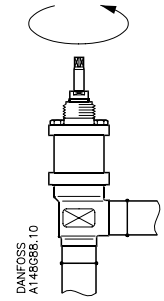


Fig. 5

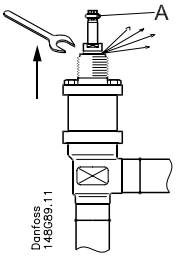


Fig. 6

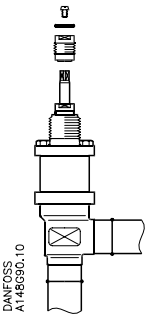


Fig. 7

	Nm	LB-feet
DN 20	50	37
DN 25	50	37

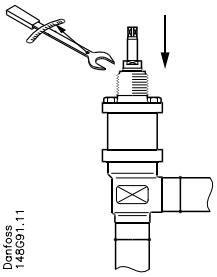


Fig. 8

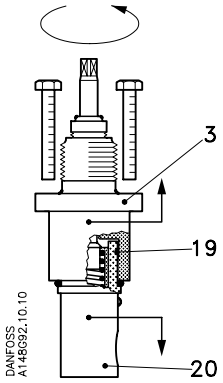


Fig. 9

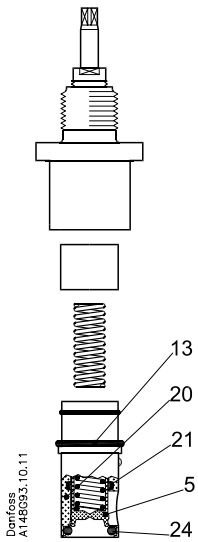


Fig. 10

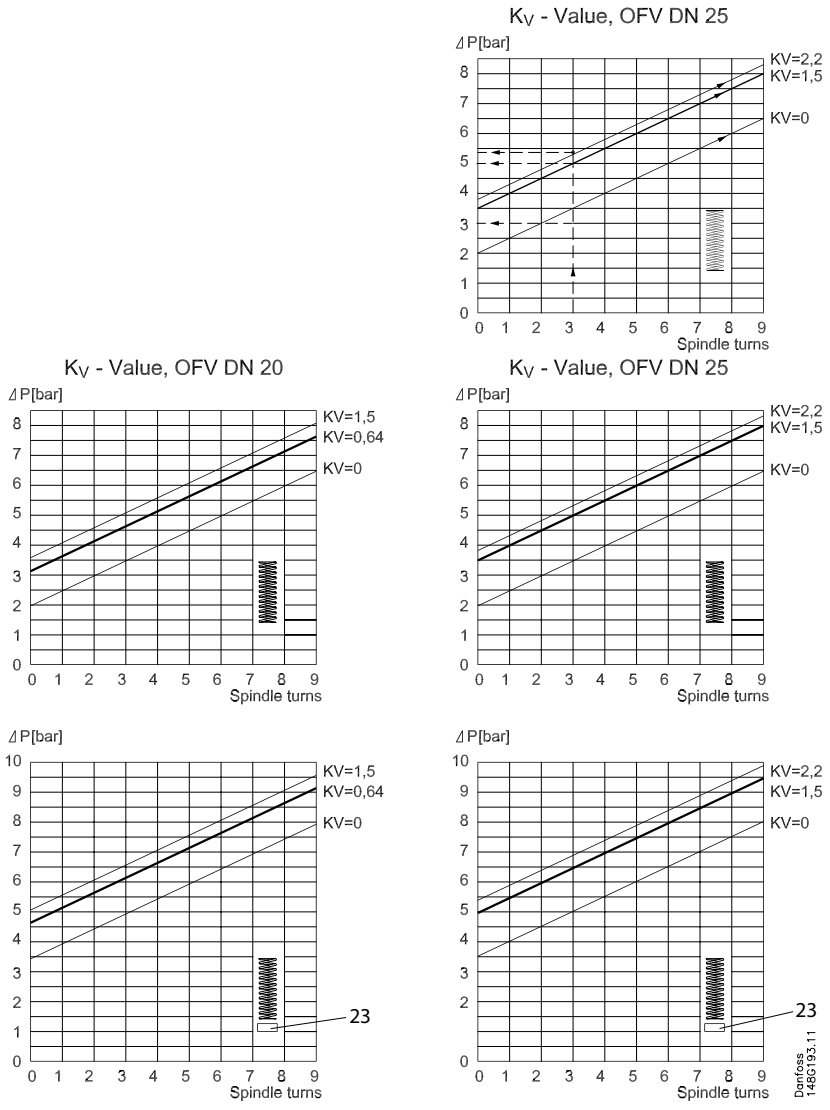


Fig. 11

Installation

Refrigerants
Applicable to all common non-flammable refrigerants, including R717 and non-corrosive gases/liquids dependent on sealing material compatability. Flammable hydrocarbons are not recommended. The valve is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range
OFV: –50/+150°C (–58/+302°F)
OFV-SS: –60/+150°C (–76/+302°F)

Pressure range
OFV: The valves are designed for a max. working pressure of 52 bar g (554 psi g).

Installation
The valve must be installed with the spindle vertically upwards or in horizontal position (fig. 1). Valves should be opened by hand according to the guidelines in the datasheet. 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.

Recommended flow direction
Direct the flow towards the cone as indicated by the arrow placed on the valve housing (fig. 2). The force used to open and close the valve must not exceed the force of an ordinary handwheel.

Welding
The bonnet should be removed before welding (fig. 3) to prevent damage to the O-rings in the packing gland and between the valve body and bonnet, as well as the teflon gasket in the valve seat. Only materials and welding methods, compatible with the valve housing material, must be welded to the valve housing. 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.

Removing the bonnet can be omitted provided that:
The temperature in the area between the valve body and bonnet during welding does not exceed +150°C/+302°F. This temperature depends on the welding method as well as on any cooling of the valve body during the welding itself. (Cooling can be ensured by, for example, wrapping a wet cloth around the valve body.)

Make sure that no dirt, welding debris etc. get into the valve during the welding procedure.
Be careful not to damage the teflon cone ring.
The valve housing must be free from stresses (external loads) after installation.

Opening pressure
From factory the OFV will be covering differential pressure (ΔP) 2-6.5 bar (29-94.3 psig).
Adjust the differential pressure by turning the spindle as shown in fig. 11. If the above range is satisfactory please continue with "Assembly".

Alternatively, by mounting the distance piece, (pos. 23) the following range can be obtained: ΔP = 3.5-8 bar (50.8-116 psig).

Mounting of distance piece (fig. 3)
Valve bonnet and guide are held together by O-ring (pos. 19). Separate the bonnet (pos. 3) and the guide (pos. 20) by pulling the pieces from each other. Now springshoe (pos. 16) and spring (pos. 14) can be removed. Then mount the distance piece (pos. 23), supplied separately together with the installation instruction, in the cone (pos. 5) at the bottom of the guide (pos. 20).
NB: Do not take cone and guide apart.

OFV 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.

Assembly
Remove welding debris and any dirt from pipes and valve body before assembly. Check that the cone has been fully screwed back towards the bonnet before it is replaced in the valve body (fig. 4).

Tightening
Tighten the bonnet with a torque wrench, to the values indicated in the table (fig. 4).

Colours and identification
The OFV valves are painted with a red oxide primer in the factory. Stainless steel valves are not painted. Precise identification of the valve is made via the ID ring at the top of the bonnet, as well as by the stamping on the valve body. The external surface of the painted OFV valve housing must be prevented against corrosion with a suitable protective coating after installation and assembly.

Protection of the ID ring when repainting the valve is recommended.

Maintenance

Packing gland
When performing service and maintenance, replace the complete packing gland only, which is available as a spare part.
As a general rule, the packing gland must not be removed if there is internal pressure in the valve.

However, if the following precautionary measures are taken, the packing gland can be removed with the valve still under pressure:

Backseating (fig. 5)
To backseat the valve, turn the spindle counter-clockwise until the valve is fully open.

Pressure equalization (fig. 6)
In some cases, pressure forms behind the packing gland. Hence a handwheel or similar should be fastened on top of the spindle (pos. A) while the pressure is equalized. The pressure can be equalized by slowly screwing out the gland.

Removal of packing gland (fig. 7)
Cap and packing gland can now be removed.

Dismantling the valve (fig. 10)
Do not remove the bonnet while the valve is still under pressure.

- Check that the O-rings (pos. 13 & 24) have not been damaged.
- Check that spindle and cone (pos. 5) are free of scratches and impact marks.
- If the sealing ring (pos. 21) has been damaged, the whole cone assembly must be inspected carefully and maybe replaced.

Replacement of O-ring (fig. 10)
O-ring (pos. 24) seals between seat and cone. Therefore, it has to be changed if the valve is leaking. Use a pointed tool to dismount the O-ring (pos. 24). Check that cone (pos. 5) and guide (pos. 20) are not worn out. If these parts are worn out it is necessary to change the complete guide which consists of all wearing parts.

Assembly
Remove any dirt from the body before the valve is assembled. Check that the cone has been screwed back towards the bonnet before it is replaced in the valve body (fig. 4).

Tightening
Tighten the bonnet with a torque wrench, to the values indicated in the table (fig. 4). Tighten the packing gland with a torque wrench, to the values indicated in the table (fig. 6).

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.

Danfoss accepts no responsibility for errors and omissions. Danfoss Industrial Refrigeration reserves the right to make changes to products and specifications without prior notice.

DECLARATION OF CONFORMITY
The Pressure Equipment Directive 97/23/EC

Name and Address of Manufacturer within the European Community
Danfoss Industrial Refrigeration A/S
Stormosevej 10
PO Box 60
DK-8361 Hasselager
Denmark

Declaration
We hereby declare that below-mentioned equipment are Classified for Fluid Group I (all refrigerants (toxic, non-toxic, flammable and non-flammable)), and that all are covered by Article 3, paragraph 3.

For further details / restrictions - see Installation Instruction

Description of Pressure Equipment

Refrigerant stop/check and check valve, with angled bonnet arrangement
Type **OFV, OFV-SS**

Nominal bore	**DN ≤ 25 mm.** (1in.)

References of other Technical Standards and Specifications used

prEN 12284 DIN 3158
AD-Merkblätter

Authorised Person for the Manufacturer within the European Community

Name: Morten Steen Hansen **Title:** Production Manager

Signature: Morten Steen Hansen **Date:** 29/04/2003

148B9731 - rev. 0

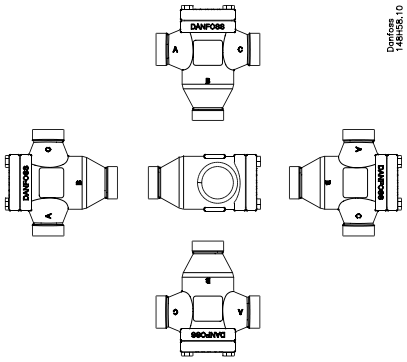
Instruction

ORV 25 - 80 (1 - 3 in.)

148R9528

148R9528

Installation



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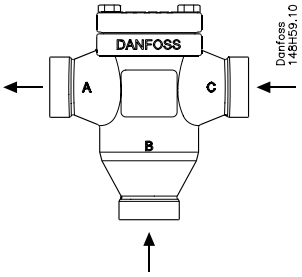

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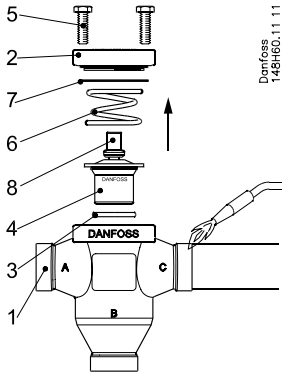

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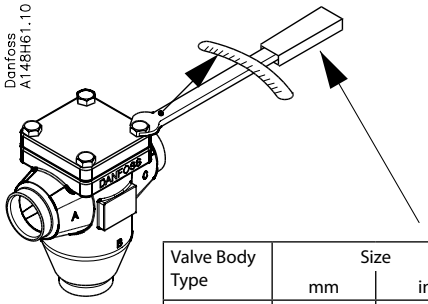
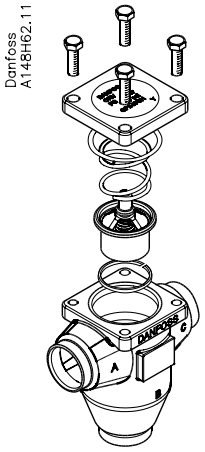


Valve Body Type	Size		Nm	ft lbs
	mm	in.		
H1	25-40	(1 - 1½ in.)	30	22
H2	40-50	(1½ - 2 in.)	50	37
H3	65-80	(2½ - 3 in.)	80	59

4



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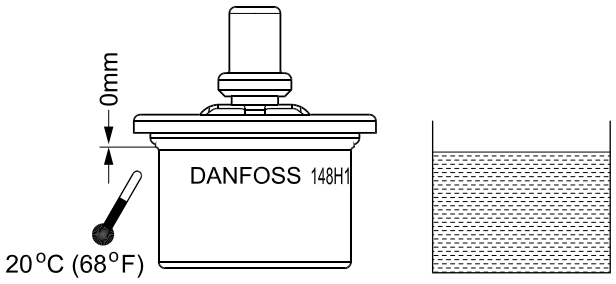
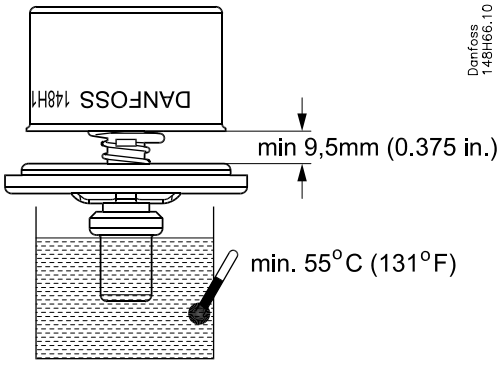


6a



6b

Installation

Oils
Applicable to all common refrigeration oils.

Refrigerants
Applicable to all common non-flammable refrigerants, including R717 and non-corrosive gases/liquids dependent on sealing material compatibility.
Flammable hydrocarbons are not recommended. The valve is only recommended for use in closed circuits.

For further information please contact Danfoss.

Temperature range
Minimum operating temperature:

≥ **−10°C (14°F)**

Continuous operation:

≤ **+85°C (+185°F)**

Short operating periods:

≤ **+120°C (+248°F)**

Pressure range
The valves are designed for a max. working pressure of 40 bar g (580 psi g.)

Installation (Fig. 1)
The valve can be installed in any position (fig. 1), however, oil spills can be avoided when servicing, if the top is mounted vertically upwards. The valve is designed to withstand a high internal pressure. However, the piping system should be designed to reduce the risk of hydraulic pressure caused by thermal expansion. It must be ensured that the valve is protected from pressure transients like accelerated liquid in the system.

Recommended flow direction (Fig. 2)
To achieve correct flow direction and function, the letter designations, A, B and C on the valve housing must be followed as shown in fig. 2. Refer to the technical leaflet to find application example.

Welding (Fig. 3)
The top cover (2), gasket (7), spring (6), and thermostatic element (4), must be removed before welding (fig. 3), to prevent damage to the thermostatic element sensor (8).
The teflon glide ring (3), in the housing (1), should be removed if the temperature will exceed 240°C (460° F). Only materials and welding methods, compatible with the valve housing material, should be used.
The valve should be cleaned internally to remove weld debris on completion and before the valve is reassembled.
Weld debris and dirt in the interior of the housing and on the glide ring should be avoided. Temperature during welding can be limited to the required limit depending on welding method and any cooling applied to the valve body. (Cooling can be ensured by, for example, wrapping a wet cloth around the valve body). Damage to the teflon glide ring should be avoided. The valve housing must be free from stresses (external loads) after installation.

Assembly (Fig. 5)
Remove weld debris and any dirt from pipes and valve body before assembly.
Check that the Teflon glide ring is free from damage prior to mounting the thermostatic element (fig. 5).

Tightening (Fig. 4)
Tighten the top cover bolts using a torque wrench, to the values indicated in the table (fig. 4). Over tightening can cause damage to the gasket.

Colours and identification
The ORV valves are painted with a red oxide primer from the factory. Precise identification of the valve is made via the cast text on the valve body and top.
The external surface of the valve housing must be treated with a suitable protective coating after installation and assembly.

Maintenance

Servicing
The ORV will fail if the thermostatic element is worn out.
It is recommended that the thermostatic element is function tested if the temperature control is not responding as designed.

Test of thermostatic element (Fig. 6)
After dismounting of the thermostatic element observe the element position. If the temperature of the actuator is approx. 20°C (68°F), the element should look as shown in fig. 6a.
Insert the active part of the element into the water at 55°C (131°F). Observe the element open into a position as shown in fig. 6b. The difference between fully open and fully closed should be approx. 9.5 mm (0.375 in.). The element must be replaced if this stroke cannot be achieved.

Glide ring
The surface of the glide ring must be inspected to ensure that no damage has occurred. Scratch marks and the like can cause oil flow to bypass the element making the temperature regulation less accurate.

Assembly (Fig. 5)
Remove any dirt from the body before the valve is assembled. Check that the thermostatic element and top gasket are in position.
Lubricate the glide ring for ease of fitting of the thermostatic element. Excessive force can damage the glide ring. Only apply moderate force.
Reposition and secure top.

Tightening (Fig. 4)
Tighten the top bolts with a torque wrench, to the values indicated in the table (fig. 4). Over tightening can cause damage to the gasket.

Use only original Danfoss parts, including thermostatic elements, gaskets and glide rings for replacement. Materials of new parts are certified for the relevant refrigerants and oils.

In cases of doubt, please contact Danfoss.

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DECLARATION OF CONFORMITY
The Pressure Equipment Directive 97/23/EC

Name and Address of Manufacturer within the European Community
Danfoss Industrial Refrigeration A/S
Stormosevej 10
PO Box 60
DK-8361 Hasselager
Denmark

Description of Pressure Equipment
Oil Regulating Valve, with 3 ports primary used for refrigerant compressor oil systems.
Type **ORV**

Nominal bore	**DN25-80 mm** (1-3 in.)	
Classified for	Fluid Group I (all refrigerants (toxic, nontoxic, flammable and nonflamable))	
Temperature range	ORV	–10°C/+85°C (14°F/+185°F)
Maximum allowable working pressure	Standard applications	40 bar (580 psi)

Conformity and Assessment Procedure Followed

Category		**II**
Module		**D1**
Certificate ID		*D1: 07 202 0511 z 0111/1H*
Nominal bore	Standard applications	DN25-80 mm. (1-3 in.)

Name and Address of the Notified Body which carried out the Inspection
TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

CE
(0045)

Name and Address of the Notified Body monitoring the Manufacturer's Quality Assurance System
TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

References of Harmonised Standards used
EN 10028-3

References of other Technical Standards and Specifications used
prEN 12284 DIN 3158 / DIN 3840
AD-Merkblätter

Authorised Person for the Manufacturer within the European Community

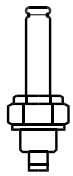
Name: Morten Steen Hansen **Title:** Production Manager

Signature: Morten Steen Hansen **Date:** 29/10/2003

148B9742 - rev. 0

Instruction
Type EVM NC/NO

032R9528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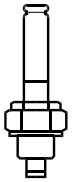
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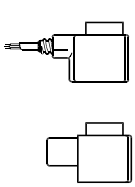
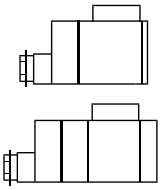
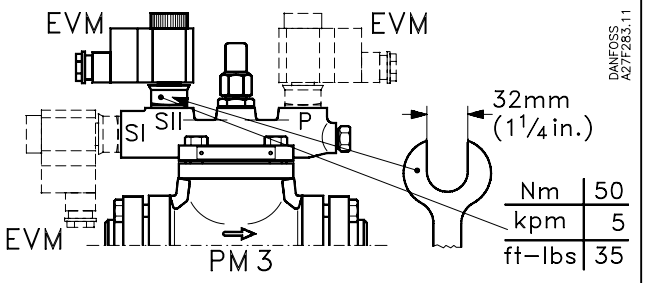
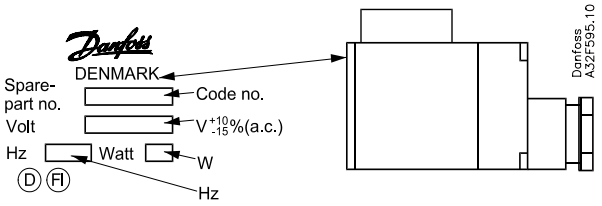
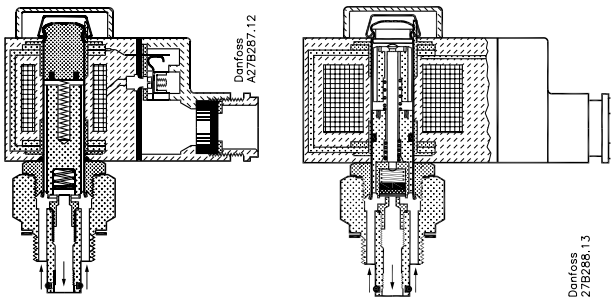


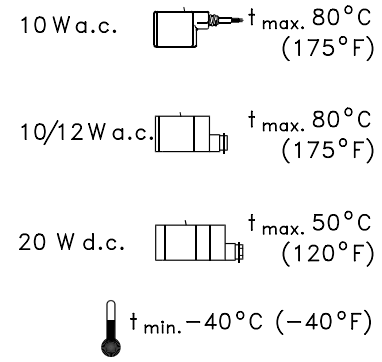






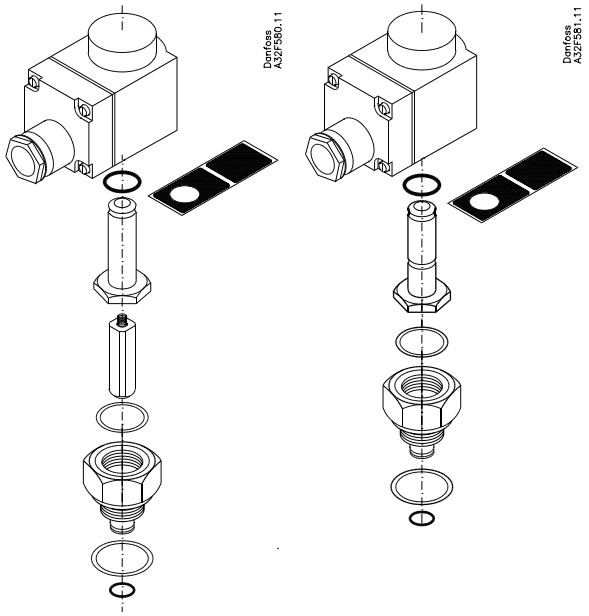


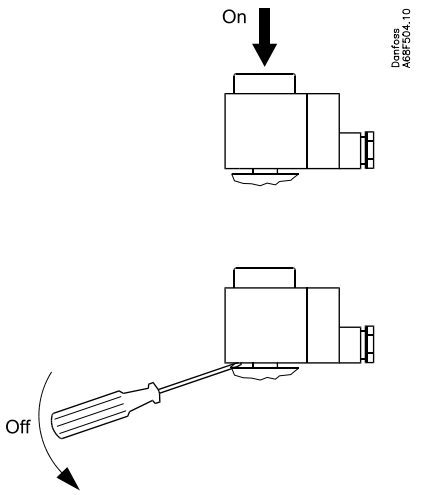
EVM (NC) EVM (NO)



Min. medium temperature: –60°C(–76°F)
Max. medium temperature: 120°C(248°F)
Max. working pressure: PB 28bar/MWP 405psig
Max. opening (MOPD):

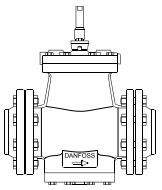
EVM (NC) EVM (NO)





Instructions

PM3 (80-125)



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Installation

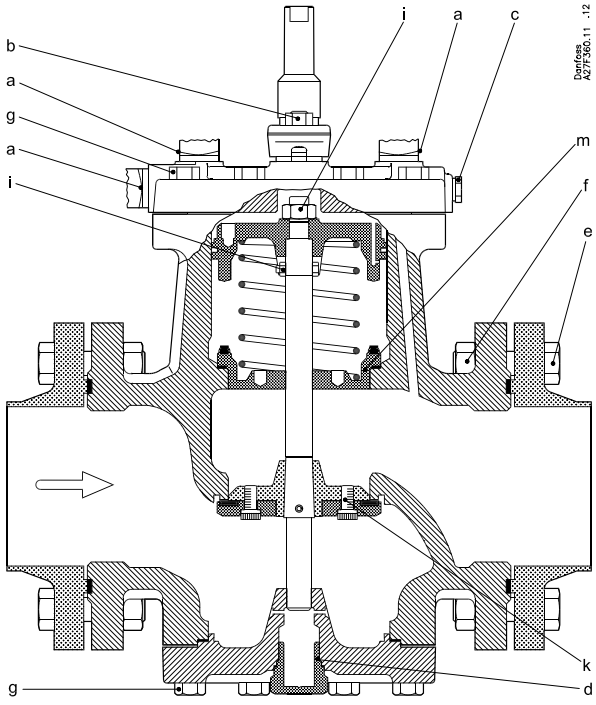


Fig. 1

Pos. item	Torque	Nm	kpm	lbf-ft
		10	1	7.4

Pos. item	Tightening Torque in Nm		
	80	100	125
a	50		
b	65		
c	25		
d	140		
e	80	80	125
f	105	135	200
g	75	80	125
i	9		
k	25	40	60
l	45	60	90
m	150	220	310

Table 1

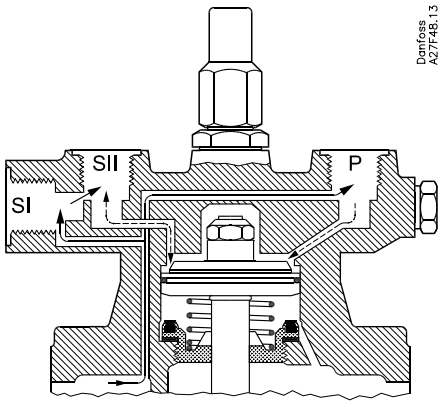


Fig. 2

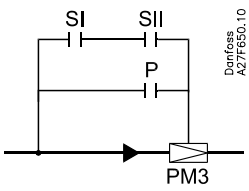


Fig. 3

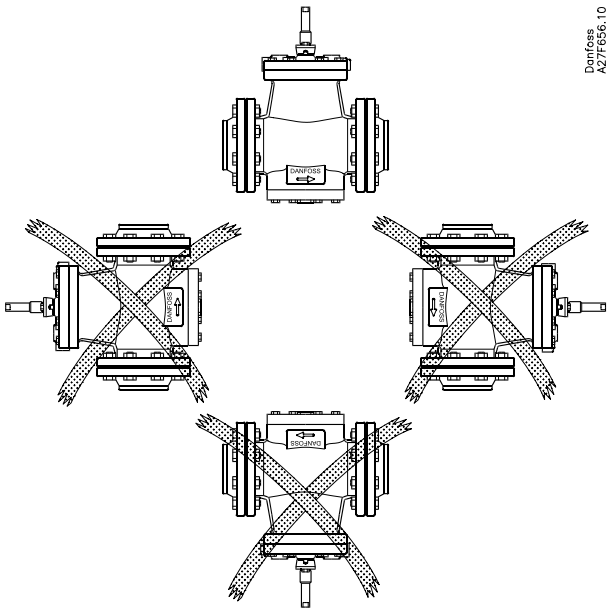
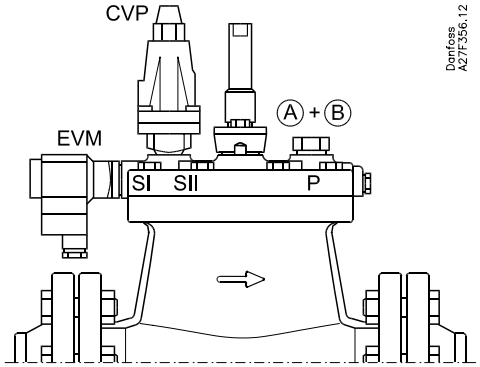
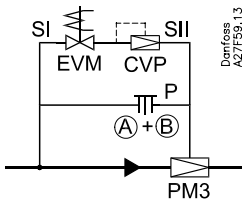


Fig. 4





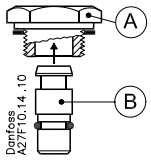
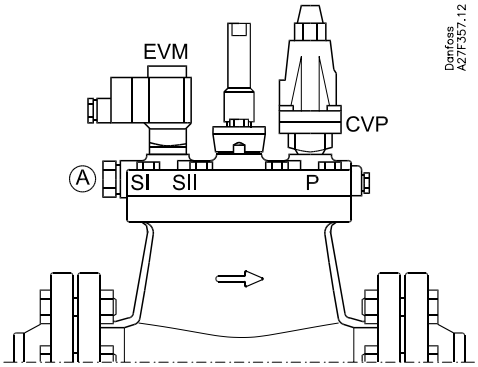
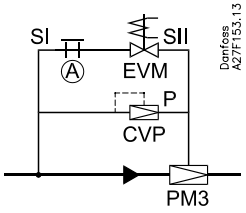


Fig. 5





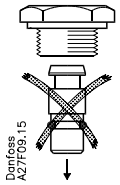
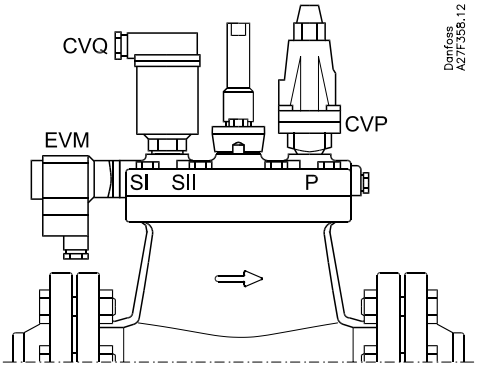


Fig. 6



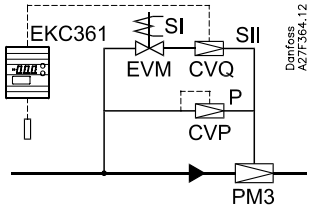
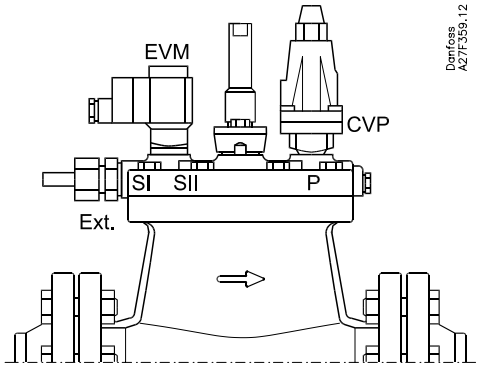


Fig. 7



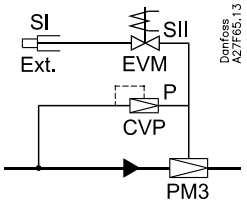


Fig. 8

ENGLISH

Installation

Refrigerants
Applicable to all common non-flammable refrigerants, including R717 and non-corrosive gases/liquids dependent on sealing material compatibility.
Flammable hydrocarbons are not recommended. The valve is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range
PM: –60/+120°C (–76/+248°F)

Pressure range
PM: The valves are designed for a max. working pressure of 28 bar g (406 psi g).

Technical data
The PM 3 can be used in suction, liquid, hot-gas and liquid/vapour lines.
The PM 3 regulates the flow of the medium by modulation or on/off function, depending on the control impulse from the screwed-on pilot valves.
The PM 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. 2 and 3.

Schematic examples of pilot valves connected to the PM can be seen in figures 5, 6, 7, and 8.

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). A blanking plug is supplied with the valve.

Regulating range
Dependent on pilot valves.

Opening differential pressure (Δp)
The PM main valve requires a minimum opening differential pressure of 0.07 bar (1 psi) to begin to open and 0.2 bar (2.8 psi) to be completely open.
Note: The valve opens when differential pressure against the direction of flow occurs.

Installation
Flange set for the PM is delivered separately. The valve must be installed with the arrow in the direction of the flow and the top cover upwards (fig. 4). The top cover can be rotated 4 × 90° in relation to the valve body.
The valve is fitted with a spindle for manual opening.
If an external pilot valve is used, the pilot line must be connected to the upper side of the main line so that any dirt and oil from the plant will not find its way into the pilot line.
If the PM 3 is to be used as a solenoid valve in a liquid line, external control pressure cannot be recommended because it can cause liquid hammer.

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.

Welding
If using welding flanges, only materials and welding methods, compatible with the flange material must be welded to the flanges. The flanges should be cleaned internally to remove welding debris on completion of welding and before the valve is inserted.

The valve housing and flanges must be free from stresses (external loads) after installation.

PM 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 PM valves are Zinc-Chromated 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 PM valves are easy to dismantle and most of its parts are replaceable. When the bottom cover is removed, the strainer can be taken out for cleaning.
Do not open the valve while the valve is still under pressure.

- Check that the gasket has not been damaged. Ideally, the gasket should be replaced.
- 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 particles or similar.

Tightening
Tightening torques
See fig. 1 and table 1.

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. Danfoss accepts no responsibility for errors and omissions. Danfoss Industrial Refrigeration reserves the right to make changes to products and specifications without prior notice.

DECLARATION OF CONFORMITY
The Pressure Equipment Directive 97/23/EC

Name and Address of Manufacturer within the European Community
Danfoss Industrial Refrigeration A/S
Stormosevej 10
PO Box 60
DK-8361 Hasselager
Denmark

Declaration
We hereby declare that below-mentioned equipment are classified for Fluid Group I (all refrigerants (toxic, non-toxic, flammable and non-flammable)), and that all are covered by Article 3, paragraph 3.

For further details / restrictions – see Installation Instruction

Description of Pressure Equipment
Refrigerant main regulating valves
Type **PM, PMC, PMFH, PMFL, MRV, MEV**

Nominal bore **DN ≤ 25 mm.** (1 in)

References of other Technical Standards and Specifications used

prEN 12284	DIN 3158
EN 1563	AD-Merkblätter

Authorised Person for the Manufacturer within the European Community

Name: Morten Steen Hansen **Title:** Production Manager

Signature: Morten Steen Hansen **Date:** 19/03/2002

148B9715 - rev. 1

DECLARATION OF CONFORMITY
The Pressure Equipment Directive 97/23/EC

Name and Address of Manufacturer within the European Community
Danfoss Industrial Refrigeration A/S
Stormosevej 10
PO Box 60
DK-8361 Hasselager
Denmark

Description of Pressure Equipment

Refrigerant main regulating valves
Type PM, PML, PMLX, PMFH, PMFL, MRV, MEV

Nominal bore	**DN 32-150 mm** ($1^1/_4$ - 6 in.)	
Classified for	**Fluid Group I** (all refrigerants (toxic, nontoxic, flammable and nonflammable)). For further details / restrictions – see Installation Instruction.	
Temperature range	All	–60°C (–76°F) to 120°C (248°F)
Maximum allowable working pressure		**28 bar** (406 psi)

Conformity and Assessment Procedure Followed

Category	II	III
Module	**D1**	**B1+D**
Certificate ID	*D1: 07 202 0511 Z 0009/1/H-0002*	*B1: 07 202 0511 Z 0074/1/H-0001* *D: 07 202 0511 Z 0009/1/H-0001*
Nominal bore	DN 32-125 mm ($1^1/_4$ - 5 in)	DN 150 mm (6 in)

Name and Address of the Notified Body which carried out the Inspection
TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

CE
(0045)

Name and Address of the Notified Body monitoring the Manufacturer's Quality Assurance System
TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

References of Harmonised Standards used

References of other Technical Standards and Specifications used
prEN 12284 DIN 3158
EN 1563 AD-Merkblätter

Authorised Person for the Manufacturer within the European Community

Name: Morten Steen Hansen **Title:** Production Manager

Signature: Morten Steen Hansen **Date:** 19/03/2002

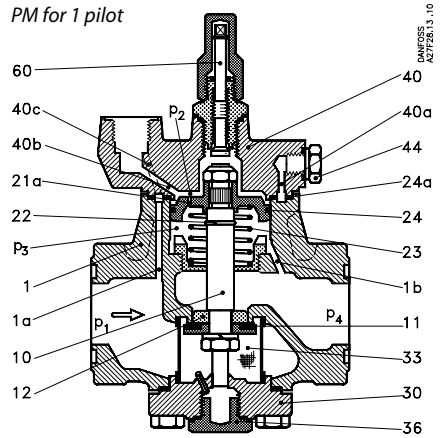
148B9704 - rev. 1

Instructions
PM 5-65

Installation / Installazione

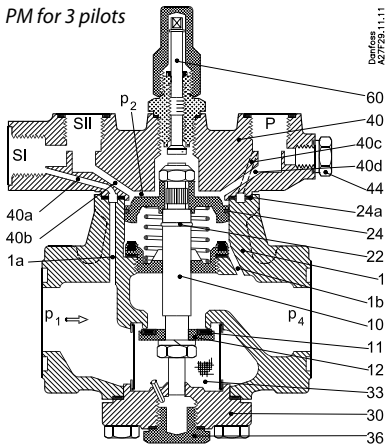
027R9524

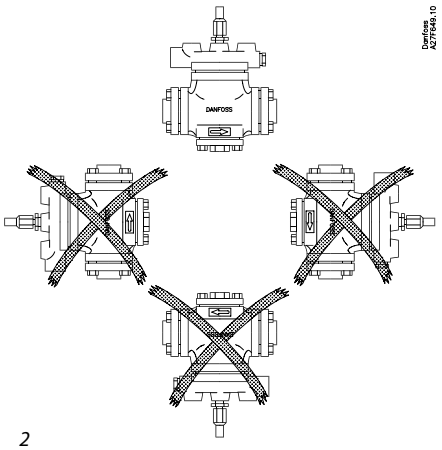
PM for 1 pilot



1

PM for 3 pilots





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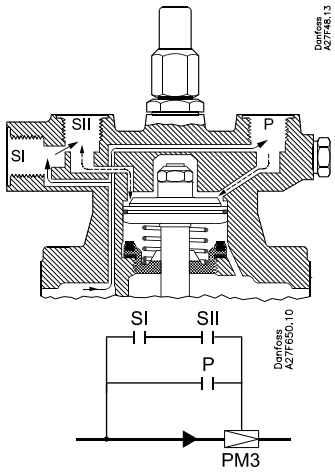
027R9524



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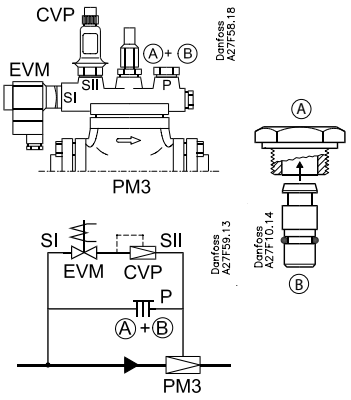
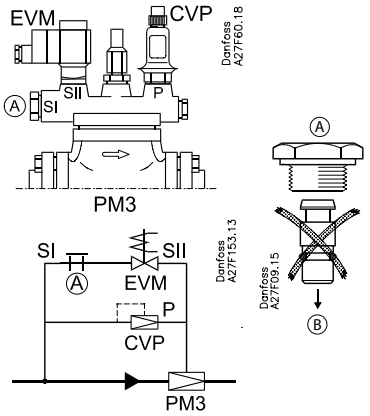


4a



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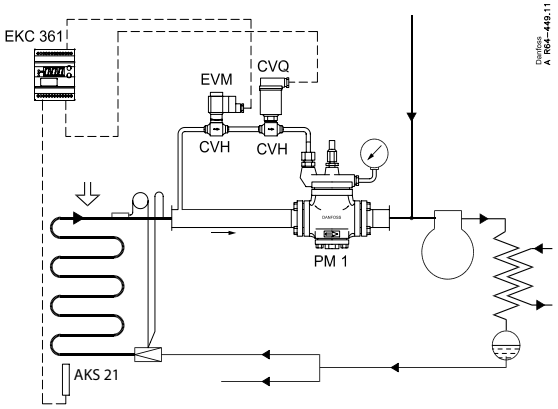

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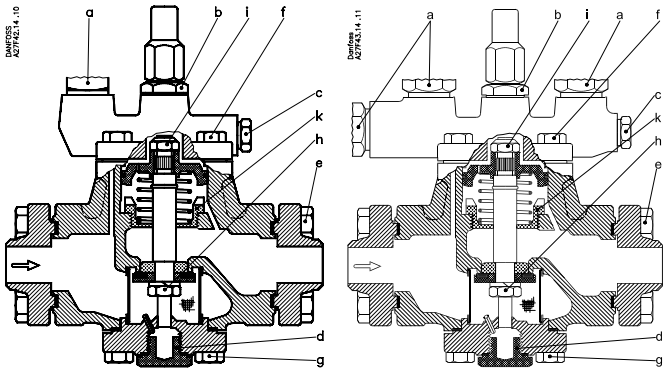


Tabel I - Table I - Tabelle - Tableau I - Tabella 1

Pos.	Tilspændingsmoment i Nm (lb - ft) Tightening Torque in Nm (lb - ft) Anzugsmoment in Nm (lb - ft) Couple de serrage en Nm (lb - ft) Coppia di serraggio in Nm(lb- ft)					
	PM størrelse / size / Grösse / dimension / PM dimensioni					
	5-20	25	32	40	50	65
a	50 (37)					
b	50 (37)					
c	25 (18)					
d	50 (37)					
e	60 (44)				80 (59)	
f	35 (26)			60 (44)		80 (59)
g	35 (26)			60 (44)		80 (59)
h	30 (22)		40 (30)		50 (37)	60 (44)
i	25 (18)					
k	80 (59)			100 (74)		120 (89)

6

 ~~RI4XS152~~ → DKRCI.PI.HL0.A1.59 / 520H0507

Installation

Design
See fig. 1
1. Valve body
1a and 1b. Channels in valve body (1)
10. Valve spindle
11. Throttle cone
12. Valve seat
21a. Equalizing hole in servo piston (24)
22. Locking ring
24. Servo piston
24a. Gasket
30. Bottom cover
33. Strainer
36. Bottom plug
40. Cover
40a, b, c and d. Channels in cover (40)
44. Pressure gauge connection
60. Manual operating spindle
S I, S II and P. Pilot valve connections

Refrigerants
Applicable to all common non-flammable refrigerants, including R717 and non-corrosive gases/liquids dependent on sealing material compatability.
Flammable hydrocarbons are not recommended. The valve is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range
PM: –60/+120°C (–76/+248°F)

Pressure range
PM: The valves are designed for a max. working pressure of 28 bar g (406 psi g).

Technical data
The PM 1 can be used in suction, liquid, hot-gas and liquid/vapour lines.
The PM 1 regulates the flow of the medium by modulation or on/off function, depending on the control impulse from the screwed on pilot valves.
The PM 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", figs. 3 and 4.

If only two pilot valves are necessary for the function required, the third pilot connection must be sealed with a blanking plug (see fig. 4). A blanking plug is supplied with the valve.

Opening differential pressure (Δp)
The PM main valve requires a minimum opening differential pressure of 0.07 bar (1 psi) to begin to open and 0.2 bar (2.8 psi) to be completely open.
Note: The valve opens when differential pressure against the direction of flow occurs.

Installation
Flange set for the PM is delivered separately. The valve must be installed with the arrow in the direction of the flow and the top cover upwards (fig. 2). The top cover can be rotated 4 X 90° in relation to the valve body. The valve is fitted with a spindle for manual opening.

If an external pilot valve is used, the pilot line must be connected to the upper side of the main line so that any dirt and oil from the plant will not find its way into the pilot line.
If the PM 1 is to be used as a solenoid valve in a liquid line, external control pressure cannot be recommended because it can cause liquid hammer.

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.

Welding
If using welding flanges, only materials and welding methods, compatible with the flange material must be welded to the flanges. The flanges should be cleaned internally to remove welding debris on completion of welding and before the valve is inserted.

