Danfoss ICF 15 Valve Station Installation Guide

ENGINEERING **TOMORROW**
Installation guide
Valve Station
Types ICF 15, ICF 20, ICF 25, ICF SS 20 and ICF SS 25
027R9782

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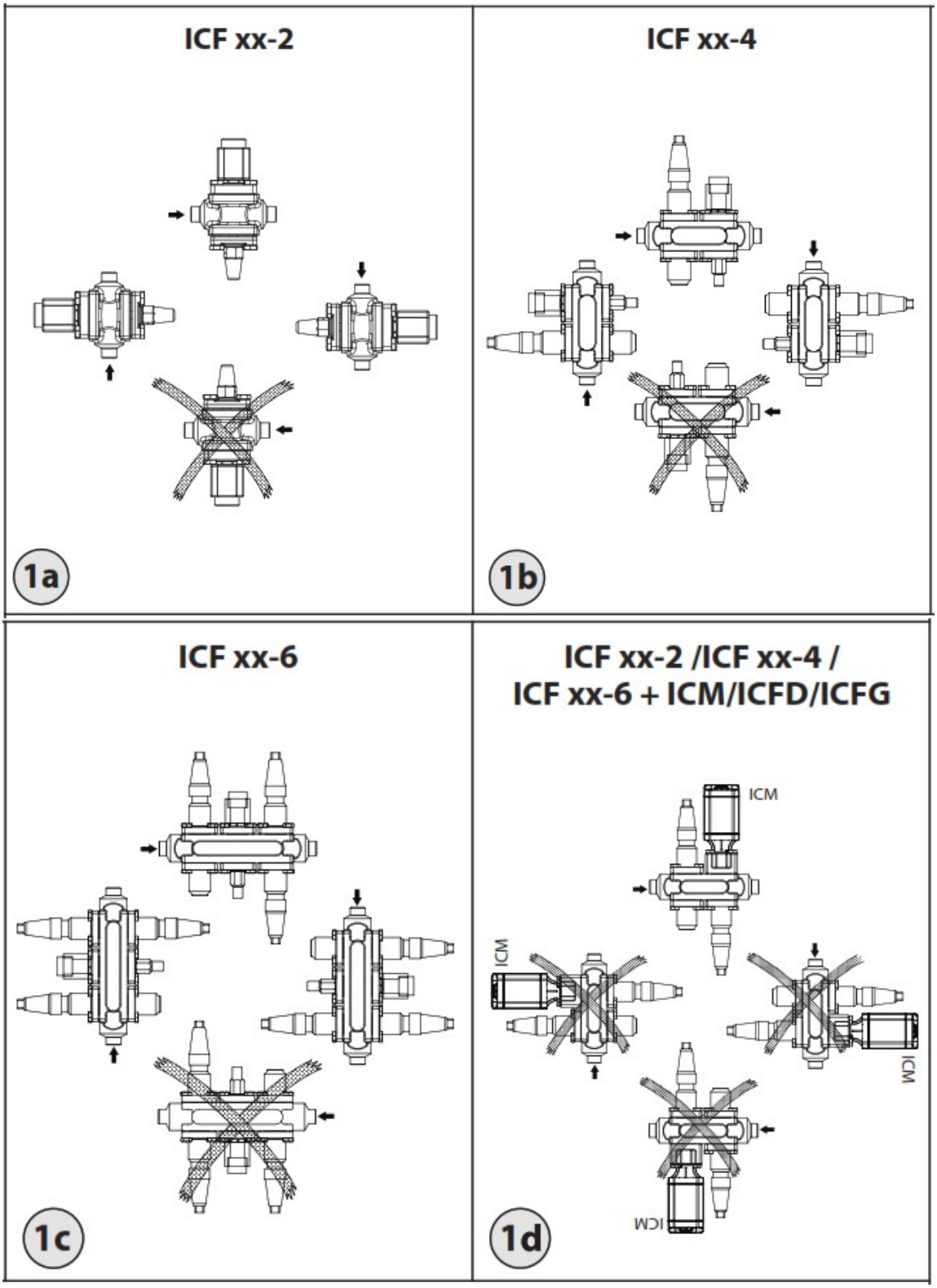
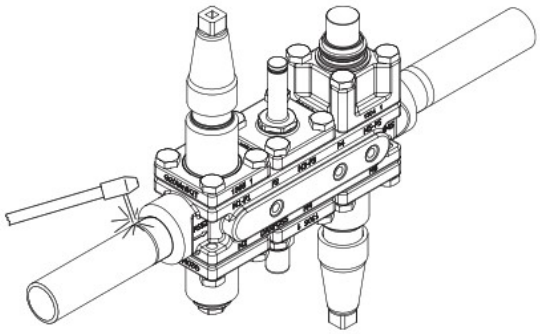
Contents

Installation


ICF xx-2
1a
ICF xx-4
1b
ICF xx-6
1c
ICF xx-2 /ICF xx-4 /
ICF xx-6 + ICM/ICFD/ICFG
ICM
ICM
ICM
ICM
1d

