ENGINEERING TOMORROW

Catalogue

Pressure and temperature regulating valves for Industrial Refrigeration

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Pilot-operated servo valve
Type ICS

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Pilot-operated servo valve
Type ICS



ICS pilot-operated servo valves belong to the ICV (Industrial Control Valve) family.

The valve comprises three main components: valve body, function module and top cover.

ICS pilot-operated servo valves are pilot operated valves for regulating pressure, temperature and ON / OFF function in refrigeration systems. ICS valves are designed for low and high-pressure refrigerants.

ICS valves can be used on the high and low-pressure sides, in wet and dry suction lines and in liquid lines without phase change (i.e. where no expansion takes place in the valve).

The function of ICS valves is dependent on the pilot pressure applied from either a pilot valve or external pilot pressure source.

ICS 1 pilot has one pilot pressure connection and ICS 3 pilot has three pilot pressure connections.

Features

- Designed for industrial refrigeration applications for a maximum working pressure of 52 bar g / 754 psi g
- Applicable to HCFC, HFC, R717 (Ammonia) and R744 (CO_2)
- Direct coupled connections
- Connection types include butt weld, socket weld, solder and threaded connections
- Low temperature steel body
- Low weight and compact design
- V-port regulating cone ensures optimum regulating accuracy particularly at part load
- Function module has a QPQ surface treated insert and a steel piston ring ensuring precise control accuracy
- ICV 4 in, 5 in and 6 in ANSI with NPT threaded pressure outlet in the outlet of the valve
- Replaceable Teflon valve seat for ICS 25-80
- Maintenance spare part kit available for ICS 100-150
- Modular Concept:
  - Each valve body is available with several different connection types and sizes.
  - Valve overhaul on ICS 25-80 is done by replacing the function module.
  - Possible to convert ICS pilot-operated servo valve to ICM motor operated valve.
- Manual opening
- The ICS valve is a multifunction valve where several pilot valves can be mounted into the pilot ports
- The standard range of pilot valves can be used on all sizes of ICS valves. Pilot valves can be either screwed directly into the ICS valve, thus eliminating the need for solder / weld connections or external pilot lines
- Pressure gauge connection port to measure valve inlet pressure
- The top cover can be rotated into any possible position without affecting the operation of the valve
- Classification: DNV, CRN, BV, EAC etc.
  To get an updated list of certification on the products please contact your local Danfoss Sales Company.

Design

ICS valves are designed as pilot operated valves requiring minimal pressure differential to open. If the pressure difference is 0 bar / 0 psi, the ICS valve will be closed. If the pressure difference is 0.2 bar / 3 psi or more, the ICS valve will be fully open. At pressure differences between 0.07 bar / 1 psi and 0.2 bar /3 psi, the opening degree will be correspondingly proportional.

The ICS is available for use with either one or three pilot valves.

Two of the three pilot pressure connections (S1 and S2) are connected in series whilst the third (P) is connected in parallel to S1 and S2. This allows different combinations of pilot valves to be used, thus providing numerous variations in control functions.

Connections
There is a very wide range of connection types available with ICS valves:

- D: Butt weld, DIN (2448)
- A: Butt weld, ANSI (B 36.10)
- J: Butt weld, JIS (B S 602)
- SOC: Socket weld, ANSI (B 16.11)
- SD: Solder connection, DIN (2856)
- SA: Solder connection, ANSI (B 16.22)
- FPT: Female pipe thread (ANSI/ASME B 1.20.1)

Approvals
The ICV valve concept is designed to fulfill global refrigeration requirements.
For specific approval information, please contact Danfoss.

The ICS valves are approved in accordance with the European standard specified in the Pressure Equipment Directive and are CE marked.
For further details / restrictions - see Installation Instruction

Valve body and top cover material
Low temperature steel

ICS valves			
Nominal bore	DN≤ 25 (1 in)	DN 32-65 (1 ¼ – 2 ½ in)	DN 80-125 (3 – 5 in)
Classified for	Fluid group I		
Category	Article 3, paragraph 3	II	III

Technical data

- *Refrigerants*
  Applicable to HCFC, HFC, R717(Ammonia) and R744 (CO_2).
  Use with flammable hydrocarbons cannot be recommended; please contact Danfoss.
- *Temperature range*
  -60 – 120 °C / -76 – 248 °F.
- *Surface protection*
  ICS 25-150:
  The external surface is zinc-chromated to provide good corrosion protection.
- *Pressure range*
  The valve is designed for:
  Max. working pressure: 52 bar g / 754 psig

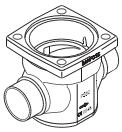
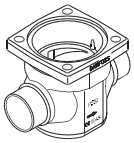
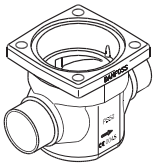
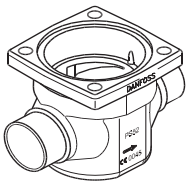
  Opening differential pressure:
  Fully open: Min. 0.2 bar g (min. 3 psig)
  Max. Opening Pressure Differential (MOPD), solenoid valves only - at nominal conditions.
  – 10 W AC up to 21 bar / 305 psi
  – 20 W AC up to 40 bar / 580 psi

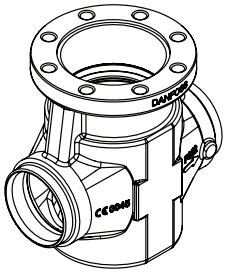
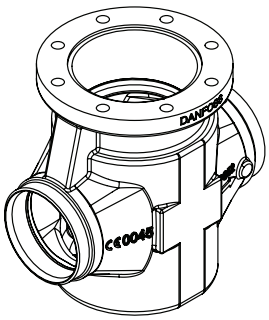
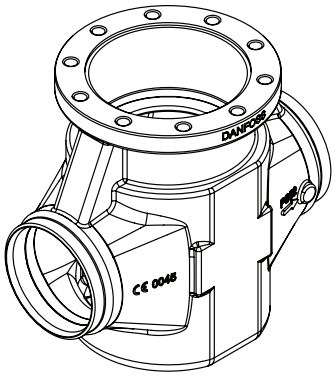
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The ICS Concept

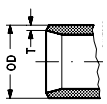
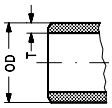
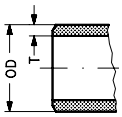
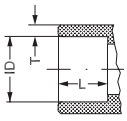
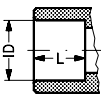
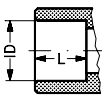
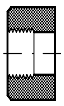
The ICS concept is developed around a modular principle. This gives the possibility of combining function modules and top covers with special valve body size that is available in a variety of connection possibilities.

- There are eight valve bodies available.

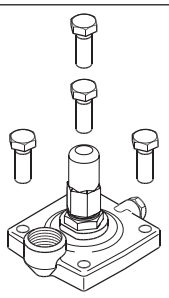
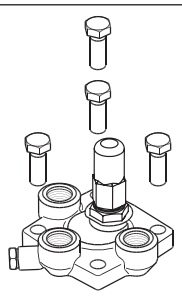
				
ICV 25	ICV 32	ICV 40	ICV 50	ICV 65

		
ICV 100	ICV 125	ICV 150

- Valve bodies in the sizes ICV 20-ICV65 are available with a range of undersizes through oversized connection sizes and types.
  ICV 100 - ICV 150 are available in butt-weld DIN and butt-weld ANSI nominal sizes

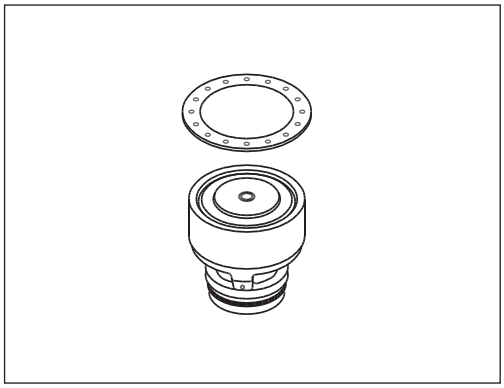
D	A	J	SOC	SD	SA	FPT
						
Butt-weld DIN	Butt-weld ANSI	Butt-weld JIS	Socket weld ANSI	Solder DIN	Solder ANSI	Female Pipe Thread

- Each valve body may be fitted with a 1 pilot or 3 pilot top cover.

The ICS Concept
(continued)

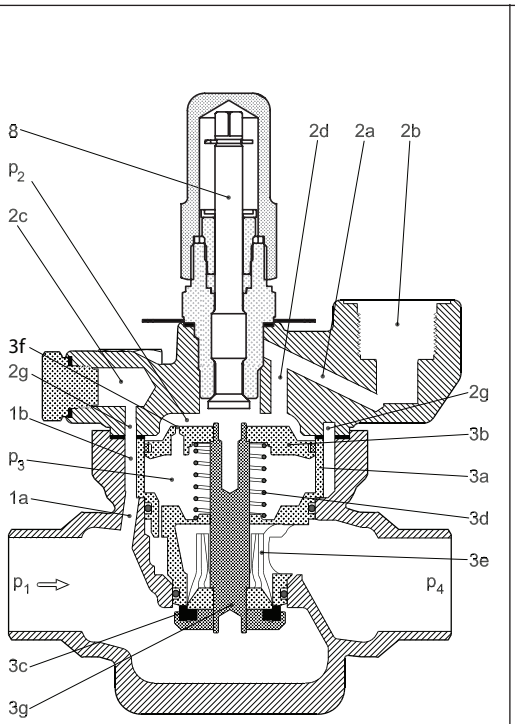
In ICS, multiple inserts (function modules) are available to give different capacities.



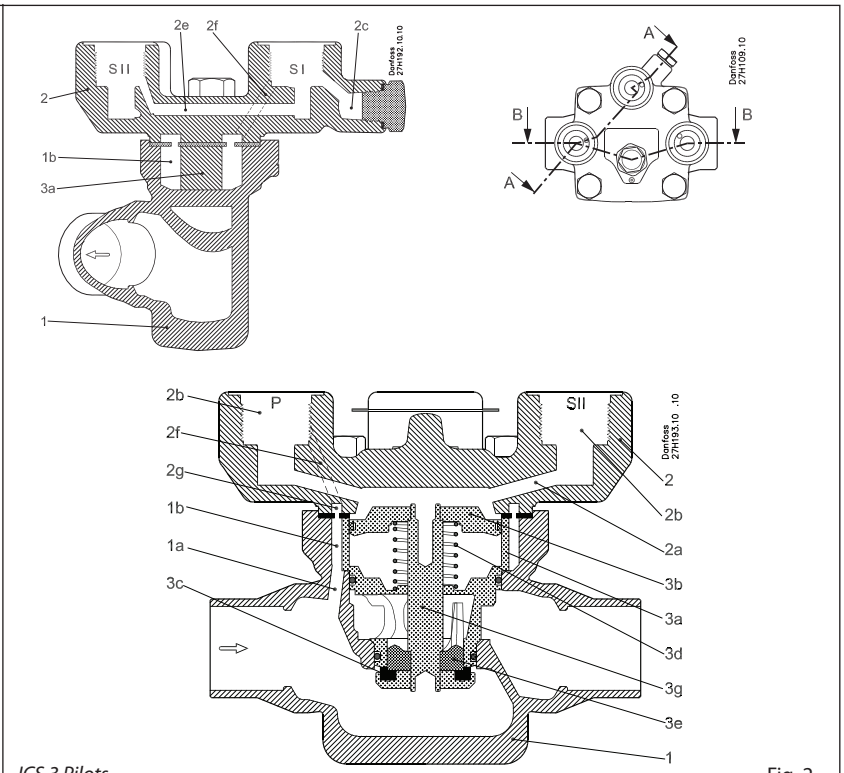
Type	Valve body size	K_v [m³/h]	C_v [USgal/min]
ICS 25-5	25	1.7	2.0
ICS 25-10		3.5	4.1
ICS 25-15		6.0	7.0
ICS 25-20		8	9.3
ICS 25-25		11.5	13.3
ICS 32	32	17	20
ICS 40	40	27	31
ICS 50	50	44	51
ICS 65	65	70	81
ICS 80	80	85	98
ICS 100	100	142	165
ICS 125	125	207	240
ICS 150	150	354	410

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Function



ICS 1 Pilot Fig. 1



ICS 3 Pilots Fig. 2

ICS 1 Pilot and ICS 3 Pilot

1.	Body
1a	Pilot channel to inlet side
1b	Circular gap between house and module
2.	Top cover
2a	Pilot channels in top cover
2b	Pilot insertion hole
2c	Pressure gauge connection
2d	Piston top inlet channel
2e	Cross channel SI to SII
2f	Inlet channel
2g	Circular groove
3	Function module
3a	Cylinder
3b	Piston
3c	Valve plate
3d	Spring
3e	Cone
3f	Equalisation orifice
3g	Piston rod

p_1	Inlet pressure
p_2	Pressure on piston
p_3	Pressure underneath piston
p_4	Outlet pressure
8	Manual operating spindle

The ICS main valve is a pilot operated valve. The types of pilot valves used determine the function. The ICS main valve with pilot valve(s) controls refrigerant flow by modulation or on/off in accordance with the pilot valve and main valve status. The manual spindle can be used to open the valve plate.

The opening degree of the main valve is determined by the pressure difference (differential pressure) between pressure p_2, which acts on top of the servo piston (3b), and pressure p_3, which acts on the underside of the servo piston.

If this pressure difference is 0, the main valve will be fully closed.
If the pressure difference is 0.2 bar (3 psi) or greater, the main valve will be fully open.
At pressure differences (p_2 - p_3) between 0.07 bar (1 psi) and 0.2 bar (3 psi), the degree of opening will be correspondingly proportional.

The port of the throttle cone (3e) is V-shaped, which provide good regulation characteristic to pilot operated main valves even at low loads.
P_3 pressure is equal to the valve outlet pressure (P_4), due to a clearance between the piston rod (3g) and the function module. The opening degree of the ICS valve is therefore controlled by the application of P_2 pressure acting on top of the servo piston, which is equal to or greater than valve outlet pressure (P_4).

$p_2 = p_4$ ~ closed
$p_2 = p_4 + 0.2$ bar (3 psi)~ fully open
$p_4 \leq p_2 \leq p_4 + 0.2$ bar (3 psi) ~ proportional degree of opening.

The maximum pressure (p_2) can act on the top of the servo piston (3b). p_2 normally corresponds to the pressure, p_1 - ICS main valve inlet pressure. Inlet pressure p_1 is led, via the drilled channels (1a, 1b, 2f, 2b (pilot), 2a, 2d) in the valve body (1) and cover (2) through the individual pilot valves and onto the top of the servo piston (3b).

The degree of opening of the individual pilot valves determines the magnitude of pressure p_2 and thus the degree of opening of the main valve. The equalisation hole (3f) in the servo piston (3b) ensures that pressure p_2 is balanced in accordance with the degree of opening of the pilot valve.

Note:
When ICS valves with 3 pilot ports are used with external pressure connector (fig. 2, pos. 61), the valve port inlet pressure will be isolated.

The ICS can be fitted with just a single screwed-in pilot valve or external pilot connection. The degree of opening of the main valve will be in accordance with the control status of the pilot valve or external pilot flow control.
ICS main valve with one pilot connection is fully closed when the pilot valve is fully closed and fully open when the pilot valve is fully open. Otherwise the degree of opening of the main valve is proportional to the degree of opening of the pilot valve.

The ICS 3 pilot version can be fitted with one, two, or three pilot valves so that up to three regulating functions are possible. If the external pilot connection is used, more functions can be added.

Function *(continued)*

In the ICS three pilot version, the pilot ports are related as follows:

- The pilot valves fitted in ports SI and SII are connected in series.
  The ICS 3 pilot operated main valve will be fully closed if just one of the series-connected pilot valves is closed. The main valve can only open if both pilot valves are open at the same time.
- The pilot valve fitted in port P is connected in parallel to the pilot valves in ports SI and SII.

The ICS valve will be fully open if the pilot valve in P is fully open, irrespective of the degree of opening of pilot valves SI and SII.
The ICS valve will be fully closed if the pilot valve in P is fully closed and at least one of the valves in SI or SII is fully closed at the same time. The relation between the pilot valves in ports SI, SII and P is shown in the table on the next page.

If the ICS is not fitted with three pilot valves, the unused port(s) must be sealed with a blanking plug. If the blanking plug is fitted as an assembled unit, A + B, the channels from the specific port will be closed. (See illustration below)

If only the top part, A, of the plug is fitted, the channels from the ports in question will be open. If the degree of opening of the ICS main valve is not to be a function of the main valve inlet pressure, or if more than three regulating functions are required, ports SI, SII or P can be fitted with a nipple for the connection of external pilot pressure. This applies to all ICS versions.

The pressure to which the external pilot line is connected will then determine pressure p_2 on top of the servo piston. The pilot valves fitted in that external pilot line will determine the main valve function. Pilot valves installed in external lines must be mounted in a type CVH housing.

Depending on the function of the pilot valves, the ICS regulating characteristic becomes:

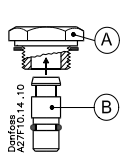
- on / off
- proportional
- integral or
- cascade.

ICS main valves are therefore especially suitable for all forms of temperature and pressure regulating systems.

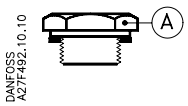
An overview of the types of pilot valves available can be found in the literature "Pilot valves for operated main valves" (AI248786497190).

On the following pages, a number of configuration examples can be found. These are only for explanatory purpose. However, by using the literature regarding pilot valves these examples are easier to comprehend.

Pilot valve port			ICS valve
SI	SII	P	
Open	Open	Closed	Open
Open	Open	Open	Open
Open	Closed	Closed	Closed
Open	Closed	Open	Open
Closed	Open	Closed	Closed
Closed	Open	Open	Open
Closed	Closed	Closed	Closed
Closed	Closed	Open	Open

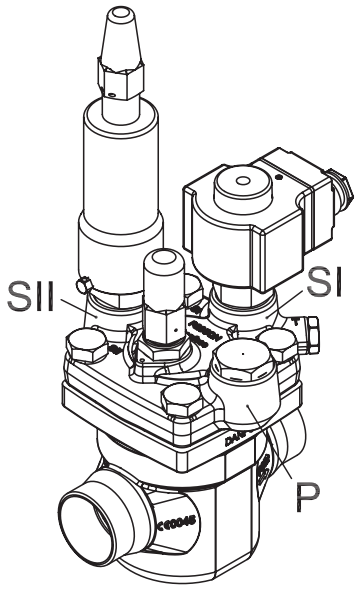


Blanking plug A + B



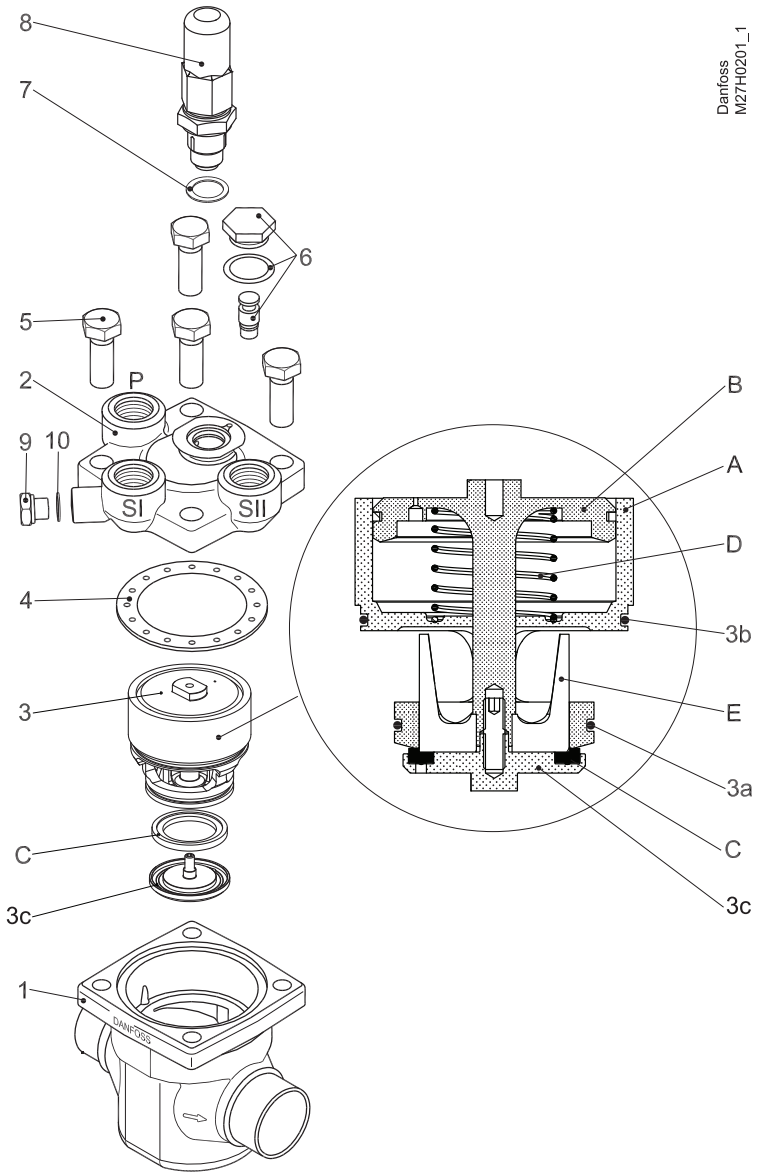
Blanking plug A

Example (ICS with 3 pilot valves)



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Material specification - ICS 25, 32, 40, 50, 65

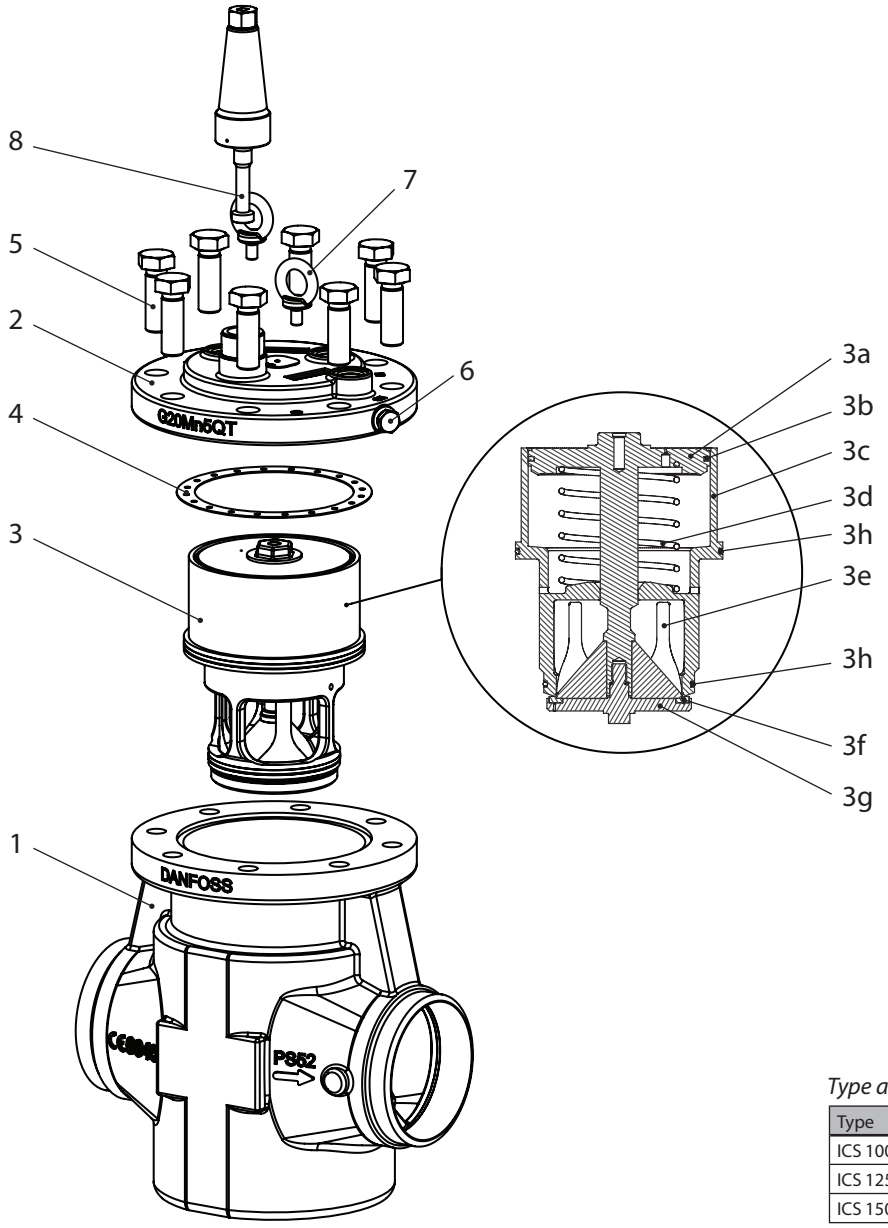


Type and size of Bolt (pos. 5)

Type	Screw
ICS 25	M12 × 30 A2-70 DIN 933
ICS 32	M14 × 35 A2-70 DIN 933
ICS 40	M14 × 40 A2-70 DIN 933
ICS 50	M16 × 40 A2-70 DIN 933
ICS 65	M16 × 50 A2-70 DIN 933

No.	Part	Material	EN	ASTM	JIS
1	Body	Low temperature steel	G20Mn5QT, EN 10213-3	LCC A352	SCPL1 G5151
2	Top cover	Low temperature steel	G20Mn5QT, EN 10213-3 P285QH+QT 10222-4	LCC A352 LF2, A350	SCPL1 G5151
3	Function module (assembled)				
3a	o-ring	Cloroprene (Neoprene)			
3b	o-ring	Cloroprene (Neoprene)			
3c	Washer plate	Steel			
A	Cylinder	Steel			
B	Piston	Steel			
C	Valve plate	PTFE			
D	Spring	Steel			
E	Cone	Steel			
4	Gasket	Fiber, non-asbestos			
5	Bolts	Stainless steel	A2-70, EN 1515-1	Grade B8 A320	A2-70, B 1054
6	Plug	Steel			
7	Gasket	Aluminium			
8	Manual operating spindle	Steel			
9	Plug	Steel			
10	Gasket	Aluminium			

Material specification - ICS 100, 125, 150



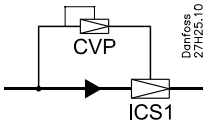
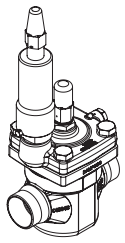
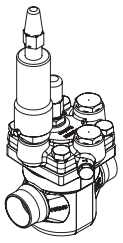
Type and size of Bolt (pos. 5)

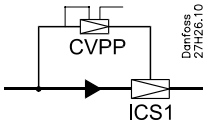
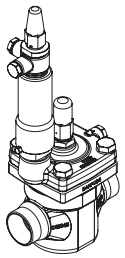
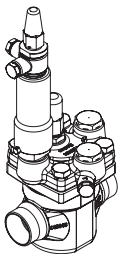
Type	Screw
ICS 100	M20 × 60 A2-70 DIN 933
ICS 125	M20 × 60 A2-70 DIN 933
ICS 150	M20 × 70 A2-70 DIN 933

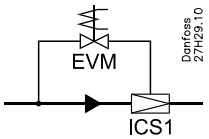
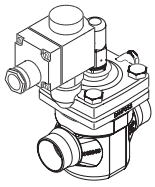
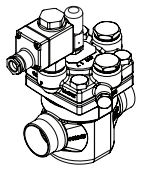
No.	Part	Material	EN	ASTM	JIS
1	Body	Low temperature steel	G20Mn5QT, EN 10213-3	LCC A352	SCPL1 G5151
2	Top cover	Low temperature steel	G20Mn5QT, EN 10213-3	LCC A352	SCPL1 G5151
3	Function module (assembled)				
3a	Piston / rod	Stainless steel / steel			
3b	Piston ring	Steel			
3c	Insert	Steel			
3d	Spring	Steel			
3e	Cone	Stainless steel / steel			
3f	Teflon plate	Teflon unfilled			
3g	Washer plate	PTFE			
3h	o-ring	Cloroprene (Neoprene)			
4	Gasket	Fiber, non-asbestos			
5	Bolts	Stainless steel	A2-70, EN 1515-1	Grade B8 A320	A2-70, B 1054
6	Plug	Steel			
7	Eye bolt	Galvanized steel			
8	Manual operating spindle	Steel			

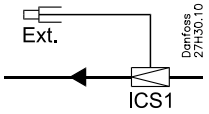
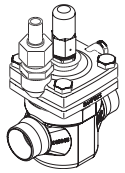
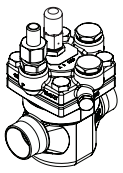
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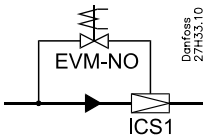
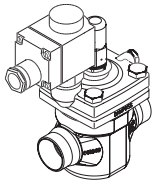
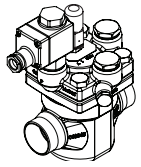
Configuration examples

Example no. 1-1		*Products*		*Products*	
Constant pressure regulation • CVP-L (-0.66 to 7 bar g) (19.5 in. Hg to 102 psig) • CVP-M (4 to 28 bar g) (58 to 406 psig) • CVP-H (25 to 52 bar g) (363 to 754 psig)		1 × ICS 1 Pilot 1 × CVP-L/M/H		1 × ICS 3 Pilots 1 × CVP-L/M/H 2 × Blanking plugs SI: A + B SII: A	

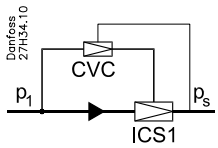
Example no. 1-2		*Products*		*Products*	
Differential pressure regulation • CVPP-L (0.66 to 7 bar g) (19.5 in. Hg to 102 psig) • CVPP-M (4 to 28 bar g) (58 to 406 psig)		1 × ICS 1 Pilot 1 × CVPP-L/M		1 × ICS 3 Pilots 1 × CVPP-L/M 2 × Blanking plugs SI: A + B SII: A	

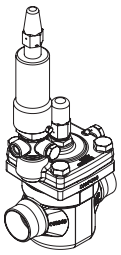
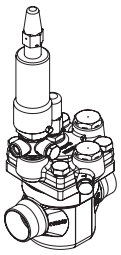
Example no. 1-3		*Products*		*Products*	
On/off regulation (solenoid valve)		1 × ICS 1 Pilot 1 × EVM 1 × coil		1 × ICS 3 Pilots 1 × EVM 1 × coil 2 × Blanking plugs SI: A + B SII: A	

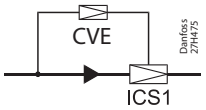
Example no. 1-4		*Products*		*Products*	
Regulation with external control pressure		1 × ICS 1 Pilot 1 × nipple for external control pressure		1 × ICS 3 Pilots 1 × nipple for external control pressure 2 × Blanking plugs SI: A + B SII: A	

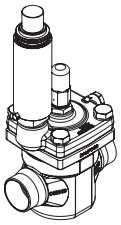
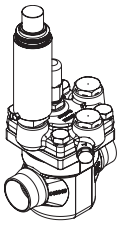
Example no. 1-5		*Products*		*Products*	
On/off regulation (solenoid valve)		1 × ICS 1 Pilot 1 × EVM-NO (12 W coil)		1 × ICS 3 Pilots 1 × EVM-NO (12 W coil) 2 × Blanking plugs SI: A + B SII: A	

Configuration examples *(continued)*

Example no. 1-6	
Crankcase pressure regulation. (Max. suction pressure regulation) • -0.45 to 7 bar g (13.3 in. Hg to 102 psig)	

Products		*Products*	
1 × ICS 1 Pilot 1 × CVC-L		1 × ICS 3 Pilots 1 × CVC-L 2 × Blanking plugs SI: A + B SII: A	

Example no. 1-7	
Electronically controlled media temperature regulation • -0.66 to 8 bar g (19.5 in. Hg to 116 psig)	

Products		*Products*	
1 × ICS 1 Pilot 1 × CVE		1 × ICS 3 Pilots 1 × CVE 2 × Blanking plugs SI: A + B SII: A	

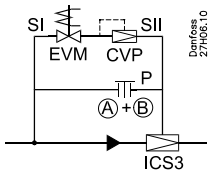
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Configuration examples *(continued)*

Example no. 2-1

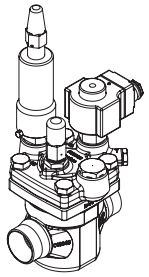
Constant pressure regulation combined with electrical shut off

- –0.66 to 7 bar g (19.5 in. Hg to 102 psig)



Products

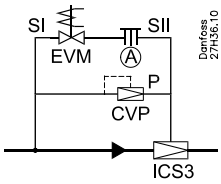
1 × ICS 3 Pilots
1 × blanking plug (A + B)
1 × CVP-L
1 × EVM
1 × coil



Example no. 2-2

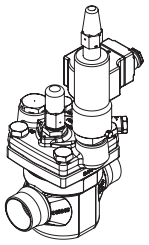
Constant pressure regulation combined with electrical wide open

- –0.66 to 7 bar g (19.5 in. Hg to 102 psig)



Products

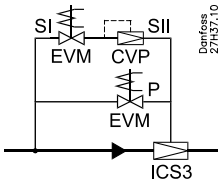
1 × ICS 3 Pilots
1 × blanking plug (A)
1 × CVP-L
1 × EVM



Example no. 2-3

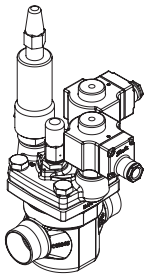
Constant pressure regulation combined with electrical shut off and wide open

- –0.66 to 7 bar g (19.5 in. Hg to 102 psig)



Products

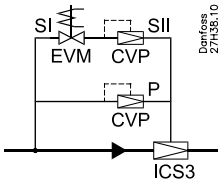
1 × ICS 3 Pilots
1 × CVP-L
2 × EVM
2 × coils



Example no. 2-4

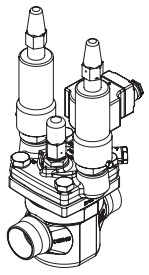
Constant pressure regulation with change-over between two preset evaporating pressures

- –0.66 to 7 bar g (19.5 in. Hg to 102 psig)



Products

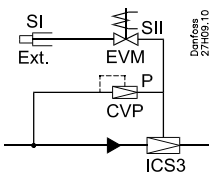
1 × ICS 3 Pilots
2 × CVP-L
1 × EVM
1 × coil



Example no. 2-5

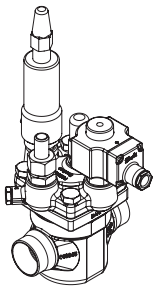
External control pressure with electrical shut off combined with constant pressure regulation

- –0.66 to 7 bar g (19.5 in. Hg to 102 psig)

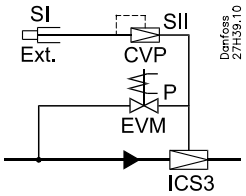


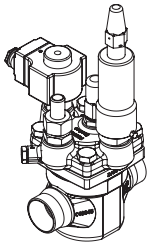
Products

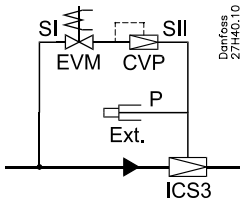
1 × ICS 3 Pilots
1 × nipple for external control pressure
1 × CVP-L
1 × EVM
1 × coil

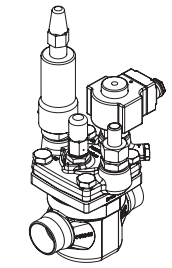


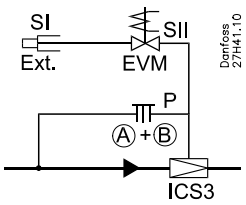
Configuration examples *(continued)*

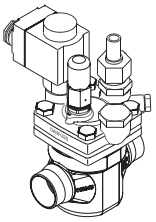
Example no. 2-6	
Constant pressure regulation with external control pressure combined with electrical wide open • –0.66 to 7 bar g (19.5 in. Hg to 102 psig)	

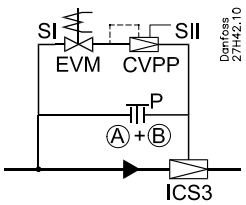
Products	
1 × ICS 3 Pilots 1 × nipple for external control pressure 1 × CVP-L 1 × EVM 1 × coil	

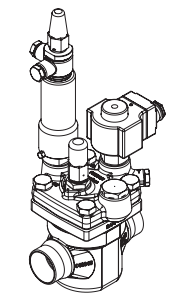
Example no. 2-7	
Constant pressure regulation with electrical shut off combined with external control pressure • –0.66 to 7 bar g (19.5 in. Hg to 102 psig)	

Products	
1 × ICS 3 Pilots 1 × nipple for external control pressure 1 × CVP-L 1 × EVM 1 × coil	

Example no. 2-8	
Solenoid valve with external control pressure for small pressure drops	

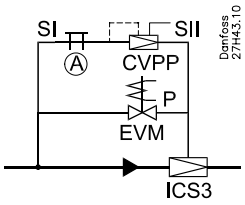
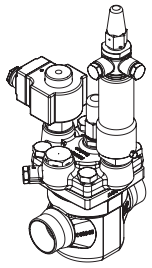
Products	
1 × ICS 3 1 × blanking plug (A + B) 1 × nipple for external control pressure 1 × EVM 1 × coil	

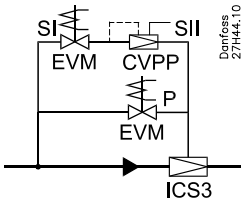
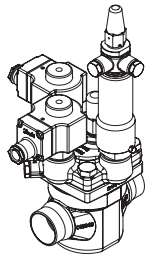
Example no. 2-9	
Differential pressure regulation combined with electrical shut off • CVPP-L (0.66 to 7 bar g) (19.5 in. Hg to 102 psig)	

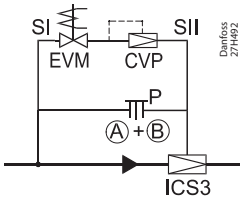
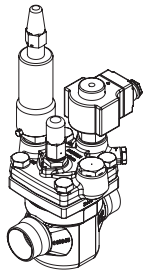
Products	
1 × ICS 3 1 × blanking plug (A + B) 1 × CVPP-L 1 × EVM 1 × coil	

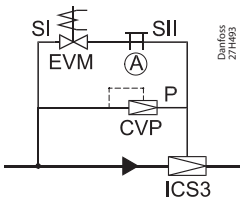
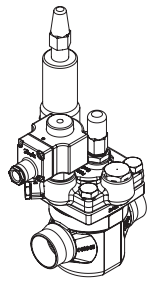
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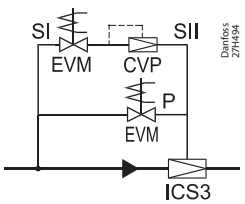
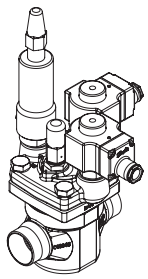
Configuration examples *(continued)*

Example no. 2-10		*Products*	
Differential pressure regulation combined with electrical wide open • CVPP-L (0.66 to 7 bar g) (19.5 in. Hg to 102 psig)		1 × ICS 3 Pilots 1 × blanking plug (A) 1 × CVPP-L 1 × EVM 1 × coil	

Example no. 2-11		*Products*	
Differential pressure regulation combined with electrical wide open and shut off • CVPP-L (0.66 to 7 bar g) (19.5 in. Hg to 102 psig)		1 × ICS 3 Pilots 1 × CVPP-L 2 × EVM 2 × coils	

Example no. 2-12		*Products*	
Constant pressure regulation combined with electrical shut off • CVP-L (-0.66 to 7 bar g) (19.5 in. Hg to 102 psig) • CVP-M (4 to 28 bar g) (58 to 406 psig) • CVP-H (25 to 52 bar g) (363 to 754 psig)		1 × ICS 3 Pilots 1 × blanking plug (A + B) 1 × CVP-L/M/H 1 × EVM 1 × coil	

Example no. 2-13		*Products*	
Constant pressure regulation combined with electrical wide open • CVP-L (-0.66 to 7 bar g) (19.5 in. Hg to 102 psig) • CVP-M (4 to 28 bar g) (58 to 406 psig) • CVP-H (25 to 52 bar g) (363 to 754 psig)		1 × ICS 3 Pilots 1 × blanking plug (A) 1 × CVP-L/M/H 1 × EVM 1 × coil	

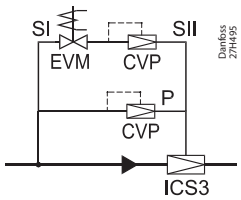
Example no. 2-14		*Products*	
Constant pressure regulation combined with electrical shut off and wide open • CVP-L (-0.66 to 7 bar g) (19.5 in. Hg to 102 psig) • CVP-M (4 to 28 bar g) (58 to 406 psig) • CVP-H (25 to 52 bar g) (363 to 754 psig)		1 × ICS 3 Pilots 1 × CVP-L/M/H 2 × EVM 2 × coils	

Configuration examples *(continued)*

Example no. 2-15

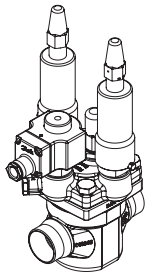
Constant pressure regulation with change-over between two preset evaporating pressures

- CVP-L (-0.66 to 7 bar g) (19.5 in. Hg to 102 psig)
- CVP-M (4 to 28 bar g) (58 to 406 psig)
- CVP-H (25 to 52 bar g) (363 to 754 psig)



Products

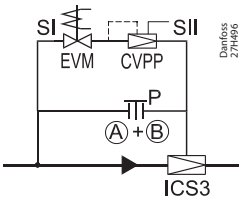
1 × ICS 3 Pilots
2 × CVP-L/M/H
1 × EVM
1 × coil



Example no. 2-16

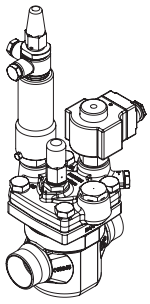
Differential pressure regulation combined with electrical shut off

- CVPP-L (-0.66 to 7 bar g) (19.5 in. Hg to 102 psig)
- CVPP-M (4 to 28 bar g) (58 to 406 psig)



Products

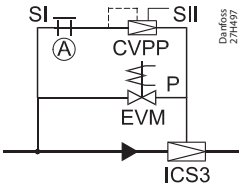
1 × ICS 3 Pilots
1 × blanking plug (A + B)
1 × CVPP-L/M
1 × EVM
1 × coil



Example no. 2-17

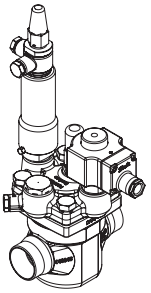
Differential pressure regulation combined with electrical wide open

- CVPP-L (-0.66 to 7 bar g) (19.5 in. Hg to 102 psig)
- CVPP-M (4 to 28 bar g) (58 to 406 psig)



Products

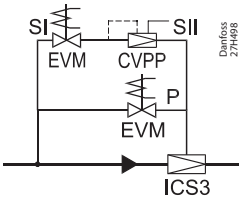
1 × ICS 3 Pilots
1 × blanking plug (A)
1 × CVPP-L/M
1 × EVM
1 × coil



Example no. 2-18

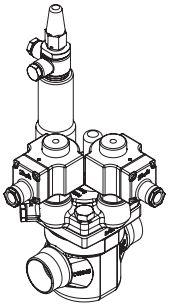
Differential pressure regulation combined with electrical wide open and shut off

- CVPP-L (-0.66 to 7 bar g) (19.5 in. Hg to 102 psig)
- CVPP-M (4 to 28 bar g) (58 to 406 psig)



Products

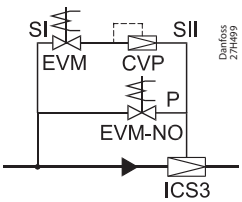
1 × ICS 3 Pilots
1 × CVPP-L/M
2 × EVM
2 × coils



Example no. 2-19

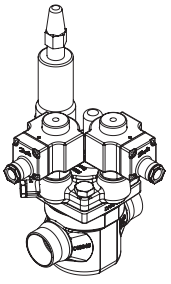
Constant pressure regulation combined with electrical wide open and shut off

- CVP-L (-0.66 to 7 bar g) (19.5 in. Hg to 102 psig)
- CVP-M (4 to 28 bar g) (58 to 406 psig)
- CVP-H (25 to 52 bar g) (363 to 754 psig)



Products

1 × ICS 3 Pilots
1 × CVP-L/M/H
1 × EVM
1 × EVM-NO (12 W coil)
2 × coils



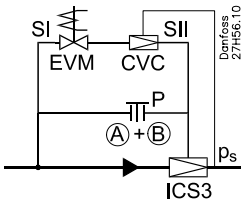
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Configuration examples *(continued)*

Example no. 2-20

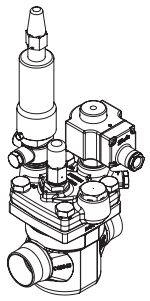
Crankcase pressure regulation (max. suction pressure regulation) combined with shut off

- –0.45 to 7 bar g (13.3 in. Hg to 102 psig)



Products

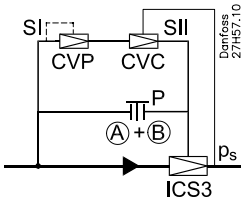
1 × ICS 3 Pilots
1 × blanking plug (A + B)
1 × CVC-L
1 × EVM
1 × coil



Example no. 2-21

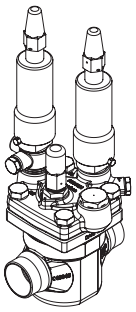
Crankcase pressure regulation (max. suction pressure regulation) combined with evaporating pressure regulation

- –0.66 to 28 bar g (19.5 in. Hg to 406 psig).



Products

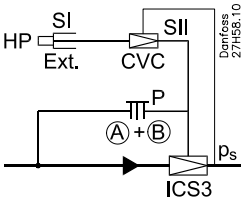
1 × ICS 3 Pilots
1 × blanking plug (A + B)
1 × CVC-L/M
1 × CVP-L/M



Example no. 2-22

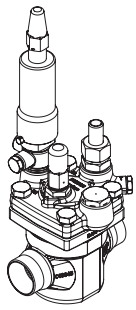
Crankcase pressure regulation (max. suction pressure regulation) at low pressure drops across the valve

- –0.45 to 7 bar g (13.3 in. Hg to 102 psig)



Products

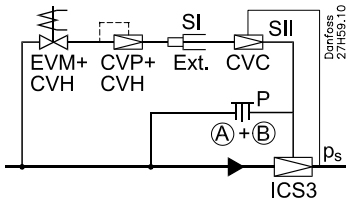
1 × ICS 3 Pilots
1 × blanking plug (A + B)
1 × nipple for external control pressure
1 × CVC-L



Example no. 2-23

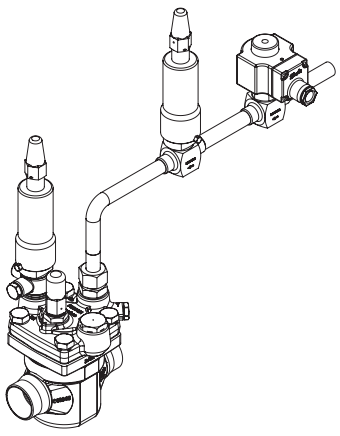
Crankcase pressure regulation (max. suction pressure regulation) combined with constant pressure regulation and electrical shut off.

- –0.66 to 7 bar g (19.5 in. Hg to 102 psig).



Products

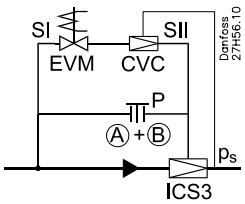
1 × ICS 3 Pilots
1 × blanking plug (A + B)
1 × nipple for external control pressure
1 × CVP-L
1 × EVM
1 × coil
2 × CVH
1 × CVC-L



Example no. 2-24

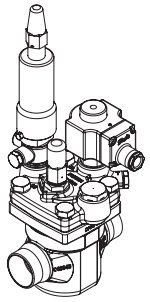
Hot gas bypass regulation combined with electrical shut off

- –0.45 to 7 bar g (13.3 in. Hg to 102 psig)



Products

1 × ICS 3 Pilots
1 × blanking plug (A + B)
1 × CVC-L
1 × EVM
1 × coil

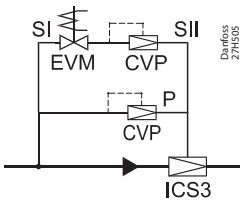


Configuration examples *(continued)*

Example no. 2-25

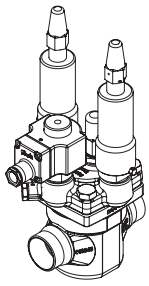
Constant pressure regulation with electrical shut off and protection against high pressure when suction line is closed

- –0.66 to 28 bar g (19.5 in. Hg to 406 psig).



Products

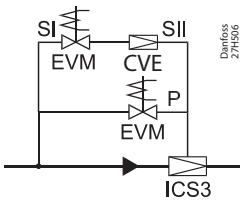
1 × ICS 3 Pilots
1 × CVP-L
1 × EVM
1 × coil
1 × CVP-M



Example no. 2-26

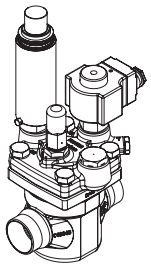
Electronically controlled media temperature regulation combined with electrical shut off

- –1 to 8 bar g (0 in. Hg to 116 psig).



Products

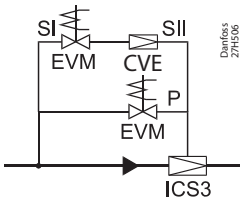
1 × ICS 3 Pilots
1 × blanking plug (A + B)
1 × CVE
1 × EVM
1 × coil



Example no. 2-27

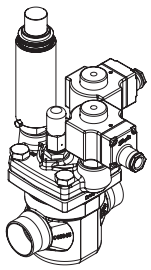
Electronically controlled media temperature regulation combined with electrical shut off and wide open

- –1 to 8 bar g (0 in. Hg to 116 psig).



Products

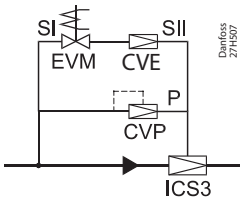
1 × ICS 3 Pilots
1 × CVE
2 × EVM
2 × coils



Example no. 2-28

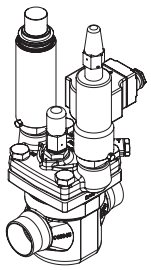
Electronically controlled media temperature regulation combined with electrical shut off and changeover to constant pressure regulation

- –1 to 8 bar g (0 in. Hg to 116 psig).



Products

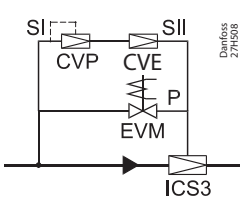
1 × ICS 3 Pilots
1 × CVQ
1 × CVP-L
1 × EVM
1 × coil



Example no. 2-29

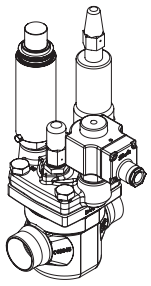
Electronically controlled media temperature regulation with low evaporating pressure protection combined with wide open

- –1 to 8 bar g (0 in. Hg to 116 psig).