The valve housing and flanges must be free from stresses (external loads) after installation.

PM 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 PM valves are Zinc-Chromated 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 PM valves are easy to dismantle and most of its parts are replaceable. When the bottom cover is removed, the strainer can be taken out for cleaning.
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 (fig. 6)
Tightening torques
See table I.

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.

Drawings are only for illustration, not for dimensioning or construction.

Danfoss accepts no responsibility for errors and omissions. Danfoss Industrial Refrigeration reserves the right to make changes to products and specifications without prior notice.

DECLARATION OF CONFORMITY
The Pressure Equipment Directive 97/23/EC

Name and Address of Manufacturer within the European Community
Danfoss Industrial Refrigeration A/S
Stormosevej 10
PO Box 60
DK-8361 Hasselager
Denmark

Declaration
We hereby declare that below-mentioned equipment are classified for Fluid Group I (all refrigerants (toxic, non-toxic, flammable and non-flammable)), and that all are covered by Article 3, paragraph 3.

For further details / restrictions - see Installation Instruction

Description of Pressure Equipment
Refrigerant main regulating valves
Type **PM, PMC, PMFH, PMFL, MRV, MEV**

Nominal bore **DN** ≤ **25 mm.** (1 in)

References of other Technical Standards and Specifications used

prEN 12284	DIN 3158
EN 1563	AD-Merkblätter

Authorised Person for the Manufacturer within the European Community

Name: Morten Steen Hansen **Title:** Production Manager

Signature: Morten Steen Hansen **Date:** 28/01/2002

148B9715 - rev. 1

 ~~RI4XS152~~ → DKRCI.PI.HL0.A1.59 / 520H0507

DECLARATION OF CONFORMITY
The Pressure Equipment Directive 97/23/EC

Name and Address of Manufacturer within the European Community
Danfoss Industrial Refrigeration A/S
Stormosevej 10
PO Box 60
DK-8361 Hasselager
Denmark

Description of Pressure Equipment
Refrigerant main regulating valves
Type PM, PML, PMLX, PMFH, PMFL, MRV, MEV

Nominal bore	**DN32-150 mm** ($1^1/_4$ - 6 in.)	
Classified for	**Fluid Group I** (all refrigerants (toxic, nontoxic, flammable and nonflammable)). For further details / restrictions - see Installation Instruction.	
Temperature range	All	–60°C (-76°F) to 120°C (248°F)
Maximum allowable working pressure		**28 bar** (406 psi)

Conformity and Assessment Procedure Followed

Category	II	III
Module	**D1**	**B1+D**
Certificate ID	***D1: 07 202 0511 Z 0009/1/H-0002***	***B1: 07 202 0511 Z 0074/1/H-0001*** ***D: 07 202 0511 Z 0009/1/H-0001***
Nominal bore	DN 32-125 mm ($1^1/_4$-5 in)	DN150 mm (6 in)

Name and Address of the Notified Body which carried out the Inspection
TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

CE
(0045)

Name and Address of the Notified Body monitoring the Manufacturer's Quality Assurance System
TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

References of Harmonised Standards used

References of other Technical Standards and Specifications used
prEN 12284
EN 1563
DIN 3158
AD-Merkblätter

Authorised Person for the Manufacturer within the European Community

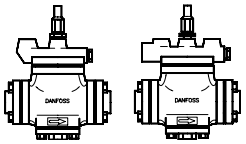
Name: Morten Steen Hansen **Title:** Production Manager

Signature: Morten Steen Hansen **Date:** 28/01/2002

148B9704 - rev. 1

INSTRUCTIONS

PMC 1/PMC 3



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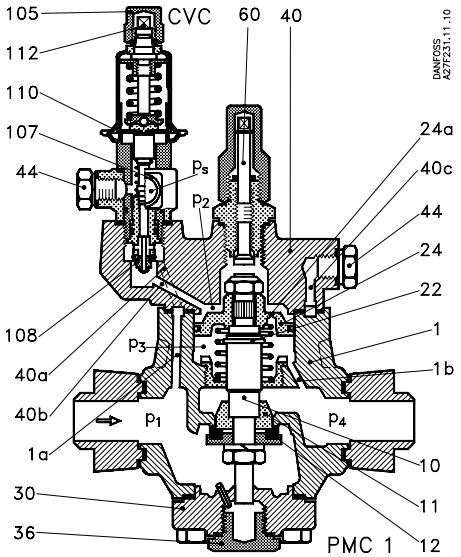


Fig. 1
PMC 1 + CVC

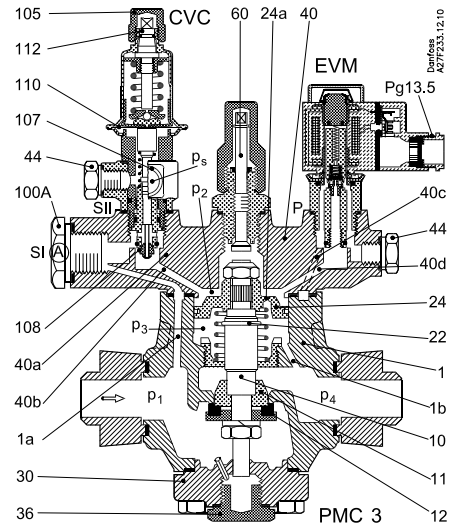


Fig. 2
PMC 3 + CVC + EVM

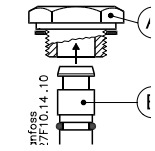


Fig. 3
A + B

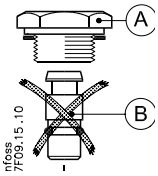


Fig. 4
A

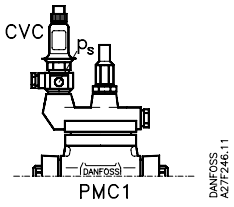


Fig. 5
PMC 1 + CVC

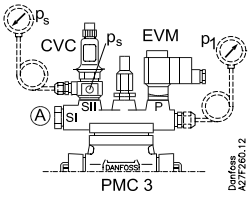


Fig. 7
PMC 3 + A + CVC + EVM

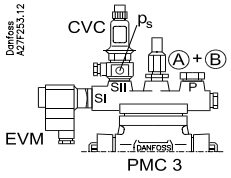


Fig. 9
PMC 3 + EVM + CVC + A + B

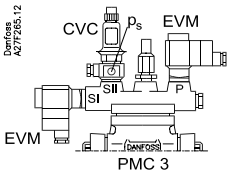


Fig. 11
PMC 3 + EVM + CVC + EVM

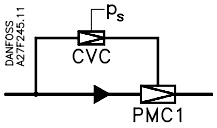


Fig. 6
PMC 1 + CVC

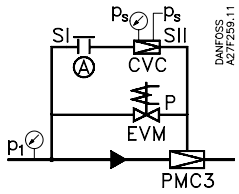


Fig. 8
PMC 3 + A + CVC + EVM

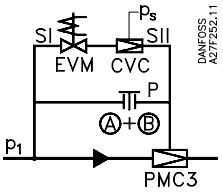


Fig. 10
PMC 3 + EVM + CVC + A +B

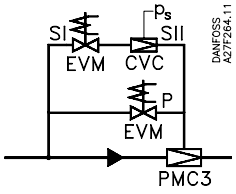


Fig. 12
PMC 3 + EVM + CVC + EVM

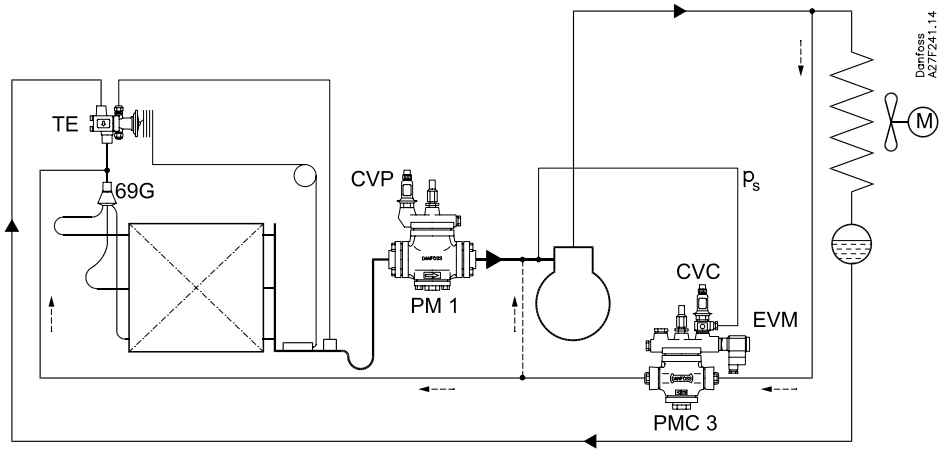


Fig. 13

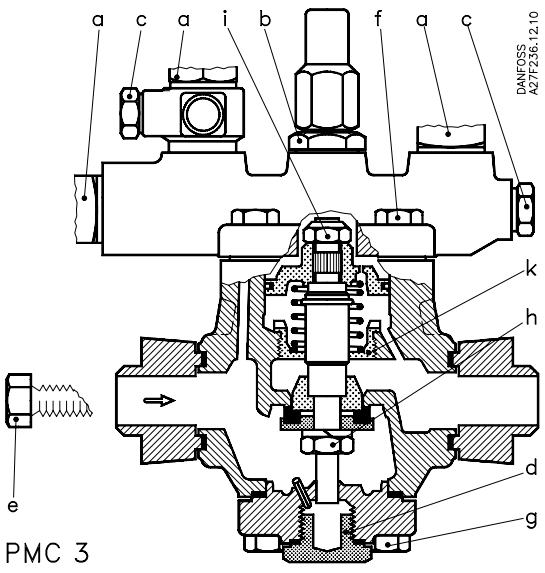


Fig. 14

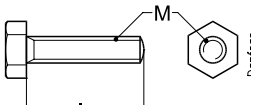


Fig. 15

I

Pos. Item.	Gevind Thread Gewinde Filetage				Tilspændingsmoment i Nm (10 Nm = 1 kpm) Tightening torque in Nm (1 Nm = 0.74 lb force ft) Anzugsmoment in Nm (10 Nm = 1 kpm) Couple de serrage en Nm (10 Nm = 1 kgf.m)			
	PMC 1 /PMC 3 Størrelse Size Grösse Dimension							
	5	8	12	20	5	8	12	20
a	M 24 × 1.5				50			
b	M 20 × 1.5				50			
c	$^1/_4$ RG $^1/_4$ BSP R $^1/_4$ $^1/_4$ G				30			
d	M 24 × 1.5				50			
e	M 12 × 1.5				60			
f	M 10 × 1.5				40			
g	M 10 × 1.5				40			
h	M 10 × 1.5				35			
i	M 12 × 1.5				30			
k	M 39 × 1.5				60			

II

Flangesæt Flange sets Flanschsätze Jeux de brides							
Type Typ	Flangeart Flange type Flanschart Nature de bride	Svejse Weld Schweißfl. A souder		Lodde Solder Lötfl. A braser			
		in	Best.nr. Code no. Bestell-Nr. N° de code *)	in	Best.nr. Code no. Bestell-Nr. N° de code *)	mm	Best.nr. Code no. Bestell-Nr. N° de code *)
PMC 1/PMC 3 5, 8, 12, 20	12	$^3/_4$ 1	027N1220 027N1225	$^7/_8$ 1 $^1/_8$	027L1223 027L1229	22 28	027L1222 027L1228

*) Best. nr. omfatter et sæt med to flanger (tilgang og afgang).
*) The code no. covers one set with two flanges (inlet and outlet).
*) Die Bestell-Nr. umfasst einen Satz mit zwei Flanschen (Eintritt und Austritt).
*) Le n° de code comprend un jeu de deux brides (entrée et sortie).

DANSK

Pilotstyrede kapacitetsregulatorer Hovedventiler

Konstruktion

Se fig. 1 og 2.

1. Ventilhus
1a og b. Kanaler i ventilhuset 1
10. Trykstang
11. Drøvlekegle
12. Ventilsæde
22. Låsering
24. Servostempel
24a. Udligningshul i servostempel
30. Bunddæksel
36. Bundprop
40. Dæksel
40a, b, c, og d. Kanaler i dækslet 40
44. Blændprop for manometertilslutning
60. Manuel betjening
100. Blændprop
105. Dækhætte
107. Signaltilslutning
108. Pilotdyse
110. Membran
112. Indstillingsspindel

PMC 3 har tre tilslutninger for pilotventiler: To i serie, mærket med »SI« og »SII«, og en parallel med disse, mærket med »P«. Se fig. 2.

Hvis kun to pilotventiler er nødvendige for den ønskede funktion, skal den tredje pilottilslutning blændes af med den medleverede blændprop 100. Se fig. 3 og 4.
En monteringsinstruktion leveres sammen med blændproppen.

Funktion

PMC 1 og PMC 3 anvendes i varmgasledninger.
PMC 1 regulerer kapaciteten modulerende i afhængighed af den påskruede CVC-pilot-ventils styreimpuls. Se fig.1, 5 og 6.
Ved faldende tryk p_s i signalledningen påvirker membranen 110 trykstiften i pilotdysen 108, der åbnes. Dette resulterer i en trykstigning over servostemplet 24, og PMC 1 åbner. Ved stigende tryk p_s i signalledningen lukker PMC 1. Signalledningen må ikke kunne afspærres.

PMC 3 regulerer kapaciteten modulerende i afhængighed af de påskruede pilotventilers styreimpulser. Se fig. 2 og 7 til 12.
CVC-pilotventilen skal altid monteres i SII. Afhængig af, hvor EVM-pilotventilerne monteres, kan følgende tre funktioner opnås

1. Prop A i SI,CVC i SII, EVM i P:
   Modulerende kapacitetsregulering kombine-ret med tvangsåbning.
   Se fig.7 og 8.
2. EVM i SI, CVC i SII, prop A + B i P:
   Modulerende kapacitetsregulering kombine-ret med tvangslukning.
   Se fig. 9 og 10.
3. EVM både i SI og P, CVC i SII:
   Modulerende kapacitetsregulering kombine-ret med tvangsåbning og tvangslukning.
   Se fig. 11 og 12.

Vedrørende bestilling af EVM, se »Reserve-dele«.

Tekniske data

Kølemidler	R 12, R 22, R 502 etc. og R 717 (NH_3)
Reguleringsområde	Afhænger af pilotventilen CVC pilotventilen leveres med reguleringsområdet p_e = 0.45 bar til +7 bar
Proportionalbånd	ca. 0.2 bar
Medietemperaturområde	–50°C til +120°C
Maks. tilladelige spændingsvariationer	For PMC 3 + EVM vekselstrøm +10°C –15°C For PMC 3 + EVM, jævnstrøm ±10%
Maks. prøvetryk	42 bar = 3300 kPa (p_e)
Maks. arbejdstryk	28 bar = 2200 kPa (p_e)
Tæthed	IP 67 i henhold til IEC 144 eller DIN 40050
Tilspændingsmomenter	Se fig. 14 og tabel I

Montering

Flangesæt til PMC 1 og PMC 3 leveres separat. Se tabel II.
De medfølgende pakninger til CVC-pilotventilen påsættes før montering i SII. O-ringen smøres med fryseolie.
Ventilen monteres i et bypass mellem kompressorens høj- og lavtrykksside med gennemstrømning i pilens retning og topdækslet opad. Se fig.13.
Topdækslet kan drejes i spring på 90° i forhold til ventilhuset.
Signalledningen tilsluttes sugeledningen mellem fordamperen og kompressoren. Anvendes for-dampningstrykregulator, tilsluttes signalledningen mellem regulatoren og kompressoren.
Vælges det at lede varmgassen ind i sugeledningen mellem fordamperen og kompressoren, kan det være nødvendigt at sikre mod for høje trykrørstemperaturer ved at indsprøjte væske i sugeledningen, f.eks. ved hjælp af den termostatiske indsprøjtningsventil type TEAT.
PMC er forsynet med en spindel 60 til manuel åbning.

El-tilslutning

Før EVM-spolen på PMC 3 tilsluttes, kontrolleres det, om dens spænding og frekvens er den samme som nettets.
Klemdåsen har Pg 13.5 kabelforskruning. Kablets diameter kan være fra 6 mm til 14 mm. Jordforbindelsen tilsluttes klemdåsens jord-skrue, der er mærket ⏚.

Indstilling

Når dækhætten 105 er fjernet kan regulatoren indstilles. Drejes indstillingsspindelen 112 med uret (højre om), strammes fjederen og regula-toren vil begynde at åbne ved et højere sugetryk.
En omdrejning ~ 1.5 bar.

Service

Ventilen er let at adskille, og de fleste dele kan udskiftes.

Reservedele

Se Spare Parts katalog. Ved bestilling af spoler angives best. nr., spænding og frekvens.

Tilbehør

Se Hovedkataloget.

ENGLISH

Pilot-controlled capacity regulators Main valves

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 orifice
110. Diaphragm
112. Setting spindle

PMC 3 has three connections for pilot valves: two in series marked "SI" and "SII" and one in parallel with these marked "P", see fig. 2. If only two pilot valves are necessary for the function required the third pilot connection must be blanked off with the seal plug supplied, post 100, see fig. 3 and 4.
A mounting instruction is supplied with the seal plug.

Function

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 p_s 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 p_s 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.

For details of ordering EVM, see "Spare parts".

Technical data

Refrigerants	R 12, R 22, R 502 etc. and R 717 (NH_3)
Regulation range	Depends on the pilot valve. The CVC pilot valve is supplied with the regulation range p_e = 0.45 bar to +7 bar
Proportional-band	Approx. 0.2 bar
Media temperature range	–50°C to +120°C
Max. permissible voltage variations	For PMC 3 + EVM a.c.: +10°C –15°C For PMC 3 + EVM, d.c.: ±10%
Max. test pressure	42 bar = 3300 kPa (p_e)
Max. operating pressure	28 bar = 2200 kPa (p_e)
Enclosure	IP 67 in accordance with IEC 144 or DIN 40050
Tightening torques	See fig. 14 and tabel I

Fitting
The flange set for PMC 1 and PMC 3 is supplied separately. See table 11.
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 top cover can be turned in steps of 90° in relation to the valve body.
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 in-jecting 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.

Electrical connections
Before connecting the EVM coil of PMC 3, check that its voltage and frequency are the same as the mains. The terminal box has a Pg 13.5 screwed cable connection which can accommodate cable diameters from 6 mm to 14 mm.
Earth connection is made to the earth screw of the terminal box which is marked ⏚.

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.

Service
The valve is easy to dismantle and most of its parts are replaceable.

Spare parts
See Spare Parts catalogue. When ordering coils, state code no., voltage and frequency.

Accessories
Se Main Catalogue.

DEUTSCH

Pilotgesteuerte Leistungsregler Hauptventile

Konstruktion
Siehe Fig.1 und 2.
1. Ventilgehäuse
1a und 1b. Kanäle im Ventilgehäuse 1
10. Druckstange
11. Drosselkegel
12. Ventilsitz
22. Verschlußring
24. Servokolben
24a. Ausgleichsöffnung im Servokolben
30. Bodendeckel
36. Bodenstopfen
40. Deckel
40a, b, c und d. Kanäle im Deckel 40
44. Blendstopfen f. Manometeranschluß
60. Handbetätigung
100. Blendstopfen
105. Abdeckkappe
107. Signalleitungsanschluß
108. Pilotdüse
110. Membrane
112. Einstellspindel

PMC 3 hat drei Anschlüsse für Pilotventile: Zwei in Serie geschaltet (Kennzeichen »SI« und »SII«) und einen mit diesen parallelgeschaltet (Kennzeichen »P«). Siehe Fig. 2.

Wenn für die gewünschte Funktion nur zwei Pilotventile erforderlich sind, so ist der dritte Pilotanschluß mit Hilfe des mitgelieferten Blendstopfens 100 abzublenden. Siehe Fig. 3 und 4.
Eine Montageanleitung für den Blendstopfen wird mitgeliefert.

Funktion
PMC 1 und PMC 3 sind zur Verwendung in Heissgasleitungen vorgesehen.
PMC 1 regelt die Leistung modulierend nach dem Steuerimpuls des aufgeschraubten CVC- Pilotventils. Siehe Fig. 1, 5 und 6.
Bei fallendem Druck p_s in der Signalleitung, beeinflußt die Membrane 110 den Druckstift in der Pilotdüse 108, die daraufhin öffnet. Dies bewirkt einen Druckanstieg über dem Servo-kolben 24, und PMC 1 öffnet. Bei steigendem Druck p_s in der Signalleitung schließt PMC 1.
Die Signalleitung darf nicht abgesperrt werden.
PMC 3 regelt die Leistung modulierend nach den Steuerimpulsen der aufgeschraubten Pilotventile. Siehe Fig. 2 und 7 bis 12.
Das CVC-Pilotventile muß stets im Anschluß »SII« montiert werden. Jeweils abhängig von der Montage der EVM-Pilotventile können die folgenden drei Funktionen erreicht werden:
1. Stopfen A in »SI« CVC in »SII«, EVM in »P«: Modulierende Leistungsregelung mit Zwangsöffnen kombiniert. Siehe Fig. 7 und 8.
2. EVM in ,»SI«, CVC in »SII«, Stopfen A+B in »P«: Modulierende Leistungsregelung mit Zwangsschliessen kombiniert. Siehe Fig. 9 und 10.
3. EVM in sowohl »II« als »P«, CVC in »SII« Modulierende Leistungsregelung mit Zwangs-öffnen und Zwangsschliessen kombiniert. Siehe Fig. 11 und 12.

Betr. Bestellung von EVM, siehe unter »Ersatzteile«.

Technische Daten

Kältemittel	R 12, R 22, R 502 usw. und R 717 (NH_3)
Regelbereich	Jeweils vom Pilotventil abhängig. Das CVC Pilotventil wird mit dem Regelbereich p_e = 0.45 bar bis +7 bar geliefert
Proportional band	ca. 0.2 bar
Medientemperaturbereich	–50°C bis +120°C
Max. zulässige Spannungsschwankungen	Für PMC 3 + EVM Wechselstrom +10°C –15°C Für PMC 3 + EVM, Gleichstrom ±10%
Max. Prüfdruck	42 bar = 3300 kPa (p_e)
Max. Betriebsdruck	28 bar = 2200 kPa (p_e)
Schutzart	IP 67gemäß IEC 144 oder DIN 40050
Anzugsmomente	Siehe Fig. 14 und Tabelle I

Montage
Flanschensätze für PMC 1 und PMC 3 sind separat lieferbar. Siehe Tabelle II.
Die beigefügten Dichtungen für CVC sind vor der Montage in SII aufzusetzen. Der O-Ring ist mit Kältemaschinenöl zu schmieren.
Das Ventil ist mit dem Durchfluß in Pfeilrichtung und mit nach oben gerichtetem Deckel in einen zwischen der Hoch- und Niederdruckseite des Kompressors verlegten Bypass einzubauen. Siehe Fig. 13.
Der Deckel kann gegenüber dem Ventilgehäuse sprungweise um jeweils 90° gedreht werden.
Die Signalleitung wird an die Saugleitung zwischen Verdampfer und Kompressor ange-schlossen. Bei Verwendung eines Verdamp-fungsdruckreglers ist die Signalleitung zwischen dem Regler und dem Kompressor anzu-schliessen.
Wenn das Heißgas in die Saugleitung zwischen dem Verdampfer und dem Kompressor geleitet wird, kann es erforderlich sein, durch Ein-spritzung von Flüssigkeit in die Saugleitung gegen zu hohe Druckrohrtemperaturen zu sichern, – z.B. mit Hilfe des thermostatischen Nachspritzventils Typ TEAT.
PMC ist mit einer Spindel 60 für ein Öffnen von Hand ausgerüstet.

Elektrischer Anschluß
Vor dem Anschluß der am PMC 3 angeordneten EVM Spule ist zu prüfen, ob deren Spannung und Frequenz mit dem Versorgungsnetz übereinstimmen. Die Klemmendose hat Pg 13.5 Kabelverschraubung. Kabeldurchmesser von 6 mm bis 14 mm sind verwendbar.
Eine Erdung erfolgt über die mit ⏚ gekenn-zeichnete Erdungsschraube der Klemmendose.

Einstellung
Nach Entfernung der Abdeckkappe 105 kann die Einstellung des Reglers vorgenommen werden. Bei einer Drehung der Spindel 112 nach rechts (im Uhrzeigersinn) wird die Feder gespannt, und der Regler beginnt bei einem höheren Saugdruck zu öffnen. Eine volle Spindelumdrehung ~ 1.5 bar.

Service
Ein Zerlegen des Ventils ist einfach, und die meisten Bauteile können ausgewechselt werden.

Ersatztelle
Siehe Ersatzteilkatalog. Bei Bestellung von Spulen bitte Artikel-Nr., Spannung und Frequenz angeben.

Zubehör
Siehe Hauptkatalog.

Für fluorierte Kältemittel: Selbstschliessendes Ventil mit Bördeanschluß, Pos. 50-53.
Für Ammoniak: ∅6.5/∅ 10 mm Schweisstutzen, Pos. 45-48.

FRANÇAIS

Régulateurs de capacité à commande pilote
Vannes principales

Construction
Voir fig. 1 et 2.

1. Corps de vanne
1a et 1b. Canaux du corps de vanne 1
10. Tige de pression
11. Cône d'étranglement
12. Siège de vanne
22. Bague de verrouillage
24. Servopiston
24a. Trou d'égalisation du servopiston
30. Couvercle de fond
36. Bouchon de fond
40. Couvercle
40a, b, c, et d. Canaux du couvercle 40
44. Bouchon obturateur pour prise manométrique
60. Manoeuvre manuelle
100. Bouchon obturateur
105. Capuchon
107. Raccord conduite commande
108. Orifice pilote
110. Membrane
112. Tige de réglage

Le PMC 3 possède trois raccords pour vannes pilotes: deux en série marqués « SI » et « SII » et un parallèlement à ceux-ci marqué « P ». Voir fig.2.
Si seulement deux vannes pilotes sont néces-saires pour la fonction désirée, obturer le troisième raccord pilote à l'aide du bouchon obturateur 100 faisant partie de la fourniture. Voir fig. 3 et 4. Des instructions de montage sont fournies avec le bouchon d'obturation.

Fonctionnement
Les PMC 1 et PMC 3 sont prévus pou r montage sur les conduites de gaz chauds.
Le *PMC 1* règle la capacité de manière modulante en fonction de l'impuision de commande de la vanne pilote CVC vissse. Voir fig. 1, 5 et 6.
En cas d'une chute de pression p_e dans la conduite de commande, la membrane 110 agit sur la tige de pression de l'orifice pilote 108 qui s'ouvre. Il en résulte une augmentation de la pression dans le servopiston 24, et le PMC 1 s'ouvre. En cas d'une augmentation de la pression p_s dans la conduite de commande, le PMC 1 se ferme.
On ne doit pas pouvoir fermer la conduite de commande.

Le *PMC 3* effectue une réqulation modulante de la capacité en fonction des impuisions de commande des vannes pilotes vissées.
Voir fig. 2 et 7 à 12.
La vanne pilote CVC doit toujours être montée en SII. Selon l'endroit de montage des vannes pilotes EVM, les trois fonctions suivantes pourront être réalisées:

1. Bouchon A en SI CVC en SII, EVM en P:
   Répulation moduiante de la capacité combinée avec ouverture forcée.
   Voir fig. 7 et 8.
2. EVM en SI, CVC en SII, bouchon A+ B en P: Régulation modulante de la capacité combinée avec fermeture forcée.
   Voir fig. 9 et 10.
3. EVM tant en SI qu'en P, CVC en SII:
   Régulation modulante de la capacité combinée avec ouverture forcée et fermeture forcée. Voir fig. 11 et 12.

Pour la commande des EVM, voir sous « Pièces de rechange ».

Caractèristiques techniques

Fluides frigorigènes	R 12, R 22, R 502 et R 717 (NH_3)
Plage de régulation	Dépend de la vanne pilote. L vanne pilote CVC est prévue pour une plage de régulation p_e = 0.45 bar à +7 bar
Bande proportionelle	env. 0.2 bar
Plage de températures du fluide	–50°C à +120°C
Variations de tension max. admissibles	Pour PMC 3 + EVM courant altern. +10°C –15°C Pour PMC 3 + EVM, courant continu ±10%
Pression d'essai max.	42 bar = 3300 kPa (p_e)
Pression de service max.	28 bar = 2200 kPa (p_e)
Protection	IP 67 selon IEC 144 ou DIN 40050
Couples de serrage	Voir fig. 14 et tableau I.

Montage
Jeu de brides pour PMC 1 et PMC 3 livré séparément. Voir tableau 11.
Mettre en place les joints livrés pour CVC avant montage en SII. Enduire le joint torique avec de l'huile frigorifique.
Monter la vanne en dérivation entre le côté haute pression et le côté basse pression du compresseur avec passage dans le sens de la flèche et le couvercle supérieur orienté vers le haut. Voir fig. 13.
Le couvercle supérieur peut être tourné de $4 \times 90°$ par rapport au corps de vanne.
Raccorder la conduite de commande à la conduite d'aspiration entre l'évaporateur et le compresseur.
En cas d'emploi d'un régulateur de la pression d'évaporation, raccorder la conduite de commande entre le régulateur et le com-presseur. Si l'on désire introduire les gaz chauds dans la conduite d'aspiration entre l'évaporateur et le compresseur, il pourra devenir nécessaire- pour éviter des températures trop élevées dans la conduite de refoulement – d'injecter un liquide dans la conduite d'aspiration, p.ex. à l'aide du détendeur d'injection thermostatique type TEAT.
Le PMC est muni d' une tige 60 pour ouverture manuelle.

Raccordement électrique
Avant de raccorder la bobine EVM du PMC 3, contrôler que sa tension et sa fréquence correspondent à celles du réseau.
La boîte à bornes est munie d'un raccord pour tube électrique Pg 13,5. Le diamètre du câble peut être de 6 à 14 mm.
Raccorder la mise à la terre à la vis de terre de la boîte à bornes. La vis de terre est marquée ⏚.

Réglage
Le capuchon 105 enlevé, ajuster le régulateur. Si la tige de réglage 112 est tourné dans le sens des aiguilles d'une montre (vers la droite), le ressort se tend, et le régulateur commencera à s'ouvrir à une pression d'aspiration plus élevée.
Un tour ~ 1.5 bar.

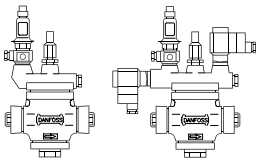
Entretien
La vanne est facile à démonter, et la plupart de ses composants sont échangeables.

Pièces de rechange
Voir dans le catalogue de pièces détachées. Dans la commande de bobines, indiquer le numéro de code, la tension et la fréquence.

Accessoires
Voir Danfoss catalogue.

Instructions

PMC 1/PMC 3



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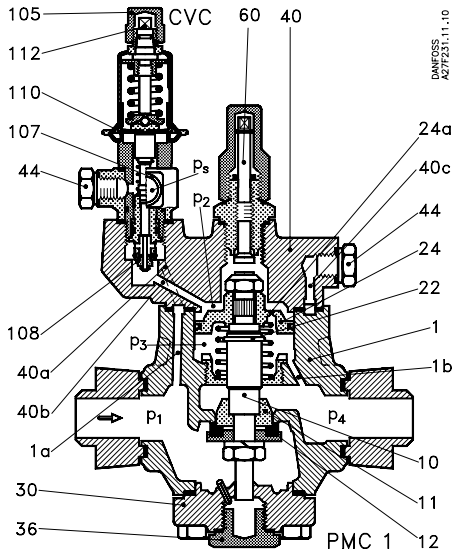


Fig. 1
PMC 1 + CVC

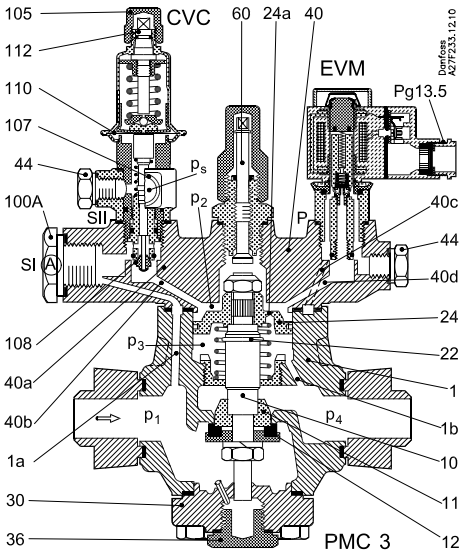


Fig. 2
PMC 3 + CVC + EVM

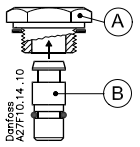


Fig. 3
A + B

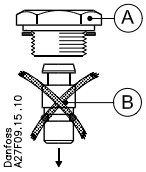


Fig. 4
A

027R9610

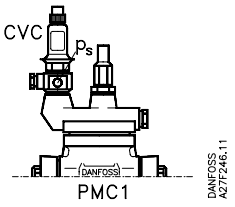


Fig. 5
PMC 1 + CVC

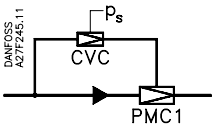


Fig. 6
PMC 1 + CVC

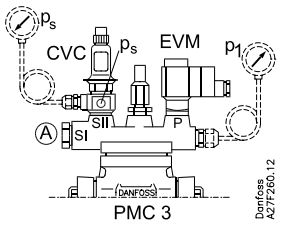


Fig. 7
PMC 3 + A + CVC + EVM

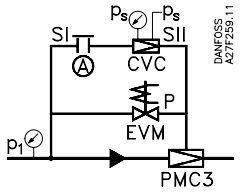


Fig. 8
PMC 3 + A + CVC + EVM

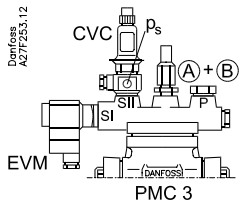


Fig. 9
PMC 3 + EVM + CVC + A + B

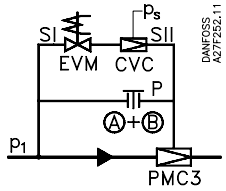


Fig. 10
PMC 3 + EVM + CVC + A + B

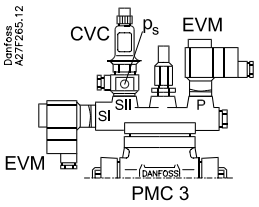


Fig. 11
PMC 3 + EVM + CVC + EVM

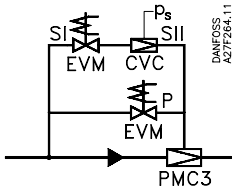


Fig. 12
PMC 3 + EVM + CVC + EVM

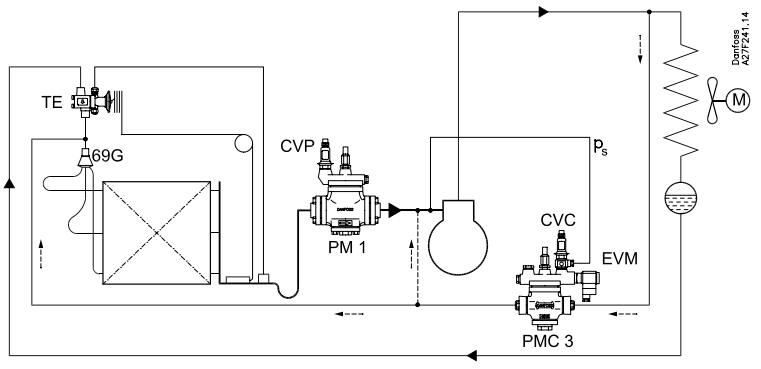


Fig. 13

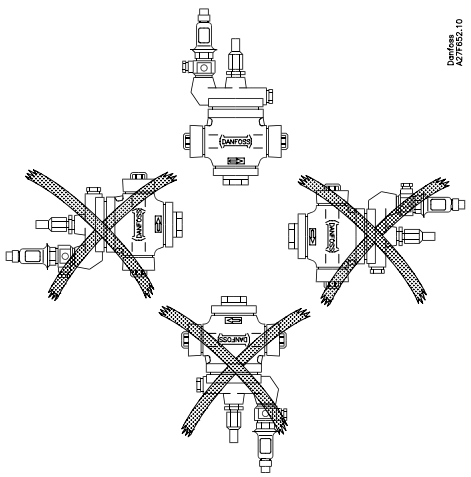


Fig. 14

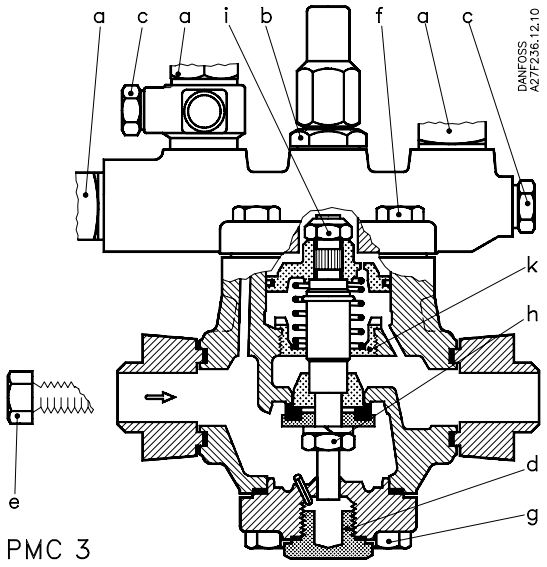


Fig. 15

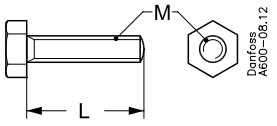


Fig. 16

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			
e	60			
f	40			
g	40			
h	35			
i	30			
k	60			

Table 1

ENGLISH

Pilot-controlled capacity regulators
Main valves

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 orifice
110. Diaphragm
112. Setting spindle

Refrigerants
Applicable to all common non-flammable refrigerants, including R717 and non-corrosive gases/liquids dependent on sealing material compatibility.
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 p_s 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.

Welding
If using welding flanges, only materials and welding methods, compatible with the flange material must be welded to the flanges. The flanges should be cleaned internally to remove welding debris on completion of welding and before the valve is inserted.

The valve housing and flanges must be free from stresses (external loads) after installation.

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 Zinc-Chromated 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.

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. Danfoss accepts no responsibility for errors and omissions. Danfoss Industrial Refrigeration reserves the right to make changes to products and specifications without prior notice.

DECLARATION OF CONFORMITY
The Pressure Equipment Directive 97/23/EC

Name and Address of Manufacturer within the European Community
Danfoss Industrial Refrigeration A/S
Stormosevej 10
PO Box 60
DK-8361 Hasselager
Denmark

Declaration
We hereby declare that below-mentioned equipment are classified for Fluid Group I (all refrigerants (toxic, non-toxic, flammable and non-flammable)), and that all are covered by Article 3, paragraph 3.

For further details / restrictions – see Installation Instruction

Description of Pressure Equipment
Refrigerant main regulating valves
Type **PM, PMC, PMFH, PMFL, MRV, MEV**

Nominal bore **DN ≤ 25 mm.** (1 in)

References of other Technical Standards and Specifications used

prEN 12284	DIN 3158
EN 1563	AD-Merkblätter

Authorised Person for the Manufacturer within the European Community

Name: Morten Steen Hansen **Title:** Production Manager

Signature: Morten Steen Hansen **Date:** 16/01/2002

148B9715 - rev. 1

DECLARATION OF CONFORMITY
The Pressure Equipment Directive 97/23/EC

Name and Address of Manufacturer within the European Community
Danfoss Industrial Refrigeration A/S
Stormosevej 10
PO Box 60
DK-8361 Hasselager
Denmark

Description of Pressure Equipment

Refrigerant main regulating valves
Type PM, PML, PMLX, PMFH, PMFL, MRV, MEV

Nominal bore	**DN 32-150 mm** ($1^1/_4$ - 6 in.)	
Classified for	**Fluid Group I** (all refrigerants (toxic, nontoxic, flammable and nonflammable)). For further details / restrictions – see Installation Instruction.	
Temperature range	All	–60°C (-76°F) to 120°C (248°F)
Maximum allowable working pressure		**28 bar** (406 psi)

Conformity and Assessment Procedure Followed

Category	II	III
Module	**D1**	**B1+D**
Certificate ID	*D1: 07 202 0511 Z 0009/1/H-0002*	*B1: 07 202 0511 Z 0074/1/H-0001* *D: 07 202 0511 Z 0009/1/H-0001*
Nominal bore	DN 32-125 mm ($1^1/_4$ - 5 in)	DN 150 mm (6 in)

Name and Address of the Notified Body which carried out the Inspection
TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

CE
(0045)

Name and Address of the Notified Body monitoring the Manufacturer's Quality Assurance System
TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

References of Harmonised Standards used

References of other Technical Standards and Specifications used
prEN 12284 DIN 3158
EN 1563 AD-Merkblätter

Authorised Person for the Manufacturer within the European Community

Name: Morten Steen Hansen **Title:** Production Manager

Signature: Morten Steen Hansen **Date:** 16/01/2002

148B9704 - rev. 1

Instructions

PMFL

027R9525

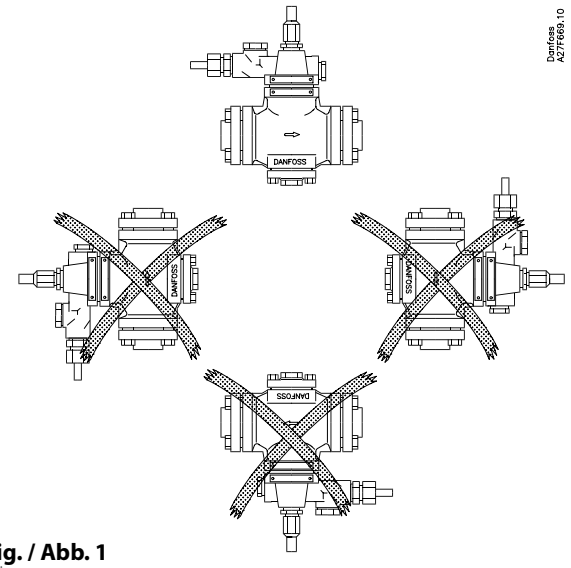


Fig. / Abb. 1

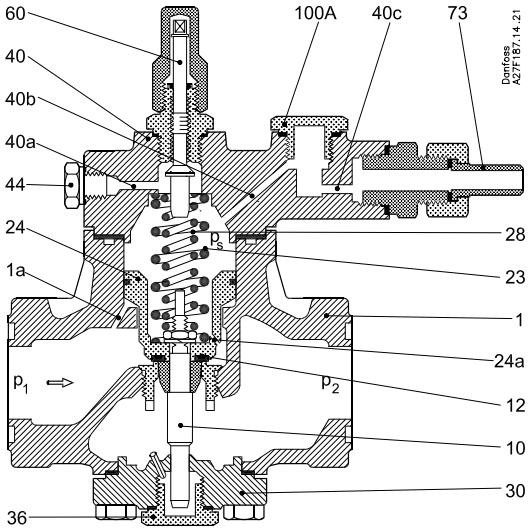
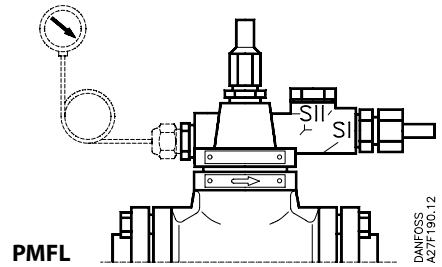


Fig. / Abb. 2



PMFL

Fig. / Abb. 3

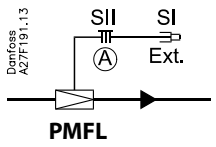
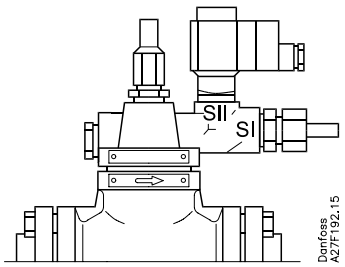


Fig. / Abb. 4



PMFL + EVM

Fig. / Abb. 5

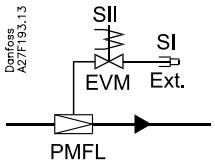


Fig. / Abb. 6

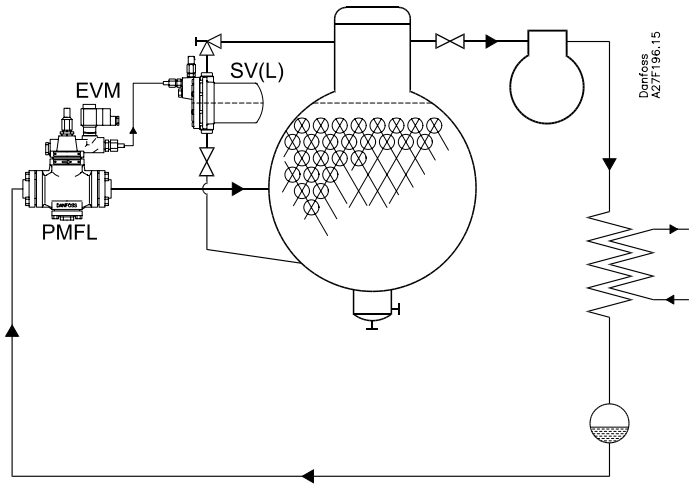
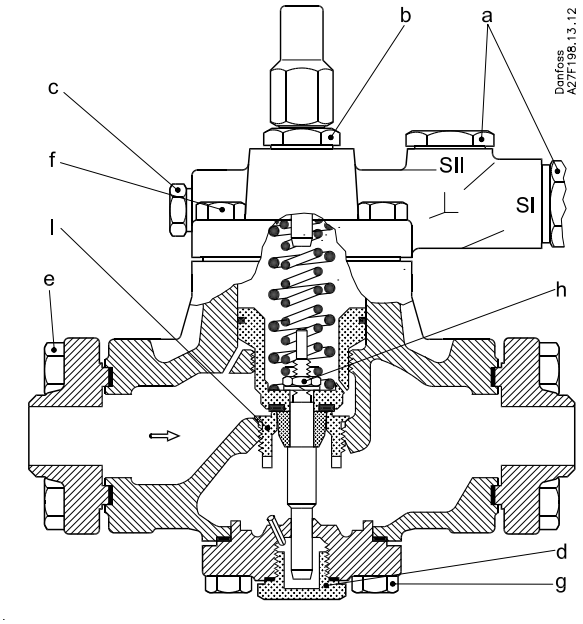


Fig. / Abb. 7

 ~~RI2CG102~~ → DKRCI.Pi.GE0.A1.59 / 520H0304



Tabel / Table / Tabelle / Tableau / Tabella 1

Pos. Item Elemento	Tilspændingsmoment i Nm (10 Nm = 1 kpm) Tightening torque in Nm (1 Nm = 0.74 lb force ft) Anzugsmoment in Nm (10 Nm = 1 kpm) Couple de serrage en Nm (10 Nm = 1 kgf.m) Coppia di serraggio in Nm (1 Nm = 0,74 lb forza ft)			
	PMFL Størrelse Size Größe Dimension Dimensioni			
	80-1…7	125	200	300
a	50			
b	50			
c	25			
d	50			
e	60			80
f	35		60	
g	35		60	
h	17	34		
i	80	120	150	

DANSK

Installation

Kølemidler
Kan anvendes med alle almindelige, ikke-brændbare kølemidler, herunder R 717, og ikke-korroderende gasser/væsker under passende hensyntagen til tætningsmaterialernes beskaffenhed. Brændbare kulbrinter bør ikke anvendes. Det anbefales, kun at anvende ventilen i lukkede kredsløb. Yderligere informationer fås ved at kontakte Danfoss.