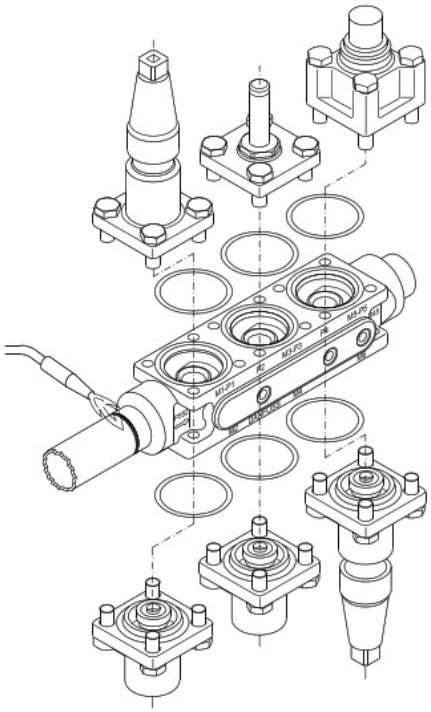
Welding

TIG/MIG/SMAW



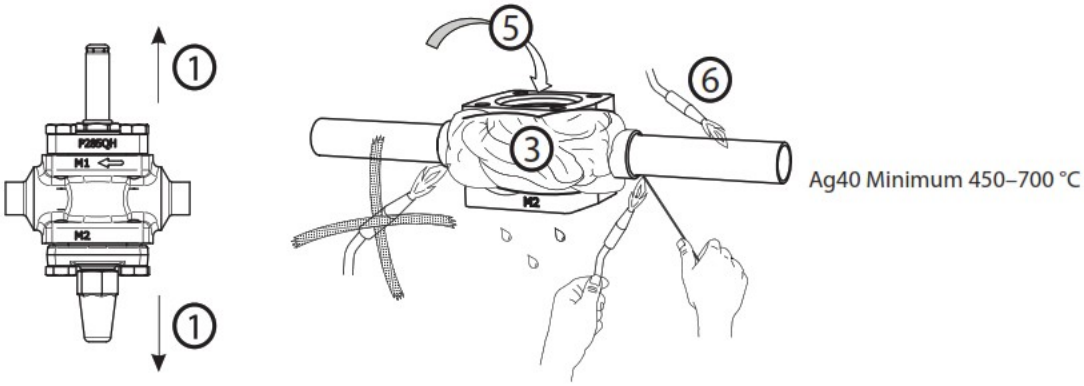
2

Gas welding



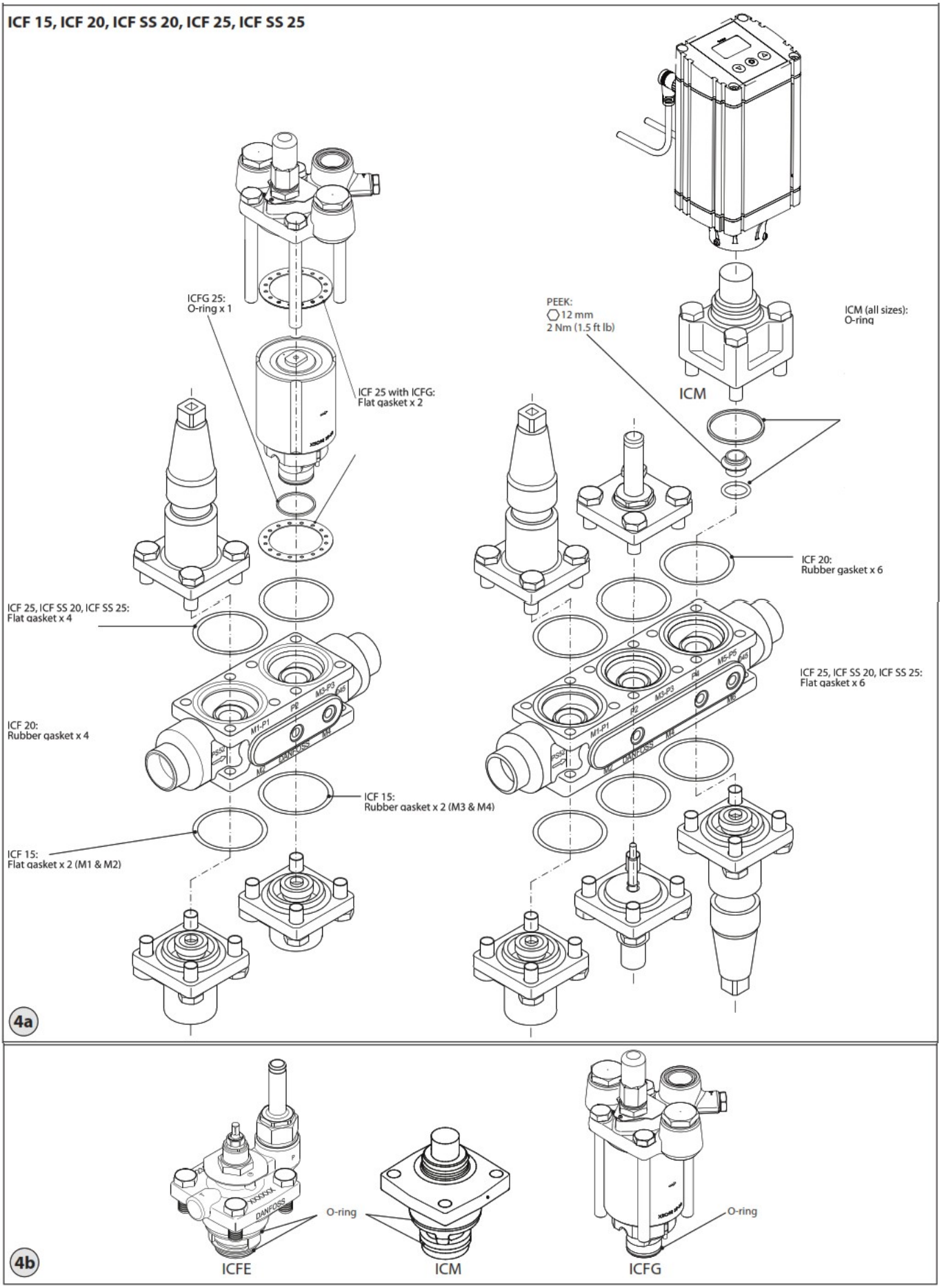
3a

Brazing

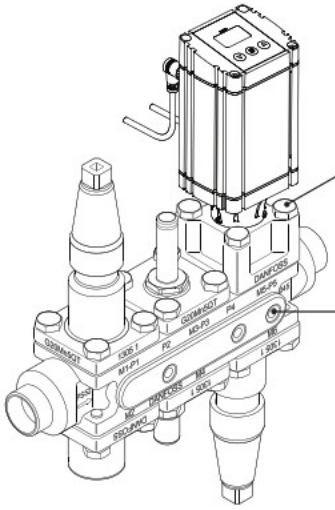


3b

Maintenance


ICF 15, ICF 20, ICF SS 20, ICF 25, ICF SS 25
ICFG 25:
O-ring x 1
ICF 25 with ICFG:
Flat gasket x 2
ICF 25, ICF SS 20, ICF SS 25:
Flat gasket x 4
ICF 20:
Rubber gasket x 4
ICF 15:
Rubber gasket x 2 (M3 & M4)
ICF 15:
Flat gasket x 2 (M1 & M2)
PEEK:
12 mm
2 Nm (1.5 ft lb)
ICM (all sizes):
O-ring
ICM
ICF 20:
Rubber gasket x 6
ICF 25, ICF SS 20, ICF SS 25:
Flat gasket x 6
4a
O-ring
O-ring
ICFE
ICM
ICFG
4b

Tightening



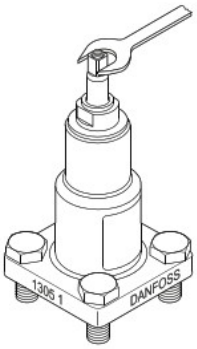
	M1	M2	M3	M4	M5	M6
ICF 15	22 Nm (16 ft lbs)	22 Nm (16 ft lbs)	35 Nm (25.8 ft lbs)	35 Nm (25.8 ft lbs)		