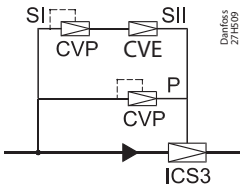
Products

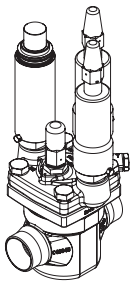
1 × ICS 3 Pilots
1 × CVE
1 × CVP-L
1 × EVM
1 × coil



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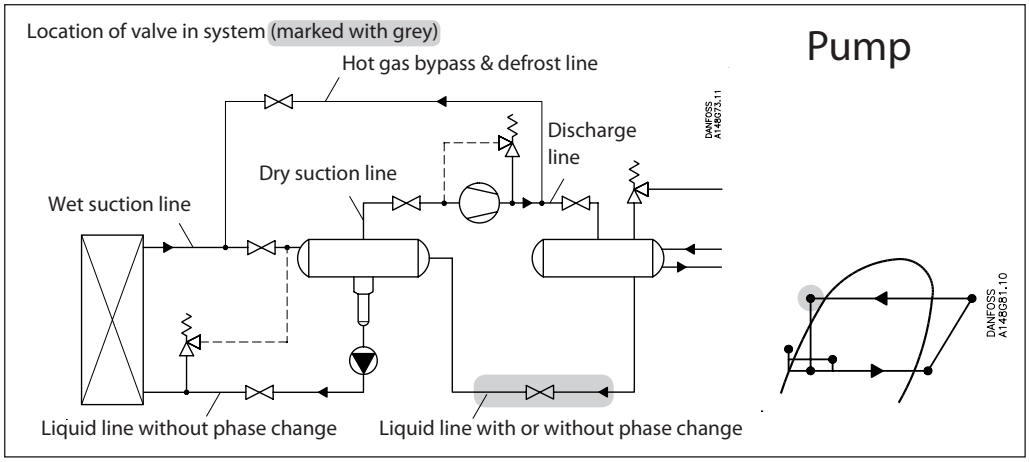
Configuration examples *(continued)*

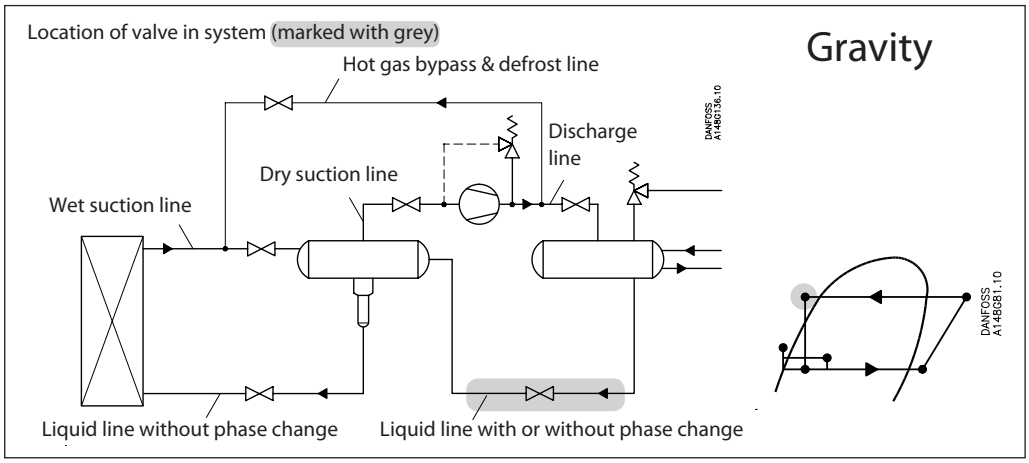
Example no. 2-30	
Electronically controlled media temperature regulation with low evaporating pressure protection combined with changeover to constant pressure regulation • –1 to 8 bar g (0 in. Hg to 116 psig).	

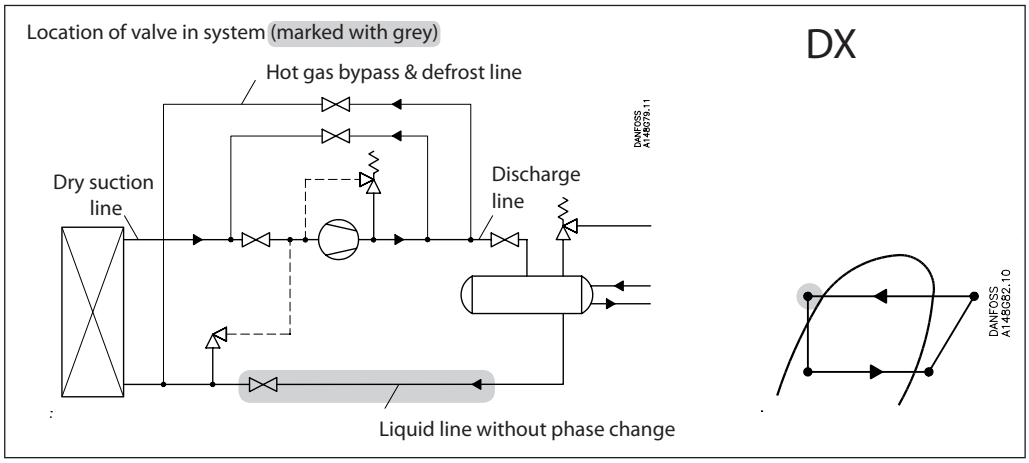
Products	
1 × ICS 3 Pilots 1 × CVE 2 × CVP-L	

Nominal capacities

Liquid line with / without phase change







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Nominal capacities

Liquid line with / without phase change

SI units

Calculation example (R 717 capacities):

Running conditions in a plant are as follows:
- T_e = -20 °C
- Q_o = 250 kW
- T_{liq} = 10 °C
- Max. Δp = 0.3 bar

The capacity table is based on nominal condition (pressure drop Δp = 0.2 bar, T_{liq} = 30 °C)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 0.3 bar $f_{\Delta p} = 0.82$
Correction factor for liquid temperature $f_{Tliq} = 0.92$

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} = 250 \times 0.82 \times 0.92 = 189$ kW

From the capacity table a ICS 25-10 with Q_n capacity 366 kW is selected.

US units

Calculation example (R 717 capacities):

Running conditions in a plant are as follows:
- T_e = -20 °F
- Q_o = 130 TR
- Liquid temperature = 50 °F
- Max. Δp = 4 psi

The capacity table is based on nominal condition (pressure drop Δp = 3 psi, T_{liq} = 90 °F)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 4 psi, $f_{\Delta p} = 0.87$
Correction factor for liquid temperature $f_{Tliq} = 0.92$

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} = 130 \times 0.87 \times 0.92 = 104$ TR

From the capacity table a ICS25-15 with Q_n capacity 175 TR is selected.

Nominal capacities

Liquid line with/without phase change

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
ΔP = 0.2 bar

R 717

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]						
			-50	-40	-30	-20	-10	0	10
ICS25-5	25	1.7	169	171	174	176	178	180	181
ICS25-10		3.5	347	353	358	362	366	370	372
ICS25-15		6	595	604	613	621	628	633	638
ICS25-20		8	794	806	818	828	838	845	852
ICS25-25		11.5	1140	1158	1175	1190	1203	1216	1223
ICS32	32	17	1687	1710	1738	1760	1777	1795	1810
ICS40	40	27	2675	2720	2760	2795	2825	2850	2875
ICS50	50	44	4365	4430	4500	4550	4600	4650	4685
ICS65	65	70	6940	7050	7150	7250	7325	7400	7450
ICS80	80	85	8432	8559	8690	8797	8893	8982	9046
ICS100	100	142	14086	14299	14517	14696	14857	15005	15112
ICS125	125	207	20533	20845	21162	21424	21658	21873	22029
ICS150	150	354	35115	35647	36191	36638	37038	37406	37673

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	1.00
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.82
-10	0.86
0	0.88
10	0.92
20	0.96
30	1.00
40	1.04
50	1.09

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi

R 717

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-60	-40	-20	0	20	40	60
ICS25-5	25	2	48.0	48.8	49.6	50.6	51.0	51.4	52.0
ICS25-10		4.1	99.0	100	102	104	105	106	107
ICS25-15		7	169	172	175	178	180	181	183
ICS25-20		9.3	226	230	233	237	240	242	244
ICS25-25		13.3	324	330	335	341	345	348	351
ICS32	32	20	480	488	496	503	509	514	518
ICS40	40	31	762	775	788	799	808	816	822
ICS50	50	51	1242	1262	1285	1302	1317	1330	1340
ICS65	65	81	1975	2010	2043	2070	2095	2115	2130
ICS80	80	98	2377	2416	2456	2496	2524	2546	2568
ICS100	100	165	4002	4068	4135	4202	4249	4287	4324
ICS125	125	240	5820	5916	6015	6113	6181	6235	6289
ICS150	150	410	9943	10107	10275	10443	10559	10651	10745

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	1.00
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.82
10	0.85
30	0.88
50	0.92
70	0.96
90	1.00
110	1.04
130	1.09

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Nominal capacities

Liquid line with / without phase change

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 10 °C,
ΔP = 0.2 bar

R 744

Type	Valve body size	K_v [m^3/h]	Evaporating temperature [°C]						
			-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	41.0	41.0	41.0	41.0	41.0	40.0	39.0
ICS25-10		3.5	84.0	85.0	85.0	85.0	85.0	83.0	80.0
ICS25-15		6	144	145	146	146	145	142	137
ICS25-20		8	193	194	195	195	194	190	183
ICS25-25		11.5	277	278	280	281	278	273	263
ICS32	32	17	409	412	415	415	411	403	388
ICS40	40	27	650	654	658	659	654	641	617
ICS50	50	44	1058	1065	1073	1073	1065	1044	1005
ICS65	65	70	1685	1695	1707	1708	1694	1661	1598
ICS80	80	85	2045	2058	2068	2070	2057	2015	1943
ICS100	100	142	3417	3438	3456	3458	3436	3365	3246
ICS125	125	207	4981	5011	5037	5040	5009	4906	4732
ICS150	150	354	8519	8570	8615	8620	8567	8390	8092

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.52
-10	0.67
0	0.91
10	**1.00**
15	1.09

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 50 °F,
ΔP = 3 psi

R 744

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-60	-40	-20	0	20	40	60
ICS25-5	25	2	11.7	11.9	12.0	12.0	11.9	11.6	10.9
ICS25-10		4.1	24.2	24.6	24.8	24.8	24.5	23.8	22.4
ICS25-15		7	41.5	42.1	42.5	42.5	42.0	40.8	38.4
ICS25-20		9.3	55.3	56.2	56.7	56.7	56.0	54.4	51.0
ICS25-25		13.3	79.5	81.8	81.5	81.5	80.5	78.0	73.5
ICS32	32	20	118	119	120	120	119	115	109
ICS40	40	31	187	190	191	191	189	184	173
ICS50	50	51	304	309	312	312	308	299	281
ICS65	65	81	484	492	496	496	490	476	448
ICS80	80	98	582	592	596	596	589	572	539
ICS100	100	165	980	997	1004	1004	992	964	907
ICS125	125	240	1426	1450	1460	1460	1444	1402	1319
ICS150	150	410	2436	2477	2494	2494	2466	2395	2254

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.48
10	0.64
30	0.88
50	**1.00**

Nominal capacities

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
ΔP = 0.2 bar

Liquid line with/without phase change

R 134a

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]						
			-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	30.0	32.0	33.0	34.0	36.0	37.0	38.0
ICS25-10		3.5	62.0	65.0	68.0	71.0	74.0	77.0	79.0
ICS25-15		6	107	112	117	122	127	131	136
ICS25-20		8	142	149	156	1625	169	175	181
ICS25-25		11.5	205	214	224	233	243	251	260
ICS32	32	17	303	317	331	345	358	372	384
ICS40	40	27	481	503	526	548	569	590	610
ICS50	50	44	783	820	857	893	928	962	994
ICS65	65	70	1246	1305	1363	1420	1476	1530	1582
ICS80	80	85	1511	1585	1655	1722	1795	1858	1919
ICS100	100	142	2525	2648	2765	2877	2999	3104	3206
ICS125	125	207	3680	3861	4030	4194	4371	4525	4674
ICS150	150	354	6294	6602	6892	7173	7475	7739	7992

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.66
-10	0.70
0	0.76
10	0.82
20	0.90
30	**1.00**
40	1.13
50	1.29

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi

R 134a

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-40	-20	0	20	40	60	80
ICS25-5	25	2	8.5	9.0	9.4	9.8	10.3	10.7	11.1
ICS25-10		4.1	17.5	18.4	19.4	20.3	21.2	22.0	22.8
ICS25-15		7	30.0	31.6	33.2	34.7	36.2	37.7	39.0
ICS25-20		9.3	40.0	42.1	44.3	46.3	48.4	50.3	52.0
ICS25-25		13.3	57.4	60.6	63.6	66.5	69.5	72.3	75.0
ICS32	32	20	85	89	94	98.5	103	107	111
ICS40	40	31	135	142	149	156	163	170	176
ICS50	50	51	220	232	244	255	266	277	287
ICS65	65	81	350	369	387	405	423	440	456
ICS80	80	98	421	443	466	487	509	530	549
ICS100	100	165	709	747	784	820	857	892	924
ICS125	125	240	1031	1086	1141	1193	1247	1297	1344
ICS150	150	410	1761	1855	1949	2038	2131	2216	2296

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.64
10	0.68
30	0.74
50	0.81
70	0.89
90	**1.00**
110	1.15
130	1.35

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Nominal capacities

Liquid line with/without phase change

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
ΔP = 0.2 bar

R 404A

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]						
			-50	-40	-30	-20	-10	0	10
ICS25-5	25	1.7	19.6	21.0	22.3	23.7	25.0	26.1	27.3
ICS25-10		3.5	40.3	43.0	46.0	49.0	51.3	54.0	56.0
ICS25-15		6	69.0	74.0	79.0	84.0	88.0	92.0	96.0
ICS25-20		8	92.0	99.0	105	111	117	123	128
ICS25-25		11.5	133	142	151	160	169	177	185
ICS32	32	17	196	210	223	237	249	261	274
ICS40	40	27	311	333	354	375	396	415	432
ICS50	50	44	507	542	577	612	645	676	705
ICS65	65	70	806	863	918	973	1025	1077	1120
ICS80	80	85	979	1049	1116	1184	1246	1307	1363
ICS100	100	142	1636	1752	1864	1978	2082	2183	2277
ICS125	125	207	2385	2554	2717	2883	3035	3182	3319
ICS150	150	354	4079	4367	4647	4931	5191	5442	5675

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.55
-10	0.60
0	0.66
10	0.74
20	0.85
30	**1.00**
40	1.23
50	1.68

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi

R 404A

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-60	-40	-20	0	20	40	60
ICS25-5	25	2	5.4	5.8	6.2	6.6	7.0	7.4	7.8
ICS25-10		4.1	11.0	11.9	12.8	13.7	14.5	15.3	16.0
ICS25-15		7	18.9	20.4	22.0	23.4	24.9	26.2	27.4
ICS25-20		9.3	25.2	27.2	29.2	31.3	33.0	35.0	36.5
ICS25-25		13.3	36.1	39.1	42.0	45.0	47.6	50.0	52.5
ICS32	32	20	53.5	57.8	62.0	66.4	70.4	74.0	77.6
ICS40	40	31	85.0	92.0	99.0	106	112	118	123
ICS50	50	51	138	150	161	172	182	192	201
ICS65	65	81	220	238	256	274	290	306	320
ICS80	80	98	265	287	308	329	348	367	385
ICS100	100	165	446	483	518	554	587	619	648
ICS125	125	240	649	702	754	806	853	900	942
ICS150	150	410	1109	1199	1288	1377	1458	1537	1609

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.52
10	0.57
30	0.63
50	0.72
70	0.83
90	**1.00**
110	1.29
130	1.92

Nominal capacities

Liquid line with/without phase change

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
ΔP = 0.2 bar

R 22

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]						
			-50	-40	-30	-20	-10	0	10
ICS25-5	25	1.7	33.7	34.8	35.8	36.8	37.8	38.6	39.4
ICS25-10		3.5	69.3	71.7	73.8	75.8	77.8	79.6	81.2
ICS25-15		6	119	123	127	130	133	136	139
ICS25-20		8	158	164	169	173	178	182	186
ICS25-25		11.5	228	235	242	249	255	261	267
ICS32	32	17	337	348	358	368	378	386	394
ICS40	40	27	535	553	569	585	600	614	626
ICS50	50	44	871	901	928	953	977	1000	1021
ICS65	65	70	1386	1433	1476	1516	1555	1591	1624
ICS80	80	85	1684	1741	1792	1841	1888	1931	1972
ICS100	100	142	2813	2908	2994	3075	3154	3226	3294
ICS125	125	207	4100	4239	4365	4482	4598	4703	4802
ICS150	150	354	7012	7249	7465	7665	7864	8042	8212

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.71
-10	0.75
0	0.80
10	0.86
20	0.92
30	**1.00**
40	1.09
50	1.22

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi

R 22

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-60	-40	-20	0	20	40	60
ICS25-5	25	2	9.5	9.8	10.1	10.5	10.7	11.0	11.3
ICS25-10		4.1	19.5	20.2	20.9	21.5	22.1	22.7	23.2
ICS25-15		7	33.5	34.6	35.9	37.0	38.0	39.0	39.8
ICS25-20		9.3	44.5	46.2	47.8	49.2	50.6	52.0	53.0
ICS25-25		13.3	64.0	66.4	68.6	71.0	73.0	75.0	76.0
ICS32	32	20	95.0	98.0	101	105	108	110	112
ICS40	40	31	151	156	161	166	171	175	179
ICS50	50	51	245	254	263	271	279	285	291
ICS65	65	81	390	404	418	431	443	454	464
ICS80	80	98	470	486	502	519	533	546	558
ICS100	100	165	791	818	846	874	897	920	939
ICS125	125	240	1150	1190	1230	1271	1305	1338	1366
ICS150	150	410	1965	2033	2102	2171	2230	2286	2333

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

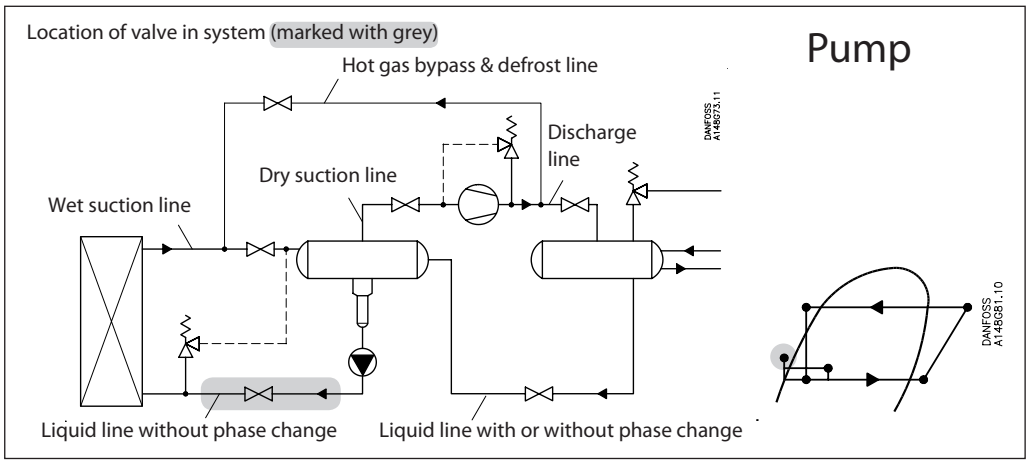
Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.73
10	0.77
30	0.82
50	0.87
70	0.93
90	**1.00**
110	1.09
130	1.20

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Nominal capacities

Liquid line without phase change



SI units

Calculation example (R 717 capacities):

Running conditions in a plant are as follows:

T_e = -20 °C
Q_o = 180 kW
Circulation rate = 3
Max. Δp = 0.3 bar

The capacity table is based on nominal condition (pressure drop Δp = 0.2 bar, circulation rate = 4)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 0.3 bar $f_{\Delta p} = 0.82$
Correction factor for circulation rate $f_{rec} = 0.75$

$Q_n = Q_o \times f_{\Delta p} \times f_{rec} = 180 \times 0.82 \times 0.75 = 111$ kW

From the capacity table a ICS 25-10 with Q_n capacity 117 kW is selected.

US units

Calculation example (R 717 capacities):

Running conditions in a plant are as follows:

T_e = -20 °F
Q_o = 130 TR
Circulation rate = 3
Max. Δp = 4 psi

The capacity table is based on nominal condition (pressure drop Δp = 3 psi, circulation rate = 4)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 4 psi, $f_{\Delta p} = 0.87$
Correction factor for circulation rate $f_{rec} = 0.75$

$Q_n = Q_o \times f_{\Delta p} \times f_{rec} = 130 \times 0.87 \times 0.75 = 85$ TR

From the capacity table a ICS 25 with Q_n capacity 114 TR is selected.

Nominal capacities

Liquid line without phase change

SI units

Capacity table for nominal conditions, Q_N [kW], circulation rate = 4, ΔP = 0.2 bar

R 717

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	63.0	61.0	59.0	56.6	55.0	52.5	50.3	48.0
ICS25-10		3.5	128	124	121	117	112	108	104	99.0
ICS25-15		6	219	213	207	200	193	185	178	169
ICS25-20		8	292	284	276	266	257	247	237	226
ICS25-25		11.5	419	408	396	383	369	355	340	325
ICS32	32	17	620	603	585	566	546	525	503	480
ICS40	40	27	985	959	930	900	868	833	798	761
ICS50	50	44	1605	1560	1515	1465	1413	1360	1300	1242
ICS65	65	70	2550	2485	2410	2330	2248	2160	2070	1976
ICS80	80	85	3106	3020	2932	2832	2732	2624	2516	2400
ICS100	100	142	5190	5045	4898	4730	4563	4383	4204	4009
ICS125	125	207	7565	7354	7140	6896	6652	6390	6128	5844
ICS150	150	354	12938	12576	12210	11793	11376	10928	10479	9994

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

R 717

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	18.0	17.4	16.9	16.2	15.6	14.9	14.2	13.4
ICS25-10		4.1	37.0	35.9	34.7	33.4	32.0	30.6	29.6	27.6
ICS25-15		7	63.4	61.5	59.4	57.3	55.0	52.5	50.0	47.3
ICS25-20		9.3	84.5	82.0	79.3	76.3	73.3	70.0	66.6	63.0
ICS25-25		13.3	122	118	114	110	105	102	95.7	91.0
ICS32	32	20	180	174	169	162	156	149	142	134
ICS40	40	31	285	276	267	258	247	236	225	213
ICS50	50	51	465	451	436	420	403	385	366	347
ICS65	65	81	740	717	694	668	641	613	583	552
ICS80	80	98	891	863	835	804	771	738	703	664
ICS100	100	165	1499	1453	1406	1353	1298	1243	1183	1118
ICS125	125	240	2181	2113	2045	1968	1889	1808	1721	1627
ICS150	150	410	3726	3609	3493	3363	3226	3088	2941	2779

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

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Nominal capacities

Liquid line without phase change

SI units

Capacity table for nominal conditions, Q_N [kW], circulation rate = 4, ΔP = 0.2 bar

R 744

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	19.0	18.0	16.6	15.2	13.6	12.0	9.8	7.1
ICS25-10		3.5	39.3	37.0	34.2	31.3	28.0	24.4	20.0	14.7
ICS25-15		6	68.0	63.0	59.0	54.0	48.0	42.0	36.0	25.0
ICS25-20		8	90.0	85.0	78.0	72.0	64.0	56.0	46.0	34.0
ICS25-25		11.5	129	121	112	103	92.0	80.0	66.0	48.0
ICS32	32	17	191	179	166	152	136	118	98	72
ICS40	40	27	303	285	264	241	216	188	155	113
ICS50	50	44	494	464	430	393	352	306	252	185
ICS65	65	70	787	738	685	626	560	487	401	294
ICS80	80	85	955	897	831	761	680	593	490	357
ICS100	100	142	1596	1499	1388	1271	1136	991	819	596
ICS125	125	207	2326	2185	2023	1853	1656	1444	1194	869
ICS150	150	354	3978	3736	3460	3170	2832	2470	2043	1486

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

R 744

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	5.6	5.8	4.8	4.3	3.8	3.2	2.4	1.4
ICS25-10		4.1	11.4	10.7	9.8	8.8	7.8	6.5	5.0	2.8
ICS25-15		7	19.6	18.3	16.8	15.2	13.3	11.2	8.6	4.8
ICS25-20		9.3	26.1	24.4	22.4	20.2	17.7	14.9	11.4	6.3
ICS25-25		13.3	37.6	35.0	32.2	29.0	25.5	21.4	16.4	9.1
ICS32	32	20	55.5	51.8	47.6	43.0	37.7	31.6	24.2	13.5
ICS40	40	31	88.0	82.0	75.5	68.0	60.0	50.2	38.5	21.4
ICS50	50	51	144	134	123	111	98.0	82.0	62.7	35.0
ICS65	65	81	229	213	196	177	155	130	100	55.4
ICS80	80	98	275	260	236	213	187	157	120	67
ICS100	100	165	463	438	397	358	315	264	202	113
ICS125	125	240	674	637	578	521	458	384	294	164
ICS150	150	410	1152	1087	987	889	783	656	502	281

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

Nominal capacities

Liquid line without phase change

SI units

Capacity table for nominal conditions, Q_N [kW], circulation rate = 4, ΔP = 0.2 bar

R 134a

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]						
			-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	14.0	13.5	13.0	12.4	11.9	11.2	10.6
ICS25-10		3.5	28.9	27.8	26.8	25.6	24.4	23.2	21.8
ICS25-15		6	49.5	47.7	45.9	43.9	41.8	39.7	37.4
ICS25-20		8	65.9	63.5	61.1	58.5	55.8	52.9	49.8
ICS25-25		11.5	94.8	91.3	87.9	84.1	80.2	76.1	71.6
ICS32	32	17	140	135	130	124	119	112	106
ICS40	40	27	223	214	206	197	188	179	168
ICS50	50	44	363	349	336	322	307	291	274
ICS65	65	70	577	556	535	512	488	463	436
ICS80	80	85	701	675	650	621	593	562	529
ICS100	100	142	1171	1127	1085	1038	991	939	885
ICS125	125	207	1707	1643	1582	1513	1444	1369	1289
ICS150	150	354	2919	2810	2706	2587	2470	2341	2205

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

R 134a

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-40	-20	0	20	40	60	80
ICS25-5	25	2	4.1	4.0	3.8	3.6	3.4	3.2	3.0
ICS25-10		4.1	8.5	8.1	7.7	7.4	7.0	6.6	6.1
ICS25-15		7	14.4	13.8	13.2	12.6	11.9	11.2	10.4
ICS25-20		9.3	19.2	18.4	17.6	16.7	15.8	14.9	13.8
ICS25-25		13.3	27.4	26.3	25.1	23.9	22.7	21.3	19.8
ICS32	32	20	41.2	39.5	37.8	35.9	34.1	32.0	29.8
ICS40	40	31	63.9	61.2	58.6	55.7	52.8	49.6	46.1
ICS50	50	51	105	101	96.3	91.6	86.9	81.5	75.9
ICS65	65	81	167	160	153	146	138	130	121
ICS80	80	98	202	194	185	176	167	157	146
ICS100	100	165	340	326	312	297	281	264	246
ICS125	125	240	495	475	453	432	409	384	357
ICS150	150	410	845	811	774	737	698	657	611

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

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Nominal capacities

Liquid line without phase change

SI units

Capacity table for nominal conditions, Q_N [kW], circulation rate = 4, ΔP = 0.2 bar

R 404A

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	12.4	12.0	11.3	10.7	10.0	9.5	9.0	8.1
ICS25-10		3.5	25.4	24.4	23.2	22.0	21.0	19.7	18.2	17.0
ICS25-15		6	44.0	42.0	40.0	38.0	36.0	34.0	31.0	29.0
ICS25-20		8	58.0	56.0	53.0	51.0	48.0	45.0	42.0	38.0
ICS25-25		11.5	84.0	80.0	76.0	73.0	69.0	65.0	60.0	55.0
ICS32	32	17	124	119	113	107	102	95.0	89.0	81.0
ICS40	40	27	196	189	179	170	161	151	141	129
ICS50	50	44	320	307	291	277	263	247	229	210
ICS65	65	70	509	488	463	441	418	393	365	334
ICS80	80	85	619	594	564	537	508	478	444	407
ICS100	100	142	1034	993	942	897	849	798	742	680
ICS125	125	207	1507	1448	1373	1307	1237	1163	1081	991
ICS150	150	354	2578	2475	2347	2235	2116	1989	1849	1694

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

R 404A

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	3.6	3.5	3.2	3.0	2.9	2.7	2.4	2.2
ICS25-10		4.1	7.4	7.0	6.7	6.3	5.9	5.5	5.0	4.5
ICS25-15		7	12.5	12.1	11.4	10.8	10.1	9.4	8.6	7.7
ICS25-20		9.3	16.9	16.1	15.2	14.4	13.5	12.6	11.5	10.3
ICS25-25		13.3	24.2	23.2	21.9	20.7	19.4	18.0	16.5	14.7
ICS32	32	20	35.8	34.2	32.3	30.6	28.8	26.7	24.4	21.8
ICS40	40	31	57.0	54.4	51.3	48.6	45.6	42.5	38.8	34.6
ICS50	50	51	93.0	88.6	84.0	79.0	74.4	69.0	63.0	56.5
ICS65	65	81	147	141	133	126	118	110	101	90.0
ICS80	80	98	177	170	160	151	142	132	121	108
ICS100	100	165	299	286	270	255	240	223	203	182
ICS125	125	240	435	416	392	370	348	324	295	265
ICS150	150	410	742	711	670	633	595	554	505	453

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

Nominal capacities

Liquid line without phase change

SI units

Capacity table for nominal conditions, Q_N [kW], circulation rate = 4, ΔP = 0.2 bar

R 22

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	15.1	14.6	14.1	13.5	12.9	12.3	11.6	10.9
ICS25-10		3.5	31.2	30.1	29.0	27.9	26.6	25.3	24.0	22.5
ICS25-15		6	53.4	51.6	49.7	47.7	45.6	43.4	41.1	38.6
ICS25-20		8	71.2	68.8	66.3	63.7	60.8	57.8	54.7	51.4
ICS25-25		11.5	102	98.9	95.3	91.5	87.4	83.1	78.7	73.9
ICS32	32	17	151	146	141	135	129	123	116	109
ICS40	40	27	240	232	224	215	205	195	185	174
ICS50	50	44	392	378	365	350	334	318	301	283
ICS65	65	70	623	602	580	557	532	506	479	450
ICS80	80	85	756	731	705	676	646	614	582	546
ICS100	100	142	1263	1221	1177	1130	1079	1027	971	913
ICS125	125	207	1841	1779	1716	1647	1572	1496	1416	1330
ICS150	150	354	3148	3043	2935	2816	2689	2559	2422	2275

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

R 22

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	4.4	4.2	4.1	3.9	3.7	3.5	3.2	3.0
ICS25-10		4.1	9.0	8.7	8.3	8.0	7.6	7.1	6.7	6.2
ICS25-15		7	15.5	14.9	14.3	13.6	13.0	12.2	11.5	10.6
ICS25-20		9.3	20.6	19.9	19.1	18.2	17.3	16.3	15.3	14.2
ICS25-25		13.3	29.7	28.6	27.4	26.2	24.9	23.5	22.0	20.4
ICS32	32	20	44.0	42.2	40.5	38.7	36.8	34.6	32.5	30.2
ICS40	40	31	70.0	67.0	64.3	61.4	58.3	55.0	51.6	47.8
ICS50	50	51	114	109	105	100	95.0	90.0	84.0	78.0
ICS65	65	81	181	174	167	159	151	143	134	124
ICS80	80	98	218	209	201	192	182	172	161	149
ICS100	100	165	366	352	338	323	307	289	271	251
ICS125	125	240	533	512	492	470	446	421	394	365
ICS150	150	410	910	875	841	802	763	719	673	624

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

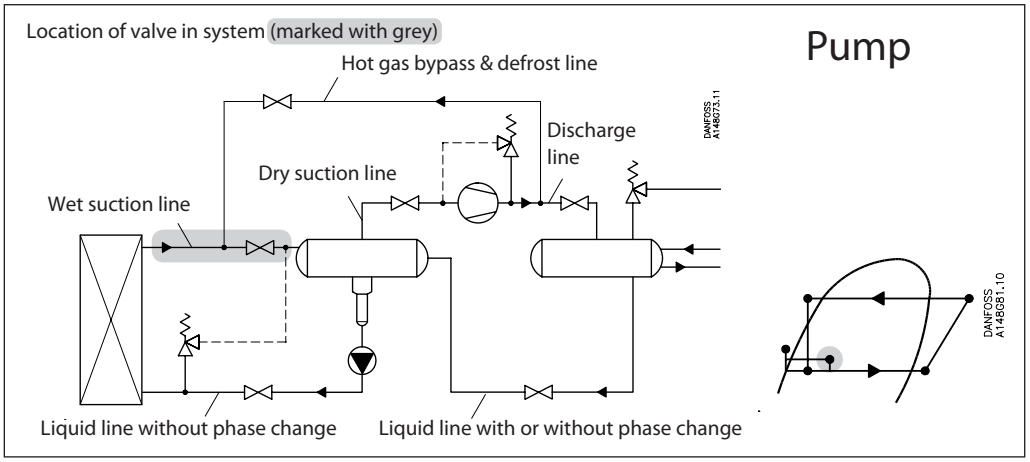
Correction factor for circulation rate (f_{rec})

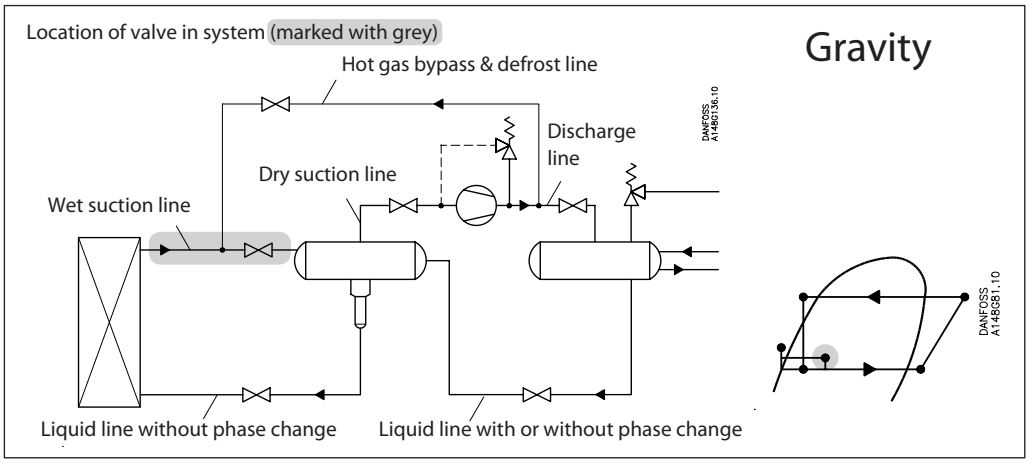
Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

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Nominal capacities

Wet suction line





Nominal capacities

Wet suction line

SI units

Calculation example (R 717 capacities):

An application has following running conditions:

T_e = -20 °C
Q_o = 80 kW
Circulation rate = 3
Max. Δp = 0.3 bar

The capacity table is based on nominal condition (pressure drop Δp = 0.2 bar, circulation rate = 4)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 0.3 bar $f_{\Delta p}$ = 0.82
Correction factor for circulation rate f_{rec} = 0.9

$Q_n = Q_o \times f_{\Delta p} \times f_{rec} = 80 \times 0.82 \times 0.9 = 59$ kW

From the capacity table a ICS 32 with Q_n capacity 60 kW is selected.

US units

Calculation example (R 717 capacities):

An application has following running conditions:

T_e = -20 °F
Q_o = 8 TR
Circulation rate = 3
Max. Δp = 4 psi

The capacity table is based on nominal condition (pressure drop Δp = 3 psi, circulation rate = 4)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 4 psi, $f_{\Delta p}$ = 0.87
Correction factor for circulation rate f_{rec} = 0.9

$Q_n = Q_o \times f_{\Delta p} \times f_{rec} = 8 \times 0.87 \times 0.9 = 6.3$ TR

From the capacity table a ICS 25-20 with Q_n capacity 6.8 TR is selected.

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Nominal capacities

Wet suction line

SI units

Capacity table for nominal conditions, Q_N [kW], circulation rate = 4, ΔP = 0.2 bar

R 717

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	2.4	3.7	4.9	6.0	7.2	8.5	9.7	11.0
ICS25-10		3.5	5.0	7.6	9.9	12.4	15.0	17.4	20.0	23.0
ICS25-15		6	8.6	13.0	17.0	21.0	25.5	30.0	34.0	39.0
ICS25-20		8	11.4	17.3	23.0	28.0	34.0	40.0	46.0	52.0
ICS25-25		11.5	18.5	25.0	33.0	41.0	49.0	57.0	66.0	75.0
ICS32	32	17	24.4	37.0	48.0	60.0	72.0	85.0	97.0	110.0
ICS40	40	27	38.7	58.0	77.0	95.0	115	134	154	176
ICS50	50	44	63.1	95	125	155	186	219	252	286
ICS65	65	70	100	152	200	247	297	348	401	455
ICS80	80	85	123	184	242	300	361	423	486	553
ICS100	100	142	206	308	405	501	603	707	812	924
ICS125	125	207	300	449	590	730	880	1031	1183	1347
ICS150	150	354	513	767	1009	1248	1504	1764	2023	2303

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

R 717

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	0.6	1.1	1.4	1.8	2.2	2.6	3.0	3.5
ICS25-10		4.1	1.3	2.2	3.0	3.7	4.5	5.4	6.2	7.1
ICS25-15		7	2.3	3.7	5.1	6.4	7.8	9.2	10.7	12.2
ICS25-20		9.3	3.0	5.0	6.8	8.5	10.3	12.3	14.2	16.2
ICS25-25		13.3	4.4	7.1	9.7	12.2	14.9	17.6	20.4	23.3
ICS32	32	20	6.5	10.5	14.3	18.1	22.0	26.0	30.0	34.5
ICS40	40	31	10.3	16.8	22.8	28.8	35.0	41.4	48.0	55.0
ICS50	50	51	16.8	27.3	37.0	47.0	57.0	67.0	78.0	89.0
ICS65	65	81	26.8	43.5	59.0	75.0	91.0	107	124	142
ICS80	80	98	32	53	71	90	109	129	149	171
ICS100	100	165	53	88	120	151	184	217	251	288
ICS125	125	240	78	129	174	219	267	316	366	419
ICS150	150	410	133	220	297	375	456	540	625	716

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

Nominal capacities

Wet suction line

SI units

Capacity table for nominal conditions, Q_N [kW], circulation rate = 4, ΔP = 0.2 bar

R 744

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	5.2	6.0	6.7	7.4	8.0	8.3	8.4	7.7
ICS25-10		3.5	10.7	12.2	13.8	15.0	16.3	17.0	17.2	16.0
ICS25-15		6	18.3	21.0	23.6	26.0	28.0	29.2	29.5	27.3
ICS25-20		8	24.4	28.0	31.5	35.0	37.0	39.0	39.3	36.5
ICS25-25		11.5	35.0	40.0	45.0	50.0	54.0	56.0	56.5	52.0
ICS32	32	17	52.0	59.0	67.0	74.0	79.0	83.0	84.0	77.0
ICS40	40	27	82.0	94.0	106	117	126	132	133	123
ICS50	50	44	134	154	173	190	205	215	216	200
ICS65	65	70	213	244	275	303	326	342	344	318
ICS80	80	85	259	297	334	369	396	415	418	386
ICS100	100	142	433	496	558	616	662	693	699	645
ICS125	125	207	631	723	814	898	966	1010	1019	941
ICS150	150	354	1079	1236	1392	1535	1651	1726	1742	1609

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

R 744

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	1.5	1.7	2.0	2.2	2.3	2.4	2.4	1.8
ICS25-10		4.1	3.0	3.5	4.0	4.5	4.8	5.0	4.8	3.7
ICS25-15		7	5.2	6.0	6.9	7.7	8.2	8.6	8.3	6.4
ICS25-20		9.3	6.9	8.1	9.2	10.2	11.0	11.4	11.1	8.5
ICS25-25		13.3	10.0	11.6	13.2	14.7	15.8	16.4	15.9	12.3
ICS32	32	20	14.7	17.2	19.4	21.7	23.3	24.2	23.5	18.2
ICS40	40	31	23.3	27.3	31.0	34.5	37.0	38.5	37.3	28.8
ICS50	50	51	38.0	44.5	50.5	56.0	60.5	62.7	60.8	47.0
ICS65	65	81	60.5	71.0	80.0	89.0	96.0	100	96.7	75.0
ICS80	80	98	73	85	97	108	115	120	117	90
ICS100	100	165	123	143	163	181	194	202	196	151
ICS125	125	240	179	208	237	264	282	294	286	220
ICS150	150	410	305	355	405	451	483	502	488	375

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

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Nominal capacities

SI units

Capacity table for nominal conditions, Q_N [kW], circulation rate = 4, ΔP = 0.2 bar

Wet suction line

R 134a

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]						
			-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	1.1	1.6	1.9	2.3	2.7	3.1	3.4
ICS25-10		3.5	2.3	3.2	4.0	4.8	5.6	6.4	7.1
ICS25-15		6	4.0	5.5	6.8	8.2	9.5	10.9	12.2
ICS25-20		8	5.4	7.3	9.1	10.9	12.7	14.5	16.2
ICS25-25		11.5	7.7	10.5	13.1	15.7	18.2	20.9	23.3
ICS32	32	17	11.4	15.5	19.4	23.2	27.0	30.8	34.5
ICS40	40	27	18.1	24.6	30.8	36.8	42.8	49.0	54.8
ICS50	50	44	29.5	40.2	50.2	60.0	69.8	79.8	89.3
ICS65	65	70	47.0	63.9	79.9	95.5	111	127	142
ICS80	80	85	57	78	97	116	135	154	172
ICS100	100	142	95	130	161	194	225	258	288
ICS125	125	207	138	190	235	282	329	376	419
ICS150	150	354	236	324	403	483	562	643	717

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

R 134a

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-40	-20	0	20	40	60	80
ICS25-5	25	2	0.3	0.5	0.6	0.7	0.8	1.0	1.1
ICS25-10		4.1	0.6	1.0	1.2	1.5	1.7	2.0	2.2
ICS25-15		7	1.0	1.6	2.1	2.5	2.9	3.4	3.8
ICS25-20		9.3	1.4	2.2	2.8	3.3	3.9	4.5	5.1
ICS25-25		13.3	2.0	3.1	3.9	4.8	5.6	6.4	7.2
ICS32	32	20	3.0	4.7	5.9	7.2	8.4	9.7	10.9
ICS40	40	31	4.6	7.2	9.2	11.1	13.1	15.0	16.8
ICS50	50	51	7.6	11.9	15.1	18.3	21.5	24.6	27.7
ICS65	65	81	12.1	18.9	24.1	29.1	34.1	39.1	44.0
ICS80	80	98	15	23	29	35	41	48	53
ICS100	100	165	25	39	49	59	69	80	90
ICS125	125	240	36	57	71	86	100	117	130
ICS150	150	410	61	97	122	147	171	199	223

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

Nominal capacities

Wet suction line

SI units

Capacity table for nominal conditions, Q_N [kW], circulation rate = 4, ΔP = 0.2 bar

R 404A

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	1.5	1.9	2.2	2.6	3.0	3.3	3.7	4.0
ICS25-10		3.5	3.0	3.8	4.5	5.3	6.1	6.9	7.6	8.2
ICS25-15		6	5.2	6.5	7.8	9.1	10.4	11.7	13.0	14.0
ICS25-20		8	6.9	8.7	10.4	12.2	14.0	15.7	17.3	18.8
ICS25-25		11.5	10.0	12.5	15.0	17.5	20.0	22.6	25.0	27.0
ICS32	32	17	14.7	18.5	22.0	26.0	29.7	33.2	37.0	40.0
ICS40	40	27	23.3	29.3	35.0	41.0	47.0	53.0	59.0	63.0
ICS50	50	44	38.0	48.0	57.0	67.0	77.0	86.0	95.0	103
ICS65	65	70	60.0	76.0	91.0	106	122	137	152	164
ICS80	80	85	74	93	110	129	148	166	185	199
ICS100	100	142	123	155	184	216	248	278	308	333
ICS125	125	207	179	226	268	315	361	405	449	485
ICS150	150	354	306	386	459	539	618	693	769	830

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

R 404A

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	0.4	0.5	0.7	0.8	0.9	1.0	1.1	1.2
ICS25-10		4.1	0.8	1.1	1.3	1.6	1.8	2.1	2.3	2.3
ICS25-15		7	1.4	1.9	2.3	2.7	3.2	3.6	3.9	2.5
ICS25-20		9.3	1.9	2.5	3.1	3.6	4.2	4.8	5.3	5.7
ICS25-25		13.3	2.8	3.6	4.4	5.2	6.0	6.8	7.5	8.1
ICS32	32	20	4.1	5.3	6.5	7.7	8.9	10.1	11.1	12.0
ICS40	40	31	6.5	8.5	10.3	12.2	14.2	16.0	17.7	19.1
ICS50	50	51	10.6	13.8	16.8	19.9	23.0	26.0	29.0	31.0
ICS65	65	81	16.9	22.0	26.7	31.7	36.7	41.5	46.0	49.5
ICS80	80	98	20	26	32	38	44	50	55	56
ICS100	100	165	34	44	55	64	74	84	93	95
ICS125	125	240	49	64	79	94	108	123	135	138
ICS150	150	410	84	110	136	160	185	209	231	236

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

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Nominal capacities

Wet suction line

SI units

Capacity table for nominal conditions, Q_N [kW], circulation rate = 4, ΔP = 0.2 bar

R 22

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	1.4	1.8	2.2	2.6	3.0	3.4	3.8	4.2
ICS25-10		3.5	2.8	3.7	4.6	5.4	6.2	7.0	7.9	8.7
ICS25-15		6	4.8	6.3	7.8	9.2	10.6	12.0	13.5	14.8
ICS25-20		8	6.4	8.4	10.4	12.2	14.2	16.0	17.9	19.8
ICS25-25		11.5	9.2	12.0	15.0	17.6	20.4	23.0	25.8	28.4
ICS32	32	17	13.6	17.8	22.1	26.0	30.1	34.0	38.1	42.0
ICS40	40	27	21.5	28.3	35.1	41.3	47.8	54.0	60.6	66.7
ICS50	50	44	35.1	46.1	57.2	67.3	77.9	88.0	98.7	109
ICS65	65	70	55.8	73.3	91.0	107	124	140	157	173
ICS80	80	85	68	89	111	130	150	170	191	210
ICS100	100	142	114	149	185	217	251	284	319	351
ICS125	125	207	166	217	269	317	366	414	464	512
ICS150	150	354	284	372	461	542	627	708	794	875

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

R 22

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	0.2	0.5	0.7	0.8	0.9	1.1	1.2	1.3
ICS25-10		4.1	0.5	1.1	1.3	1.6	1.9	2.2	2.4	2.7
ICS25-15		7	0.8	1.8	2.3	2.8	3.2	3.7	4.1	4.6
ICS25-20		9.3	1.1	2.4	3.0	3.7	4.3	4.9	5.5	6.1
ICS25-25		13.3	1.6	3.5	4.4	5.2	6.1	7.0	7.9	8.7
ICS32	32	20	2.4	5.2	6.5	7.9	9.2	10.5	11.9	13.1
ICS40	40	31	3.7	8.1	10.1	12.2	14.3	16.3	18.4	20.3
ICS50	50	51	6.1	13.3	16.7	20.1	23.5	26.9	30.2	33.4
ICS65	65	81	9.69	21.1	26.5	31.9	37.3	42.7	48.0	53.0
ICS80	80	98	11	25	32	39	45	52	58	64
ICS100	100	165	19	43	54	65	76	88	98	108
ICS125	125	240	28	62	79	95	110	127	142	157
ICS150	150	410	48	107	135	162	188	217	243	269

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

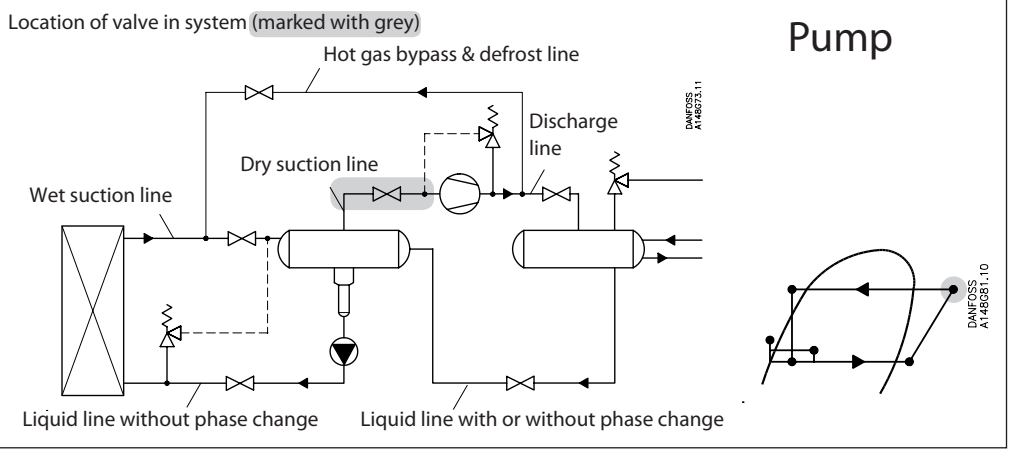
Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

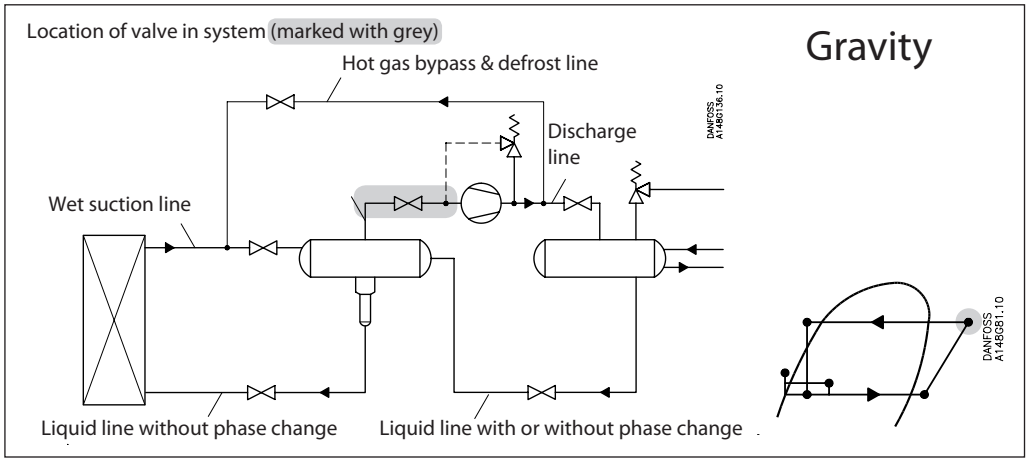
Nominal capacities

Dry suction line

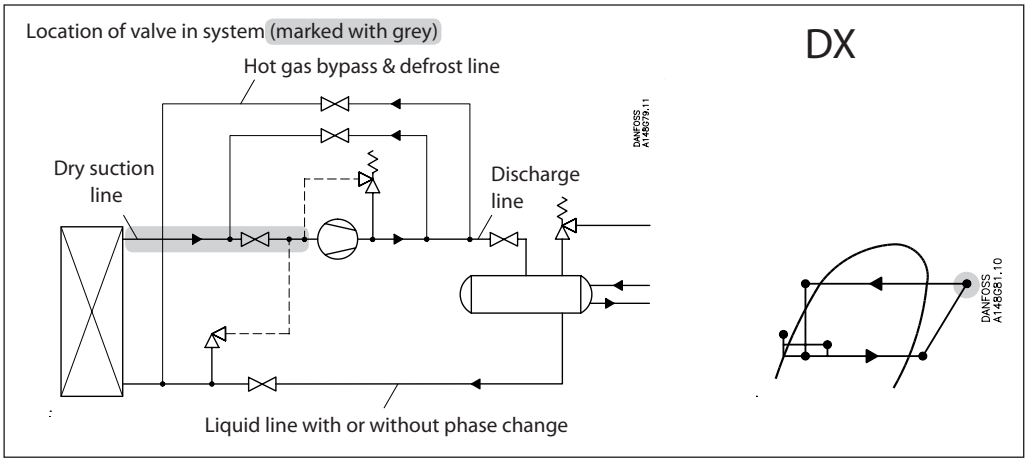
Pump



Gravity



DX



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Nominal capacities

Dry suction line

SI units

Calculation example (R 717 capacities):

An application has following running conditions:

T_e = -20 °C
Q_o = 90 kW
T_{liq} = 10 °C
Max. Δp = 0.3 bar

The capacity table is based on nominal condition (pressure drop Δp = 0.2 bar, T_{liq} = 30 °C)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 0.3 bar $f_{\Delta p}$ = 0.82
Correction factor for liquid temperature f_{Tliq} = 0.92
$Q_n = Q_o \times f\,\Delta p \times f_{Tliq} = 90 \times 0.82 \times 0.92 = 67.9$kW
From the capacity table a ICS 32 with Q_n capacity 92 kW is selected.

US units

Calculation example (R 717 capacities):

An application has following running conditions:

T_e = 0 °F
Q_o = 20 TR
T_{liq} = 50 °F
Max. Δp = 4 psi

The capacity table is based on nominal condition (pressure drop Δp = 3 psi, T_{liq} = 90 °F)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 4 psi, T_{liq} = 0.87
Correction factor for liquid temperature f_{Tliq} = 0.92

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} = 20 \times 0.87 \times 0.92 = 16$ TR

From the capacity table a ICS 25-25 with Q_n capacity 18.7 TR is selected.