Temperaturområde
PMFL: –60/+120°C (–76/+248°F)

Trykområde
PMFL: Ventilerne er beregnet til et maks. arbejdstryk på 28 bar g (406 psi g).

Tekniske data
PMFL-ventiler kan anvendes i suge-, væske-, varmgas- og væske-/dampledninger. PMFL regulerer medieflowet ved hjælp af en totrins on/off-funktion afhængigt af styreimpulsen fra de påskruede pilotventiler.

Konstruktion
Se fig. 2

1.	Ventilhus
1a.	Kanal i ventilhus 1
10.	Ventilspindel
12.	Ventilplade
23.	Drivfjeder
24.	Servostempel
24a.	Kanal i servostempel 24
28.	Hjælpefjeder
30.	Bunddæksel
36.	Bundprop
40.	Dæksel
40a. b. c.	Kanaler i dæksel 40
44.	Manometertilslutning
60.	Spindel for manuel åbning
73.	Pilottilslutning
100A.	Blændprop

Installation
Flangesæt til PMFL leveres separat. Ventilen monteres, så pilen peger i flowretningen og topdækslet vender opad (fig. 1). Topdækslet kan roteres 4 90° i forhold til ventilhuset. Ventilen er udstyret med en spindel for manuel åbning.
Hvis der anvendes en ekstern pilotventil, skal pilotledningen tilsluttes den øverste side af hovedledningen, så eventuelt snavs og olie fra anlægget ikke trænger ind i pilotledningen.

PMFL-ventilen kan styres ved hjælp af en SV-svømmerventil, som vist i fig. 7. Se instruktioner og retningslinier for SV-ventiler.

Ventilen kan modstå et højt indvendigt tryk. Rørsystemet bør imidlertid konstrueres, så væskefælder undgås og risikoen for hydraulisk tryk forårsaget af termisk ekspansion reduceres. Ventilen skal beskyttes mod tryktransienter såsom væskeslag i systemet.

Svejsning
Hvis der bruges svejseflanger, må der kun anvendes materialer og svejsemetoder, der er kompatible med flangematerialet. Før ventilen sættes på plads, bør flangerne rengøres indvendigt efter svejsning for at fjerne svejseslagger.

Efter installation skal ventilhuset og flangerne være uden spænding (ekstern belastning).

Der må ikke installeres PMFL-ventiler i systemer, hvor ventilens udløbsside er åben til atmosfæren. Ventilens udløbsside skal altid tilsluttes systemet eller blændes korrekt af, for eksempel med en påsvejset endebund.

Farver og identifikation
PMFL-ventilerne er zinkkromateret fra fabrikken. Hvis yderligere korrosionsbeskyttelse er påkrævet, kan ventilerne males.

Ventilerne kan identificeres nøjagtigt ved hjælp af typeskiltet på topdækslet. Når ventilhuset er installeret og monteret, skal dets udvendige overflade beskyttes mod korrosion med et velegnet antikorrosionsmiddel.

Det anbefales at afdække typeskiltet ved ommaling af ventilen.

Vedligeholdelse

Service
PMFL-ventilerne er lette at demontere og består primært af udskiftelige dele. Når bunddækslet fjernes, kan smudsfiltret afmonteres og rengøres. Undlad at åbne ventilen, mens den stadig er under tryk.
- Kontroller, at O-ringen eller pakningerne ikke er beskadiget.
- Kontroller, at spindlen er fri for ridser og slagmærker.
- Udskift delene, hvis teflonringen er beskadiget.

Montering
Fjern eventuelt snavs fra huset, før ventilen samles. Kontroller, at kanalerne i ventilen ikke er tilstoppet med partikler eller lignende.

Tilspænding
Tilspændingsmomenter
Se fig. 3 og tabel 1.

Anvend kun originale Danfoss-dele, herunder pakdåser, O-ringe og pakninger. De materialer, som er anvendt til nye dele, er certificeret til det pågældende kølemiddel.

Kontakt venligst Danfoss i tilfælde af tvivl. Danfoss påtager sig intet ansvar for fejl og undladelser. Danfoss Industrial Refrigeration forbeholder sig retten til at foretage ændringer i produkter og specifikationer uden forudgående varsel.

ENGLISH

Installation

Refrigerants
Applicable to all common non-flammable refrigerants, including R717 and non-corrosive gases/liquids dependent on sealing material compatibility.
Flammable hydrocarbons are not recommended. The valve is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range
PMFL: –60/+120°C (–76/+248°F)

Pressure range
PMFL: The valves are designed for a max. working pressure of 28 bar g (406 psi g).

Technical data
PMFL can be used in suction, liquid, hot-gas and liquid/vapour lines.
The PMFL regulates the flow of the medium by two step on/off function, depending on the control impulse from the screwed-on pilot valves.

Design
See fig. 2

1.	Valve body
1a.	Channel in valve body 1
10.	Valve spindle
12.	Valve plate
23.	Main spring
24.	Servo piston
24a.	Channel in servo piston 24
28.	Supplementary spring
30.	Bottom cover
36.	Drain plug
40.	Cover
40a. b. c.	Channels in cover 40
44.	Pressure gauge connection
60.	Manual operating spindle
73.	Pilot connection
100A.	Blanking plug

Installation
Flange set for the PMFL is delivered separately. The valve must be installed with the arrow in the direction of the flow and the top cover upwards (fig. 1). The top cover can be rotated $4 \times 90°$ in relation to the valve body.
The valve is fitted with a spindle for manual opening.
When an external pilot valve is used, the pilot line must be connected to the upper side of the main line so that any dirt and oil from the plant will not find its way into the pilot line.

The PMFL valve can be controlled by the SV float valve as shown in fig. 7. Please refer to SV instruction guidelines.

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.

Welding
If using welding flanges, only materials and welding methods, compatible with the flange material must be welded to the flanges. The flanges should be cleaned internally to remove welding debris on completion of welding and before the valve is inserted.

The valve housing and flanges must be free from stresses (external loads) after installation.

PMFL 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 PMFL valves are Zinc-Chromated 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 PMFL valves are easy to dismantle and most of its parts are replaceable. When the bottom cover is removed, the strainer can be taken out for cleaning.
Do not open the valve while the valve is still under pressure.

- Check that the O-ring or gaskets have 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 particles or similar.

Tightening
Tightening torques
See fig. 3 and table 1.

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. Danfoss accepts no responsibility for errors and omissions. Danfoss Industrial Refrigeration reserves the right to make changes to products and specifications without prior notice.

DEUTSCH

Installation

Kältemittel
Anwendbar für alle herkömmlichen, nicht entflammbaren Kältemittel, einschließlich R 717, und nicht korrodierenden Gase/Flüssigkeiten, sofern die Dichtungsmaterialien geeignet sind. Entflammbare Kohlenwasserstoffe werden nicht empfohlen. Das Ventil wird nur für den Einsatz in geschlossenen Kreisläufen empfohlen. Für weitere Informationen wenden Sie sich bitte an Danfoss.

Temperaturbereich
PMFL: –60/+120°C (–76/+248°F)

Druckbereich
PMFL: Die Ventile sind für einen max. Arbeitsdruck von 28 bar (406 psi) ausgelegt.

Technische Daten
PMFL kann in Saug-, Flüssigkeits-, Heißgas- und Flüssigkeits-/Dampfleitungen eingesetzt werden. PMFL regelt den Medienstrom mittels zweistufiger Ein-Aus-Funktion, abhängig vom Steuerimpuls der aufgeschraubten Pilotventile.

Konstruktion
Siehe Abb. 2

1.	Ventilkörper
1a.	Kanal im Ventilkörper 1
10.	Ventilspindel
12.	Ventilplatte
23.	Hauptfeder
24.	Servokolben
24a.	Kanal im Servokolben 24
28.	Zusatzfeder
30.	Bodendeckel
36.	Ablassschraube
40.	Verschluss
40a. b. c.	Kanäle im Gehäuse 40
44.	Manometeranschluss
60.	Manuelle Einstellspindel
73.	Pilotanschluss
100A.	Blindstopfen

Installation
Flanschsätze für PMFL werden separat geliefert. Das Ventil muss mit dem Pfeil in Durchflussrichtung und dem Kopf nach oben installiert werden (Abb. 1). Der Ventilkopf lässt sich gegenüber dem Ventilgehäuse um 4 × 90° drehen. Das Ventil ist mit einer Spindel zum manuellen Öffnen ausgestattet. Kommt ein externes Pilotventil zum Einsatz, muss die Pilotleitung mit der Oberseite der Hauptleitung verbunden sein, um das Eindringen von in der Anlage befindlichem Schmutz und Öl in die Pilotleitung zu verhindern.
Das PMFL-Ventil kann vom SV-Schwimmerventil, wie in Abb. 7 dargestellt, geregelt werden. Bitte die Richtlinien in der SV-Anleitung beachten.

Das Ventil ist für sehr hohe Innendrücke dimensioniert. Jedoch ist bei der Auslegung des Rohrsystems darauf zu achten, dass Kältemitteleinschlüsse vermieden werden, und dass das Risiko von durch thermische Expansion verursachtem hydraulischem Druck herabgesetzt wird. Es ist sicherzustellen, dass das Ventil gegen Druckschwingungen in der Anlage, wie "Flüssigkeitsschläge", geschützt ist.

Anschweißenden
Werden Anschweißenden benutzt, dürfen nur mit dem Flanschwerkstoff verträgliche Materialien und Schweißmethoden angewandt werden. Die Flansche müssen nach Abschluss der Schweißarbeiten und vor dem Einsetzen des Ventils innen von Schweißabfällen gereinigt werden.

Das Ventilgehäuse und die Flansche sind nach der Installation frei von Belastungen (externen Kräften) zu sein.

PMFL-Ventile dürfen nicht in Anlagen eingebaut werden, in denen die Ausgangsseite des Ventils zur Atmosphäre offen ist. Die Ausgangsseite des Ventils muss immer an die Anlage angeschlossen oder korrekt verschlossen sein, beispielsweise mit einem aufgeschweißten Enddeckel.

Farben und Kennzeichnung
Die PMFL-Ventile werden im Werk zinkchromatiert. Ist zusätzlicher Korrosionsschutz erforderlich, empfiehlt sich ein Anstrich der Ventile.

Die genaue Identifikation des Ventils kann dem Typenschild am Ventilkopf entnommen werden. Die Außenoberfläche des Ventilgehäuses muss mit einer passenden Schutzschicht nach Installation und Zusammenbau gegen Korrosion geschützt werden.

Beim Anstreichen ist das Typenschild zum Schutz abzudecken.

Instandhaltung

Service
PMFL-Ventile sind einfach auseinander zu nehmen, und die meisten Teile sind austauschbar. Nach Entfernen der Bodenabdeckung lässt sich der Schmutzfänger zum Reinigen herausnehmen. Das Ventil nicht öffnen, solange es unter Druck steht.

- Kontrollieren, dass der O-Ring oder die Dichtungen nicht beschädigt sind.
- Kontrollieren, dass die Spindel frei von Riefen und Schlagkerben ist.
- Ist der Teflonring beschädigt, muss er ausgetauscht werden.

Zusammenbau
Vor dem Zusammenbau das Gehäuse sorgfältig von Schmutz reinigen. Kontrollieren, dass keiner der Kanäle durch Partikel etc. blockiert wird.

Festspannen
Anzugsmomente
Siehe Abb. 3 und Tabelle 1.

Zum Austausch nur Originalteile von Danfoss, einschließlich Stopfbuchsen, O-Ringe und Dichtungen, benutzen. Die Werkstoffe von Neuteilen sind für das betreffende Kältemittel zertifiziert.

Im Zweifelsfall bitte mit Danfoss Kontakt aufnehmen. Danfoss lehnt jede Verantwortung für Fehler und Auslassungen ab. Danfoss Industrial Refrigeration behält sich das Recht zu Produkt- und Spezifikationsänderungen ohne vorherige Ankündigung vor.

FRANÇAIS

Installation

Fluides frigorigènes
Utilisable avec tous les fluides frigorigènes ininflammables courants (y compris le R 717) et tous les fluides non-corrosifs adaptés aux matériaux d'étanchéité. L'utilisation des hydrocarbures inflammables est déconseillée. L'utilisation de la vanne est uniquement conseillée dans les circuits fermés. Si vous souhaitez en savoir davantage, veuillez contacter Danfoss.

Plage de température
PMFL: –60/+120°C (–76/+248°F)

Plage de pression
PMFL : La vanne est conçue pour fonctionner à une pression de service maximale de 28 bars g (406 psi g).

Caractéristiques techniques
La vanne PMFL peut être utilisée dans les conduites d'aspiration, de liquide, de gaz chauds et de fluides à l'état liquide ou gazeux. Elle permet de régler le débit du fluide par fonction marche-arrêt à deux étapes, selon les impulsions de commande envoyées par les vannes pilotes vissées.

Conception
Se reporter à la figure 2

1.	Corps de vanne
1a.	Canal situé dans le corps de vanne 1
10.	Tige de vanne
12.	Plaque de vanne
23.	Ressort principal
24.	Servopiston
24a.	Canal situé dans le servopiston 24
28.	Ressort complémentaire
30.	Couvercle inférieur
36.	Bouchon d'évacuation
40.	Couvercle
40a. b. c.	Canaux situés dans le couvercle 40
44.	Prise manométrique
60.	Tige d'ouverture manuelle
73.	Raccord pilote
100A.	Bouchon obturateur

Installation
Le jeu de brides de la vanne PMFL est fourni séparément. La vanne doit être installée en faisant correspondre l'orientation indiquée sur le corps de la vanne avec le sens d'écoulement et en dirigeant le couvercle supérieur vers le haut (figure 1). Il est possible de faire pivoter le couvercle supérieur de 4 × 90° par rapport au corps de la vanne. La vanne est équipée d'une tige destinée à l'ouverture manuelle.
Lorsqu'une vanne pilote externe est utilisée, la conduite pilote doit être raccordée au côté supérieur de la conduite principale, afin d'éviter tout passage d'impuretés ou d'huile de l'installation dans la conduite pilote.

La vanne PMFL peut être commandée par la vanne à flotteur SV comme indiqué sur la figure 7. Veuillez vous reporter aux directives concernant la vanne SV.

La vanne est conçue pour résister à des pressions internes élevées. Cependant, il est souhaitable que la conception du réseau de canalisations empêche la stagnation du liquide et réduise ainsi le risque de pression hydraulique engendré par expansion thermique. Il convient de vérifier que la vanne est protégée des phénomènes de pression transitoires, tels que les coups de bélier, dans le système.

Soudage
En cas d'utilisation de brides soudées, seuls les matériaux et les méthodes de soudage compatibles avec le matériau des brides sont autorisés. Avant la mise en place de la vanne, nettoyer intérieurement les brides et enlever les restes de soudure en fin de soudage.

Ne soumettre le corps et les brides de la vanne à aucune tension (charges externes) après l'installation.

La vanne PMFL ne doit jamais être montée dans les systèmes où le côté sortie de la vanne est ouvert à l'air atmosphérique. Le côté sortie de la vanne doit toujours être raccordé au système ou correctement fermé, par exemple à l'aide d'une plaque d'extrémité soudée.

Couleurs et identification
La vanne PMFL est traitée en usine au chromate de zinc. Lorsqu'une protection supplémentaire contre la corrosion est exigée, la vanne peut être peinte.

L'identification précise de la vanne se fait à l'aide de la plaque d'identification située sur le couvercle supérieur. La surface externe du corps de la vanne doit être protégée contre la corrosion à l'aide d'une application adéquate réalisée après l'installation et le montage.

Il est conseillé de couvrir la plaque d'identification lors de la remise en peinture de la vanne.

Entretien

Entretien
La vanne PMFL est aisément démontable et la plupart de ses pièces sont interchangeables. Lorsque le couvercle inférieur est enlevé, il est possible de sortir la crépine pour la nettoyer. Ne pas ouvrir la vanne lorsqu'elle est encore sous pression.

- Vérifier que le joint torique ou les joints d'étanchéité n'ont pas été endommagés.
- Vérifier que la tige est exempte d'éraflures et de marques d'impact.
- Si la bague en téflon a été endommagée, la remplacer.

Montage
Enlever toute trace d'impuretés du corps de la vanne avant le montage. Vérifier qu'aucun canal de la vanne n'est bloqué par des impuretés ou d'aucune autre manière.

Serrage
Couples de serrage
Se reporter à la figure 3 et au tableau 1.

Utiliser uniquement des composants Danfoss d'origine, en particulier pour tout remplacement du presse-étoupe ou des joints toriques et d'étanchéité. Les matériaux des nouveaux composants sont homologués pour le fluide frigorigène utilisé.

En cas de doute, veuillez prendre contact avec Danfoss. Danfoss n'assume aucune responsabilité quant aux erreurs ou omissions éventuelles. Danfoss Industrial Refrigeration se réserve le droit d'apporter sans préavis toutes modifications à ses produits et à leurs spécifications.

ITALIANO

Installazione

Refrigeranti
Applicabile a tutti i refrigeranti comuni non infiammabili, compreso l'R717 e i gas/liquidi non corrosivi, in base alla compatibilità con il materiale delle tenute. Gli idrocarburi infiammabili sono sconsigliati. La valvola è consigliata unicamente per l'uso in circuiti chiusi. Per ulteriori informazioni contattare Danfoss.

Campo di temperatura
PMFL: –60/+120°C (–76/+248°F)

Campo di pressione
PMFL: le valvole sono progettate per una pressione massima d'esercizio di 28 bar g (406 psi g).

Dati tecnici
La valvola PMFL può essere utilizzata su linee di aspirazione, liquido, gas caldo e linee miste vapore/liquido.
La valvola PMFL regola il flusso del mezzo grazie ad una funzione on/off in due fasi, che dipende dall'impulso di controllo proveniente dalle valvole pilota avvitate.

Design
Vedere fig. 2

1.	Corpo della valvola
1a.	Canale nel corpo della valvola 1
10.	Perno della valvola
12.	Disco valvola
23.	Molla principale
24.	Servo-pistone
24a.	Canale nel servo-pistone 24
28.	Molla supplementare
30.	Coperchio inferiore
36.	Tappo di drenaggio
40.	Coperchio
40a. b. c.	Canali nel coperchio 40
44.	Connessione per manometro
60.	Perno per regolazione manuale
73.	Connessione pilota
100A.	Tappo di chiusura

Installazione
Il set di flange per la valvola PMFL viene consegnato separatamente. La valvola deve essere installata con la freccia in direzione del flusso e il coperchio superiore verso

l'alto (fig. 1). Il coperchio superiore può essere ruotato di 90° rispetto al corpo della valvola.

La valvola è dotata di un perno per l'apertura manuale. Quando viene utilizzata una valvola pilota esterna, la linea pilota deve essere collegata alla parte superiore della linea principale. In tal modo la sporcizia e l'olio dell'impianto non penetreranno nella linea pilota.

La valvola PMFL può essere controllata mediante una valvola galleggiante SV, come indicato nella fig. 7. Consultare le istruzioni per l'uso della valvola SV.

La valvola è progettata per resistere ad un'elevata pressione interna. Tuttavia, il sistema di condutture dovrebbe essere progettato in modo da evitare trappole di liquido e ridurre il rischio di pressione idraulica causata dall'espansione termica. Si deve verificare che la valvola sia protetta da pressioni transitorie, come colpi di liquido all'interno del sistema.

Saldatura
Se si utilizzano flangie a saldare, si potranno utilizzare solamente materiali e metodi di saldatura compatibili con il materiale della flangia. Le flangie devono essere pulite internamente per rimuovere residui di saldatura prima dell'inserimento della valvola.

La sede della valvola e delle flangie non deve essere sottoposto a pressioni (carichi esterni) dopo l'installazione.

Le valvole PMFL non devono essere montate in sistemi in cui il lato di scarico della valvola sia aperto all'atmosfera. Il lato di scarico della valvola deve essere sempre collegato al sistema o chiuso adeguatamente, ad esempio con una piastra terminale saldata su di essa.

Colori ed identificazione
Le valvole PMFL vengono zinco-cromate in fabbrica. Se si richiede un'ulteriore protezione contro la corrosione, le valvole possono essere verniciate.

Un'identificazione precisa della valvola è possibile grazie alla targhetta situata sul coperchio superiore. La superficie esterna della valvola deve essere protetta contro la corrosione mediante un rivestimento protettivo adatto applicato dopo l'installazione e l'assemblaggio.

Si consiglia la protezione della targhetta di identificazione durante la riverniciatura della valvola.

Servizio di manutenzione

Le valvole PMFL sono facili da smontare e la maggior parte delle loro parti sono sostituibili.

Non aprire la valvola mentre questa si trova ancora sotto pressione.

- Controllare che gli O-ring o le guarnizioni non siano stati danneggiati.
- Controllare che il perno non presenti graffi o segni dovuti ad urti.
- Se l'anello in Teflon ha subito danni, le parti devono essere sostituite.

Assemblaggio
Eliminare tutta la sporcizia dal corpo della valvola prima di procedere all'assemblaggio. Controllare che tutti i canali all'interno della valvola non siano ostruiti da particelle o elementi simili.

Serraggio
Coppie di serraggio
Vedere la fig. 3 e la tabella 1.

Utilizzare solamente ricambi originali Danfoss, comprese le guarnizioni di tenuta, gli O-ring e le guarnizioni di ricambio. I materiali delle nuove parti sono certificate per il refrigerante corrispondente.
In caso di dubbio, contattare Danfoss.

Danfoss non si ritiene responsabile di errori ed omissioni. Danfoss Industrial Refrigeration si riserva il diritto di effettuare modifiche ai prodotti e alle caratteristiche tecniche degli stessi senza alcun preavviso.

DECLARATION OF CONFORMITY
The Pressure Equipment Directive 97/23/EC

Name and Address of Manufacturer within the European Community
Danfoss Industrial Refrigeration A/S
Stormosevej 10
PO Box 60
DK-8361 Hasselager
Denmark

Declaration
We hereby declare that below-mentioned equipment are classified for Fluid Group I (all refrigerants (toxic, non-toxic, flammable and non-flammable)), and that all are covered by Article 3, paragraph 3.

For further details / restrictions – see Installation Instruction

Description of Pressure Equipment
Refrigerant main regulating valves
Type **PM, PMC, PMFH, PMFL, MRV, MEV**

Nominal bore **DN ≤ 25 mm.** (1 in)

References of other Technical Standards and Specifications used

prEN 12284	DIN 3158
EN 1563	AD-Merkblätter

Authorised Person for the Manufacturer within the European Community

Name: Morten Steen Hansen **Title:** Production Manager

Signature: Morten Steen Hansen **Date:** 14/08/2002

148B9715 - rev. 1

DECLARATION OF CONFORMITY
The Pressure Equipment Directive 97/23/EC

Name and Address of Manufacturer within the European Community
Danfoss Industrial Refrigeration A/S
Stormosevej 10
PO Box 60
DK-8361 Hasselager
Denmark

Description of Pressure Equipment
Refrigerant main regulating valves
Type PM, PML, PMLX, PMFH, PMFL, MRV, MEV

Nominal bore	**DN 32-150 mm** ($1^1/_4$ - 6 in.)	
Classified for	**Fluid Group I** (all refrigerants (toxic, nontoxic, flammable and nonflammable)). For further details / restrictions – see Installation Instruction.	
Temperature range	All	–60°C (-76°F) to 120°C (248°F)
Maximum allowable working pressure		**28 bar** (406 psi)

Conformity and Assessment Procedure Followed

Category	II	III
Module	**D1**	**B1 + D**
Certificate ID	*D1: 07 202 0511 Z 0009/1/H-0002*	*B1: 07 202 0511 Z 0074/1/H-0001* *D: 07 202 0511 Z 0009/1/H-0001*
Nominal bore	DN 32-125 mm ($1^1/_4$ - 5 in)	DN 150 mm (6 in)

Name and Address of the Notified Body which carried out the Inspection
TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

CE
(0045)

Name and Address of the Notified Body monitoring the Manufacturer's Quality Assurance System
TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

References of Harmonised Standards used

References of other Technical Standards and Specifications used
prEN 12284 DIN 3158
EN 1563 AD-Merkblätter

Authorised Person for the Manufacturer within the European Community

Name: Morten Steen Hansen **Title:** Production Manager

Signature: Morten Steen Hansen **Date:** 14/08/2002

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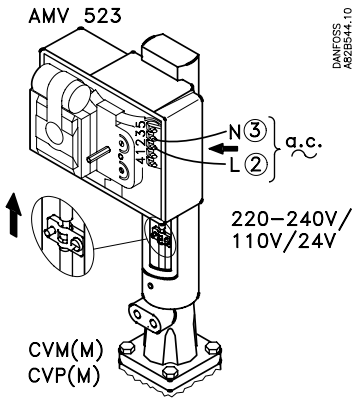
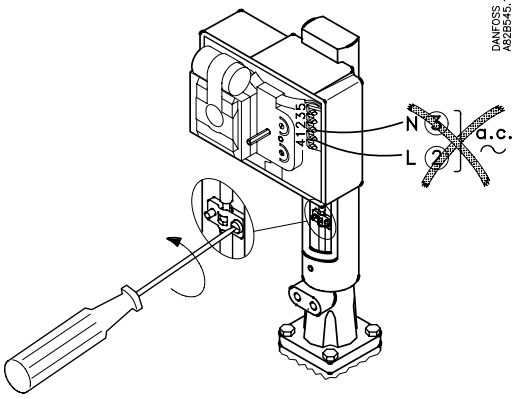
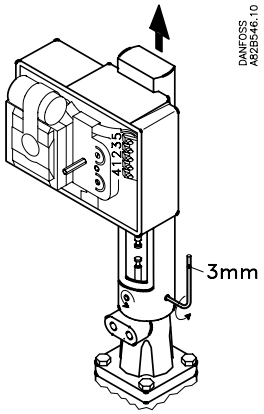
INSTRUCTIONS

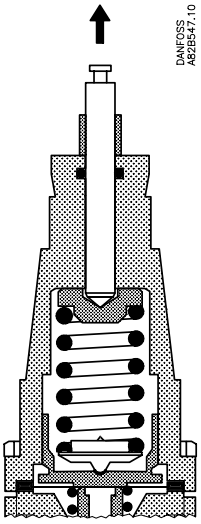
Spare parts 027B2059
for CVMM and CVPM

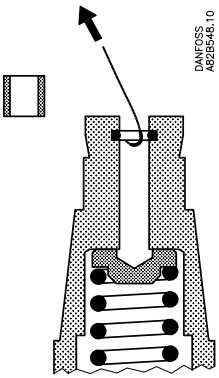
027R9504

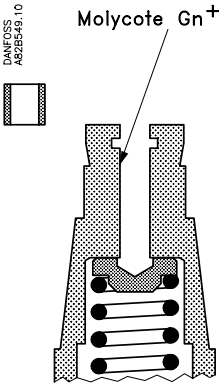


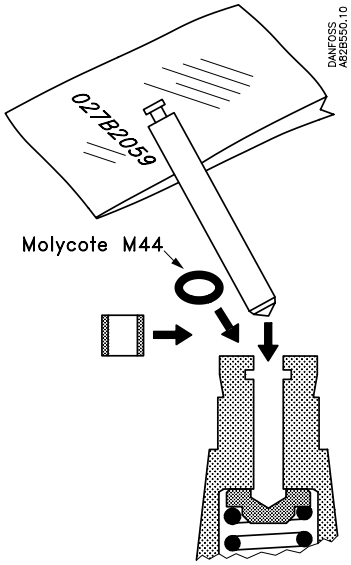


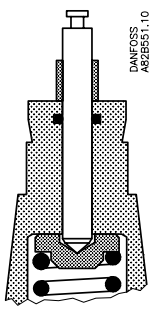


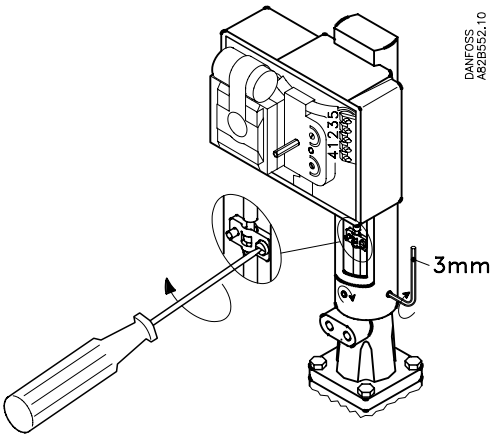






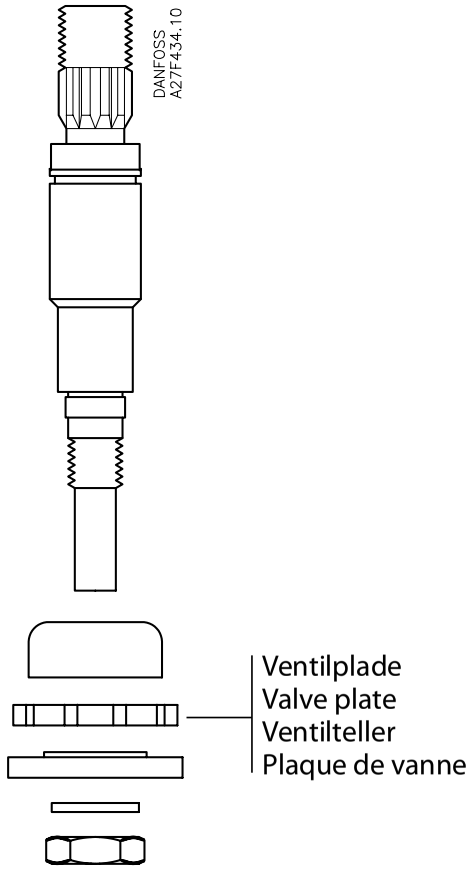






Instructions
Valve plate for
PM, PML, PMFL/H

027R9501



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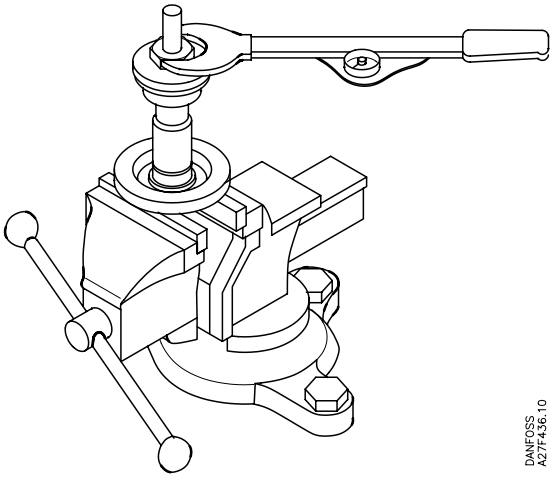
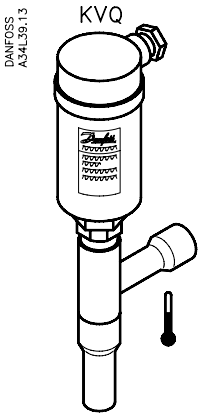


Ventilplade Valve plate Ventilteller Plaque de vanne	Ventil type Valve type Ventil Typ Type de vanne	Tilspændingsmoment Thightening torque Anzugsmoment Couple de serrage
Code no.		Nm
027F0683	PM 5-25, PMC 5-20 PMFL 200, PMFH 200	35 ±5
027F0684	PM 32 PMFL 300, PMFH 300	55 ±5 35 ±5
027F0685	PM 40, PML 32 PMFH 500	55 ±5 50 ±5
027F0686	PM 50 PML 40	60 ±5 55 ±5
027F0687	PM 65, PML 50	60 ±5
027F0688	PML 65	65 ±5
027F0689	PMFL 80 - 1, 2, 3	17 ±2
027F0690	PMFL 80 - 4, 5, 6 7 PMFH 80 - 2, 4, 5, 6, 7	17 ±2
027F0691	PMFL 125, PMFH 125	35 ±5

Instructions

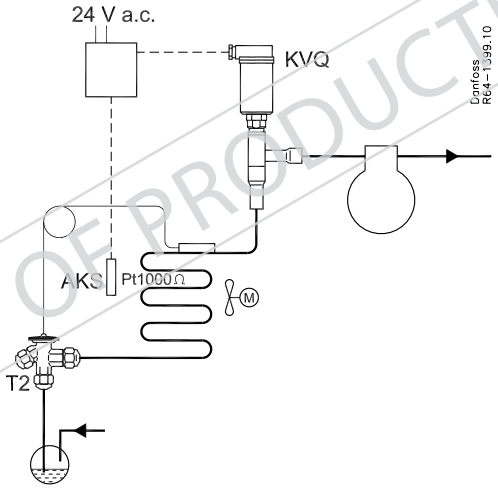
KVQ

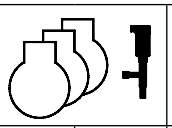
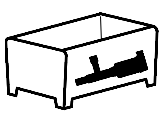
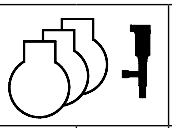
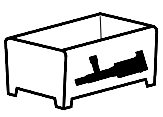
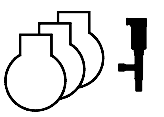
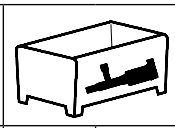
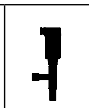
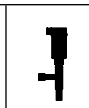
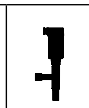
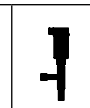
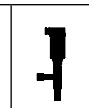
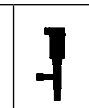
KVQ 15
KVQ 22
KVQ 28
KVQ 35

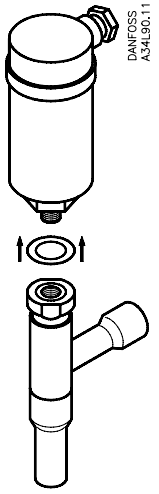


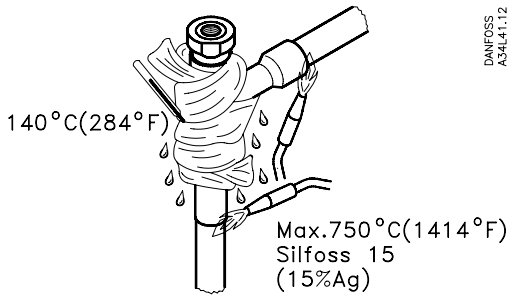
Max. 40°C (104°F)
Min. -45°C (-49°F)

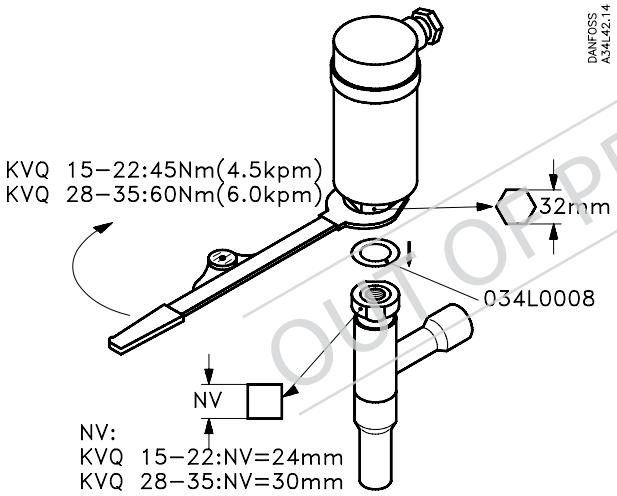
$t_{max.}$ (R134a, R22, R404A) = 35°C (95°F)
$t_{min.}$ (R134a, R22, R404A) = -45°C (-49°F)

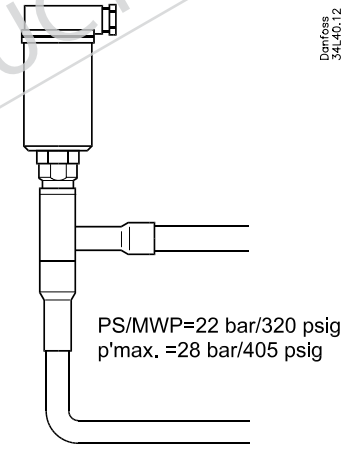


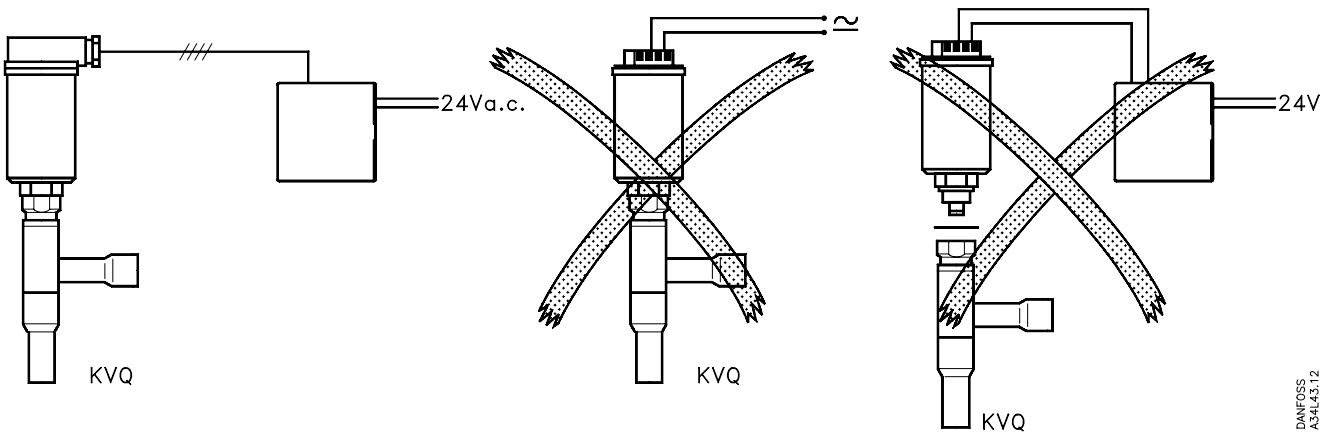
Afrimningssystem Defrosting system Abtausystem Systéme de dégivrage	Elafrimning/Stille afrimning Electr. defrost/Off-cycle defrost El-Abtauung/Stille Abtauung Dégivrage électrique			Varmgasafrimning Hot gas defrost Heissgasabtauung Dégivrage par gaz chaud				
Omgivelsestemp. for KVQ Ambient temp. for KVQ Umgebungstemp. für KVQ Temp. ambiante du KVQ	± °C			+ °C			- °C	
Placeringssted for KVQ KVQ location Plazierung des KVQ Position du KVQ								
Orientering af KVQ KVQ orientation Einbau des KVQ Orientation du KVQ												











RC-ET

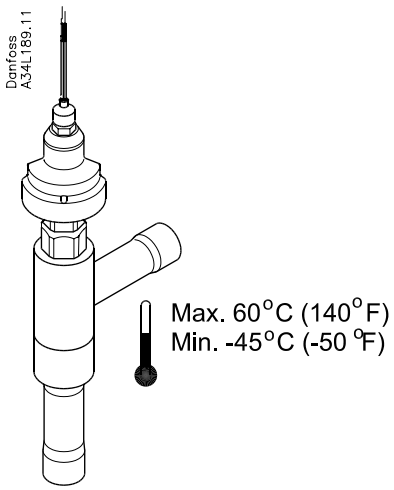
Instructions

KVS

034R9509

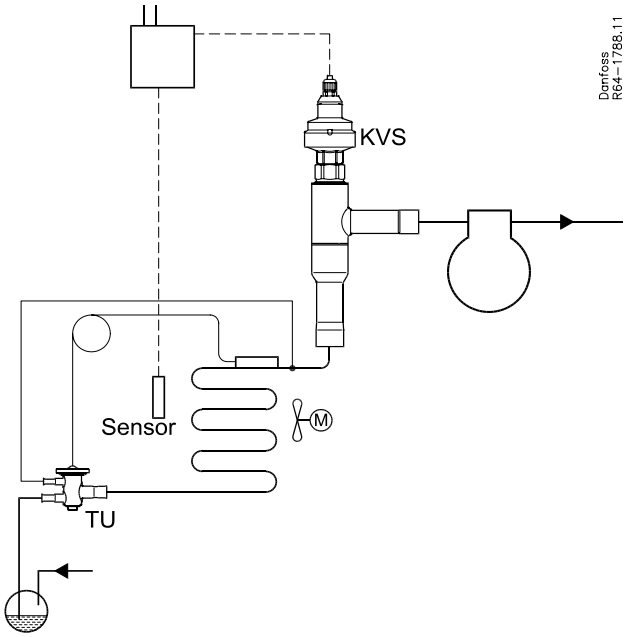
Tilladt omgivelsestemperatur
Allowable ambient temperature
Zulässige Umgebungstemperatur
Température ambiante admissible
Temperatura ambiente permisible

KVS 15
KVS 22
KVS 28
KVS 35

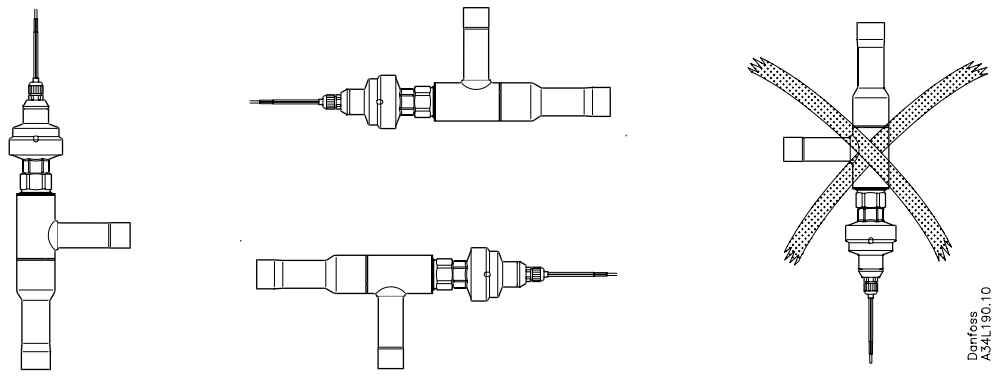


034R9509

Anvendelse
Application
Anwendung
Application
Aplicación

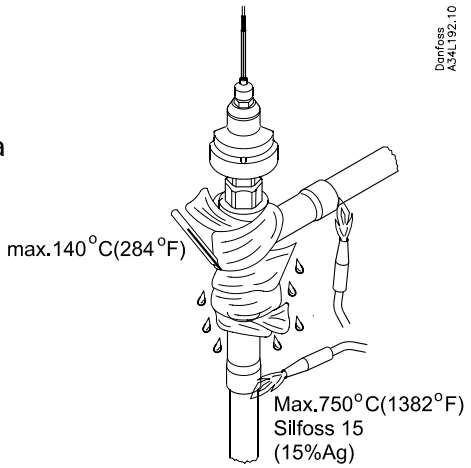


Montage
Mounting
Einbau
Montage
Installación

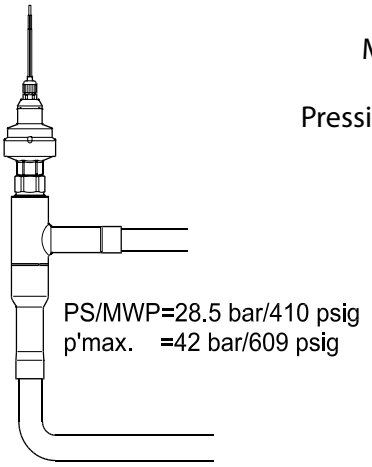


 RI4JU653

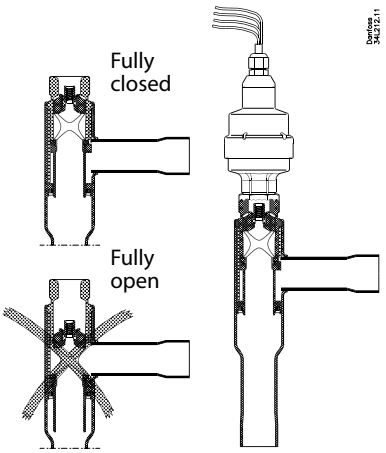
Svejsning
Soldering
Löten
Soudure
Soldadura

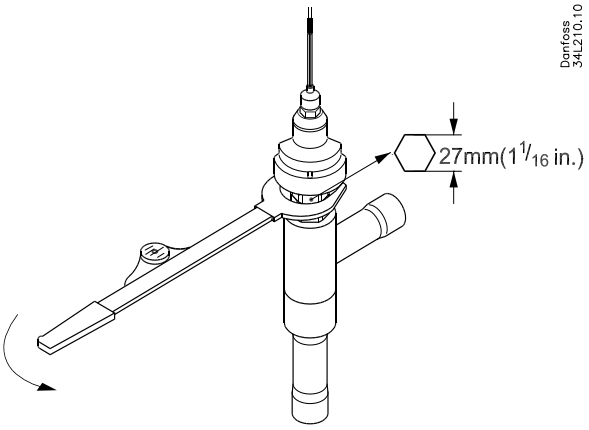


Max. tryk
Max. pressure
Max. Druck
Pression maximale
Presión máx.