ICF 20 ICF SS 20	35 Nm (25.8 ft lbs)	35 Nm (25.8 ft lbs)	35 Nm (25.8 ft lbs)	35 Nm (25.8 ft lbs)	35 Nm (25.8 ft lbs)	35 Nm (25.8 ft lbs)
ICF 25	60 Nm (44 ft lbs)	60 Nm (44 ft lbs)	60 Nm (44 ft lbs)	60 Nm (44 ft lbs)	60 Nm (44 ft lbs)	60 Nm (44 ft lbs)
ICF SS 25	80 Nm (58 ft lbs)	80 Nm (58 ft lbs)	80 Nm (58 ft lbs)	80 Nm (58 ft lbs)	80 Nm (58 ft lbs)	80 Nm (58 ft lbs)

ICF 15-25	60 Nm (44 ft lbs)
ICF SS 20-25	80 Nm (58 ft lbs)

5

ICF 15, ICF 20, ICF SS 20 Manual stem

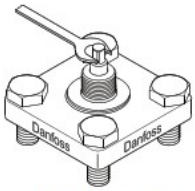
Max. 25 Nm (18 ft lbs) (Closing ICFR: max. 4 Nm (3 ft lbs)



6a ICFS, ICFS SS, ICFR, ICFR SS, ICFN, ICFN SS

Max. 20 Nm (15 ft lbs) at stop. Automatic mode (ICFE ON/OFF by coil)

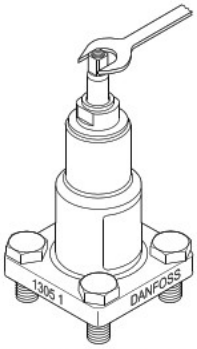
Max. 2.5 Nm (1.8 ft lbs) at stop. Manual mode (ICFE forced open)