Nominal capacities

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
ΔP = 0.2 bar
Superheating = 8 °C

Dry suction line

R 717

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	4.4	5.7	7.3	9.2	11.4	14.0	16.5	19.6
ICS25-10		3.5	9.0	11.7	15.0	19.0	23.5	28.5	34.0	40.0
ICS25-15		6	15.5	20.0	26.0	32.5	40.0	49.0	59.0	69.0
ICS25-20		8	20.6	27.0	34.0	43.3	54.0	65.0	78.0	92.0
ICS25-25		11.5	29.7	38.0	49.0	63.0	77.0	94	112	132
ICS32	32	17	44.0	57.0	73.0	92.0	114	139	166	196
ICS40	40	27	70.0	90.0	116	146	181	220	263	311
ICS50	50	44	113	147	189	239	295	359	429	507
ICS65	65	70	181	234	301	380	470	570	682	807
ICS80	80	85	219	284	365	461	570	694	829	978
ICS100	100	142	367	475	609	770	952	1159	1384	1634
ICS125	125	207	534	692	888	1123	1388	1690	2018	2381
ICS150	150	354	914	1183	1519	1921	2374	2890	3451	4072

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.82
-10	0.86
0	0.88
10	0.92
20	0.96
30	**1.00**
40	1.04
50	1.09

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi
Superheating = 12 °F

R 717

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	1.3	1.6	2.2	2.8	3.5	4.3	5.2	6.2
ICS25-10		4.1	2.5	3.4	4.4	5.7	7.2	8.9	10.7	12.8
ICS25-15		7	4.2	5.7	7.6	9.8	12.3	15.2	18.4	22.0
ICS25-20		9.3	5.6	7.6	10.1	13.0	16.4	20.2	24.5	29.3
ICS25-25		13.3	8.1	11.0	14.5	18.7	23.6	29.0	35.3	42.0
ICS32	32	20	12.0	16.2	21.5	27.7	35.0	43.0	52.0	62.0
ICS40	40	31	19.0	25.8	34.2	44.0	55.5	68.0	83.0	99.0
ICS50	50	51	30.9	42.0	55.7	72.0	90.0	111	135	161
ICS65	65	81	48.2	67.0	89.0	114	144	177	215	256
ICS80	80	98	60	80	107	137	173	213	258	308
ICS100	100	165	101	135	180	231	291	358	435	519
ICS125	125	240	146	197	261	336	424	521	632	754
ICS150	150	410	250	336	447	575	724	891	1080	1288

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for superheat (T_S)

T_s	Correction factor
10	1.00
14	1.00
18	1.00
20	1.00

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.82
10	0.85
30	0.88
50	0.92
70	0.96
90	**1.00**
110	1.04
130	1.09

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Nominal capacities

Dry suction line

SI units

Capacity table at nominal conditions, Q_N [kW],
T_{liq} = 10 °C,
Δp = 0.2 bar
Superheating = 8 °C

R 744

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	6.0	7.3	8.8	10.4	12.0	14.0	15.8	17.7
ICS25-10		3.5	12.3	15.0	18.0	21.5	25.0	28.6	32.5	36.5
ICS25-15		6	21.0	26.0	31.0	37.0	43.0	49.0	56.0	63.0
ICS25-20		8	28.0	34.0	41.0	49.0	57.0	67.0	75.0	84.0
ICS25-25		11.5	40.0	49.0	59.0	70.0	82.0	94.0	107	120
ICS32	32	17	60.0	73.0	88.0	104	121	139	158	177
ICS40	40	27	95.0	116	139	165	192	221	251	281
ICS50	50	44	154	189	227	268	313	360	409	459
ICS65	65	70	245	300	361	427	498	573	650	730
ICS80	80	85	298	365	438	520	605	697	791	887
ICS100	100	142	498	609	732	869	1011	1165	1322	1482
ICS125	125	207	726	888	1067	1266	1474	1699	1927	2161
ICS150	150	354	1242	1518	1824	2166	2520	2905	3295	3696

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.52
-10	0.67
0	0.91
10	**1.00**
15	1.09

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 50 °F,
Δp = 3 psi
Superheating = 12 °F

R 744

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	1.7	2.1	2.6	3.1	3.7	4.2	4.9	5.4
ICS25-10		4.1	3.4	4.3	5.3	6.4	7.5	8.7	10.0	11.2
ICS25-15		7	5.9	7.4	9.1	10.9	12.9	15.0	17.0	19.2
ICS25-20		9.3	7.9	9.9	12.1	14.5	17.2	20.0	22.8	25.5
ICS25-25		13.3	11.3	14.2	17.4	21.0	24.7	28.6	32.8	36.7
ICS32	32	20	16.7	21.0	25.7	31.0	36.5	42.4	48.5	54.3
ICS40	40	31	26.6	33.3	41.0	49.0	58.0	67.0	77.0	86.0
ICS50	50	51	43.3	54.3	66.5	80.0	94.0	110	125	141
ICS65	65	81	69.0	86.5	106	127	150	174	199	223
ICS80	80	98	83	104	128	153	181	210	240	269
ICS100	100	165	140	175	215	258	305	353	404	453
ICS125	125	240	203	255	313	375	443	513	588	658
ICS150	150	410	347	435	534	641	757	877	1005	1124

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for superheat (T_S)

T_S [°F]	Correction factor
10	1.00
14	1.00
18	1.00
20	1.00

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.48
10	0.64
30	0.88
50	**1.00**

Nominal capacities

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
ΔP = 0.2 bar
Superheating = 8 °C

Dry suction line

R 134a

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]						
			-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	1.5	1.9	2.5	3.2	4.0	4.9	5.9
ICS25-10		3.5	3.0	4.0	5.2	6.5	8.2	10.0	12.1
ICS25-15		6	5.2	6.9	8.9	11.2	14.0	17.2	20.8
ICS25-20		8	6.9	9.1	11.9	15.0	18.6	23.0	28.0
ICS25-25		11.5	9.9	13.1	17.1	22.0	27.0	33.0	40.0
ICS32	32	17	14.7	19.0	25.0	32.0	40.0	49.0	59.0
ICS40	40	27	23.0	31.0	40.0	51.0	63.0	77.0	94.0
ICS50	50	44	38.0	50.0	65.0	82.0	103	126	153
ICS65	65	70	60.0	80.0	104	131	163	200	243
ICS80	80	85	73	97	126	160	199	244	295
ICS100	100	142	123	161	210	267	332	407	493
ICS125	125	207	179	235	307	389	484	594	719
ICS150	150	354	305	402	524	665	828	1015	1230

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.66
-10	0.70
0	0.76
10	0.82
20	0.90
30	**1.00**
40	1.13
50	1.29

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi
Superheating=12 °F

R 134a

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-40	-20	0	20	40	60	80
ICS25-5	25	2	0.5	0.6	0.8	1.0	1.3	1.6	1.9
ICS25-10		4.1	0.9	1.2	1.6	2.0	2.6	3.2	4.0
ICS25-15		7	1.5	2.0	2.7	3.5	4.4	5.5	6.8
ICS25-20		9.3	2.0	2.7	3.6	4.7	5.9	7.4	9.1
ICS25-25		13.3	2.9	3.9	5.2	6.7	8.5	10.6	13.0
ICS32	32	20	4.2	5.8	7.7	9.9	12.6	15.7	19.3
ICS40	40	31	6.7	9.2	12.2	15.7	20.0	25.0	30.6
ICS50	50	51	11.0	15.0	19.8	25.7	32.5	40.6	50.0
ICS65	65	81	17.4	23.7	31.5	40.8	52.0	64.6	79.0
ICS80	80	98	21	29	38	49	63	78	95
ICS100	100	165	36	48	64	83	105	131	161
ICS125	125	240	53	70	94	120	153	191	234
ICS150	150	410	90	120	160	205	262	325	399

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for superheat (T_S)

T_s [°F]	Correction factor
10	1.00
14	1.00
18	1.00
20	1.00

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.64
10	0.68
30	0.74
50	0.81
70	0.89
90	**1.00**
110	1.15
130	1.35

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Nominal capacities

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
ΔP = 0.2 bar
Superheat = 8 °C

Dry suction line

R 404A

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	1.4	1.8	2.4	3.0	3.8	4.6	5.7	6.8
ICS25-10		3.5	2.8	3.7	4.8	6.2	7.7	9.5	11.6	14.0
ICS25-15		6	4.8	6.4	8.3	10.6	13.2	16.4	20.0	24.0
ICS25-20		8	6.4	8.5	11.0	14.0	17.7	22.0	26.5	32.0
ICS25-25		11.5	9.1	12.2	16.0	20.3	25.5	31.3	38.0	46.0
ICS32	32	17	13.5	18.0	23.5	30.0	37.5	46.0	56.0	68.0
ICS40	40	27	21.5	28.5	37.0	47.5	60.0	74.0	90.0	108
ICS50	50	44	35.0	47.0	61.0	78.0	97.0	120	146	175
ICS65	65	70	55.0	74.0	97.0	123.0	155	190	232	280
ICS80	80	85	68	90	118	150	188	232	282	340
ICS100	100	142	113	151	197	250	314	387	471	568
ICS125	125	207	165	220	287	365	458	564	687	827
ICS150	150	354	283	375	490	624	783	964	1175	1415

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.55
-10	0.60
0	0.66
10	0.74
20	0.85
30	**1.00**
40	1.23
50	1.68

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi
Superheat =12 °F

R 404A

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	0.4	0.5	0.7	0.9	1.1	1.4	1.8	2.1
ICS25-10		4.1	0.7	1.0	1.4	1.8	2.3	2.9	3.6	4.4
ICS25-15		7	1.3	1.8	2.4	3.1	4.0	5.0	6.2	7.5
ICS25-20		9.3	1.7	2.3	3.1	4.1	5.3	6.6	8.2	10.0
ICS25-25		13.3	2.4	3.4	4.5	5.9	7.6	9.6	11.8	14.4
ICS32	32	20	3.6	5.0	6.7	8.8	11.2	14.1	17.5	21.3
ICS40	40	31	5.7	7.9	10.6	13.9	17.8	22.4	27.7	34.0
ICS50	50	51	9.3	12.9	17.3	22.7	29.0	36.6	45.1	55.0
ICS65	65	81	14.8	20.5	27.5	36.0	46.2	58.0	72.0	88.0
ICS80	80	98	18	25	33	43	55	70	87	105
ICS100	100	165	30	42	56	73	93	118	146	177
ICS125	125	240	44	60	82	107	136	171	213	258
ICS150	150	410	75	103	139	182	232	292	363	441

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for superheat (T_S)

T_s [°F]	Correction factor
10	1.00
14	1.00
18	1.00
20	1.00

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.52
10	0.57
30	0.63
50	0.72
70	0.83
90	**1.00**
110	1.29
130	1.92

Nominal capacities

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
ΔP = 0.2 bar
Superheat = 8 °C

Dry suction line

R 22

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	1.7	2.3	2.9	3.6	4.4	5.3	6.2	7.4
ICS25-10		3.5	3.6	4.7	5.9	7.4	9.0	10.9	12.9	15.2
ICS25-15		6	6.2	8.0	10.1	12.6	15.4	18.6	22.0	26.0
ICS25-20		8	8.2	10.7	13.5	16.8	20.6	24.8	29.4	34.6
ICS25-25		11.5	11.8	15.3	19.4	24.2	29.6	35.7	42.2	49.8
ICS32	32	17	17.5	22.7	28.7	35.7	43.7	52.7	62.4	73.6
ICS40	40	27	27.8	36.0	45.5	56.7	69.4	83.7	99.1	117
ICS50	50	44	45.3	58.6	74.2	92.4	113	136	162	190
ICS65	65	70	72.0	93.3	118	147	180	217	257	303
ICS80	80	85	87	114	144	179	219	264	312	368
ICS100	100	142	146	190	240	299	365	441	521	615
ICS125	125	207	212	277	349	436	533	642	760	897
ICS150	150	354	363	473	598	745	911	1098	1300	1534

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.71
-10	0.75
0	0.80
10	0.86
20	0.92
30	**1.00**
40	1.09
50	1.22

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi
Superheat =12 °F

R 22

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	0.5	0.7	0.8	1.1	1.3	1.6	2.0	2.3
ICS25-10		4.1	1.0	1.3	1.7	2.2	2.7	3.4	4.0	4.8
ICS25-15		7	1.7	2.3	3.0	3.8	4.7	5.7	6.9	8.2
ICS25-20		9.3	2.3	3.0	3.9	5.0	6.2	7.6	9.2	10.9
ICS25-25		13.3	3.2	4.3	5.6	7.2	8.9	10.9	13.1	15.6
ICS32	32	20	4.9	6.5	8.5	10.8	13.4	16.4	19.8	23.5
ICS40	40	31	7.5	10.1	13.1	16.7	20.8	25.4	30.6	36.4
ICS50	50	51	12.4	16.6	21.6	27.5	34.2	41.8	50.4	59.9
ICS65	65	81	19.7	26.4	34.3	43.6	54.3	66.4	80.0	95.1
ICS80	80	98	24	32	41	53	65	80	97	115
ICS100	100	165	40	54	69	89	110	135	163	193
ICS125	125	240	59	79	101	130	160	196	237	281
ICS150	150	410	100	134	172	222	273	335	405	480

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for superheat (T_S)

T_s [°F]	Correction factor
10	1.00
14	1.00
18	1.00
20	1.00

Correction factor for liquid temperature (T_{liq})

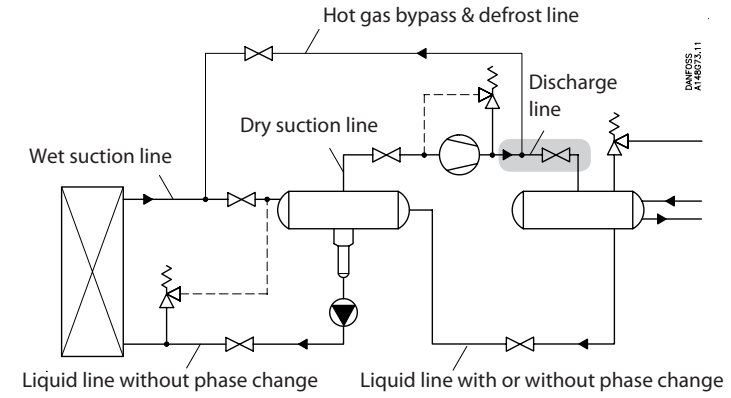
Liquid temperature [°F]	Correction factor
-10	0.73
10	0.77
30	0.82
50	0.87
70	0.93
90	**1.00**
110	1.09
130	1.20

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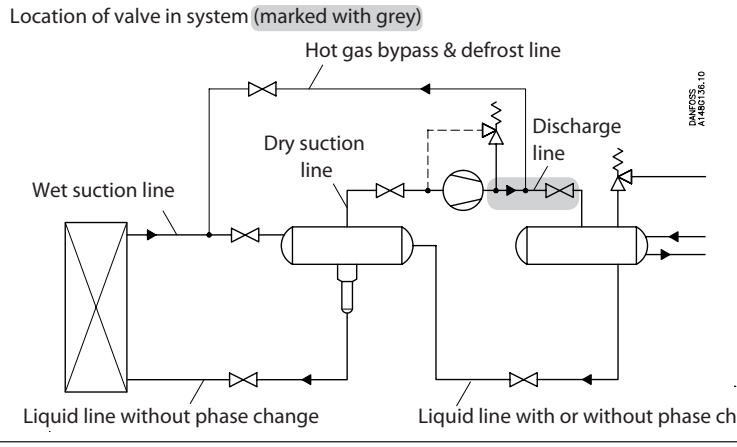
Nominal capacities

Discharge line

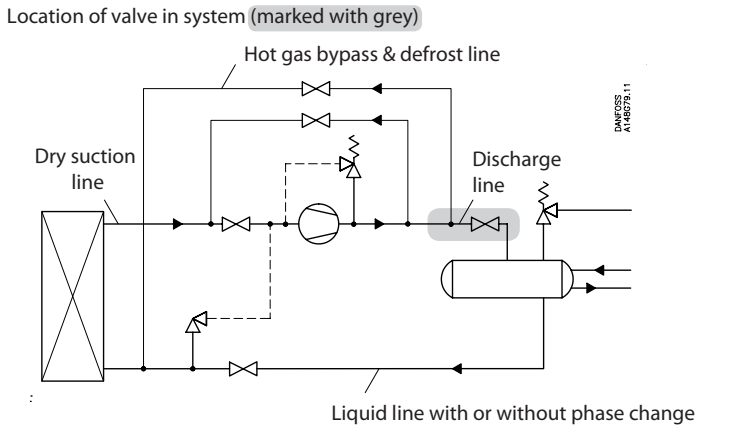
Pump



Gravity



DX



Nominal capacities

Discharge line

SI units

Calculation example (R 717 capacities):

An application has following running conditions:

T_e = -20 °C
Q_o = 90 kW
T_{liq} = 10 °C
Max. Δp = 0.4 bar
$T_{disch.}$ = 60 °C

The capacity table is based on nominal condition (Δp = 0.2 bar, T_{liq} = 30 °C, $P_{disch.}$= 12 bar, $T_{disch.}$= 80 °C)
Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 0.4 bar $f_{\Delta p}$ = 0.71
Correction factor for liquid temperature f_{Tliq} = 0.92
Correction factor for $T_{disch.}$ 60 °C , $f_{disch.}$ = 0.97

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} \times f_{Tdisch.} =$
$90 \times 0.71 \times 0.92 \times 0.97 = 57$ kW

From the capacity table a ICS 25-15 with Q_n capacity 73 kW is selected.

US units

Calculation example (R 717 capacities):

An application has following running conditions:

T_e = 0 °F
Q_o = 18 TR
T_{liq} = 50 °F
Max. Δp = 5.8 psi
$T_{disch.}$ = 120 °F

The capacity table is based on nominal conditions (Δp = 3 psi, T_{liq} = 90 °F, $P_{disch.}$= 185 psi, $T_{disch.}$= 180 °F)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 5.8 psi, $f_{\Delta p}$ = 0.72
Correction factor for liquid temperature f_{Tliq} = 0.92
Correction factor for $T_{disch.}$ 120 °C , $f_{disch.}$ = 0.95

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} \times f_{Tdisch.} =$
$18 \times 0.72 \times 0.92 \times 0.95 = 11.3$ TR

From the capacity table a ICS 25-10 with Q_n capacity 12.0 TR is selected.

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Nominal capacities

Discharge line

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
$P_{disch.}$ = 12 bar,
ΔP = 0.2 bar,
$T_{disch.}$ = 80 °C
Superheat = 8 °C

R 717

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	19.8	20.2	20.5	20.7	20.9	21.1	21.3	21.5
ICS25-10		3.5	40.8	41.5	42.0	42.5	43.0	43.5	44.0	44.2
ICS25-15		6	70.0	71.0	72.0	73.0	74.0	74.8	75.4	76.0
ICS25-20		8	93.0	95.0	96.0	97.5	99.0	99.7	101	101
ICS25-25		11.5	134	136	138	140	142	143	144	145
ICS32	32	17	199	201	205	207	209	211	213	215
ICS40	40	27	315	320	325	329	333	336	339	341
ICS50	50	44	514	521	529	536	542	548	553	556
ICS65	65	70	817	829	843	854	864	872	879	885
ICS80	80	85	991	1007	1022	1035	1048	1058	1067	1074
ICS100	100	142	1656	1682	1707	1729	1750	1767	1783	1794
ICS125	125	207	2414	2453	2489	2521	2551	2575	2600	2616
ICS150	150	354	4129	4194	4257	4311	4363	4404	4446	4473

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°C]	Correction factor
50	0.96
60	0.97
80	**1.00**
90	1.01
100	1.03
110	1.04
120	1.06

Correction factor for liquid temperature (T_{liq}).

Liquid temperature [°C]	Correction factor
-20	0.82
-10	0.86
0	0.88
10	0.92
20	0.96
30	**1.00**
40	1.04
50	1.09

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 2.9 psi,
$P_{disch.}$ = 185 psi,
$T_{disch.}$ = 180 °F
Superheat = 12 °F

R 717

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	5.6	5.7	5.8	5.8	5.9	6.0	6.0	6.0
ICS25-10		4.1	11.4	11.6	11.8	12.0	12.1	12.3	12.3	12.4
ICS25-15		7	19.6	20.0	20.3	20.6	20.8	21.0	21.2	21.3
ICS25-20		9.3	26.2	26.6	27.0	27.4	27.8	28.0	28.2	28.3
ICS25-25		13.3	37.6	38.3	39.0	39.4	39.9	40.3	40.5	40.8
ICS32	32	20	55.5	56.5	57.5	58.3	59.0	59.5	60.0	60.3
ICS40	40	31	88.0	90.0	91.0	92.5	94.0	94.5	95.0	95.7
ICS50	50	51	144	146	149	151	153	154	155	156
ICS65	65	81	229	233	237	240	243	245	247	248
ICS80	80	98	275	280	285	289	292	295	297	298
ICS100	100	165	464	472	480	486	492	497	500	502
ICS125	125	240	674	687	698	707	716	723	727	731
ICS150	150	410	1152	1173	1192	1207	1223	1235	1242	1248

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°F]	Correction factor
120	0.95
140	0.97
180	1.00
200	1.02
210	1.02
230	1.04
250	1.06

Correction factor for liquid temperature (T_{liq}).

Liquid temperature [°F]	Correction factor
-10	0.82
10	0.85
30	0.88
50	0.92
70	0.96
90	1.00
110	1.04
130	1.09

Nominal capacities

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 10 °C,
P_{disch} = 10 bar,
ΔP = 0.2 bar
T_{disch} = 80 °C
Superheat = 8 °C

Discharge line

R 744

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	12.5	12.7	12.8	12.9	12.9	12.9	12.5	12.8
ICS25-10		3.5	25.7	26.2	26.5	26.6	26.6	26.3	25.8	26.4
ICS25-15		6	44.0	45.0	45.3	45.6	45.5	45.1	44.2	45.0
ICS25-20		8	59.0	60.0	60.2	60.7	60.7	60.1	59.0	60.0
ICS25-25		11.5	85.0	86.0	87.0	87.4	87.3	86.5	85.0	87.0
ICS32	32	17	125	127	128	129	129	128	125	128
ICS40	40	27	199	202	204	205	205	203	199	203
ICS50	50	44	324	329	332	334	334	331	324	331
ICS65	65	70	515	523	529	532	531	526	516	527
ICS80	80	85	626	636	642	646	645	640	626	640
ICS100	100	142	1045	1062	1072	1078	1078	1069	1046	1069
ICS125	125	207	1524	1549	1562	1572	1571	1558	1525	1558
ICS150	150	354	2605	2649	2672	2688	2687	2664	2608	2664

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°C]	Correction factor
50	0.96
60	0.97
80	**1.00**
90	1.01
100	1.03
110	1.04
120	1.06

Correction factor for liquid temperature (T_{liq}).

Liquid temperature [°C]	Correction factor
-20	0.52
-10	0.67
0	0.91
10	**1.00**
15	1.09

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi
P_{disch} = 120 psi,
T_{disch} = 180 °F
Superheat = 12 °F

R 744

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	3.4	3.4	3.5	3.5	3.4	3.3	3.2	3.1
ICS25-10		4.1	6.9	7.0	7.1	7.1	7.0	6.8	6.6	6.4
ICS25-15		7	11.9	12.1	12.2	12.2	12.0	11.7	11.3	11.0
ICS25-20		9.3	15.8	16.1	16.2	16.2	16.0	15.6	15.1	14.7
ICS25-25		13.3	22.8	23.1	23.3	23.3	23.0	22.4	21.8	21.1
ICS32	32	20	33.7	34.1	34.5	34.5	34.0	33.1	32.2	31.2
ICS40	40	31	53.4	54.3	54.7	54.7	54.0	52.5	51.0	49.6
ICS50	50	51	87.0	88.4	89.0	89.0	88.0	85.5	83.3	80.8
ICS65	65	81	138	141	142	142	140	136	132	129
ICS80	80	98	167	169	171	171	168	164	159	154
ICS100	100	165	281	285	288	288	284	276	268	260
ICS125	125	240	408	414	419	419	412	401	389	378
ICS150	150	410	698	708	715	715	705	685	665	646

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°F]	Correction factor
120	0.95
140	0.97
180	**1.00**
200	1.02
210	1.02
230	1.04
250	1.05

Correction factor for liquid temperature (T_{liq}).

Liquid temperature [°F]	Correction factor
-10	0.48
10	0.64
30	0.88
50	**1.00**

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Nominal capacities

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
P_{disch} = 8 bar,
ΔP = 0.2 bar
T_{disch} = 80 °C
Superheat = 8 °C

Discharge line

R 134a

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]						
			-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	5.1	5.4	5.6	5.9	6.1	6.3	6.5
ICS25-10		3.5	10.6	11.0	11.6	12.0	12.5	13.0	13.4
ICS25-15		6	18.1	19.0	19.8	20.6	21.5	22.3	23.0
ICS25-20		8	24.1	25.3	26.4	27.5	28.6	29.7	30.7
ICS25-25		11.5	34.7	36.0	38.0	39.6	41.0	42.7	44.0
ICS32	32	17	51.0	54.0	56.0	58.5	61.0	63.0	65.0
ICS40	40	27	82.0	85.0	89.0	93.0	97.0	100	104
ICS50	50	44	133	139	145	151	157	163	169
ICS65	65	70	211	221	231	241	251	260	269
ICS80	80	85	256	268	280	293	304	315	326
ICS100	100	142	428	448	469	489	508	527	544
ICS125	125	207	624	654	683	712	741	768	794
ICS150	150	354	1068	1118	1168	1218	1267	1313	1357

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°C]	Correction factor
50	0.96
60	0.97
80	**1.00**
90	1.01
100	1.03
110	1.04
120	1.06

Correction factor for liquid temperature (T_{liq}).

Liquid temperature [°C]	Correction factor
-20	0.66
-10	0.70
0	0.76
10	0.82
20	0.90
30	**1.00**
40	1.13
50	1.29

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi
P_{disch} = 120 psi,
T_{disch} = 180 °F
Superheat = 12 °F

R 134a

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-40	-20	0	20	40	60	80
ICS25-5	25	2	1.4	1.5	1.5	1.6	1.7	1.7	1.8
ICS25-10		4.1	2.3	3.0	3.1	3.3	3.4	3.6	3.7
ICS25-15		7	4.9	5.1	5.4	5.6	5.9	6.1	6.3
ICS25-20		9.3	6.5	6.8	7.2	7.5	7.8	8.1	8.4
ICS25-25		13.3	9.3	9.8	10.3	10.8	11.3	11.7	12.1
ICS32	32	20	13.8	14.5	15.2	16.0	16.6	17.3	18.0
ICS40	40	31	21.9	23.0	24.2	25.3	26.5	27.5	28.5
ICS50	50	51	35.6	37.5	39.4	41.3	43.0	44.8	46.5
ICS65	65	81	56.7	59.7	62.9	65.7	68.5	71.3	74.0
ICS80	80	98	67	72	75	79	83	86	89
ICS100	100	165	113	121	127	133	139	144	150
ICS125	125	240	164	176	184	194	202	210	218
ICS150	150	410	280	301	315	331	345	358	372

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°F]	Correction factor
120	0.95
140	0.97
180	**1.00**
200	1.02
210	1.02
230	1.04
250	1.05

Correction factor for liquid temperature (T_{liq}).

Liquid temperature [°F]	Correction factor
-10	0.64
10	0.68
30	0.74
50	0.81
70	0.89
90	**1.00**
110	1.15
130	1.35

Nominal capacities

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
P_{disch} = 12 bar
ΔP = 0.2 bar,
T_{disch} = 80 °C
Superheat = 8 °C

Discharge line

R 404A

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	4.8	5.1	5.4	5.7	6.0	6.3	6.6	6.8
ICS25-10		3.5	9.8	10.4	11.1	11.8	12.4	13.0	13.6	14.1
ICS25-15		6	16.7	18.0	19.0	20.2	21.3	22.3	23.3	24.2
ICS25-20		8	22.3	24.0	25.4	27.0	28.3	29.7	31.0	32.0
ICS25-25		11.5	32.0	34.0	36.5	38.5	40.7	42.7	44.6	46.0
ICS32	32	17	48.0	51.0	54.0	57.0	60.0	63.0	66.0	69.0
ICS40	40	27	75.0	81.0	86.0	91.0	96.0	100	105	109
ICS50	50	44	123	131	140	148	156	163	171	177
ICS65	65	70	195	208	222	235	248	260	271	282
ICS80	80	85	238	254	270	286	301	315	330	342
ICS100	100	142	397	424	451	477	503	527	551	571
ICS125	125	207	579	618	657	696	733	768	803	833
ICS150	150	354	990	1057	1124	1190	1254	1313	1374	1424

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°C]	Correction factor
50	0.96
60	0.97
80	**1.00**
90	1.01
100	1.03
110	1.04
120	1.06

Correction factor for liquid temperature (T_{liq}).

Liquid temperature [°C]	Correction factor
-20	0.55
-10	0.60
0	0.66
10	0.74
20	0.85
30	**1.00**
40	1.23
50	1.68

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi,
P_{disch} = 120 psi,
T_{disch} = 180 °F
Superheat = 12 °F

R 404A

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.8
ICS25-10		4.1	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.8
ICS25-15		7	4.4	4.7	5.0	5.4	5.7	6.0	6.3	6.5
ICS25-20		9.3	5.8	6.2	6.7	7.2	7.6	8.0	8.4	8.7
ICS25-25		13.3	8.4	8.9	9.6	10.3	10.9	11.5	12.0	12.5
ICS32	32	20	12.4	13.2	14.2	15.2	16.1	17.0	17.8	18.4
ICS40	40	31	19.6	21.0	22.6	24.1	25.6	27.0	28.2	29.3
ICS50	50	51	32.0	34.2	36.8	39.3	41.7	44.0	46.0	47.7
ICS65	65	81	51.0	54.3	58.5	62.5	66.3	70.0	73.0	76.0
ICS80	80	98	61	65	70	75	80	84	88	91
ICS100	100	165	103	110	118	127	134	142	149	153
ICS125	125	240	149	160	172	184	195	206	216	223
ICS150	150	410	255	273	294	315	334	352	369	381

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°F]	Correction factor
120	0.95
140	0.97
180	**1.00**
200	1.02
210	1.02
230	1.04
250	1.05

Correction factor for liquid temperature (T_{liq}).

Liquid temperature [°F]	Correction factor
-10	0.52
10	0.57
30	0.63
50	0.72
70	0.83
90	**1.00**
110	1.29
130	1.92

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Nominal capacities

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
P_{disch} = 12 bar
ΔP = 0.2 bar,
T_{disch} = 80 °C
Superheat = 8 °C

Discharge line

R 22

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICS25-5	25	1.7	6.4	6.6	6.8	7.0	7.2	7.4	7.5	7.7
ICS25-10		3.5	13.2	13.7	14.1	14.5	14.8	15.2	15.5	15.8
ICS25-15		6	22.6	23.4	24.1	24.8	25.4	26.0	26.6	27.1
ICS25-20		8	30.2	31.2	32.1	33.0	33.8	34.6	35.4	36.1
ICS25-25		11.5	43.4	44.9	46.2	47.5	48.6	49.8	50.9	51.9
ICS32	32	17	64.1	66.3	68.2	70.2	71.9	73.6	75.3	76.7
ICS40	40	27	102	105	108	111	114	117	120	122
ICS50	50	44	166	172	177	182	186	190	195	199
ICS65	65	70	264	273	281	289	296	303	310	316
ICS80	80	85	321	331	341	351	359	368	376	384
ICS100	100	142	536	554	570	586	600	615	629	641
ICS125	125	207	781	807	831	855	875	897	917	935
ICS150	150	354	1335	1381	1421	1461	1497	1534	1568	1599

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°C]	Correction factor
50	0.96
60	0.97
80	**1.00**
90	1.01
100	1.03
110	1.04
120	1.06

Correction factor for liquid temperature (T_{liq}).

Liquid temperature [°C]	Correction factor
-20	0.71
-10	0.75
0	0.80
10	0.86
20	0.92
30	**1.00**
40	1.09
50	1.22

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi,
P_{disch} = 120 psi,
T_{disch} = 180 °F
Superheat = 12 °F

R 22

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICS25-5	25	2	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.2
ICS25-10		4.1	3.7	3.9	4.0	4.1	4.3	4.4	4.5	4.6
ICS25-15		7	6.4	6.6	6.8	7.1	7.3	7.4	7.6	7.8
ICS25-20		9.3	8.5	8.8	9.1	9.4	9.6	9.9	10.1	10.3
ICS25-25		13.3	12.1	12.6	13.0	13.4	13.8	14.2	14.5	14.8
ICS32	32	20	18.2	18.9	19.6	20.2	20.7	21.3	21.8	22.2
ICS40	40	31	28.3	29.3	30.3	31.3	32.1	33.0	33.8	34.4
ICS50	50	51	46.5	48.2	49.9	51.4	52.9	54.3	55.5	56.7
ICS65	65	81	73.9	76.6	79.2	81.7	84.0	86.2	88.2	90.0
ICS80	80	98	89	93	96	99	102	104	107	109
ICS100	100	165	150	156	162	166	172	175	180	183
ICS125	125	240	218	227	235	242	250	255	262	267
ICS150	150	410	373	388	402	413	426	436	447	456

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°F]	Correction factor
120	0.95
140	0.97
180	**1.00**
200	1.02
210	1.02
230	1.04
250	1.05

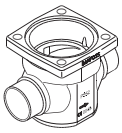
Correction factor for liquid temperature (T_{liq}).

Liquid temperature [°F]	Correction factor
-10	0.73
10	0.77
30	0.82
50	0.87
70	0.93
90	**1.00**
110	1.09
130	1.20

ICS 25

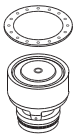
Ordering from the parts programme

Example (select from table I, II and III)



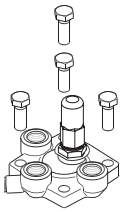
Valve body 25 D (1 in.)
027H2120
Table I

+



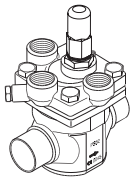
Function module ICS 25-15
027H2203
Table II

+



Top cover 3 pilots
027H2173
Table III

=

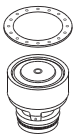


ICV 25 valve body w/different connections *Table I*



20 D (¾ in.)	25 D (1 in.)	32 D (1¼ in.)	40 D (1½ in.)
027H2128	**027H2120**	**027H2129**	**027H2135**
35 SD (1⅜ in. SA)	28 SA (1⅛ in.)	22 SA (⅞ in.)	28 SD (1⅛ in.)
027H2134	**027H2126**	**027H2125**	**027H2124**
22 SD (⅞ in.)	20 A (¾ in.)	25 A (1 in.)	32 A (1¼ in.)
027H2123	**027H2131**	**027H2121**	**027H2130**
20 SOC (¾ in.)	25 SOC (1 in.)	20 FPT (½ in.)	25 FPT (1 in.)
027H2132	**027H2122**	**027H2133**	**027H2127**

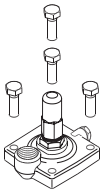
ICS 25 function module *Table II*



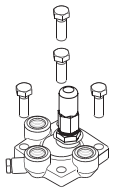
Description	Code Number
ICS 25-5	**027H2201** *)
ICS 25-10	**027H2202** *)
ICS 25-15	**027H2203** *)
ICS 25-20	**027H2204** *)
ICS 25-25	**027H2200** *)

*) Including gasket and O-rings

ICS 25 top cover *Table III*



ICS 1



ICS 3

Description	Code Number
Top cover 1 Pilot	**027H2172** *)
Top cover 3 Pilots	**027H2173** **)

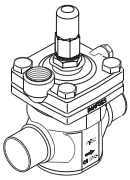
*) Including bolts
**) including bolts and one blanking plug

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

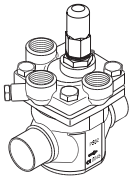
Ordering complete factory assembled valve

(body, function module and top cover)

Table A



1 pilot



3 pilots

		Available connections							
		20 D (¾ in.)	25 D (1 in.)	32 D (1¼ in.)	40 D (1½ in.)	35 SD (1⅜ in. SA)	28 SA (1⅛ in.)	22 SA (⅞ in.)	28 SD (1⅛ in.)
ICS 25-5	1 Pilot	**027H2028**	**027H2020**				**027H2026**	**027H2025**	**027H2024**
	3 Pilots *)	**027H2078**	**027H2070**				**027H2076**	**027H2075**	**027H2074**
ICS 25-10	1 Pilot	**027H2038**	**027H2030**				**027H2036**	**027H2035**	**027H2034**
	3 Pilots *)	**027H2088**	**027H2080**				**027H2086**	**027H2085**	**027H2084**
ICS 25-15	1 Pilot	**027H2048**	**027H2040**				**027H2046**	**027H2045**	**027H2044**
	3 Pilots *)	**027H2098**	**027H2090**				**027H2096**	**027H2095**	**027H2094**
ICS 25-20	1 Pilot	**027H2058**	**027H2050**				**027H2056**	**027H2055**	**027H2054**
	3 Pilots *)	**027H2108**	**027H2100**				**027H2106**	**027H2105**	**027H2104**
ICS 25-25	1 Pilot	**027H2068**	**027H2060**				**027H2066**	**027H2065**	**027H2064**
	3 Pilots *)	**027H2118**	**027H2110**				**027H2116**	**027H2115**	**027H2114**

		22 SD (⅞ in.)	20 A (¾ in.)	25 A (1 in.)	32 A (1¼ in.)	20 SOC (¾ in.)	25 SOC (1 in.)	20 FPT (½ in.)	25 FPT (1 in.)
ICS 25-5	1 Pilot	**027H2023**	**027H2029**	**027H2021**		**027H2140**			
	3 Pilots *)	**027H2073**	**027H2079**	**027H2071**		**027H2145**			
ICS 25-10	1 Pilot	**027H2033**	**027H2039**	**027H2031**					
	3 Pilots *)	**027H2083**	**027H2089**	**027H2081**		**027H2146**			
ICS 25-15	1 Pilot	**027H2043**	**027H2049**	**027H2041**		**027H2142**			
	3 Pilots *)	**027H2093**	**027H2099**	**027H2091**					
ICS 25-20	1 Pilot	**027H2053**	**027H2059**	**027H2051**		**027H2143**			
	3 Pilots *)	**027H2103**	**027H2109**	**027H2101**		**027H2148**			
ICS 25-25	1 Pilot	**027H2063**		**027H2061**			**027H2062**		
	3 Pilots *)	**027H2113**		**027H2111**			**027H2112**		

Select from parts programme

*) Including one blanking plug (A+B)

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ICS 32

Ordering from the parts programme

Example (select from table I, II and III)

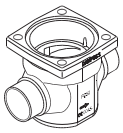


Valve body 32 D (1 1/4 in.)
027H3120
Table I

Function module ICS 32
027H3200
Table II

Top cover 3 pilots
027H3173
Table III

ICV 32 valve body w/different connections *Table I*

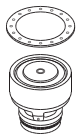


32 D (1¼ in.)	40 D (1½ in.)	42 SA (1⅝ in.)	42 SD (1⅝ in.)
027H3120	**027H3125**	**027H3127**	**027H3128**

35 SD (1⅜ in. SA)	32 A (1¼ in.)	32 SOC (1¼ in.)	40 A (1½ in.)
027H3123	**027H3121**	**027H3122**	**027H3126**

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ;
SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

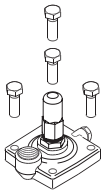
ICS 32 function module *Table II*



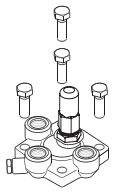
Description	Code Number
ICS 32	**027H3200** *)

*) Including gasket and O-rings

ICS 32 top cover *Table III*



ICS 1



ICS 3

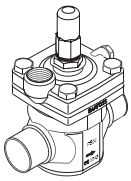
Description	Code Number
Top cover 1 Pilot	**027H3172** *)
Top cover 3 Pilots	**027H3173** **)

*) Including bolts
**) including bolts and one blanking plug

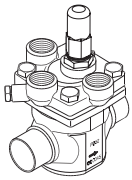
Ordering complete factory assembled valve

(body, function module and top cover)

Table A



1 pilot



3 pilots

		Available connections							
		32 D (1¼ in.)	40 D (1½ in.)	42 SA (1⅝ in.)	42 SD (1⅝ in.)	35 SD (1⅜ in. SA)	32 A (1¼ in.)	32 SOC (1¼ in.)	40 A (1½ in.)
ICS 32	1 Pilot	**027H3020**				**027H3023**	**027H3021**	**027H3022**	
	3 Pilots *)	**027H3030**				**027H3033**	**027H3031**	**027H3032**	

Select from parts programme

*) Including one blanking plug (A+B)

ICS 40

Ordering from the parts programme

Example (select from table I, II and III)



Valve body 50 D (2 in.)
027H4126
Table I

Function module ICS 40
027H4200
Table II

Top cover 1 pilot
027H4172
Table III

ICV 40 valve body w/different connections *Table I*

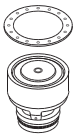


40 D (1½ in.)	50 D (2 in.)	42 SA (1⅝ in.)	42 SD (1⅝ in.)
027H4120	**027H4126**	**027H4124**	**027H4123**

40 A (1½ in.)	40 SOC (1½ in.)	50 A (2 in.)	
027H4121	**027H4122**	**027H4127**	

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ;
SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

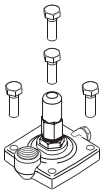
ICS 40 function module *Table II*



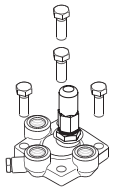
Description	Code Number
ICS 40	**027H4200** *)

*) Including gasket and O-rings

ICS 40 top cover *Table III*



ICS 1



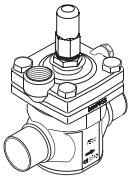
ICS 3

Description	Code Number
Top cover 1 Pilot	**027H4172** *)
Top cover 3 Pilots	**027H4173** **)

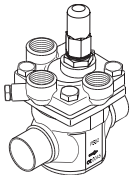
*) Including bolts
**) including bolts and one blanking plug

Ordering complete factory assembled valve

(body, function module and top cover) *Table A*



1 pilot



3 pilots

		Available connections						
		40 D (1½ in.)	50 D (2 in.)	42 SA (1⅝ in.)	42 SD (1⅝ in.)	40 A (1½ in.)	40 SOC (1½ in.)	50 A (2 in.)
ICS 40	1 Pilot	**027H4020**		**027H4024**	**027H4023**	**027H4021**	**027H4022**	
	3 Pilots *)	**027H4030**		**027H4034**	**027H4033**	**027H4031**	**027H4032**	

Select from parts programme

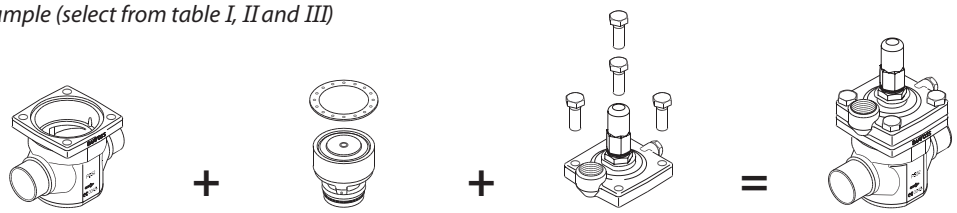
*) Including one blanking plug (A+B)

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ICS 50

Ordering from the parts programme

Example (select from table I, II and III)

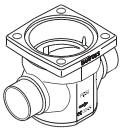


Valve body 65 D (2½ in.)
027H5124
Table I

Function module ICS 40
027H5200
Table II

Top cover 1 pilot
027H5172
Table III

ICV 50 valve body w/different connections *Table I*

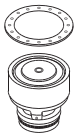


50 D (2 in.)	65 D (2½ in.)	54 SD (2⅛ in. SA)	50 A (2 in.)
027H5120	**027H5124**	**027H5123**	**027H5121**

50 SOC (2 in.)	65 A (21/2 in.)		
027H5122	**027H5125**		

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ;
SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

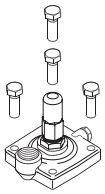
ICS 50 function module *Table II*



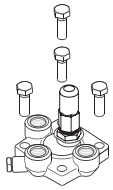
Description	Code Number
ICS 50	**027H5200** *)

*) Including gasket and O-rings

ICS 50 top cover *Table III*



ICS 1



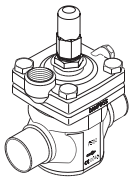
ICS 3

Description	Code Number
Top cover 1 Pilot	**027H5172** *)
Top cover 3 Pilots	**027H5173** **)

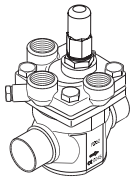
*) Including bolts
**) including bolts and one blanking plug

Ordering complete factory assembled valve

(body, function module and top cover) *Table A*



1 pilot



3 pilots

		Available connections					
		50 D (2 in.)	65 D (2½ in.)	54 SD (2⅛ in. SA)	65 A (2½ in.)	50 A (2 in.)	50 SOC (2 in.)
ICS 50	1 Pilot	**027H5020**		**027H5023**		**027H5021**	**027H5022**
	3 Pilots *)	**027H5030**		**027H5033**		**027H5031**	**027H5032**

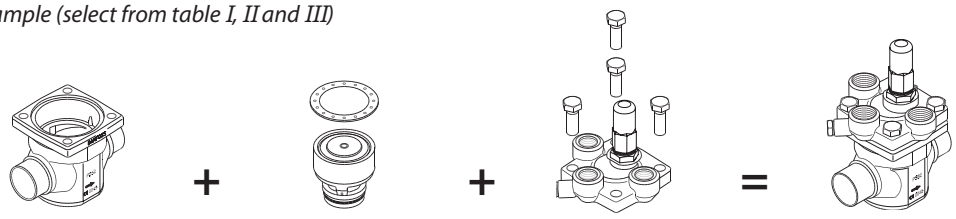
Select from parts programme

*) Including one blanking plug (A+B)

ICS 65 and ICS 80

Ordering from the parts programme

Example (select from table I, II and III)



Valve body 76 SD (2¾ in.)
027H6124
Table I

Function module
ICS 65 **027H6200**
ICS 80 **027H8200**
Table II

Top cover 3 pilots
027H6173
Table III

ICV 65 valve body w/different connections *Table I*

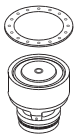


65 D (2½ in.)	65 A (2½ in.)	65 J (2½ in.)	80 D (3 in.)
027H6120	**027H6121**	**027H6122**	**027H6126**

80 A (3 in.)	67 SA (2 ⅝ in.)	76 SD (3 in.)	65 SOC (2½ in.)
027H6127	**027H6125**	**027H6124**	**027H6123**

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ;
SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

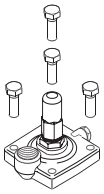
ICS 65 and ICS 80 function module *Table II*



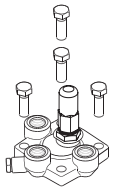
Description	Code Number
ICS 65	**027H6200** *)
ICS 80	**027H8200** *)

*) Including gasket and O-rings

ICS 65/80 top cover *Table III*



ICS 1



ICS 3

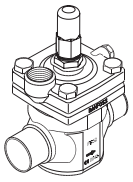
Description	Code Number
Top cover 1 Pilot (65)	**027H6172** *)
Top cover 3 Pilots (65)	**027H6173** **)
Top cover 1 Pilot (80)	**027H8192** *)
Top cover 3 Pilots (80)	**027H8193** **)

*) Including bolts
**) Including bolts and one blanking plug

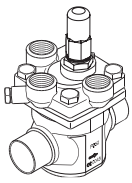
Ordering complete factory assembled valve

(body, function module and top cover)

Table A



1 pilot



3 pilots

		Available connections							
		65 D (2½ in.)	65 A (2½ in.)	65 SOC (2½ in.)	80 D (3 in.)	80 A (3 in.)	67 SA (2⅝ in.)	76 SD (3 in.)	65 J (2½ in.)
ICS 65	1 Pilot	**027H6020**	**027H6021**	**027H6023**			**027H6025**	**027H6024**	
	3 Pilots *)	**027H6030**	**027H6031**	**027H6033**			**027H6035**	**027H6034**	
ICS 80	1 Pilot				**027H8020**	**027H8021**			
	3 Pilots *)				**027H8030**	**027H8031**			

Select from parts programme

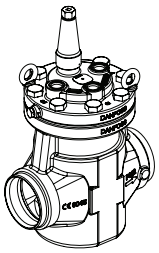
*) Including one blanking plug (A+B)

Note:
The capacity of the ICS 80 module can only be achieved when using the valve body with 80 D or A (3 in) connections.
If any other ICV 65 valve body is used the capacity of the complete valve will be reduced by approximately 6%.

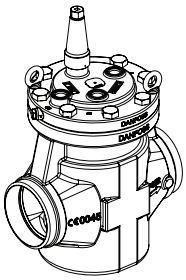
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ICS 100 - 150

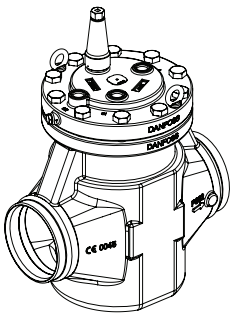
Ordering complete factory assembled valve
(body, function module and top cover)



	Connections		
	100 D (4 in.)	100 A (4 in.)	100 A (4 in.) with ⅜ in. NPT pressure outlet
ICS 100 *)	**027H7120**	**027H7121**	**027H7122**



	Connections		
	125 D (5 in.)	125 A (5 in.)	125 A (5 in.) with ⅜ in. NPT pressure outlet
ICS 125 *)	**027H7140**	**027H7141**	**027H7142**

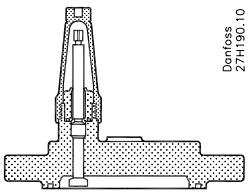


	Connections		
	150 D (6 in.)	150 A (6 in.)	150 A (6 in.) with ⅜ in. NPT pressure outlet
ICS 150 *)	**027H7160**	**027H7161**	**027H7162**

*) Including two blanking plugs (A) and one sealing plug (B)

Spare parts: Please see AI245486497115

Accessories

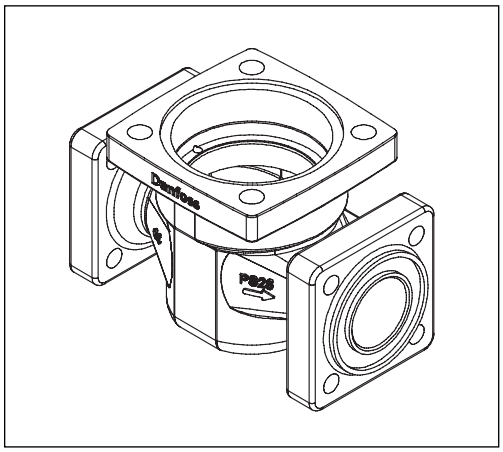


Top covers		
Consist of: Top cover complete with manuel spindle, and gasket	Size	Code number
	ICS 100	**027H7123**
	ICS 125	**027H7143**
	ICS 150	**027H7163**

Accessories

ICV PM flanged valve housings
ICV PM flanged valve housings can replace the PM valves on already installed refrigeration systems.

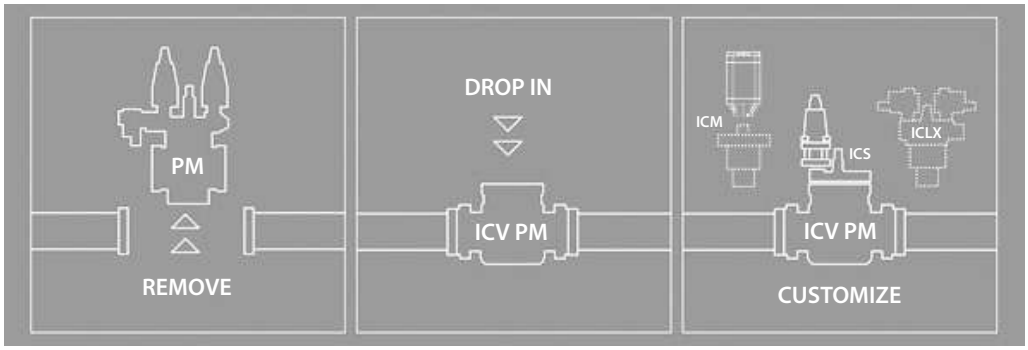
Pressure range
The ICV PM valve housing is designed for a max. working pressure of 28 bar g (406 psig) and therefore a suitable replacement for PM valves in the service market. They also offer the same drop-in dimensions as the PM valves.



Description	Code no.
ICV 25 PM Valve housing	**027H2119 *)**
ICV 32 PM Valve housing	**027H3129 *)**
ICV 40 PM Valve housing	**027H4128 *)**
ICV 50 PM Valve housing	**027H5127 **)**
ICV 65 PM Valve housing	**027H6128 **)**

*) Includes ICV PM valve housing, flange gaskets and flange bolts.
**) Includes ICV PM valve housing, flange gaskets, flange bolts and flange nuts.

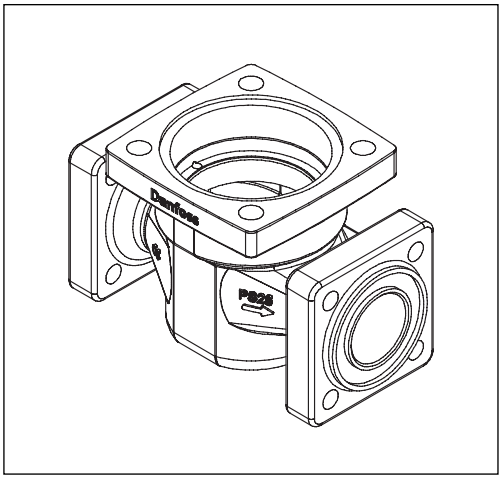
Function modules and top covers must be ordered separately (see the section “Ordering”).