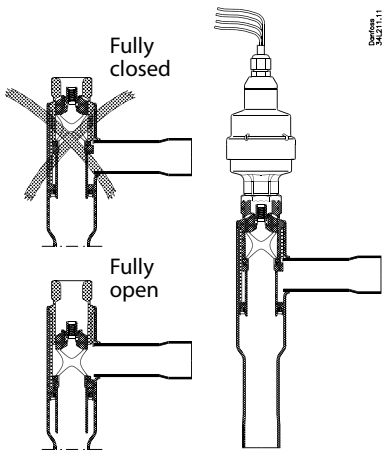


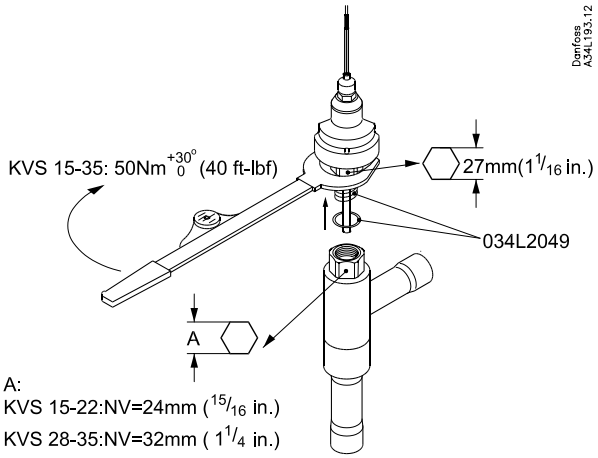
Adskillelse
Disassembling
Zerlegung
Désassemblage
Desmontaje





Samling
Assembling
Zusammenbau
Assemblage
Montaje

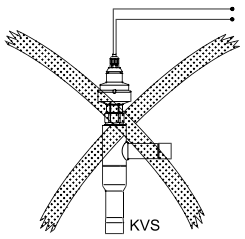




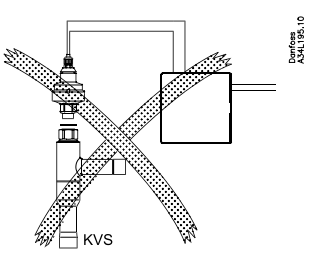
Tilslutning
Connection
Anschluss
Raccordement
Conexión

Stepper Motor Switch Sequence						
	STEP	Coil I		Coil II		
		Red	Green	White	Black	
↓CLOSING↓	1	+	-	+	-	↑OPENING↑
	2	+	-	-	+	
	3	-	+	-	+	
	4	-	+	+	-	
	1	+	-	+	-	

Advarsel!
Warning!
Achtung!
Attention !
Advertencia



Ventilen må ikke tilsluttes direkte.
Do not apply power directly to valve.
Das Ventil darf nicht direkt angeschlossen werden.
Ne pas raccorder l'alimentation électrique directement sur la vanne
No aplicar tensión directamente a la válvula

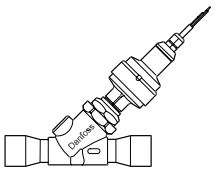


Tilslut aldrig spænding til en usamlet ventil.
Do not apply power to unassembled valve.
Das Ventil darf nur wenn komplett zusammengebaut angeschlossen werden.
Ne pas raccorder l'alimentation électrique sur une vanne non assemblée.
No aplicar tensión a la válvula desmontada.

Electrical data

Parameter	KVS15-22 / 28-35
Stepper motor type	Bi-polar - Permanent Magnet
Step Mode	2 phase full step
Phase Resistance	52Ω ±10%
Phase Inductance	85 mH
Holding Current	Depends on application. Full current allowed (100% duty cycle)
Step Angle	7.5° (motor), 0.9° (lead screw), Gearing ration 8.5:1. $(38/13)^2$:1
Nominal Voltage	(Constant voltage drive) 12 Volt dc –4% +15%, 150 step/sec
Phase Current	(Using chopper drive) 100mA RMS –4% +15%,
Max total Power	Voltage / current drive: 5.5 / 1.3 Watt (UL: NEC class 2)
Step rate	150 steps per sec. (constant voltage drive)0-300 steps per sec. 300 recommended (chopper current drive)
Total steps	KVS15-22: 4100 [+160 / -0] Steps KVS28-35: 5540 [+160 / -0] Steps
Full travel time	KVS15-22: 27 / 13.5 sec. (voltage / current) KVS28-35: 37 / 18.5 sec. (voltage / current)
Reference position	Overdriving against the full close position
Electrical connection	4 wire 0.5 mm^2 (0.02 in^2), 2 meter (6.5 ft) long cable

Instructions
KVS 42 & 54



034R9526

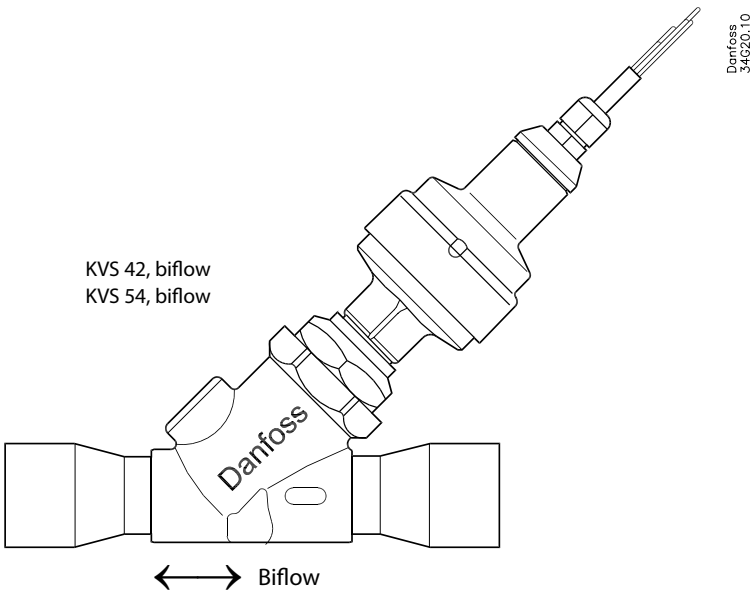
034R9526

Temperature range

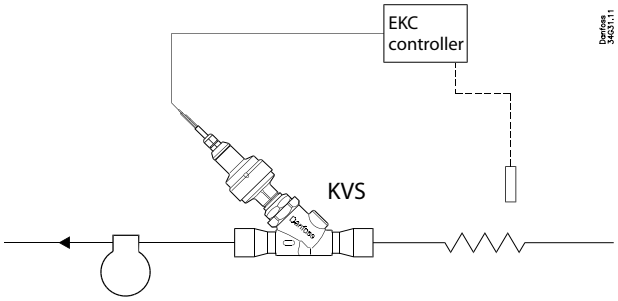
Max. +60°C (140°F)
Min. –40°C (–40°F)

Max. pressure

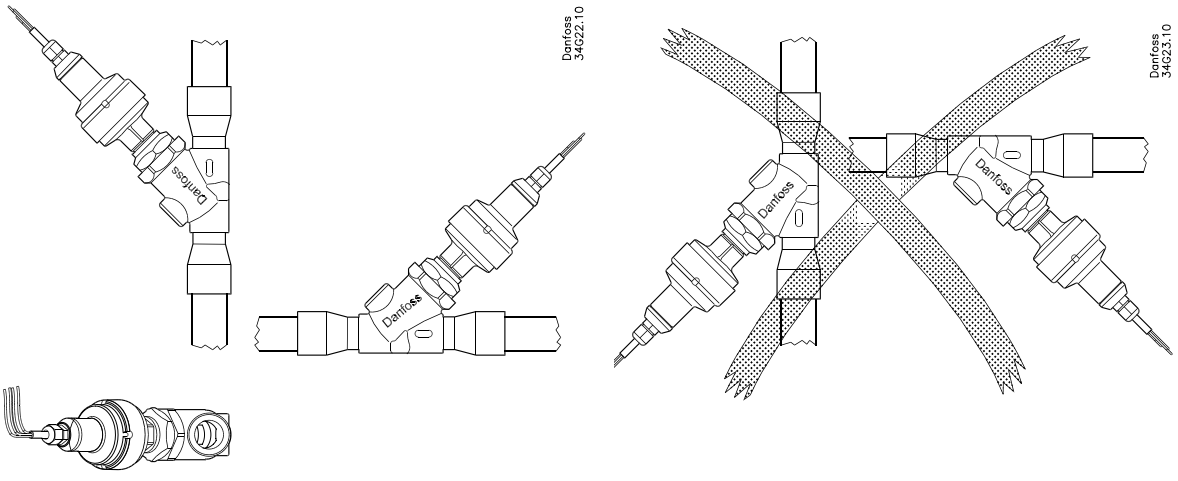
PS/MWP = 34 bar (493 psig)
PT = 49 bar (711 psig)



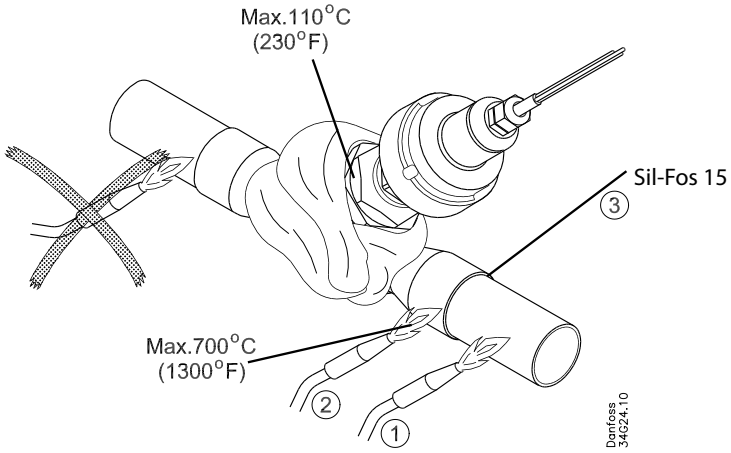
Application



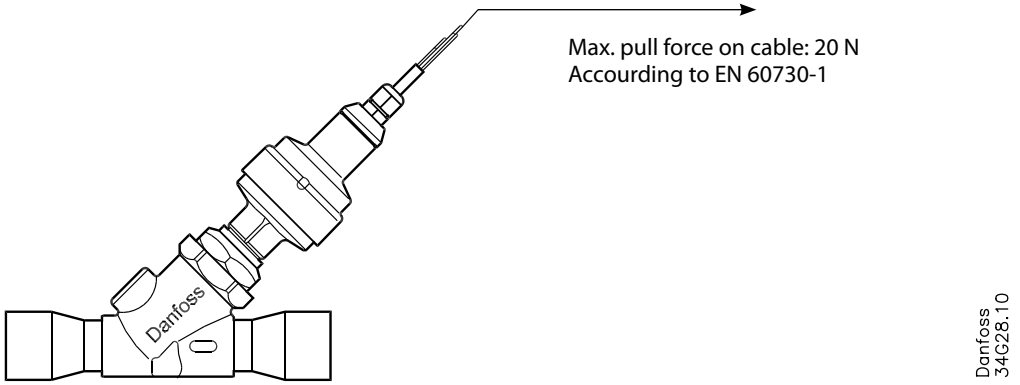
Mounting



Brazing



Electrical connection



Stepper motor switch sequence:

	STEP	Coil I		Coil II		
		Red	Green	White	Black	
↑ CLOSING ↑	1	+	-	+	-	↓ OPENING ↓
	2	+	-	-	+	
	3	-	+	-	+	
	4	-	+	+	-	
	1	+	-	+	-	

Advarsel!
Warning!
Achtung!
Attention !
Advertencia

- Ventilen må ikke tilsluttes direkte.
- Do not apply power directly to valve.
- Das Ventil darf nicht direkt angeschlossen werden.
- Ne pas raccorder l'alimentation électrique directement sur la vanne.
- • No aplicar tensión directamente a la válvula.

- Tilslut aldrig spænding til en usamlet ventil.
- Do not apply power to unassembled valve.
- Das Ventil darf nur wenn komplett zusammengebau angeschlossen werden.
- Ne pas raccorder l'alimentation électrique sur une vanne non assemblée.
- No aplicar tensión a la válvula desmontada.

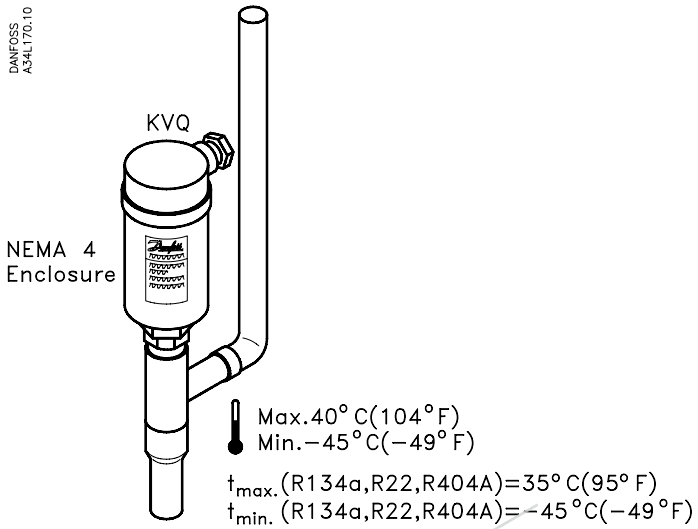
REFRIGERATION AND AIR CONDITIONING

Instructions

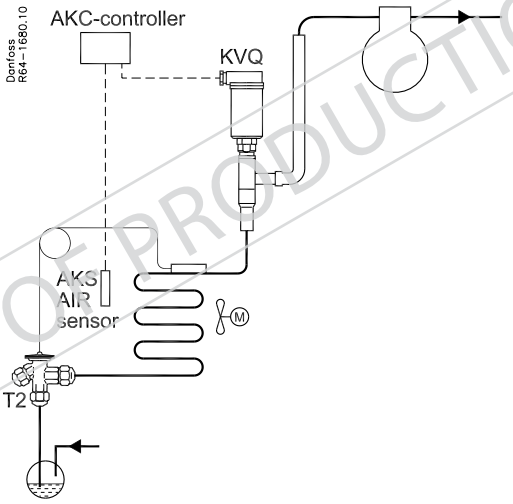
KVQ

Allowable ambient temperature

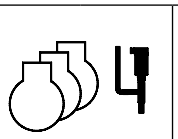
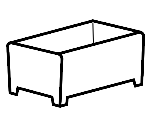
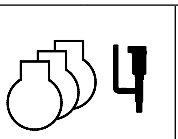
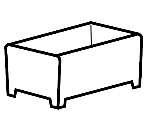
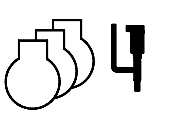
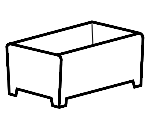
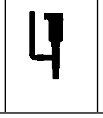
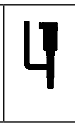
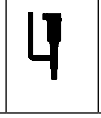
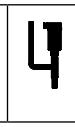
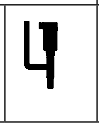
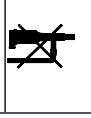
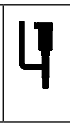
KVQ 15
KVQ 22
KVQ 28
KVQ 35



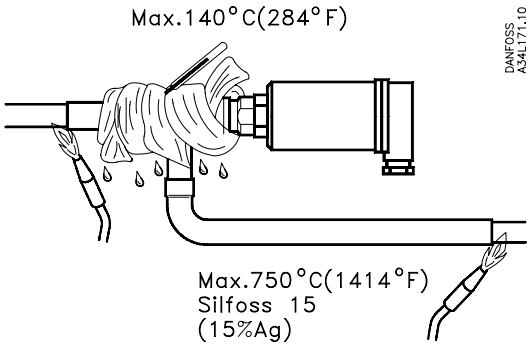
Application



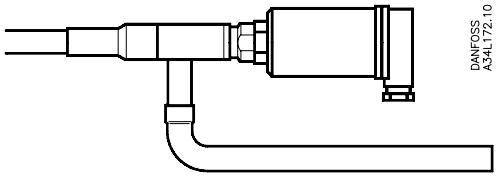
KVQ mounting (horizontal / vertical)

Defrosting system	Electr. defrost/Off-cycle defrost		Hot gas defrost			
Ambient temp. for KVQ	-45°C < t_{amb} < 40°C -49°F < t_{amb} < 104°F		t_{amb} > 0°C t_{amb} > 32°F		t_{amb} < 0°C t_{amb} < 32°F	
KVQ location						
KVQ orientation												

Soldering

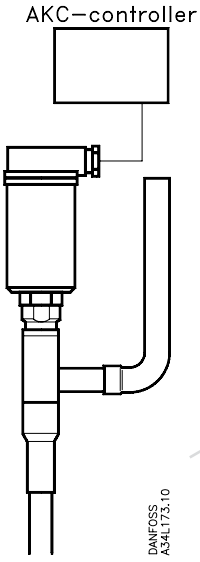


Max. pressure

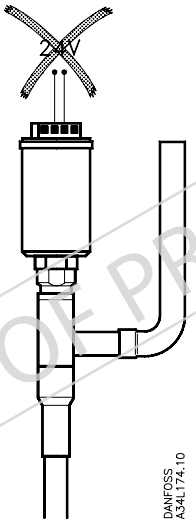


PS/MWP = 22 bar / 320 psig
p'max. = 28 bar / 405 psig

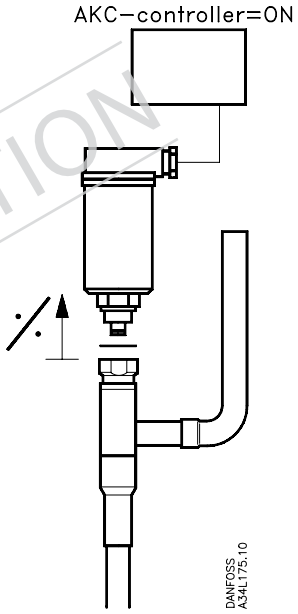
Connection



Warning

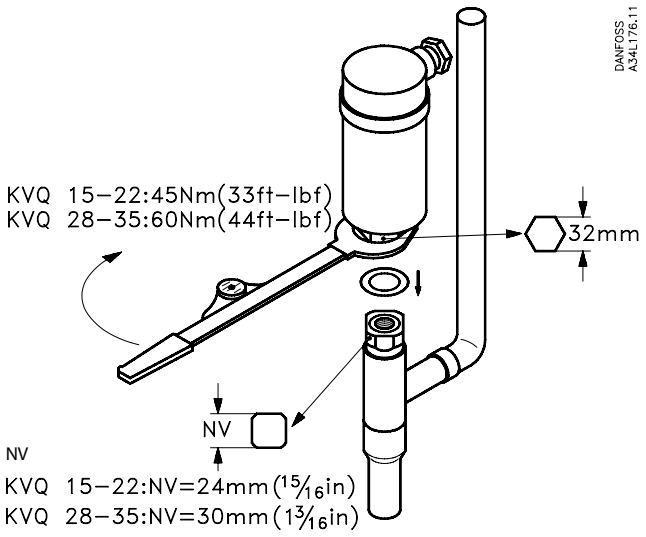


Do not supply 24 V directly to valve



Do not apply power to unassembled valve

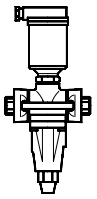
Service



RC-ET

Instructions

CVMQ



027R9503

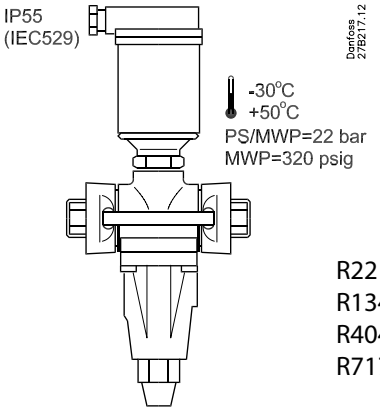


Fig. 1

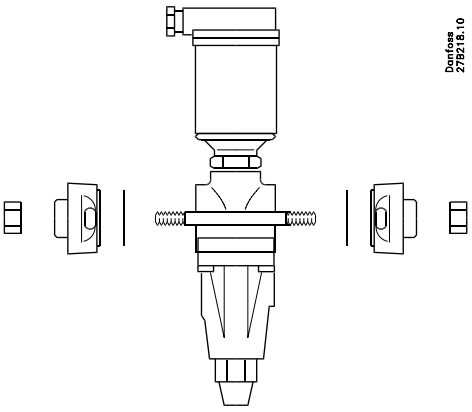


Fig. 2

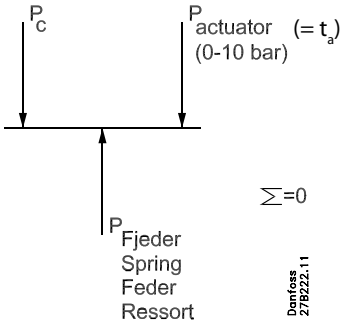


Fig. 3

Fabriksindstilling / Factory setting
Werkseinstellung / Réglage en usine

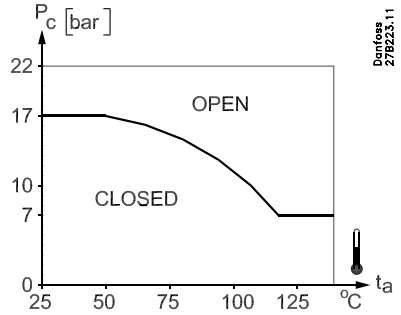
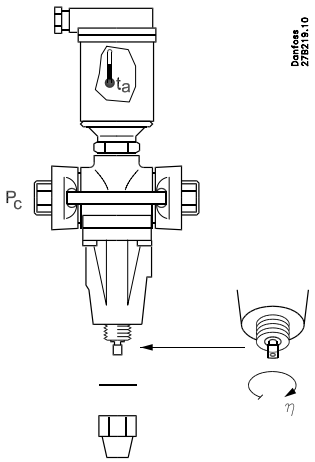


Fig. 4



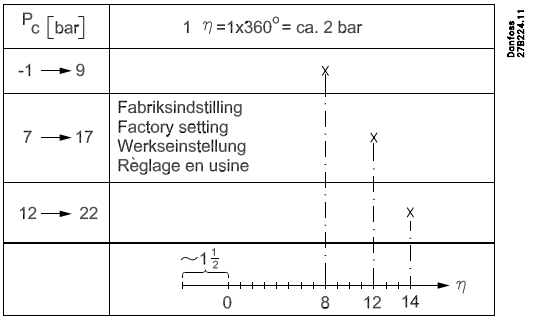


Fig. 5

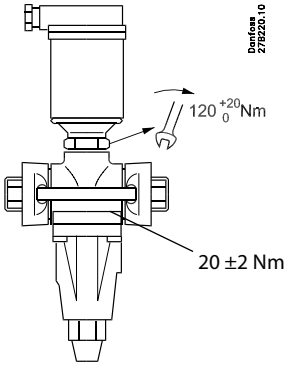


Fig. 6

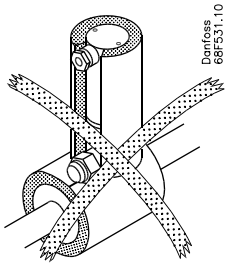


Fig. 7

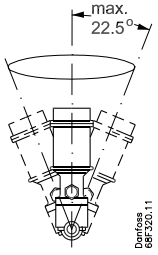


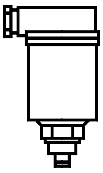
Fig. 8

027R9503

 ~~RI1DH452~~ → DKRCI.PI.VH1.B1.52 / 520H0799

Instructions

CVQ



027R9626

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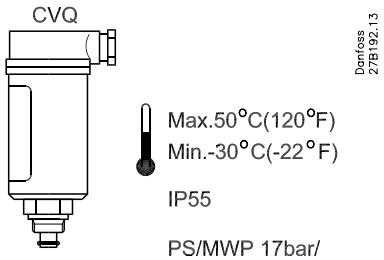


Fig. 1

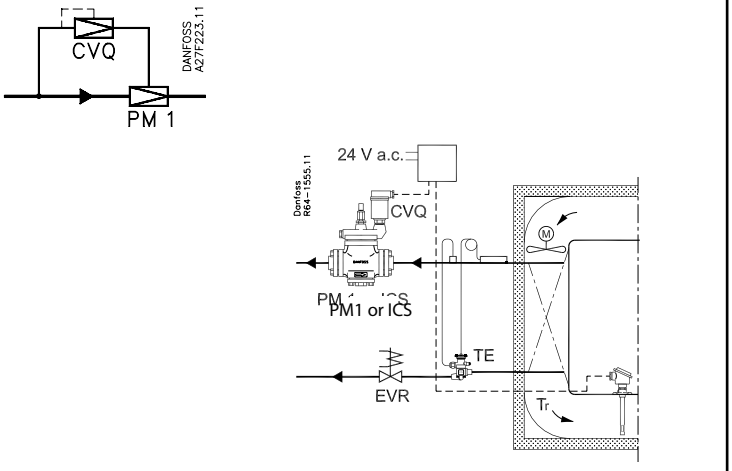


Fig. 2

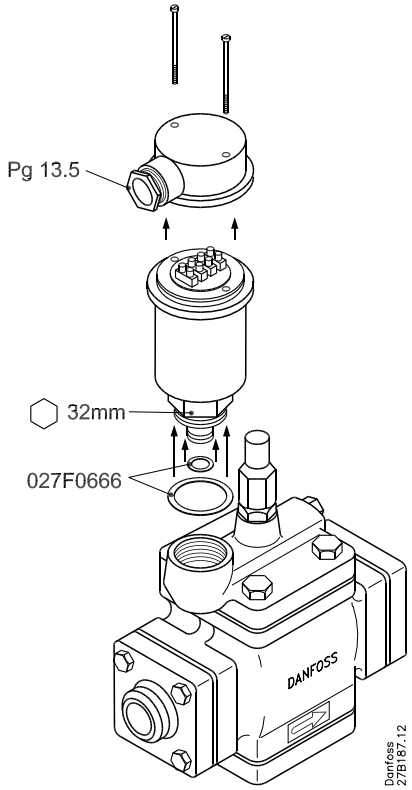


Fig. 3

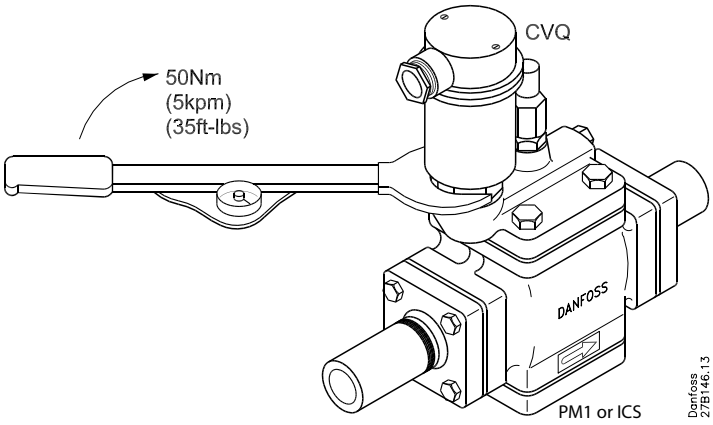


Fig. 4

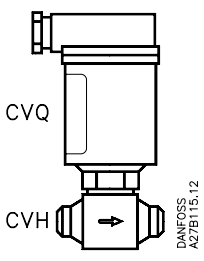


Fig. 5

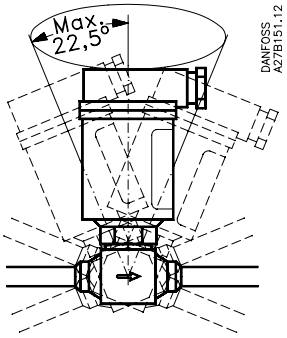


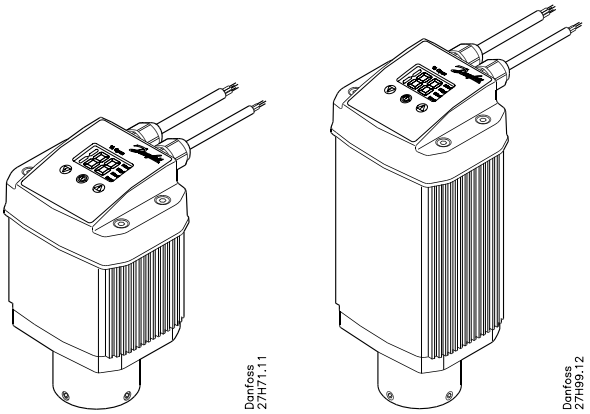
Fig. 6

 ~~RI4JK100~~ → DKRCI.PI.VH1.A1.00 / 520H0798

Instruction

Aktuator / Actuator / Stellmotor / Actuateur / Actuador
ICAD 600 / ICAD 900

027R9778



ICAD 600 *ICAD 900*

Fig. / Abb. 1

ICAD 600
ICAD 900

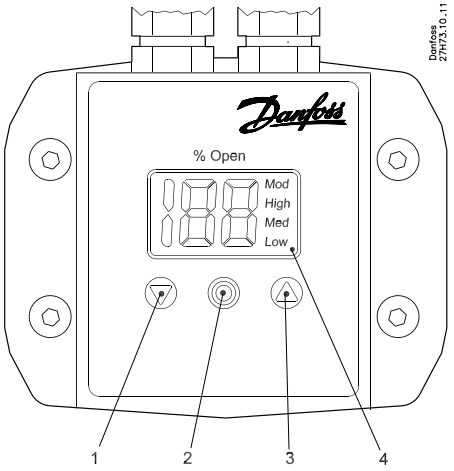
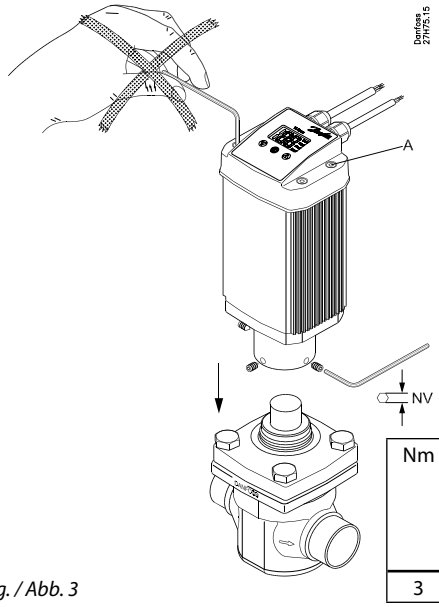


Fig. / Abb. 2



Nm	LB-fod LB-feet lb-ft Pieds-livre pie
3	2.5

Fig. / Abb. 3

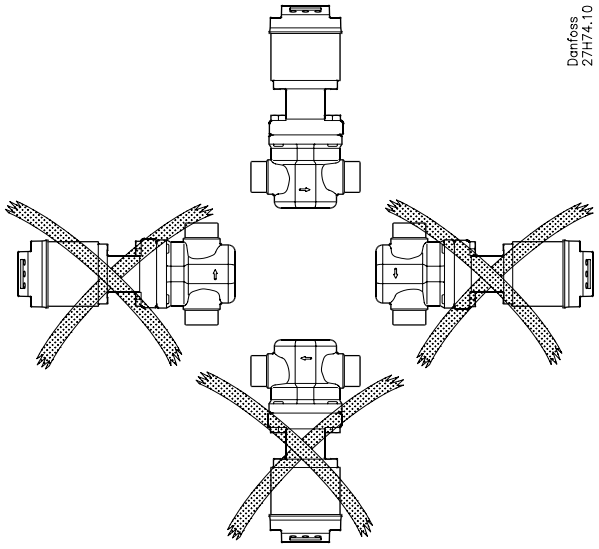


Fig. / Abb. 4

	mm	in. / Zoll / pouces
H	45	1.77
L_3	25	1

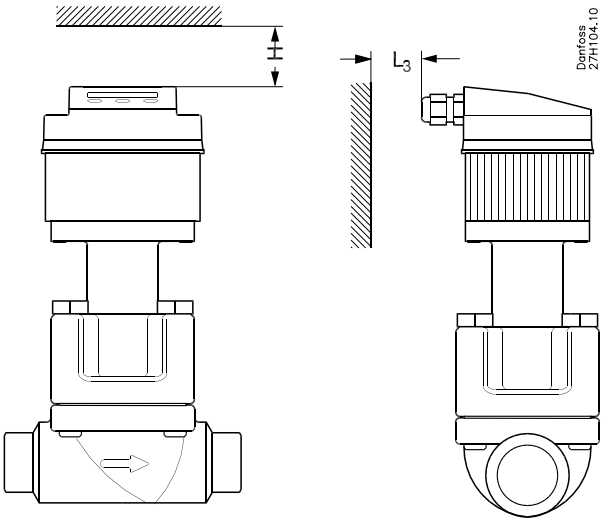


Fig. / Abb. 5a, ICM + ICAD 600

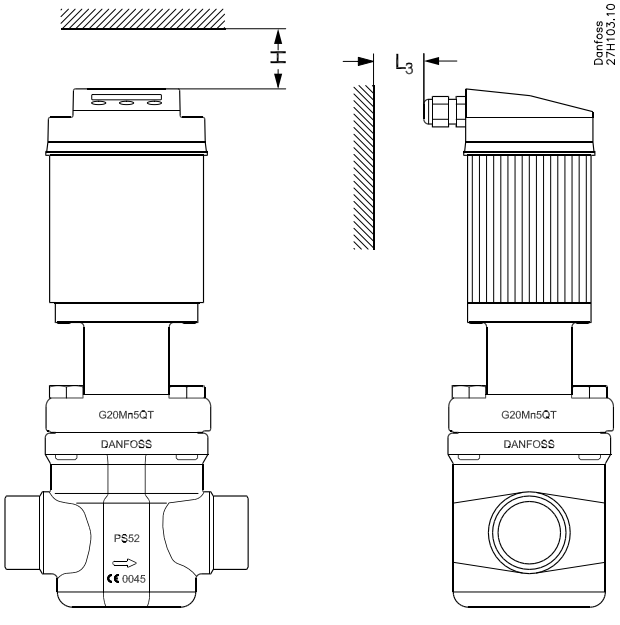
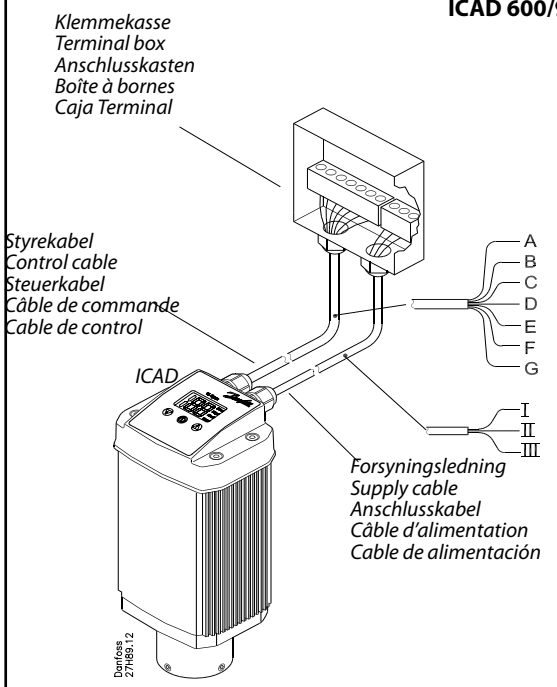


Fig. / Abb. 5b, ICM + ICAD 900

 DKRCI.PI.HV0.A1.53 / 520H0546

ICAD 600/900



Reference Reference Referenz Réf. Referencia	Farve Color Farbe Couleur Color		Beskrivelse Description Beschreibung Description Descripción	
A	Hvid / White / Weiß / Blanc / Blanco	–	Fælles alarm Common Alarm Gemeinsamer Alarm Alarme commune Alarma común	Digital Udgang Digital Ouput Digitalausgang Sortie numérique Salida digital
B	Brun / Brown / Braun / Marron/ Marrón	–	ICM helt åben ICM fully open ICM voll geöffnet ICM complètement ouverte ICM totalmente abierta	Analog Ind-/Udgang Analog In/Output Analogein-/-ausgang E/S analogique Entrada/salida analógica
C	Grøn / Green / Grün / Vert / Verde	–	ICM helt lukket ICM fully closed ICM voll geschlossen ICM complètement fermée ICM totalmente cerrada	
D	Gul / Yellow / Gelb / Jaune/ amarillo	–	Jord GND ground GND Erde Terre Tierra	
E	Grå / Grey / Grau / Gris/ Gris	+	0/4 - 20 mA Indgang 0/4 - 20 mA Input 0/4 - 20-mA-Eingang Entrée 0/4 - 20 mA Entrada 0/4 - 20 mA	
F	Lyserød / Pink / Rosa / Rose/ Rosa	+	0/2 - 10 V Indgang 0/2 - 10 V Input 0/2-10-V-Eingang Entrée 0/2 -10 V Entrada 0/2 - 10V	
G	Blå / Blue / Blau / Bleu / Azul	+	0/4 - 20 mA Udgang 0/4 - 20 mA Output 0/4-20-mA-Ausgang Sortie 0/4 - 20 mA Salida 0/4 - 20 mA	
I	Hvid / White / Weiß / Blanc/ Blanco	+	Nødstrømsforsyning Batteri / UPS* 19 V d.c. Fail safe supply Battery / UPS* 19 V d.c. Störungssichere Versorgung Batterie / USV* 19 VDC Alimentation à sécurité intégrée. Batterie/UPS* 19 V c.c. Alimentación de seguridad Bateria / UPS* 19V c.c	
II	Brun / Brown / Braun / Marron/ Marrón	+	Forsyningsspænding 24 V d.c. Supply voltage 24 V d.c. Versorgungsspannung 24 V DC Tension d'alimentation 24 V c.c. Tensión 24 V c.c	
III	Grøn / Green / Grün / Vert/Verde	–		

* Nødstrømsforsyning / Uninterruptible Power Supply / Unterbrechungsfreie Stromversorgung / Système d'alimentation sans coupure / Fuente de alimentación ininterrumpida

Fig. / Abb. 6

ICAD 600/900 - Analog I/O (indgang/udgang) for modulerende betjening
ICAD 600/900 - Analog I/O for modulating control
ICAD 600/900 - Analoge E/A für modulierenden Betrieb
ICAD 600/900 - E/S analogique pour commande modulante
ICAD 600/900 - E/S analógicas para control modulante

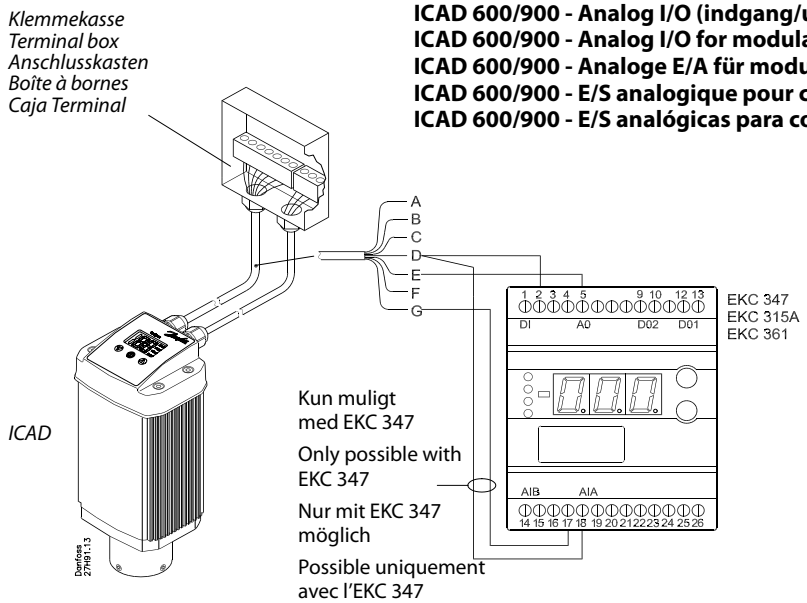
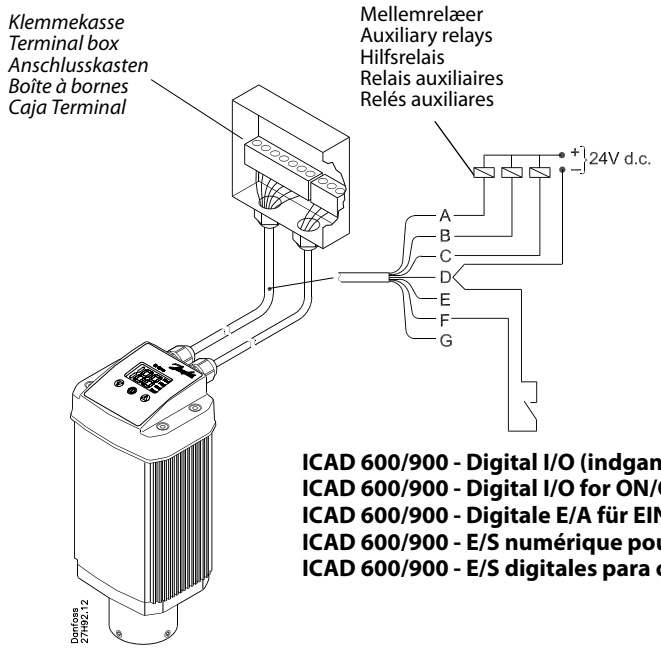


Fig. / Abb. 7



ICAD

ICAD 600/900 - Digital I/O (indgang/udgang) for ON/OFF-ventildrift
ICAD 600/900 - Digital I/O for ON/OFF valve operation
ICAD 600/900 - Digitale E/A für EIN/AUS-Betrieb eines Ventils
ICAD 600/900 - E/S numérique pour marche/arrêt de la vanne
ICAD 600/900 - E/S digitales para control todo/nada

Fig. / Abb. 8

ENGLISH

Installation

ICAD must not be installed before welding.
This apply for electrical as well as for mechanical.