6b ICFO, ICFO SS

ICF 25, ICF SS 25 Manual stem

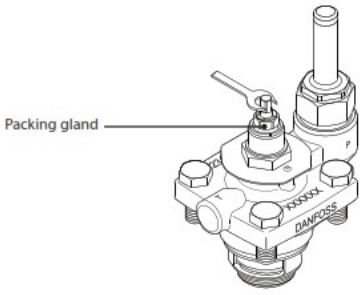
Max. 40 Nm (30 ft lbs) (Closing ICFR, ICFN: max. 10 Nm (7 ft lbs)



7a ICFS, ICFS SS, ICFR, ICFR SS, ICFN, ICFN SS

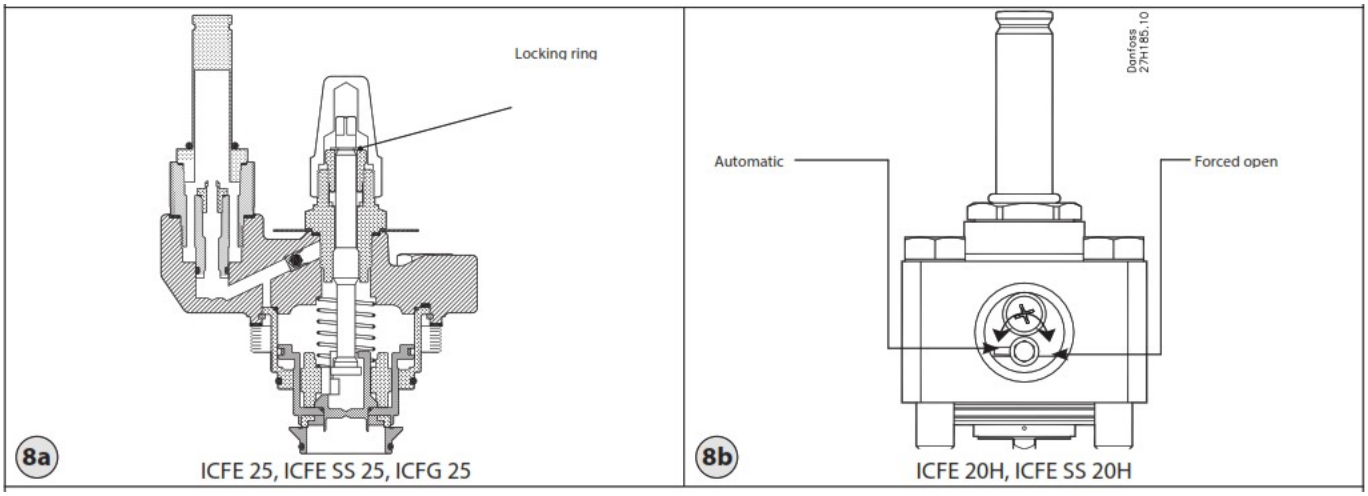
Max. 4 Nm (3 ft lbs) at stop. Automatic mode (ICFE ON/OFF by coil)

Max. 10 Nm (7 ft lbs) at stop. Manual mode (ICFE forced open)