Accessories

ICV (H)A4A flanged valve housings
ICV (H)A4A flanged valve housings can replace the (H)A4A valves on already installed refrigeration systems.

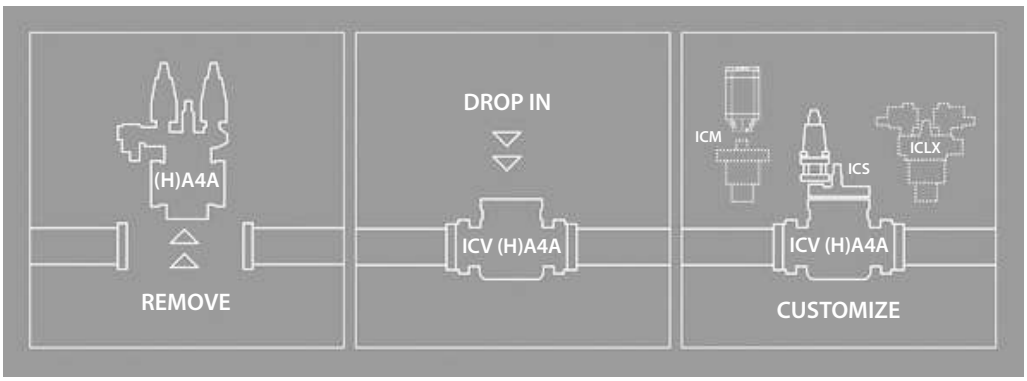
Pressure range
The ICV (H)A4A valve housing is designed for a max. working pressure of 28 bar g (406 psig) and therefore a suitable replacement for (H)A4A valves in the service market. They also offer the same drop-in dimensions as the (H)A4A valves.



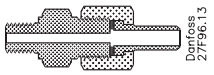
Description	Code no.
ICV 25 (H)A4A Valve housing	**027H2304** *)
ICV 32 A4A Valve housing	**027H3130** *)
ICV 32 HA4A Valve housing	**027H3131** *)
ICV 40 (H)A4A Valve housing	**027H4129** *)
ICV 50 (H)A4A Valve housing	**027H5128** *)
ICV 65 (H)A4A Valve housing	**027H6129** *)

*) Includes ICV (H)A4A valve housing, flange gaskets, flange bolts and flange nuts.

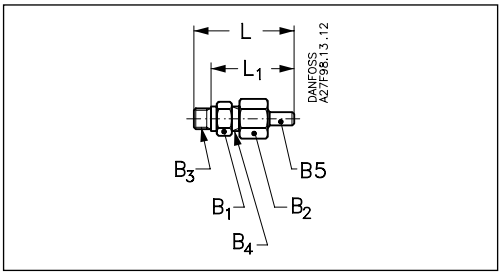
Function modules and top covers must be ordered separately (see the section "Ordering").



Pressure gauge connection (weal / solder).



Description	Code no.
∅ 6.5 mm / ∅ 10 mm (∅ 0.26 in. / ∅ 0.39 in.) weld / solder	**027B2035**

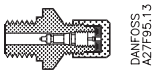


Accessories		L	L_1	B_1	B_2	B_3	B_4	B_5
Pressure gauge connection (weld / solder)								
	mm in.	66 2.60	54 2.13	AF 19	AF 22	G 1/4 A	G 3/4 A	∅6.5 / ∅10

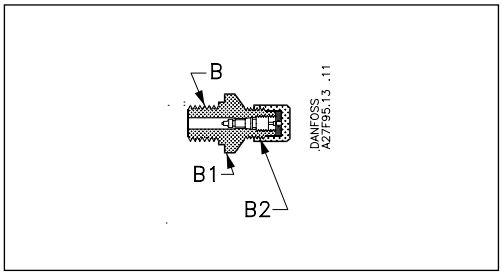
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Accessories
(continued)

Pressure gauge connection, 1/4 in flare (self-closing)
Must not be used in R 717 plant.

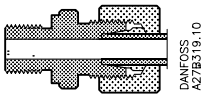


Description	Code no.
¼ in flare	**027B2041**

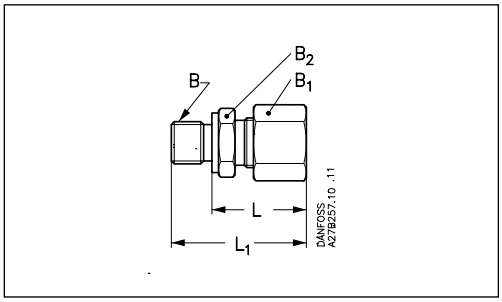


Accessories						B	B_1	B_2
Pressure gauge connection, 1/4 in flare (self-closing)								
¼ in flare						G ¼ A	AF 19	¼ in flare

Pressure gauge connection (cutting ring).



Description	Code no.
Cutting ring connection, 6 mm	**027B2063**
Cutting ring connection, 10 mm	**027B2064**



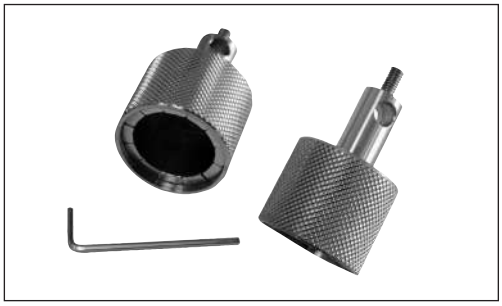
Accessories			L	L_1		B	B_1	B_2
Pressure gauge connection (cutting ring)								
6 mm	[mm] [in]		27 1.06	39 1.54		G ¼ A	AF 19	AF 14
10 mm	[mm] [in]		29 1.14	40 1.57		G ¼ A	AF 19	AF 14

Multi-function tool

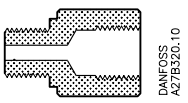
Description	Code no.
Multi-function tool for ICS 25-65	**027H0180 / 027H0181**

The multi-funktion tool can be used for:
- Removing the ICS function module
- Operating the manual spindle

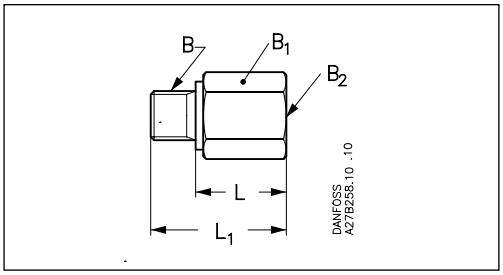
For further information please see the instruction PIHU0A.



Pressure gauge connection.



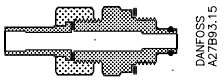
Description	Code no.
1/4 FPT	**027B2062**



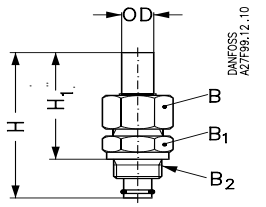
Accessories			L	L_1		B	B_1	B_2
Pressure gauge connection								
	[mm] [in]		23 0.91	35.5 1.40		G ¼ A	AF 22	¼ FPT

Accessories
(continued)

External pilot connection.



ICS	Description	Code no.
5 - 80	External pilot connection (incl. damping orifice, D: 1.0 mm)	**027F1048**
5 - 150	Accessory bag with seal and O-ring for pilot valve	**027F0666**
100 - 150	External pilot connection (incl. damping orifice, D: 1.8 mm)	**027F1049**

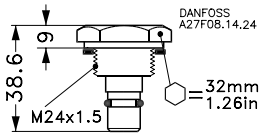


Accessories			H	H_1	OD	B	B_1	B_2
External pilot connection								
	[mm] [in]		90 3.54	66 2.60	18 0.71	AF 32	AF 32	M 24 × 1.5

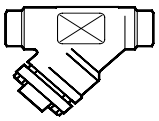
Blanking plug for pilot valves.



Description	Code no.
Blanking plug	**027F1046**

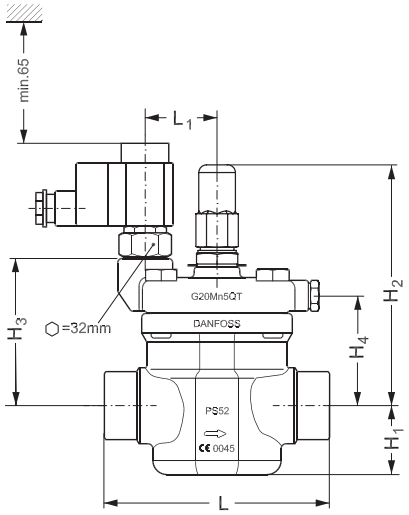


Recommended filters

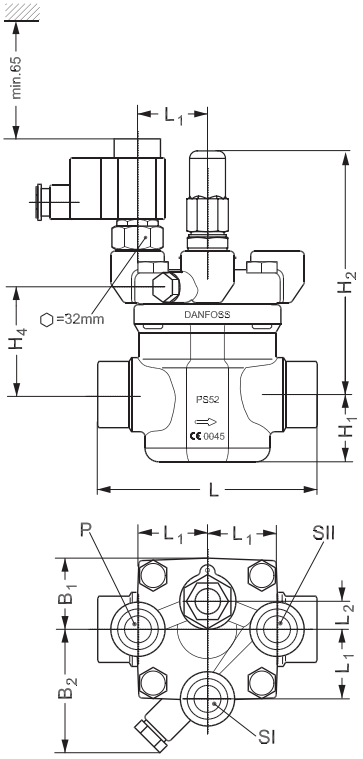
							Filter element for liquid line		Filter element for suction line	
							150 mesh	100 mesh	72 mesh	38 mesh
	Filter Type	Size	D	A	FPT	SOC	100 my	150 my	250 my	500 my
	FIA Straightway	20 (¾ in)	**148B5343**	**148B5347**	**148B5349**	**148B5348**	**148H3122**	**148H3124**	**148H3126**	**148H3128**
	FIA Straightway	25 (1 in)	**148B5443**	**148B5447**	**148B5449**	**148B5448**	**148H3123**	**148H3125**	**148H3127**	**148H3129**
	FIA Straightway	32 (1 ¼ in)	**148B5544**	**148B5552**	**148B5549**	**148B5548**	**148H3123**	**148H3125**	**148H3127**	**148H3129**
	FIA Straightway	40 (1 ½ in)	**148B5625**	**148B5644**		**148B5645**	**148H3123**	**148H3125**	**148H3127**	**148H3129**
	FIA Straightway	50 (2 in)	**148B5713**	**148B5716**		**148B5717**	**148H3157**	**148H3130**	**148H3138**	**148H3144**
	FIA Straightway	65 (2 ½ in)	**148B5813**	**148B5815**				**148H3131**	**148H3139**	**148H3145**
	FIA Straightway	80 (3 in)	**148B5906**	**148B5908**				**148H3119**	**148H3120**	**148H3121**
	FIA Straightway	100 (4 in)	**148B6007**	**148B6009**				**148H3132**	**148H3140**	**148H3146**
	FIA Straightway	125 (5 in)	**148B6106**	**148B6108**				**148H3133**	**148H3141**	**148H3147**
	FIA Straightway	150 (6 in)	**148B6203**	**148B6205**				**148H3134**	**148H3142**	**148H3148**

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Dimensions and weights - **ICS 25-5 to ICS 25-25**



ICS 1 pilot

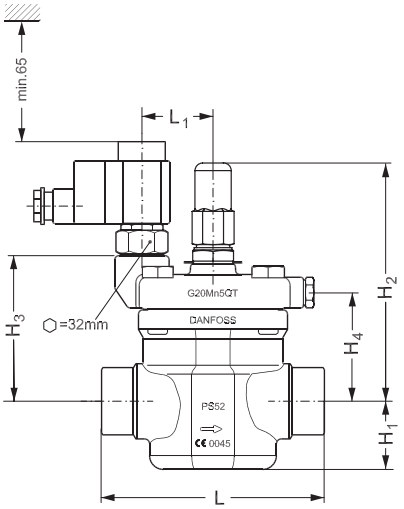


ICS 3 Pilots

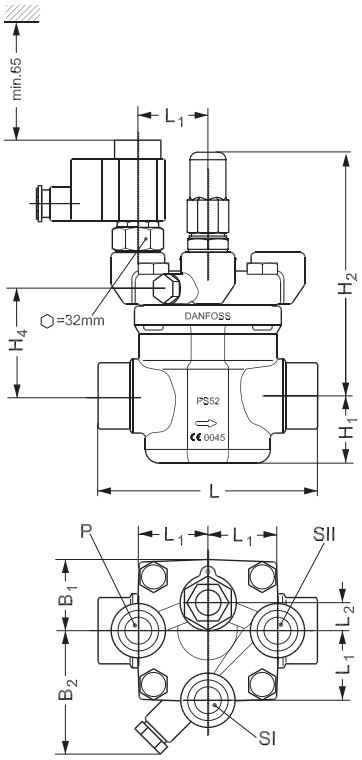
Connection		H_1	H_2	H_3	H_4	L	L_1	L_2	B_1	B_2	Weight ICS 1 Pilot	Weight ICS 3 Pilots
20 D (¾ in.)	mm	37	145	86	60	135	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.31	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
25 D (1 in.)	mm	37	145	86	60	135	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.31	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
32 D (1¼ in.)	mm	37	145	86	60	135	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.31	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
40 D (1½ in.)	mm	37	145	86	60	135	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.31	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
20 A (¾ in.)	mm	37	145	86	60	135	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.31	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
25 A (1 in.)	mm	37	145	86	60	135	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.31	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
32 A (1¼ in.)	mm	37	145	86	60	135	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.31	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
20 SOC (¾ in.)	mm	37	145	86	60	135	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.31	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
25 SOC (1 in.)	mm	37	145	86	60	147	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.79	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
22 SD (⅞ in.)	mm	37	145	86	60	135	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.31	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
28 SD (1⅛ in.)	mm	37	145	86	60	147	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.78	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
22 SA (⅞ in.)	mm	37	145	86	60	135	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.31	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
28 SA (1⅛ in.)	mm	37	145	86	60	147	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.78	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
35 SA (1⅜ in.)	mm	37	145	86	60	147	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.78	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
20 FPT (¾ in.)	mm	37	145	86	60	135	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.31	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.
25 FPT (1 in.)	mm	37	145	86	60	135	42	15	42	87	3 kg	3.6 kg
	in.	1.46	5.71	3.39	2.36	5.31	1.65	0.59	1.65	3.43	6.6 lb.	7.92 lb.

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

Dimensions and weights - ICS 32



ICS 1 pilot



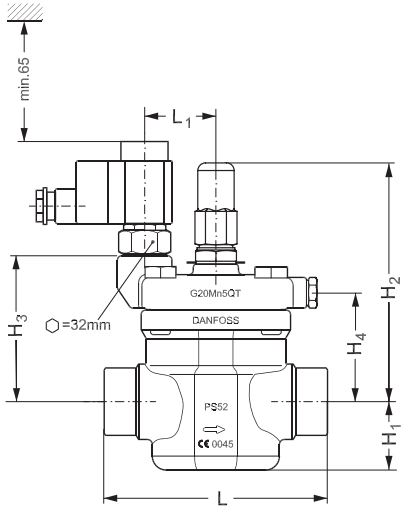
ICS 3 Pilots

Connection		H_1	H_2	H_3	H_4	L	L_1	L_2	B_1	B_2	Weight ICS 1 Pilot	Weight ICS 3 Pilots
32 D (1¼ in.)	mm	40	160	100	74	145	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.71	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
40 D (1½ in.)	mm	40	160	100	74	145	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.71	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
32 A (1¼ in.)	mm	40	160	100	74	145	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.71	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
40 A (1½ in.)	mm	40	160	100	74	145	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.71	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
32 SOC (1¼ in.)	mm	40	160	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.83	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
35 SD (1⅜ in. SA)	mm	40	160	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.83	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
42 SD (1⅝ in.)	mm	40	160	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.83	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
42 SA (1⅝ in.)	mm	40	160	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.83	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.

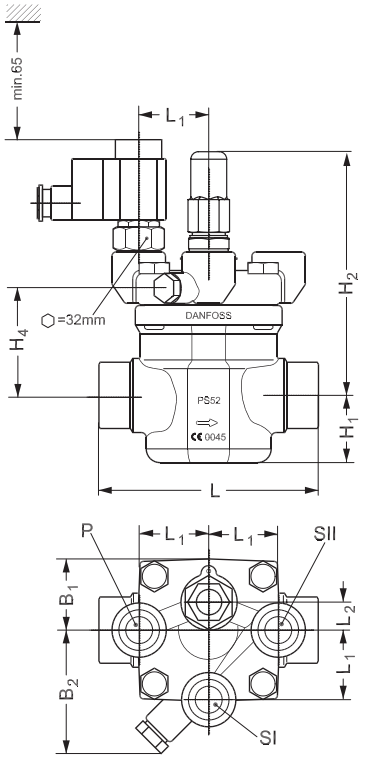
D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

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Dimensions and weights - ICS 40



ICS 1 pilot

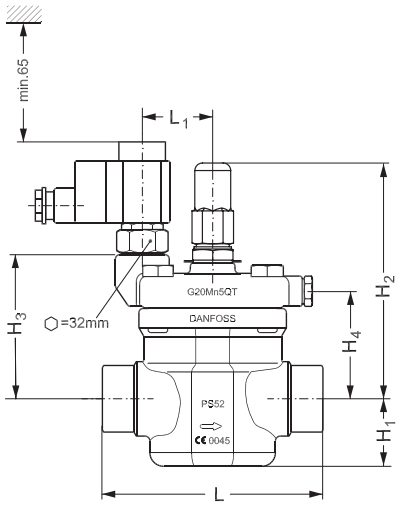


ICS 3 Pilots

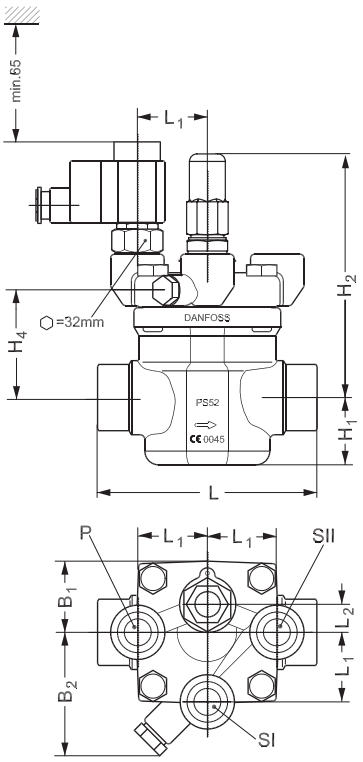
Connection		H_1	H_2	H_3	H_4	L	L_1	L_2	B_1	B_2	Weight ICS 1 Pilot	Weight ICS 3 Pilots
40 D (1½ in.)	mm	49	166	105	78	160	51	15	54	87	5.9 kg	6.3 kg
	in.	1.93	6.54	4.13	3.07	6.30	2.00	0.59	2.13	3.43	13.0 lb.	13.9 lb.
50 D (2 in.)	mm	49	166	105	78	180	51	15	54	87	5.9 kg	6.3 kg
	in.	1.93	6.54	4.13	3.07	7.09	2.00	0.59	2.13	3.43	13.0 lb.	13.9 lb.
40 A (1½ in.)	mm	49	166	105	78	160	51	15	54	87	5.9 kg	6.3 kg
	in.	1.93	6.54	4.13	3.07	6.30	2.00	0.59	2.13	3.43	13.0 lb.	13.9 lb.
50 A (2 in.)	mm	49	166	105	78	180	51	15	54	87	5.9 kg	6.3 kg
	in.	1.93	6.54	4.13	3.07	7.09	2.00	0.59	2.13	3.43	13.0 lb.	13.9 lb.
40 SOC (1½ in.)	mm	49	166	105	78	180	51	15	54	87	5.9 kg	6.3 kg
	in.	1.93	6.54	4.13	3.07	7.09	2.00	0.59	2.13	3.43	13.0 lb.	13.9 lb.
42 SD (1⅝ in.)	mm	49	166	105	78	180	51	15	54	87	5.9 kg	6.3 kg
	in.	1.93	6.54	4.13	3.07	7.09	2.00	0.59	2.13	3.43	13.0 lb.	13.9 lb.
42 SA (1⅝ in.)	mm	49	166	105	78	180	51	15	54	87	5.9 kg	6.3 kg
	in.	1.93	6.54	4.13	3.07	7.09	2.00	0.59	2.13	3.43	13.0 lb.	13.9 lb.

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

Dimensions and weights - ICS 50



ICS 1 pilot



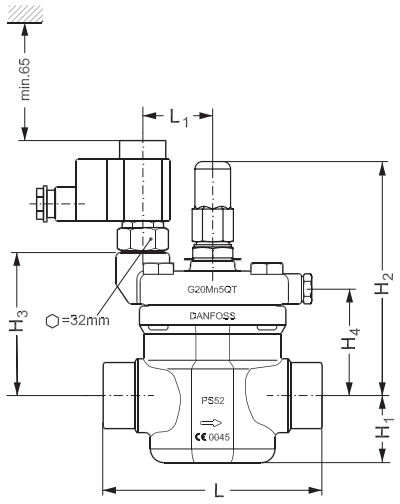
ICS 3 Pilots

Connection		H_1	H_2	H_3	H_4	L	L_1	L_2	B_1	B_2	Weight ICS 1 Pilot	Weight ICS 3 Pilots
50 D (2 in.)	mm	59	181	120	93	200	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	7.13	4.72	3.66	7.87	2.00	0.59	2.48	3.58	19.6 lb.	20.2 lb.
65 D (2½ in.)	mm	59	181	120	93	210	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	7.13	4.72	3.66	8.27	2.00	0.59	2.48	3.58	19.6 lb.	20.2 lb.
50 A (2 in.)	mm	59	181	120	93	200	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	7.13	4.72	3.66	7.87	2.00	0.59	2.48	3.58	19.6 lb.	20.2 lb.
65 A (2½ in.)	mm	59	181	120	93	210	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	7.13	4.72	3.66	8.27	2.00	0.59	2.48	3.58	19.6 lb.	20.2 lb.
50 SOC (2 in.)	mm	59	181	120	93	216	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	7.13	4.72	3.66	8.50	2.00	0.59	2.48	3.58	19.6 lb.	20.2 lb.
54 SD (2⅛ in. SA)	mm	59	181	120	93	216	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	7.13	4.72	3.66	8.50	2.00	0.59	2.48	3.58	19.6 lb.	20.2 lb.

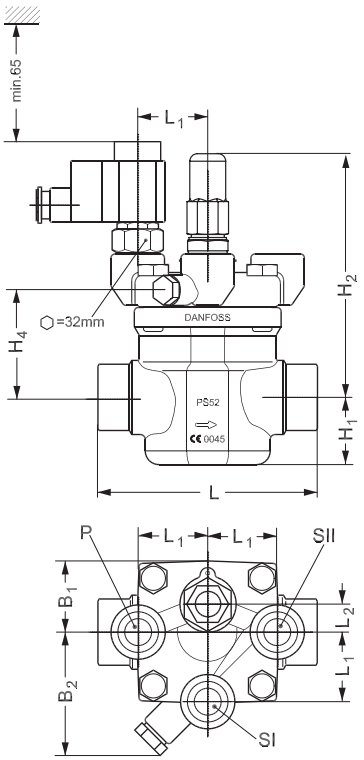
D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

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Dimensions and weights - ICS 65/ ICS 80



ICS 1 pilot

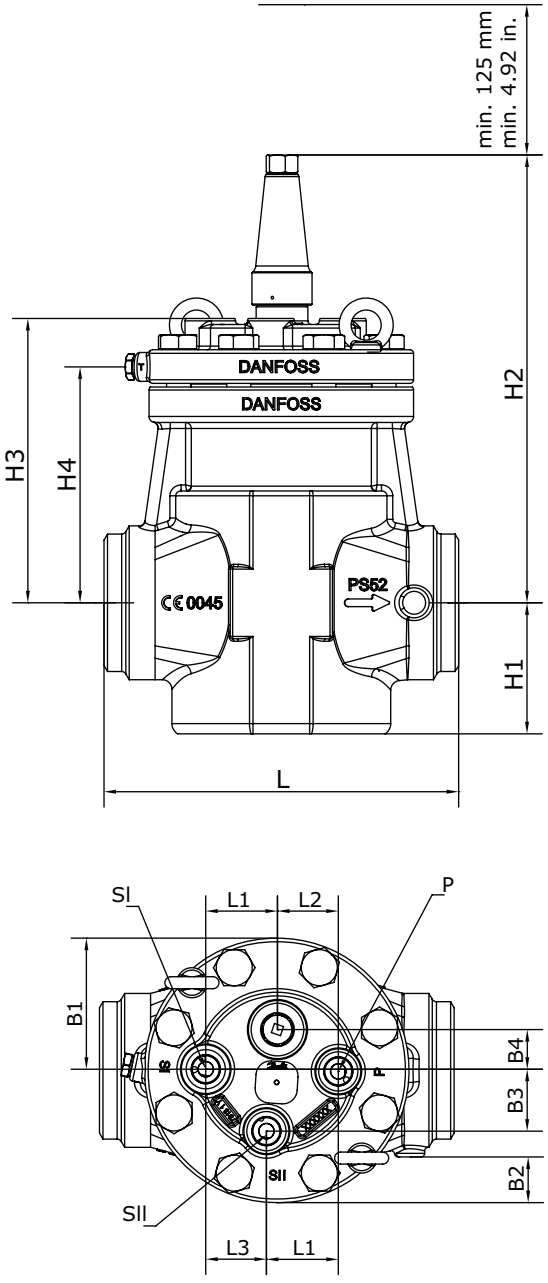


ICS 3 Pilots

Connection		H_1	H_2	H_3	H_4	L	L_1	L_2	B_1	B_2	Weight ICS 1 Pilot	Weight ICS 3 Pilots
65 D (2½ in.)	mm	65	202	140	115	230	51	15	70	91	13.4 kg	13.5 kg
	in.	2.56	7.95	5.51	4.53	9.06	2.00	0.59	2.76	3.58	29.48 lb.	29.7 lb.
80 D (3 in.)	mm	65	202	140	115	245	51	15	70	91	13.4 kg	13.5 kg
	in.	2.56	7.95	5.51	4.53	9.65	2.00	0.59	2.76	3.58	29.48 lb.	29.7 lb.
65 A (2½ in.)	mm	65	202	140	115	230	51	15	70	91	13.4 kg	13.5 kg
	in.	2.56	7.95	5.51	4.53	9.06	2.00	0.59	2.76	3.58	29.48 lb.	29.7 lb.
80 A (3 in.)	mm	65	202	140	115	245	51	15	70	91	13.4 kg	13.5 kg
	in.	2.56	7.95	5.51	4.53	9.65	2.00	0.59	2.76	3.58	29.48 lb.	29.7 lb.
65 J (2½ in.)	mm	65	202	140	115	230	51	15	70	91	13.4 kg	13.5 kg
	in.	2.56	7.95	5.51	4.53	9.06	2.00	0.59	2.76	3.58	29.48 lb.	29.7 lb.
65 SOC (2½ in.)	mm	65	202	140	115	230	51	15	70	91	13.4 kg	13.5 kg
	in.	2.56	7.95	5.51	4.53	9.06	2.00	0.59	2.76	3.58	29.48 lb.	29.7 lb.
76 SD (3 in.)	mm	65	202	140	115	245	51	15	70	91	13.4 kg	13.5 kg
	in.	2.56	7.95	5.51	4.53	9.65	2.00	0.59	2.76	3.58	29.48 lb.	29.7 lb.
67 SA (2⅝ in.)	mm	65	202	140	115	245	51	15	70	91	13.4 kg	13.5 kg
	in.	2.56	7.95	5.51	4.53	9.65	2.00	0.59	2.76	3.58	29.48 lb.	29.7 lb.

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

Dimensions and weights - ICS 100

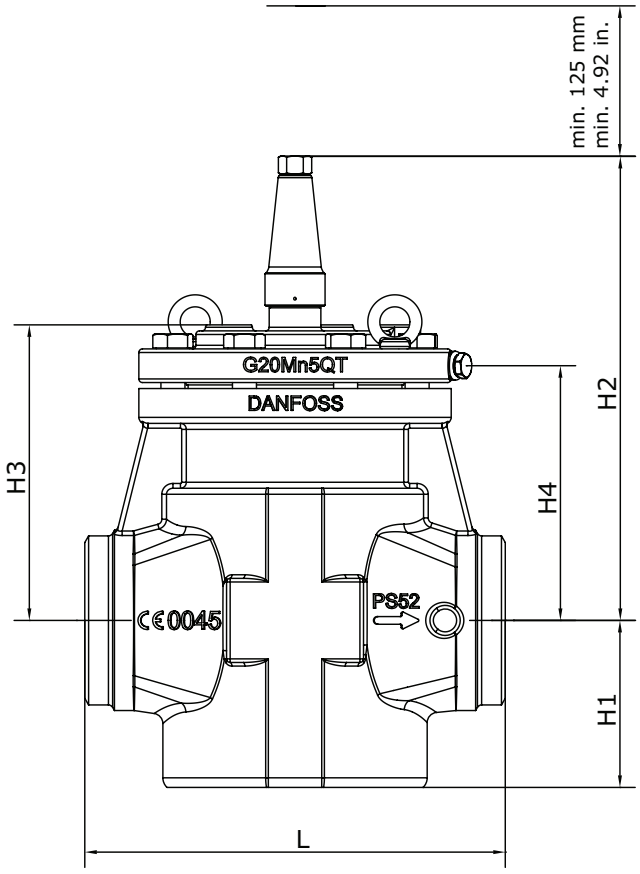


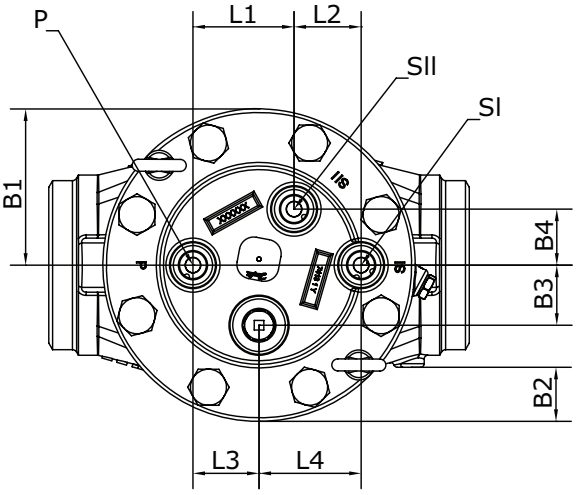
Connection		H1	H2	H3	H4	L	L1	L2	L3	B1	B2	B3	B4	Weight
100 D or A (4 in)	[mm]	109	372	237	196	295	60	51	50	109	38	52	33	45 kg
	[in]	4.3	14.7	9.3	7.7	11.6	2.4	2.0	2.0	4.3	1.5	2.1	1.3	99.2 lb.

D = Butt-weld DIN ; A = Butt-weld ANSI

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Dimensions and weights - ICS 125

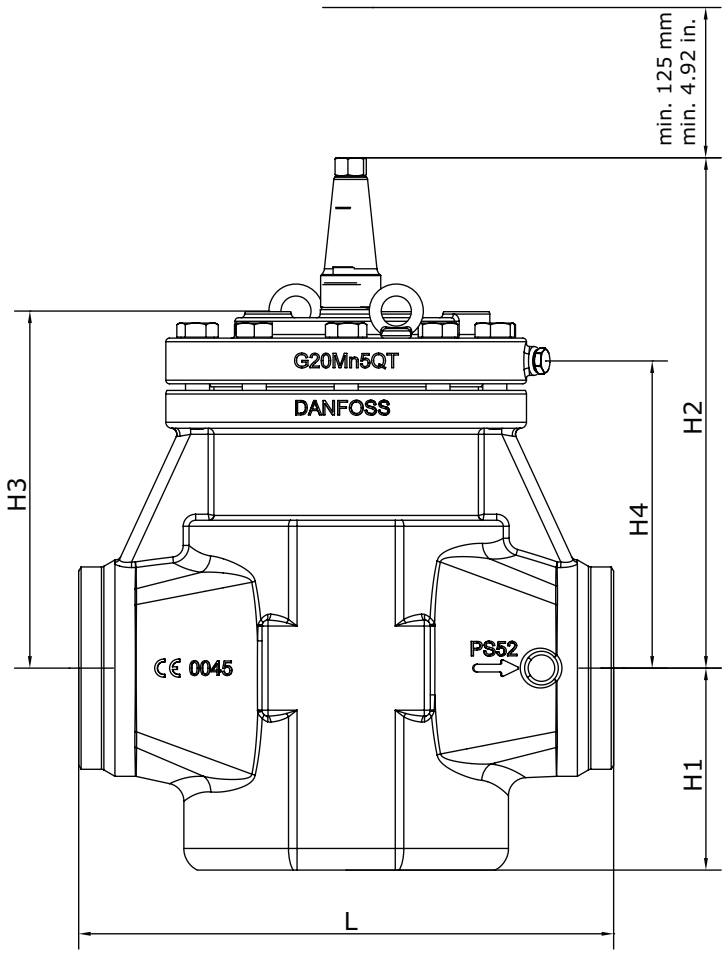


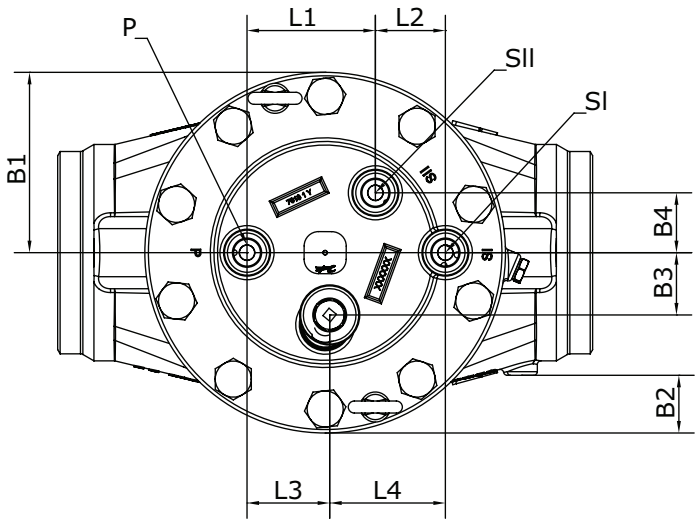


Connection		H1	H2	H3	H4	L	L1	L2	L3	L4	B1	B2	B3	B4	Weight
125 D or A (5 in)	[mm]	139	386	246	212	350	84	56	55	85	130	45	50	47	68 kg
	[in]	5.5	15.2	9.7	8.4	13.8	3.3	2.2	2.2	3.4	5.1	1.8	2.0	1.9	149.9 lb.

D = Butt-weld DIN ; A = Butt-weld ANSI

Dimensions and weights - ICS 150





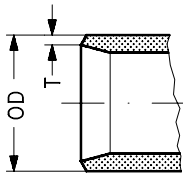
Connection		H1	H2	H3	H4	L	L1	L2	L3	L4	B1	B2	B3	B4	Weight
150 D or A (6 in)	[mm]	168	425	297	256	445	107	58	69	96	150	48	52	50	115 kg
	[in]	6.6	16.7	11.7	10.1	17.5	4.2	2.3	2.7	3.8	5.9	1.9	2.1	2.0	253.5 lb.

D = Butt-weld DIN ; A = Butt-weld ANSI

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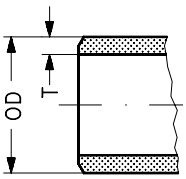
Connections

D: *Butt-weld DIN (2448)*



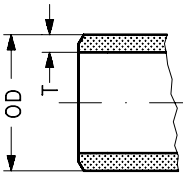
Size [mm]	Size [in]	OD [mm]	T [mm]	OD [in]	T [in]		
20	¾	26.9	2.3	1.059	0.091		
25	1	33.7	2.6	1.327	0.103		
32	1¼	42.4	2.6	1.669	0.102		
40	1½	48.3	2.6	1.902	0.103		
50	2	60.3	2.9	2.37	0.11		
65	2½	76.1	2.9	3	0.11		
80	3	88.9	3.2	3.50	0.13		
100	4	114.3	3.6	4.5	0.14		
125	5	140.7	4	5.5	0.16		
150	6	168.3	6.3	6.6	0.25		

A: *Butt-weld ANSI (B 36.10)*



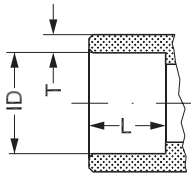
Size [mm]	Size [in]	OD [mm]	T [mm]	OD [in]	T [in]	Schedule	
(20)	¾	26.9	4.0	1.059	0.158	80	
(25)	1	33.7	4.6	1.327	0.181	80	
(32)	1¼	42.4	4.9	1.669	0.193	80	
(40)	1½	48.3	5.1	1.902	0.201	80	
(50)	2	60.3	3.9	2.37	0.15	40	
(65)	2½	73.0	5.2	2.87	0.20	40	
(80)	3	88.9	5.5	3.50	0.22	40	
(100)	4	114.3	6	4.5	0.24		
(125)	5	140.7	6.5	5.5	0.26		
(150)	6	168.3	7.1	6.6	0.28		

J: *Butt-weld JIS*



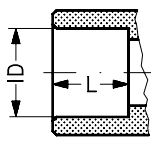
Size [mm]	Size [in]	OD [mm]	T [mm]	OD [in]	T [in]		
(20)	¾	26.9	4.0	1.059	0.158		
(25)	1	33.7	4.6	1.327	0.181		
(32)	1¼	42.4	4.9	1.669	0.193		
(40)	1½	48.3	5.1	1.902	0.201		
(50)	2	60.3	3.9	2.37	0.15		
(65)	2½	76.3	5.2	3.0	0.20		

SOC:
Socket welding ANSI (B 16.11)



Size [mm]	Size [in]	ID [mm]	T [mm]	ID [in]	T [in]	L [mm]	L [in]
(20)	¾	27.2	4.6	1.071	0.181	13	0.51
(25)	1	33.9	7.2	1.335	0.284	13	0.51
(32)	1¼	42.7	6.1	1.743	0.240	13	0.51
(40)	1½	48.8	6.6	1.921	0.260	13	0.51
(50)	2	61.2	6.2	2.41	0.24	16	0.63
(65)	2½	74	8.8	2.91	0.344	16	0.63

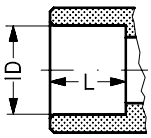
SD: *Soldering (DIN 2856)*



Size [mm]	Size [in]	ID [mm]		ID [in]		L [mm]	L [in]
22		22.08				16.5	
28		28.08				26	
35		35.07				25	
42		42.07				28	
54		54.09				33	
76		76.1				33	

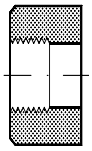
Connections *(continued)*

SA: Soldering (ANSI B 16.22)



	⅞			0.875			0.650
	1⅛			1.125			1.024
	1⅜			1.375			0.984
	1⅝			1.625			1.102
	2⅛			2.125			1.300
	2⅝			2.625			1.300

FPT:
Female pipe thread,
(ANSI/ASME B 1.20.1)



Size [mm]	Size [in]	Inside pipe thread		
(20)	¾	(3/4 × 14 NPT)		
(25)	1	(1 × 11.5 NPT)		
(32)	1¼	(1 1/4 × 11.5 NPT)		

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ENGINEERING
TOMORROW

Pilot valves
Types CVP, CVPP, CVC, CVE, EVM and CVH

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ENGINEERING
TOMORROW

Pilot valves
Types CVP, CVPP, CVC, CVE, EVM and CVH

Pilot valves for direct mounting in main valves



Pilot valves are intended for mechanical control of a main valve and are ready for direct installation in the top cover of the main valve.

Small capacities can be controlled by the pilot valve directly without a main valve when installed in the matching CVH housing.

The extensive range of Danfoss pilot valves include:

- Constant-pressure pilot valve, type CVP
- Differential-pressure pilot valve, type CVPP
- Pressure-operated pilot valve with reference pressure connection, type CVC
- Electronically operated constant-pressure pilot valve, type CVE
- Solenoid pilot valve, type EVM (NC)
- Solenoid pilot valve, type EVM (NO)
- Housing, type CVH for pilot valves, for mounting in external pilot lines

Features

- Applicable to HCFC, non flammable HFC, R717 (Ammonia) and R744 (CO_2). The use of Pilots with flammable hydrocarbons is not recommended
- Extremely accurate pressure and temperature control.
- The pilot valves can be screwed directly into the main valve, thus avoiding the necessity of welding, soldering and separate pilot lines.
- The pilot valves can be mounted directly in the ICS, PM or ICF valve or it can be connected via an external pilot line and a CVH housing.
- All pilot valves can be used on all sizes of main valves.
- Several pilot valves can be connected in series or in parallel to provide many functions in the same ICS or ICF valve.
- All pilot valves are delivered with gaskets.

Design

Each pilot valve is designed to give the optimum control accuracy within the specific function range of the valve.

Several pilot valves can be mounted in series and/or in parallel on the main valve (ICS, ICF or the discontinued PM) to suit numerous applications.

Mounted in a CVH housing, the pilot valves can be used in external lines, either as independently operating valves or as external control valves for the main valve.

The pilot valves can be used for all sizes of ICS and for ICF 50/65.

Technical data

Refrigerants
Applicable to HCFC, non flammable HFC, R717 (Ammonia) and R744 (CO_2). The use of pilot valves with flammable hydrocarbons is not recommended

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

Pressure range:
The pilot valves are designed for a max. working pressure of 52 bar g (754 psig)

Pressure setting ranges are given separately for the specific pilot valve.

For further information please see installation guides for ICS or ICF valves.

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Constant-pressure pilot valve, type CVP

Design and function

CVP



CVP is a constant-pressure pilot valve for a max. working pressure (MWP) of 52 bar (754 psi) and with 3 setting ranges covering settings of -0.66 to 52 bar (19.5 in. Hg to 754 psi).

This pilot valve is used for maintaining a constant pressure on the inlet side of the main valve.

When a CVP is mounted in a CVH housing, it can be used as a separate constant-pressure valve or a pressure relief valve (e.g. to prevent hydraulic overpressure in an entrapped liquid).

Please note:
The CVP pilot can be used for most applications in the refrigeration system including hot gas relief systems.

Technical data

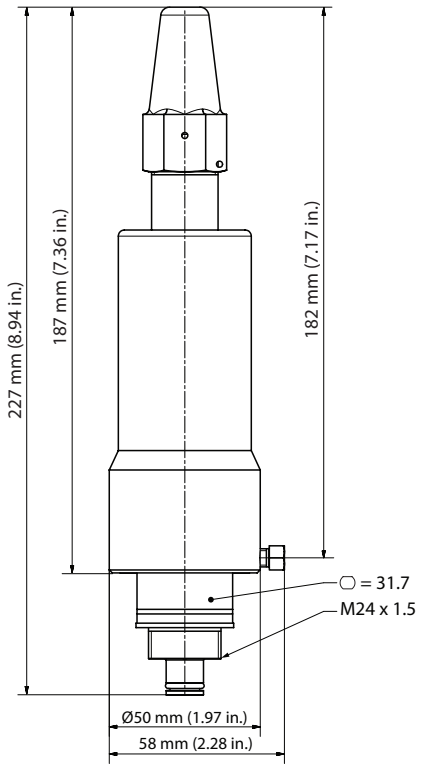
Valve type	Max. working pressure		k_v / C_v value		Temperature range		Pressure range		Code no.
	[bar]	[psi]	[m³/h]	[US gal/min]	[°C]	[°F]	[bar]	[psi]	
CVP-L	52	754	0.40	0.46	-60/+120	-76/+248	-0.66 - 7	19.5 in Hg to 102	027B0920
CVP-M	52	754	0.40	0.46	-60/+120	-76/+248	4 - 28	58 - 406	027B0921
CVP-H	52	754	0.40	0.46	-60/+120	-76/+248	25 - 52	363 - 754	027B0922

The k_v/C_v value is measured with the pilot valve mounted in a CVH housing for external pilot lines. The value can vary slightly, depending on the setting value.

P-band for a valve system regulated by CVP and ICS or PM main valve: < 0.2 bar g (2.9 psi g)

Dimensions and weights

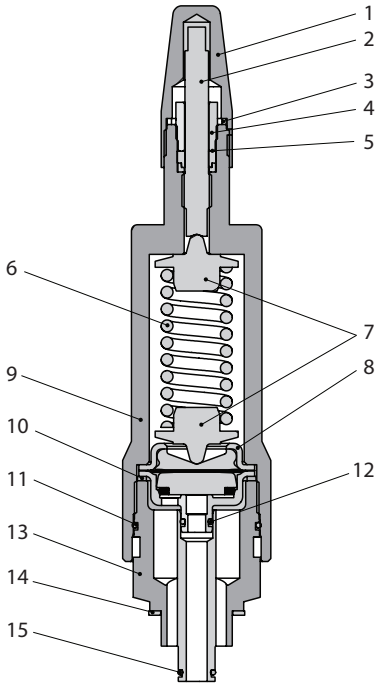
CVP



Weight: Approx. 1.46 kg (3.22 lbs)

Constant-pressure pilot valve, type CVP - *continued*

Material specification - CVP



No.	Part	Material
1	Protective cap	Steel
2	Setting spindle	Stainless steel
3	Cap seal	Nylon
4	Packing gland	Steel
5	Seal	Teflon
6	Spring	Steel
7	Spring plate	Steel
8	Diaphragm assembly	Stainless steel
9	Valve bonnet	Steel
10	Cover seal	Alu
11	Back up O-ring	
12	O-ring	
13	Base part	Steel
14	Seal	Fiber gasket
15	O-ring	

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Differential-pressure pilot valve, type CVPP

Design and function

CVPP



CVPP is a differential-pressure pilot valve for a max. working pressure (MWP) of 52 bar (754 psi) and with 2 setting ranges covering settings of -0.66 to 28 bar (19.5 in. Hg to 406 psi).

The pilot valve is used for maintaining a constant differential pressure between the CVPP valve reference pressure connection and the main valve inlet pressure.

CVPP incorporates a diaphragm so that the reference pressure and the refrigerant in the valve are physically separated. The pilot valve can therefore also be used as a pneumatic control valve either to control a main valve or as a separate pneumatic valve mounted in a CVH housing.

Technical data

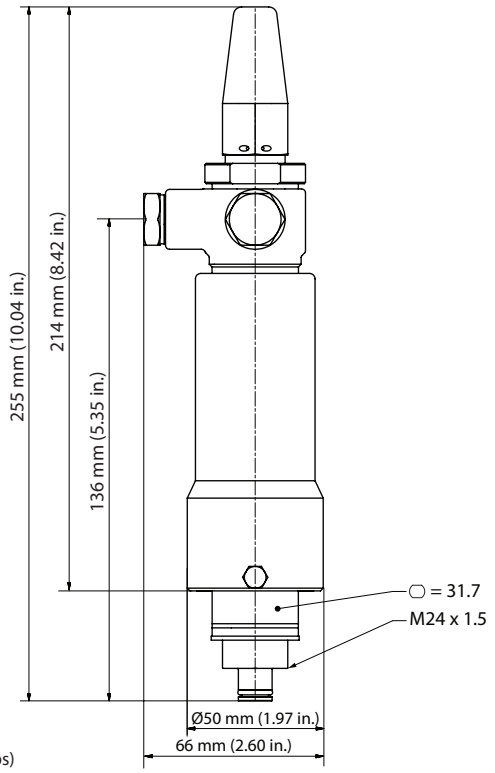
Valve type	Max. working pressure		k_v / C_v value		Temperature range		Pressure range		Code no.
	[bar]	[psi]	[m³/h]	[US gal/min]	[°C]	[°F]	[bar]	[psi]	
CVPP-L	52	754	0.40	0.46	-60/+120	-76/+248	-0.66 - 7	19.5 in Hg to 102	027B0930
CVPP-M	52	754	0.40	0.46	-60/+120	-76/+248	4 - 28	58 - 406	027B0931

The k_v/C_v value is measured with the pilot valve mounted in a CVH housing for external pilot lines. The value can vary slightly, depending on the setting value.

P-band for a valve system regulated by CVPP and ICS, ICF or PM main valve: <0.2 bar g (2.9 psi g).

Dimensions and weights

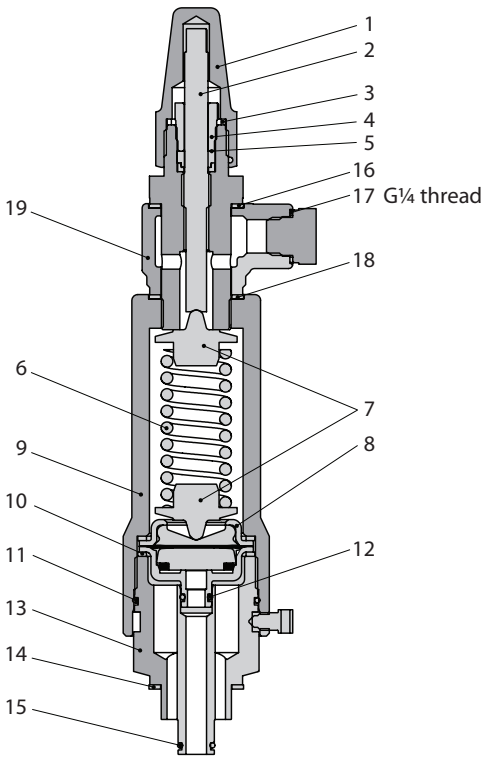
CVPP



Weight: Approx. 1.75 kg (3.86 lbs)

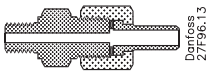
Differential-pressure pilot valve, type CVPP) - *continued*

Material specification - CVPP

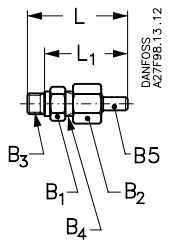


No.	Part	Material
1	Protective cap	Steel
2	Setting spindle	Stainless steel
3	Cap seal	Nylon
4	Packing gland	Steel
5	Seal	Teflon
6	Spring	Steel
7	Spring plate	Steel
8	Diaphragm assembly	Stainless steel
9	Valve bonnet	Steel
10	Cover seal	Alu
11	Back up O-ring	
12	O-ring	
13	Base part	Steel
14	Seal	Fiber gasket
15	O-ring	
16	Seal	Fiber gasket
17	Plug for external pressure G¼	Steel
18	Seal	Fiber gasket
19	Banjo	Steel

Pilot welding connector (included in the box)
Use code number to order as accessory



Description	Code no.
∅ 6.5 mm / ∅ 10 mm (∅ 0.26 in. / ∅ 0.39 in.) weld / solder	027B2035



	L	L_1	B_1	B_2	B_3	B_4	B_5
mm in.	66 2.60	54 2.13	AF 19	AF 22	G 1/4 A	G 3/8 A	∅6.5 / ∅10 ∅0.26/ ∅0.39

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Pressure-operated pilot valve with reference pressure connection, type CVC

Design and function

CVC



CVC is a constant pressure pilot valve at an external reference point for a max. working pressure (MWP) of 52 bar (754 psi) and with 2 setting ranges covering settings of -0.66 to 28 bar (19.5 in. Hg to 406 psi).

The CVC-pilot is designed to maintain a constant pressure at an external reference point in the system.

CVC pilot valve installed in an ICS servo valve are used for e.g.:

- Outlet pressure regulator to regulate max. suction pressure, e.g. as a compressor crankcase pressure regulator;
- Outlet pressure regulator as a pressure limiter, e.g. for hot gas defrost of hot gas lines.

The reference pressure must be connected to the low-pressure side of the system.

The k_v/C_v value is measured with the pilot valve mounted in a CVH housing for external pilot lines. The value can vary slightly, depending on the setting value.