Use
ICAD 600 and ICAD 900 can be used together with the following Danfoss valves (fig. 1, 5a and 5b).

ICAD 600	ICAD 900
ICM 20	ICM 40
ICM 25	ICM 50
ICM 32	ICM 65

Electrical data
Supply voltage is galvanically isolated from in-/output.

Supply voltage
24 V d.c., +10% / -15%
Load ICAD 600: 1.2 A
ICAD 900: 2.0 A

Fail safe supply
Min. 19 V d.c.
Load ICAD 600: 1.2 A
ICAD 900: 2.0 A

Anolog input - Current or Voltage
Current
0/4 - 20 mA
Load: 200 Ω
Voltage
0/2 - 10 V d.c.
Load: 10 kΩ

Analog output
0/4 - 20 mA
Load: ≤ 250 Ω

Digital input - Digital ON/OFF input by means of voltfree contact (Signal/Telecom relays with gold-plated contacts recommended)
– Voltage input used
ON: contact impedance < 50 Ω)
OFF: contact impedance > 100 kΩ

Digital output - 3 pcs. NPN transistor output
External supply: 5 - 24 V d.c. (same supply as for ICAD can be used, but please note that the galvanically isolated system will then be spoiled).
Output load: 50 Ω
Load: Max. 50 mA

Temperature range (ambient)
–30°C/+50°C (–22°F/122°F)

Enclosure
IP 65 (~NEMA 4)

Cable connection
Two 1.8 m. (70.7 in.) cables premounted
Supply cable
3 x 0.25 mm² (3 x ~24 AWG) (fig. 6)
I: White (+) 19 - 24 V d.c. fail safe supply (optional).
II: Brown (+) 24 V d.c.
III: Green (–) 24 V d.c.

Control cable
7 x 0.25 mm² (7 x ~24 AWG) (fig. 7)
A: White (–) Digital output. Common Alarm.
B: Brown (–) Digital output. ICM fully open.
C: Green (–) Digital output. ICM fully closed.
D: Yellow (–) GND - Ground.
E: Grey (+) Analog input 0/4-20 mA.
F: Pink (+) Analog input 0/2-10 V / Digital ON/OFF input.
G: Blue (+) Analog output 0/4-20 mA.

Electrical installation
General procedure for ICAD 600/900 installed on all ICM valves.

All necessary electrical connections to be made. Analog or digital operation of ICM valve.

Fig. 6

- *Analog operation* - 7 wired cable (A-G) Modulation control. ICM valve to be controlled from Danfoss electronics, type EKC (fig. 7), or third party electronics (like e.g. PLC).
  – Connect analog input signals. Currrent (mA) or Voltage (V). See **Parameter list** for configuration of analog input signals.
  – Grey (+) and Yellow (GND) are used for current (mA) input.
  or
  – Pink (+) and Yellow (GND) are used for Voltage (V) input.
  – Blue (+) and Yellow (GND) are used for current (mA) output (optional, not mandatory).

Fig. 6

- *Digital operation* - 7 wired cable (A-G) ON/OFF ICM solenoid valve operation. ICM valve to be controlled by means of a digital voltfree contact.
  – Connect digital input signals (fig. 8). See **Parameter list** for configuration of digital input signals.
  – Pink (+) and Yellow (GND) are connected to a voltfree contact.

  Digital output signals are optional, not mandatory.
  – White (–) and Yellow (GND) are connected to auxiliary relay for Common Alarm.
  – Brown (–) and Yellow (GND) are connected to an auxiliary relay indicating ICM fully open.
  – Green (–) and Yellow (GND) are connected to an auxiliary relay indicating ICM fully closed.
- *Supply voltage* - 3 wired cable (I, II, III) ICAD must be connected to a normal 24 V d.c. supply. As an option, a fail safe supply is possible by means of a battery or UPS (Uninterruptible Power Supply). When voltage is applied as described below, ICAD is ready to be configurated. See **Parameter list**.
  ICAD configuration can be done independently whether the ICAD is installed on the ICM valve or not.
  See **Mechanical installation**.
  – Connect the Brown (+) and Green (–) to a 24 V d.c. supply voltage (fig. 6).

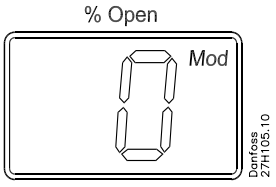
  Fail safe supply as an option (not mandatory).
  – Connect the White (+) and Green (–) to a fail safe supply.

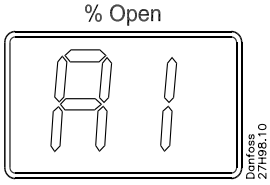
Mechanical installation
General procedure for ICAD 600/900 installed on all ICM valves (fig. 3).

- Check that the three socket set screws are fully unscrewed counter clockwise with a 2.5 mm Hexagon key.
- Mount ICAD by slowly lowering it on top of the ICM valve.
- The magnet coupling will drag the ICM and ICAD together and in position.
- Push ICAD in place.
- Fasten ICM and ICAD with the three socket set screws using a 2.5 mm Hexagon key.

Special moisture seal is damaged if screws are removed (fig. 3, pos. A)

Startup
When voltage is applied for the first time the display on the ICAD (fig. 2) will alternate between showing: Actual opening degree and **A1**.





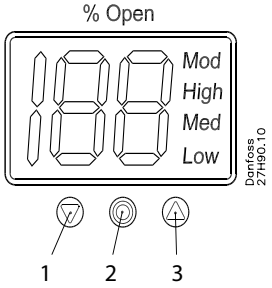
A1 indicates an alarm which corresponds to: No ICM valve selected. See **Alarms** for further information.

Please observe that when the correct ICM valve is entered in parameter **¡26** (see p. 8 for **Parameter list**) an automatic calibration is carried out. I.e it is not necessary to carry out another calibration in parameter **¡05**.

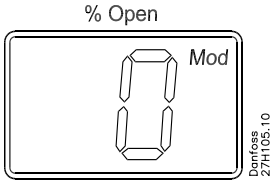
See Parameter list to select the correct.

It is important to select and verify correct valve.

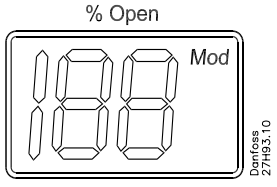
General Operation
ICAD is equipped with an MMI (Man Machine Interface) from which it is possible to see and change different parameters to adapt the ICAD and the corresponding ICM to the actual refrigeration application. The operation of parameters is done by means of the integrated ICAD MMI (fig. 2) and consists of:



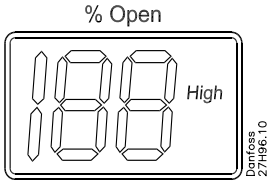
- Down arrow push button (fig. 2, pos. 1) decreases parameter number by 1 for each activation
- Enter push button (fig. 2, pos. 2)
  - Gives access to the **Parameter list** by keeping the push button activated for 2 seconds. A **Parameter list** is shown below (parameter **¡08**):



  - Gives access to change a value once the **Parameter list** has been accessed.
  - Acknowledge and save change of value of a parameter.
  - To exit from the **Parameter list** and return to the display of Opening Degree (OD) keep the push button activated for 2 seconds.
- Up arrow push button (fig. 2, pos. 3)
  - Increases parameter number by 1 for each activation
- Display (fig. 2, pos. 4)
  - Normally the Opening Degree (OD) 0 - 100 % of the ICM valve is displayed. No activation of push buttons for 20 seconds means that the display will always show OD. Like below:



  - Displays the parameter
  - Displays the actual value of a parameter.
- Displays the status by means of text (fig. 2, pos. 4)
  - ***Mod*** represents that ICAD is positioning the ICM valve according to an analog input signal (Current or Voltage).
  - ***Low*** represents that ICAD is operating the ICM valve like an ON/OFF solenoid valve with low speed according to a digital input signal.
  - ***Med*** represents that ICAD is operating the ICM valve like an ON/OFF solenoid valve with medium speed according to a digital input signal.
  - ***High*** represents that ICAD is operating the ICM valve like an ON/OFF solenoid valve with high speed according to a digital input signal. Like below:



Alarms
ICAD can handle and display different alarms.

Description	ICM alarm text	Comments
No valve type selected	**A1**	At start-up **A1** and **CA** will be displayed
Controller fault	**A2**	Internal fault inside electronics
All input error	**A3**	Not active if **¡01** = 2 or **¡02** = 2 When **¡03** = 1 and AI A > 22 mA When **¡03** = 2 and AI A > 22 mA or AI A < 2 mA When **¡03** = 3 and AI A >12 V When **¡03** = 4 and AI A >12 V or AI A < 1 V
Low voltage of fail safe supply	**A4**	If 5 V d.c. < Fail safe supply < 18 V d.c.
Check Supply to ICAD	**A5**	If supply voltage < 18 V d.c.

If an alarm has been detected the display at ICAD (fig. 2) will alternate between showing actual alarm and present Opening Degree.

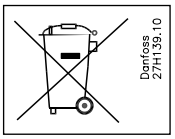
If more than one alarm is active at the same time only the alarm with the highest priority will appear. **A1** has the highest priority, **A5** the lowest.

Any active alarm will activate the Common Digital Alarm output (Normally Open).

All alarms will automatically reset themselves when they physically disappear.

Old alarms (alarms that have been active, but have physically disappeared again) can be found in parameter **¡11**.

Disposal Note



The Product contains electrical components And may not be disposed together with domestic waste.

Equipment must be separate collected with Electrical and Electronic waste. According to Local and currently valid legislation.

Parameter list

Description	Display name	Min.	Max.	Factory setting	Unit	Comments
ICM OD (Opening Degree)	-	0	100	-	%	ICM valve Opening Degree is displayed during normal operation. Running display value (see **¡01**, **¡05**).
Main Switch	**¡01**	1	2	1	-	Internal main switch 1: Normal operation 2: Manual operation. Valve Opening Degree will be flashing. With the down arrow and the up arrow push buttons the OD can be entered manually.
Mode	**¡02**	1	2	1	-	Operation mode 1: Modulating – ICM positioning according to Analog Input (see **¡03**) 2: ON/OFF - operating the ICM valve like an ON/OFF solenoid valve controlled via Digital Input. See also **¡09**.
Analog Input signal	**¡03**	1	4	2	-	Type of Analog Input signal from external controller 1: 0 - 20 mA 2: 4 - 20 mA 3: 0 - 10 V 4: 2 - 10 V
Speed at ON/OFF and Modulating Mode	**¡04**	1	100	100	%	Speed can be decreased. Max. speed is 100 % Not active when **¡01** = 2 If **¡02** = 2 the display will indicate speed in display. **Low**, **Med** and **High** also means ON/OFF operation. If **¡04** < = 33, **Low** is displayed 33 < If **¡04** < = 66, **Med** is displayed If **¡04** > = 67 **High** is displayed
Automatic calibration	**¡05**	0	1	0	-	Not active before **¡26** has been operated. Always auto reset to 0. **CA**" will flash in the display during calibration, if Enter push button has been activated for two seconds.
Analog Output signal	**¡06**	0	2	2	-	Type of A0 signal for ICM valve position 0: No signal 1: 0 - 20 mA 2: 4 - 20 mA
Fail safe	**¡07**	1	4	1	-	Define condition at power cut when fail safe is installed. 1: Close valve 2: Open valve 3: Maintain valve position 4: Go to OD given by **¡12**
Digital Input function	**¡09**	1	2	1		Define function when DI is ON (short circuited DI terminals) when **¡02** = 2 1: Open ICM valve (DI = OFF = > Close ICM valve) 2: Close ICM valve (DI = OFF = > Open ICM valve)
Password	**¡10**	0	199	0	-	Enter number to access password protected parameters: **¡26** Password = **11**
Old Alarms	**¡11**	A1	A99	-	-	Old alarms will be listed with the latest shown first. Alarm list can be reset by means of activating down arrow and up arrow at the same time for 2 seconds.
OD at powercut	**¡12**	0	100	50	-	Only active if **¡07** = 4 If fail safe supply is connected and powercut occurs ICM will go to entered OD.
ICM configuration	**¡26**	0	6	0		**NB:** Password protected. Password = **11** At first start up **A1** will flash in display. Enter valve type 0: No valve selected. Alarm **A1** will become active. 1: ICM20 with ICAD 600 2: ICM25 with ICAD 600 3: ICM32 with ICAD 600 4: ICM40 with ICAD 900 5: ICM50 with ICAD 900 6: ICM65 with ICAD 900

Service

Description	Display name	Min.	Max.	Factory setting	Unit	Comments
OD %	**¡50**	0	100	-	%	ICM valve Opening Degree
AI [mA]	**¡51**	0	20	-	mA	Analog Input signal
AI [V]	**¡52**	0	10	-	V	Analog Input signal
AO [mA]	**¡53**	0	20	-	mA	Analog Output signal
DI	**¡54**	0	1	-	-	Digital Input signal
DO Close	**¡55**	0	1	-	-	Digital Output Closed status. ON when OD < 3 %
DO Open	**¡56**	0	1	-	-	Digital Output Open status. ON when OD > 97 %
DO Alarm	**¡57**	0	1	-	-	Digital Output alarm status. ON when an alarm is detected
MAS mP SW ver.	**¡58**	0	100	-	-	Software version for MASTER Microprocessor
SLA mP SW ver.	**¡59**	0	100	-	-	Software version for SLAVE Microprocessor

Reset to factory setting:

1. Remove the power supply.
2. Activate down arrow and up arrow push buttons at the same time.
3. Connect the power supply.
4. Release down arrow and up arrow push buttons.
5. When the display on ICAD (fig. 2) is alternating between showing: **CA** and **A1** the factory resetting is complete.

Instruction

Heat cartridge kit

ICAD 600 / ICAD 900 for ICM

027R9788

027R9788

	Code no.
Heat cartridge kit ICAD 600 for ICM 20 ICM 25 ICM 32	**027H1209**
Heat cartridge kit ICAD 900 for ICM 40 ICM 50 ICM 65	**027H1219**

The heat cartidge kit contain:
- Heat cartidge
- Heat cartidge holder
- Heat conduction compound

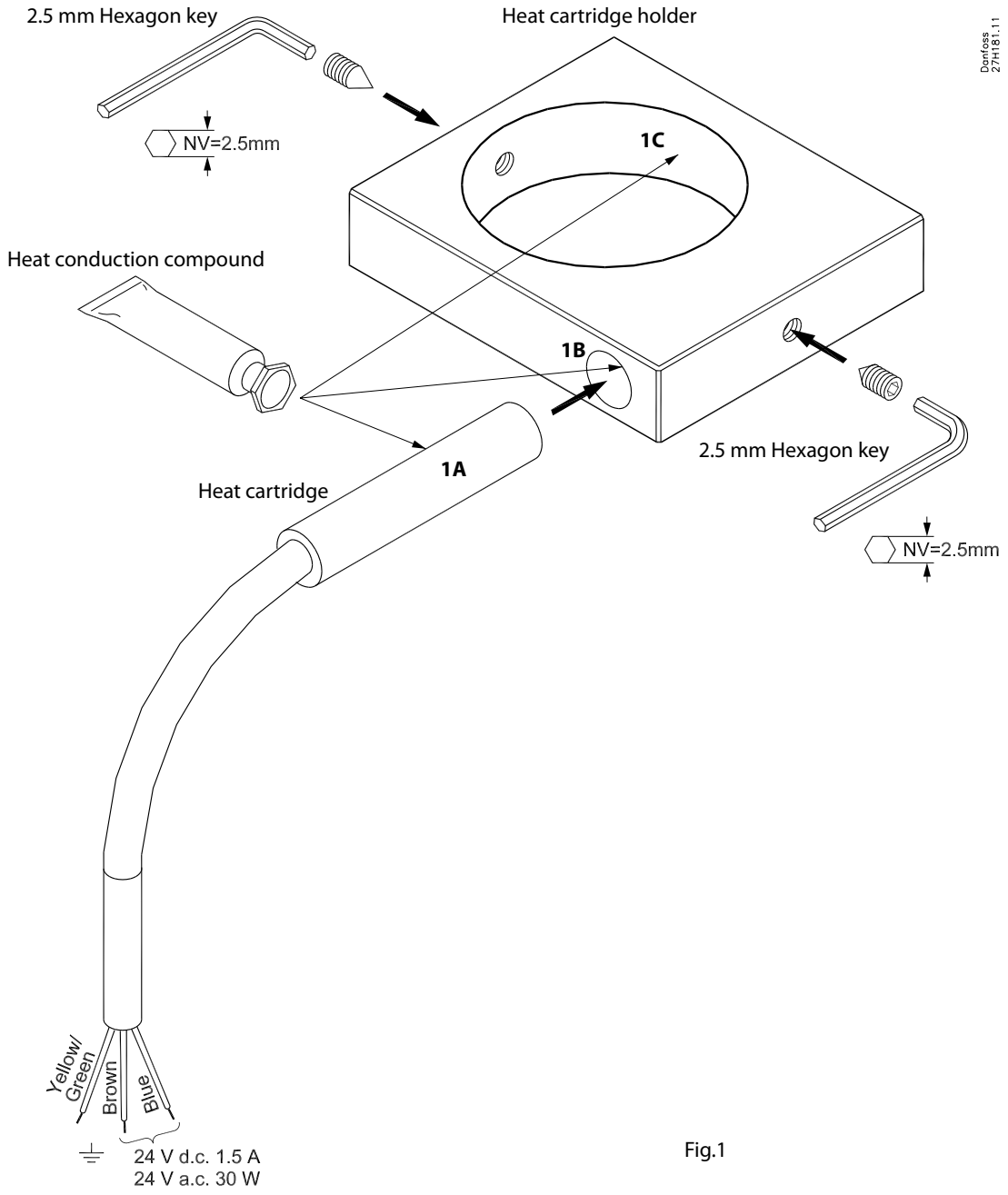


Fig.1

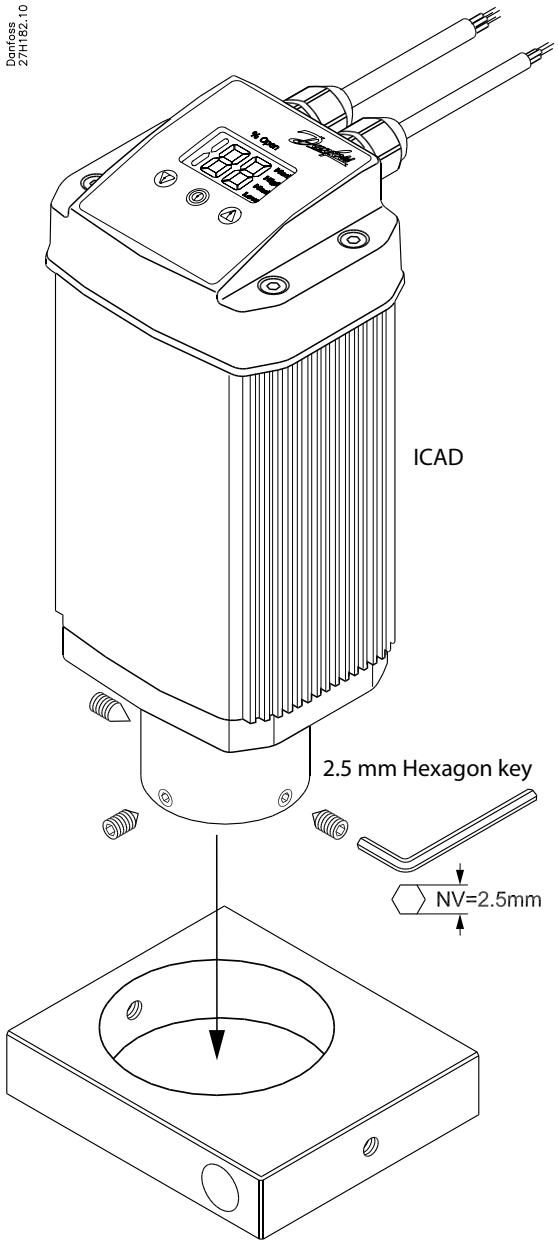


Fig. 2

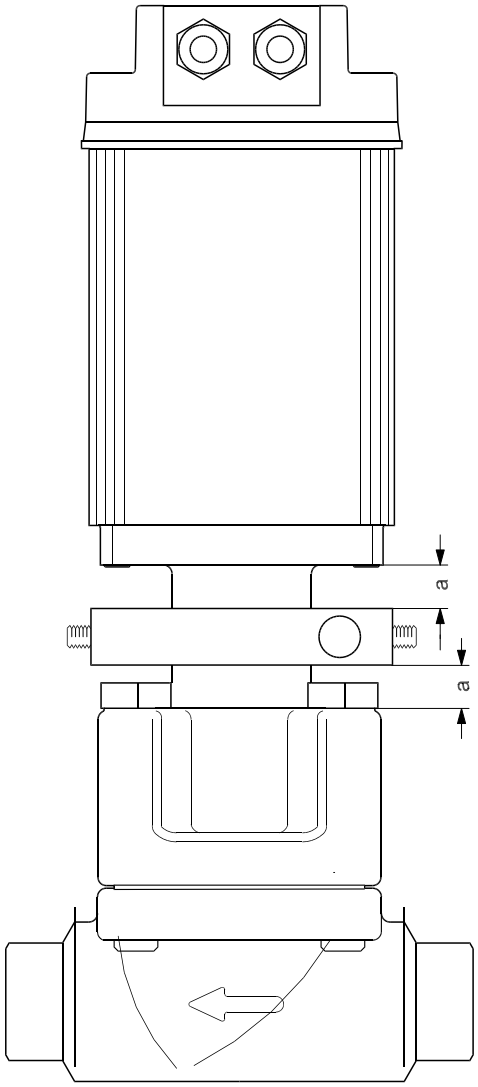


Fig. 3

Technical data

The Heat cartridge kit ICAD 600 / ICAD 900 is recommended to be installed on ICM in the following applications:
When media temperatur through ICM valve is lower than – 30°C (-22°F)
When ICM is installed outdoor and media temperatur through ICM valve is lower than – 10°C (14°F)
When ICM is installed indoor, with relative humidity higher than 90%, and media temperature though ICM valve is lower than - 10°C (14°F)

Voltage
24 V d.c
24 V a.c

Load
1.5 A
30 W

Cable
The heat cartridge is delivered with 1 m (39 in.) cable.
3 x 0,5 mm^2 (3x ~20 AWG)

Brown and Blue : 24 V d.c (polarity unimportant), 24 V a.c
Yellow/Green : Ground/Earth

Installation

Mechanical installation

General procedure for installation of heat cartridge kit ICAD 600 / ICAD 900 for all sizes of ICM valves.

Please observe that heat cartridge kit ICAD 600 / ICAD 900 must be installed before ICAD 600/900 are mounted on the ICM valves

- Check that the three socket set screws on ICAD are fully unscrewed counter clockwise and removed with a 2.5 mm Hexagon key. See Fig.2

- Check that the two socket set screws on heat cartridge holder are fully unscrewed counter clockwise with a 2.5 mm Hexagon key. See Fig.1

- Apply heat conductive compound to

    - the heat cartridge (marked 1A on fig. 1)

    - into the both ends of the holes for heat cartridge, on the heat cartridge holder. (marked 1B on fig. 1)

    - on the inner surface of the heat cartridge holder (marked 1C on fig. 1)

- Insert the heat cartridge into the hole of the the heat cartridge holder. Please observe to install it in to the rigth end ,as shown in fig. 1

- Fasten the heat cartridge with the socket set screw using a 2.5 mm Hexagon key.

- Insert the ICAD into the hole the heat cartridge holder. (fig. 2)

- Install the heat cartridge holder on the ICAD. Position the heat cartridge holder in a center position as shown on fig. 3

- Fasten the heat cartridge holder the socket set screw using a 2.5 mm Hexagon key.

- Reinstall the three socket set screws on ICAD.

- Please ICAD instruction PIHV0A352 on how to mount ICAD on ICM

Electrical installation

Please observe. Never connect supply voltage before the heat cartridge is insertted into the hole of the the heat cartridge holder.

Connect 24 V d.c/a.c

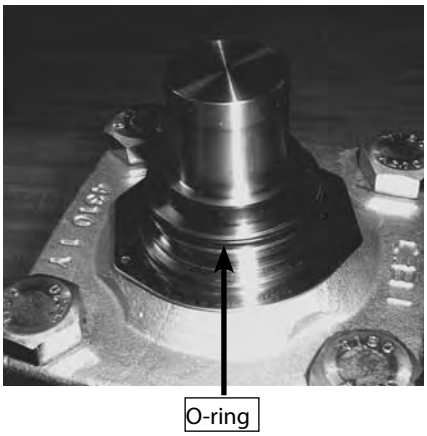
Instructions

How to apply
Molycote G 4500 grease
for ICM motorized valves

027R9787

027R9787

Remove the O-ring on the ICM adapter with your fingers. Do not use any tool because it could damage the O-ring.



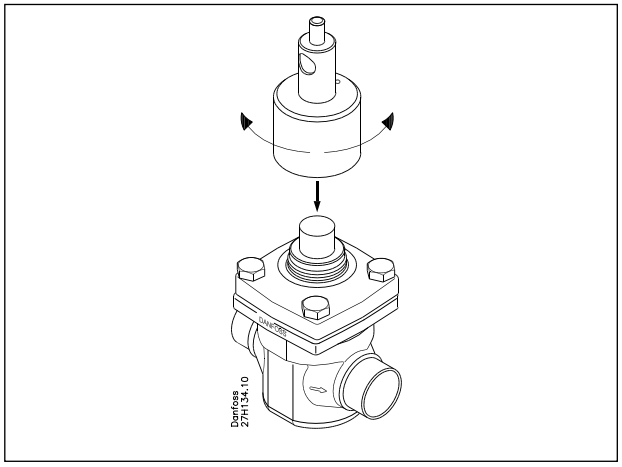
For ICM in service
If there is any ice or moisture present, it must be removed prior to applying the grease. The ice can be melted with an electric heater or hair dryer.

Apply the molycote G4500 grease (supplied with ICAD) to the O-ring grove on the ICM adapter and O-ring. Then install the greased O-ring into the groove on the ICM adapter as shown in the picture.

Apply another layer of grease over the O-ring as shown in the picture.

Close ICM by turning the manual magnet tool counter-clockwise, until it cannot be tightened further.

Open ICM by turning the magnet tool appox. 1 turn clockwise.



Install the ICAD motor actuator on the ICM adapter making sure it is pushed completely down. Fasten the set screws using a 2.5 mm hexagon key

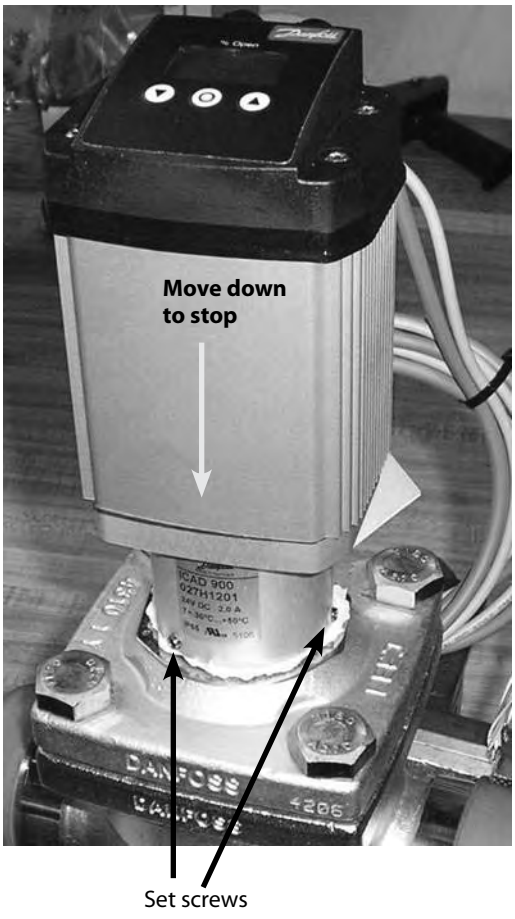
For ICAD already electrical connected to control system.
Program ICAD to manual mode. (i01=2).

Install the ICAD motor actuator on the ICM adapter making sure it is pushed completely down. Fasten the set screws using a 2.5 mm hexagon key.

Program ICAD to calibrate to the actual ICM valve - i10 (password) and i26 (selection of ICM size).

Await calibration to finish.

Return ICAD to normal operation. (i01=1)

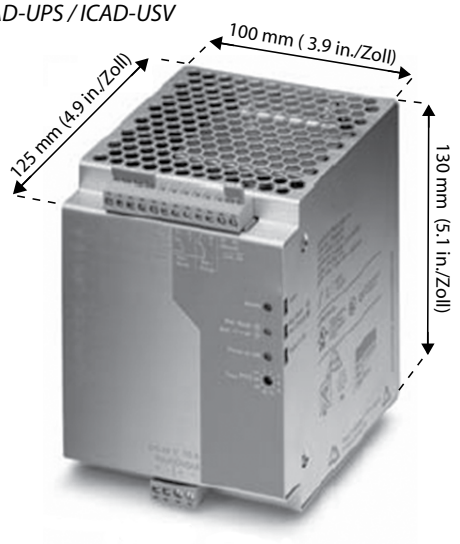


Instructions

ICAD-UPS til ICM 20 – ICM 125
ICAD-UPS for ICM 20 – ICM 125
ICAD-USV für ICM 20 – ICM 125
ICAD-UPS pour ICM 20 – ICM 125

027R9784

ICAD-UPS / ICAD-USV



Danfoss bestillingsnr.: **027H0182**
Danfoss code no.: **027H0182**
Danfoss Bestell-Nr.: **027H0182**
N° de code Danfoss : **027H0182**

Fig. / Abb. 1

DIN-skinnemontering
DIN rail mounting
DIN-Schienenmontage
Montage sur rail DIN

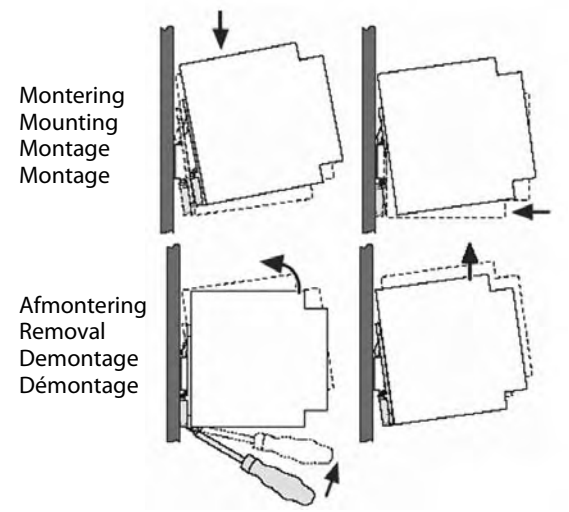


Fig. / Abb. 2

027R9784

Strømydelse ved strømsvigt
Current output at power failure
Stromausgang bei Netzausfall
Courant de sortie lors des coupures d'alimentation

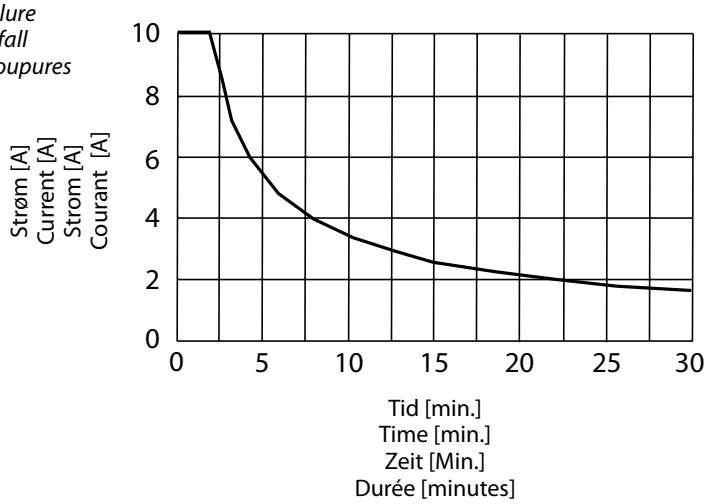


Fig. / Abb. 3

DK *Digitale udgangsrelæer og LED-funktion*

Tilstand	Grøn LED	Udgang batteriopladning Klemme 31, 32, 33	Gul LED	Udgang batteriopladning Klemme 21, 22, 23	Rød LED	Alarmudgang Klemme 11, 12, 13
Forsyningsspænding OK Batteriopladning	ON	31-33 ON (slutter) 31-32 OFF (bryder)	Blinker	21-22 ON (slutter) 21-23 OFF (bryder)	OFF	11-12 ON (slutter) 11-13 OFF (bryder)
Forsyningsspænding OK Ingen opladning (normal drift)	ON	31-33 OFF (bryder) 31-32 ON (slutter)	OFF	21-22 ON (slutter) 21-23 OFF (bryder)	OFF	11-12 ON (slutter) 11-13 OFF (bryder)
Ingen netstrøm - buffer-funktion	OFF	31-33 OFF (bryder) 31-32 ON (slutter)	ON	21-22 OFF (bryder) 21-23 ON (slutter)	OFF	11-12 ON (slutter) 11-13 OFF (bryder)
Batteri fuldt afladet	OFF	31-33 OFF (bryder) 31-32 ON (slutter)	OFF	21-22 ON (slutter) 21-23 OFF (bryder)	ON	11-12 OFF (bryder) 11-13 ON (slutter)
Forsyningsspænding OK Batteri defekt	ON	31-33 OFF (bryder) 31-32 ON (slutter)	OFF	21-22 ON (slutter) 21-23 OFF (bryder)	ON	11-12 OFF (bryder) 11-13 ON (slutter)
Ingen netstrøm Buffer-tid afsluttet eller klemme R1-R2 OFF (bryder)	OFF	31-33 OFF (bryder) 31-32 ON (slutter)	OFF	21-22 ON (slutter) 21-23 OFF (bryder)	OFF	11-12 OFF (bryder) 11-13 ON (slutter)

Fig. / Abb. 4

 DKRCI.PI.HV0.B2.52 / 520H0949

GB *Digital output relays and LED function*

Condition	Green LED	Bat.-charge output Terminal 31, 32, 33	Yellow LED	Bat.-mode output Terminal 21, 22, 23	Red LED	Alarm output Terminal 11, 12, 13
Supply voltage OK Charging battery	ON	31-33 ON (makes) 31-32 OFF (brakes)	Flashing	21-22 ON (makes) 21-23 OFF (brakes)	OFF	11-12 ON (makes) 11-13 OFF (brakes)
Supply voltage OK No charging (normal operation)	ON	31-33 OFF (brakes) 31-32 ON (makes)	OFF	21-22 ON (makes) 21-23 OFF (brakes)	OFF	11-12 ON (makes) 11-13 OFF (brakes)
No power - Buffer mode	OFF	31-33 OFF (brakes) 31-32 ON (makes)	ON	21-22 OFF (brakes) 21-23 ON (makes)	OFF	11-12 ON (makes) 11-13 OFF (brakes)
Battery fully discharged	OFF	31-33 OFF (brakes) 31-32 ON (makes)	OFF	21-22 ON (makes) 21-23 OFF (brakes)	ON	11-12 OFF (brakes) 11-13 ON (makes)
Supply voltage OK Battery faulty	ON	31-33 OFF (brakes) 31-32 ON (makes)	OFF	21-22 ON (makes) 21-23 OFF (brakes)	ON	11-12 OFF (brakes) 11-13 ON (makes)
No power Buffer time ended or Terminal R1-R2 OFF (Brakes)	OFF	31-33 OFF (brakes) 31-32 ON (makes)	OFF	21-22 ON (makes) 21-23 OFF (brakes)	OFF	11-12 OFF (brakes) 11-13 ON (makes)

D *Digitale Ausgangsrelais und LED-Funktion*

Zustand	Grüne LED	Batt.Lader-Ausgang Klemmen 31, 32, 33	Gelbe LED	Batt.modus-Ausgang Klemmen 21, 22, 23	Rote LED	Alarmausgang Klemmen 11, 12, 13
Netzspannung OK Batterie wird geladen	EIN	31-33 ON (schließen) 31-32 OFF (öffnen)	Blinkt	21-22 ON (schließen) 21-23 OFF (öffnen)	AUS	11-12 ON (schließen) 11-13 OFF (öffnen)
Netzspannung OK Keine Ladung (Normalbetrieb)	EIN	31-33 OFF (öffnen) 31-32 ON (schließen)	AUS	21-22 ON (schließen) 21-23 OFF (öffnen)	AUS	11-12 ON (schließen) 11-13 OFF (öffnen)
Keine Leistung - Pufferbetrieb	AUS	31-33 OFF (öffnen) 31-32 ON (schließen)	EIN	21-22 OFF (öffnen) 21-23 ON (schließen)	AUS	11-12 ON (schließen) 11-13 OFF (öffnen)
Batterie völlig entladen	AUS	31-33 OFF (öffnen) 31-32 ON (schließen)	AUS	21-22 ON (schließen) 21-23 OFF (öffnen)	EIN	11-12 OFF (öffnen) 11-13 ON (schließen)
Netzspannung OK Batterie defekt	EIN	31-33 OFF (öffnen) 31-32 ON (schließen)	AUS	21-22 ON (schließen) 21-23 OFF (öffnen)	EIN	11-12 OFF (öffnen) 11-13 ON (schließen)
Keine Leistung Pufferzeit beendet oder Klemmen R1-R2 OFF	AUS	31-33 OFF (öffnen) 31-32 ON (schließen)	AUS	21-22 ON (schließen) 21-23 OFF (öffnen)	AUS	11-12 OFF (öffnen) 11-13 ON (schließen)

F *Relais de sorties numériques et fonctionnement des DEL*

État	DEL verte	Sortie charge batterie Bornes 31, 32, 33	DEL jaune	Sortie mode batterie Bornes 21, 22, 23	DEL rouge	Sortie alarme Bornes 11, 12, 13
Tension d'alimentation OK Batterie en charge	ON	31-33 ON (fermeture) 31-32 OFF (ouverture)	Flashing	21-22 ON (fermeture) 21-23 OFF (ouverture)	OFF	11-12 ON (fermeture) 11-13 OFF (ouverture)
Tension d'alimentation OK Ne charge pas (mode d'exploitation normale)	ON	31-33 OFF (ouverture) 31-32 ON (fermeture)	OFF	21-22 ON (fermeture) 21-23 OFF (ouverture)	OFF	11-12 ON (fermeture) 11-13 OFF (ouverture)
Pas d'alimentation - Mode tampon	OFF	31-33 OFF (ouverture) 31-32 ON (fermeture)	ON	21-22 OFF (ouverture) 21-23 ON (fermeture)	OFF	11-12 ON (fermeture) 11-13 OFF (ouverture)
Batterie complètement déchargée	OFF	31-33 OFF (ouverture) 31-32 ON (fermeture)	OFF	21-22 ON (fermeture) 21-23 OFF (ouverture)	ON	11-12 OFF (ouverture) 11-13 ON (fermeture)
Tension d'alimentation OK Batterie défectueuse	ON	31-33 OFF (ouverture) 31-32 ON (fermeture)	OFF	21-22 ON (fermeture) 21-23 OFF (ouverture)	ON	11-12 OFF (ouverture) 11-13 ON (fermeture)
Pas d'alimentation Durée tampon terminée ou bornes R1-R2 OFF (ouverture)	OFF	31-33 OFF (ouverture) 31-32 ON (fermeture)	OFF	21-22 ON (fermeture) 21-23 OFF (ouverture)	OFF	11-12 OFF (ouverture) 11-13 ON (fermeture)

Fig. / Abb. 4

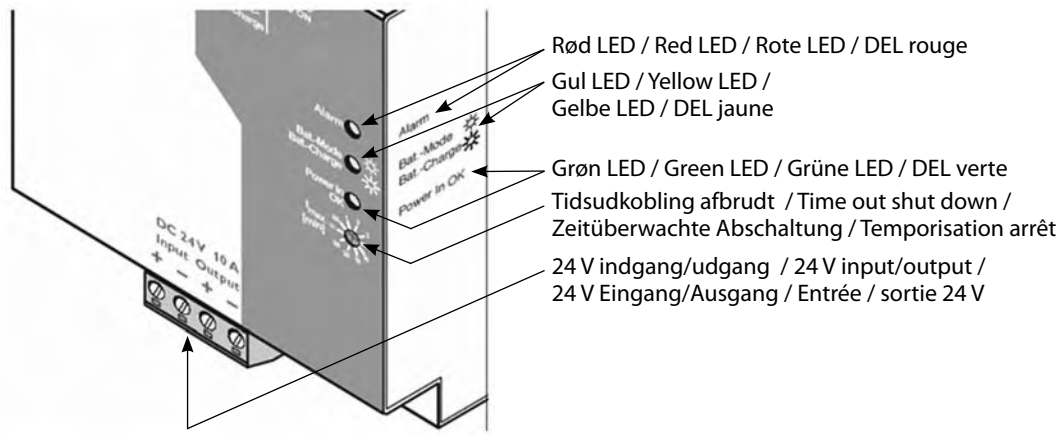
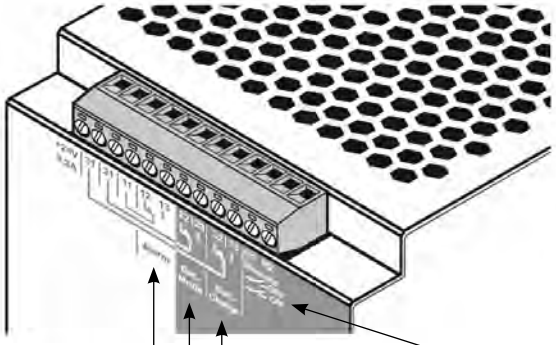


Fig. / Abb. 5



Alarmudgang Klemme 11, 12, 13	Udgang batterifunktion Klemme 21, 22, 23	Udgang batteriopladning Klemme 31, 32, 33	Tvungen fjernnedlukning Klemme R1, R2
Alarm output Terminal 11, 12, 13	Bat.-Mode output Terminal 21, 22, 23	Bat.-Charge output Terminal 31, 32, 33	Forced remote shut down Terminal R1, R2
Alarmausgang Klemmen 11, 12, 13	Batteriemodus-Ausgang Klemmen 21, 22, 23	Batt.Lader-Ausgang Klemmen 31, 32, 33	Ferngesteuerte Abschaltung Klemmen R1, R2
Sortie alarme Bornes 11, 12, 13	Sortie mode batterie Bornes 21, 22, 23	Sortie charge batterie Bornes 31, 32, 33	Arrêt forcé à distance Bornes R1, R2

Fig. / Abb. 6

Separat 24 V d.c.-transformer til både ICAD-UPS og ICAD 600/900
Seperate 24 V d.c tranformer for both ICAD-UPS and ICAD 600/900
Separater 24 V DC-Trafo sowohl für ICAD-USV und ICAD 600/900
Transformateurs indépendants 24 Vcc pour ICAD-UPS et ICAD 600/900

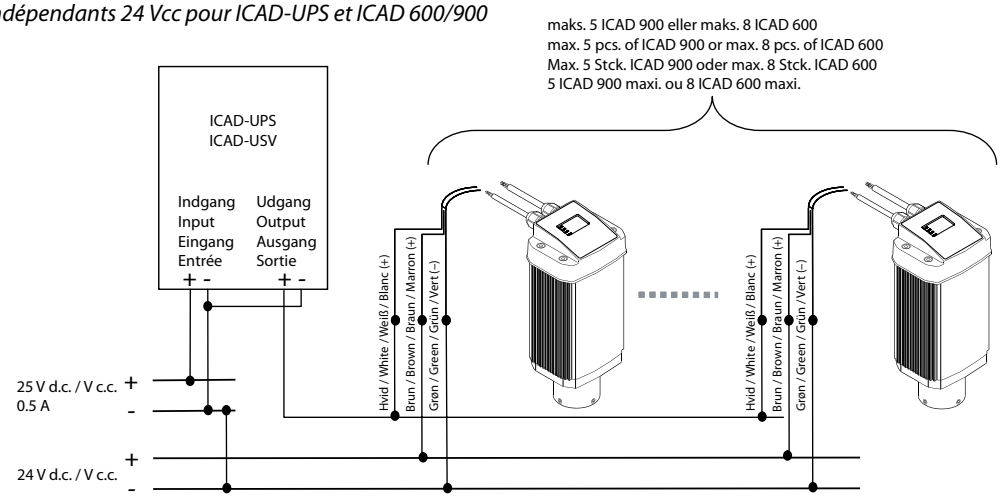


Fig. / Abb. 7

En 24 V d.c.-transformer til ICAD-UPS og ICAD 600/900
One 24 V d.c tranformer for ICAD-UPS and ICAD 600/900
Ein 24 V DC-Trafo sowohl für ICAD-USV und ICAD 600/900
Transformateur 24 Vcc unique pour ICAD-UPS et ICAD 600/900

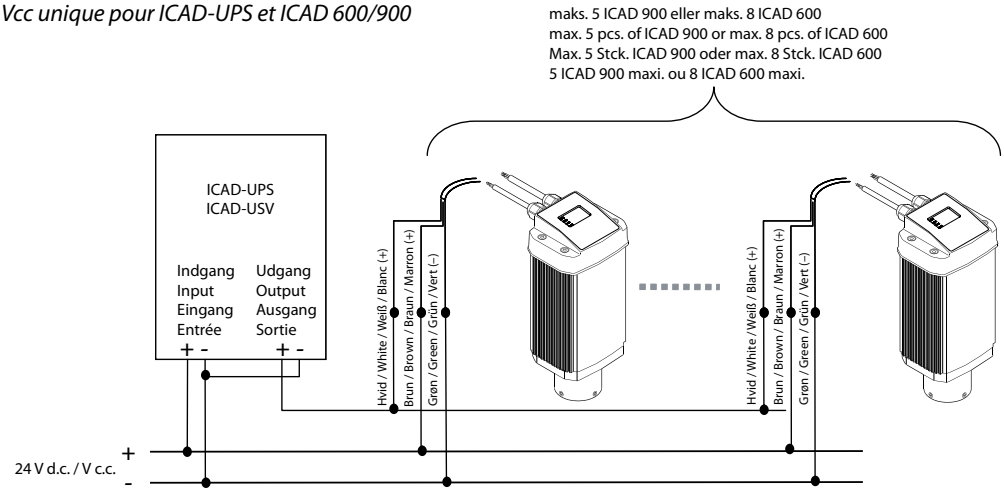


Fig. / Abb. 8

Technical data

Input Data
Input voltage range:
22.5 - 30 V d.c
Current consumption:
No load/charging/maximum -
0.1 A/0.5 A/10.5 A
Switching threshold:
Ua< 22 V; dynamic
Uin- 1 V/0.1 s
Input fuse:
Internal, 15 A

Output Data – Normal Operation
Nominal output voltage:
24 V DC
Output voltage:
Correspond to Input voltage range
Output current:
10 A
Current limit:
None
Overload fuse:
Internal, 15 A

Output Data – At power failure (buffer Mode)
Nominal output voltage:
24 V d.c
Output voltage:
27.9 V DC, maximum
Output current:
10 A
Current limit:
15 A
Overload fuse:
15 A, internal fuse

Charging
Charge characteristic curve
I/U characteristic curve
End-of-charge voltage
27 V
Charge current
400 mA
Time interval for check of battery
60 seconds

General
Nominal capacity:
1.3 Ah
Service life:
6 years at +20°C (68°F)
Ambient temperature:
Operation/storage:
0°C(32°F) to +50°C(122°F)/
0°C(32°F) to +40°C(104°F)
Enclosure:
IP 20 (~NEMA 1)
Terminals:
0.2 mm^2 to 2.5 mm^2 (25 AWG -14 AWG)
Digital Output relays:
30 V a.c/d.c. , Max. 1 A
Alarm Output
Bat.-Mode Output
Bat- Charge Output.