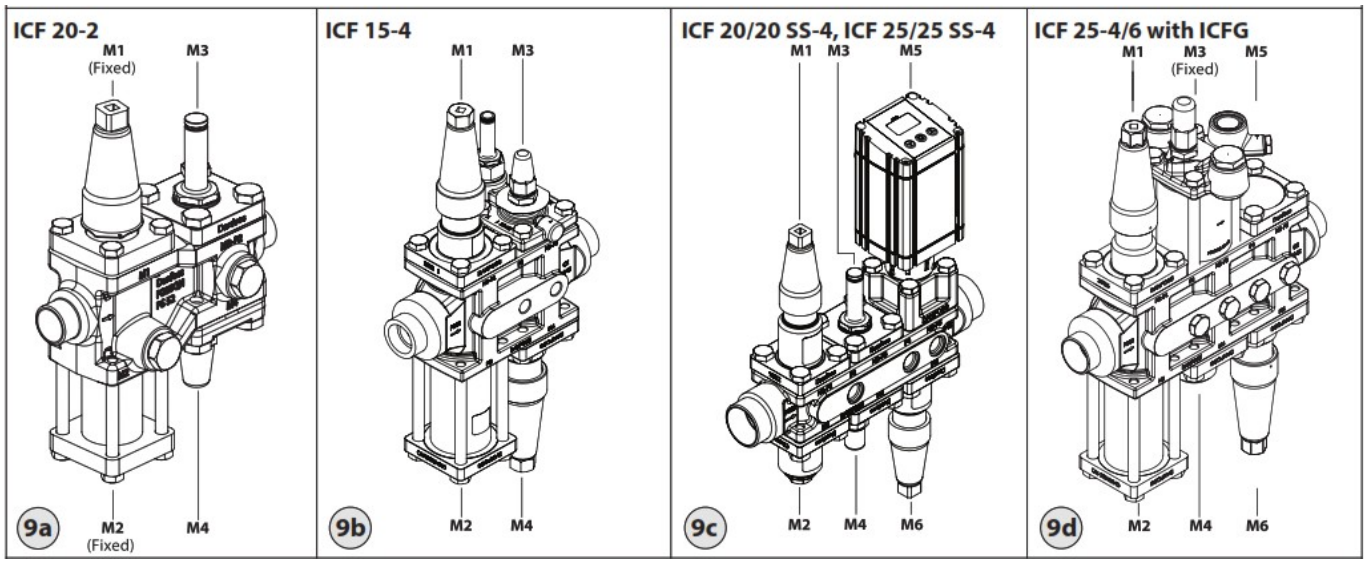


7b ICFE, ICFE SS, ICFG

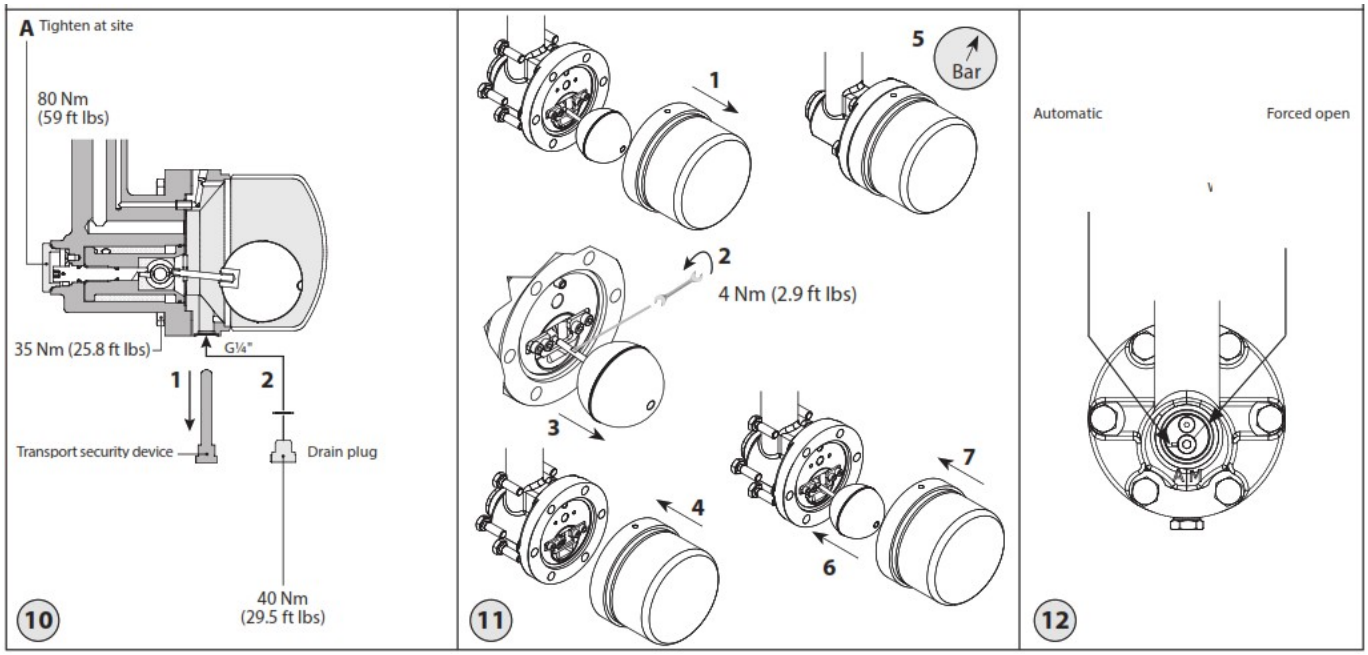
ICFE 25, ICFE SS 25, ICFG 25, ICFE 20H, ICFE SS 20H Manual stem