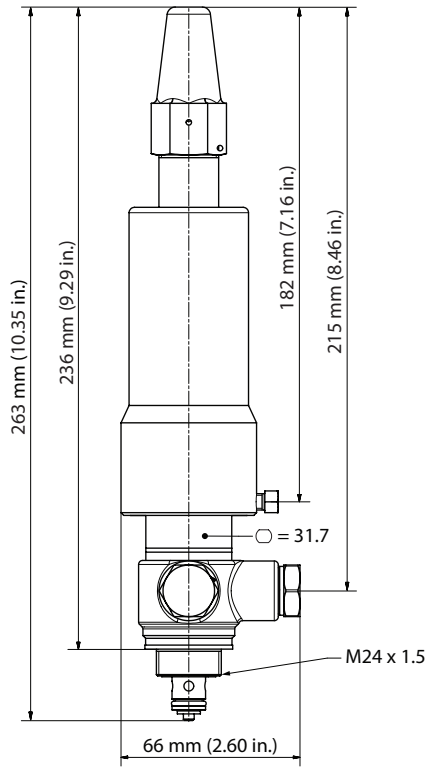
Technical data

Valve type	Max. working pressure		k_v / C_v value		Temperature range		Pressure range		Code no.
	[bar]	[psi]	[m³/h]	[US gal/min]	[°C]	[°F]	[bar]	[psi]	
CVC-L	52	754	0.20	0.23	-60/+120	-76/+248	-0.66 - 7	19.5 in Hg to 102	027B0940
CVC-M	52	754	0.20	0.23	-60/+120	-76/+248	4 - 28	58 - 406	027B0941

P-band for a valve system regulated by CVC and ICS/PM/PMC: < 0.3 bar g (4.4 psi g)

Dimensions and weights

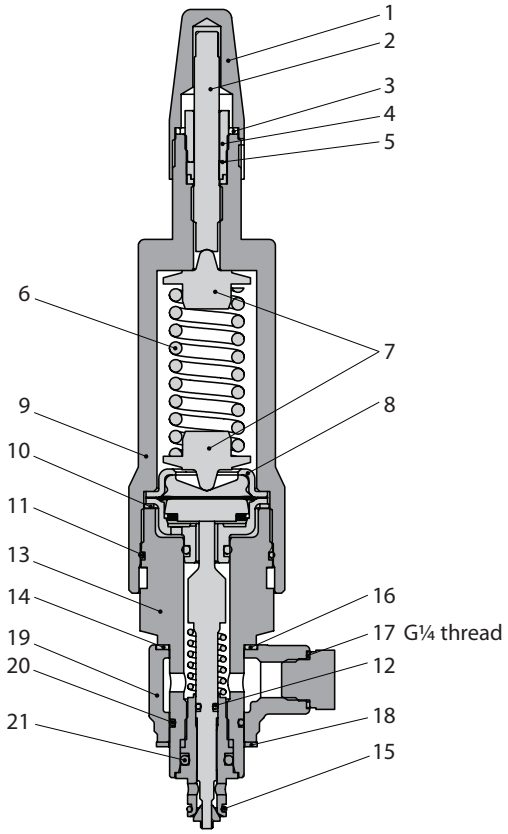
CVC



Weight: Approx. 1.78 kg (3.92 lbs)

Pressure-operated pilot valve with reference pressure connection, type CVC - *continued*

Material specification - CVC

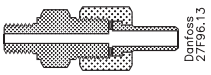


No.	Part	Material
1	Protective cap	Steel
2	Setting spindle	Stainless steel
3	Cap seal	Nylon
4	Packing gland	Steel
5	Seal	Teflon
6	Spring	Steel
7	Spring plate	Steel
8	Diaphragm assembly	Stainless steel
9	Valve bonnet	Steel
10	Cover seal	Alu
11	Back up O-ring	
12	O-ring	
13	Base part	Steel
14	Seal	Fiber gasket
15	O-ring	
16	Seal	Fiber gasket
17	Plug for external pressure G¼	Steel
18	Seal	Fiber gasket
19	Banjo	Steel
20	O-ring	
21	O-ring	

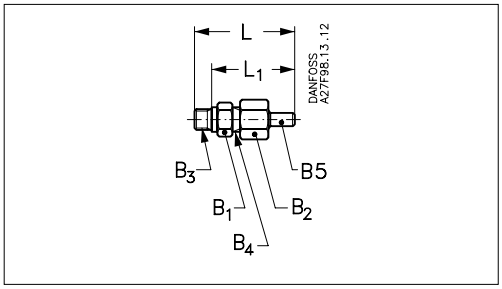
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Pressure-operated pilot valve with reference pressure connection, type CVC - *continued*

Pilot welding connector (included in the box)
Use code number to order as accessory



Description	Code no.
∅ 6.5 mm / ∅ 10 mm (∅ 0.26 in. / ∅ 0.39 in.) weld / solder	**027B2035**



	L	L_1	B_1	B_2	B_3	B_4	B_5
mm in.	66 2.60	54 2.13	AF 19	AF 22	G 1/4 A	G 3/8 A	∅6.5 / ∅10 ∅0.26/ ∅0.39

Electronically operated constant-pressure (constant pressure difference) pilot valve, type CVE

Design and function

CVE



CVE is, when fitted with the ICAD 1200A stepper motor, a constant pressure pilot valve with electronic change of set-point for a max. working pressure (MWP) of 52 bar (754 psi) and with electronic controlled full range settings of -0.66 to 8 bar gauge (19.5 in. Hg to 116 psi). The CVE interface to the ICAD is hermetic closed and rotation force is transferred from the ICAD by magnetic forces.

The CVE pilot valve is designed to maintain a constant and very accurate inlet pressure of an ICS servo valve, e.g. evaporator pressure regulation.

The CVE/ICAD unit can be either stand-alone or connected to a remote EKE 347 or PLC with appropriate controller function.

The stand-alone arrangement allows the on-site ICAD setting - and the remote wiring allows remote setting of the desired set pressure.

Technical data

The k_v/C_v value is measured with the pilot valve mounted in a CVH housing for external pilot lines. The value can vary slightly, depending on the setting value.

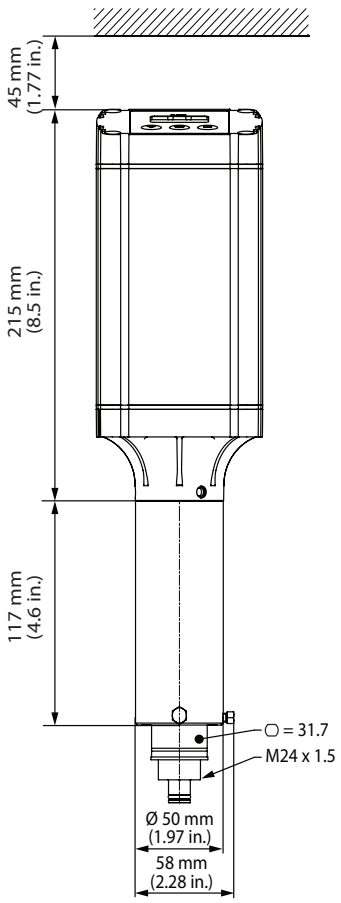
Valve type	Max. working pressure		k_v / C_v value		Temperature range		Pressure range		Code no.
	[bar]	[psi]	[m³/h]	[US gal/min]	[°C]	[°F]	[bar]	[psi]	
CVE-L	52	754	0.40	0.46	-60/+120	-76/+248	-0.66 - 8	19.5 in. Hg to 116	027B0980

ICAD 1200A is the suitable stepper motor for CVE

ICAD 1200A with 1.5 m. / 60 in. cables	ICAD 1200A without cable
027H9077	027H9122

Dimensions and weights

CVE



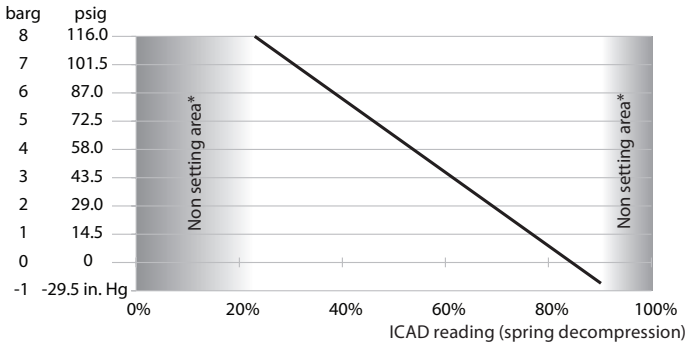
Weight: Approx. 1.75 kg (3.86 lbs)

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Electronically operated constant-pressure (constant pressure difference) pilot valve, type CVE - *continued*

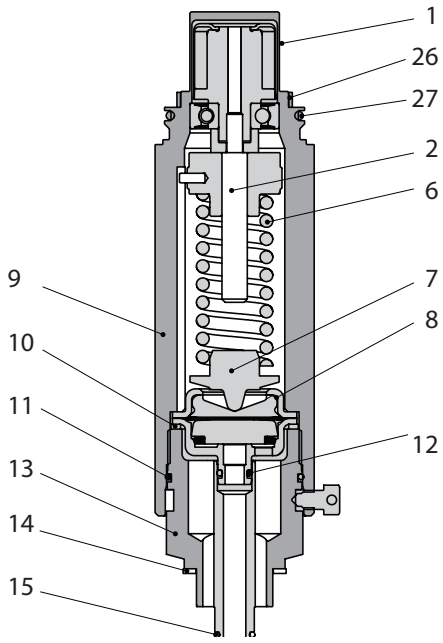
CVE Pressure setting (see the installation guide AN213086423355 for ICAD setup)

barg	-0.66	0	1	2	3	4	5	6	7	8
psig	19.5 in. Hg	0	14.5	29.0	43.5	58.0	72.5	87.0	101.5	116.0
mA	18.3	17.1	15.9	14.7	13.5	12.3	11.1	9.9	8.7	7.5
ICAD reading %	90%	83%	75%	67%	60%	53%	45%	37%	30%	23%



* These areas are dedicated regulation band for the pilot valve. It is recommended not to exceed the limits in above table

Material specification - CVE

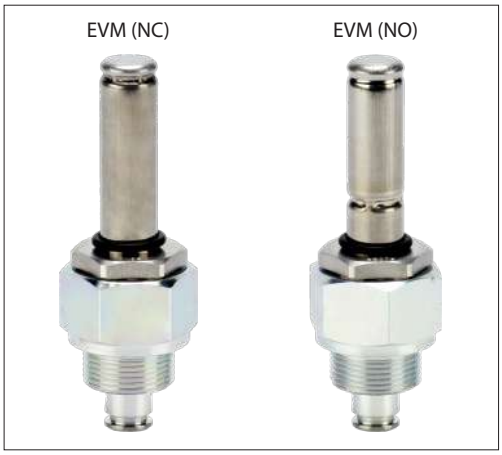


No.	Part	Material
1	Adapter	Stainless steel
2	Setting spindle	Stainless steel
6	Spring	Steel
7	Spring plate	Steel
8	Diaphragm assembly	Stainless steel
9	Valve bonnet	Stainless steel
10	Cover seal	Alu
11	Back up O-ring	
12	O-ring	
13	Base part	Steel
14	Seal	Fiber gasket
15	O-ring	
26	Seal	Teflon
27	O-ring	Cloroprene (Neoprene)

Solenoid pilot valve, type EVM (NC)

Solenoid pilot valve, type EVM (NO)

Design and function



EVM is a solenoid pilot valve for use when on/off operation of the main valve is required. EVM valves are intended for use with Danfoss solenoid valve coils ("Coils for solenoid valves", data sheet DKRCC.PD.BS0.F).

Together with CVH, an EVM can also be used as an independent solenoid valve.

Technical data

The k_v/C_v value is measured with the pilot valve mounted in a CVH housing for external pilot lines.

MOPD: Maximum opening differential pressure with a 10 W a.c. coil.

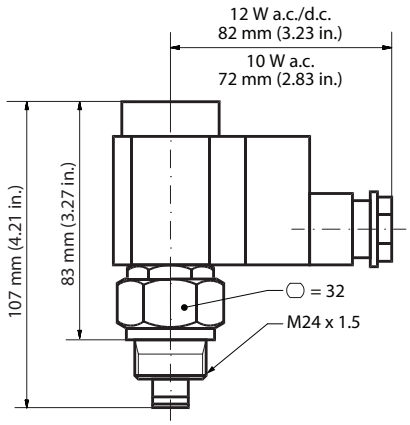
With:
20 W a.c. coil: 40 bar (580 psi)
20 W d.c. coil: 14 bar (203 psi)

MCPD: Maximum closing differential pressure with a 10/12 W a.c. coil or a 20 W d.c.coil.

Valve type	Max. working pressure		k_v / C_v value		Temperature range		Pressure range MOPD/MCPD		Code no.
	[bar]	[psi]	[m³/h]	[US gal/min]	[°C]	[°F]	[bar]	[psi]	
EVM NC	65	940	0.28	0.32	-60/+120	-76/+248	21	305	027B1120
EVM NO	52	754	0.12	0.14	-60/+120	-76/+248	19	276	027B1130
EVM NO	52	754	0.12	0.14	-60/+120	-76/+248	40	580	027B1132

Dimensions and weights

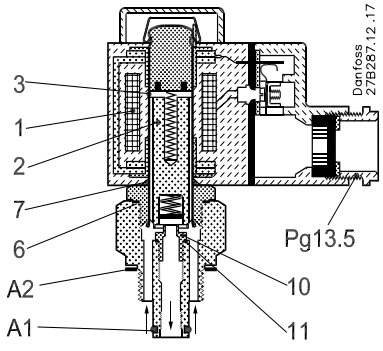
EVM



Weight: Approx. 0.25 kg (0.6 lbs) - without coil

Material specification

EVM

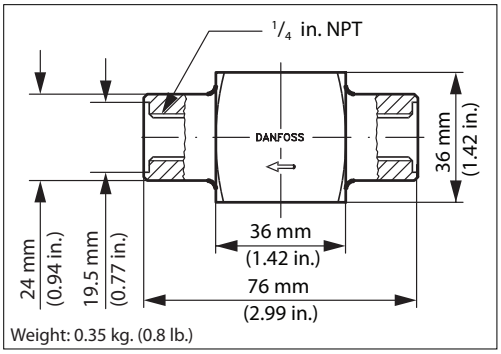


No.	Part	Material
1	Coil	
2	Armature	Stainless steel
3	Armature tube	Stainless steel
A2	Seal	Non-asbestos
A1	O-ring	Cloroprene (Neoprene)
6	Seal	Aluminium
7	Spacing ring	
8	Nut	
9	Lock button	
10	Valve body	Steel
11	Valve seat	Teflon (PTFE)

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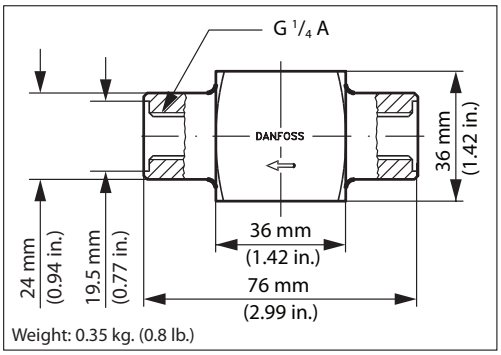
Housing for pilot valves, type CVH, for mounting in external pilot lines





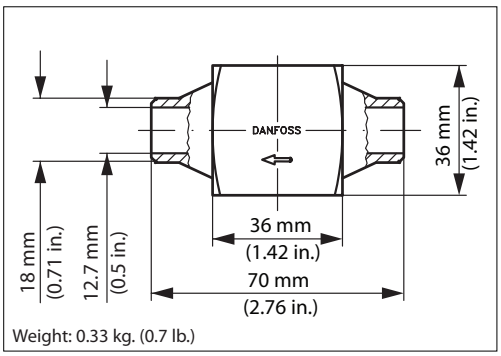
Weight: 0.35 kg. (0.8 lb.)

DN	Standard	Material	Code no.
Internal pipe thread			
6	ANSI/ASME B1.20.1	DIN 9SMnPb 28 W no. 1.0718	027F1159



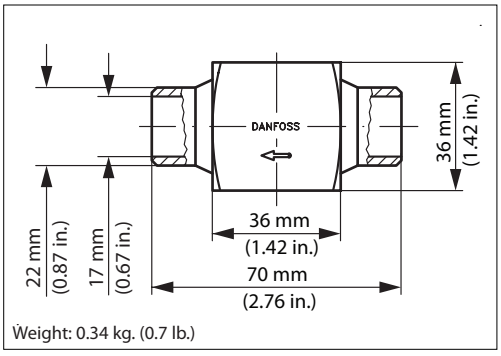
Weight: 0.35 kg. (0.8 lb.)

DN	Standard	Material	Code no.
Internal pipe thread			
6	ISO 228-1	DIN 9SMnPb 28 W no. 1.0718	027F1160



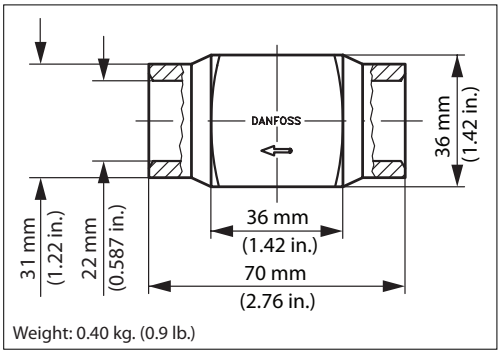
Weight: 0.33 kg. (0.7 lb.)

DN	Standard	Material	Code no.
3/8 in. butt weld			
10	ASME B 36.10M SCHEDULE 80	DIN. CK 15. W no. 1.1141	027F1047



Weight: 0.34 kg. (0.7 lb.)

DN	Standard	Material	Code no.
½ in. butt weld			
15	ASME B 36.10M SCHEDULE 80	DIN. CK 15. W no. 1.1141	027F1090



Weight: 0.40 kg. (0.9 lb.)

DN	Standard	Material	Code no.
½ in. socket weld			
15	ASME B 16.11	DIN. CK 15. W no. 1.1141	027F1091

ENGINEERING TOMORROW

Motor operated valves and Actuators
Type ICM and ICAD

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ENGINEERING
TOMORROW

Motor operated valves and Actuators
Type ICM and ICAD



ICM motor operated valves belong to the ICV family and are one of two product groups.

ICV types
– ICS - Pilot operated servo valve
– ICM - Motor operated vave

The motor operated valve comprises four main components: Valve body, top cover, function module and Actuator. On ICM 20-65 the top cover and function module will be combined. ICM are motor operated valves driven by actuator type ICAD.

ICM valves are designed to regulate an expansion process in liquid lines with or without phase change or control pressure or temperature in dry and wet suction lines and hot gas lines. ICM valves are designed so that the opening and closing forces are balanced, therefore, only two sizes of ICAD actuators are needed for the complete range of ICM from DN 20 to DN 150. The ICM motor operated valve and ICAD actuator assembly offers a very compact unit with small dimensions.

Features (valve)

- Designed for Industrial Refrigeration applications for a maximum working pressure of 52 bar g / 754 psi g
- Applicable to HCFC, HFC, R717 (Ammonia) and R744 (CO_2)
- Direct coupled connections
- Connection types include butt weld, socket weld, solder and threaded connections
- Low temperature steel body
- Low weight and compact design
- V-port regulating cone ensures optimum regulating accuracy particularly at part load
- Cavitation resistant valve seat on A cones
- Modular Concept
  - Each valve body is available with several different connection types and sizes.
  - Valve overhaul is performed by replacing the function module (ICM 20-65).
  - Possible to convert ICM motor operated valve to ICS pilot operated servo valve.
  - Spare parts available for ICM 100-150.
- Manual opening possible via ICAD or Multi-function tool
- PTFE seat provides excellent valve tightness
- Magnet coupling - real hermetic sealing
- ICAD 600A/1200A include encoder function that will provide a true valve position feedback to Danfoss controller or non-Danfoss control systems
- Classification: DNV, CRN, BV, EAC etc. To get an updated list of certification on the products please contact your local Danfoss Sales Company

Introduction

The ICM motor operated valve and ICAD actuator combinations are as follows:

Actuator	ICAD 600A	ICAD 1200A
Valve size	ICM 20	ICM 40
	ICM 25	ICM 50
	ICM 32	ICM 65
		ICM 100
		ICM 125
		ICM 150

ICAD 600A / ICAD 1200A
ICAD actuators can be controlled using the following signals:

- 0 – 20 mA
- 4 – 20 mA (default)
- 0 – 10 V
- 2 – 10 V
- One or two digital Input

ICAD actuators can operate an ICM valve as an On / Off function supported by one digital input.

ICAD actuators can operate an ICM valve as Neutral zone / 3 point control supported by two digital inputs.

The ICM valve can be operated manually via the ICAD actuator or the Multi-function tool for ICM (see the ordering section).

Fail Safe supply options
In the event of a power failure, multiple fail safe options are possible, provided that a ICAD-UPS or similar is used.
During power failure, ICM can be selected to:
- Close ICM
- Open ICM
- Stay in the same position, as when power failure occurs
- Go to a specific ICM valve opening degree

See the section ICAD UPS for further information.

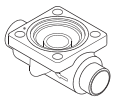
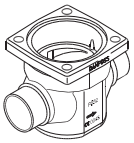
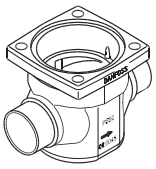
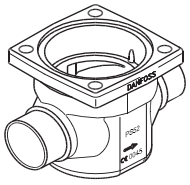
Please note: a fail safe supply (battery or UPS) is required.

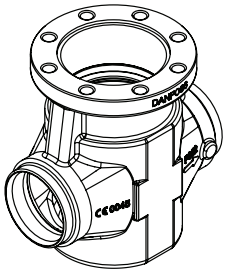
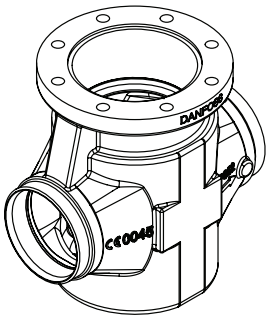
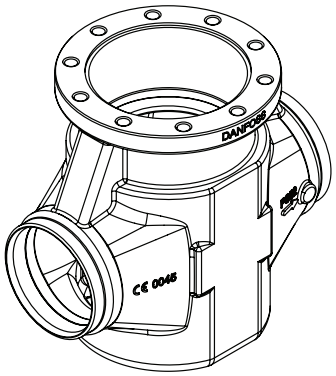
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The ICM Concept

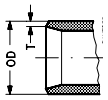
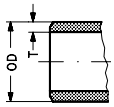
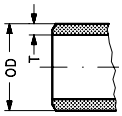
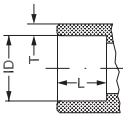
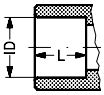
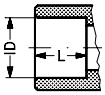
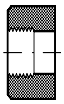
The ICM concept is developed around a modular principle. This gives the possibility of combining function modules and top covers with special valve body size that is available in a variety of connection possibilities.

- There are nine valve bodies available.

					
ICV 20	ICV 25	ICV 32	ICV 40	ICV 50	ICV 65

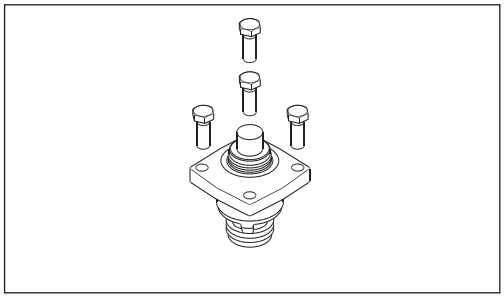
		
ICV 100	ICV 125	ICV 150

- Valve bodies in the sizes ICV 20 – ICV65 are available with a range of undersizes through oversized connection sizes and types.
  ICV 100 – ICV 150 are available in butt-weld DIN and butt-weld ANSI nominal sizes

D	A	J	SOC	SD	SA	FPT
						
Butt-weld DIN	Butt-weld ANSI	Butt-weld JIS	Socket weld ANSI	Solder DIN	Solder ANSI	Female Pipe Thread

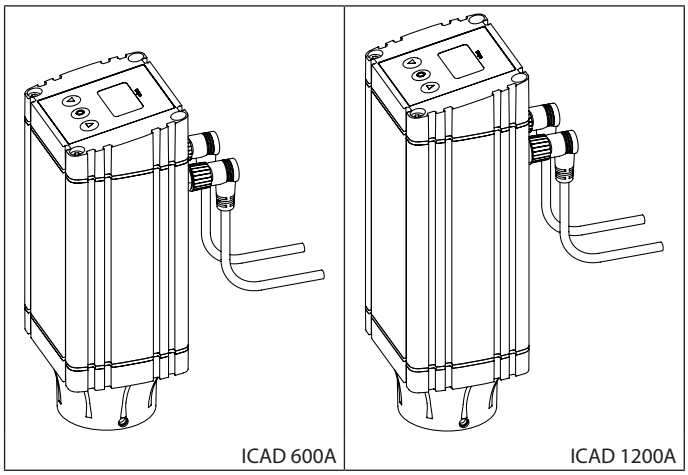
The ICM Concept
(continued)

- Each body may be fitted with multiple function / top cover to give different capacities.



Type	Valve body size	K_v (m^3/h)	C_v (USgal/min)
ICM 20A-33	20	0.2	0.23
ICM 20-A		0.6	0.7
ICM 20-B66		1.6	1.9
ICM 20-B		2.4	2.8
ICM 20-C		4.6	5.3
ICM 25-A	25	6	7.0
ICM 25-A33		2	2.3
ICM 25-B		12	13.9
ICM 32-A	32	9	10.4
ICM 32-B		17	20
ICM 40-A	40	15	17
ICM 40-B		26	30
ICM 50-A	50	23	27
ICM 50-B		40	46
ICM 65-A	65	35	41
ICM 65-B		70	81
ICM 100-B	100	142	167
ICM 125-B	125	223	260
ICM 150-B	150	370	430

A magnetic coupled actuator is easily installed.
Only two actuators are needed to cover the entire ICM program



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Design (valve)

Connections
There is a very wide range of connection types available with ICM valves:

- D: Butt weld, EN 10220
- A: Butt weld, ANSI (B 36.10)
- J: Butt weld, JIS (B S 602)
- SOC: Socket weld, ANSI (B 16.11)
- SD: Solder connection, EN 1254-1
- SA: Solder connection, ANSI (B 16.22)
- FPT: Female pipe thread (ANSI/ASME B 1.20.1)

Approvals
The ICV valve concept is designed to fulfil global refrigeration requirements.

ICM is CE, UL and CRN approved

For specific approval information, please contact Danfoss.

The ICM valves are approved in accordance with the European standard specified in the Pressure Equipment Directive and are CE marked.
For further details / restrictions - see Installation Instruction.

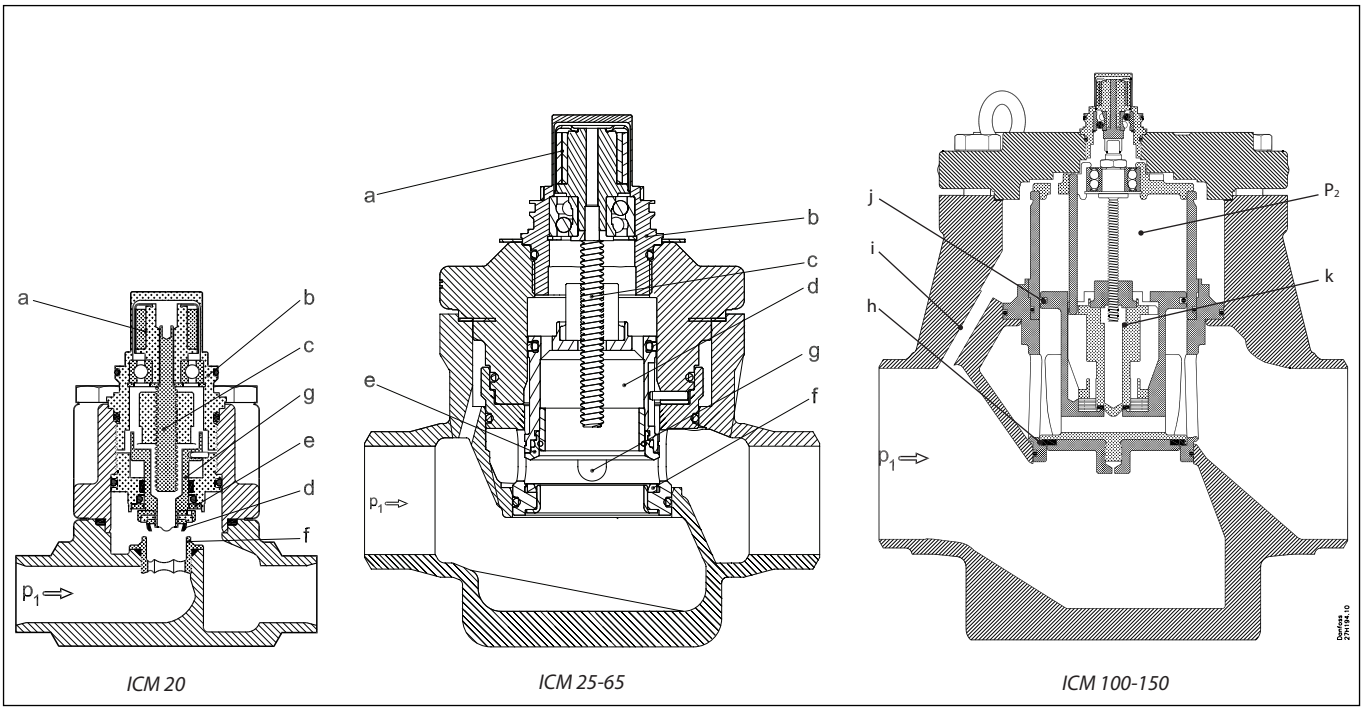
Valve body and top cover material
Low temperature steel

ICM valves			
Nominal bore	DN≤ 25 (1 in)	DN 32-65 (1 ¼ – 2 ½ in)	DN 80-125 (3 – 5 in)
Classified for	Fluid group I		
Category	Article 3, paragraph 3	II	III

Technical data (valve)

- *Refrigerants*
  ICM 20, ICM 100, ICM 125 and ICM 150:
  Applicable to HCFC, non flammable HFC, R717 (Ammonia) and R744 (CO_2)
  ICM 25-65:
  Applicable to HCFC, non flammable HFC, R717 (Ammonia), R744 (CO_2) and R1234ze
  Use with flammable hydrocarbons cannot be recommended. For further information please contact your local Danfoss sales company.
- *Temperature range:*
  Media: -60 – 120 °C / -76 – 248 °F.
  When used in liquid refrigerant above 75 °C / 167 °F, please contact Danfoss
- *Pressure*
  The valve is designed for:
  Max. working pressure: 52 bar g / 754 psi g
- *Surface protection*
  ICM 20-150:
  The external surface is zinc-chromated to provide good corrosion protection.
- Max. openening pressure differential (MOPD)
  - ICM 20-32: 52 bar / 750 psi
  - ICM 40: 40 bar / 580 psi
  - ICM 50: 30 bar / 435 psi
  - ICM 65: 20 bar / 290 psi
  - ICM 100 20 bar / 290 psi
  - ICM 125 20 bar / 290 psi
  - ICM 150 20 bar / 290 psi
- Time to move from Closed to Open position or in reverse order with maximum selected speed at ICAD.
  - ICM 20: 3 Sec. ICM 65: 13 Sec.
  - ICM 25: 7 Sec. ICM 100: 25 Sec.
  - ICM 32: 8 Sec. ICM 125: 35 Sec.
  - ICM 40: 10 Sec. ICM 150: 45 Sec.
  - ICM 50: 13 Sec.

Function (valve)



ICM 20 *ICM 25-65* *ICM 100-150*

ICM, motor operated valves are designed for use with the ICAD actuator with Display.

The driving force from the actuator is transferred via a magnetic coupling (a) through the stainless steel top housing (b) and thus eliminates the need for a packing gland. The rotational movement of the magnetic coupling (a) is transferred to a spindle (c) which in turn provides the vertical movement of the piston (d) and the valve seat (e), to open and close the valve. The closing force of the actuator, combined with the the valve seat (e) and PTFE valve plate (f), provides an effective seal to prevent leakage across the valve port, when the valve is in the closed position. To prevent damage to the PTFE valve seat (e) and plate (f) from system debris, it is recommended that a filter is installed upstream of the valve. Please refer to page 105 for filter sizing and application recommendations.

ICM 20-65:
Valve inlet pressure (P_1) acting on the underside of the PTFE valve seat (e) also passes through the hollow piston assembly (d) on to the top of the piston (d) and balances the pressure acting on the piston (d). Any trapped liquid across the throttle cone (g) is allowed to equalise down to the valve outlet without affecting the valve performance.

ICM 100-150:
Valve inlet pressure (P1) acting on the underside of the PTFE valve plate (h) also passes through the equalization hole (i) and ensures that the servo piston (j) is pressure balanced. This will equalize P1 and P2. During an opening operation of the valve, the pilot piston (k) will be raised from its valve seat inside the servo piston (j). This allows the P2 pressure to escape through the servo piston (j) to the outlet of the valve. The pressure P1 will act on the underside of the servo piston (j) and force it to open. This will close the gap between the pilot piston (k) and the servo piston (j) until the pressures P1 and P2 are equalized again. When there is no pressure difference between P1 and the outlet of the valve the pilot piston (k) is attached to the servo piston (j) ensuring it to open up.

ICAD
There are two sizes of ICAD actuator that covers the range of valves from ICM 20 to ICM 150. The actuators have a fully weather protected enclosure with none of the moving parts exposed to the environment.

The fast acting actuators and balanced valve design results in the valve being able to move from the fully closed to the fully open position in between 3 to 45 seconds depending on valve size and ICAD setup.

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ICAD

Actuator types ICAD 600A and 1200A are dedicated for use with ICM motor operated valves. There are only two sizes of ICAD actuators that cover the range of valves from ICM 20 to ICM 150.

The ICAD is controlled via a modulating analogue signal (e.g. 4 – 20 mA/2 – 10 V) or a digital ON / OFF signal. ICAD incorporates an advanced MMI (Man Machine Interface), including continuous display of Opening Degree, which gives the user a very advanced and flexible setup procedure that can meet many different applications.

Features (actuator)

- Designed for industrial refrigeration installations.
- Advanced and high speed Digital Stepper Motor Technology
- Seven segment LCD display and three programming keys included
- Valve opening degree can be observed continuously.
- Can easily be configured to different applications on-site (change speed, ON / OFF, Fail Safe operation, modulating valve, etc..)
- Open – Close time: 3-45 seconds depending on valve size
- Modulating, ON / OFF operation or Neutral zone / 3 point control
- Multiple speed selection during operation
- Logging of old alarms
- Password protection
- Control input signal :
  4 – 20 mA, 0 – 20 mA, 0 – 10 V, 2 – 10 V.
  One or two digital inputs.
- Position feed back : 0 – 20 mA, 4 – 20 mA (ICM)
- 3 Digital ON / OFF feedback
- Resolution: 20 micron/step
  (0.02 mm stroke pr. step)
- Total steps: 250 – 3650 depending on size
- Auto Calibration, Neutral zone
- In the event of a power failure, multiple fail safe options are possible. During power failure, ICM can be selected to:
  Close ICM,
  Open ICM,
  Stay in the same position, as when power failure occurs
  Go to a specific ICM valve opening degree
- Hermetic magnetic motor
- Enclosure: IP67 ~ NEMA 6
- Approvals: CE, UL, CRN
- Connectors for easy installation and servicing
- ICAD 600A/1200A ensures an acurate feedback on the valve position.

Technical data (actuator)

ICAD 600A and ICAD 1200A can be used together with following Danfoss valves.

ICAD 600A	ICAD 1200A
ICM 20	ICM 40
ICM 25	ICM 50
ICM 32	ICM 65
	ICM 100
	ICM 125
	ICM 150

- *Materials*
  Housing
  Aluminium
  Top part of ICAD
  PBT thermo plastic
- *Weight*
  ICAD 600A: 1.2 kg (2.64 lb)
  ICAD 1200A: 1.9 kg (4.19 lb)
- *Temperature range (ambient)*
  -30 °C – 50 °C / -22 – 122 °F
- *Enclosure*
  IP 67 (~NEMA 6)
  Electrical connection
  Connection to ICAD is done via M12 connectors. ICAD has two M12 male connectors build-in:
  Power supply:
  4 poled M12 male connector
  Control signals:
  8 poled M12 male connector

  ICAD can be delivered with (1.5 m. (60 in)) or without cables with M12 female connectors:
  Power Supply cable with 4 poled M12 female connector: 3 x 0.34 mm^2 (3 x ~22 AWG)
  Control cable with 8 poled M12 female connector: 7 x 0.25 mm^2 (7 x ~24 AWG)

  Cable set with M12 female connectors in other lengths are available. See the section "Spare parts and accessories".

Electrical data



Please observe cable voltage drop
Distance between the applied DC transformer and the ICAD terminal box may cause a voltage drop. Cross section of cables and size of DC transformer must be calculated so that the voltage at all time **at the ICAD terminal box***, both during standstill and during operation of ICAD, is within this range:

Prefabricated ICAD cable length Code number		1.5 m 027H0426	3 m 027H0438	10 m 027H0427	15 m 027H0435
Voltage ICAD terminal	Min.	21	22	23	24
(600A/1200A) [V DC]	Max.	26.4			

* Do not measure inside the ICAD itself.

Supply voltage is galvanic isolated from Input / Output.

Supply voltage: See above table
Load: ICAD 600A: 1.2 A
ICAD 1200A: 2.0 A

Fail safe supply: See above table
Load: ICAD 600A: 1.2 A
ICAD 1200A: 2.0 A

Analogue Input - Current or Voltage
Current: 0/4 – 20 mA
Load: 200 Ω
Voltage: 0/2 – 10 V DC
Load : 10 kΩ

Analogue Output: 0/4 – 20 mA
Load : ≤ 250 Ω

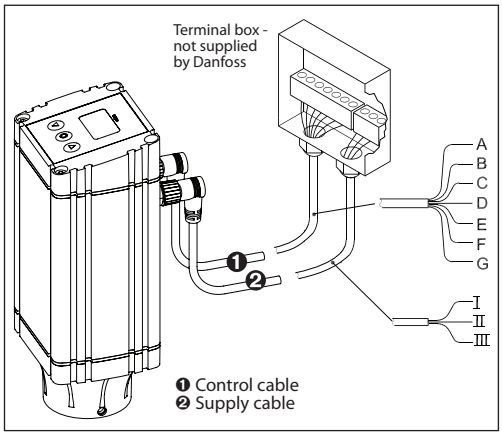
Digital Input - Digital ON / OFF input by means of volt-free contact (Signal / Telecom relays with gold-plated contacts recommended) – Voltage input used
ON: Contact impedance < 50 Ω)
OFF: Contact impedance > 100 k Ω

Digital Output - 3 pcs. NPN transistor output
External supply: 5 – 24 V DC
(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

Battery capacity:
For each open/closed cycle

	Speed Parameter i04	ICM 20	ICM 25	ICM 32
ICAD 600A	Max. (i04 = 100)	2 mAh	5 mAh	5 mAh
	Min. (i04 = 1)	200 mAh	467 mAh	533 mAh
	Speed Parameter i04	**ICM 40**	**ICM 50**	**ICM 65**
ICAD 1200A	Max. (i04 = 100)	17 mAh	22 mAh	22 mAh
	Min. (i04 = 1)	1667 mAh	2167 mAh	2167 mAh
	Speed Parameter i04	**ICM 100**	**ICM 125**	**ICM 150**
ICAD 1200A	Max. (i04 = 100)	54 mAh	65 mAh	76 mAh
	Min. (i04 = 1)	5318 mAh	6351 mAh	7501 mAh

Cable connection
Two 1.5 m (60 in) cables pre-mounted



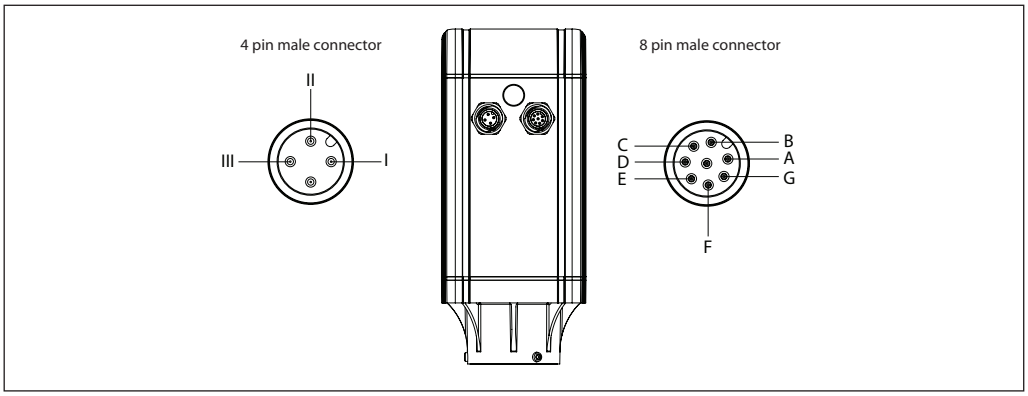
Ref.	Colour		Description	
A	Black	–	Common Alarm	Digital Ouput
B	Brown	–	ICM fully open	
C	Red	–	ICM fully closed	
D	Orange	–	GND ground	
E	Yellow	+	0/4 – 20 mA Input ***	Analogue In/Output
F	Green	+	0/2 – 10 V Input **	
G	Blue	+	0/4 – 20 mA Output ***	

I	Black	+	Fail safe supply Battery / UPS* 19 V DC
II	White	+	Supply voltage 24 V DC
III	Brown	–	

* Uninterruptable Power Supply
** Also used with D (GND, ground) for DI1 - Digital ON-OFF operation.
*** If Neutral zone / 3 point control is selected (parameter i02 = 3) then E and G are used as DI2 - Digital ON/OFF input.
Note: Colour code changed when compared to older colour wiring diagram.

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Cable connection
Two 1.5 m (60 in) cables pre-mounted (continued)



Approvals

CE according to 89/336 EEC (EMC)
Emission : EN61000-6-3
Immunity:EN61000-6-2

c UL us

Function (actuator)

The design of ICAD is based on a digital stepper motor technology combined with an advanced MMI (Man Machine Interface), that gives excellent possibilities for having a high degree of flexibility with the same type of ICAD actuator.

At the ICAD display the Opening Degree (0 – 100%) of the actual ICM valve installed can be continuously observed.

The advanced menu system will allow several parameters to be ajusted to obtain the required function.

Many different parameters can be configurated, among these:

- Modulating, ON / OFF operation or Neutral zone / 3 point control
- Analog input
  0 – 20 mA or 4 – 20 mA
  0 – 10 V or 2 – 10 V
- Digital Input
  ICAD can be configured to support one or two digital inputs.
  When using one digital input, 0 – 10 V can not be used at the same time.
  By using two digital inputs at Neutral zone / 3 point control, the analog input (0/2 – 10 V, 0/4 – 20 mA) and Analog Output (0/4 – 20 mA) can not be used at the same time.
- Analog output
  0 – 20 mA or 4 – 20 mA
- Automatic or manual control
- Change of ICM valve speed
- Automatic calibration
- Multiple Fail Safe set-up options during power cut

For service all Input and Output signals can be recalled and observed from the ICAD display.

A password protection has been linked to the parameter of entering the correct ICM valve to avoid unintentional and non-authorised operation.

ICAD can manage and display different alarms. If an alarm has been detected the display will alternate between showing: Actual alarm present and Opening Degree of ICM valve. If more than one alarm is active at the same time the alarm with the highest priority will take preference. The alarm with the highest priority is shown on the display.
All alarms will automatically reset when disappearing.

Previous alarms can be recalled for traceability and service purposes.

Any active alarm will activate the common digital alarm output.
All alarms will automatically reset when disappearing.

ICAD provides two digital output signals to 3rd party control equipment (e.g. PLC) indicating if the ICM valve is completely open or completely closed.

The hermetic magnetic motor coupling makes it easy to dismount the ICAD from ICM valve.

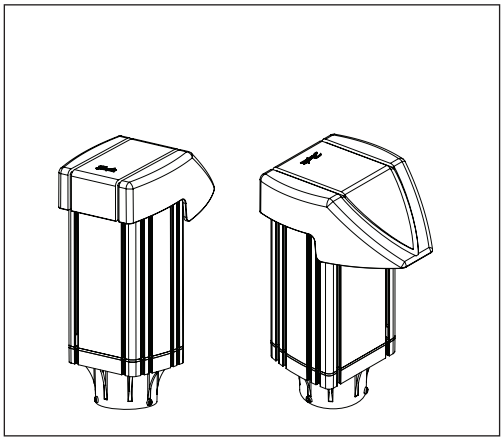
ICAD protection cap

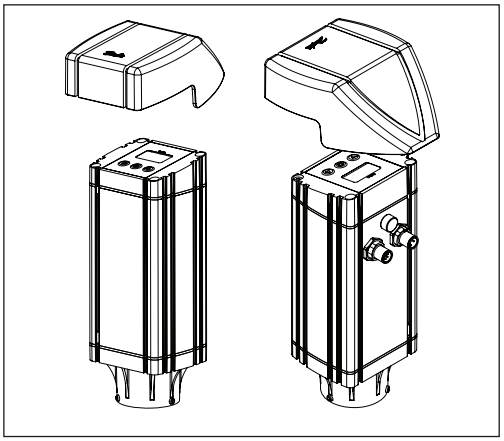
For all outdoor applications or where extra protection of the display and keyboard is needed, Danfoss recommends using the ICAD protection cap.

The protection cap will give the ICAD display and keyboard an extra protection against e.g. sun radiation or other impacts from the surrounding environment. Furthermore it protects the cable connectors against inappropriate loads.

The special designed protection cap can be mounted on all ICAD 600A/1200A.

The installation of the protection cap is done by sliding the protection cap down on the top of the ICAD. To secure the protection cap, tie it to the connector cables using the hole in the protection cap.





ICAD-UPS for ICM 20-150



ICAD-UPS is dedicated for use along with ICM sizes 20 - 150 installed with ICAD 600A and ICAD 1200A actuators.

In the event of power failure, there is a need to make sure that the ICM goes to a safe position.

ICAD-UPS can be connected to the ICAD 600A/1200A.

The solution ICM with ICAD connected to ICAD-UPS will give one of the following possibilities in the event of power failure:
– close ICM
– open ICM
– stay
– go to a specefic ICM Opening Degree

When power supply has been re-established the system will automatically return to normal operation.

Facts and features

- Industrial product.
- *Can support up to*
  – 3 pcs. of ICAD 1200A or
  – 8 pcs. of ICAD 600A
- Integrated solution - battery and UPS.
- *Industrial approvals:*
  CE, UL, GL (Germanisher Lloyd).
- DIN rail mounting.
- *LED indication*
  – Green (Power ON)
  – Yellow (Flashing:charging, Constant:
  – Buffer mode (Failsafe supply to ICAD))
  – Red (Battery fully discharged/Battery faulty)
- 24 V DC supply → Same transformer as for ICAD can be used. Only +0,5 A extra load on the transformer.
- Check of battery every 60 sec.
- Adjustable buffer time*. (1, 2, 3, 5, 10, 15, 20, 30 or infinity) = Ensures longer life time of the battery.
- Forced remote shutdown in buffer mode via digital input.
- 3 digital volt free relay change over contacts for signals to PLC systems. (Power OK, Buffer mode (failsafe supply to ICAD), Alarm).

* Buffer time is defined as the period where ICAD is only powered from the ICAD-UPS (i.e. not from main supply). On ICAD-UPS there is an adjustable buffer time setting (1, 2, 3, 5, 10, 15, 20, 30 min. or infinity). If set to 3, ICAD-UPS will switch off power to connected ICAD 600A/1200A, 3 minutes after the power failure occurs. This ensures that the internal battery inside ICAD-UPS do not fully discharge.

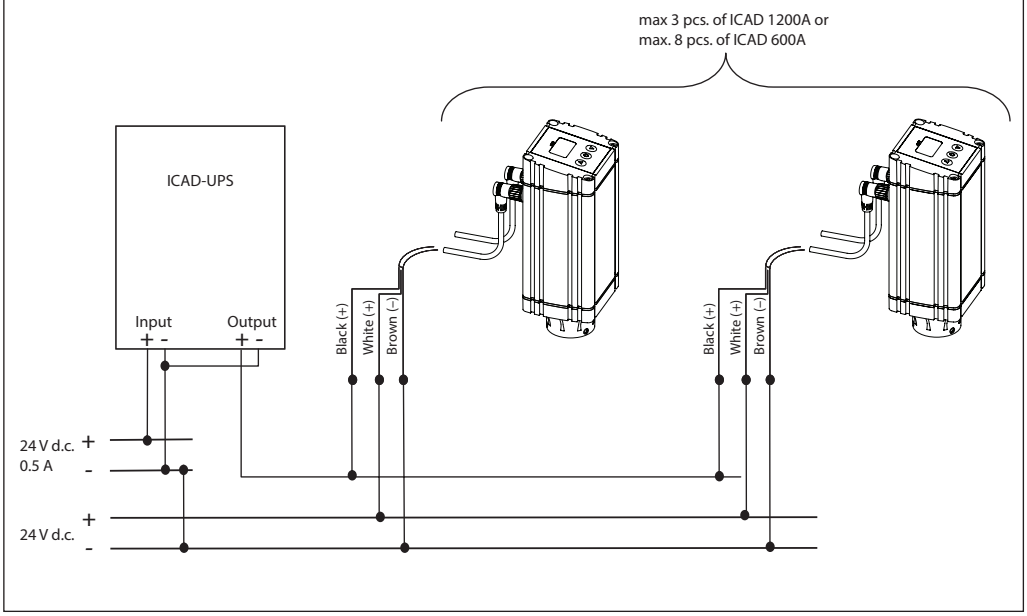
Code number: **027H0182**

For further information please see the instruction PI.HV0.B.