Installation

Mounting
ICAD-UPS is for DIN rail mounting and must always be installed in an electrical panel.
See fig.2.

ICAD-UPS
When ICAD-UPS is fully charged it can provide capacity according to fig. 3., at power failure
From fig. 3: 10 A in 1.5 min
2 A in 20 min

Definition of Power failure
If the supply voltage drops more than 1 V in a period of 0.1 seconds or falls below the minimum threshold of 22 V, the ICAD-UPS switches to buffer mode.

If the output voltage drops below 20.4 V in buffer mode, this will be indicated by the Alarm relay and Red LED.

If the output voltage drops to 19.2 V due to a flat (low) battery module, the ICAD-UPS will be shut down completely.

When the supply voltage is reapplied, the ICAD-UPS automatically switches on again.

At power failure there are two different ways to shut down the ICAD-UPS, when all connected ICAD 600/900 has been driven to the predefined condition (closed/open/stay/go to specific opening degree).
This will save capacity and shorten the time to fully recharge again, when power comes back.

1. Remote shut down via digital input R1 and R2. See fig. 6
When the connection between terminal R1 and R2 is OFF (brakes) the ICAD-UPS will unconditionally shut down, i.e. the DC output will be forced to switch off, independent of the current capacity of the ICAD-UPS.

2. Time out [min] which can be adjusted on ICAD-UPS. See fig 5
After power failure has taken place an internal time-out timer is started in ICAD-UPS.

With this timer the ICAD-UPS automatically can shut down when a selected time has elapsed. See fig. 5.

Possible time out time which can be selected : 0.5, 1,2,3,5,10,15,20,30 [min].
Also *infinite* (no shut down due to time out) can be selected.

Digital output relays and the LED on the front of ICAD-UPS, can be used to indicate the condition of the ICAD-UPS.
See fig. 4 for detailed information on digital output relays.

Overall general function
Alarm relay (terminal 11,12,13)
Battery fully discharged (red LED)
Battery quality check negative (red LED)

Bat-Mode relay (terminal 21,22,23)
Power failure (buffer mode) (yellow LED)

Bat-Charge relay (terminal 31,32,33)
Battery is charging (yellow LED flashing)

ICAD-UPS used together with ICAD 600/900
See fig. 7 and fig. 8 for different applications with ICAD-UPS, ICAD 600/900 and 24 V d.c. transformer.

The number of ICAD 600/900 to be supported by ICAD-UPS must not exceed 10 A.
ICAD 600: 1.2 A
ICAD 900: 2.0 A

This means:
- max 8 pcs. of ICAD 600 connected to 1 pcs. ICAD-UPS or
- 5 pcs. of ICAD 900 connected to 1 pcs. ICAD-UPS or
- A number of ICAD 600 and ICAD 900 which does not exceed 10 A. (See example below)

In fig. 7, separate transformers are used for both ICAD-UPS and all ICAD 600/900.

The ICAD-UPS will only load the 24 V d.c. transformer with 0.5 A.

In fig 8, one common transformer is used for both ICAD-UPS and all ICAD 600/900. The 24 V d.c. transformer will be loaded with the load of all ICAD 600 (1.2 A)/ICAD 900 (2.0 A) plus the load of ICAD-UPS (0.5 A).

Sizing of transformer when one common transformer is used
Example
ICAD UPS: 0.5 A
ICAD 600 : 1.2 A
ICAD 900 : 2.0 A

E.g. 3 pcs. ICAD 600 and 2 pcs. of ICAD 900 means that the size of the d.c. transformer is : $0.5 + (3 \times 1.2) + (2 \times 2.0) = 8.1$ A

Instructions

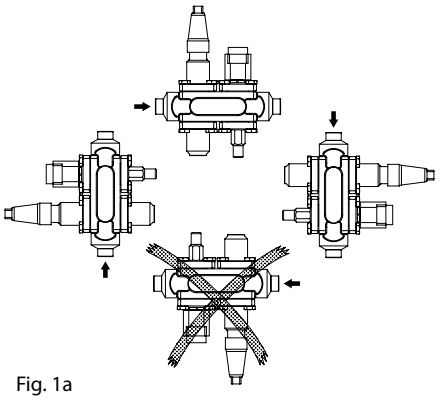
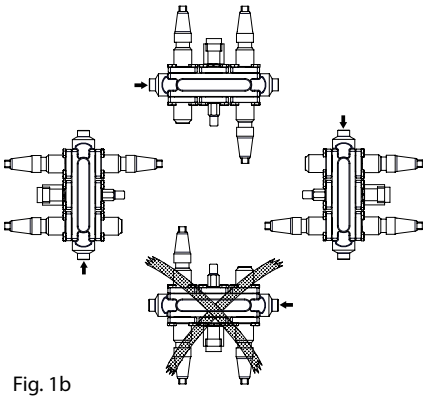
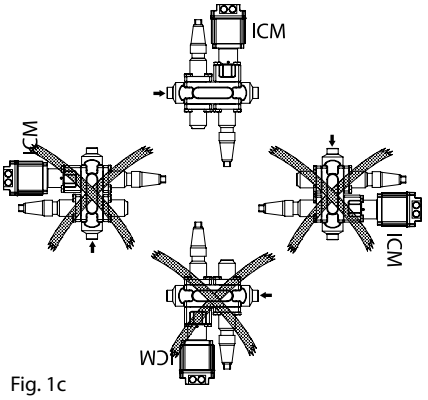
Control Solution

ICF 20-4, ICF 25-4,
ICF 32-4. ICF 40-4,
ICF 20-6, ICF 25-6,
ICF 32-6, ICF 40-6,

027R9782

027R9782

Direction and Position

ICF xx-4	ICF xx-6	ICF xx-4 / ICF xx-6 with ICM
 Fig. 1a	 Fig. 1b	 Fig. 1c

Welding

TIG/MIG welding

Inlet and outlet stop valves must be closed all the time before commissioning of the installation in ordre to prevent rust formations in the valve.
ICF must be cooled during the welding (e.g. by wet cloth).

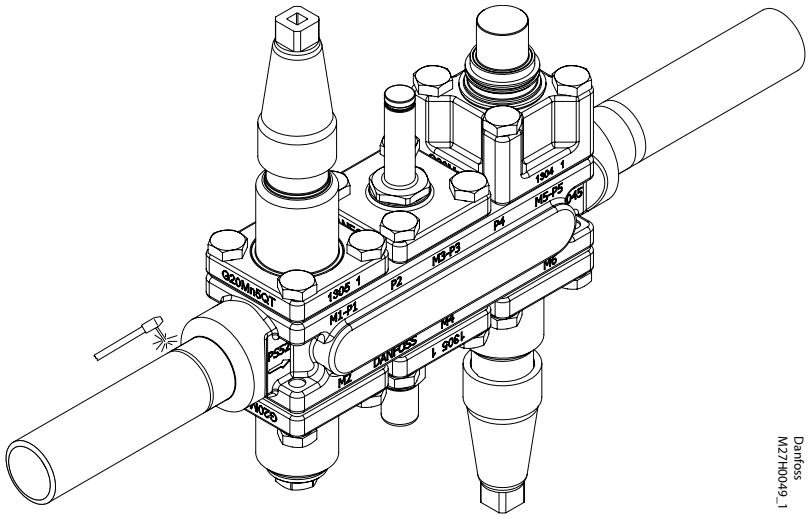


Fig. 2

Other welding methods

Remove all parts before welding.
Make sure that when the valve is assembled some rust protective oil is added in the valve.
Inlet and outlet valves must be closed all the time before commissioning.

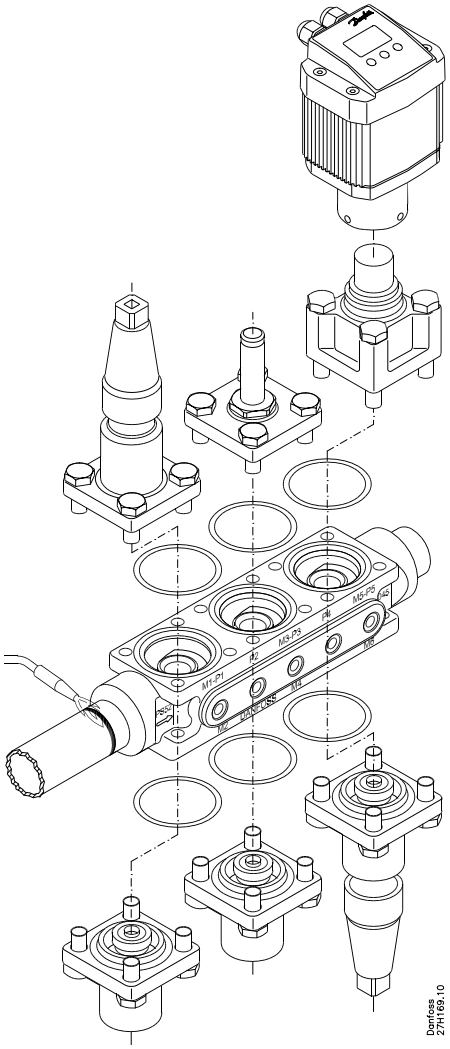


Fig. 3

Service and maintenance

For both ICF 20 and ICF 25 - 40 with ICM

Please observe, when used in CO2, that the o-rings (see fig. 4) on the ICM module can swell (grove).
At service it is recommend that new o-rings are installed, before the ICM functions module again is installed in the ICV valve body.

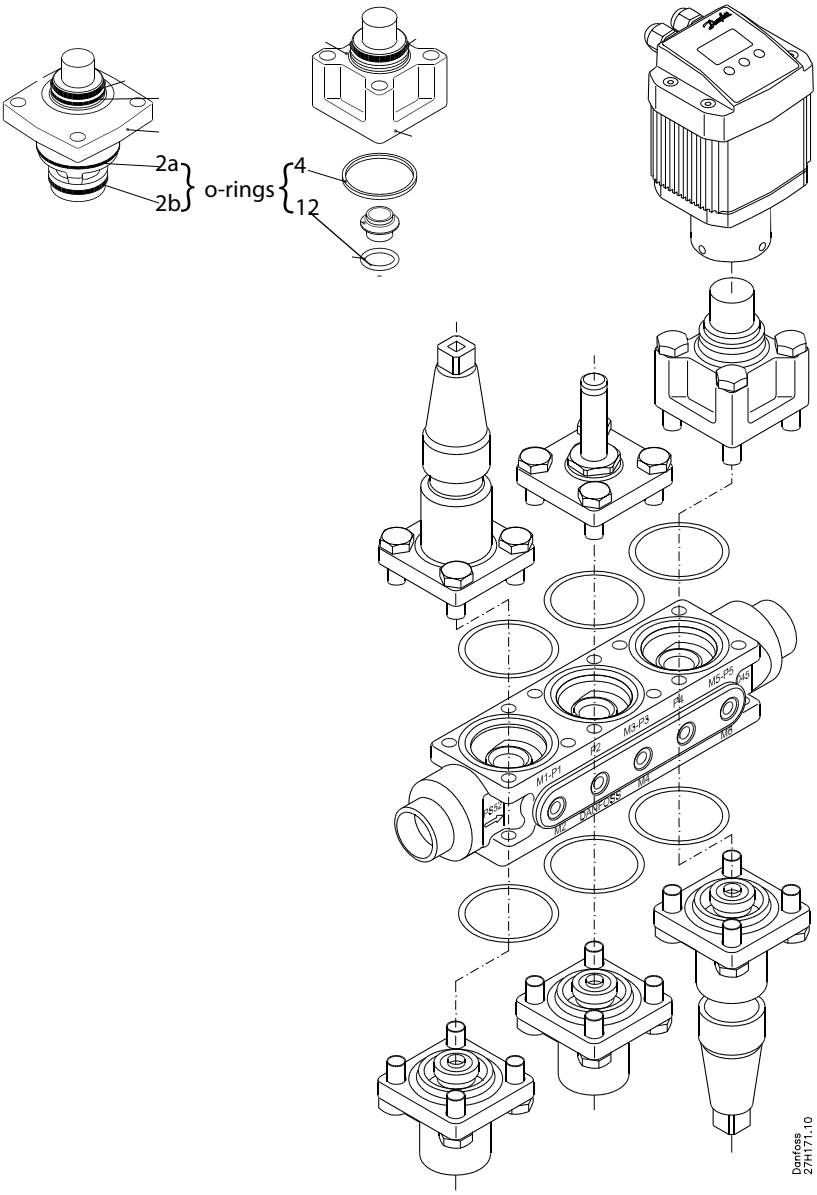
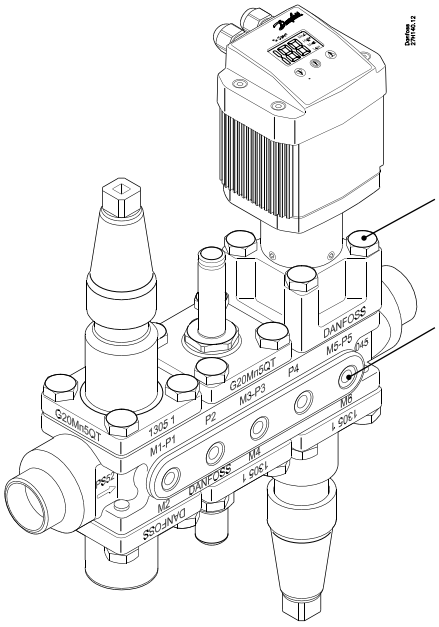


Fig. 4

Tightening torques



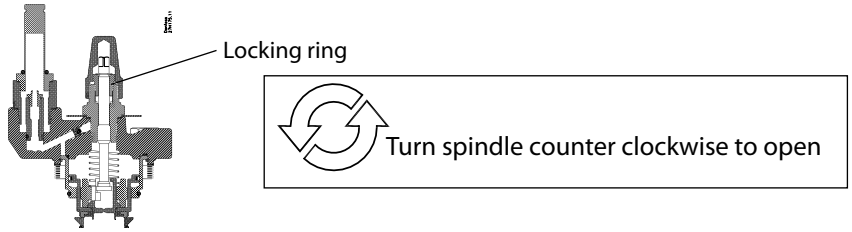
ICF 20:	ICF 25-40:
50 Nm (36 lbf)	80 Nm (58 lbf)
50 Nm (36 lbf)	50 Nm (36 lbf)

Fig. 5

Operating the manual opener on ICFE 25 solenoid module

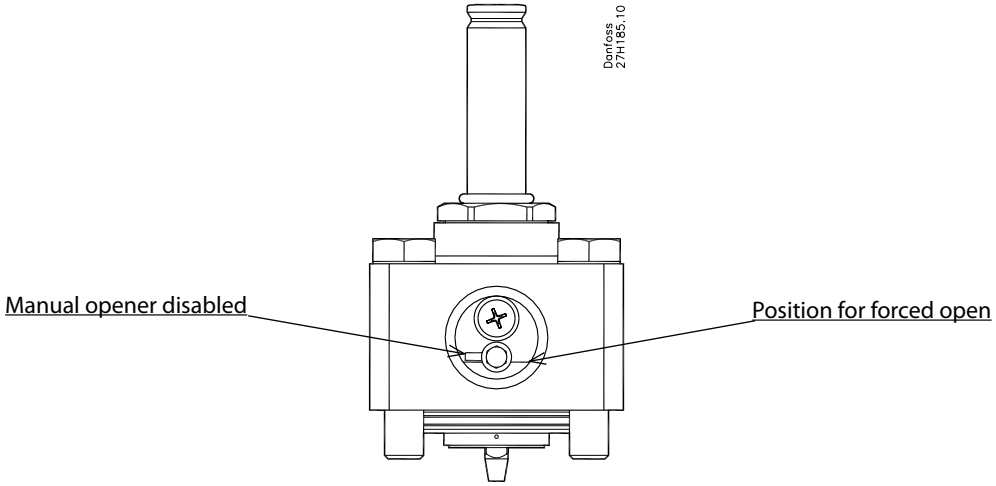
To open the solenoid by the manual stem turn it **counter clockwise** full way up.
To close the solenoid by the manual stem turn it **clockwise** until the locking ring stop. Do not force the spindle further, in case the locking ring is damaged or removed the spindle will start to leak.
The valve can not be forced to close by the manual stem.

ICFE 25-40 solenoid valve module



Operating the manual opener on ICFE 20H solenoid valve module

Remove the cap on the side of ICFE 20H
At 9 o'clock position the manual opener is disabled (not active)
To force the ICFE 20H solenoid to open use a 5 mm Allen key and turn it **clockwise** to 3 o'clock position.



ICF 20-4

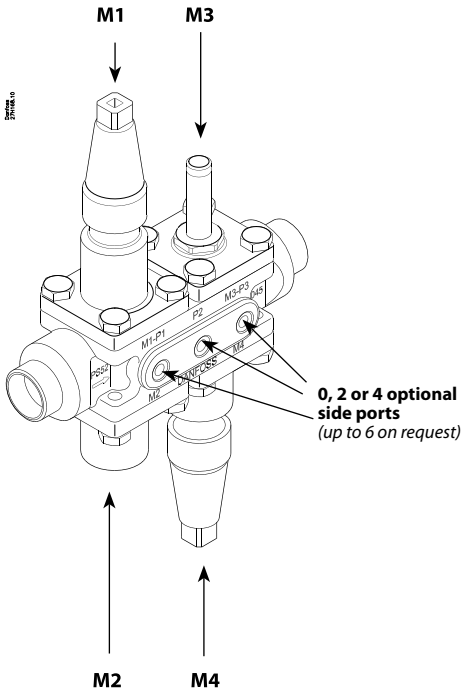


Fig. 6

In order to supply the ICF solution best suited for liquid lines and hot gas lines certain function modules are dedicated to specific module ports.

Function	M1	M2	M3	M4
ICFS 20 - Stop valve module				
ICFR 20A - Manual regulating valve module				
ICFF 20 - Filter module	☒		☒	
ICFE 20 - Solenoid valve module	☒	☒		☒
ICFE 20H - Solenoid valve module		☒		☒
ICFA 10 - Electronic expansion valve module		☒		☒
ICFO 20 - Manual opening module	☒	☒	☒	
ICFC 20 - Check valve module	☒		☒	
ICFN 20 - Stop/check valve module	☒		☒	
ICM 20-A, B or C - Motor valve module		☒		☒
ICFB 20 - Blank top cover				

☒ *location not possible*

ICF 20-6

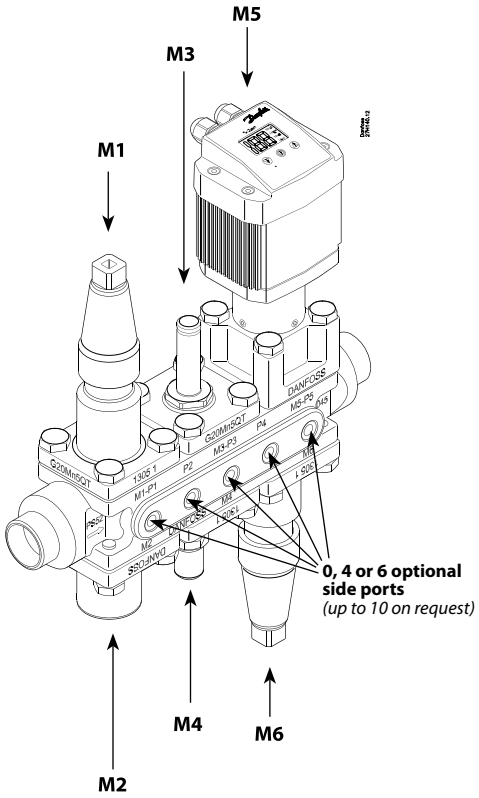


Fig. 7

In order to supply the ICF solution best suited for liquid lines and hot gas lines certain function modules are dedicated to specific module ports.

Function	M1	M2	M3	M4	M5	M6
ICFS 20 - Stop valve module						
ICFR 20A - Manual regulating valve module						
ICFF 20 - Filter module	☒		☒		☒	
ICFE 20 - Solenoid valve module	☒	☒		☒	☒	☒
ICFE 20H - Solenoid valve module		☒		☒		☒
ICFA 10 - Electronic expansion valve module		☒		☒		☒
ICFO 20 - Manual opening module	☒	☒	☒		☒	☒
ICFC 20 - Check valve module	☒		☒		☒	
ICFN 20 - Stop/check valve module	☒		☒		☒	
ICM 20-A, B or C - Motor valve module		☒		☒		☒
ICFB 20 - Blank top cover						

☒ *location not possible*

ICF 25-4 → 40-4

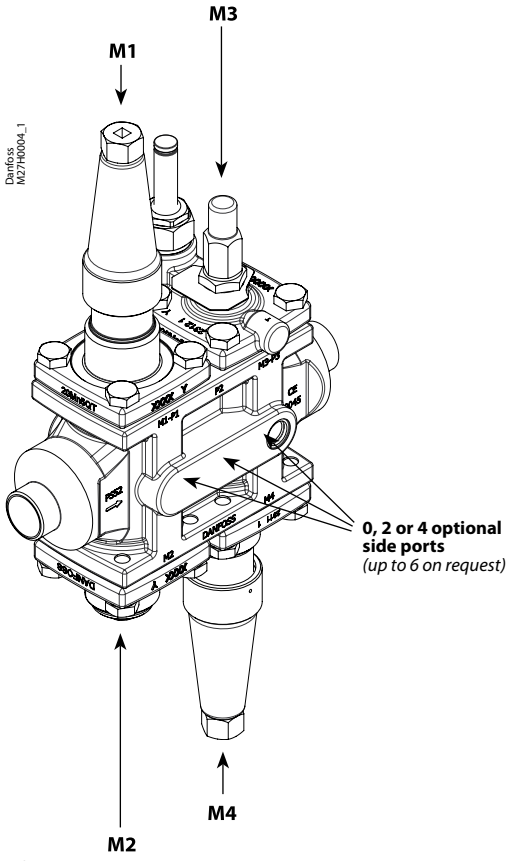


Fig. 8

In order to supply the ICF solution best suited for liquid lines and hot gas lines certain function modules are dedicated to specific module ports.

Function	M1	M2	M3	M4
ICFS 25-40 - Stop valve module				
ICFR 25-40 A or B - Manual regulating valve module				
ICFF 25-40 - Filter module	⊠		⊠	
ICFE 25-40 - Solenoid valve module	⊠	⊠		⊠
ICFC 25-40 - Check valve module	⊠		⊠	
ICFN 25-40 - Stop/check valve module	⊠		⊠	
ICM 25-A or C - Motor valve module		⊠		⊠
ICFB 25-40 - Blank top cover				
ICFW 25-40 - Welding module, 25DIN				

⊠ *location not possible*

ICF 25-6 → 40-6

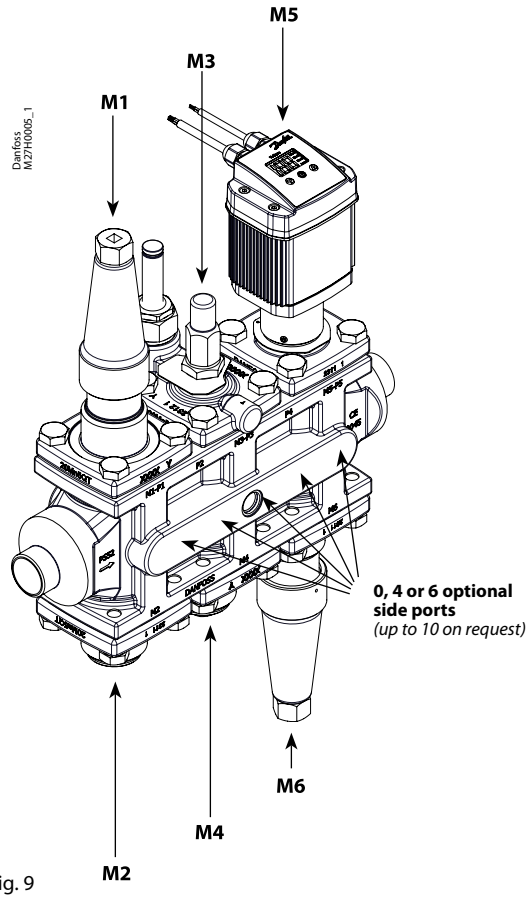


Fig. 9

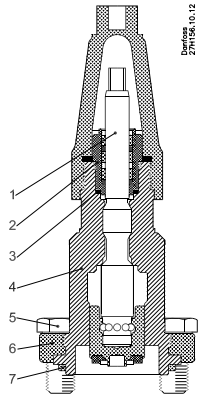
In order to supply the ICF solution best suited for liquid lines and hot gas lines certain function modules are dedicated to specific module ports.

Function	M1	M2	M3	M4	M5	M6
ICFS 25-40 - Stop valve module						
ICFR 25-40 A or B - Manual regulating valve module						
ICFF 25-40 - Filter module	⊠		⊠		⊠	
ICFE 25-40 - Solenoid valve module	⊠	⊠		⊠	⊠	⊠
ICFC 25-40 - Check valve module	⊠		⊠		⊠	
ICFN 25-40 - Stop/check valve module	⊠		⊠		⊠	
ICM 25-A or C - Motor valve module		⊠		⊠		⊠
ICFB 25-40 - Blank top cover						
ICFW 25-40 - Welding module, 25DIN						

⊠ *location not possible*

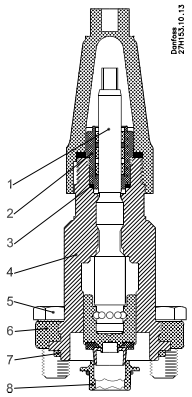
The function modules - ICF 20

ICFS 20 stop valve module



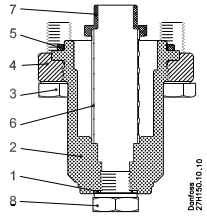
1. Spindle
2. Thread part
3. AL-gasket
4. Bonnet
5. Hex-head bolt
6. Flange
7. Gasket

ICFR 20 manual regulating valve module



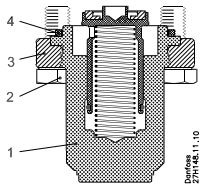
1. Spindle
2. Thread part
3. AL-gasket
4. Bonnet
5. Hex-head bolt
6. Flange
7. Gasket
8. Seat

ICFF 20 filter module



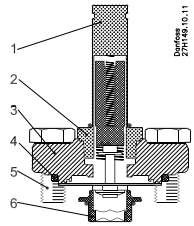
1. Gasket
2. Bonnet
3. Hex-head bolt
4. Flange
5. Gasket
6. Filter element
7. Plug
8. Plug ¼" RG

ICFC 20 check valve module



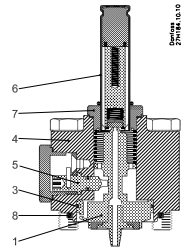
1. Bonnet
2. Hex-head bolt
3. Flange
4. Gasket

ICFE 20 solenoid valve module



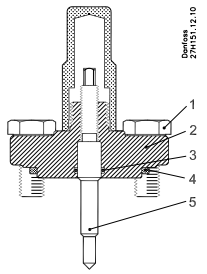
1. Armature tube
2. Armature tube nut
3. Flange
4. Gasket
5. Hex-head bolt
6. Seat

ICFE 20H solenoid valve module



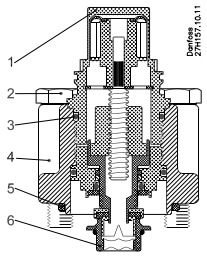
1. Piston
3. Piston ring
4. Bonnet cylindre
5. Manual opener
6. Armature tube
7. Armature tube nut
8. Gasket

ICFO 20 manual opening module



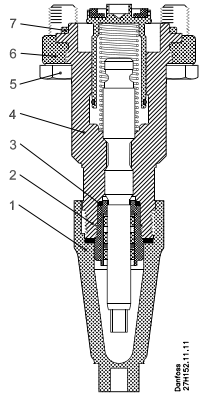
1. Hex-head bolt
2. Flange
3. O-ring
4. Rubber gasket
5. Spindle

ICM 20 A, 20 B or 20 C motor valve module



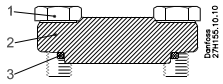
1. Adapter
2. Hex-head bolt
3. O-ring
4. Bonnet
5. Gasket
6. Seat

ICFN 20 stop/check valve module



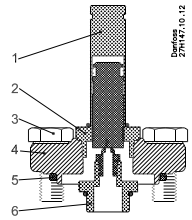
1. Spindle
2. Thread part
3. AL-gasket
4. Bonnet
5. Hex-head bolt
6. Flange
7. Gasket

ICFB 20 blank top cover module



1. Hex-head bolt
2. Flange
3. Gasket

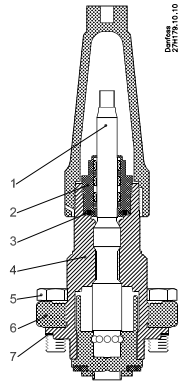
ICFA 10 Electronic expansion valve



1. Armature tube
2. Armature tube nut
3. Hex-head bolt
4. Flange
5. Gasket
6. Adaptor

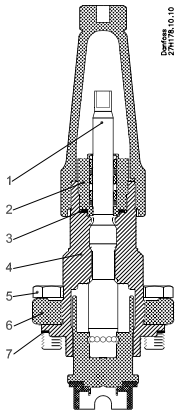
The function modules - ICF 25-40

ICFS 25-40 stop valve module



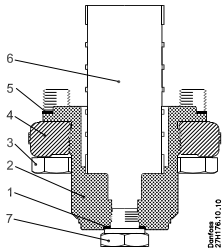
1. Spindle
2. Thread part
3. O-ring
4. Bonnet
5. Hex-head bolt
6. Flange
7. Gasket

ICFR 25- 40 A or B manual regulating valve module



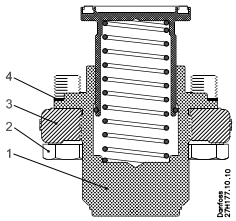
1. Spindle
2. Thread part
3. O-ring
4. Bonnet
5. Hex-head bolt
6. Flange
7. Gasket

ICFF 25-40 filter module



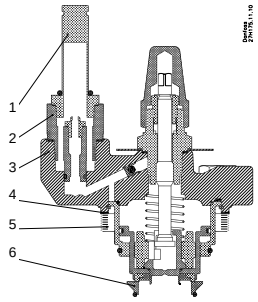
1. Al gasket
2. Bonnet
3. Hex-head bolt
4. Flange
5. Gasket
6. Filter element
7. Plug ¼" RG

ICFC 25-40 check valve module



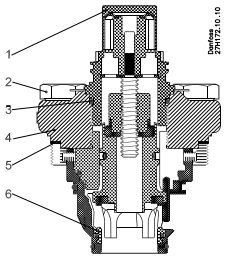
1. Bonnet
2. Hex-head bolt
3. Flange
4. Gasket

ICFE 25-40 solenoid valve module



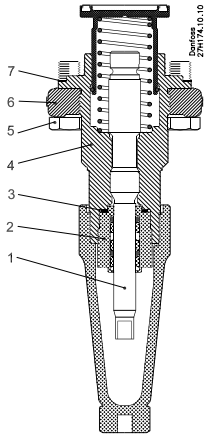
1. Armature tube
2. Armature tube nut
3. Bonnet
4. Gasket
5. Hex-head bolt
6. Seat

ICM 25 A or 20 B motor valve module



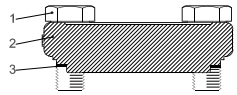
1. Adapter
2. Hex-head bolt
3. O-ring
4. Bonnet
5. Gasket
6. Seat

ICFN 25-40 stop/check valve module



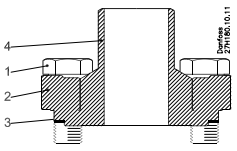
1. Spindle
2. Thread part
3. O-ring
4. Bonnet
5. Hex-head bolt
6. Flange
7. Gasket

ICFB 25-40 blank top cover module



1. Hex-head bolt
2. Flange
3. Gasket

ICFW 25-40 Welding module 25 DIN



1. Hex-head bolt
2. Flange
3. Gasket
4. Weld connection

Installation

Refrigerants
Applicable to all common non-flammable refrigerants, including R717 and non-corrosive gases/liquids dependent on sealing material compatibility.

The use of ICF solutions with flammable hydrocarbons is not recommended.

The ICF is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range
–60/+120°C (–76/+248°F)

Pressure range
The ICF is designed for a max. working pressure of 52 bar g (754 psi g).

Technical data
The ICF can be used in suction, liquid, hotgas and liquid/vapor lines. The ICF are available with 4 or 6 function modules. The ICF regulates the flow of the medium by modulation or on/off function, depending on function modules installed on the ICF.

Regulating range
Dependent on the chosen type and combination of modules installed in the valve.

Installation
The ICF must be installed with the modules 1,3,5 vertically upwards position (fig. 1). The ICF must be installed with the arrow in the direction of the flow).

The ICF will be delivered with all the function modules fully assembled. The modules can be taken off for service or inspection and may be rotated 4 x 90° in relation to the valve body upon installation.

The ICF may be fitted with a spindle for manual opening of the solenoid valve.

The ICF 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 ICF is protected from pressure transients like "liquid hammer" in the system.

Welding
The ICF solution can be welded by using either TIG /MIG welding (fig. 2) or arc welding (fig. 3).

Attention!
It is not necessary to remove any of the modules before TIG/MIG welding; however, it must be ensured that the valve is cooled during the welding (e. g. by wet cloth) and that the ICF is protected against weld splatter. Inlet and outlet stop valves must be closed all the time before commissioning in ordre to protect ICF against rust formations.

During arc welding the modules must be removed.
Avoid welding debris and dirt in the valve body and the function module. The housing must be free from stresses (external loads) after installation. The ICF must not be mounted in systems where the outlet side of the ICF is open to atmosphere. The outlet side of the ICF must always be connected to the system or properly capped off, for example with a welded-on end plate.

Colours and identification
The ICF solutions are Zinc-Chromated from factory. The Zinc-Chromatization does not cover the welding connections. If further corrosion protection is required, the ICF can be painted.

Precise identification of the ICF is made via the ID label on each of the 4 or 6 function modules. The external surface of the housing must be protected against corrosion with a suitable top coating after installation involving welding and consequent assembly. Protection of the ID label when painting the ICF is recommended.

Maintenance

Service
The ICF solutions are easy to service. Do not open the ICF while the it is still under pressure.

Debris blocking the bolt hole will need cleaning. Upon opening and removal of the function modules:
- Check that the O-rings on the function module has not been damaged.
  A valve with a damaged o-ring might not modulate according to the specification.

For both ICF 20 and ICF 25 - 40 with ICM

Please observe ,when used in CO2, that the o-rings (see fig.4) on the ICM module can swell (grove). At service it is recommend that new o-rings are installed, before the ICM functions module again is installed in the ICV valve body.

- Check that the piston and cylinder is free of scratches and look for wear marks. If the wear is excessive the function module should be replaced to prevent false pilot signal around the piston ring.
- Check that the movement of the cylinder and valve seat is free and with low friction.
- If the teflon valve plate has been damaged, the function module must be replaced.

Assembly
Remove any dirt from the housing before the ICF is assembled.
- Check that all channels in the ICF are free of particles or similar debris.
  If possible, apply some refrigeration oil to ease the insertion of the modules and to protect the O-rings.

Tightening (fig. 5)
Tighten the top cover with a torque wrench, to the values indicated in the table.
Use only original Danfoss parts, including O-rings and gaskets for replacement.

Materials of new parts are certified for the relevant refrigerant.

In cases of doubt, please contact Danfoss.

Drawings are only for illustration, not for dimensioning or construction. Danfoss accepts no responsibility for errors and omissions.

Danfoss Industrial Refrigeration reserves the right to make changes to products and specifications without prior notice.