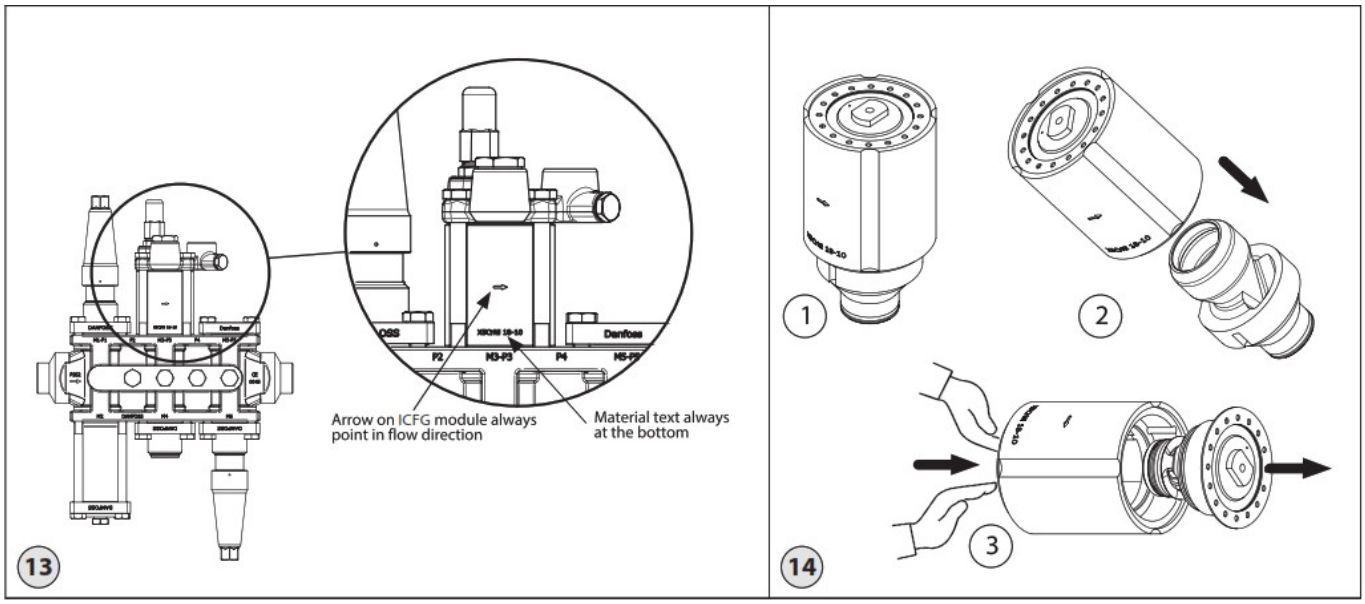
Module location



ICFD: Disassembly/assembly Transport device and float



ICFG 25: Disassembly/assembly module



Refrigerants
Applicable to HCFC, non flammable HFC, R717 (Ammonia) and R744 (CO_2).
Exception:
ICFD is designed for ammonia and CO_2 only
ICFD 20 = ammonia version
ICFD 20C = CO_2 version

The use of ICF valve stations with flammable hydrocarbons is not recommended.
The ICF is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range
ICF in general: –60/+120 °C (–76/+248 °F)
ICFD 20: -50/+50 °C (-58/+122 °F) at 28 bar g (406 psi g)
ICFD 20C: -50/+50 °C (-58/+122 °F) at 52 bar g(754 psi g)

Pressure range
The general ICF is designed for:
Max. working pressure: 52 bar g (754 psi g)
ICF 20-2 housing with 65 bar function modules only:
Max. working pressure: 65 bar g (943 psi g)

ICFD 20 (Ammonia):
For ICF with ICFD module the max. working pressure is 28 bar g / 406 psi g. If the refrigeration system include ICFD 20 module, a test pressure of the system must not exceed 28 bar g / 406 psi g, unless the ICFD float is temporarily taken out before test. See fig. 11.

ICFD 20C (CO_2):
For ICF with ICFD 20C module the max. working pressure is 52 bar g / 754 psi g. If the refrigeration system include ICFD 20C module, a test pressure of the system must not exceed 52 bar g / 754 psi g, unless the ICFD 20C float is temporarily taken out before test. See fig. 11.

Application
The ICF can be used in suction, liquid, hotgas and liquid/vapor lines. The ICF is available with 2, 4 or 6 function modules. The ICF regulates the flow of the medium by modulation or on/ off function, depending on function modules installed in the ICF.

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

Installation (fig. 1)
The ICF must be installed according to fig. 1. The ICF must be installed with the arrow in the direction of the flow).

ICM, ICFD and ICFG modules require horizontal valve orientation.

The ICF will be delivered with all the function modules fully assembled. The modules can be taken out for service or inspection and may be rotated 4 x 90° in relation to the valve body upon installation. Please make sure that the position of ICFD allows space for modules at each side of the ICFD.
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 (fig. 2 and 3)
The ICF valve station can be welded by using either TIG/MIG/SMAW welding (fig. 2) or gas welding/ brazing (fig. 3 a/b).
Always keep inlet and outlet protecting caps on the valve until the valve is ready to be installed, in order to prevent rust formation inside the valve station.

TIG/MIG/SMAW welding
It is not necessary to remove any of the function modules prior to TIG/MIG/SMAW welding (fig. 2) and auxiliary cooling is not needed at normal heat impact.
At excessive heat impact due to high ambient temperature, sun radiation, a wet cloth is recommended around the valve housing.

Every precaution must be taken to minimize welding spatter.
For ICF valve stations equipped with a stop valve in the first module (M1) and a stop-, regulating- or stop/check valve in the last module (M4 or M6), it is recommended to open these valves slightly (approx. 1 turn from closed position) to minimize welding heat impact to the Teflon seats.
After welding it is recommended to close these valves again to avoid potential pull through of gases, and keep them closed until the system is ready for operation.
All other valve modules are able, in any module position, to compensate for normal welding heat impact and need no special attention.

Gas welding/ brazing
Remove all inserts before welding/ brazing (fig. 3 a/b).
Auxiliary cooling needed when brazing (fig. 3b) to reduce heat impact.