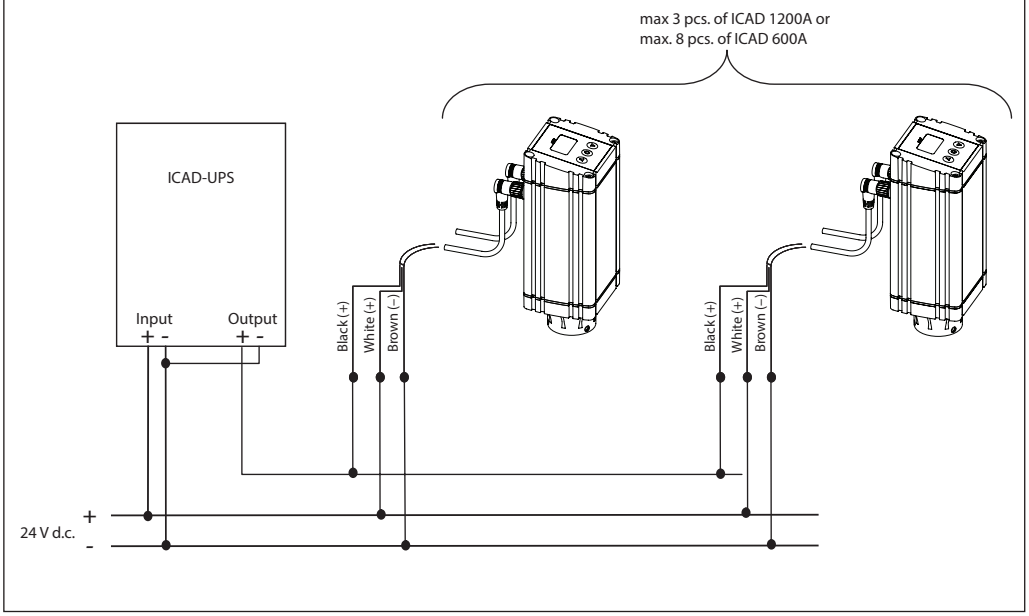
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ICAD-UPS applications

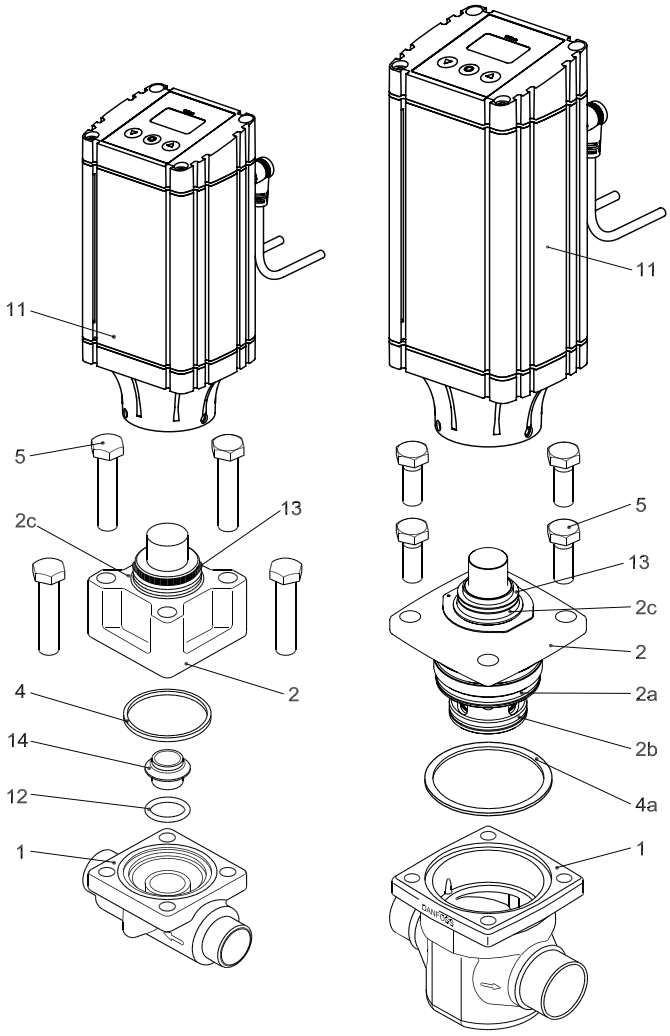
Seperate 24 V DC tranformer for both ICAD-UPS and ICAD 600A/1200A



One 24 V DC tranformer for ICAD-UPS and ICAD 600A/1200A



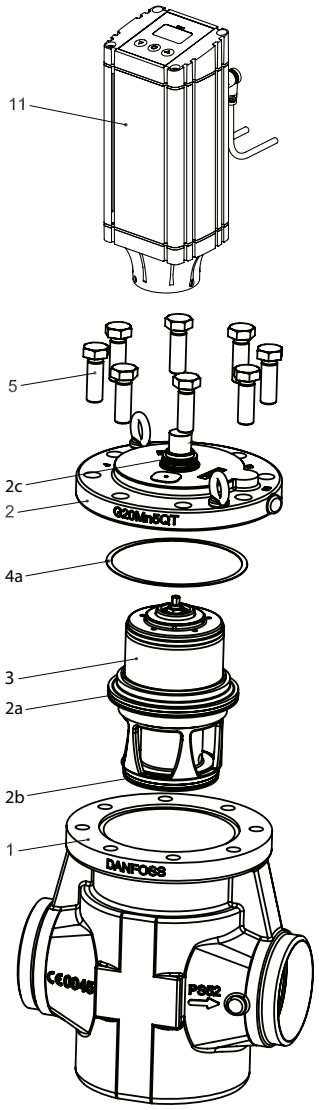
Material specification



ICM 20 ICM 25-65

Bolt sizes (pos. 5)

Type	Screw
ICM 20	M10 × 55 A2-70 DIN 931
ICM 25	M12 × 30 A2-70 DIN 933
ICM 32	M14 × 35 A2-70 DIN 933
ICM 40	M14 × 35 A2-70 DIN 933
ICM 50	M16 × 40 A2-70 DIN 933
ICM 65	M16 × 40 A2-70 DIN 933



ICM 100-150

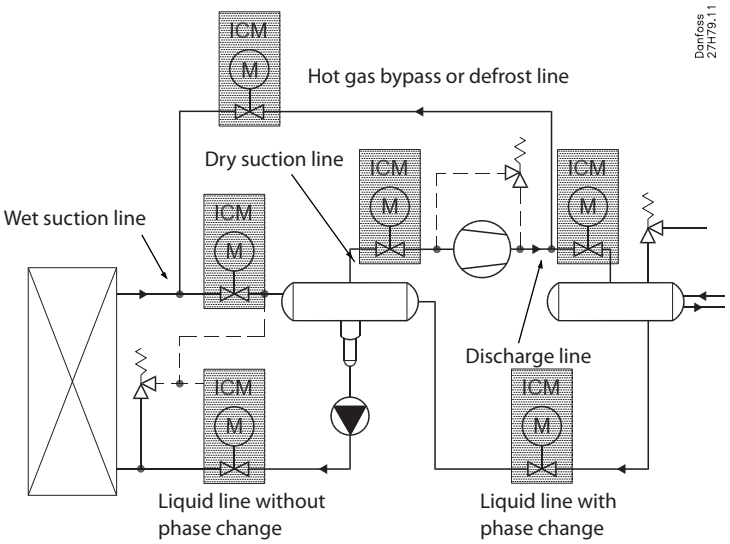
Bolt sizes (pos. 5)

Type	Screw
ICM 100	M20 × 60 A2-70 DIN 933
ICM 125	M20 × 60 A2-70 DIN 933
ICM 150	M20 × 70 A2-70 DIN 933

No.	Part	Material	EN	ASTM	JIS
1	Housing	Low temperature steel	G20Mn5QT, EN 10213-3	LCC, A352	SCPL1, G5151
2	Top cover	Low temperature steel	G20Mn5QT, EN 10213-3	LCC, A352	SCPL1, G5151
2a	O-ring	Cloroprene (Neoprene)			
2b	O-ring	Cloroprene (Neoprene)			
2c	O-ring	Cloroprene (Neoprene)			
3	Function module				
4	Gasket	Cloroprene (Neoprene)			
4a	Gasket	Fiber, non-asbestos			
5	Bolts	Stainless steel	A2-70, EN 1515-1	Grade B8 A320	A2-70, B 1054
11	Actuator				
12	O-ring	Cloroprene (Neoprene)			
13	O-ring	Cloroprene (Neoprene)			
14	Seat	High density polymer			

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ICM Application



ICM can be used for pressure and temperature regulation in dry and wet suction lines, in hot gas lines and in liquid lines with or without phase change (i.e. where no expansion occurs in the valve).

Valve capacities for different refrigerants and applications are given in the following tables. Selection of ICM / ICS valves will be available with the DIRcalc ver. 1.3 selection program and later. The resultant valve selections will be:- ICM-EXP for expansion valve functions and where the selection criteria has been predefined for expansion valve application: ICM will be for control valve functions and will include for all available function modules as valve pressure drop is the main consideration for valve selection.

The process for identifying the ICM valve solution can be determined from the ordering pages. Initially select the nominal valve size, identify the required valve body and connection types, followed by the module insert and then the correct actuator to suit the module insert and valve body.

As the ICM and ICS valves use a common body it is possible to install the body without having previously determined whether a servo or motor function is required. A blank top cover complete with fixing screws can be supplied to allow for pressure testing.

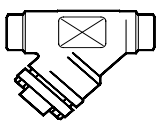
In applications where the ICM is used to control pressure / temperature at differing operating conditions e.g. dual temperature store, the ICM must be selected so that the full operating conditions (minimum and maximum capacity / summer and winter conditions) are within the control range of the selected ICM valve.

It is particularly important to ensure that the ICM valve selection is not oversized and as a consequence operates at a minimum opening degree, which can result in a hunting condition and continuous recalibration of the ICM valve.

Note:
ICM valves should be sized to suit required capacity and operating conditions. ICM valves should not be line sized.

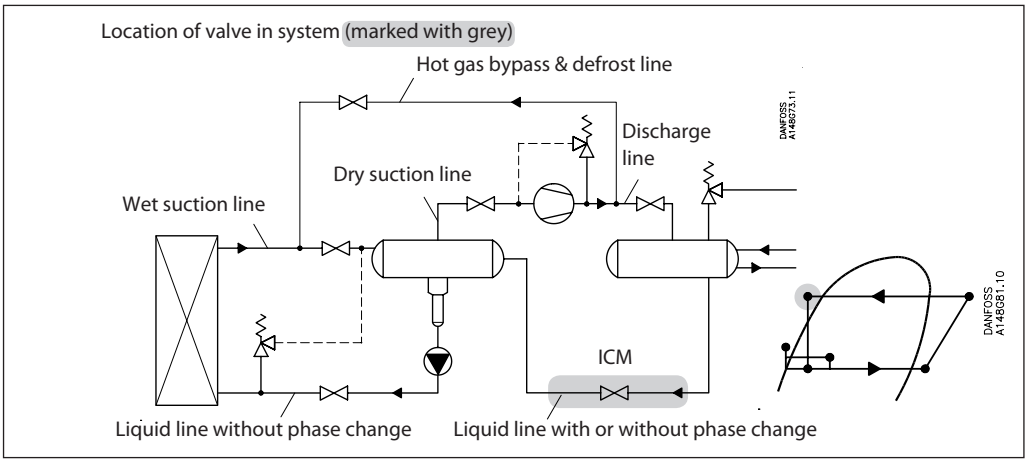
For ICM 20-65 applications it is recommended that the valve opening degree at the minimum operating conditions is greater than 5%.

For ICM 100-150 applications it is recommended that the valve opening degree at the minimum operating conditions is greater than 10%.

Recommended filters							Filter element for liquid line		Filter element for suction line	
							150 mesh	100 mesh	72 mesh	38 mesh
	Filter Type	Size	D	A	FPT	SOC	100 my	150 my	250 my	500 my
	FIA Straightway	20 (¾ in)	**148B5343**	**148B5347**	**148B5349**	**148B5348**	**148H3122**	**148H3124**	**148H3126**	**148H3128**
	FIA Straightway	25 (1 in)	**148B5443**	**148B5447**	**148B5449**	**148B5448**	**148H3123**	**148H3125**	**148H3127**	**148H3129**
	FIA Straightway	32 (1 ¼ in)	**148B5544**	**148B5552**	**148B5549**	**148B5548**	**148H3123**	**148H3125**	**148H3127**	**148H3129**
	FIA Straightway	40 (1 ½ in)	**148B5625**	**148B5644**		**148B5645**	**148H3123**	**148H3125**	**148H3127**	**148H3129**
	FIA Straightway	50 (2 in)	**148B5713**	**148B5716**		**148B5717**	**148H3157**	**148H3130**	**148H3138**	**148H3144**
	FIA Straightway	65 (2 ½ in)	**148B5813**	**148B5815**				**148H3131**	**148H3139**	**148H3145**
	FIA Straightway	80 (3 in)	**148B5906**	**148B5908**				**148H3119**	**148H3120**	**148H3121**
	FIA Straightway	100 (4 in)	**148B6007**	**148B6009**				**148H3132**	**148H3140**	**148H3146**
	FIA Straightway	125 (5 in)	**148B6106**	**148B6108**				**148H3133**	**148H3141**	**148H3147**
	FIA Straightway	150 (6 in)	**148B6203**	**148B6205**				**148H3134**	**148H3142**	**148H3148**

Nominal capacities

Liquid line with/without phase change



SI units

Calculation example (R717 capacities):

An application has following running conditions:

T_e = -20 °C
Q_o = 250 kW
T_{liq} = 10 °C
Max. Δp = 0.3 bar
Connection: DN20

The capacity table is based on nominal condition (pressure drop Δp = 0.2 bar, T_{liq} = 30 °C)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.
Correction factor for Δp 0.3 bar $f_{\Delta p}$ = 0.82
Correction factor for liquid tempereature f_{Tliq} = 0.92

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} = 250 \times 0.82 \times 0.92 = 189$ kW

From the capacity table a ICM 20-B with Q_n capacity 249 kW is selected.

US units

Calculation example (R717 capacities):

An application has following running conditions:

T_e = -20 °F
Q_o = 130 TR
T_{liq} = 50 °F
Max. Δp = 3.5 psi
Connection: $^3/_4$"

The capacity table is based on nominal condition (pressure drop Δp = 3 psi, T_{liq} = 90 °F)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.
Correction factor for Δp 3.5 psi $f_{\Delta p}$ = 0.91
Correction factor for liquid tempereature f_{Tliq} = 0.92

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} = 130 \times 0.91 \times 0.92 = 109$ TR

From the capacity table a ICM 20-C with Q_n capacity 134 TR is selected.

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Nominal capacities

Liquid line with / without phase change

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
ΔP = 0.2 bar

R 717

Type	Valve body size	K_v	Evaporating temperature [°C]							
		[m³/h]	-50	-40	-30	-20	-10	0	10	20
ICM20-A33	20	0.2	19.8	20.2	20.5	20.7	21.0	21.1	21.3	21.4
ICM20-A		0.6	59.5	60.5	61.4	62.2	62.9	63.4	63.9	64.2
ICM20-B		2.4	238	242	245	249	251	254	256	257
ICM20-C		4.6	457	464	471	477	482	486	490	493
ICM25-A	25	6	595	605	614	622	629	634	639	642
ICM25-B		12	1191	1210	1227	1243	1257	1269	1278	1285
ICM32-A	32	9	893	907	921	933	943	952	959	964
ICM32-B		17	1687	1714	1739	1761	1781	1797	1811	1820
ICM40-A	40	15	1489	1512	1534	1554	1571	1586	1598	1606
ICM40-B		26	2580	2622	2659	2694	2724	2749	2769	2784
ICM50-A	50	23	2283	2319	2353	2383	2409	2432	2450	2463
ICM50-B		40	3970	4033	4091	4145	4190	4229	4260	4283
ICM65-A	65	35	3473	3529	3580	3627	3666	3700	3728	3748
ICM65-B		70	6947	7058	7160	7253	7333	7401	7455	7495
ICM100	100	142	14091	14318	14524	14717	14875	15013	15127	15205
ICM125	125	223	22129	22485	22810	23112	23361	23577	23756	23877
ICM150	150	370	36717	37306	37845	38347	38760	39119	39415	39617

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.82
-10	0.86
0	0.88
10	0.92
20	0.96
30	**1.00**
40	1.04
50	1.09

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi

R 717

Type	Valve body size	C_v	Evaporating temperature [°F]							
		[USgal/min]	-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	5.6	5.7	5.8	5.9	6.0	6.0	6.1	6.1
ICM20-A		0.7	17.1	17.4	17.7	17.9	18.1	18.3	18.4	18.5
ICM20-B		2.8	68.3	69.5	70.7	71.7	72.5	73.2	73.7	74.0
ICM20-C		5.3	129	132	134	136	137	139	140	140
ICM25-A	25	7	171	174	177	179	181	183	184	185
ICM25-B		14	342	348	353	358	363	366	369	370
ICM32-A	32	10	244	248	252	256	259	261	263	264
ICM32-B		20	488	497	505	512	518	523	527	529
ICM40-A	40	17	415	422	429	435	440	445	448	450
ICM40-B		30	732	745	757	768	777	784	790	793
ICM50-A	50	27	659	670	681	691	699	706	711	714
ICM50-B		46	1122	1142	1161	1177	1191	1203	1211	1216
ICM65-A	65	41	1000	1018	1035	1049	1061	1072	1080	1084
ICM65-B		81	1976	2011	2044	2073	2098	2118	2133	2142
ICM100	100	165	4026	4099	4165	4223	4271	4315	4345	4362
ICM125	125	259	6320	6433	6538	6629	6705	6773	6820	6846
ICM150	150	430	10493	10681	10855	11006	11132	11245	11323	11367

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.82
10	0.85
30	0.88
50	0.92
70	0.96
90	**1.00**
110	1.04
130	1.09

Nominal capacities

Liquid line with / without phase change

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 10 °C,
ΔP = 0.2 bar

R 744

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICM20-A33	20	0.2	19.8	20.2	20.5	20.7	21.0	21.1	21.3	21.4
ICM20-A		0.6	14.4	14.6	14.8	14.8	14.7	14.4	13.8	12.8
ICM20-B		2.4	57.8	58.6	59.0	59.1	58.7	57.5	55.3	51.1
ICM20-C		4.6	111	112	113	113	112	110	106	97.8
ICM25-A	25	6	144	146	148	148	147	144	138	128
ICM25-B		12	289	293	295	296	293	288	277	255
ICM32-A	32	9	217	220	221	222	220	216	207	191
ICM32-B		17	409	415	418	419	416	408	392	362
ICM40-A	40	15	361	366	369	369	367	360	346	319
ICM40-B		26	626	634	640	640	636	623	599	553
ICM50-A	50	23	554	561	566	566	562	551	530	489
ICM50-B		40	963	976	984	985	978	959	922	851
ICM65-A	65	35	3473	3529	3580	3627	3666	3700	3728	3748
ICM65-B		70	1685	1708	1722	1724	1711	1678	1613	1489
ICM100	100	142	14091	14318	14524	14717	14875	15013	15127	15205
ICM125	125	223	22129	22485	22810	23112	23361	23577	23756	23877
ICM150	150	370	36717	37306	37845	38347	38760	39119	39415	39617

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.52
-10	0.67
0	0.91
10	**1.00**
15	1.09

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 50 °F,
ΔP = 3 psi

R 744

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-60	-40	-20	0	20	40	60
ICM20-A33	20	0.23	1.4	1.4	1.4	1.4	1.4	1.4	1.3
ICM20-A		0.7	4.2	4.2	4.3	4.3	4.2	4.1	3.9
ICM20-B		2.8	16.7	17.0	17.1	17.1	16.9	16.5	15.5
ICM20-C		5.3	31.7	32.2	32.5	32.5	32.1	31.1	29.3
ICM25-A	25	7	41.8	42.5	42.9	42.9	42.3	41.1	38.7
ICM25-B		14	83.7	85.0	85.7	85.7	84.7	82.3	77.3
ICM32-A	32	10	59.8	60.7	61.2	61.2	60.5	58.8	55.2
ICM32-B		20	120	121	122	122	121	118	110
ICM40-A	40	17	102	103	104	104	103	100	94
ICM40-B		30	179	182	184	184	181	176	166
ICM50-A	50	27	161	164	165	165	163	159	149
ICM50-B		46	275	279	282	282	278	270	254
ICM65-A	65	41	245	249	251	251	248	241	227
ICM65-B		81	484	492	496	496	490	476	448
ICM100	100	165	987	1000	1010	1010	997	970	912
ICM125	125	259	1549	1570	1586	1586	1565	1522	1432
ICM150	150	430	2571	2607	2633	2633	2598	2527	2377

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.48
10	0.64
30	0.88
50	**1.00**

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Nominal capacities

Liquid line with / without phase change

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
ΔP = 0.2 bar

R 134a

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]						
			-40	-30	-20	-10	0	10	20
ICM20-A33	20	0.2	3.6	3.7	3.9	4.1	4.2	4.4	4.5
ICM20-A		0.6	10.7	11.2	11.7	12.2	12.7	13.1	13.6
ICM20-B		2.4	42.7	44.7	46.7	48.7	50.6	52.5	54.2
ICM20-C		4.6	81.9	85.8	89.6	93.3	97.0	101	104
ICM25-A	25	6	107	112	117	122	127	131	136
ICM25-B		12	214	224	234	243	253	262	271
ICM32-A	32	9	160	168	175	183	190	197	203
ICM32-B		17	303	317	331	345	358	372	384
ICM40-A	40	15	267	280	292	304	316	328	339
ICM40-B		26	463	485	506	527	548	568	588
ICM50-A	50	23	409	429	448	467	485	503	520
ICM50-B		40	712	746	779	811	843	874	904
ICM65-A	65	35	623	653	682	710	738	765	791
ICM65-B		70	1246	1305	1363	1420	1476	1530	1582
ICM100	100	142	2529	2649	2766	2882	2996	3105	3210
ICM125	125	223	3971	4160	4343	4525	4704	4876	5041
ICM150	150	370	6589	6902	7206	7509	7805	8090	8364

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.66
-10	0.70
0	0.76
10	0.82
20	0.90
30	**1.00**
40	1.13
50	1.29

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi

R 134a

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	1.0	1.0	1.1	1.2	1.2	1.2	1.3
ICM20-A		0.7	3.0	3.2	3.3	3.5	3.7	3.8	3.9
ICM20-B		2.8	12.1	12.7	13.4	14.0	14.6	15.2	15.8
ICM20-C		5.3	22.9	24.1	25.3	26.5	27.7	28.8	29.8
ICM25-A	25	7	30.2	31.8	33.4	35.0	36.6	38.0	39.4
ICM25-B		14	60.4	63.7	66.9	70.1	73.1	76.0	78.8
ICM32-A	32	10	43.1	45.5	47.8	50.1	52.2	54.3	56.3
ICM32-B		20	86.3	91.0	95.6	100	104	109	113
ICM40-A	40	17	73.4	77.3	81.2	85.1	88.8	92.3	95.7
ICM40-B		30	129	136	143	150	157	163	169
ICM50-A	50	27	117	123	129	135	141	147	152
ICM50-B		46	198	209	220	230	240	250	259
ICM65-A	65	41	177	186	196	205	214	223	231
ICM65-B		81	350	369	387	406	423	440	456
ICM100	100	165	712	751	787	825	862	897	928
ICM125	125	259	1117	1178	1236	1296	1354	1407	1457
ICM150	150	430	1855	1956	2052	2151	2247	2336	2420

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.64
10	0.68
30	0.74
50	0.81
70	0.89
90	**1.00**
110	1.15
130	1.35

Nominal capacities

Liquid line with / without phase change

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
ΔP = 0.2 bar

R 404A

Type	Valve body size	K_v	Evaporating temperature [°C]							
		[m³/h]	-50	-40	-30	-20	-10	0	10	20
ICM20-A33	20	0.2	2.3	2.5	2.6	2.8	2.9	3.1	3.2	3.3
ICM20-A		0.6	6.9	7.4	7.9	8.3	8.8	9.2	9.6	10.0
ICM20-B		2.4	27.7	29.6	31.5	33.4	35.2	36.9	38.5	39.9
ICM20-C		4.6	53.0	56.7	60.4	64.0	67.5	70.8	73.8	76.5
ICM25-A	25	6	69.2	74.0	78.8	83.5	88.0	92.3	96.3	100
ICM25-B		12	138	148	158	167	176	185	193	200
ICM32-A	32	9	104	111	118	125	132	138	144	150
ICM32-B		17	196	210	223	237	249	262	273	283
ICM40-A	40	15	173	185	197	209	220	231	241	249
ICM40-B		26	300	321	341	362	381	400	417	432
ICM50-A	50	23	265	284	302	320	337	354	369	382
ICM50-B		40	461	493	525	557	587	615	642	665
ICM65-A	65	35	403	432	460	487	513	538	562	582
ICM65-B		70	807	863	919	974	1027	1077	1123	1164
ICM100	100	142	1637	1752	1865	1975	2082	2184	2278	2362
ICM125	125	223	2571	2751	2928	3102	3270	3430	3578	3710
ICM150	150	370	4265	4564	4859	5147	5426	5691	5936	6156

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.55
-10	0.60
0	0.66
10	0.74
20	0.85
30	**1.00**
40	1.23
50	1.68

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi

R 404A

Type	Valve body size	C_v	Evaporating temperature [°F]							
		[USgal/min]	-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.6	0.7	0.7	0.8	0.8	0.9	0.9	0.9
ICM20-A		0.7	1.9	2.1	2.2	2.4	2.5	2.6	2.8	2.9
ICM20-B		2.8	7.6	8.2	8.8	9.5	10.0	10.6	11.0	11.4
ICM20-C		5.3	14.4	15.6	16.8	17.9	19.0	20.0	20.9	21.7
ICM25-A	25	7	19.0	20.6	22.1	23.6	25.1	26.4	27.6	28.6
ICM25-B		14	38.0	41.1	44.2	47.3	50.1	52.8	55.2	57.2
ICM32-A	32	10	27.2	29.4	31.6	33.8	35.8	37.7	39.4	40.9
ICM32-B		20	54.3	58.8	63.2	67.5	71.6	75.5	78.9	81.7
ICM40-A	40	17	46.2	50.0	53.7	57.4	60.9	64.1	67.1	69.5
ICM40-B		30	81.5	88.1	94.8	101	107	113	118	123
ICM50-A	50	27	73.3	79.3	85.3	91.2	96.7	102	107	110
ICM50-B		46	125	135	145	155	165	174	181	188
ICM65-A	65	41	111	121	129	139	147	155	162	168
ICM65-B		81	220	238	256	274	290	306	320	331
ICM100	100	165	448	486	521	558	591	622	651	675
ICM125	125	259	703	762	818	876	927	976	1022	1060
ICM150	150	430	1168	1266	1357	1454	1539	1621	1697	1759

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.52
10	0.57
30	0.63
50	0.72
70	0.83
90	**1.00**
110	1.29
130	1.92

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Nominal capacities

Liquid line with / without phase change

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
ΔP = 0.2 bar

R 22

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICM20-A33	20	0.2	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7
ICM20-A		0.6	11.9	12.3	12.7	13.0	13.3	13.6	13.9	14.2
ICM20-B		2.4	47.6	49.1	50.6	52.0	53.3	54.5	55.7	56.7
ICM20-C		4.6	91.3	94.2	97.0	100	102	105	107	109
ICM25-A	25	6	119	123	127	130	133	136	139	142
ICM25-B		12	238	246	253	260	267	273	278	283
ICM32-A	32	9	179	184	190	195	200	205	209	213
ICM32-B		17	337	348	358	368	378	386	394	401
ICM40-A	40	15	298	307	316	325	333	341	348	354
ICM40-B		26	516	532	548	563	578	591	603	614
ICM50-A	50	23	456	471	485	498	511	523	534	543
ICM50-B		40	794	819	843	866	889	909	928	945
ICM65-A	65	35	695	717	738	758	777	796	812	827
ICM65-B		70	1389	1433	1476	1516	1555	1591	1624	1653
ICM100	100	142	2818	2908	2996	3077	3154	3228	3294	3355
ICM125	125	223	4425	4566	4704	4832	4953	5069	5173	5269
ICM150	150	370	7342	7576	7805	8017	8217	8410	8583	8743

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.71
-10	0.75
0	0.80
10	0.86
20	0.92
30	**1.00**
40	1.09
50	1.22

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
ΔP = 3 psi

R 22

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.3
ICM20-A		0.7	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1
ICM20-B		2.8	13.5	14.0	14.4	14.9	15.3	15.7	16.0	16.3
ICM20-C		5.3	25.5	26.4	27.4	28.2	29.0	29.7	30.4	30.9
ICM25-A	25	7	33.7	34.9	36.1	37.2	38.3	39.2	40.1	40.8
ICM25-B		14	67.4	69.8	72.2	74.5	76.6	78.5	80.2	81.6
ICM32-A	32	10	48.1	49.9	51.6	53.2	54.7	56.0	57.3	58.3
ICM32-B		20	96.3	100	103	106	109	112	115	117
ICM40-A	40	17	81.9	84.8	87.7	90.5	93.0	95.3	97.4	99.1
ICM40-B		30	144	150	155	160	164	168	172	175
ICM50-A	50	27	130	135	139	144	148	151	155	157
ICM50-B		46	221	229	237	245	252	258	264	268
ICM65-A	65	41	197	205	211	218	224	230	235	239
ICM65-B		81	390	404	418	431	443	454	464	472
ICM100	100	165	795	824	851	878	902	924	946	962
ICM125	125	259	1247	1293	1335	1377	1416	1450	1484	1510
ICM150	150	430	2071	2146	2217	2287	2350	2408	2464	2507

Correction factor for ΔP ($f_{\Delta P}$)

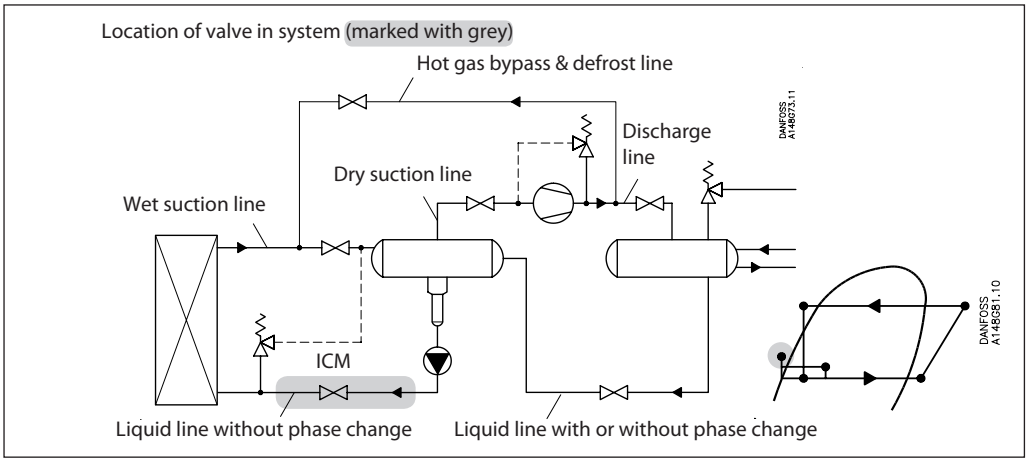
ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.73
10	0.77
30	0.82
50	0.87
70	0.93
90	**1.00**
110	1.09
130	1.20

Nominal capacities

Liquid line without phase change



SI units

Calculation example (R717 capacities):

An application has following running conditions:

T_e = -20 °C
Q_o = 180 kW
Circulation rate = 3
Max. Δp = 0.3 bar
Connection: DN20

The capacity table is based on nominal condition (pressure drop Δp = 0.2 bar, circulation rate = 4)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.
Correction factor for Δp 0.3 bar $f_{\Delta p}$ = 0.82
Correction factor for circulation rate f_{rec} = 0.75

$Q_n = Q_o \times f_{\Delta p} \times f_{rec} = 180 \times 0.82 \times 0.75 = 111$ kW

From the capacity table a ICM 20-C with Q_n capacity 153 kW is selected.

US units

Calculation example (R717 capacities):

An application has following running conditions:

T_e = -20 °F
Q_o = 130 TR
Circulation rate = 3
Max. Δp = 3.5 psi
Connection: 1 1/4"

The capacity table is based on nominal condition (pressure drop Δp = 3 psi, circulation rate = 4)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.
Correction factor for Δp 3.5 psi $f_{\Delta p}$ = 0.91
Correction factor for circulation rate f_{rec} = 0.75

$Q_n = Q_o \times f_{\Delta p} \times f_{rec} = 130 \times 0.91 \times 0.75 = 89$ TR

From the capacity table a ICM 32-B with Q_n capacity 171 TR is selected.

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Nominal capacities

Liquid line without phase change

SI units

Capacity table at nominal conditions, Q_N [kW], Circulation rate = 4, Δp = 0.2 bar

R 717

Type	Valve body size	K_v	Evaporating temperature [°C]							
		[m³/h]	-50	-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	7.3	7.1	6.9	6.7	6.4	6.2	5.9	5.6
ICM20-A		0.6	21.9	21.3	20.7	20.0	19.3	18.5	17.8	16.9
ICM20-B		2.4	87.6	85.2	82.7	80.0	77.1	74.2	71.0	67.8
ICM20-C		4.6	168	163	159	153	148	142	136	130
ICM25-A	25	6	219	213	207	200	193	185	178	169
ICM25-B		12	438	426	413	400	386	371	355	339
ICM32-A	32	9	329	320	310	300	289	278	266	254
ICM32-B		17	621	604	586	567	546	525	503	480
ICM40-A	40	15	548	533	517	500	482	464	444	424
ICM40-B		26	949	923	896	867	836	803	770	734
ICM50-A	50	23	840	817	793	767	739	711	681	650
ICM50-B		40	1460	1421	1378	1333	1286	1236	1184	1130
ICM65-A	65	35	1278	1243	1207	1167	1125	1081	1036	988
ICM65-B		70	2555	2486	2412	2333	2250	2163	2072	1977
ICM100	100	142	5185	5042	4895	4733	4565	4386	4204	4009
ICM125	125	223	8143	7919	7687	7433	7168	6888	6601	6296
ICM150	150	370	13510	13139	12755	12332	11894	11429	10953	10446

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration], Circulation rate = 4, Δp = 3 psi

R 717

Type	Valve body size	C_v	Evaporating temperature [°F]							
		[USgal/min]	-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	2.1	2.0	2.0	1.9	1.8	1.7	1.7	1.6
ICM20-A		0.7	6.4	6.2	6.0	5.8	5.5	5.3	5.0	4.8
ICM20-B		2.8	25.6	24.8	24.0	23.1	22.2	21.2	20.2	19.1
ICM20-C		5.3	48.4	46.9	45.3	43.7	41.9	40.1	38.1	36.1
ICM25-A	25	7	64.0	62.0	59.9	57.7	55.4	53.0	50.4	47.7
ICM25-B		14	128	124	120	115	111	106	101	95.4
ICM32-A	32	10	91.4	88.5	85.6	82.5	79.1	75.7	72.0	68.1
ICM32-B		20	183	177	171	165	158	151	144	136
ICM40-A	40	17	155	150	145	140	135	129	122	116
ICM40-B		30	274	266	257	247	237	227	216	204
ICM50-A	50	27	247	239	231	223	214	204	194	184
ICM50-B		46	420	407	394	379	364	348	331	313
ICM65-A	65	41	375	363	351	338	324	310	295	279
ICM65-B		81	740	717	693	668	641	613	583	552
ICM100	100	165	1508	1461	1412	1361	1305	1249	1187	1125
ICM125	125	259	2367	2293	2217	2136	2049	1960	1863	1765
ICM150	150	430	3929	3806	3680	3546	3402	3254	3093	2931

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

Nominal capacities

Liquid line without phase change

SI units

Capacity table at nominal conditions, Q_N [kW],
Circulation rate = 4,
Δp = 0.2 bar

R 744

Type	Valve body size	K_v	Evaporating temperature [°C]						
		[m³/h]	-50	-40	-30	-20	-10	0	10
ICM20A-33	20	0.2	2.2	2.1	2.0	1.8	1.6	1.4	1.1
ICM20-A		0.6	6.7	6.3	5.9	5.4	4.8	4.2	3.4
ICM20-B		2.4	27.0	25.3	23.5	21.5	19.2	16.7	13.7
ICM20-C		4.6	51.7	48.5	45.0	41.1	36.8	32.0	26.4
ICM25-A	25	6	67.5	63.3	58.7	53.7	48.0	41.7	34.4
ICM25-B		12	134.9	126.5	117.4	107.3	96.0	83.5	68.7
ICM32-A	32	9	101.2	94.9	88.1	80.5	72.0	62.6	51.6
ICM32-B		17	191	179	166	152	136	118	97.4
ICM40-A	40	15	169	158	147	134	120	104	85.9
ICM40-B		26	292	274	254	233	208	181	149
ICM50-A	50	23	259	242	225	206	184	160	132
ICM50-B		40	450	422	391	358	320	278	229
ICM65-A	65	35	393	369	343	313	280	243	200
ICM65-B		70	787	738	685	626	560	487	401
ICM100	100	142	1596	1496	1390	1271	1136	988	813
ICM125	125	223	2506	2350	2182	1996	1784	1551	1276
ICM150	150	370	4159	3898	3621	3312	2960	2574	2118

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
Circulation rate = 4,
Δp = 3 psi

R 744

Type	Valve body size	C_v	Evaporating temperature [°F]						
		[USgal/min]	-60	-40	-20	0	20	40	60
ICM20-A33	20	0.23	0.7	0.6	0.6	0.5	0.4	0.4	0.3
ICM20-A		0.7	2.0	1.8	1.7	1.5	1.3	1.1	0.9
ICM20-B		2.8	7.9	7.4	6.8	6.1	5.4	4.5	3.4
ICM20-C		5.3	15.0	13.9	12.8	11.6	10.1	8.5	6.5
ICM25-A	25	7	19.8	18.4	16.9	15.3	13.4	11.2	8.6
ICM25-B		14	39.5	36.8	33.9	30.5	26.8	22.5	17.2
ICM32-A	32	10	28.2	26.3	24.2	21.8	19.1	16.1	12.3
ICM32-B		20	56.4	52.6	48.4	43.6	38.3	32.1	24.6
ICM40-A	40	17	48.0	44.7	41.1	37.1	32.5	27.3	20.9
ICM40-B		30	84.7	78.9	72.6	65.4	57.4	48.2	37.0
ICM50-A	50	27	76.2	71.0	65.3	58.9	51.7	43.4	33.3
ICM50-B		46	130	121	111	100	88.0	73.9	56.7
ICM65-A	65	41	116	108	99	89	78	66	51
ICM65-B		81	229	213	196	177	155	130	100
ICM100	100	165	466	433	399	359	315	264	204
ICM125	125	259	732	680	627	564	495	415	320
ICM150	150	430	1216	1129	1040	937	821	689	531

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

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Nominal capacities

Liquid line without phase change

SI units

Capacity table at nominal conditions, Q_N [kW], Circulation rate = 4, Δp = 0.2 bar

R 134a

Type	Valve body size	K_v	Evaporating temperature [°C]						
		[m³/h]	-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	1.6	1.6	1.5	1.5	1.4	1.3	1.2
ICM20-A		0.6	4.9	4.8	4.6	4.4	4.2	4.0	3.7
ICM20-B		2.4	19.8	19.1	18.3	17.6	16.7	15.9	14.9
ICM20-C		4.6	37.9	36.6	35.2	33.6	32.1	30.4	28.7
ICM25-A	25	6	49.5	47.7	45.9	43.9	41.8	39.7	37.4
ICM25-B		12	98.9	95.5	91.7	87.8	83.7	79.4	74.7
ICM32-A	32	9	74.2	71.6	68.8	65.8	62.7	59.5	56.1
ICM32-B		17	140	135	130	124	119	112	106
ICM40-A	40	15	124	119	115	110	105	99.2	93.4
ICM40-B		26	214	207	199	190	181	172	162
ICM50-A	50	23	190	183	176	168	160	152	143
ICM50-B		40	330	318	306	293	279	265	249
ICM65-A	65	35	288	278	268	256	244	232	218
ICM65-B		70	577	557	535	512	488	463	436
ICM100	100	142	1170	1130	1086	1039	991	940	884
ICM125	125	223	1837	1774	1706	1632	1556	1476	1388
ICM150	150	370	3049	2944	2830	2707	2581	2448	2302

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration], Circulation rate = 4, Δp = 3 psi

R 134a

Type	Valve body size	C_v	Evaporating temperature [°F]						
		[USgal/min]	-40	-20	-0	20	40	60	80
ICM20-A33	20	0.23	0.5	0.5	0.4	0.4	0.4	0.4	0.3
ICM20-A		0.7	1.4	1.4	1.3	1.3	1.2	1.1	1.0
ICM20-B		2.8	5.8	5.5	5.3	5.0	4.8	4.5	4.2
ICM20-C		5.3	10.9	10.5	10.0	9.5	9.0	8.5	7.9
ICM25-A	25	7	14.4	13.8	13.2	12.6	11.9	11.2	10.4
ICM25-B		14	28.8	27.7	26.4	25.1	23.8	22.4	20.8
ICM32-A	32	10	20.6	19.8	18.9	18.0	17.0	16.0	14.9
ICM32-B		20	41.1	39.5	37.8	35.9	34.0	32.0	29.8
ICM40-A	40	17	35.0	33.6	32.1	30.5	28.9	27.2	25.3
ICM40-B		30	61.7	59.3	56.7	53.9	51.0	48.0	44.6
ICM50-A	50	27	55.5	53.3	51.0	48.5	45.9	43.2	40.2
ICM50-B		46	94.6	90.9	86.9	82.6	78.2	73.5	68.4
ICM65-A	65	41	84	81	77	74	70	66	61
ICM65-B		81	167	160	153	146	138	130	121
ICM100	100	165	339	326	311	297	281	264	245
ICM125	125	259	532	512	489	466	441	414	385
ICM150	150	430	883	850	811	774	732	687	638

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

Nominal capacities

Liquid line without phase change

SI units

Capacity table at nominal conditions, Q_N [kW],
Circulation rate = 4,
Δp = 0.2 bar

R 404A

Type	Valve body size	K_v	Evaporating temperature [°C]							
		[m³/h]	-50	-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	1.5	1.4	1.3	1.3	1.8	1.1	1.0	1.0
ICM20-A		0.6	4.4	4.2	4.0	3.8	5.3	3.4	3.1	2.9
ICM20-B		2.4	17.5	16.7	15.9	15.1	21.2	13.5	12.5	11.5
ICM20-C		4.6	33.4	32.1	30.4	29.0	40.6	25.8	24.0	21.9
ICM25-A	25	6	43.6	41.8	39.7	37.8	53.0	33.7	31.3	28.6
ICM25-B		12	87.3	83.7	79.4	75.6	105.9	67.4	62.6	57.3
ICM32-A	32	9	65.4	62.7	59.5	56.7	79.5	50.5	46.9	42.9
ICM32-B		17	124	119	112	107	150	95.4	88.6	81.1
ICM40-A	40	15	109	105	99.2	94.5	132.4	84.2	78.2	71.6
ICM40-B		26	189	181	172	164	230	146	136	124
ICM50-A	50	23	167	160	152	145	203	129	120	110
ICM50-B		40	291	279	265	252	353	225	209	191
ICM65-A	65	35	255	244	232	221	309	197	182	167
ICM65-B		70	509	488	463	441	618	393	365	334
ICM100	100	142	1033	991	940	895	1254	798	740	678
ICM125	125	223	1623	1556	1476	1406	1969	1253	1162	1066
ICM150	150	370	2693	2581	2448	2332	3267	2079	1929	1768

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	1.2
10	2.5

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
Circulation rate = 4,
Δp = 3 psi

R 404A

Type	Valve body size	C_v	Evaporating temperature [°F]							
		[USgal/min]	-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
ICM20-A		0.7	1.3	1.2	1.1	1.1	1.0	1.0	0.9	0.8
ICM20-B		2.8	5.1	4.9	4.6	4.4	4.1	3.8	3.5	3.1
ICM20-C		5.3	9.7	9.2	8.7	8.2	7.7	7.2	6.6	5.9
ICM25-A	25	7	12.7	12.2	11.5	10.9	10.2	9.5	8.7	7.8
ICM25-B		14	25.5	24.4	23.0	21.8	20.4	19.0	17.4	15.5
ICM32-A	32	10	18.2	17.4	16.4	15.6	14.6	13.6	12.4	11.1
ICM32-B		20	36.4	34.8	32.8	31.1	29.2	27.2	24.8	22.2
ICM40-A	40	17	31.0	29.6	27.9	26.4	24.8	23.1	21.1	18.8
ICM40-B		30	54.6	52.2	49.3	46.7	43.8	40.7	37.2	33.3
ICM50-A	50	27	49.2	47.0	44.3	42.0	39.4	36.7	33.5	29.9
ICM50-B		46	83.8	80.1	75.5	71.6	67.2	62.5	57.1	51.0
ICM65-A	65	41	75	71	67	64	60	56	51	46
ICM65-B		81	148	141	133	126	118	110	101	89.8
ICM100	100	165	301	287	270	257	240	225	206	183
ICM125	125	259	473	450	424	404	377	353	323	288
ICM150	150	430	785	748	703	670	626	587	536	478

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

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Nominal capacities

Liquid line without phase change

SI units

Capacity table at nominal conditions, Q_N [kW], Circulation rate = 4, Δp = 0.2 bar

R 22

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	1.8	1.7	1.7	1.6	1.5	1.4	1.4	1.3
ICM20-A		0.6	5.3	5.2	5.0	4.8	4.6	4.3	4.1	3.9
ICM20-B		2.4	21.4	20.6	19.9	19.1	18.2	17.3	16.4	15.4
ICM20-C		4.6	40.9	39.6	38.1	36.5	35.0	33.3	31.5	29.6
ICM25-A	25	6	53.4	51.6	49.7	47.7	45.6	43.4	41.1	38.6
ICM25-B		12	107	103	99.4	95.3	91.2	86.7	82.1	77.1
ICM32-A	32	9	80.1	77.4	74.6	71.5	68.4	65.1	61.6	57.9
ICM32-B		17	151	146	141	135	129	123	116	109
ICM40-A	40	15	134	129	124	119	114	108	103	96
ICM40-B		26	231	224	215	207	198	188	178	167
ICM50-A	50	23	205	198	191	183	175	166	157	148
ICM50-B		40	356	344	331	318	304	289	274	257
ICM65-A	65	35	311	301	290	278	266	253	239	225
ICM65-B		70	623	602	580	556	532	506	479	450
ICM100	100	142	1263	1222	1177	1129	1080	1025	972	913
ICM125	125	223	1984	1919	1848	1773	1696	1610	1526	1434
ICM150	150	370	3292	3184	3067	2942	2814	2671	2532	2379

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration], Circulation rate = 4, Δp = 3 psi

R 22

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4
ICM20-A		0.7	1.6	1.5	1.4	1.4	1.3	1.2	1.2	1.1
ICM20-B		2.8	6.2	6.0	5.8	5.5	5.2	4.9	4.6	4.3
ICM20-C		5.3	11.8	11.4	10.9	10.4	9.9	9.3	8.7	8.1
ICM25-A	25	7	15.6	15.0	14.4	13.7	13.1	12.3	11.6	10.7
ICM25-B		14	31.2	30.1	28.8	27.5	26.1	24.7	23.1	21.4
ICM32-A	32	10	22.3	21.5	20.6	19.6	18.7	17.6	16.5	15.3
ICM32-B		20	44.6	43.0	41.2	39.3	37.3	35.2	33.0	30.6
ICM40-A	40	17	37.9	36.5	35.0	33.4	31.7	29.9	28.1	26.0
ICM40-B		30	66.9	64.4	61.7	58.9	56.0	52.9	49.5	45.9
ICM50-A	50	27	60.2	58.0	55.6	53.0	50.4	47.6	44.6	41.3
ICM50-B		46	103	98.8	94.7	90.4	85.8	81.0	75.9	70.4
ICM65-A	65	41	92	88	84	81	76	72	68	63
ICM65-B		81	181	174	167	159	151	143	134	124
ICM100	100	165	369	354	339	324	308	290	273	253
ICM125	125	259	579	556	532	509	483	455	429	397
ICM150	150	430	961	923	884	845	802	755	712	659

Correction factor for ΔP ($f_{\Delta P}$)

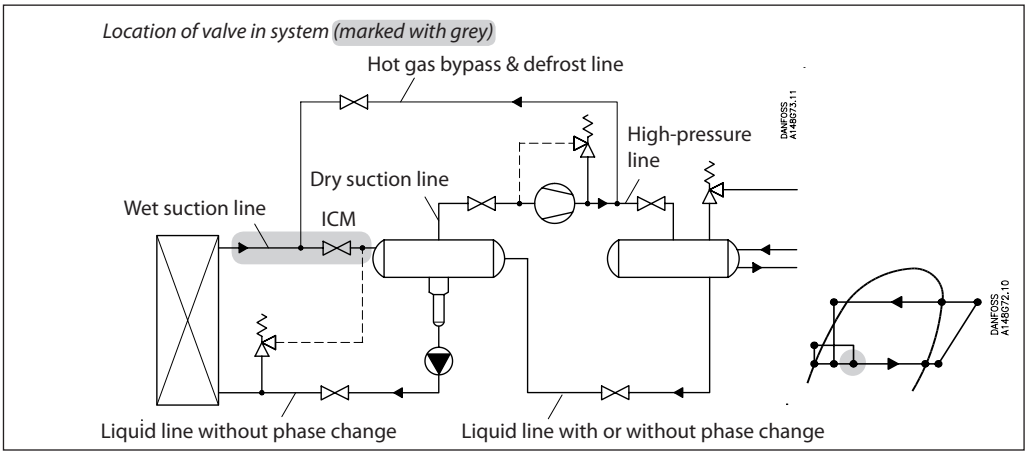
ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

Nominal capacities

Wet suction line



SI units

Calculation example (R717 capacities):

An application has following running conditions:

T_e = -20 °C
Q_o = 80 kW
Circulation rate = 3
Max. Δp = 0.3 bar
Connection: DN32

The capacity table is based on nominal condition (pressure drop Δp = 0.2 bar, recirculation rate = 4)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.
Correction factor for Δp 0.3 bar $f_{\Delta p}$ = 0.82
Correction factor for circulation rate f_{rec} = 0.9

$Q_n = Q_o \times f_{\Delta p} \times f_{rec} = 80 \times 0.82 \times 0.9 = 59$ kW

From the capacity table a ICM 32-B with Q_n capacity 60.1 kW is selected.

US units

Calculation example (R717 capacities):

An application has following running conditions:

T_e = -20 °F
Q_o = 8 TR
Circulation rate = 3
Max. Δp = 3.5 psi
Connection: 1″

The capacity table is based on nominal condition (pressure drop Δp = 3 psi, recirculation rate = 4)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.
Correction factor for Δp 3.5 psi $f_{\Delta p}$ = 0.91
Correction factor for circulation rate f_{rec} = 0.9

$Q_n = Q_o \times f_{\Delta p} \times f_{rec} = 8 \times 0.91 \times 0.9 = 6.6$ TR

From the capacity table a ICM 25-B with Q_n capacity 10.2 TR is selected.