DECLARATION OF CONFORMITY
The Pressure Equipment Directive 97/23/EC

Name and Address of Manufacturer within the European Community
Danfoss A/S
Albuen 29
DK-6000 Kolding
Denmark

Description of Pressure Equipment

Refrigerant regulation valve, with straight bonnet arrangement
Type ICM, ICS, ICL, ICF

Nominal bore	**ICM, ICS, ICL, ICF** **DN20-80 mm** ($^3/_4$ - 3 in.)	
Classified for	**Fluid Group I** (all refrigerants (toxic, non-toxic, flammable and non-flammable)) For further details / restrictions - see Installation Instruction	
Temperature range	**ICM, ICS, ICL, ICF**	–60°C/+120°C (–76°F/+248°F)
Maximum allowable working pressure	**ICM, ICS, ICL, ICF** **DN20-DN80** ($^3/_4$ - 3 in.)	**52 bar (754 psi)** **–60°C/+120°C (–76°F/+248°F)**

Conformity and Assessment Procedure Followed

		ICV 25-65 platform	**ICV 20**
Category		**II**	**Article 3, paragraph 3**
Module		**D1**	
Certificate ID		*D1: 07 202 0511 Z 0009/1/H-0002*	
Nominal bore	Standard appl.	**ICM, ICS, ICL, ICF** **DN20-80 mm ($^3/_4$ - 3 in.)**	**ICM** **DN 15-25 ($^1/_2$ - 1 in.)**

Name and Address of the Notified Body which carried out the Inspection
TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

CE
(0045)

Name and Address of the Notified Body monitoring the Manufacturer's Quality Assurance System
TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

References of Harmonised Standards used
EN 10213-3 EN 10222-4

References of other Technical Standards and Specifications used
EN 12284 AD-Merkblätter

Authorised Person for the Manufacturer within the European Community

Name: Peter Suhr **Title:** Operations Director

Signature: **Date:** 01/06/2007

148B9746 - rev. 3 ECM 500000018810

Instructions

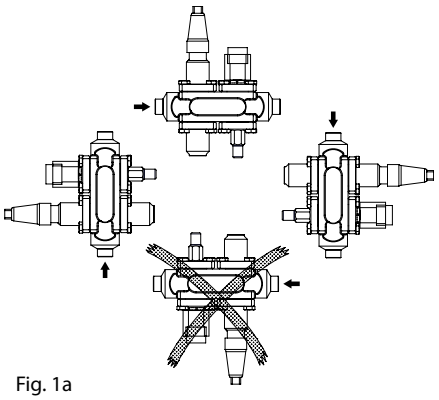
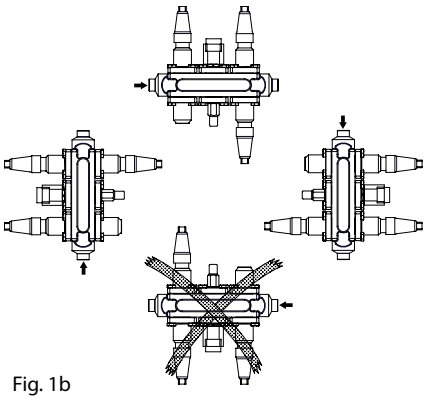
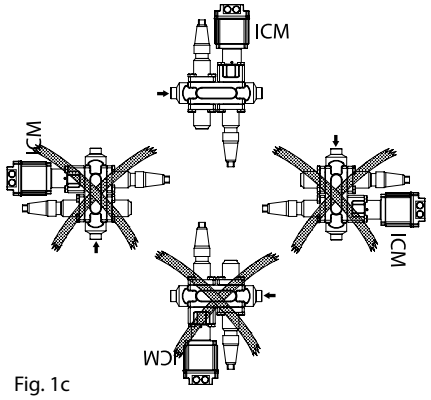
Control Solution

ICF 20-4, ICF 25-4,
ICF 32-4. ICF 40-4,
ICF 20-6, ICF 25-6,
ICF 32-6, ICF 40-6,

027R9789

027R9789

Direction and Position

ICF xx-4	ICF xx-6	ICF xx-4 / ICF xx-6 with ICM
 Fig. 1a	 Fig. 1b	 Fig. 1c

Welding

TIG/MIG welding

All modules must be fully opened before welding.

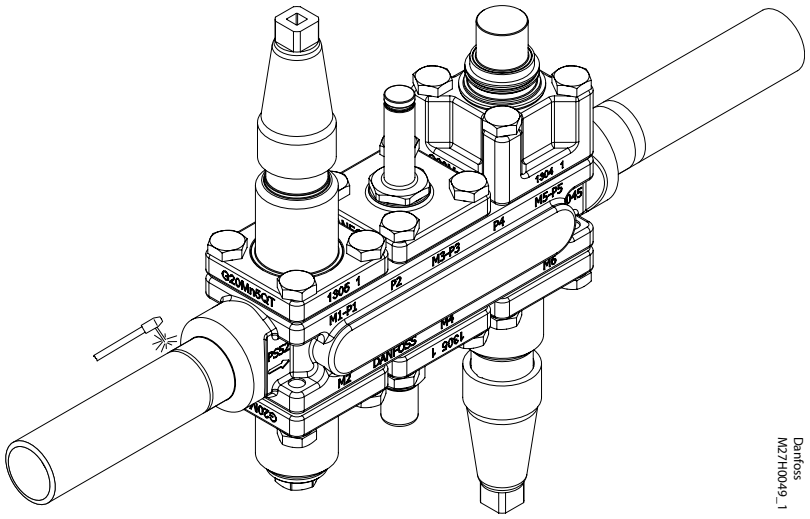


Fig. 2

Other welding methods

Remove all parts before welding.

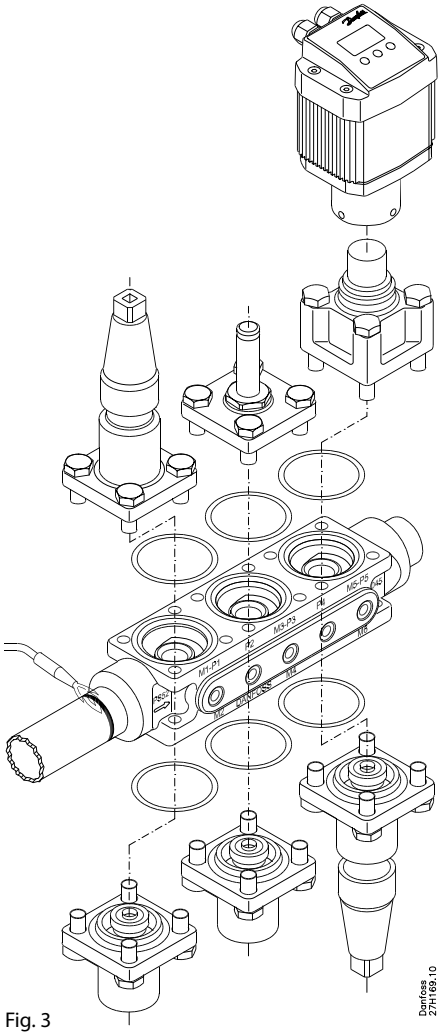


Fig. 3

 DKRCI.PI.FT0.A4.22 / 520H2244

Service and maintenance

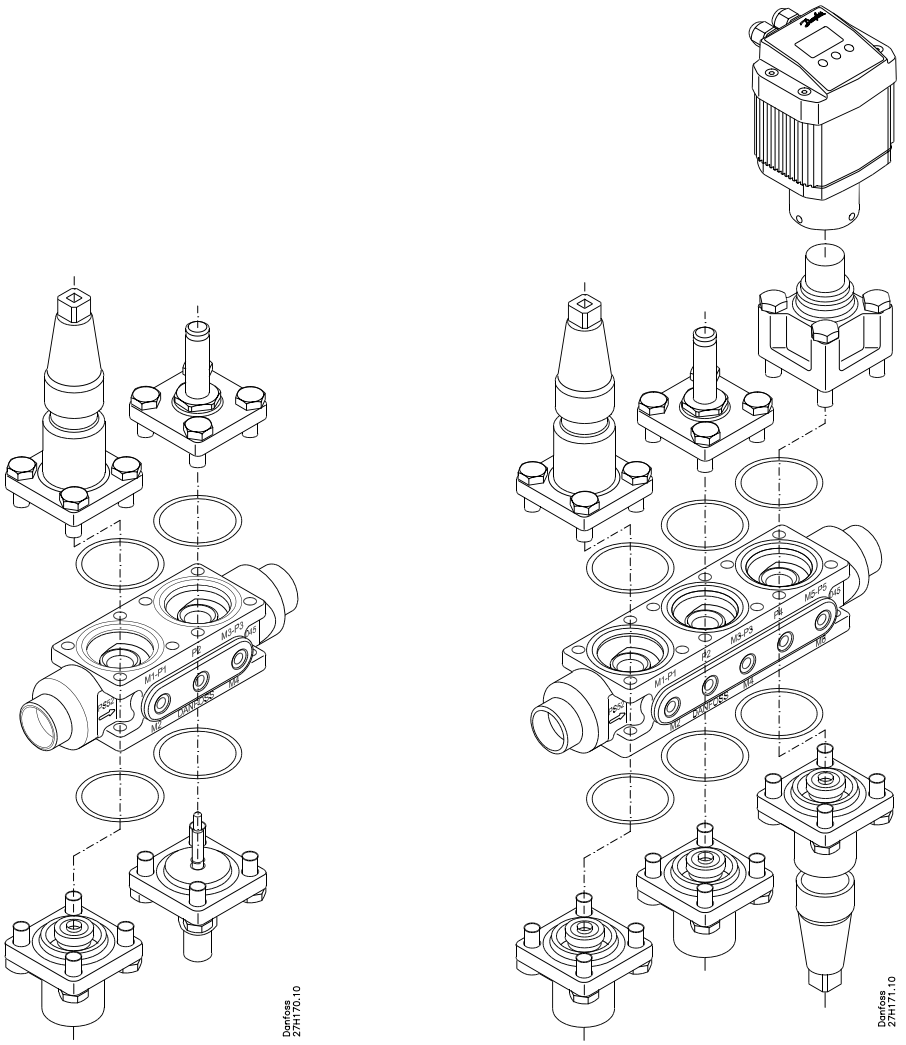
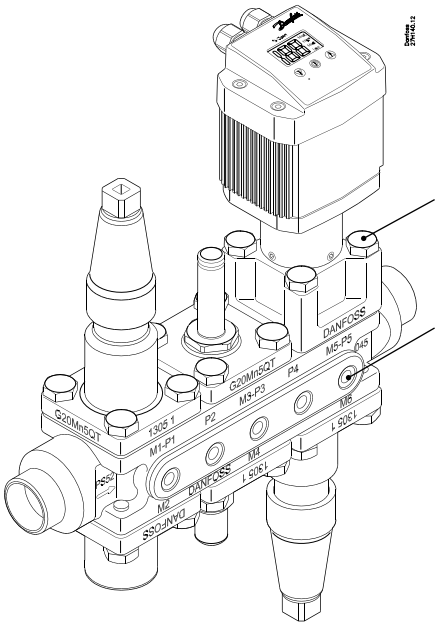


Fig. 4

Tightening torques



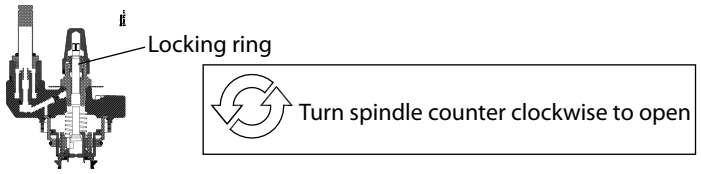
ICF 20:	ICF 25-40:
50 Nm (36 lbf)	80 Nm (58 lbf)
50 Nm (36 lbf)	50 Nm (36 lbf)

Fig. 5

Operating the manual opener on ICF 25 solenoid module

To open the solenoid by the manual stem turn it **counter clockwise** full way up.
To close the solenoid by the manual stem turn it **clockwise** until the locking ring stop. Do not force the spindle further, in case the locking ring is damaged or removed the spindle will start to leak.
The valve can not be forced to close by the manual stem.

ICF 25 - 40 solenoid valve module



Module location

ICF 20-4

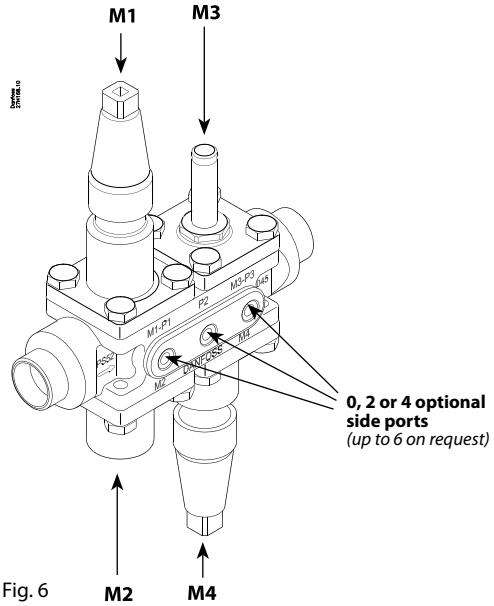


Fig. 6

In order to supply the ICF solution best suited for liquid lines and hot gas lines certain function modules are dedicated to specific module ports.

Function	M1	M2	M3	M4
ICFS 20 - Stop valve module				
ICFR 20A - Manual regulating valve module				
ICFF 20 - Filter module	⊠		⊠	
ICFE 20 - Solenoid valve module	⊠	⊠		⊠
ICFA 10 - Electronic expansion valve module		⊠		⊠
ICFO 20 - Manual opening module	⊠	⊠	⊠	
ICFC 20 - Check valve module	⊠		⊠	
ICFN 20 - Stop/check valve module	⊠		⊠	
ICM 20-A, B or C - Motor valve module		⊠		⊠
ICFB 20 - Blank top cover				

⊠ *location not possible*

ICF 20-6

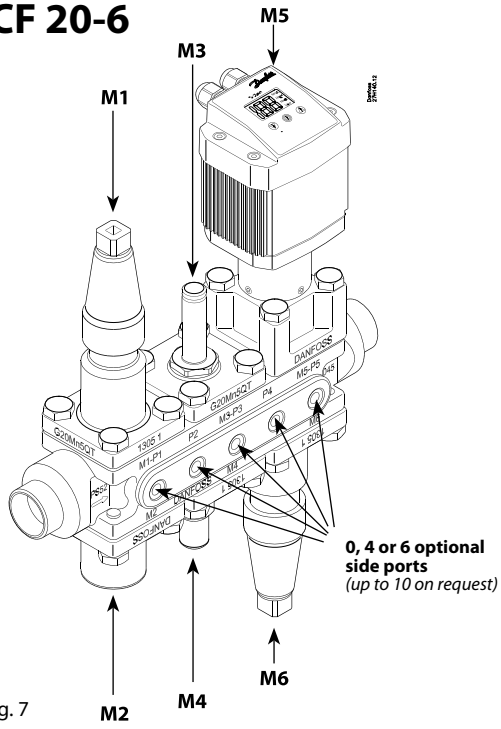


Fig. 7

In order to supply the ICF solution best suited for liquid lines and hot gas lines certain function modules are dedicated to specific module ports.

Function	M1	M2	M3	M4	M5	M6
ICFS 20 - Stop valve module						
ICFR 20A - Manual regulating valve module						
ICFF 20 - Filter module	⊠		⊠		⊠	
ICFE 20 - Solenoid valve module	⊠	⊠		⊠	⊠	⊠
ICFA 10 - Electronic expansion valve module		⊠		⊠		⊠
ICFO 20 - Manual opening module	⊠	⊠	⊠		⊠	⊠
ICFC 20 - Check valve module	⊠		⊠		⊠	
ICFN 20 - Stop/check valve module	⊠		⊠		⊠	
ICM 20-A, B or C - Motor valve module		⊠		⊠		⊠
ICFB 20 - Blank top cover						

⊠ *location not possible*

Module location

ICF 25-4 → 40-4

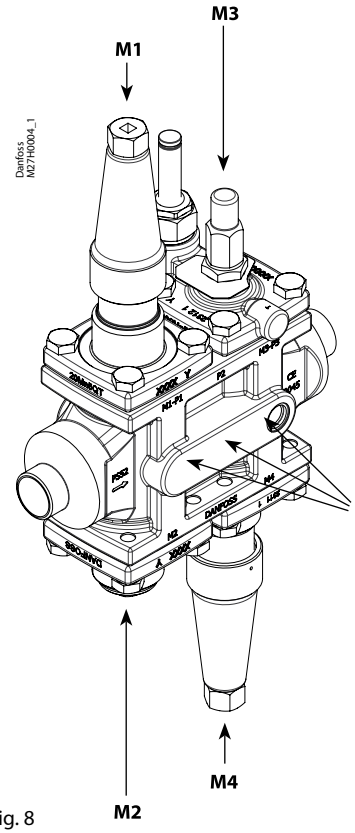


Fig. 8

In order to supply the ICF solution best suited for liquid lines and hot gas lines certain function modules are dedicated to specific module ports.

Function	M1	M2	M3	M4
ICFS 25-40 - Stop valve module				
ICFR 25-40 A or B - Manual regulating valve module				
ICFF 25-40 - Filter module	☒		☒	
ICFE 25-40 - Solenoid valve module	☒	☒		☒
ICFC 25-40 - Check valve module	☒		☒	
ICFN 25-40 - Stop/check valve module	☒		☒	
ICM 25-A or C - Motor valve module		☒		☒
ICFB 25-40 - Blank top cover				
ICFW 25-40 - Welding module, 25DIN				

☒ *location not possible*

ICF 25-6 → 40-6

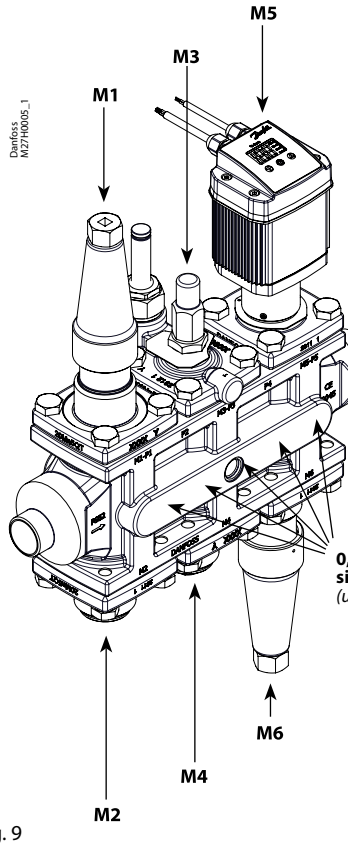


Fig. 9

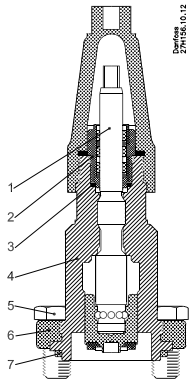
In order to supply the ICF solution best suited for liquid lines and hot gas lines certain function modules are dedicated to specific module ports.

Function	M1	M2	M3	M4	M5	M6
ICFS 25-40 - Stop valve module						
ICFR 25-40 A or B - Manual regulating valve module						
ICFF 25-40 - Filter module	☒		☒		☒	
ICFE 25-40 - Solenoid valve module	☒	☒		☒	☒	☒
ICFC 25-40 - Check valve module	☒		☒		☒	
ICFN 25-40 - Stop/check valve module	☒		☒		☒	
ICM 25-A or C - Motor valve module		☒		☒		☒
ICFB 25-40 - Blank top cover						
ICFW 25-40 - Welding module, 25DIN						

☒ *location not possible*

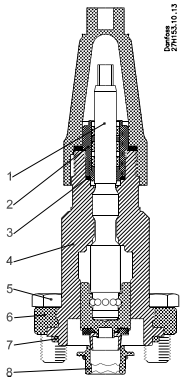
The function modules - ICF 20

ICFS 20 stop valve module



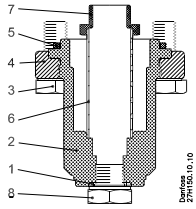
1. Spindle
2. Thread part
3. AL-gasket
4. Bonnet
5. Hex-head bolt
6. Flange
7. Gasket

ICFR 20 manual regulating valve module



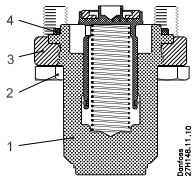
1. Spindle
2. Thread part
3. AL-gasket
4. Bonnet
5. Hex-head bolt
6. Flange
7. Gasket
8. Seat

ICFF 20 filter module



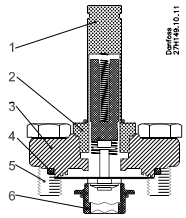
1. Gasket
2. Bonnet
3. Hex-head bolt
4. Flange
5. Gasket
6. Filter element
7. Plug
8. Plug ¼" RG

ICFC 20 check valve module



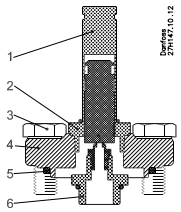
1. Bonnet
2. Hex-head bolt
3. Flange
4. Gasket

ICFE 20 solenoid valve module



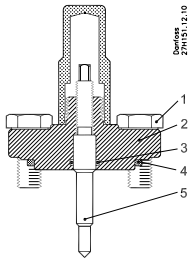
1. Armature tube
2. Armature tube nut
3. Flange
4. Gasket
5. Hex-head bolt
6. Seat

ICFA 10 Electronic expansion valve



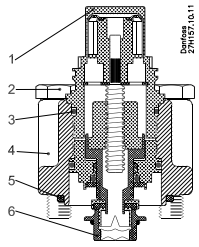
1. Armature tube
2. Armature tube nut
3. Hex-head bolt
4. Flange
5. Gasket
6. Adaptor

ICFO 20 manual opening module



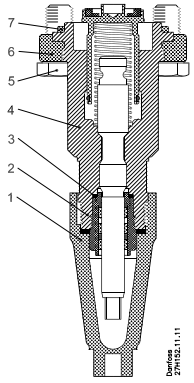
1. Hex-head bolt
2. Flange
3. O-ring
4. Rubber gasket
5. Spindle

ICM 20 A, 20 B or 20 C motor valve module



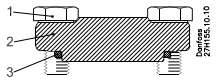
1. Adapter
2. Hex-head bolt
3. O-ring
4. Bonnet
5. Gasket
6. Seat

ICFN 20 stop/check valve module



1. Spindle
2. Thread part
3. AL-gasket
4. Bonnet
5. Hex-head bolt
6. Flange
7. Gasket

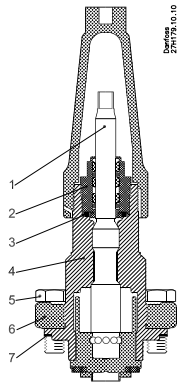
ICFB 20 blank top cover module



1. Hex-head bolt
2. Flange
3. Gasket

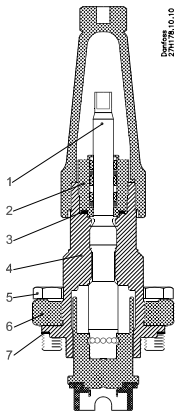
The function modules - ICF 25-40

ICFS 25-40 stop valve module



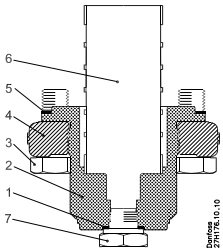
1. Spindle
2. Thread part
3. O-ring
4. Bonnet
5. Hex-head bolt
6. Flange
7. Gasket

ICFR 25- 40 A or B manual regulating valve module



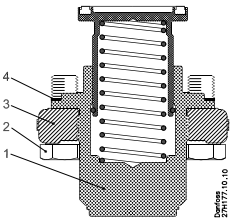
1. Spindle
2. Thread part
3. O-ring
4. Bonnet
5. Hex-head bolt
6. Flange
7. Gasket

ICFF 25-40 filter module



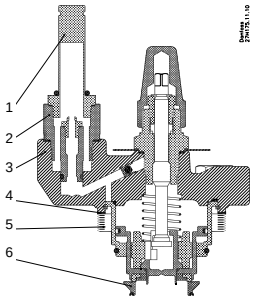
1. Al gasket
2. Bonnet
3. Hex-head bolt
4. Flange
5. Gasket
6. Filter element
7. Plug ¼" RG

ICFC 25-40 check valve module



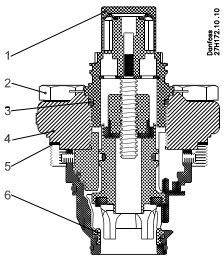
1. Bonnet
2. Hex-head bolt
3. Flange
4. Gasket

ICFE 25-40 solenoid valve module



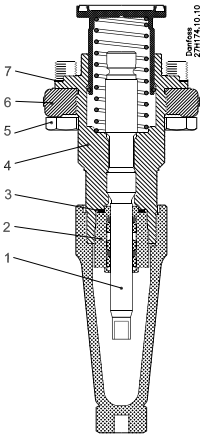
1. Armature tube
2. Armature tube nut
3. Bonnet
4. Gasket
5. Hex-head bolt
6. Seat

ICM 25 A or 20 B motor valve module



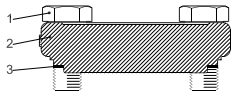
1. Adapter
2. Hex-head bolt
3. O-ring
4. Bonnet
5. Gasket
6. Seat

ICFN 25-40 stop/check valve module



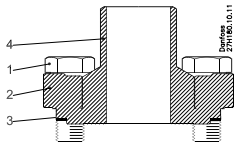
1. Spindle
2. Thread part
3. O-ring
4. Bonnet
5. Hex-head bolt
6. Flange
7. Gasket

ICFB 25-40 blank top cover module



1. Hex-head bolt
2. Flange
3. Gasket

ICFW 25-40 Welding module 25 DIN



1. Hex-head bolt
2. Flange
3. Gasket
4. Weld connection

ENGLISH

Installation

Refrigerants
Applicable to all common non-flammable refrigerants, including R717 and non-corrosive gases/liquids dependent on sealing material compatibility.

The use of ICF solutions with flammable hydrocarbons is not recommended.

The ICF is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range
–60/+120°C (–76/+248°F)

Pressure range
The ICF is designed for a max. working pressure of 52 bar g (754 psi g).

Technical data
The ICF can be used in suction, liquid, hotgas and liquid/vapor lines. The ICF are available with 4 or 6 function modules. The ICF regulates the flow of the medium by modulation or on/off function, depending on function modules installed on the ICF.

Regulating range
Dependent on the chosen type and combination of modules installed in the valve.

Installation
The ICF must be installed with the modules 1,3,5 vertically upwards position (fig. 1). The ICF must be installed with the arrow in the direction of the flow).

The ICF will be delivered with all the function modules fully assembled. The modules can be taken off for service or inspection and may be rotated 4 x 90° in relation to the valve body upon installation.

The ICF may be fitted with a spindle for manual opening of the solenoid valve.

The ICF 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 ICF is protected from pressure transients like "liquid hammer" in the system.

Welding
The ICF solution can be welded by using either TIG /MIG welding (fig. 2) or arc welding (fig. 3).

Attention!
It is not necessary to remove any of the modules before TIG/MIG welding; however, it must be ensured that all valve modules are opened before the welding process takes place and that the ICF is protected against weld splatter.
During arc welding the modules must be removed.
Avoid welding debris and dirt in the valve body and the function module.
The housing must be free from stresses (external loads) after installation. The ICF must not be mounted in systems where the outlet side of the ICF is open to atmosphere. The outlet side of the ICF must always be connected to the system or properly capped off, for example with a welded-on end plate.

Colours and identification
The ICF solutions are Zinc-Chromated from factory. The Zinc-Chromatization does not cover the welding connections. If further corrosion protection is required, the ICF can be painted.

Precise identification of the ICF is made via the ID label on each of the 4 or 6 function modules. The external surface of the housing must be protected against corrosion with a suitable top coating after installation involving welding and consequent assembly. Protection of the ID label when painting the ICF is recommended.

Maintenance

Service
The ICF solutions are easy to service. Do not open the ICF while the it is still under pressure.

Debris blocking the bolt hole will need cleaning. Upon opening and removal of the function modules:
- Check that the O-rings on the function module has not been damaged. A valve with a damaged o-ring might not modulate according to the specification.
- Check that the piston and cylinder is free of scratches and look for wear marks. If the wear is excessive the function module should be replaced to prevent false pilot signal around the piston ring.
- Check that the movement of the cylinder and valve seat is free and with low friction.
- If the teflon valve plate has been damaged, the function module must be replaced.

Assembly
Remove any dirt from the housing before the ICF is assembled.
- Check that all channels in the ICF are free of particles or similar debris. If possible, apply some refrigeration oil to ease the insertion of the modules and to protect the O-rings.

Tightening (fig. 5)
Tighten the top cover with a torque wrench, to the values indicated in the table.
Use only original Danfoss parts, including O-rings and gaskets for replacement.

Materials of new parts are certified for the relevant refrigerant.

In cases of doubt, please contact Danfoss.

Drawings are only for illustration, not for dimensioning or construction. Danfoss accepts no responsibility for errors and omissions.

Danfoss Industrial Refrigeration reserves the right to make changes to products and specifications without prior notice.

DECLARATION OF CONFORMITY

The Pressure Equipment Directive 97/23/EC

Name and Address of Manufacturer within the European Community

Danfoss Industrial Refrigeration
Stormosevej 10
PO Box 60
DK-8361 Hasselager
Denmark

Description of Pressure Equipment

Refrigerant regulation valve, with straight bonnet arrangement
Type ICM, ICS, ICL, ICF

Nominal bore	**ICM, ICS, ICL, ICF** **DN20-80 mm** ($^3/_4$ - 3 in.)	
Classified for	**Fluid Group I** (all refrigerants (toxic, non-toxic, flammable and non-flammable)) For further details / restrictions - see Installation Instruction	
Temperature range	**ICM, ICS, ICL, ICF**	–60°C/+120°C (–76°F/+248°F)
Maximum allowable working pressure	**ICM, ICS, ICL, ICF** **DN20-DN80** ($^3/_4$ - 3 in.)	**52 bar (754 psi)** **–60°C/+120°C (–76°F/+248°F)**

Conformity and Assessment Procedure Followed

		ICV 25-65 platform	**ICV 20**
Category		**II**	**Article 3, paragraph 3**
Module		**D1**	
Certificate ID		*D1: 07 202 0511 Z 0009/1/H-0002*	
Nominal bore	Standard appl.	**ICM, ICS, ICL, ICF** **DN20-80 mm ($^3/_4$ - 3 in.)**	**ICM** **DN 15-25 ($^1/_2$ - 1 in.)**

Name and Address of the Notified Body which carried out the Inspection

TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

CE
(0045)

Name and Address of the Notified Body monitoring the Manufacturer's Quality Assurance System

TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

References of Harmonised Standards used

EN 10213-3 EN 10222-4

References of other Technical Standards and Specifications used

EN 12284 AD-Merkblätter

Authorised Person for the Manufacturer within the European Community

Name: Michael Breumsø **Title:** Production Manager

Signature: M.Breumsø **Date:** 01/03/2006

148B9746 - rev. 3 ECM 500000018810

Instruction

Motorstyret ventil ICM 20 - 65
Motor operated valve ICM 20 - 65
Motorventil ICM 20 - 65
Vanne motorisée ICM 20 - 65

027R9777

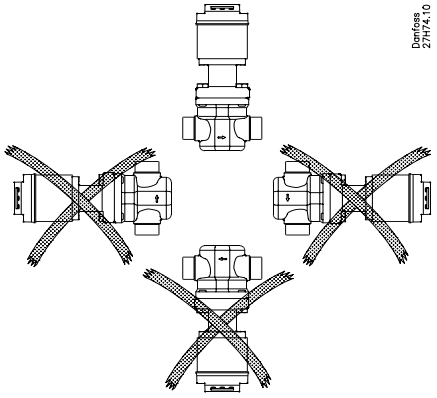


Fig.1

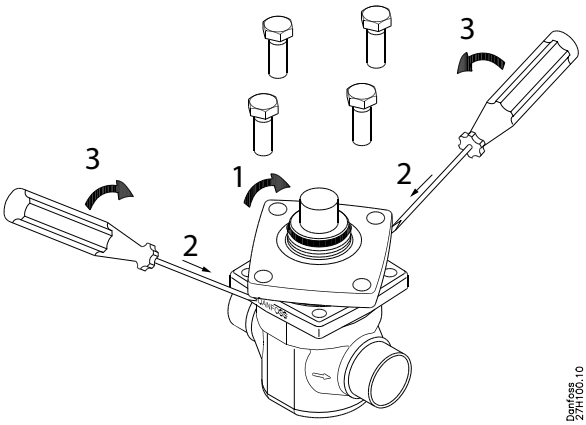


Fig.2

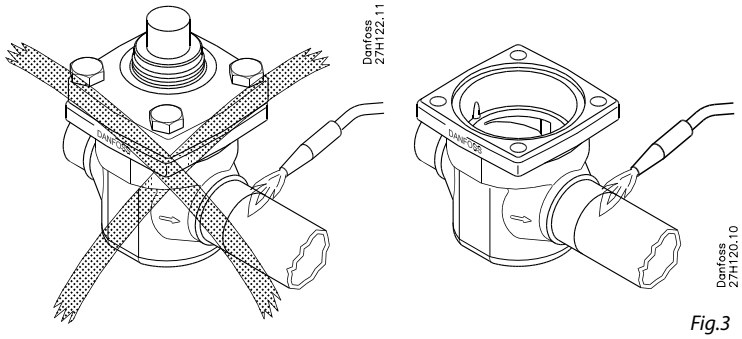
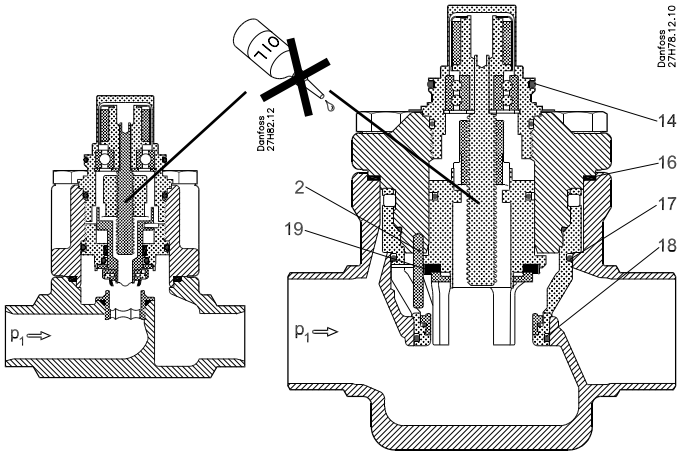
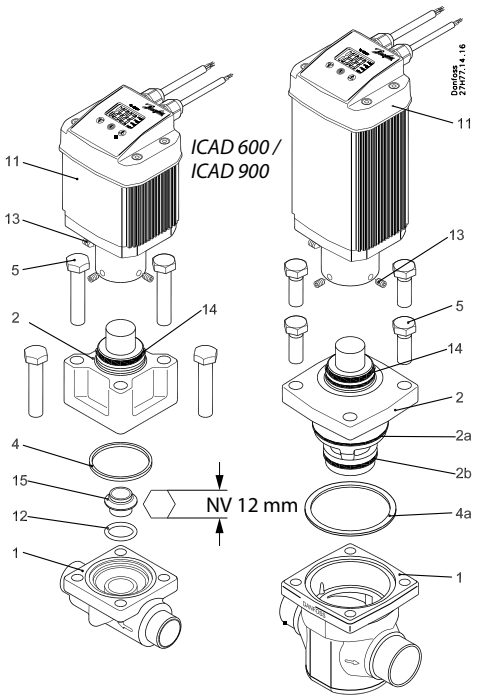


Fig.3



ICM 20 *ICM 25 - 65*

Fig.4



ICM 20 *ICM 25 - 65*

Fig.5

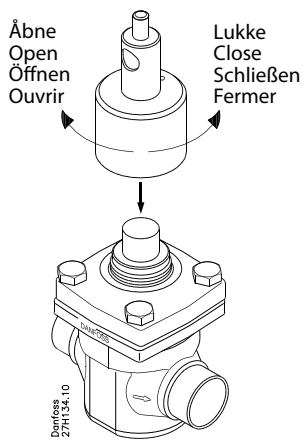
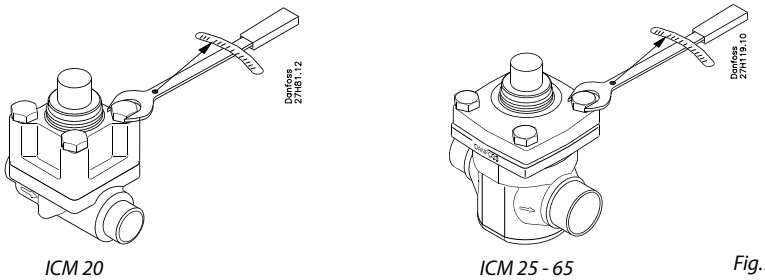


Fig.6

Ventilhus / Valve body / Ventilgehäuse / Corps de vanne	Nm	ft lbs
ICM 20	40	29
ICM 25	100	74
ICM 32	120	88
ICM 40	120	88
ICM 50	140	103
ICM 65	150	110



ICM 20 *ICM 25 - 65*

Fig.7

 DKRCI.PI.HT0.A3.52 / 520H0073

ENGLISH

Installation

Refrigerants
Applicable to all common non-flammable refrigerants, including R717 and non-corrosive gases/liquids dependent on sealing material compatibility.
Flammable hydrocarbons are not recommended. The valve is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range
Media: –60/+120°C (–76/+248°F)
Ambient: –30/+50°C (–22/+122°F)

Pressure
The valves are designed for a max. working pressure of 52 bar g (754 psig).

Technical data
ICM is a balanced valve which remains in its position. Return function must be provided with the actuator used.

The ICM can be used in suction, liquid, hot gas, and liquid/vapour lines. The ICM regulates the flow of the medium by modulation or on/off function, depending on the control impulse to the actuator. Refer to the technical leaflet for details on design and regarding selections.

The ICM valve is designed for use with the ICAD actuator from Danfoss. The ICAD actuator on the ICM ensures compatibility with the regulators provided by Danfoss plus a range of other controllers, especially PLC controllers. A control signal from a Danfoss controller or PLC will activate the ICAD motor and through a magnetic coupling rotate the spindle in the ICM to make the cone move vertically.

Valve cone
A V-shaped regulating cone provides optimum regulation accuracy.

Valve sizes
ICM is available in sizes from ICM 20-A (k_v: 0.6 m^3/h) to ICM 65-B (k_v: 70 m^3/h).

Modular valve concept
The ICM valve can be delivered as a parts program or a complete valve depending on the combination of parts wanted to form the selected and needed valve.
If the valve is delivered as a parts program it will consist of a valve body, a complete function module, and an actuator.

Installation
ICM + ICAD can be installed in horizontal pipelines with the actuator pointing upwards (fig. 1).

The top cover of the ICM can be turned 90° in any direction without any influence on the valve function. The motor can be mounted in any position before locking it with the 4 Allen screws (fig. 5, pos.13).

The ICM valve must be installed with the arrow in the direction of flow.
When installing an ICM, refrigerant must not be allowed to escape and dirt must not be allowed to enter the valve.
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.

ICM 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.

Welding (fig. 3)
The top cover, complete with function module, should be removed before welding to prevent damage to O-rings and Teflon (PTFE) in the function module and to avoid getting welding debris in the module.

Note: Remove <u>all</u> parts from the valve body before welding (as shown in fig. 3). Especially on ICM 20 it is important to remove the seat (fig. 5, pos. 15) as the heat will damage the seat.
Reassemble and tighten with hexagon key 12 mm (2 Nm).

The internal surfaces and weld connections of the enclosed ICS/ ICM valve have been applied with an anti-corrosion treatment.

In order to maintain the effectiveness of this anti-corrosion treatment, it is important to ensure that the valve is disassembled just prior to the welding / brazing process being undertaken.

In the event that the function modules are to be left disassembled for any length of time, please ensure that the function modules are further protected by placing in a polyethylene bag or by applying a rust protection agent (e.g. refrigeration oil or BRANOROL) on the surfaces.

Only materials and welding methods, compatible with the valve body material, must be welded to the valve body. 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 valve body and the function module. The valve body must be free from stresses (external loads) after installation.

Manual operation
A magnetic coupling can be used to rotate the spindle manually if the actuator has been removed. To make use of the manual operation, a multi-function tool (optional) is used (see fig. 6). The code numbers for the multi-function tools are:

ICM 20 – ICM 32: **027H0180**
ICM 40 – ICM 65: **027H0181**

Manual operation is also possible with the actuator mounted on the valve and the power supply connected to the actuator. No matter if the signal connections are wired to the actuator it will be possible to use the manual operation function built into the actuator electronics allowing the motor to step in 1% increments meaning that 100 steps will correspond to a fully open valve. Please refer to the separate instruction on ICAD to address the manual function.

Insulation
Insulating the valve and its actuator is only necessary if an energy consideration in the plant requires this. Regarding the function of the ICM + ICAD no insulation is necessary when kept inside temperature limits.

Surface treatment and identification
The ICM valves are Zinc-Chromated from factory. If further corrosion protection is required, the valves can be painted.

Note: Magnet coupling must be protected.

Precise identification of the valve is made via the ID plate on the top cover. After welding, the external surface around the connections of the valve body must be protected to prevent against corrosion with a suitable coating.
Protection of the ID plate when repainting the valve is recommended.

Assembly
Remove welding debris and any dirt from pipes and valve body before assembly. Check that the cone has been fully screwed back towards the top cover before it is mounted in the valve body. Use the manual magnetic tool (fig. 6) to achieve rotation through the top. A small amount of refrigeration oil on both O-rings can make the insert easier to install into the valve body.

Tightening
Tighten the top cover/function module with a torque wrench, to the values indicated in the table (fig. 7).

Maintenance

Service
A precise service schedule cannot be given for the valve as service intervals will depend on operating conditions, i.e. how often the valve operates and the amount of impurities and dirt the system carries.
The ICM valves are easy to dismantle and all parts inside can be replaced by changing the function module.
Do not open the valve while the valve is still under pressure.

Be aware that the valve can be under pressure from both sides and that the manual magnet tool (fig. 6) can be used to open the seat and thus equalize pressure internally before removing the top cover.

If the Teflon ring (fig. 4, pos. 19) has been damaged, the Teflon must be machined or replaced according to the condition of the parts.

Dismantling the valve (fig. 2)
Do not remove the function module while the valve is still under pressure.
- (1) Upon removing the 4 bolts twist the module approx. 45° in either direction.
- (2) Push two screwdrivers in between the top cover and the valve body.
- (3) Pull the screwdrivers upwards to release the function module and its o-rings.

Replacement of the function module
The function module is easily replaced.
Remove the existing module (fig. 2):
(1) Upon removing the 4 bolts twist the module approx. 45° in either direction.
(2) Push two screwdrivers in between the top cover and the valve body.
(3) Pull the screwdrivers upwards to release the function module and its o-rings.
- Remove the old module.
- Oil the O-rings on the new module with a small amount of refrigeration oil.

The spindle inside the valve must not be greased or oiled (fig. 4).

If the valve seat has been dismounted, the ICM top must remain loosely connected to this. The two Allen screws that are holding the insert should not be tightened for the alignment to be precise.

Please observe, when used in CO2, that the o-rings (Pos. 2a and 2b on fig.5) on the ICM module can swell (grow).
At service it is recommend that new o-rings are installed, before the ICM functions module again is installed in the ICV valve body.

Use only original Danfoss parts, including 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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Danfoss accepts no responsibility for errors and omissions. Danfoss Industrial Refrigeration reserves the right to make changes to products and specifications without prior notice.