Follow these steps during brazing (fig. 3b):

1. Remove topcover/insert
2. Clean connections with cleaning agent
3. Wrap around wet cloth
4. Apply flux on piping ends
5. Apply inert gas internal
6. Heat up piping
7. Braze with recommended brazing material and within temperature range specified
8. Remove risidual flux

Every precaution must be taken to minimize welding spatter.
After welding, clean the valve inside for welding spatter and welding debris.
It is recommended to reinstall the modules right after welding and to close the manual-operable M1 and M4/M6 in order to protect the interior of the valve until the system is ready for operation. In case the valve is not assembled immediately make sure that rust protective oil is applied to the inside surfaces.
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 weldedon end plate.

Surface protection and identification (not applicable for SS versions)
The external surface is zinc-chromated to provide corrosion protection according to EN 12284:2003 8.13. The Zinc-Chromatization does not cover the welding connections. After installation has been completed the external surface of the valve must be protected against corrosion with a suitable top coating. Coverage of the ID label when painting the ICF is recommended.
Precise identification of the ICF is made via the ID label on each of the 2, 4 or 6 function modules.

Maintenance (fig. 4)


Do not to mix up carbon steel parts with stainless steel parts.

Service
The ICF valve stations are easy to service. Do not open the ICF while it is still under pressure.
Upon opening and removal of the function modules:

- Check that the flat gaskets and/or O-rings between the function module and the housing and O-rings on the function module has not been damaged. Replace flat gaskets and O-rings if not intact.
  A valve with damaged O-rings or flat gaskets do not regulate in accordance with its specifications.
  Flat gaskets are present in ICF 15 module M1/M2 and ICF 20-2/ICF 25/ICF SS 25 all modules.
  Rubber gaskets are present in these locations: (see fig 4a, 4b)
  ICF 15: 1 rubber gasket in each module M3/M4
  ICF 20-4/6 and ICF SS 20-4/6: 1 rubber gasket in all modules


CO^2 applications
When used in CO2 systems the O-rings (see fig. 4a and 4b) can swell (grow).
At service it is recommended to replace the actual number of used O-rings before the function modules are reinstalled in the ICF valve body.

ICFD 20C defrost module for CO_2:
Make sure that the module is type ICFD 20C

- 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.
- On ICM 20 motor valve modules check that the PEEK seat has not been damaged or scratched. If damaged or

scratched; replace the PEEK seat. (Allen key 12 mm, torque 2 Nm (1.5 ft lb)).

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, 6 and 7)
Tighten the top cover with a torque wrench, to the values indicated in the table (see fig. 5).

Operating the manual stem (fig. 6 to 8) ICF 15, ICF 20, ICF SS 20 (fig. 6a and 6b)

- ICFS/ICFS SS – stop valve module
- ICFR/ICFR SS – manual regulating valve module
- ICFN/ICFN SS – stop/check valve module
- ICFO/ICFO SS – manual opening module

Before remounting the cap on the modules ICFS/ICFS SS (stop valve module), ICFR/ICFR SS (manual regulating valve module) or ICFN/ICFN SS (stop/check valve module) please ensure that the gasket is present in the cap. Then tighten the cap with 16 Nm (12 ft lbs).

ICF 25, ICF SS 25 (see fig. 7a)

- ICFS/ICFS SS – stop valve module
- ICFR/ICFR SS – manual regulating valve module
- ICFN/ICFN SS – stop/check valve module
- ICFE/ICFE SS – manual opening module

Before remounting the cap on the modules ICFS/ICFS SS (stop valve module), ICFR/ICFR SS (manual regulating valve module) or ICFN/ICFN
SS (stop/check valve module) please ensure that the gasket is present in the cap. Then tighten the cap with 24 Nm (18 ft lbs).
Packing gland (ICFE/ICFE SS) (see fig. 7b): If the packing gland is leaking, tighten it carefully with a wrench. Do not apply too much force.
Danfoss recommends that you conduct a stepwise tightening of the packing gland. For each turn check for possible leaks.

Operating the manual stem on ICFE 25/ ICFE SS 25 solenoid module (see fig. 8a):
To force open the solenoid by the manual stem turn it counter clockwise full way up (manual mode).
To operate the solenoid in automatic mode, turn the manual stem clockwise until the locking ring stops.
Do not force the spindle further. If the locking ring is damaged or removed the spindle will start to leak.
The valve cannot be forced closed by the manual stem.

Operating the manual stem on ICFE 20H/ICFE SS 20H solenoid valve module (see fig. 8b)
Remove the cap on the side of the ICFE 20H/ICFE SS 20H
At 9 o’clock position the manual opener is disabled (not active).
To force the ICFE 20H/ICFE SS 20H solenoid to open use a 5 mm Allen key and turn it clockwise to 3 o’clock position.

ICFD defrost module
Transportation protection
Remove the transport security device (pos. 1 in fig 10). Insert the drain plug + alu gasket attached to the valve (pos. 2 in fig 10) and tighten with the torque indicated.