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Nominal capacities

SI units

Capacity table at nominal conditions, Q_N [kW], Circulation rate = 4, Δp = 0.2 bar

R 717

Wet suction line

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	0.3	0.4	0.6	0.7	0.8	1.0	1.1	1.3
ICM20-A		0.6	0.9	1.3	1.7	2.1	2.5	3.0	3.4	3.9
ICM20-B		2.4	3.4	5.2	6.8	8.5	10.2	11.9	13.7	15.6
ICM20-C		4.6	6.6	10.0	13.1	16.3	19.5	22.9	26.4	29.9
ICM25-A	25	6	8.6	13.0	17.1	21.2	25.5	29.8	34.4	39.0
ICM25-B		12	17.2	26.0	34.2	42.4	50.9	59.7	68.7	78.0
ICM32-A	32	9	12.9	19.5	25.7	31.8	38.2	44.7	51.6	58.5
ICM32-B		17	24.4	36.8	48.5	60.1	72.1	84.5	97.4	111
ICM40-A	40	15	21.5	32.5	42.8	53.0	63.6	74.6	85.9	97.5
ICM40-B		26	37.3	56.3	74.1	91.9	110	129	149	169
ICM50-A	50	23	33.0	49.8	65.6	81.3	97.6	114	132	150
ICM50-B		40	57.4	86.6	114	141	170	199	229	260
ICM65-A	65	35	50	76	100	124	148	174	200	228
ICM65-B		70	101	152	200	248	297	348	401	455
ICM100	100	142	204	308	405	502	602	706	813	924
ICM125	125	223	321	483	635	788	945	1109	1276	1450
ICM150	150	370	532	802	1054	1307	1568	1839	2118	2407

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration], Circulation rate = 4, Δp = 3 psi

R 717

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.08	0.12	0.17	0.21	0.26	0.30	0.35	0.40
ICM20-A		0.7	0.2	0.4	0.5	0.6	0.8	0.9	1.1	1.2
ICM20-B		2.8	0.9	1.5	2.0	2.6	3.1	3.7	4.3	4.9
ICM20-C		5.3	1.8	2.8	3.9	4.9	5.9	7.0	8.1	9.3
ICM25-A	25	7	2.3	3.8	5.1	6.4	7.8	9.3	10.8	12.3
ICM25-B		14	4.6	7.5	10.2	12.9	15.7	18.5	21.5	24.5
ICM32-A	32	10	3.3	5.4	7.3	9.2	11.2	13.2	15.4	17.5
ICM32-B		20	6.6	10.7	14.6	18.4	22.4	26.5	30.7	35.0
ICM40-A	40	17	5.6	9.1	12.4	15.6	19.0	22.5	26.1	29.8
ICM40-B		30	9.9	16.1	21.9	27.6	33.5	39.7	46.1	52.5
ICM50-A	50	27	8.9	14.5	19.7	24.8	30.2	35.8	41.5	47.3
ICM50-B		46	15.2	24.7	33.5	42.3	51.4	60.9	70.7	80.5
ICM65-A	65	41	13	22	30	38	46	54	63	72
ICM65-B		81	26.8	43.5	59.0	74.5	90.6	107	125	142
ICM100	100	165	54	89	120	151	185	218	254	289
ICM125	125	259	84	140	188	237	290	342	399	453
ICM150	150	430	140	232	313	394	481	568	662	752

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

Nominal capacities

Wet suction line

SI units

Capacity table at nominal conditions, Q_N [kW],
Circulation rate = 4,
Δp = 0.2 bar

R 744

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]						
			-50	-40	-30	-20	-10	0	10
ICM20A-33	20	0.2	0.6	0.7	0.8	0.9	0.9	1.0	1.0
ICM20-A		0.6	1.8	2.1	2.4	2.6	2.8	2.9	2.9
ICM20-B		2.4	7.3	8.4	9.4	10.4	11.2	11.7	11.8
ICM20-C		4.6	14.0	16.1	18.1	19.9	21.5	22.5	22.6
ICM25-A	25	6	18.3	21.0	23.6	26.0	28.0	29.3	29.5
ICM25-B		12	36.5	41.9	47.1	51.9	56.0	58.6	59.0
ICM32-A	32	9	27.4	31.4	35.4	39.0	42.0	44.0	44.2
ICM32-B		17	51.7	59.4	66.8	73.6	79.3	83.1	83.5
ICM40-A	40	15	45.6	52.4	58.9	64.9	70.0	73.3	73.7
ICM40-B		26	79.1	90.8	102	113	121	127	128
ICM50-A	50	23	70.0	80.3	90.4	100	107	112	113
ICM50-B		40	122	140	157	173	187	195	197
ICM65-A	65	35	106	122	138	152	163	171	172
ICM65-B		70	213	245	275	303	327	342	344
ICM100	100	142	432	496	559	615	663	693	697
ICM125	125	223	678	780	877	966	1041	1088	1095
ICM150	150	370	1125	1294	1456	1603	1726	1805	1816

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
Circulation rate = 4,
Δp = 3 psi

R 744

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-60	-40	-20	0	20	40	60
ICM20-A33	20	0.23	0.17	0.20	0.23	0.25	0.27	0.28	0.27
ICM20-A		0.7	0.5	0.6	0.7	0.8	0.8	0.9	0.8
ICM20-B		2.8	2.1	2.4	2.8	3.1	3.3	3.4	3.3
ICM20-C		5.3	4.0	4.6	5.3	5.8	6.3	6.5	6.3
ICM25-A	25	7	5.2	6.1	7.0	7.7	8.3	8.6	8.4
ICM25-B		14	10.5	12.2	13.9	15.4	16.6	17.2	16.7
ICM32-A	32	10	7.5	8.7	9.9	11.0	11.9	12.3	11.9
ICM32-B		20	14.9	17.4	19.9	22.0	23.7	24.6	23.9
ICM40-A	40	17	12.7	14.8	16.9	18.7	20.1	20.9	20.3
ICM40-B		30	22.4	26.1	29.8	33.0	35.6	36.9	35.8
ICM50-A	50	27	20.2	23.5	26.8	29.7	32.0	33.2	32.2
ICM50-B		46	34.4	40.1	45.7	50.7	54.5	56.6	54.9
ICM65-A	65	41	31	36	41	45	48	51	49
ICM65-B		81	60.5	70.6	80.5	89.2	96.0	100	97
ICM100	100	165	123	143	164	182	195	203	196
ICM125	125	259	193	225	258	286	306	319	308
ICM150	150	430	320	373	428	475	508	530	511

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

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Nominal capacities

Wet suction line

SI units

Capacity table at nominal conditions, Q_N [kW], Circulation rate = 4, Δp = 0.2 bar

R 134a

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]						
			-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	0.1	0.2	0.2	0.3	0.3	0.4	0.4
ICM20-A		0.6	0.4	0.5	0.7	0.8	1.0	1.1	1.2
ICM20-B		2.4	1.6	2.2	2.7	3.3	3.8	4.3	4.9
ICM20-C		4.6	3.1	4.2	5.3	6.3	7.3	8.3	9.4
ICM25-A	25	6	4.0	5.5	6.8	8.2	9.5	10.9	12.2
ICM25-B		12	8.0	11.0	13.7	16.4	19.1	21.7	24.4
ICM32-A	32	9	6.0	8.2	10.3	12.3	14.3	16.3	18.3
ICM32-B		17	11.4	15.5	19.4	23.2	27.0	30.8	34.6
ICM40-A	40	15	10.1	13.7	17.1	20.5	23.9	27.2	30.5
ICM40-B		26	17.4	23.7	29.7	35.5	41.3	47.1	52.9
ICM50-A	50	23	15.4	21.0	26.3	31.4	36.6	41.6	46.8
ICM50-B		40	26.8	36.5	45.7	54.6	63.6	72.4	81.4
ICM65-A	65	35	23	32	40	48	56	63	71
ICM65-B		70	47.0	63.9	79.9	95.5	111	127	142
ICM100	100	142	95	129	162	194	226	257	289
ICM125	125	223	149	202	255	304	356	404	453
ICM150	150	370	248	336	423	505	590	670	752

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration], Circulation rate = 4, Δp = 3 psi

R 134a

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.04	0.05	0.07	0.08	0.10	0.11	0.13
ICM20-A		0.7	0.1	0.2	0.2	0.3	0.3	0.3	0.4
ICM20-B		2.8	0.5	0.7	0.8	1.0	1.2	1.4	1.5
ICM20-C		5.3	0.9	1.2	1.6	1.9	2.2	2.6	2.9
ICM25-A	25	7	1.2	1.6	2.1	2.5	2.9	3.4	3.8
ICM25-B		14	2.3	3.3	4.1	5.0	5.9	6.8	7.6
ICM32-A	32	10	1.7	2.3	3.0	3.6	4.2	4.8	5.4
ICM32-B		20	3.3	4.7	5.9	7.2	8.4	9.7	10.9
ICM40-A	40	17	2.8	4.0	5.0	6.1	7.2	8.2	9.2
ICM40-B		30	5.0	7.0	8.9	10.8	12.6	14.5	16.3
ICM50-A	50	27	4.5	6.3	8.0	9.7	11.4	13.0	14.7
ICM50-B		46	7.6	10.7	13.6	16.5	19.4	22.2	25.0
ICM65-A	65	41	7	10	12	15	17	20	22
ICM65-B		81	13.4	18.9	24.0	29.1	34.1	39.1	44.0
ICM100	100	165	27	39	49	60	70	79	90
ICM125	125	259	43	62	76	94	109	124	141
ICM150	150	430	71	102	127	157	181	207	234

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

Nominal capacities

Wet suction line

SI units

Capacity table at nominal conditions, Q_N [kW], Circulation rate = 4, Δp = 0.2 bar

R 404A

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5
ICM20-A		0.6	0.5	0.7	0.8	0.9	1.0	1.2	1.3	1.4
ICM20-B		2.4	2.1	2.6	3.1	3.7	4.2	4.7	5.2	5.6
ICM20-C		4.6	4.0	5.0	6.0	7.0	8.0	9.0	10.0	10.8
ICM25-A	25	6	5.2	6.5	7.8	9.1	10.5	11.7	13.0	14.1
ICM25-B		12	10.4	13.0	15.6	18.3	20.9	23.5	26.0	28.2
ICM32-A	32	9	7.8	9.8	11.7	13.7	15.7	17.6	19.5	21.1
ICM32-B		17	14.7	18.5	22.1	25.9	29.6	33.3	36.8	39.9
ICM40-A	40	15	12.9	16.3	19.5	22.8	26.1	29.4	32.5	35.2
ICM40-B		26	22.4	28.3	33.7	39.6	45.3	50.9	56.3	61.1
ICM50-A	50	23	19.8	25.0	29.8	35.0	40.1	45.0	49.8	54.0
ICM50-B		40	34.5	43.5	51.9	60.9	69.7	78.3	86.6	93.9
ICM65-A	65	35	30	38	46	53	61	69	76	82
ICM65-B		70	60.4	76.1	90.8	107	122	137	152	164
ICM100	100	142	122	155	185	216	247	278	308	333
ICM125	125	223	192	244	290	339	387	437	483	523
ICM150	150	370	319	404	481	563	643	725	802	868

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration], Circulation rate = 4, Δp = 3 psi

R 404A

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.05	0.06	0.07	0.09	0.10	0.12	0.13	0.14
ICM20-A		0.7	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.4
ICM20-B		2.8	0.6	0.8	0.9	1.1	1.3	1.4	1.6	1.7
ICM20-C		5.3	1.1	1.4	1.7	2.1	2.4	2.7	3.0	3.2
ICM25-A	25	7	1.5	1.9	2.3	2.7	3.2	3.6	4.0	4.3
ICM25-B		14	2.9	3.8	4.6	5.5	6.3	7.2	7.9	8.6
ICM32-A	32	10	2.1	2.7	3.3	3.9	4.5	5.1	5.7	6.1
ICM32-B		20	4.2	5.4	6.6	7.8	9.1	10.2	11.3	12.2
ICM40-A	40	17	3.5	4.6	5.6	6.7	7.7	8.7	9.6	10.4
ICM40-B		30	6.2	8.1	9.9	11.7	13.6	15.4	17.0	18.3
ICM50-A	50	27	5.6	7.3	8.9	10.6	12.2	13.8	15.3	16.5
ICM50-B		46	9.6	12.4	15.2	18.0	20.8	23.6	26.1	28.1
ICM65-A	65	41	8	11	13	16	19	21	23	25
ICM65-B		81	16.9	21.9	26.7	31.7	36.7	41.5	45.9	49.5
ICM100	100	165	34	45	54	65	75	85	94	100
ICM125	125	259	53	71	84	102	117	134	147	157
ICM150	150	430	88	117	140	170	194	222	244	261

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

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Nominal capacities

Wet suction line

SI units

Capacity table at nominal conditions, Q_N [kW], Circulation rate = 4, Δp = 0.2 bar

R 22

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.5
ICM20-A		0.6	0.5	0.6	0.8	0.9	1.1	1.2	1.3	1.5
ICM20-B		2.4	1.9	2.5	3.1	3.7	4.2	4.8	5.4	5.9
ICM20-C		4.6	3.7	4.8	5.9	7.0	8.1	9.2	10.3	11.4
ICM25-A	25	6	4.8	6.3	7.7	9.1	10.6	12.0	13.5	14.9
ICM25-B		12	9.6	12.6	15.4	18.3	21.2	24.1	26.9	29.7
ICM32-A	32	9	7.2	9.4	11.6	13.7	15.9	18.1	20.2	22.3
ICM32-B		17	13.6	17.8	21.9	25.9	30.0	34.1	38.1	42.1
ICM40-A	40	15	12.0	15.7	19.3	22.8	26.5	30.1	33.6	37.2
ICM40-B		26	20.7	27.2	33.4	39.6	45.9	52.2	58.3	64.4
ICM50-A	50	23	18.3	24.1	29.6	35.0	40.6	46.2	51.6	57.0
ICM50-B		40	31.9	41.9	51.4	60.9	70.6	80.3	89.7	99.1
ICM65-A	65	35	28	36	45	53	62	70	78	87
ICM65-B		70	55.8	73.3	90.0	107	124	141	157	173
ICM100	100	142	114	148	183	216	251	285	318	352
ICM125	125	223	179	233	288	339	395	447	499	553
ICM150	150	370	296	386	477	563	655	742	828	917

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration], Circulation rate = 4, Δp = 3 psi

R 22

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.04	0.06	0.07	0.09	0.11	0.12	0.14	0.15
ICM20-A		0.7	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5
ICM20-B		2.8	0.5	0.7	0.9	1.1	1.3	1.5	1.7	1.8
ICM20-C		5.3	1.0	1.4	1.7	2.1	2.4	2.8	3.1	3.5
ICM25-A	25	7	1.3	1.8	2.3	2.8	3.2	3.7	4.1	4.6
ICM25-B		14	2.7	3.6	4.6	5.5	6.4	7.4	8.3	9.2
ICM32-A	32	10	1.9	2.6	3.3	3.9	4.6	5.3	5.9	6.5
ICM32-B		20	3.8	5.2	6.5	7.9	9.2	10.5	11.9	13.1
ICM40-A	40	17	3.2	4.4	5.6	6.7	7.8	9.0	10.1	11.1
ICM40-B		30	5.7	7.8	9.8	11.8	13.8	15.8	17.8	19.6
ICM50-A	50	27	5.1	7.0	8.8	10.6	12.4	14.2	16.0	17.7
ICM50-B		46	8.7	12.0	15.0	18.1	21.2	24.2	27.3	30.1
ICM65-A	65	41	8	11	13	16	19	22	24	27
ICM65-B		81	15.4	21.1	26.5	31.9	37.3	42.7	48.0	53.0
ICM100	100	165	30	43	53	65	75	88	98	109
ICM125	125	259	48	68	84	103	118	138	153	171
ICM150	150	430	79	112	139	171	196	229	254	283

Correction factor for ΔP ($f_{\Delta P}$)

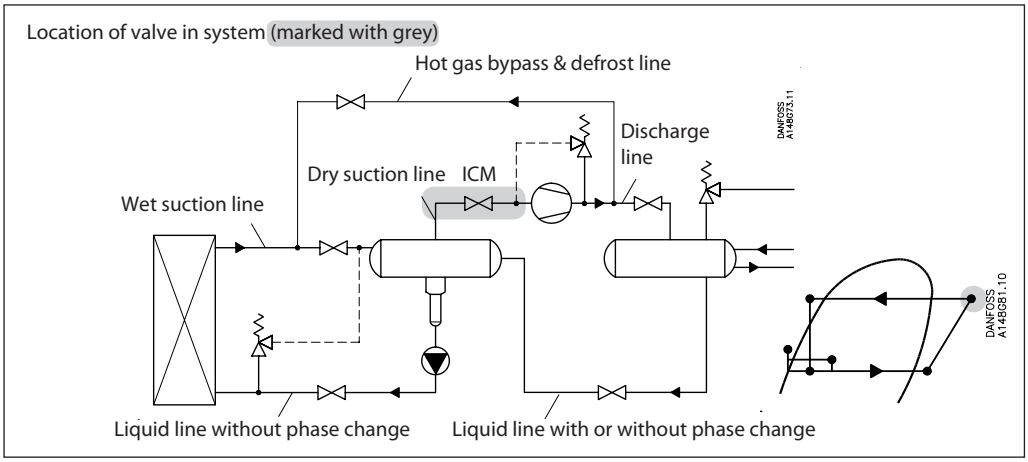
ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

Nominal capacities

Dry suction line



SI units

Calculation example (R717 capacities):

An application has following running conditions:

T_e = -20 °C
Q_o = 90 kW
T_{liq} = 10 °C
Max. Δp = 0.3 bar
Connection: DN32

The capacity table is based on nominal condition (pressure drop Δp = 0.2 bar, T_{liq} = 30 °C)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.
Correction factor for Δp 0.3 bar $f_{\Delta p}$ = 0.82
Correction factor for liquid temperature f_{Tliq} = 0.92

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} = 90 \times 0.82 \times 0.92 = 68$ kW

From the capacity table a ICM 32-B with Q_n capacity 92.3 kW is selected.

US units

Calculation example (R717 capacities):

An application has following running conditions:

T_e = 0 °F
Q_o = 20 TR
T_{liq} = 50 °F
Max. Δp = 3.5 psi
Connection: 1 1/4"

The capacity table is based on nominal condition (Δp = 3 psi, T_{liq} = 90 °F)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.
Correction factor for Δp 3.5 psi $f_{\Delta p}$ = 0.91
Correction factor for liquid temperature f_{Tliq} = 0.92

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} = 20 \times 0.91 \times 0.92 = 16.7$ TR

From the capacity table a ICM 32-B with Q_n capacity 28.2 TR is selected.

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Nominal capacities

SI units

Capacity table at nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
Δp = 0.2 bar
Superheating = 8 °C

R 717

Dry suction line

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	0.5	0.7	0.9	1.1	1.3	1.6	2.0	2.3
ICM20-A		0.6	1.6	2.0	2.6	3.3	4.0	4.9	5.9	6.9
ICM20-B		2.4	6.2	8.0	10.3	13.0	16.1	19.5	23.4	27.7
ICM20-C		4.6	11.9	15.3	19.8	25.0	30.9	37.5	44.9	53.0
ICM25-A	25	6	15.5	20.0	25.8	32.6	40.3	48.9	58.5	69.2
ICM25-B		12	31.0	40.0	51.6	65.1	80.6	97.7	117	138
ICM32-A	32	9	23.3	30.0	38.7	48.9	60.4	73.3	87.8	104
ICM32-B		17	44.0	56.7	73.1	92.3	114	138	166	196
ICM40-A	40	15	38.8	50.0	64.5	81.4	101	122	146	173
ICM40-B		26	67.2	86.7	112	141	175	212	254	300
ICM50-A	50	23	59.5	76.7	98.9	125	154	187	224	265
ICM50-B		40	103	133	172	217	269	326	390	461
ICM65-A	65	35	91	117	151	190	235	285	342	403
ICM65-B		70	181	234	301	380	470	570	683	807
ICM100	100	142	368	473	611	772	953	1156	1386	1637
ICM125	125	223	578	743	960	1212	1497	1816	2176	2571
ICM150	150	370	959	1233	1592	2011	2483	3013	3611	4265

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.82
-10	0.86
0	0.88
10	0.92
20	0.96
30	**1.00**
40	1.04
50	1.09

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
Δp = 3 psi
Superheating = 12 °F

R 717

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.15	0.19	0.25	0.32	0.41	0.50	0.61	0.73
ICM20-A		0.7	0.5	0.6	0.8	1.0	1.2	1.5	1.9	2.2
ICM20-B		2.8	1.9	2.3	3.1	3.9	5.0	6.1	7.4	8.8
ICM20-C		5.3	3.5	4.4	5.8	7.5	9.4	11.6	14.0	16.8
ICM25-A	25	7	4.7	5.8	7.6	9.9	12.4	15.3	18.5	22.1
ICM25-B		14	9.3	11.6	15.3	19.7	24.8	30.6	37.1	44.2
ICM32-A	32	10	6.7	8.3	10.9	14.1	17.7	21.9	26.5	31.6
ICM32-B		20	13.3	16.5	21.9	28.2	35.5	43.8	53.0	63.2
ICM40-A	40	17	11.3	14.0	18.6	23.9	30.1	37.2	45.0	53.7
ICM40-B		30	20.0	24.8	32.8	42.3	53.2	65.6	79.4	94.8
ICM50-A	50	27	18.0	22.3	29.5	38.0	47.9	59.1	71.5	85.3
ICM50-B		46	30.7	38.0	50.3	64.8	81.6	101	122	145
ICM65-A	65	41	28	34	45	58	73	90	109	129
ICM65-B		81	54.0	66.9	88.5	114	144	177	215	256
ICM100	100	165	111	137	181	233	292	360	438	521
ICM125	125	259	174	215	284	365	458	566	687	818
ICM150	150	430	289	357	472	606	761	939	1141	1357

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for superheat (T_S)

T_s [°F]	Correction factor
10	1.00
14	1.00
18	1.00
20	1.00

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.82
10	0.85
30	0.88
50	0.92
70	0.96
90	**1.00**
110	1.04
130	1.09

Nominal capacities

Dry suction line

R 744

SI units

Capacity table at nominal conditions, Q_N [kW],
T_{liq} = 10 °C,
Δp = 0.2 bar
Superheating = 8 °C

Type	Valve body size	K_v		Evaporating temperature [°C]						
		[m³/h]	-50	-40	-30	-20	-10	0	10
ICM20A-33	20	0.2	0.7	0.9	1.0	1.2	1.4	1.6	1.9
ICM20-A		0.6	2.1	2.6	3.1	3.7	4.3	4.9	5.6
ICM20-B		2.4	8.4	10.3	12.4	14.6	17.1	19.6	22.3
ICM20-C		4.6	16.1	19.7	23.7	28.1	32.7	37.7	42.8
ICM25-A	25	6	21.0	25.8	30.9	36.6	42.7	49.1	55.8
ICM25-B		12	42.1	51.5	61.9	73.2	85.4	98.2	112
ICM32-A	32	9	31.6	38.6	46.4	54.9	64.0	73.7	83.7
ICM32-B		17	59.6	73.0	87.7	104	121	139	158
ICM40-A	40	15	52.6	64.4	77.4	91.5	107	123	140
ICM40-B		26	91.2	112	134	159	185	213	242
ICM50-A	50	23	80.7	98.7	119	140	164	188	214
ICM50-B		40	140	172	206	244	285	327	372
ICM65-A	65	35	123	150	181	214	249	286	326
ICM65-B		70	246	301	361	427	498	573	651
ICM100	100	142	498	610	733	867	1012	1162	1322
ICM125	125	223	782	958	1150	1362	1589	1825	2076
ICM150	150	370	1297	1590	1909	2259	2636	3027	3444

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.52
-10	0.67
0	0.91
10	**1.00**
15	1.09

R 744

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 50 °F,
Δp = 3 psi
Superheating = 12 °F

Type	Valve body size	C_v		Evaporating temperature [°F]					
		[USgal/min]	-60	-40	-20	0	20	40	60
ICM20-A33	20	0.23	0.20	0.24	0.30	0.36	0.43	0.50	0.57
ICM20-A		0.7	0.6	0.7	0.9	1.1	1.3	1.5	1.7
ICM20-B		2.8	2.4	3.0	3.7	4.4	5.2	6.0	6.9
ICM20-C		5.3	4.5	5.7	6.9	8.3	9.8	11.4	13.0
ICM25-A	25	7	6.0	7.5	9.1	11.0	13.0	15.1	17.2
ICM25-B		14	11.9	14.9	18.3	22.0	26.0	30.2	34.5
ICM32-A	32	10	8.5	10.7	13.1	15.7	18.5	21.5	24.6
ICM32-B		20	17.0	21.3	26.1	31.4	37.1	43.1	49.2
ICM40-A	40	17	14.5	18.1	22.2	26.7	31.5	36.6	41.8
ICM40-B		30	25.5	32.0	39.2	47.1	55.6	64.6	73.9
ICM50-A	50	27	23.0	28.8	35.3	42.4	50.1	58.2	66.5
ICM50-B		46	39.1	49.1	60.1	72.2	85.3	99.1	113
ICM65-A	65	41	35	44	54	64	76	88	101
ICM65-B		81	68.9	86.4	106	127	150	175	199
ICM100	100	165	141	175	215	259	306	355	405
ICM125	125	259	221	275	338	407	480	558	636
ICM150	150	430	366	457	561	675	797	926	1057

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for superheat (T_S)

T_s [°F]	Correction factor
10	1.00
14	1.00
18	1.00
20	1.00

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.48
10	0.64
30	0.88
50	**1.00**

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Nominal capacities

Dry suction line

R 134a

SI units

Capacity table at nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
Δp = 0.2 bar
Superheating = 8 °C

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]						
			-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	0.2	0.2	0.3	0.4	0.5	0.6	0.7
ICM20-A		0.6	0.5	0.7	0.9	1.2	1.4	1.8	2.1
ICM20-B		2.4	2.1	2.8	3.6	4.6	5.7	7.0	8.5
ICM20-C		4.6	4.1	5.4	7.0	8.8	11.0	13.5	16.3
ICM25-A	25	6	5.3	7.0	9.1	11.5	14.4	17.6	21.3
ICM25-B		12	10.6	14.1	18.2	23.1	28.7	35.2	42.6
ICM32-A	32	9	8.0	10.5	13.6	17.3	21.5	26.4	32.0
ICM32-B		17	15.1	19.9	25.7	32.7	40.7	49.9	60.4
ICM40-A	40	15	13.3	17.6	22.7	28.8	35.9	44.0	53.3
ICM40-B		26	23.1	30.5	39.4	50.0	62.2	76.3	92.3
ICM50-A	50	23	20.4	26.9	34.8	44.2	55.0	67.5	81.7
ICM50-B		40	35.5	46.9	60.6	76.9	95.7	117	142
ICM65-A	65	35	31	41	53	67	84	103	124
ICM65-B		70	62.1	82.0	106	135	168	206	249
ICM100	100	142	125	166	215	274	339	417	504
ICM125	125	223	197	261	337	430	532	655	791
ICM150	150	370	326	433	560	713	883	1087	1312

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.66
-10	0.70
0	0.76
10	0.82
20	0.90
30	**1.00**
40	1.13
50	1.29

R 134a

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90,
Δp = 3 psi
Superheating = 12

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.05	0.07	0.09	0.12	0.15	0.18	0.23
ICM20-A		0.7	0.2	0.2	0.3	0.4	0.4	0.6	0.7
ICM20-B		2.8	0.6	0.8	1.1	1.4	1.8	2.2	2.7
ICM20-C		5.3	1.1	1.6	2.1	2.7	3.4	4.2	5.2
ICM25-A	25	7	1.5	2.1	2.7	3.5	4.5	5.6	6.9
ICM25-B		14	3.0	4.1	5.4	7.1	9.0	11.2	13.7
ICM32-A	32	10	2.2	2.9	3.9	5.0	6.4	8.0	9.8
ICM32-B		20	4.3	5.9	7.8	10.1	12.8	16.0	19.6
ICM40-A	40	17	3.7	5.0	6.6	8.6	10.9	13.6	16.6
ICM40-B		30	6.5	8.8	11.7	15.1	19.2	23.9	29.4
ICM50-A	50	27	5.8	7.9	10.5	13.6	17.3	21.5	26.4
ICM50-B		46	9.9	13.5	17.9	23.2	29.4	36.7	45.0
ICM65-A	65	41	9	12	16	21	26	33	40
ICM65-B		81	17.4	23.8	31.5	40.8	51.8	64.6	79.3
ICM100	100	165	36	48	65	84	105	132	162
ICM125	125	259	57	76	102	132	165	208	254
ICM150	150	430	95	126	169	219	273	345	421

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for superheat (T^S)

T_s [°F]	Correction factor
10	1.00
14	1.00
18	1.00
20	1.00

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.64
10	0.68
30	0.74
50	0.81
70	0.89
90	**1.00**
110	1.15
130	1.35

Nominal capacities

SI units

Capacity table at nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
Δp = 0.2 bar
Superheating = 8 °C

R 404A

Dry suction line

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	0.2	0.2	0.3	0.4	0.4	0.5	0.7	0.8
ICM20-A		0.6	0.5	0.6	0.8	1.1	1.3	1.6	2.0	2.4
ICM20-B		2.4	1.9	2.5	3.3	4.2	5.3	6.5	8.0	9.6
ICM20-C		4.6	3.6	4.9	6.3	8.1	10.2	12.5	15.2	18.3
ICM25-A	25	6	4.8	6.4	8.3	10.6	13.2	16.3	19.9	23.9
ICM25-B		12	9.5	12.7	16.5	21.1	26.5	32.7	39.8	47.8
ICM32-A	32	9	7.1	9.5	12.4	15.9	19.9	24.5	29.8	35.9
ICM32-B		17	13.5	18.0	23.4	29.9	37.5	46.3	56.3	67.8
ICM40-A	40	15	11.9	15.9	20.7	26.4	33.1	40.8	49.7	59.8
ICM40-B		26	20.6	27.5	35.8	45.8	57.4	70.8	86.2	104
ICM50-A	50	23	18.2	24.3	31.7	40.5	50.8	62.6	76.2	91.7
ICM50-B		40	31.7	42.3	55.1	70.5	88.3	109	133	159
ICM65-A	65	35	28	37	48	62	77	95	116	140
ICM65-B		70	55.5	74.1	96.5	123	155	191	232	279
ICM100	100	142	113	150	195	251	313	386	471	566
ICM125	125	223	177	235	306	394	492	606	740	889
ICM150	150	370	294	390	508	654	816	1005	1227	1476

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.55
-10	0.60
0	0.66
10	0.74
20	0.85
30	**1.00**
40	1.23
50	1.68

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
Δp = 3 psi
Superheating = 12 °F

R 404A

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.04	0.06	0.08	0.10	0.13	0.16	0.20	0.25
ICM20-A		0.7	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.8
ICM20-B		2.8	0.5	0.7	1.0	1.2	1.6	2.0	2.5	3.0
ICM20-C		5.3	1.0	1.3	1.8	2.4	3.0	3.8	4.7	5.7
ICM25-A	25	7	1.3	1.8	2.4	3.1	4.0	5.0	6.2	7.6
ICM25-B		14	2.6	3.5	4.8	6.2	8.0	10.0	12.4	15.2
ICM32-A	32	10	1.8	2.5	3.4	4.5	5.7	7.2	8.9	10.8
ICM32-B		20	3.7	5.1	6.8	8.9	11.4	14.3	17.8	21.7
ICM40-A	40	17	3.1	4.3	5.8	7.6	9.7	12.2	15.1	18.4
ICM40-B		30	5.5	7.6	10.2	13.4	17.1	21.5	26.6	32.5
ICM50-A	50	27	4.9	6.8	9.2	12.0	15.4	19.4	24.0	29.3
ICM50-B		46	8.4	11.6	15.7	20.5	26.2	33.0	40.8	49.9
ICM65-A	65	41	7	10	14	18	23	29	36	45
ICM65-B		81	14.8	20.5	27.6	36.1	46.2	58.1	71.9	87.8
ICM100	100	165	30	42	56	73	94	118	146	179
ICM125	125	259	47	66	87	115	148	186	229	282
ICM150	150	430	77	110	145	191	245	308	381	467

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for superheat (T_S)

T_s [°F]	Correction factor
10	1.00
14	1.00
18	1.00
20	1.00

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.52
10	0.57
30	0.63
50	0.72
70	0.83
90	**1.00**
110	1.29
130	1.92

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Nominal capacities

SI units

Capacity table at nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
Δp = 0.2 bar
Superheating = 8 °C

R 22

Dry suction line

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.9
ICM20-A		0.6	0.6	0.8	1.0	1.3	1.5	1.9	2.2	2.6
ICM20-B		2.4	2.5	3.2	4.1	5.0	6.2	7.4	8.8	10.4
ICM20-C		4.6	4.7	6.1	7.8	9.7	11.8	14.2	16.9	19.9
ICM25-A	25	6	6.2	8.0	10.1	12.6	15.4	18.6	22.1	26.0
ICM25-B		12	12.3	16.0	20.3	25.2	30.8	37.1	44.1	51.9
ICM32-A	32	9	9.3	12.0	15.2	18.9	23.1	27.8	33.1	39.0
ICM32-B		17	17.5	22.6	28.7	35.7	43.6	52.6	62.5	73.6
ICM40-A	40	15	15.4	20.0	25.4	31.5	38.5	46.4	55.2	64.9
ICM40-B		26	26.7	34.6	43.9	54.6	66.7	80.4	95.6	113
ICM50-A	50	23	23.7	30.6	38.9	48.3	59.0	71.1	84.6	100
ICM50-B		40	41.1	53.3	67.6	84.0	103	124	147	173
ICM65-A	65	35	36	47	59	74	90	108	129	152
ICM65-B		70	72.0	93.2	118	147	180	217	258	303
ICM100	100	142	146	189	240	299	364	440	522	615
ICM125	125	223	229	297	377	469	572	691	820	966
ICM150	150	370	380	493	625	779	948	1147	1360	1603

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.71
-10	0.75
0	0.80
10	0.86
20	0.92
30	**1.00**
40	1.09
50	1.22

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
Δp = 3 psi
Superheating = 12 °F

R 22

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.06	0.07	0.10	0.12	0.16	0.19	0.23	0.27
ICM20-A		0.7	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.8
ICM20-B		2.8	0.7	0.9	1.2	1.5	1.9	2.3	2.8	3.3
ICM20-C		5.3	1.3	1.7	2.2	2.9	3.6	4.3	5.2	6.2
ICM25-A	25	7	1.7	2.3	3.0	3.8	4.7	5.7	6.9	8.2
ICM25-B		14	3.4	4.6	5.9	7.5	9.4	11.5	13.8	16.4
ICM32-A	32	10	2.4	3.3	4.2	5.4	6.7	8.2	9.9	11.7
ICM32-B		20	4.9	6.5	8.5	10.8	13.4	16.4	19.8	23.5
ICM40-A	40	17	4.1	5.5	7.2	9.2	11.4	13.9	16.8	20.0
ICM40-B		30	7.3	9.8	12.7	16.1	20.1	24.6	29.6	35.2
ICM50-A	50	27	6.6	8.8	11.4	14.5	18.1	22.1	26.7	31.7
ICM50-B		46	11.2	15.0	19.5	24.8	30.8	37.7	45.4	54.0
ICM65-A	65	41	10	13	17	22	28	34	41	48
ICM65-B		81	19.7	26.4	34.3	43.6	54.3	66.4	80.0	95.1
ICM100	100	165	41	53	70	89	111	136	163	193
ICM125	125	259	64	83	110	140	175	213	256	303
ICM150	150	430	106	139	182	233	290	353	425	503

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for superheat (T_S)

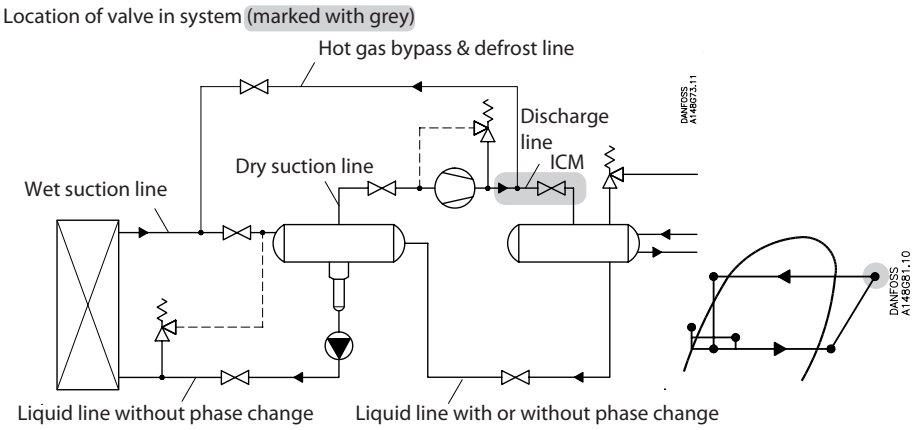
T_s [°F]	Correction factor
10	1.00
14	1.00
18	1.00
20	1.00

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.73
10	0.77
30	0.82
50	0.87
70	0.93
90	**1.00**
110	1.09
130	1.20

Nominal capacities

Discharge line



SI units

Calculation example (R717 capacities):

An application has following running conditions:

T_e = -20 °C
Q_o = 90 kW
T_{liq} = 10 °C
Max. Δp = 0.4 bar
$T_{disch.}$ = 60 °C
Connection: DN25

The capacity table is based on nominal condition (Δp = 0.2 bar, T_{liq} = 30 °C, $P_{disch.}$ = 12 bar, $T_{disch.}$ = 80 °C)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.
Correction factor for Δp 0.4 bar $f_{\Delta p}$ = 0.72
Correction factor for liquid temperature f_{Tliq} = 0.92
Correction factor for $T_{disch.}$ 60 °C, $f_{disch.}$ = 0.97

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} \times f_{Tdisch.}$ =
90 × 0.72 × 0.92 × 0.97 = 58 kW

From the capacity table a ICM 25-A with Q_n capacity 73.2 kW is selected.

US units

Calculation example (R717 capacities):

An application has following running conditions:

T_e = 0 °F
Q_o = 8 TR
T_{liq} = 50 °F
Max. Δp = 4.5 psi
$T_{disch.}$ = 120 °F
Connection: 3/4"

The capacity table is based on nominal condition (Δp = 3 psi, T_{liq} = 90 °F, $P_{disch.}$ = 185 psi, $T_{disch.}$ = 180 °F)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.
Correction factor for Δp 4.5 psi $f_{\Delta p}$ = 0.81
Correction factor for liquid temperature f_{Tliq} = 0.92
Correction factor for $T_{disch.}$ 120 °F, $f_{disch.}$ = 0.95

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} \times f_{Tdisch.}$ =
8 × 0.81 × 0.92 × 0.95 = 5.7 TR

From the capacity table a ICM 20-B with Q_n capacity 8.4 TR is selected.

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Nominal capacities

SI units

Capacity table at nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
Δp = 0.2 bar,
$P_{disch.}$ = 12 bar,
$T_{disch.}$ = 80 °C
Superheating = 8 °C

R 717 — Discharge line

Type	Valve body size	K_v	Evaporating temperature [°C]							
		[m³/h]	-50	-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	2.3	2.4	2.4	2.4	2.5	2.5	2.5	2.5
ICM20-A		0.6	7.0	7.1	7.2	7.3	7.4	7.5	7.5	7.6
ICM20-B		2.4	28.0	28.5	28.9	29.3	29.6	29.9	30.1	30.3
ICM20-C		4.6	53.7	54.5	55.4	56.1	56.8	57.3	57.8	58.1
ICM25-A	25	6	70.0	71.1	72.3	73.2	74.1	74.7	75.3	75.8
ICM25-B		12	140	142	145	146	148	149	151	152
ICM32-A	32	9	105	107	108	110	111	112	113	114
ICM32-B		17	198	202	205	207	210	212	213	215
ICM40-A	40	15	175	178	181	183	185	187	188	189
ICM40-B		26	303	308	313	317	321	324	326	328
ICM50-A	50	23	268	273	277	281	284	287	289	290
ICM50-B		40	467	474	482	488	494	498	502	505
ICM65-A	65	35	408	415	422	427	432	436	439	442
ICM65-B		70	817	830	843	854	864	872	879	884
ICM100	100	142	1656	1684	1710	1732	1753	1769	1782	1794
ICM125	125	223	2601	2644	2686	2720	2752	2778	2798	2817
ICM150	150	370	4316	4388	4456	4512	4567	4610	4643	4675

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°C]	Correction factor
50	0.96
60	0.97
80	**1.00**
90	1.01
100	1.03
110	1.04
120	1.06

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.82
-10	0.86
0	0.88
10	0.92
20	0.96
30	**1.00**
40	1.04
50	1.09

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
Δp = 2.9 psi,
$P_{disch.}$ = 185 psi,
$T_{disch.}$ = 180 °F
Superheating = 12 °F

R 717

Type	Valve body size	C_v	Evaporating temperature [°F]							
		[USgal/min]	-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.66	0.67	0.68	0.69	0.70	0.71	0.71	0.72
ICM20-A		0.7	2.0	2.0	2.1	2.1	2.1	2.2	2.2	2.2
ICM20-B		2.8	8.0	8.2	8.3	8.4	8.5	8.6	8.7	8.7
ICM20-C		5.3	15.2	15.4	15.7	15.9	16.1	16.3	16.4	16.5
ICM25-A	25	7	20.0	20.4	20.7	21.0	21.3	21.5	21.7	21.8
ICM25-B		14	40.1	40.8	41.5	42.0	42.6	43.0	43.4	43.6
ICM32-A	32	10	28.6	29.1	29.6	30.0	30.4	30.7	31.0	31.2
ICM32-B		20	57.3	58.3	59.3	60.0	60.9	61.5	62.0	62.3
ICM40-A	40	17	48.7	49.5	50.4	51.0	51.7	52.3	52.7	53.0
ICM40-B		30	85.9	87.4	88.9	90.0	91.3	92.2	93.0	93.5
ICM50-A	50	27	77.3	78.7	80.0	81.0	82.2	83.0	83.7	84.2
ICM50-B		46	132	134	136	138	140	141	143	143
ICM65-A	65	41	117	119	122	123	125	126	127	128
ICM65-B		81	232	236	240	243	247	249	251	253
ICM100	100	165	472	480	489	495	501	508	512	514
ICM125	125	259	741	754	768	777	787	797	804	807
ICM150	150	430	1231	1251	1275	1290	1307	1324	1335	1341

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°F]	Correction factor
120	0.95
140	0.97
180	**1.00**
200	1.02
210	1.02
230	1.04
250	1.05

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.82
10	0.85
30	0.88
50	0.92
70	0.96
90	**1.00**
110	1.04
130	1.09

Nominal capacities

Discharge line

SI units

Capacity table at nominal conditions, Q_N [kW],
T_{liq} = 10 °C,
Δp = 0.2 bar,
$P_{disch.}$ = 10 bar,
$T_{disch.}$ = 80 °C
Superheating = 8 °C

R 744

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]						
			-50	-40	-30	-20	-10	0	10
ICM20A-33	20	0.2	1.5	2.4	2.4	2.4	2.5	2.5	2.5
ICM20-A		0.6	4.4	4.5	4.5	4.6	4.6	4.5	4.4
ICM20-B		2.4	17.7	17.9	18.1	18.2	18.2	18.0	17.7
ICM20-C		4.6	33.8	34.4	34.8	34.9	34.9	34.6	33.9
ICM25-A	25	6	44.1	44.8	45.3	45.5	45.5	45.1	44.2
ICM25-B		12	88.3	89.7	90.7	91.0	91.0	90.2	88.5
ICM32-A	32	9	66.2	67.2	68.0	68.3	68.3	67.6	66.3
ICM32-B		17	125	127	128	129	129	128	125
ICM40-A	40	15	110	112	113	114	114	113	111
ICM40-B		26	191	194	196	197	197	195	192
ICM50-A	50	23	169	172	174	174	174	173	170
ICM50-B		40	294	299	302	303	303	301	295
ICM65-A	65	35	257	262	264	266	266	263	258
ICM65-B		70	515	523	529	531	531	526	516
ICM100	100	142	1044	1061	1071	1078	1078	1067	1047
ICM125	125	223	1639	1666	1683	1693	1693	1676	1644
ICM150	150	370	2720	2765	2792	2808	2808	2781	2728

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°C]	Correction factor
50	0.96
60	0.97
80	**1.00**
90	1.01
100	1.03
110	1.04
120	1.06

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.52
-10	0.67
0	0.91
10	**1.00**
15	1.09

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
Δp = 3 psi,
$P_{disch.}$ = 120 psi,
$T_{disch.}$ = 180 °F
Superheating = 12 °F

R 744

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-60	-40	-20	0	20	40	60
ICM20-A33	20	0.23	0.40	0.41	0.42	0.42	0.42	0.41	0.41
ICM20-A		0.7	1.2	1.3	1.3	1.3	1.3	1.2	1.2
ICM20-B		2.8	4.9	5.0	5.1	5.1	5.1	5.0	5.0
ICM20-C		5.3	9.3	9.5	9.6	9.7	9.6	9.5	9.5
ICM25-A	25	7	12.3	12.6	12.7	12.8	12.7	12.5	12.5
ICM25-B		14	24.7	25.1	25.4	25.5	25.4	25.0	25.0
ICM32-A	32	10	17.6	18.0	18.1	18.2	18.1	17.8	17.8
ICM32-B		20	35.3	35.9	36.3	36.5	36.3	35.7	35.7
ICM40-A	40	17	30.0	30.5	30.9	31.0	30.9	30.3	30.3
ICM40-B		30	52.9	53.9	54.4	54.7	54.4	53.5	53.5
ICM50-A	50	27	47.6	48.5	49.0	49.2	49.0	48.2	48.2
ICM50-B		46	81.1	82.6	83.5	83.9	83.5	82.1	82.1
ICM65-A	65	41	72	74	75	75	75	73	73
ICM65-B		81	143	145	147	148	147	145	145
ICM100	100	165	290	297	300	301	300	294	294
ICM125	125	259	455	466	471	473	471	461	461
ICM150	150	430	756	774	782	786	782	765	765

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°F]	Correction factor
120	0.95
140	0.97
180	**1.00**
200	1.02
210	1.02
230	1.04
250	1.05

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.48
10	0.64
30	0.88
50	**1.00**

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Nominal capacities

Discharge line

SI units

Capacity table at nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
Δp = 0.2 bar,
$P_{disch.}$ = 8 bar,
$T_{disch.}$ = 80 °C
Superheating = 8 °C

R 134a

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]						
			-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	1.9	2.0	2.1	2.2	2.3	2.3	2.4
ICM20-A		0.6	5.7	6.0	6.3	6.5	6.8	7.0	7.3
ICM20-B		2.4	22.9	24.0	25.1	26.1	27.2	28.2	29.1
ICM20-C		4.6	43.8	45.9	48.0	50.1	52.0	54.0	55.9
ICM25-A	25	6	57.2	59.9	62.7	65.3	67.9	70.5	72.9
ICM25-B		12	114	120	125	131	136	141	146
ICM32-A	32	9	85.8	89.9	94.0	98.0	102	106	109
ICM32-B		17	162	170	178	185	192	200	206
ICM40-A	40	15	143	150	157	163	170	176	182
ICM40-B		26	248	260	272	283	294	305	316
ICM50-A	50	23	219	230	240	250	260	270	279
ICM50-B		40	381	399	418	435	453	470	486
ICM65-A	65	35	333	350	366	381	396	411	425
ICM65-B		70	667	699	731	762	792	822	850
ICM100	100	142	1353	1419	1484	1545	1607	1667	1724
ICM125	125	223	2124	2228	2331	2426	2524	2618	2708
ICM150	150	370	3524	3697	3867	4025	4188	4344	4492

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°C]	Correction factor
50	0.96
60	0.97
80	**1.00**
90	1.01
100	1.03
110	1.04
120	1.06

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.66
-10	0.70
0	0.76
10	0.82
20	0.90
30	**1.00**
40	1.13
50	1.29

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
Δp = 3 psi,
$P_{disch.}$ = 120 psi,
$T_{disch.}$ = 180 °F
Superheating = 12 °F

R 134a

Type	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]						
			-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.17	0.18	0.19	0.19	0.20	0.21	0.22
ICM20-A		0.7	0.5	0.5	0.6	0.6	0.6	0.6	0.7
ICM20-B		2.8	2.0	2.1	2.3	2.4	2.5	2.6	2.7
ICM20-C		5.3	3.9	4.1	4.3	4.5	4.7	4.9	5.0
ICM25-A	25	7	5.1	5.4	5.6	5.9	6.2	6.4	6.7
ICM25-B		14	10.2	10.7	11.3	11.8	12.3	12.8	13.3
ICM32-A	32	10	7.3	7.7	8.0	8.4	8.8	9.2	9.5
ICM32-B		20	14.5	15.3	16.1	16.9	17.6	18.3	19.0
ICM40-A	40	17	12.4	13.0	13.7	14.3	15.0	15.6	16.2
ICM40-B		30	21.8	23.0	24.1	25.3	26.4	27.5	28.5
ICM50-A	50	27	19.6	20.7	21.7	22.8	23.8	24.7	25.7
ICM50-B		46	33.4	35.3	37.0	38.8	40.5	42.1	43.7
ICM65-A	65	41	30	31	33	35	36	37	39
ICM65-B		81	58.9	62.1	65.2	68.3	71.3	74.2	77.0
ICM100	100	165	120	126	134	140	145	151	158
ICM125	125	259	188	197	210	219	228	236	248
ICM150	150	430	312	328	348	364	379	393	411

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°F]	Correction factor
120	0.95
140	0.97
180	**1.00**
200	1.02
210	1.02
230	1.04
250	1.05

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.64
10	0.68
30	0.74
50	0.81
70	0.89
90	**1.00**
110	1.15
130	1.35

Nominal capacities

Discharge line

SI units

Capacity table at nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
Δp = 0.2 bar,
$P_{disch.}$ = 12 bar,
$T_{disch.}$ = 80 °C
Superheating = 8 °C

R 404A

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	1.8	1.9	2.0	2.1	2.2	2.4	2.5	2.5
ICM20-A		0.6	5.3	5.7	6.0	6.4	6.7	7.1	7.4	7.6
ICM20-B		2.4	21.2	22.6	24.1	25.5	26.9	28.2	29.5	30.5
ICM20-C		4.6	40.6	43.4	46.2	48.9	51.5	54.1	56.4	58.6
ICM25-A	25	6	53.0	56.6	60.3	63.8	67.2	70.5	73.6	76.4
ICM25-B		12	106	113	121	128	134	141	147	153
ICM32-A	32	9	79.5	84.9	90.4	95.7	101	106	110	115
ICM32-B		17	150	160	171	181	190	200	209	216
ICM40-A	40	15	132	141	151	159	168	176	184	191
ICM40-B		26	230	245	261	276	291	306	319	331
ICM50-A	50	23	203	217	231	244	258	270	282	293
ICM50-B		40	353	377	402	425	448	470	491	509
ICM65-A	65	35	309	330	352	372	392	412	430	445
ICM65-B		70	618	660	703	744	784	823	859	891
ICM100	100	142	1254	1339	1427	1510	1590	1670	1743	1807
ICM125	125	223	1969	2103	2240	2371	2497	2623	2737	2838
ICM150	150	370	3267	3489	3717	3934	4142	4352	4541	4709

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.05	2.00
0.1	1.41
0.2	**1.00**
0.3	0.82
0.4	0.71
0.5	0.63

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°C]	Correction factor
50	0.96
60	0.97
80	**1.00**
90	1.01
100	1.03
110	1.04
120	1.06

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°C]	Correction factor
-20	0.55
-10	0.60
0	0.66
10	0.74
20	0.85
30	**1.00**
40	1.23
50	1.68

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
Δp = 3 psi,
$P_{disch.}$ = 120 psi,
$T_{disch.}$ = 180 °F
Superheating = 12 °F

R 404A

Typ	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.15	0.16	0.17	0.19	0.20	0.21	0.22	0.23
ICM20-A		0.7	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.7
ICM20-B		2.8	1.8	2.0	2.1	2.3	2.4	2.5	2.7	2.8
ICM20-C		5.3	3.5	3.7	4.0	4.3	4.6	4.8	5.0	5.2
ICM25-A	25	7	4.6	5.0	5.3	5.7	6.0	6.4	6.6	6.9
ICM25-B		14	9.2	9.9	10.6	11.4	12.0	12.7	13.3	13.8
ICM32-A	32	10	6.5	7.1	7.6	8.1	8.6	9.1	9.5	9.9
ICM32-B		20	13.1	14.1	15.2	16.2	17.2	18.1	19.0	19.7
ICM40-A	40	17	11.1	12.0	12.9	13.8	14.6	15.4	16.1	16.8
ICM40-B		30	19.6	21.2	22.8	24.3	25.8	27.2	28.5	29.6
ICM50-A	50	27	17.7	19.1	20.5	21.9	23.2	24.5	25.6	26.6
ICM50-B		46	30.1	32.5	35.0	37.3	39.6	41.7	43.7	45.4
ICM65-A	65	41	27	29	31	33	35	37	39	41
ICM65-B		81	53.0	57.3	61.6	65.7	69.7	73.5	76.9	79.9
ICM100	100	165	109	117	124	135	142	149	157	163
ICM125	125	259	171	183	195	211	223	234	247	256
ICM150	150	430	283	304	324	351	370	388	410	425

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.75	1.97
1.5	1.39
3	**1.00**
3.5	0.91
4	0.85
4.5	0.81

Correction factor for discharge temperature (T_{disch}).

Discharge temperature	Correction factor
120	0.95
140	0.97
180	**1.00**
200	1.02
210	1.02
230	1.04
250	1.05

Correction factor for liquid temperature (T_{liq})

Liquid temperature [°F]	Correction factor
-10	0.52
10	0.57
30	0.63
50	0.72
70	0.83
90	**1.00**
110	1.29
130	1.92

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Nominal capacities

SI units

Capacity table at nominal conditions, Q_N [kW],
T_{liq} = 30 °C,
Δp = 0.2 bar,
$P_{disch.}$ = 12 bar,
$T_{disch.}$ = 80 °C
Superheating = 8 °C

R 22

Discharge line

Type	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			-50	-40	-30	-20	-10	0	10	20
ICM20A-33	20	0.2	0.76	0.78	0.80	0.83	0.84	0.87	0.89	0.90
ICM20-A		0.6	2.3	2.3	2.4	2.5	2.5	2.6	2.7	2.7
ICM20-B		2.4	9.1	9.3	9.6	9.9	10.1	10.4	10.6	10.8
ICM20-C		4.6	17.3	17.9	18.4	19.0	19.5	19.9	20.4	20.8
ICM25-A	25	6	22.6	23.4	24.0	24.7	25.4	26.0	26.6	27.1
ICM25-B		12	45.3	46.7	48.1	49.5	50.7	51.9	53.1	54.2
ICM32-A	32	9	33.9	35.0	36.1	37.1	38.1	39.0	39.9	40.6
ICM32-B		17	64.1	66.2	68.1	70.1	71.9	73.6	75.3	76.7
ICM40-A	40	15	56.6	58.4	60.1	61.8	63.4	64.9	66.4	67.7
ICM40-B		26	98.1	101	104	107	110	113	115	117
ICM50-A	50	23	86.7	89.5	92.2	94.8	97.3	100	102	104
ICM50-B		40	151	156	160	165	169	173	177	181
ICM65-A	65	35	132	136	140	144	148	152	155	158
ICM65-B		70	264	273	281	289	296	303	310	316
ICM100	100	142	536	552	569	586	600	615	630	641
ICM125	125	223	842	867	893	920	942	966	989	1006
ICM150	150	370	1398	1438	1482	1527	1563	1603	1641	1670

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

Correction factor for discharge temperature (T_{disch}).

Discharge temperature [°C]	Correction factor
50	0.96
60	0.97
80	**1.00**
90	1.01
100	1.03
110	1.04
120	1.06

Correction factor for liquid temperature (T_{liq}).

Liquid temperature [°C]	Correction factor
-20	0.71
-10	0.75
0	0.80
10	0.86
20	0.92
30	**1.00**
40	1.09
50	1.22

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90 °F,
Δp = 3 psi,
$P_{disch.}$ = 120 psi,
$T_{disch.}$ = 180 °F
Superheating = 12 °F

R 22

Typ	Valve body size	C_v [USgal/min]	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.21	0.22	0.23	0.23	0.24	0.24	0.25	0.26
ICM20-A		0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8
ICM20-B		2.8	2.6	2.6	2.7	2.8	2.9	3.0	3.0	3.1
ICM20-C		5.3	4.8	5.0	5.2	5.3	5.5	5.6	5.8	5.9
ICM25-A	25	7	6.4	6.6	6.8	7.1	7.3	7.4	7.6	7.8
ICM25-B		14	12.8	13.2	13.7	14.1	14.5	14.9	15.2	15.6
ICM32-A	32	10	9.1	9.5	9.8	10.1	10.4	10.6	10.9	11.1
ICM32-B		20	18.2	18.9	19.6	20.2	20.7	21.3	21.8	22.2
ICM40-A	40	17	15.5	16.1	16.6	17.1	17.6	18.1	18.5	18.9
ICM40-B		30	27.4	28.4	29.3	30.3	31.1	31.9	32.7	33.3
ICM50-A	50	27	24.6	25.5	26.4	27.2	28.0	28.7	29.4	30.0
ICM50-B		46	42.0	43.5	45.0	46.4	47.7	49.0	50.1	51.1
ICM65-A	65	41	37	39	40	41	42	43	45	46
ICM65-B		81	73.9	76.6	79.2	81.7	84.0	86.2	88.2	90.0
ICM100	100	165	150	157	161	166	171	175	180	184
ICM125	125	259	235	246	253	261	268	274	283	288
ICM150	150	430	391	408	421	433	445	455	470	479

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for discharge temperature (T_{disch}).