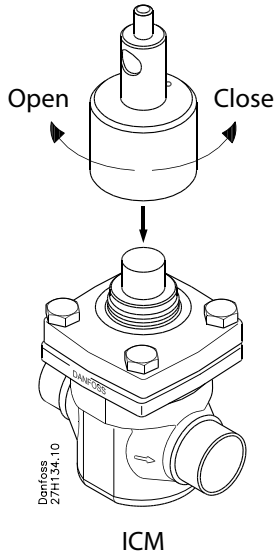
Instruction

Multi-function Tool

Installation

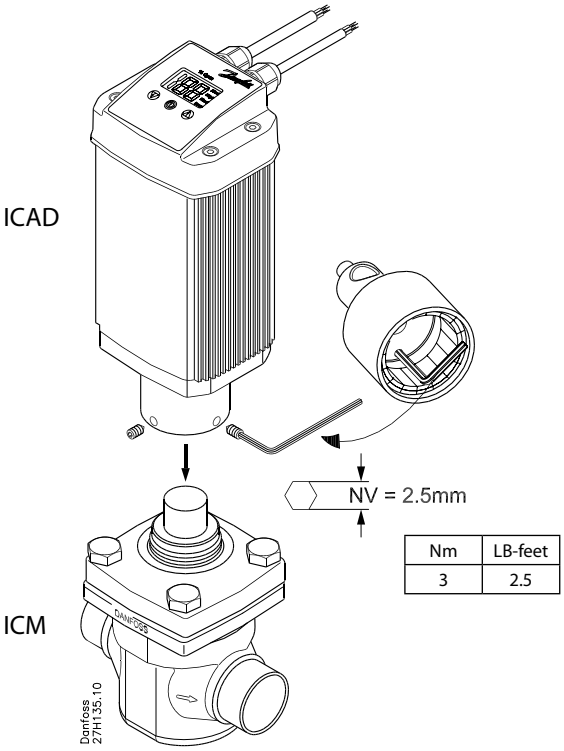
027R9781

Manual open / close of ICM
without ICAD installed



1

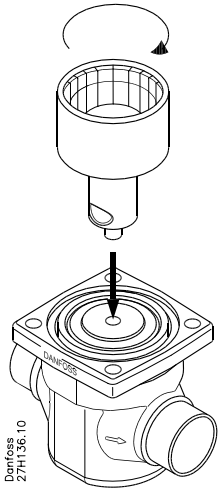
Mounting of ICAD on ICM



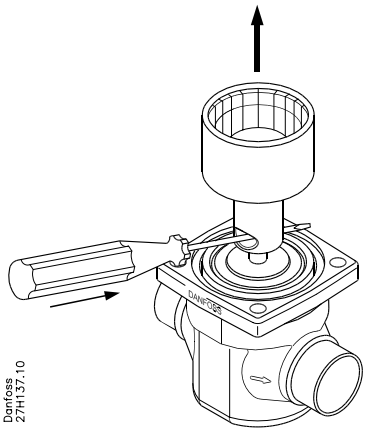
Nm	LB-feet
3	2.5

2

Removal of function module (ICS)

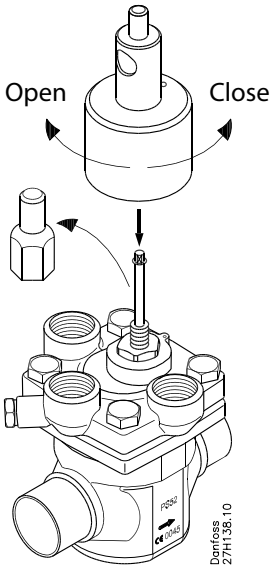


3a



3b

Operation of manual spindle
(ICS or PM)



4

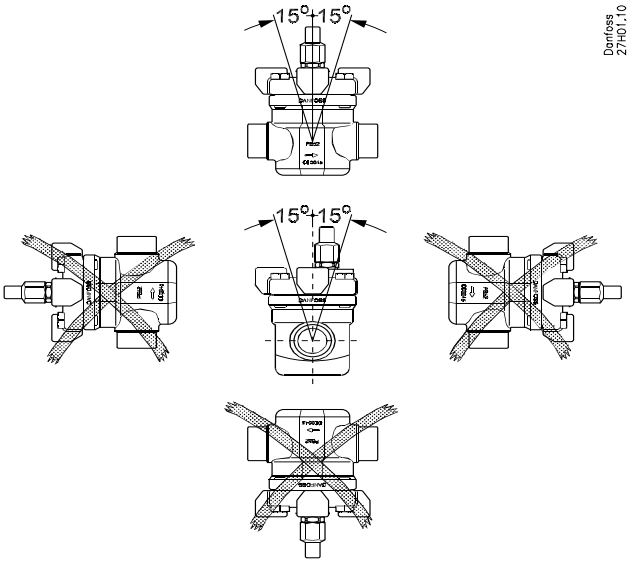
027R9781

Instruction

Servostyret ventil ICS 25 - 65
Servo Operated Valve ICS 25 - 65
Servoventil ICS 25 - 65
Vanne à servocommande ICS 25 - 65
Válvula servoaccionada ICS 25 - 65

Installation

027R9775



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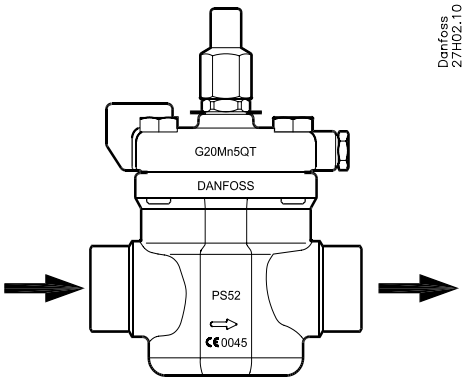

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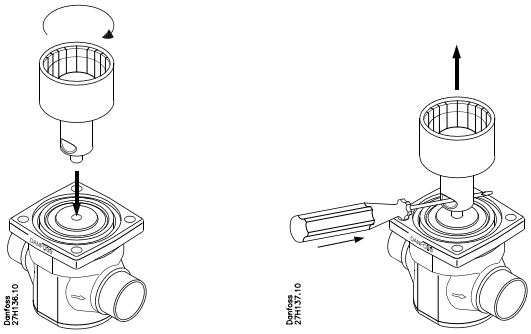

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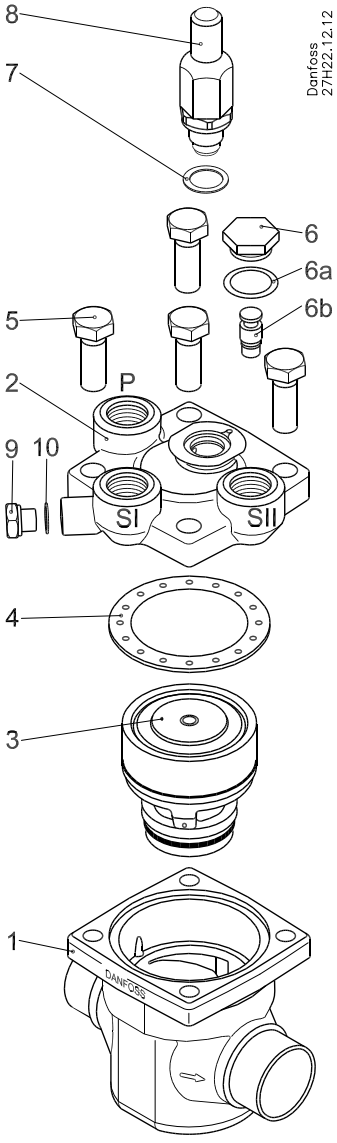

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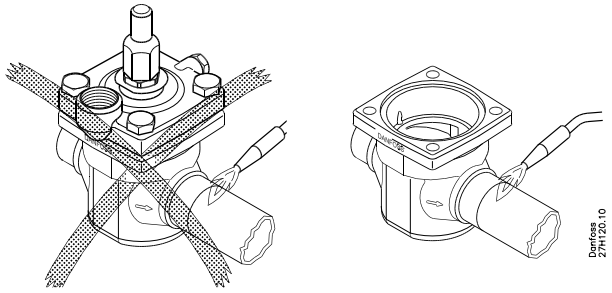

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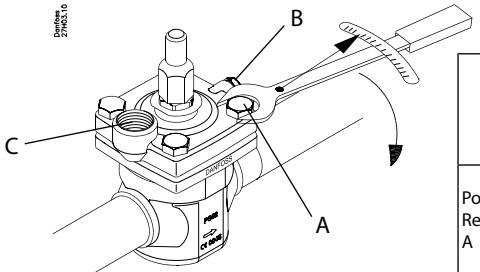

	Ventilhus størrelse Valve body size Ventil-gehäusegröße Taille du corps de vanne Tamaño del cuerpo de la válvula	Nm	ft lb Pie-lb
Pos. Rep. A	25	100	74
	32	120	88
	40	120	88
	50	140	103
	65	150	110
Pos. Rep. B	25	25	18
	32		
	40		
	50		
	65		
Pos. Rep. C	25	50	37
	32		
	40		
	50		
	65		

6

Installation

Refrigerants
Applicable to all common non-flammable refrigerants, including R717 and non-corrosive gases/liquids dependent on sealing material compatibility.
Flammable hydrocarbons are not recommended.
The valve is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range
–60/+120°C (–76/+248°F)

Pressure range
The valves are designed for a max. working pressure of 52 bar g (754 psi g).

Technical data
The ICS can be used in suction, liquid, hotgas and liquid/vapor lines. The ICS regulates the flow of the medium by modulation or on/off function, depending on the control impulse from the screwed on pilot valve or valves.

Regulating range
Dependent on the chosen type and combination of pilot valves.

Opening differential pressure (p)
The ICS main valve requires a minimum opening differential pressure of 0.07 bar (1 psi) to begin to open and 0.2 bar (3 psi) to be completely open.

The valve must be protected against back pressure. A check valve should be installed upstream of the ICS in installations where there is a risk of back pressure. Back pressure can affect the correct position of the piston ring.

Design (fig. 4)
1. Body
2. Top cover
3. Function module
4. Gasket
5. Bolts
6. Plug
7. Gasket
8. Manual operating spindle
9. Plug
10. Gasket

Installation

The valve must be installed with the spindle in vertically upwards position (fig. 1).

The valve must be installed with the arrow in the direction of the flow and the top cover upwards (fig. 2). The top cover can be rotated 4 X 90° in relation to the valve body.
The valve is fitted with a spindle for manual opening. If an external pilot valve is used, the pilot line must be connected to the upper side of the main line so that any dirt and oil from the plant will not find its way into the pilot line.
If the ICS 1 is to be used as a solenoid valve in a liquid line, external control pressure cannot be recommended because it can cause liquid hammer.
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.

Welding (fig. 3, 4 and 5)
The top cover (fig. 4, pos. 2) and function module (fig. 4, pos. 3), must be removed before welding to prevent damage to o-rings and teflon (PTFE) in the function module and to avoid getting welding debris in the module.
The function module can be lifted out using a bolt size M6 or multi-function tool screwed into the threaded hole of the piston on the function module (fig. 3). Debris blocking the bolt hole will need cleaning.

Note: Remove <u>all</u> parts from the valve body before welding (as shown in fig. 5).

The internal surfaces and weld connections of the enclosed ICS/ICM valve have been applied with an anti-corrosion treatment.

In order to maintain the effectiveness of this anti-corrosion treatment, it is important to ensure that the valve is disassembled just prior to the welding / brazing process being undertaken.

In the event that the function modules are to be left disassembled for any length of time, please ensure that the function modules are further protected by placing in a polyethylene bag or by applying a rust protection agent (e.g. refrigeration oil or BRANOROL) on the surfaces.

Only materials and welding methods, compatible with the valve body material, must be welded to the valve body. 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 valve body and the function module. The valve body must be free from stresses (external loads) after installation.

The 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.

Assembly
Remove welding debris and any dirt from pipes and valve body before assembly. Check that the o-rings are intact before replacing the function module. If possible, apply some refrigeration oil to ease the insertion and to protect the o-rings. Check that the top gasket has not been damaged. If the surface has been damaged or the gasket has been bent, it must be replaced.

Tightening (fig. 6)
Tighten the top cover with a torque wrench, to the values indicated in the table.

Colours and identification
The ICS valves are Zinc-Chromated from factory. The Zinc-Chromatization does not cover the welding connections. 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 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

Service
The ICS valves are easy to dismantle.

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

Pressure relief can be done by carefully opening the manual operating spindle. Small grooves along the thread will release refrigerant into open air. This operation must only be done after providing the correct countermeasures under local legislation.

The function module can be lifted out using a bolt size M6 screwed into the threaded hole of the piston on the function module (fig. 3). Debris blocking the bolt hole will need cleaning.

Upon opening and removal of the function module:
- Check that the o-rings on the function module has not been damaged. A valve with a damaged o-ring might not modulate according to the specification.
- Check that the piston and cylinder is free of scratches and look for wear marks. If the wear is excessive the function module should be replaced to prevent false pilot signal around the piston ring.
- Check that the movement of the cylinder and valve seat is free and with low friction.
- If the teflon valve plate has been damaged, the function module 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 by particles or similar.

If possible, apply some refrigeration oil to ease the insertion and to protect the o-rings.

Tightening (fig. 6)
Tighten the top cover with a torque wrench, to the values indicated in the table.

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

In cases of doubt, please contact Danfoss.

Drawings are only for illustration, not for dimensioning or construction.

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Instruction

Servo Operated Valve ICS 100 - 150

Installation

027R9793

Mounting orientation

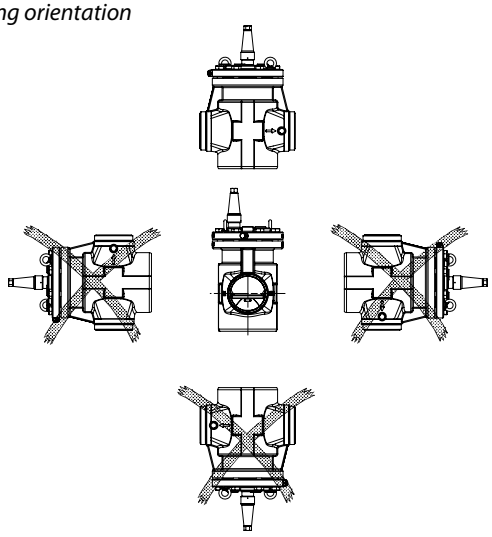


fig. 1

Direction of flow

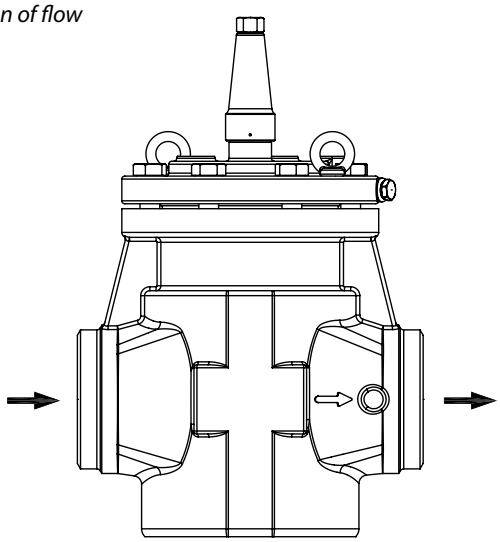


fig. 2

027R9793

Removing function module with eyebolt

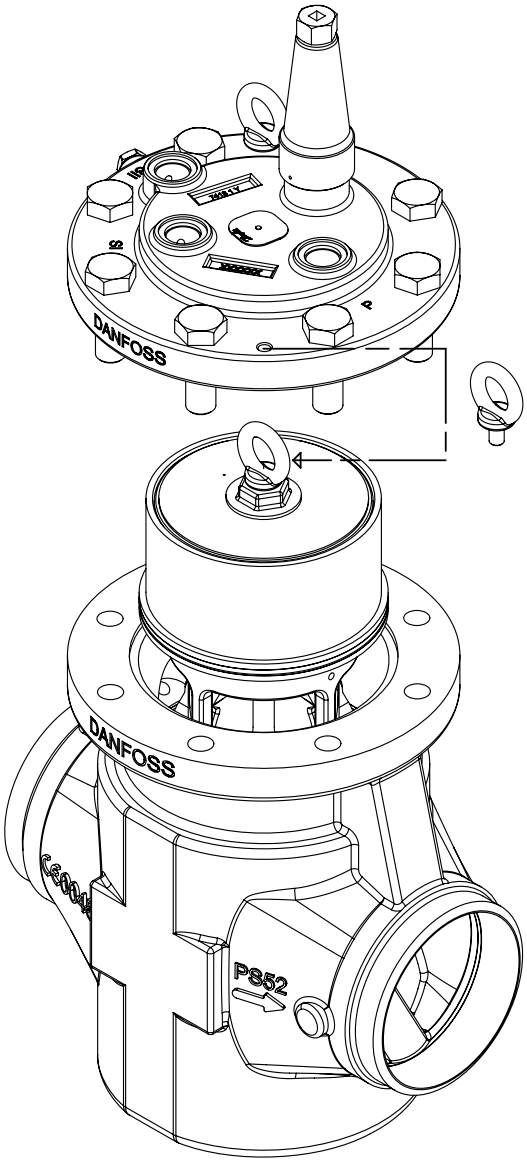


fig. 3

Exploded view

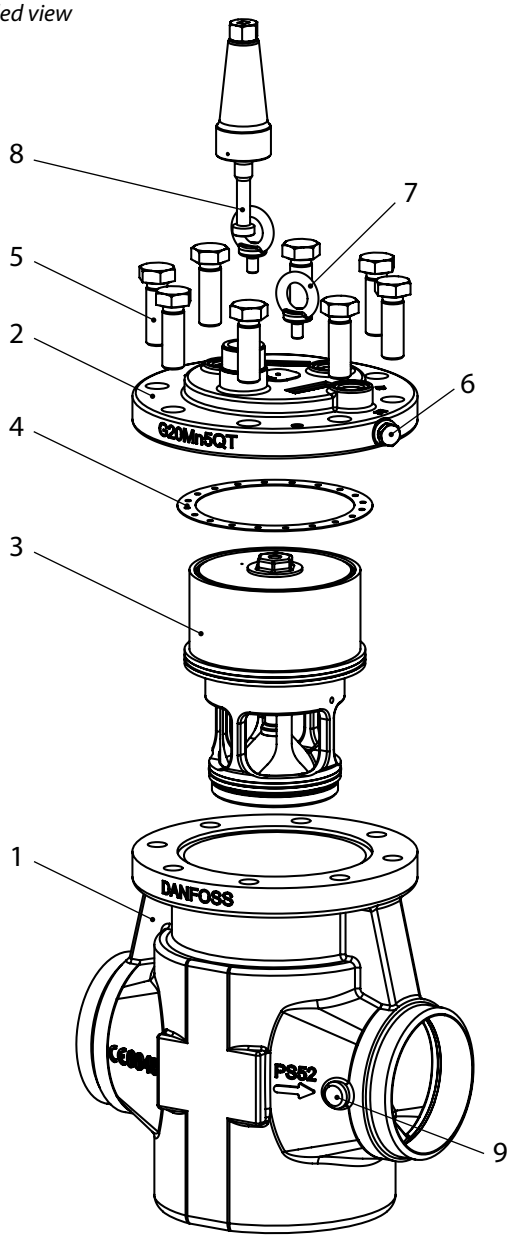


fig. 4

 DKRCI.PI.HS0.B2.02 / 520H3521

Installation

Welding

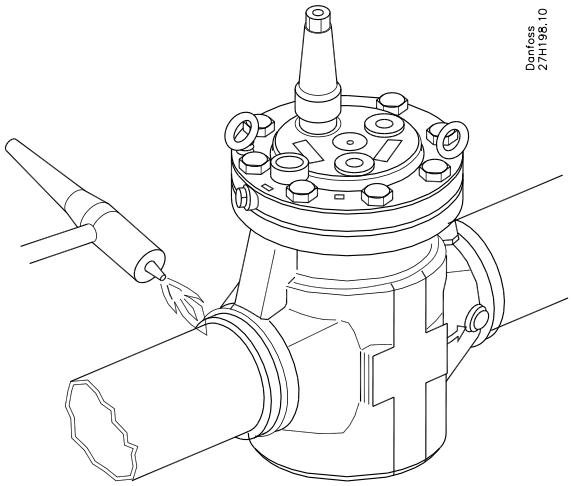
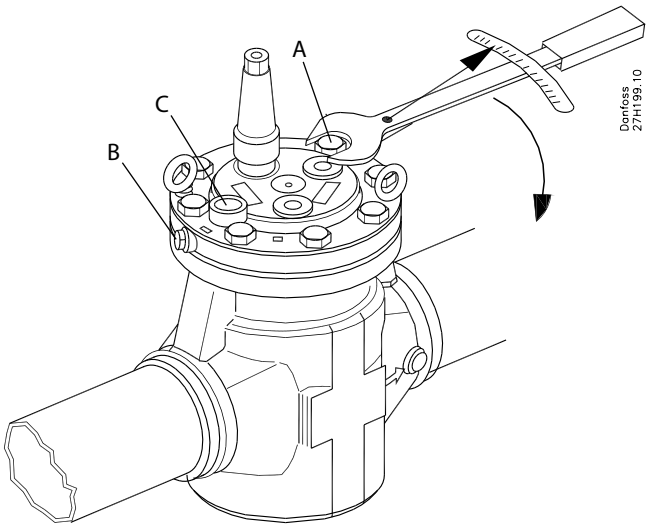


fig. 5

Torque specification

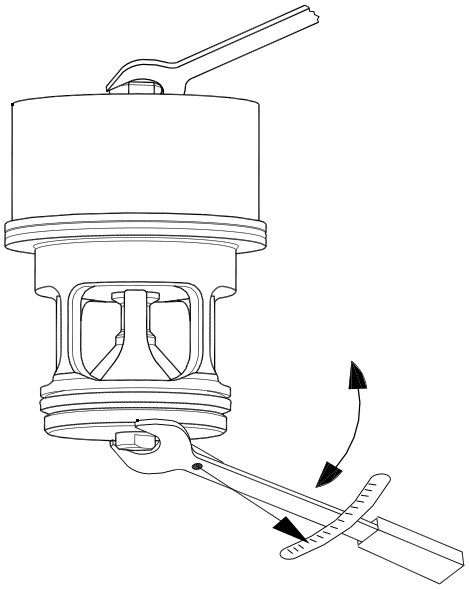


	Valve body size	Nm	ft lb
Pos. A	100-150	220	162
Pos. B	100-150	25	18
Pos. C	100-150	50	37

fig. 6

Maintenance

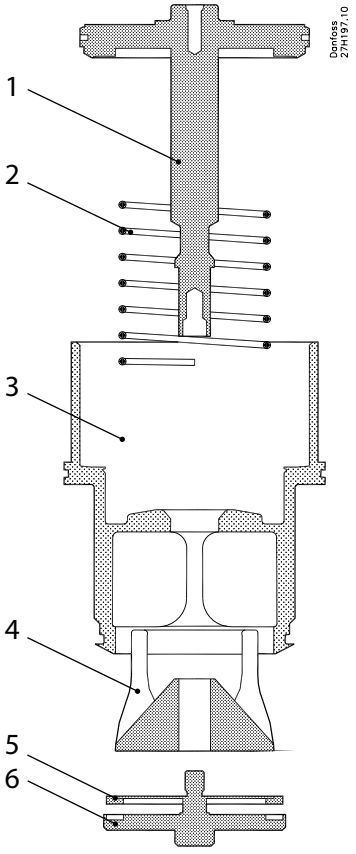
Module torque specification



ICS 100-150 = 80 Nm (59 ft lb)

fig. 7

Exploded view of function module



1. Piston
2. Spring
3. Insert
4. Cone
5. Valve plate
6. Washer plate

fig. 8

Installation

Refrigerants
Applicable to R717. For other refrigerants please contact Danfoss
Flammable hydrocarbons are not recommended.
The valve is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range
–60/+120°C (–76/+248°F)

Pressure range
The valves are designed for a max. working pressure of 52 bar g (754 psi g).

Technical data
The ICS can be used in suction, liquid, hotgas and liquid/vapor lines. The ICS regulates the flow of the media by modulation or on/off function, depending on the control impulse from the screwed on pilot valve or valves.

Regulating range
Dependent on the chosen type and combination of pilot valves.

Opening differential pressure (p)
The ICS main valve requires a minimum opening differential pressure of 0.07 bar (1 psi) to begin to open and 0.2 bar (2.9 psi) to be completely open.

The valve must be protected against back pressure. A check valve should be installed upstream of the ICS in installations where there is a risk of back pressure. Back pressure can affect the correct position of the piston ring.

Design (fig. 4)
1. Body
2. Top cover
3. Function module
4. Gasket
5. Bolts
6. Plug
7. Eye bolt
8. Manual operating spindle
9. $^{3}/_{8}$ NPT plug
   (available on certain valve bodies)

Installation

The valve must be installed with the manual opening in vertically upwards position (fig. 1).

The valve must be installed with the arrow in the direction of the flow and the top cover upwards (fig. 2). The top cover can be rotated in any direction.
The valve is fitted with a spindle for manual opening. The spindle can open the ICS 100-150 valves against a differential pressure of 10 bar (154 psi). If an external pilot valve is used, the pilot line must be connected to the upper side of the main line so that any dirt and oil from the plant will not find its way into the pilot line.
If the ICS is to be used as a solenoid valve in a liquid line, external control pressure cannot be recommended because it can cause liquid hammer.

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.

Welding (fig. 3, 4 and 5)
The valve can stay assembled during the welding process provided that the welding method is controlled and ensuring no welding debris.
The function module can be lifted out using a bolt size M10 or by using one of the eyebolts placed in the topcover (fig 4, pos. 7). Debris blocking the bolt hole will need to be removed.

The internal surfaces and weld connections of the enclosed ICS/ICM valve have been applied with an anti-corrosion treatment.

In the event that the function modules are to be left disassembled for any length of time, please ensure that the function modules are further protected by placing in a polyethylene bag or by applying a rust protection agent (e.g. refrigeration oil or BRANOROL) on the surfaces.

Only materials and welding methods, compatible with the valve body material, must be welded to the valve body. The valve should be cleaned internally to remove welding debris on completion of welding.

Avoid welding debris and dirt in the valve body and the function module. The valve body must be free from stresses (external loads) after installation.

The 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.

Assembly
Remove welding debris and any dirt from pipes and valve body before assembly. Check that the o-rings are intact before installing the function module. If possible, apply some refrigeration oil to ease the insertion and to protect the o-rings. Check that the top gasket has not been damaged. If the surface has been damaged or the gasket has been bent, it must be replaced.

Tightening (fig. 6)
Tighten the top cover with a torque wrench, to the values indicated in the table.

Colours and identification
The ICS valves are Zinc-Chromated from factory. The Zinc-Chromatization does not cover the welding connections. 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 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

Service
The ICS 100-150 valves are easy to dismantle and can be serviced by using spare parts available from Danfoss.

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

Pressure relief can be done by carefully opening the manual operating spindle. Because of small grooves along the thread on the spindle, refrigerant can be released into open air when operating the manual opener. This operation must only be done after providing the correct countermeasures under local legislation.

The function module can be lifted out using a bolt size M10 screwed into the threaded hole of the piston on the function module (fig. 3). Debris blocking the bolt hole will need to be removed.

The ICS 100-150 insert can be serviced by dismantling the insert. This is done by screwing off the washer plate fig 7 and removing the parts (fig 8). When reassembling the valve, Danfoss recommends to use Loctite 586 or similar on the thread of the washer plate.

Upon opening and removal of the function module:
- Check that the o-rings on the function module has not been damaged. A valve with a damaged o-ring might not modulate according to the specification.
- Check that the piston and cylinder is free of scratches and look for wear marks. If the wear is excessive the function module should be serviced or replaced to prevent false pilot signal.
- Check that the movement of the cylinder and valve seat is free and with low friction.
- If the teflon valve plate has been damaged the teflon valve plate should be replaced by using a Danfoss sparepart kit.

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

If possible, apply some refrigeration oil to ease the insertion and to protect the o-rings.

Tightening (fig. 6)
Tighten the top cover with a torque wrench, to the values indicated in the table.

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

In cases of doubt, please contact Danfoss.

Drawings are only for illustration, not for dimensioning or construction.

Danfoss accepts no responsibility for errors and omissions. Danfoss Industrial Refrigeration reserves the right to make changes to products and specifications without prior notice.

DECLARATION OF CONFORMITY
The Pressure Equipment Directive 97/23/EC

Name and Address of Manufacturer within the European Community

Danfoss A/S
Albuen 29
DK 6000 Kolding
Denmark

Description of Pressure Equipment

Refrigerant regulation valve, with straight bonnet arrangement
Type ICS 100-150 & ICM 100-150

Nominal bore	DN100-150 mm (4 - 6 in.)	
Classified for	Fluid Group I (all refrigerants (toxic, non-toxic, flammable and non-flammable))	
Maximum allowable working pressure and temperature range	Standard applications	52 bar (754 psi) –60°C/+120°C (–76°F/+248°F)
	High pressure applications	65 bar (943 psi) –60°C/+120°C (–76°F/+248°F)

Conformity and Assessment Procedure Followed

Category		**III**
Module		B1 + D
Certificate ID		B1: D:07 202 0511 Z 0111/1H
Nominal bore	Standard applications	DN 100-150 mm (4 - 6 in.)
Nominal bore	High pressure applications	DN 100-125 mm (4 - 5 in.)

Name and Address of the Notified Body which carried out the Inspection
TÜV-Nord e.V.
Grosse Bahnstrasse 31
22525 Hamburg, Germany

CE
(0045)

References of Harmonised Standards used
EN 10213-3 EN 10222-4

References of other Technical Standards and Specifications used
EN 12284 AD-Merkblätter

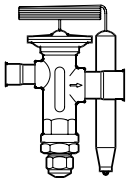
Authorised Person for the Manufacturer within the European Community

Name: Claus Schou Nielsen **Title:** Director, Operations

Signature: **Date:** 01/08/2008

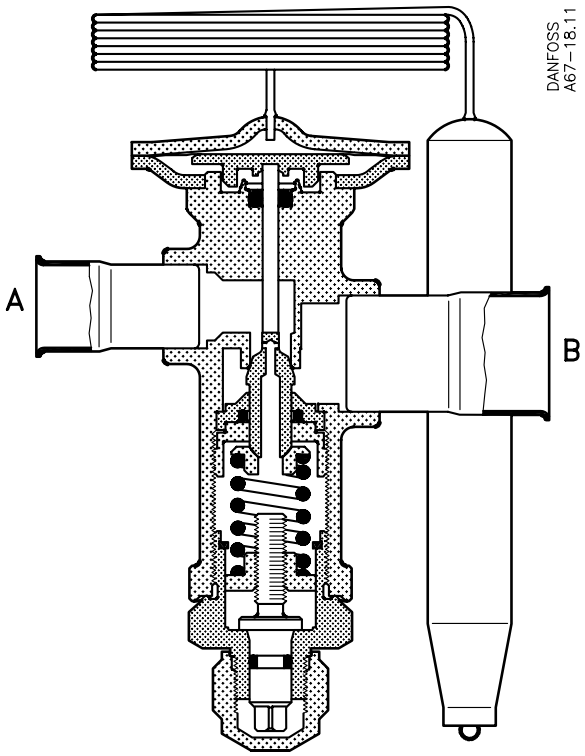
Instruction

TRHE

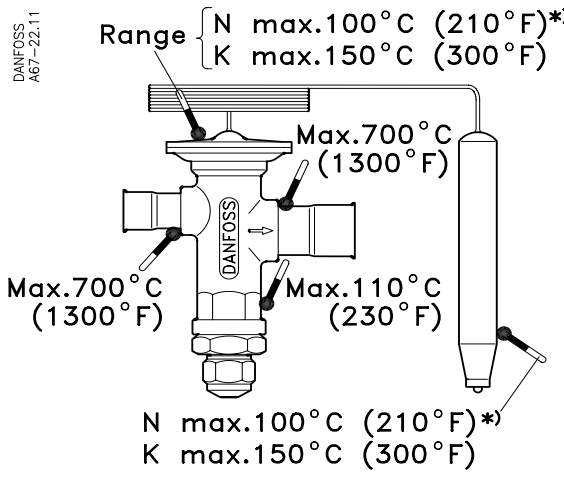


068R9801

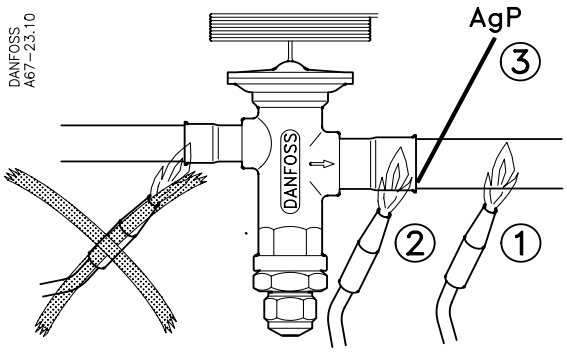
PB = 42 bar / MWP = 600 psig
p_{test} = max. 46.5 bar (670 psig)

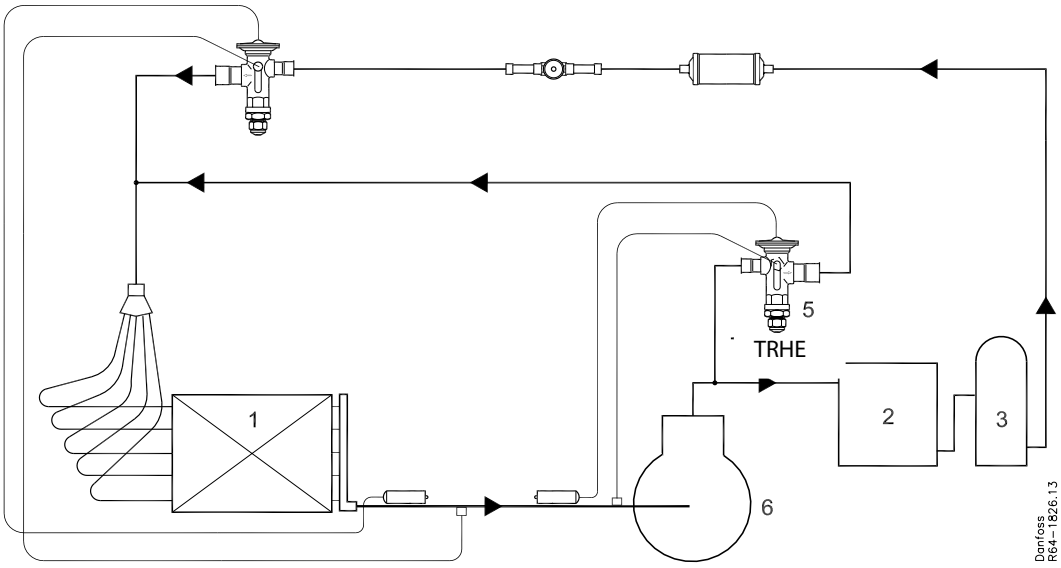


Adjustable setting

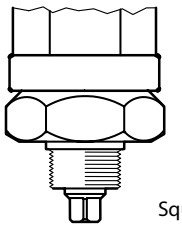


*) R 410A max. 70°C (155°F)

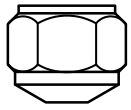




1. Evaporator
2. Condenser
3. Receiver
4. Solenoid valve
5. Discharge bypass valve with adjustable setting
6. Compressor

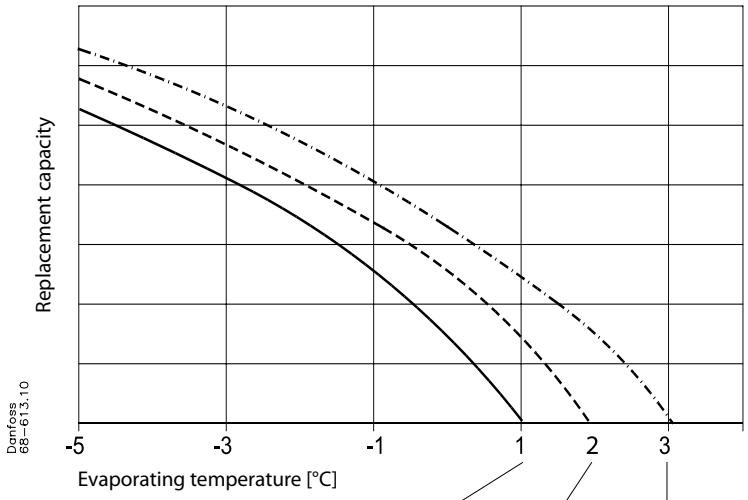


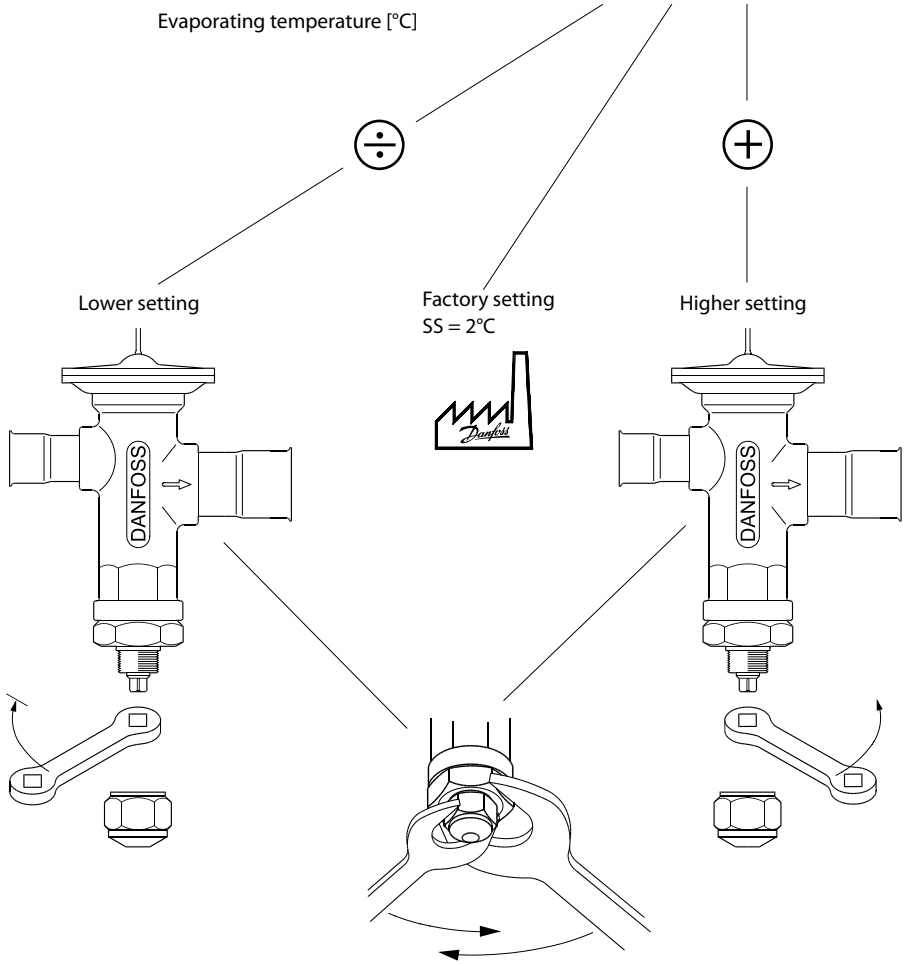
Square $^{3}/_{16}$ in.



⬡=19mm ($^{3}/_{4}$ in.)
T=10Nm
(7ft–lbf)

Setting of TRHE



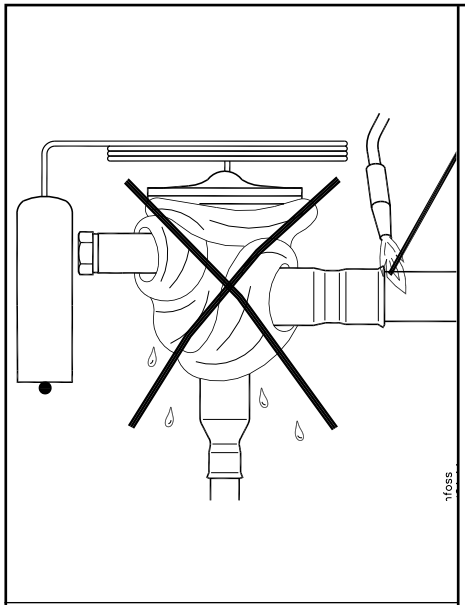


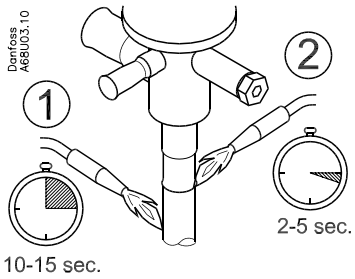
Valve type	°C / turn				
	R134a	R404A/R507	R407C	R410A	R22
TRHE 10	1.1	0.9	1.2	0.8	1.1
TRHE 20	1.4	1.1	1.2	1.2	1.2
TRHE 40	0.8	0.7	0.8	0.6	0.8
TRHE 80	0.8	0.8	1.0	0.6	1.0

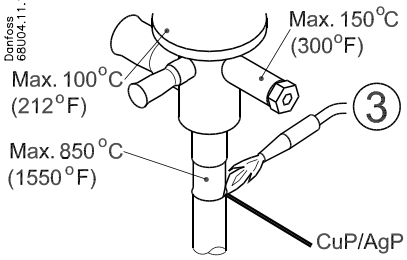
Instructions

Type TUH / TCHE

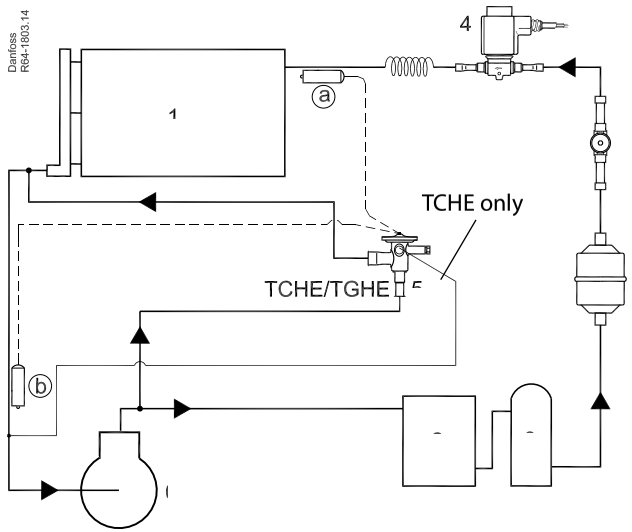
068R9798



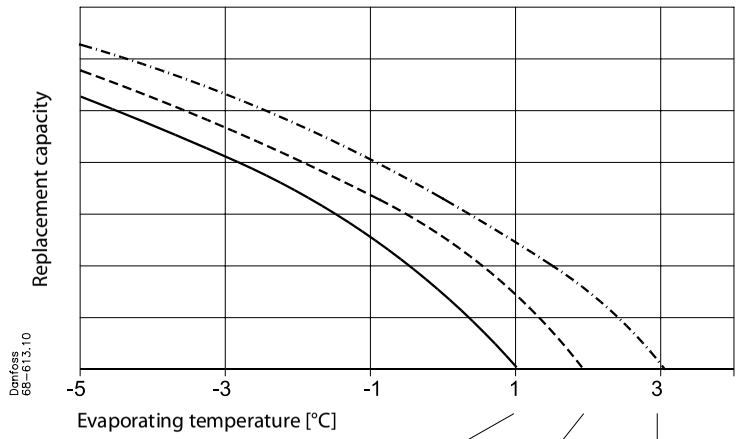


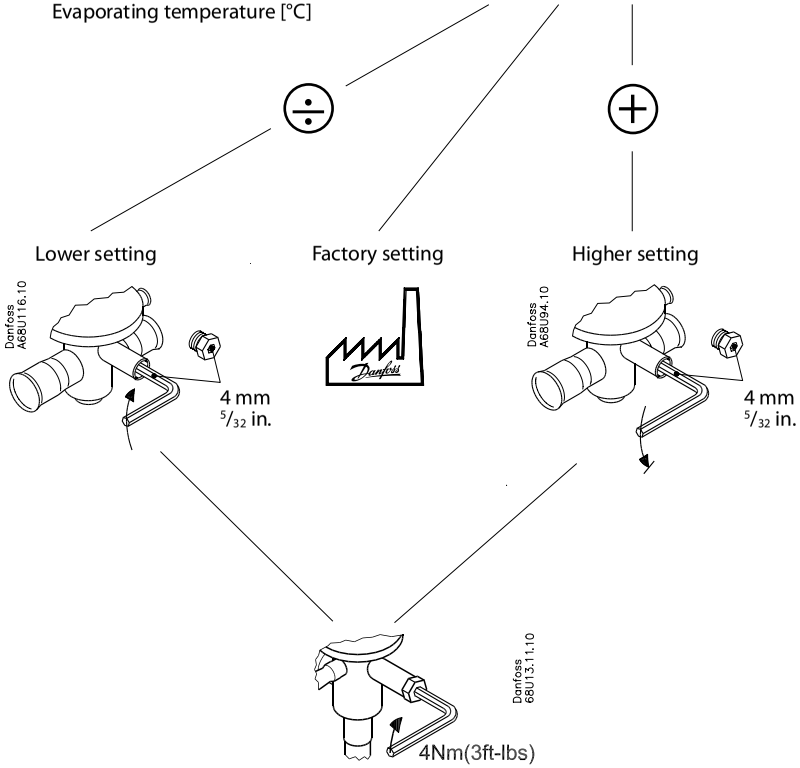


P_{test} = max. 37.5 bar (540 psig)



Setting of TUH / TCHE





Valve type	°C / turn				
	R134a	R404A/R507	R407C	R410A	R22
TUH	1.8	1	1.2	0.7	1.1
TCHE	1.4	0.8	1	1.4	1