Test pressure maximum
If the system test pressure needs to exceed:
ICFD 20 (Ammonia): 28 bar g / 406 psi g
ICFD 20C (CO_2): 52 bar g / 754 psi g
it is necessary to prepare the ICFD module like shown in fig. 11:
1. Unscrew the 6 flange bolts and remove the Float housing.
2. + 3. Unscrew and remove the Lever together with the Float assembly using A/F 4 mm.
Caution – float end of lever must not be unscrewed and do not use float for unscrewing.
4. Remount the Float housing and tighten the 6 flange bolts with the torque indicated in fig 10.
5. Test with the system pressure higher than: ICFD 20 (Ammonia): 28 bar g / 406 psi g ICFD 20C (CO_2): 52 bar g / 754 psi g
6. Reinstall the Lever together with the Float assembly using A/F 4 mm. Do not use float for tightening.
7. Remount the Float housing and tighten the 6 flange bolts with the torque indicated in fig 10.

It is recommended to replace the float housing gasket with a new gasket after this repeated compression.

Operating the manual stem on ICFD defrost module (see fig. 12)

Remove the cap on the side of the ICFD (pos. A in fig. 10).
At 9 o'clock position the manual opener is disabled (A = Automatic mode).
To force the ICFD to open use a 5 mm Allen key and turn it clockwise to approx.
2 o'clock position till it reaches the mechanical stop (M = Manual open mode).
Allways return the manual opener to automatic mode for normal operation.
Remount the cap A in fig 10 and tighten with torque 80 Nm (59 ft lbs).
It is recommended to replace the Alu gasket if further openings of cap are required.

Operating the manual stem on ICFG 25 (see fig. 8a)
Always pay attention to the spindle during operation of the manual opener

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

Module location (fig. 9a, 9b, 9c)

ICF with two modules

Function Module Type		Can be installed in these locations	
ICFE/ICFA	Solenoid valve module	M1	
ICFE20H	Solenoid valve module	M1*	
ICFO	Manual opening module		M2
ICFB	Blank top cover	M1	M2
ICFW	Welding module	M1	M2
ICFC	Check valve module		M2
ICFC 20P1	Check valve module		M2
ICFN 20	Stop & check valve module		M2
ICFR	Manual regulating valve module	M1	M2
ICM	Motor valve module	M1	
ICFD 20	Defrost module		M2
ICFS	Shut-off valve module	M1	M2
ICFF	Strainer module		M2
ICM	Motor operated valve module	M1	

*) Not in combination with ICFO

ICF with four modules

Function Module Type		Can be installed in these locations			
ICFS/ICFS SS	Stop valve module	M1 *)	M2	M3	M4
ICFR/ICFR SS	Manual regulating valve module	M1	M2	M3	M4
ICFF/ICFF SS	Filter (strainer) module		M2 *)		M4
ICFE/ICFE SS	Solenoid valve module			M3	
ICFC/ICFC SS	Check valve module				M4
ICFN / ICFN SS	Stop/check valve module				M4
ICM/ICM SS	Motor valve module	M1		M3	
ICFB/ICFB SS	Blank top cover	M1	M2	M3	M4
ICFA/ICFA SS	Electronic expansion valve module (not for ICF 25)	M1		M3	
ICFE 20H/ICFE SS 20H	Solenoid valve module (not for ICF 25)	M1		M3	
ICFO/ICFO SS	Manual opening module (not for ICF 25)				M4
ICFW/ICFW SS	Welding module	M1	M2	M3	M4
ICFD	Defrost module		M2		M4
ICFG	Pilot-operated servo module			M3	

ICF with six modules

Function Module Type		Can be installed in these locations					
ICFS/ICFS SS	Stop valve module	M1	M2	M3	M4	M5	M6
ICFR/ICFR SS	Manual regulating valve module	M1	M2	M3	M4	M5	M6
ICFF/ICFF SS	Filter (strainer) module		M2		M4		M6
ICFE/ICFE SS	Solenoid valve module			M3			
ICFC/ICFC SS	Check valve module				M4		M6
ICFN / ICFN SS	Stop/check valve module				M4		M6
ICM/ICM SS	Motor valve module	M1		M3		M5	
ICFB/ICFB SS	Blank top cover	M1	M2	M3	M4	M5	M6
ICFA/ICFA SS	Electronic expansion valve module (not for I CF 25)	M1		M3		M5	
ICFE 20H/ICFE SS 2 0H	Solenoid valve module (not for ICF 25)	M1		M3		M5	
ICFO/ICFO SS	Manual opening module (not for ICF 25)				M4		
ICFW/ICFW SS	Welding module	M1	M2	M3	M4	M5	M6
ICFD	Defrost module		M2		M4		M6
ICFG	Pilot-operated servo module			M3			

Module locations are indicated by M1, M2, M3, M4, M5 and M6. With respect to refrigerant flow, M1 is closest to inlet.

location not possible
*) ICF 15 – M1 and M2 modules are fixed (stop valve and filter, respectively)
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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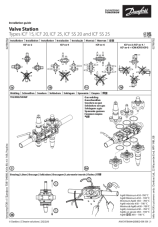
Documents / Resources



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ICF 15 Valve Station, Valve Station, ICF 15 Valve, Valve, ICF 15, ICF 20