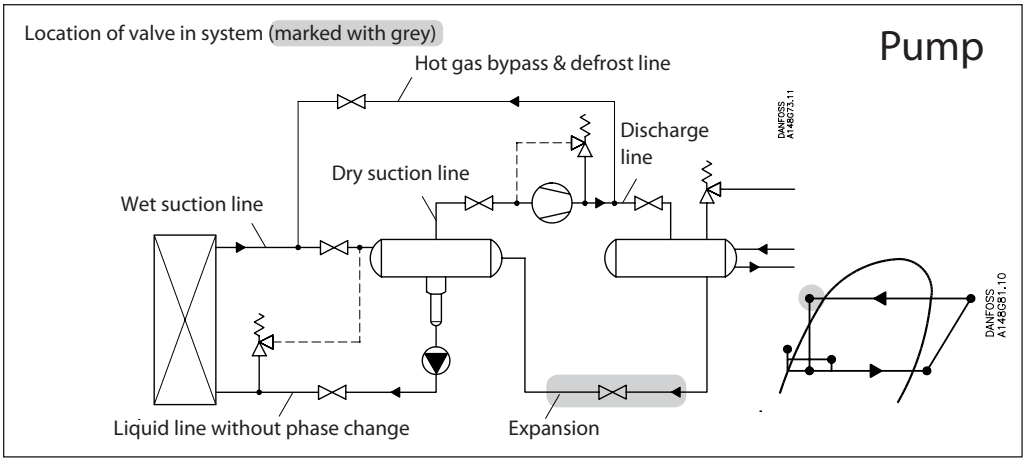
Discharge temperature [°F]	Correction factor
120	0.95
140	0.97
180	**1.00**
200	1.02
210	1.02
230	1.04
250	1.05

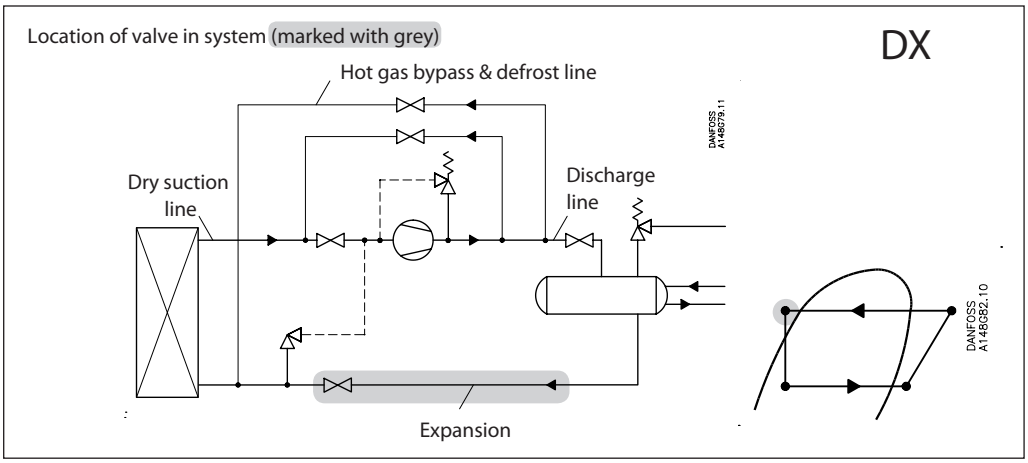
Correction factor for liquid temperature (T_{liq}).

Liquid temperature [°F]	Correction factor
-10	0.73
10	0.77
30	0.82
50	0.87
70	0.93
90	**1.00**
110	1.09
130	1.20

Nominal capacities

Expansion - ICM





Correction factors
When dimensioning, multiply the evaporator capacity by a correction factor k dependent on the subcooling Δt_{sub} just ahead of the valve.
The corrected capacity* can then be found in the capacity table.

Correction factors for subcooling

Subcooling K	2	4	10	15	20	25	30	35	40
R717	1.01	1	0.98	0.96	0.94	0.92	0.91	0.89	0.87
R744	1.02	1	0.95	0.90	0.86	0.82	0.79	0.75	0.73
R134a	1.03	1	0.93	0.88	0.84	0.80	0.76	0.73	0.70
R404A	1.04	1	0.91	0.83	0.78	0.73	0.68	0.65	0.61
R22	1.03	1	0.94	0.90	0.87	0.83	0.80	0.77	0.74

* The capacity table is based on nominal conditions of subcooling just ahead of the valve of 4°K.

Calculation example:
An application has the following operating conditions:

Refrigerant R717
T_e = -10 °C
T_c = 30 °C
Q_0 = 1500 kW
Δt_{sub} = 20 °K

Correction factor for subcooling: 0.94

Pressure drop across the valve:
11.7 bar - 2.9 bar = 8.8 bar

Corrected capacity: 1500 x 0.94 = 1410 kW

From the R717 capacity table ICM 20-C is selected with Q_{nom} capacity 1990 kW at 8 bar.

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Expansion

R 717

Capacities for nominal conditions, Q_n (kW)

Type			Pressure drop across valve Δp bar						Pressure drop across valve Δp bar					
			1	2	4	8	12	16	1	2	4	8	12	16
		K_v	Evaporating temperature 10 °C						Evaporating temperature 0 °C					
ICM20-A33	DN20	0.2	28.5	39.5	53.9	71.8	83.5	92.2	29.6	40.8	55.4	73.1	84.7	93.3
ICM20-A	DN20	0.6	85.9	119	163	217	253	279	89	123	167	221	256	282
ICM20-B	DN20	2.4	498	686	930	1230	1435	1587	515	705	950	1245	1450	1594
ICM20-C	DN20	4.6	824	1124	1507	1990	2310	2550	850	1145	1525	2000	2320	2560
ICM25-A	DN25	6	1274	1739	2337	3080	3575	3970	1310	1773	2370	3100	3600	3980
ICM32-A	DN32	9	1834	2515	3400	4490	5220	5775	1890	2580	3450	4530	5250	5790
ICM40-A	DN40	15	3410	4630	6200	8150	9450	10450	3500	4700	6250	8170	9480	10450
ICM50-A	DN50	23	5960	8050	10750	14100	16300	18100	6100	8150	10800	14100	16300	18100
ICM65-A	DN65	35	9793	13270	17686	23178	26940	29745	10034	13431	17749	23194	26914	29749
			Evaporating temperature -10 °C						Evaporating temperature -20 °C					
ICM20-A33	DN20	0.2	30.5	41.9	56.4	74	85.4	93.8	31.3	42.7	57.2	74.5	85.6	93.8
ICM20-A	DN20	0.6	92	127	170	224	258	284	94.5	129	172	224	258	284
ICM20-B	DN20	2.4	527	715	955	1253	1452	1594	535	718	957	1250	1450	1594
ICM20-C	DN20	4.6	859	1152	1520	1990	2310	2550	860	1140	1505	1975	2290	2525
ICM25-A	DN25	6	1332	1780	2360	3090	3590	3960	1332	1770	2345	3070	3570	3940
ICM32-A	DN32	9	1930	2600	3450	4520	5240	5780	1935	2590	3440	4510	5220	5750
ICM40-A	DN40	15	3550	4715	6220	8140	9450	10430	3520	4650	6140	8050	9350	10350
ICM50-A	DN50	23	6150	8150	10700	14000	16300	18000	6070	8000	10550	13850	16100	17800
ICM65-A	DN65	35	10118	13393	17640	23065	26784	29613	29353	13181	17379	22806	26524	29354
			Evaporating temperature -30 °C						Evaporating temperature -40 °C					
ICM20-A33	DN20	0.2	31.8	43.2	57.5	74.5	85.4	93.3	32.3	43.5	57.5	74.2	84.8	92.5
ICM20-A	DN20	0.6	96	130	173	225	258	282	97	131	173	224	256	280
ICM20-B	DN20	2.4	532	716	950	1240	1435	1580	527	705	940	1230	1420	1555
ICM20-C	DN20	4.6	840	1111	1480	1950	2270	2505	815	1085	1448	1920	2230	2470
ICM25-A	DN25	6	1310	1740	2310	3030	3530	3880	1270	1690	2270	2990	3480	3830
ICM32-A	DN32	9	1920	2560	3400	4460	5150	5700	1870	2500	3350	4400	5100	5630
ICM40-A	DN40	15	3430	4530	6030	7950	9250	10200	3300	4400	5900	7820	9120	10100
ICM50-A	DN50	23	5900	7800	10350	13650	15900	17600	5670	7550	10150	13400	15700	17400
ICM65-A	DN65	35	9732	12842	17045	22491	26193	28997	9364	12465	16707	22144	25832	28581
			Evaporating temperature -50 °C											
ICM20-A33	DN20	0.2	32.5	43.5	57.3	73.5	83.9	91.4						
ICM20-A	DN20	0.6	97.5	131	172	222	253	276						
ICM20-B	DN20	2.4	512	690	925	1210	1400	1535						
ICM20-C	DN20	4.6	780	1055	1425	1890	2200	2430						
ICM25-A	DN25	6	1220	1650	2220	2950	3420	3780						
ICM32-A	DN32	9	1810	2450	3280	4325	5030	5540						
ICM40-A	DN40	15	3170	4280	5800	7710	8950	9900						
ICM50-A	DN50	23	5430	7350	9900	13200	15400	17100						
ICM65-A	DN65	35	8659	12096	16354	21774	25423	28137						

Expansion

R 717

Capacities for nominal conditions, Q_n (TR)

Type			Pressure drop across valve Δp psi					
			15	30	60	120	180	240
		C_v	**Evaporating temperature 60 °F**					
ICM20-A33	DN20	0.2	8.1	11.2	15.3	20.4	23.8	26.3
ICM20-A	DN20	0.7	24.5	33.9	46.3	61.8	72	79.3
ICM20-B	DN20	2.8	142	196	265	352	410	451
ICM20-C	DN20	5.3	235	321	432	570	660	730
ICM25-A	DN25	7	363	497	670	880	1025	1130
ICM32-A	DN32	10	523	720	970	1280	1490	1645
ICM40-A	DN40	17	975	1325	1780	2330	2705	3000
ICM50-A	DN50	27	1695	2310	3070	4030	4690	5170
ICM65-A	DN65	41	2790	3789	5061	6643	7708	8517
			Evaporating temperature 20 °F					
ICM20-A33	DN20	0.2	8.7	12	16.2	21.2	24.5	26.9
ICM20-A	DN20	0.7	26.3	36.2	48.8	64	74	81.4
ICM20-B	DN20	2.8	151	206	275	360	416	459
ICM20-C	DN20	5.3	248	332	439	574	665	734
ICM25-A	DN25	7	383	515	681	888	1030	1135
ICM32-A	DN32	10	553	746	993	1299	1510	1657
ICM40-A	DN40	17	1020	1360	1795	2346	2715	3005
ICM50-A	DN50	27	1770	2350	3100	4040	4680	5170
ICM65-A	DN65	41	2907	3862	5089	6647	7711	8518
			Evaporating temperature -20 °F					
ICM20-A33	DN20	0.2	9.2	12.5	16.6	21.4	24.6	26.8
ICM20-A	DN20	0.7	27.7	37.5	50	64.5	74	81
ICM20-B	DN20	2.8	154	206	274	357	413	454
ICM20-C	DN20	5.3	244	323	428	560	653	720
ICM25-A	DN25	7	380	503	665	875	1015	1120
ICM32-A	DN32	10	555	740	978	1285	1485	1635
ICM40-A	DN40	17	995	1315	1740	2290	2660	2945
ICM50-A	DN50	27	1720	2255	2985	3930	4570	5050
ICM65-A	DN65	41	2817	3712	4921	6481	7539	8338
			Evaporating temperature -60 °F					
ICM20-A33	DN20	0.2	9.4	12.6	16.5	21.1	24.1	26.2
ICM20-A	DN20	0.7	28.1	37.6	49.5	63.7	72.5	79
ICM20-B	DN20	2.8	147	199	266	347	400	440
ICM20-C	DN20	5.3	225	304	410	544	630	695
ICM25-A	DN25	7	352	475	640	845	980	1080
ICM32-A	DN32	10	520	703	943	1246	1440	1585
ICM40-A	DN40	17	910	1230	1660	2210	2570	2850
ICM50-A	DN50	27	1560	2110	2850	3800	4430	4900
ICM65-A	DN65	41	2567	3474	4699	6251	7292	8063

Pressure drop across valve Δp psi					
15	30	60	120	180	240
Evaporating temperature 40 °F					
8.4	11.6	15.8	20.9	24.2	26.7
25.3	35	47.6	63	73	80.4
147	201	271	358	415	458
243	328	438	574	665	735
375	510	680	888	1030	1140
539	735	985	1294	1500	1655
1000	1350	1800	2344	2715	3010
1745	2350	3100	4050	4700	5200
2863	3852	5104	6671	7736	8545
Evaporating temperature 0 °F					
9	12.3	16.4	21.4	24.6	26.9
27.1	37	49.5	64.5	74.3	81.5
154	207	276	360	416	458
249	330	435	570	660	728
385	513	678	884	1025	1130
560	747	990	1293	1500	1650
1022	1345	1775	2325	2700	2970
1770	2320	3050	4000	4650	5130
2895	3812	5019	6576	7639	8446
Evaporating temperature -40 °F					
9.3	12.6	16.6	21.3	24.4	26.6
28	37.8	50	64.3	73.5	79.9
152	203	270	353	408	446
235	313	418	553	642	710
366	488	653	860	1000	1100
540	723	965	1265	1465	1610
955	1270	1700	2250	2615	2900
1640	2180	2920	3870	4500	4990
2696	3590	4809	6368	7422	8209

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Expansion

R 744

Capacities for nominal conditions, Q_n (kW)

Type			Pressure drop across valve Δp bar					
			1	2	4	8	12	16
		K_v	**Evaporating temperature 10 °C**					
ICM20-A33	DN20	0.2	6.1	8.6	11.9	15.9	18.4	20
ICM20-A	DN20	0.6	18.7	26.2	36.1	48.3	56	61
ICM20-B	DN20	2.4	109	152	209	280	324	353
ICM20-C	DN20	4.6	180	251	347	465	535	583
ICM25-A	DN25	6	277	389	535	718	826	900
ICM32-A	DN32	9	400	560	770	1030	1190	1300
ICM40-A	DN40	15	743	1040	1435	1920	2215	2400
ICM50-A	DN50	23	1295	1810	2500	3340	3850	4180
ICM65-A	DN65	35	2116	2964	4086	5458	6297	6836
			Evaporating temperature -10 °C					
ICM20-A33	DN20	0.2	8.1	11.4	15.7	21	24.4	27
ICM20-A	DN20	0.6	24.7	34.5	47.5	63.6	74	81
ICM20-B	DN20	2.4	143	200	275	368	428	470
ICM20-C	DN20	4.6	238	331	455	608	705	770
ICM25-A	DN25	6	368	513	705	940	1090	1195
ICM32-A	DN32	9	528	735	1015	1355	1570	1720
ICM40-A	DN40	15	980	1370	1880	2510	2910	3180
ICM50-A	DN50	23	1710	2380	3280	4380	5050	5550
ICM65-A	DN65	35	2808	3916	5383	7173	8306	9083
			Evaporating temperature -30 °C					
ICM20-A33	DN20	0.2	9.8	13.6	18.6	24.8	28.7	31.3
ICM20-A	DN20	0.6	29.7	41	56.3	75	86.8	95
ICM20-B	DN20	2.4	172	238	325	432	500	545
ICM20-C	DN20	4.6	285	395	536	710	820	895
ICM25-A	DN25	6	440	610	828	1100	1270	1380
ICM32-A	DN32	9	632	880	1195	1585	1830	2000
ICM40-A	DN40	15	1175	1630	2220	2920	3370	3680
ICM50-A	DN50	23	2050	2850	3850	5080	5850	6400
ICM65-A	DN65	35	3369	4673	6337	8350	9616	10492
			Evaporating temperature -50 °C					
ICM20-A33	DN20	0.2	11	15.2	20.7	27.2	31.3	34
ICM20-A	DN20	0.6	33.3	46	62.5	82.5	94.8	103
ICM20-B	DN20	2.4	193	266	359	472	540	588
ICM20-C	DN20	4.6	319	438	587	765	880	955
ICM25-A	DN25	6	494	678	910	1190	1360	1480
ICM32-A	DN32	9	710	980	1320	1720	1980	2155
ICM40-A	DN40	15	1320	1810	2420	3150	3610	3940
ICM50-A	DN50	23	2300	3150	4210	5450	6250	6800
ICM65-A	DN65	35	3781	5179	6917	8989	10290	11193

Pressure drop across valve Δp bar					
1	2	4	8	12	16
Evaporating temperature 0 °C					
7.4	10.2	14	18.7	21.7	23.7
22.4	31	42.5	56.8	66	72
130	179	246	329	381	417
215	297	408	542	630	686
333	460	630	838	975	1065
478	660	905	1210	1400	1530
890	1230	1680	2250	2600	2830
1550	2140	2940	3900	4530	4750
2541	3509	4808	6407	7408	8084
Evaporating temperature -20 °C					
9	12.5	17.1	23	26.7	29.3
27.1	37.8	52	69.6	81	88.5
157	219	302	402	468	512
260	363	497	665	770	840
402	563	770	1025	1190	1300
580	810	1110	1480	1715	1880
1075	1500	2060	2740	3160	3470
1870	2620	3580	4750	5500	6030
3080	4300	5890	7821	9039	9880
Evaporating temperature -40 °C					
10.7	14.6	19.8	26.2	30.2	32.9
32.1	44	60	79	91.2	99.5
186	256	345	455	525	571
308	422	570	745	855	930
478	655	880	1155	1325	1444
685	940	1270	1670	1915	2090
1275	1750	2350	3060	3530	3830
2220	3050	4080	5330	6100	6650
3657	5003	6705	8751	10040	10934

Expansion

R 744

Capacities for nominal conditions, Q_n (TR)

Type			Pressure drop across valve Δp psi					
			15	30	60	120	180	240
		C_v	**Evaporating temperature 60 °F**					
ICM20-A33	DN20	0.2	1.58	2.21	3.05	4.05	4.64	5
ICM20-A	DN20	0.7	4.8	6.7	9.2	12.3	14.2	15.3
ICM20-B	DN20	2.8	27.8	39	53.7	71.5	82	88.8
ICM20-C	DN20	5.3	46	64.5	89	118	136	146
ICM25-A	DN25	7	71.1	100	137	183	210	226
ICM32-A	DN32	10	102	144	198	264	303	327
ICM40-A	DN40	17	191	267	368	490	561	605
ICM50-A	DN50	27	332	465	640	855	976	1055
ICM65-A	DN65	41	543	762	1048	1393	1594	1713
			Evaporating temperature 20 °F					
ICM20-A33	DN20	0.2	2.27	3.16	4.35	5.82	6.75	7.38
ICM20-A	DN20	0.7	6.8	9.6	13.2	17.7	20.5	22.4
ICM20-B	DN20	2.8	39.9	55.7	76.5	102	118	130
ICM20-C	DN20	5.3	66	92	126	169	195	214
ICM25-A	DN25	7	102	142	196	261	303	330
ICM32-A	DN32	10	147	205	281	376	437	476
ICM40-A	DN40	17	273	381	524	699	805	880
ICM50-A	DN50	27	475	663	910	1215	1400	1535
ICM65-A	DN65	41	781	1088	1495	1990	2300	2510
			Evaporating temperature -20 °F					
ICM20-A33	DN20	0.2	2.78	3.87	5.3	7.05	8.15	8.9
ICM20-A	DN20	0.7	8.4	11.7	16	21.4	24.7	27
ICM20-B	DN20	2.8	48.9	68	93	123	142	155
ICM20-C	DN20	5.3	81	112	153	203	233	255
ICM25-A	DN25	7	125	174	237	313	362	395
ICM32-A	DN32	10	180	250	341	453	523	570
ICM40-A	DN40	17	335	464	633	835	960	1050
ICM50-A	DN50	27	584	810	1100	1450	1670	1820
ICM65-A	DN65	41	958	1332	1809	2383	2741	2987
			Evaporating temperature -60 °F					
ICM20-A33	DN20	0.2	3.19	4.41	5.97	7.84	8.99	9.76
ICM20-A	DN20	0.7	9.6	13.3	18.1	23.7	27.3	29.5
ICM20-B	DN20	2.8	56	77	104	136	156	169
ICM20-C	DN20	5.3	92.8	127	170	221	253	275
ICM25-A	DN25	7	143	197	263	342	391	425
ICM32-A	DN32	10	206	284	380	496	568	618
ICM40-A	DN40	17	383	524	700	907	1040	1130
ICM50-A	DN50	27	667	915	1215	1570	1800	1950
ICM65-A	DN65	41	1099	1499	1996	2587	2956	3211

Type			Pressure drop across valve Δp psi					
			15	30	60	120	180	240
			Evaporating temperature 40 °F					
ICM20-A33	DN20	0.2	1.93	2.71	3.74	5.01	5.8	6.32
ICM20-A	DN20	0.7	5.8	8.2	11.3	15.2	17.6	19.2
ICM20-B	DN20	2.8	33.9	47.6	66	88.3	102	111
ICM20-C	DN20	5.3	56	79	109	146	169	184
ICM25-A	DN25	7	87	122	169	226	261	285
ICM32-A	DN32	10	125	176	242	325	376	410
ICM40-A	DN40	17	232	326	450	603	699	760
ICM50-A	DN50	27	405	570	785	1050	1215	1320
ICM65-A	DN65	41	664	933	1288	1720	1986	2159
			Evaporating temperature 0 °F					
ICM20-A33	DN20	0.2	2.55	3.55	4.86	6.49	7.53	8.23
ICM20-A	DN20	0.7	7.7	10.7	14.7	19.7	22.8	25
ICM20-B	DN20	2.8	44.7	62.3	85.5	114	132	144
ICM20-C	DN20	5.3	74.3	103	141	188	217	237
ICM25-A	DN25	7	115	159	218	290	335	367
ICM32-A	DN32	10	165	230	315	418	485	528
ICM40-A	DN40	17	307	426	585	775	895	975
ICM50-A	DN50	27	535	745	1015	1350	1555	1700
ICM65-A	DN65	41	879	1221	1668	2210	2551	2783
			Evaporating temperature -40 °F					
ICM20-A33	DN20	0.2	3.02	4.17	5.68	7.52	8.64	9.41
ICM20-A	DN20	0.7	9.1	12.6	17.2	22.7	26.2	28.5
ICM20-B	DN20	2.8	53	73.3	99	131	150	164
ICM20-C	DN20	5.3	87.8	121	163	214	245	267
ICM25-A	DN25	7	135	187	253	331	380	414
ICM32-A	DN32	10	195	270	365	480	549	600
ICM40-A	DN40	17	362	500	675	878	1010	1100
ICM50-A	DN50	27	633	870	1170	1530	1750	1900
ICM65-A	DN65	41	1040	1431	1923	2510	2877	3129

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Expansion

Capacities for nominal conditions, Q_n (kW)

R 134a

Type		K_v	Pressure drop across valve Δp bar 1	2	4	8	12	16	Pressure drop across valve Δp bar 1	2	4	8	12	16
			Evaporating temperature 10 °C						**Evaporating temperature 0 °C**					
ICM20-A33	DN20	0.2	6.4	8.6	11.1	13.4	14.1	14	6.6	8.9	11.3	13.5	14.1	14
ICM20-A	DN20	0.6	19.4	26	33.6	40.5	42.7	42.5	20.1	26.8	34.3	40.8	42.5	42.1
ICM20-B	DN20	2.4	112	149	192	230	243	242	116	153	194	231	242	240
ICM20-C	DN20	4.6	184	243	310	370	392	391	189	247	311	370	389	388
ICM25-A	DN25	6	285	377	480	575	607	606	292	383	482	575	604	602
ICM32-A	DN32	9	410	545	699	835	885	883	422	555	703	835	880	875
ICM40-A	DN40	15	760	1000	1270	1520	1610	1605	775	1015	1270	1515	1596	1590
ICM50-A	DN50	23	1320	1730	2200	2620	2770	2785	1350	1750	2200	2610	2750	2740
ICM65-A	DN65	35	2169	2847	3606	4304	4550	4551	2215	2877	3612	4285	4508	4492
			Evaporating temperature -10 °C						**Evaporating temperature -20 °C**					
ICM20-A33	DN20	0.2	6.9	9.1	11.5	13.4	13.9	13.7	7	9.2	11.4	13.3	13.6	13.3
ICM20-A	DN20	0.6	20.7	27.4	34.5	40.5	42	41.5	21.1	27.6	34.5	40	41.1	40.1
ICM20-B	DN20	2.4	118	154	194	229	238	235	119	154	193	225	233	228
ICM20-C	DN20	4.6	191	247	310	365	381	379	190	244	305	357	372	365
ICM25-A	DN25	6	296	383	481	568	593	587	295	380	474	555	575	568
ICM32-A	DN32	9	430	559	702	826	865	855	430	555	695	810	840	826
ICM40-A	DN40	15	785	1013	1265	1490	1565	1550	775	995	1240	1460	1520	1495
ICM50-A	DN50	23	1360	1740	2180	2570	2700	2670	1340	1710	2130	2510	2620	2590
ICM65-A	DN65	35	2229	2866	3579	4222	4420	4384	2203	2818	3509	4124	4296	4235
			Evaporating temperature -30 °C						**Evaporating temperature -40 °C**					
ICM20-A33	DN20	0.2	7.1	9.2	11.3	13	13.2	12.8	7.1	9.1	11.1	12.6	12.7	12.1
ICM20-A	DN20	0.6	21.3	27.6	34.2	39.1	40	38.7	21.4	27.5	33.6	38	38.3	36.8
ICM20-B	DN20	2.4	118	152	189	219	225	218	116	149	184	211	216	208
ICM20-C	DN20	4.6	186	238	297	347	357	350	180	231	288	335	342	333
ICM25-A	DN25	6	290	372	463	540	555	545	280	361	448	520	532	516
ICM32-A	DN32	9	425	545	680	790	812	792	415	532	660	760	780	755
ICM40-A	DN40	15	760	970	1210	1415	1465	1430	730	940	1175	1360	1410	1358
ICM50-A	DN50	23	1305	1670	2080	2440	2530	2480	1260	1610	2010	2350	2420	2350
ICM65-A	DN65	35	2146	2744	3417	3998	4141	4054	2068	2654	3310	3853	3964	3849

Expansion

Capacities for nominal conditions, Q_n (TR)

R 134a

Type			Pressure drop across valve Δp psi					
			15	30	60	120	180	240
		C_v	**Evaporating temperature 60 °F**					
ICM20-A33	DN20	0.2	1.8	2.42	3.13	3.76	3.96	3.93
ICM20-A	DN20	0.7	5.5	7.3	9.5	11.4	12	11.9
ICM20-B	DN20	2.8	31.5	42	54.1	65	68.5	68.2
ICM20-C	DN20	5.3	52	69	88	105	111	111
ICM25-A	DN25	7	80.3	106	136	163	172	171
ICM32-A	DN32	10	116	154	198	237	250	249
ICM40-A	DN40	17	214	284	360	431	455	454
ICM50-A	DN50	27	373	493	625	745	787	787
ICM65-A	DN65	41	612	808	1026	1225	1292	1287
			Evaporating temperature 20 °F					
ICM20-A33	DN20	0.2	1.95	2.58	3.26	3.82	3.93	3.87
ICM20-A	DN20	0.7	5.9	7.8	9.9	11.6	12	11.8
ICM20-B	DN20	2.8	33.6	44.3	55.5	65.5	68	66.7
ICM20-C	DN20	5.3	54.8	71	88.5	105	109	108
ICM25-A	DN25	7	85	110	138	162	169	167
ICM32-A	DN32	10	123	160	201	237	247	243
ICM40-A	DN40	17	225	291	363	428	447	442
ICM50-A	DN50	27	390	503	625	737	770	760
ICM65-A	DN65	41	640	824	1029	1211	1264	1249
			Evaporating temperature -20 °F					
ICM20-A33	DN20	0.2	2.03	2.63	3.24	3.69	3.74	3.59
ICM20-A	DN20	0.7	6.1	7.9	9.8	11.2	11.3	10.9
ICM20-B	DN20	2.8	34	43.9	54.3	62.6	64	61.8
ICM20-C	DN20	5.3	53.5	68.5	85.3	99	102	99
ICM25-A	DN25	7	83.5	107	132	154	158	154
ICM32-A	DN32	10	122	157	195	225	231	224
ICM40-A	DN40	17	219	280	347	405	416	405
ICM50-A	DN50	27	377	480	597	695	720	710
ICM65-A	DN65	41	618	790	981	1144	1179	1148

Pressure drop across valve Δp psi					
15	30	60	120	180	240
Evaporating temperature 40 °F					
1.88	2.51	3.21	3.82	3.99	3.93
5.7	7.6	9.7	11.6	12.1	11.9
32.7	43.5	55.3	65.8	68.8	68
53.6	70.5	89	106	111	110
83	109	138	164	172	170
120	158	201	238	250	248
222	289	364	432	455	452
385	500	630	745	785	780
631	823	1035	1226	1287	1278
Evaporating temperature 0 °F					
2	2.62	3.27	3.78	3.87	3.75
6	7.9	9.9	11.4	11.7	11.4
34.1	44.4	55.4	64.2	66.2	64.5
54.8	70.2	87.5	102	106	104
85	109	136	159	164	161
124	160	199	232	240	235
224	287	357	418	433	425
387	495	615	720	747	735
634	813	1010	1183	1227	1204
Evaporating temperature -40 °F					
2.04	2.61	3.18	3.57	3.58	3.4
6.1	7.8	9.6	10.8	10.8	10.3
33.3	42.7	52.8	60.1	61	58.5
51.7	66.6	82.5	95	97	93.7
80.7	103.3	128	148	151	145
119	153	189	217	220	212
211	270	336	388	397	383
362	463	575	667	685	660
594	762	948	1098	1123	1082

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Expansion

R 404A

Capacities for nominal conditions, Q_n (kW)

Type			Pressure drop across valve Δp bar					
			1	2	4	8	12	16
		K_v	**Evaporating temperature 10 °C**					
ICM20-A33	DN20	0.2	5.2	7.1	9.2	11.2	11.7	11.3
ICM20-A	DN20	0.6	15.7	21.3	27.8	33.8	35.3	34.5
ICM20-B	DN20	2.4	91	123	160	194	203	198
ICM20-C	DN20	4.6	150	203	263	315	330	322
ICM25-A	DN25	6	233	313	406	490	510	500
ICM32-A	DN32	9	335	452	589	710	740	723
ICM40-A	DN40	15	621	835	1080	1300	1360	1323
ICM50-A	DN50	23	1085	1455	1880	2250	2350	2300
ICM65-A	DN65	35	1779	2388	3075	3687	3848	3755
			Evaporating temperature -10 °C					
ICM20-A33	DN20	0.2	5.8	7.8	10	11.9	12.4	12
ICM20-A	DN20	0.6	17.4	23.5	30.3	36.1	37.5	36.5
ICM20-B	DN20	2.4	101	135	173	206	214	209
ICM20-C	DN20	4.6	166	220	280	333	345	338
ICM25-A	DN25	6	257	340	435	515	535	525
ICM32-A	DN32	9	370	493	629	748	778	760
ICM40-A	DN40	15	685	904	1150	1360	1420	1390
ICM50-A	DN50	23	1190	1570	1990	2350	2450	2400
ICM65-A	DN65	35	1958	2581	3266	3864	4019	3928
			Evaporating temperature -30 °C					
ICM20-A33	DN20	0.2	6.2	8.3	10.4	12	12.3	11.8
ICM20-A	DN20	0.6	18.7	24.7	31.3	36.5	37.3	35.8
ICM20-B	DN20	2.4	107	140	176	205	211	204
ICM20-C	DN20	4.6	173	225	281	329	338	328
ICM25-A	DN25	6	269	349	437	510	525	508
ICM32-A	DN32	9	389	508	637	745	765	742
ICM40-A	DN40	15	711	922	1150	1345	1385	1340
ICM50-A	DN50	23	1235	1590	1980	2320	2390	2320
ICM65-A	DN65	35	2029	2611	3253	3801	3920	3803
			Evaporating temperature -50 °C					
ICM20-A33	DN20	0.2	6.5	8.3	10.2	11.6	11.6	10.9
ICM20-A	DN20	0.6	19.5	25	30.9	35	35.1	33.2
ICM20-B	DN20	2.4	108	138	171	196	198	188
ICM20-C	DN20	4.6	170	215	268	310	315	301
ICM25-A	DN25	6	265	335	418	484	490	468
ICM32-A	DN32	9	388	493	613	705	715	680
ICM40-A	DN40	15	695	875	1090	1270	1290	1230
ICM50-A	DN50	23	1195	1505	1880	2180	2230	2130
ICM65-A	DN65	35	1968	2475	3088	3585	3650	3487

Pressure drop across valve Δp bar					
1	2	4	8	12	16
Evaporating temperature 0 °C					
5.5	7.5	9.7	11.6	12.1	11.8
16.6	22.5	29.3	35.2	36.8	35.9
96.5	130	168	201	210	205
159	213	273	327	341	333
246	329	423	508	528	518
354	475	612	733	766	750
659	876	1123	1340	1400	1370
1145	1525	1950	2330	2430	2380
1881	2503	3198	3810	3973	3886
Evaporating temperature -20 °C					
6.1	8.1	10.3	12.1	12.4	12
18.2	24.3	31	36.5	37.7	36.5
105	139	176	207	214	208
172	225	283	333	345	335
265	348	439	515	535	520
384	506	640	750	778	755
706	920	1160	1360	1410	1375
1230	1600	2000	2350	2435	2380
2017	2621	3284	3857	3997	3896
Evaporating temperature -40 °C					
6.4	8.3	10.4	11.9	12	11.4
19.2	25	31.3	35.8	36.3	34.7
109	140	174	202	205	197
173	221	276	320	328	316
269	345	428	499	510	490
393	503	628	730	745	715
711	902	1130	1310	1340	1295
1225	1555	1940	2255	2320	2240
2014	2557	3190	3808	3801	3662

Expansion

R 404A

Capacities for nominal conditions, Q_n (TR)

Type			Pressure drop across valve Δp psi					
			15	30	60	120	180	240
		C_v	**Evaporating temperature 60 °F**					
ICM20-A33	DN20	0.2	1.44	1.95	2.54	3.07	3.18	3.06
ICM20-A	DN20	0.7	4.4	5.9	7.7	9.3	9.7	9.3
ICM20-B	DN20	2.8	25.2	34.1	44.5	53.5	55.5	53.8
ICM20-C	DN20	5.3	41.8	56.3	73	87.5	91	87.5
ICM25-A	DN25	7	64.5	87	113	135	141	136
ICM32-A	DN32	10	93	125	163	196	204	197
ICM40-A	DN40	17	173	233	300	360	373	360
ICM50-A	DN50	27	300	405	522	625	647	625
ICM65-A	DN65	41	494	664	856	1022	1059	1021
			Evaporating temperature 20 °F					
ICM20-A33	DN20	0.2	1.64	2.2	2.84	3.37	3.48	3.36
ICM20-A	DN20	0.7	4.9	6.6	8.6	10.2	10.6	10.2
ICM20-B	DN20	2.8	28.7	38.4	49.1	58.2	60.5	58.5
ICM20-C	DN20	5.3	47.3	62.6	79.8	94.5	97.5	94.7
ICM25-A	DN25	7	73	97	123	146	151	147
ICM32-A	DN32	10	105	140	179	212	220	213
ICM40-A	DN40	17	195	259	327	387	402	389
ICM50-A	DN50	27	340	448	567	670	694	675
ICM65-A	DN65	41	558	736	931	1098	1137	1104
			Evaporating temperature -20 °F					
ICM20-A33	DN20	0.2	1.78	2.35	2.96	3.42	3.48	3.32
ICM20-A	DN20	0.7	5.4	7.1	8.9	10.4	10.5	10.1
ICM20-B	DN20	2.8	30.8	40.2	50.5	58.7	60	57.5
ICM20-C	DN20	5.3	50	64.5	80.5	93.5	96	92.5
ICM25-A	DN25	7	77.5	100	125	145	149	143
ICM32-A	DN32	10	112	146	183	212	217	209
ICM40-A	DN40	17	205	265	330	383	394	380
ICM50-A	DN50	27	355	457	567	660	678	655
ICM65-A	DN65	41	584	751	933	1085	1113	1072
			Evaporating temperature -60 °F					
ICM20-A33	DN20	0.2	1.86	2.38	2.91	3.27	3.25	3.04
ICM20-A	DN20	0.7	5.6	7.1	8.8	9.9	9.9	9.3
ICM20-B	DN20	2.8	31.1	39.5	48.8	55.6	55.6	52.2
ICM20-C	DN20	5.3	49	61.5	76.7	87.8	89	84
ICM25-A	DN25	7	76.3	96	119	137	138	130
ICM32-A	DN32	10	111	141	175	200	201	190
ICM40-A	DN40	17	200	250	312	360	363	343
ICM50-A	DN50	27	344	430	535	620	628	595
ICM65-A	DN65	41	564	708	881	1016	1027	972

Pressure drop across valve Δp psi					
15	30	60	120	180	240
Evaporating temperature 40 °F					
1.55	2.09	2.71	3.25	3.38	3.26
4.7	6.3	8.2	9.9	10.2	9.9
27.2	36.5	47.3	56.5	58.8	57
45	60	77	92	95.5	92.5
69.5	93	119	143	148	144
100	134	173	207	215	208
186	248	318	377	393	381
325	431	550	655	680	660
532	707	904	1073	1113	1080
Evaporating temperature 0 °F					
1.72	2.28	2.92	3.43	3.51	3.38
5.2	6.9	8.8	10.4	10.6	10.3
29.9	39.5	50.3	59	60.6	58.5
49	64.3	81	95	98	94.5
76	99.5	125	147	152	147
109	144	183	214	221	214
202	264	332	389	401	389
352	457	573	672	694	672
577	751	940	1101	1135	1099
Evaporating temperature -40 °F					
1.82	2.38	2.95	3.37	3.39	3.2
5.5	7.2	8.9	10.2	10.3	9.7
31.2	40.2	50	57.5	58	55.3
50	63.6	79	91.5	93	89
77.5	99	123	142	144	138
113	144	180	207	211	201
204	259	323	373	380	363
353	447	555	643	657	630
571	734	913	1056	1076	1028

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Expansion

R 22

Capacities for nominal conditions, Q_n (kW)

Type			Pressure drop across valve Δp bar					
			1	2	4	8	12	16
		K_v	**Evaporating temperature 10 °C**					
ICM20-A33	DN20	0.2	6.7	9.2	12.2	15.5	17.1	18
ICM20-A	DN20	0.6	20.1	27.6	36.8	46.7	51.7	54.2
ICM20-B	DN20	2.4	117	160	212	268	297	312
ICM20-C	DN20	4.6	193	263	346	435	482	505
ICM25-A	DN25	6	299	406	535	675	746	785
ICM32-A	DN32	9	430	585	777	980	1085	1140
ICM40-A	DN40	15	798	1080	1420	1790	1980	2080
ICM50-A	DN50	23	1390	1880	2470	3100	3430	3600
ICM65-A	DN65	35	2286	3090	4057	5097	5638	5918
			Evaporating temperature -10 °C					
ICM20-A33	DN20	0.2	7.3	9.9	13	16.2	17.7	18.5
ICM20-A	DN20	0.6	21.9	29.8	39	48.8	53.7	55.8
ICM20-B	DN20	2.4	126	170	223	278	305	318
ICM20-C	DN20	4.6	208	277	360	448	493	514
ICM25-A	DN25	6	321	430	557	695	764	796
ICM32-A	DN32	9	463	621	809	1010	1110	1157
ICM40-A	DN40	15	855	1140	1472	1830	2012	2112
ICM50-A	DN50	23	1490	1970	2550	3170	3480	3650
ICM65-A	DN65	35	2449	3247	4192	5205	5730	5999
			Evaporating temperature -30 °C					
ICM20-A33	DN20	0.2	7.7	10.3	13.3	16.3	17.7	18.3
ICM20-A	DN20	0.6	23.2	31	40	49.3	53.5	55.3
ICM20-B	DN20	2.4	132	175	225	277	302	313
ICM20-C	DN20	4.6	212	279	357	443	485	505
ICM25-A	DN25	6	329	433	556	685	752	783
ICM32-A	DN32	9	478	631	812	1000	1095	1140
ICM40-A	DN40	15	873	1140	1465	1810	1980	2070
ICM50-A	DN50	23	1510	1970	2520	3110	3420	3560
ICM65-A	DN65	35	2479	3235	4147	5127	5623	5865
			Evaporating temperature -50 °C					
ICM20-A33	DN20	0.2	7.9	10.4	13.2	15.9	17.1	17.6
ICM20-A	DN20	0.6	23.8	31.3	39.8	48	51.8	53
ICM20-B	DN20	2.4	131	172	220	269	291	300
ICM20-C	DN20	4.6	205	269	346	427	465	480
ICM25-A	DN25	6	320	418	540	663	720	747
ICM32-A	DN32	9	470	615	789	970	1055	1090
ICM40-A	DN40	15	835	1095	1410	1740	1900	1970
ICM50-A	DN50	23	1435	1880	2430	3000	3270	3400
ICM65-A	DN65	35	2370	3097	3989	4931	5390	5593

Pressure drop across valve Δp bar					
1	2	4	8	12	16
Evaporating temperature 0 °C					
7	9.5	12.6	15.9	17.5	18.3
21.1	28.8	38.1	48	53	55.4
122	166	218	274	303	316
201	271	355	443	490	513
312	420	550	687	760	795
448	606	798	998	1100	1155
830	1115	1460	1820	2005	2110
1450	1940	2530	3150	3480	3650
2378	3187	4149	5179	5714	5989
Evaporating temperature -20 °C					
7.5	10.1	13.2	16.3	17.8	18.4
22.7	30.5	39.8	49.3	53.7	55.7
130	174	225	279	305	317
212	280	361	447	490	510
328	435	559	693	760	792
475	630	815	1012	1105	1151
870	1150	1475	1830	2005	2100
1510	1980	2550	3150	3460	3630
2490	3264	4190	5185	5697	5952
Evaporating temperature -40 °C					
7.9	10.4	13.2	16.2	17.5	18
23.6	31.3	40.1	48.8	52.8	54.3
133	174	223	274	298	308
210	275	353	436	475	495
327	428	550	676	740	765
478	626	805	990	1075	1120
860	1120	1440	1780	1940	2020
1480	1930	2480	3070	3350	3500
2443	3178	4078	5041	5520	5743

Expansion

R 22

Capacities for nominal conditions, Q_n (TR)

Type			Pressure drop across valve Δp psi					
			15	30	60	120	180	240
		C_v	**Evaporating temperature 60 °F**					
ICM20-A33	DN20	0.2	1.86	2.55	3.41	4.33	4.8	5.02
ICM20-A	DN20	0.7	5.6	7.7	10.3	13.1	14.5	15.2
ICM20-B	DN20	2.8	32.5	44.6	59.5	75.5	83.6	87.5
ICM20-C	DN20	5.3	54	73.5	97.5	123	136	142
ICM25-A	DN25	7	83.2	114	151	190	210	220
ICM32-A	DN32	10	120	164	218	275	305	320
ICM40-A	DN40	17	223	303	400	505	560	585
ICM50-A	DN50	27	388	528	695	878	970	1015
ICM65-A	DN65	41	638	868	1144	1439	1590	1665
			Evaporating temperature 20 °F					
ICM20-A33	DN20	0.2	2.07	2.8	3.68	4.6	5.03	5.23
ICM20-A	DN20	0.7	6.3	8.5	11.2	13.9	15.2	15.9
ICM20-B	DN20	2.8	36	48.7	63.6	79	87	90.6
ICM20-C	DN20	5.3	59.5	79.5	103	128	140	146
ICM25-A	DN25	7	92	123	160	198	218	227
ICM32-A	DN32	10	133	178	232	289	317	329
ICM40-A	DN40	17	245	326	423	525	575	600
ICM50-A	DN50	27	427	565	730	905	995	1038
ICM65-A	DN65	41	700	930	1201	1489	1637	1709
			Evaporating temperature -20 °F					
ICM20-A33	DN20	0.2	2.21	2.95	3.8	4.65	5.05	5.19
ICM20-A	DN20	0.7	6.7	8.9	11.5	14.1	15.2	15.7
ICM20-B	DN20	2.8	37.9	50.3	64.5	79.2	86.2	89.1
ICM20-C	DN20	5.3	61.3	80.1	103	127	138	144
ICM25-A	DN25	7	95	125	160	197	215	223
ICM32-A	DN32	10	138	182	233	287	314	325
ICM40-A	DN40	17	251	329	421	518	567	590
ICM50-A	DN50	27	435	565	725	895	980	1020
ICM65-A	DN65	41	714	932	1192	1470	1608	1672
			Evaporating temperature -60 °F					
ICM20-A33	DN20	0.2	2.27	2.98	3.78	4.53	4.86	4.96
ICM20-A	DN20	0.7	6.9	9	11.4	13.7	14.7	15
ICM20-B	DN20	2.8	37.7	49.5	63	76.8	83	85
ICM20-C	DN20	5.3	59	77	99	122	132	136
ICM25-A	DN25	7	92	120	154	189	205	212
ICM32-A	DN32	10	135	177	227	276	300	309
ICM40-A	DN40	17	240	314	403	498	540	560
ICM50-A	DN50	27	412	540	695	855	935	965
ICM65-A	DN65	41	679	888	1143	1408	1534	1586

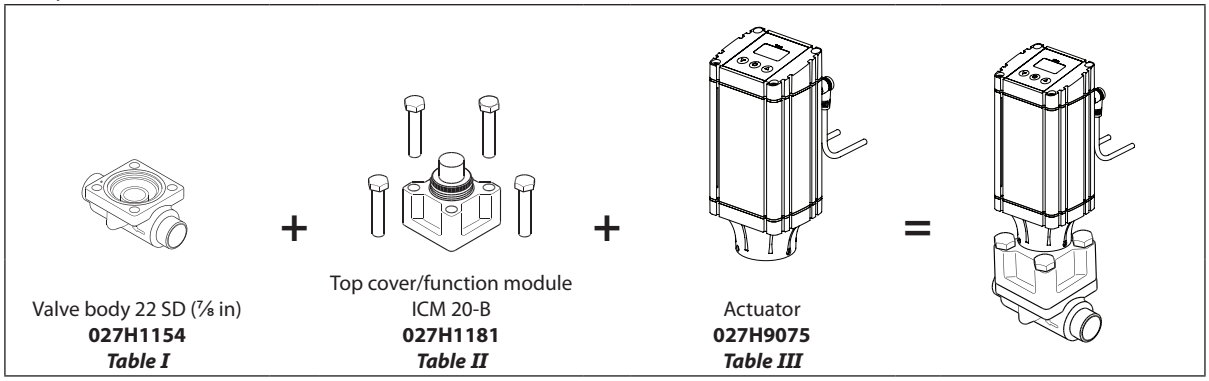
Pressure drop across valve Δp psi					
15	30	60	120	180	240
Evaporating temperature 40 °F					
1.97	2.96	3.57	4.49	4.95	5.16
6	8.2	10.8	13.6	15	15.6
34.5	47	62	77.8	85.5	89.5
57	77	101	126	139	145
88	119	156	196	216	226
127	172	226	283	313	327
236	317	415	517	570	596
410	550	720	895	990	1035
674	906	1182	1475	1624	1698
Evaporating temperature 0 °F					
2.14	2.89	3.76	4.65	5.06	5.24
6.5	8.7	11.4	14.1	15.3	15.9
37.3	49.8	64.5	80	87	90.2
60.7	80.5	104	128	140	146
94	125	161	199	217	226
136	181	234	289	316	329
250	330	424	524	575	599
435	570	730	905	993	1035
714	938	1203	1487	1630	1698
Evaporating temperature -40 °F					
2.25	2.98	3.81	4.61	4.97	5.1
6.8	9	11.5	13.9	15	15.4
38.1	50.2	64	78.5	85	87.6
60.5	79	101	125	136	140
94	123	157	193	211	218
138	180	231	283	307	318
248	323	413	510	555	575
428	555	710	875	960	995
702	913	1170	1443	1575	1634

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ICM 20 / ICAD 600A

Ordering from the parts programme

Example (select from table I, II and III)

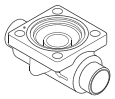


Valve body 22 SD (⅞ in)
027H1154
Table I

Top cover/function module
ICM 20-B
027H1181
Table II

Actuator
027H9075
Table III

ICV 20 valve body w/different connections *Table I*



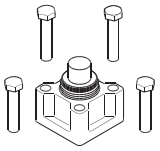
20 D (¾ in)	25 D (1 in)	20 A (¾ in)	20 SOC (¾ in)
027H1145	**027H1163**	**027H1148**	**027H1151**

16 SA (⅝ in)	22 SA (⅞ in)	16 SD (⅝ in)	22 SD (⅞ in)
027H1129	**027H1160**	**027H1132**	**027H1154**

20 FPT (¾ in)		25 A (1 in)	
027H1157		**027H1166**	

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ;
SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ;
FPT = Female Pipe Thread

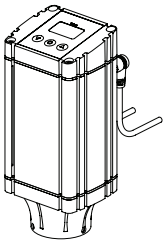
ICM 20 Function module / top cover *Table II*



Description	Code Number
ICM 20-A33	**027H1186** *)
ICM 20-A	**027H1180** *)
ICM 20-B66	**027H1194** *)
ICM 20-B	**027H1181** *)
ICM 20-C	**027H1182** *)

*) Including:
Bolts and O-ring (for assembly with ICV valve body)
Seat and O-ring (for seat to be mounted in ICV valve body)

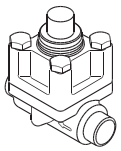
Actuator ICAD 600A *Table III*



Description	Code Number
ICAD 600A with 1.5 m. (60 in) cables	**027H9075**
ICAD 600A without cables	**027H9120**

Ordering complete factory assembled valve without actuator

(body, function module/top cover) *Table A*



	Available connections								
	20 D (¾ in)	25 D (1 in)	20 A (¾ in)	20 SOC (¾ in)	16 SA (⅝ in)	22 SA (⅞ in)	16 SD (⅝ in)	22 SD (⅞ in)	20 FPT (¾ in)
ICM 20-A	**027H1030**	**027H1020**	**027H1035**	**027H1040**		**027H1050**		**027H1045**	
ICM 20-B	**027H1031**	**027H1021**	**027H1036**	**027H1041**		**027H1051**		**027H1046**	
ICM 20-C	**027H1032**	**027H1022**				**027H1052**		**027H1047**	

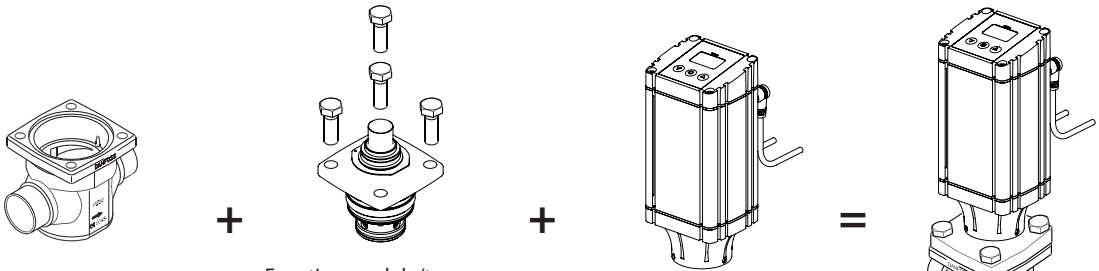
	25 A (1 in)
ICM 20-A	
ICM 20-B	
ICM 20-C	**027H1025**

Select from parts programme

ICM 25 / ICAD 600A

Ordering from the parts programme

Example (select from table I, II and III)

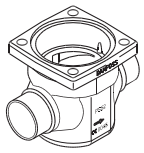


Valve body 32 D (1¼ in.)
027H2129
Table I

Function module/top cover
ICM 25-B
027H2181
Table II

Actuator
027H9075
Table III

ICV 25 valve body w/different connections *Table I*



20 D (¾ in.)	25 D (1 in.)	32 D (1¼ in.)	40 D (1½ in.)
027H2128	**027H2120**	**027H2129**	**027H2135**

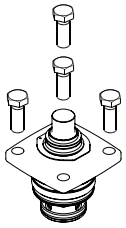
35 SD (1⅜ in. SA)	28 SA (1⅛ in.)	22 SA (⅞ in.)	28 SD (1⅛ in.)
027H2134	**027H2126**	**027H2125**	**027H2124**

22 SD (⅞ in.)	20 A (¾ in.)	25 A (1 in.)	32 A (1¼ in.)
027H2123	**027H2131**	**027H2121**	**027H2130**

20 SOC (¾ in.)	25 SOC (1 in.)	20 FPT (¾ in.)	25 FPT (1 in.)
027H2132	**027H2122**	**027H2133**	**027H2127**

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ;
SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ;
FPT = Female Pipe Thread

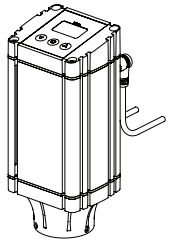
ICM 25 Function module / top cover *Table II*



Description	Code Number
ICM 25-A	**027H2180** *)
ICM 25-A33	**027H2190** *)
ICM 25-B	**027H2181** *)

*) Including gasket and O-rings

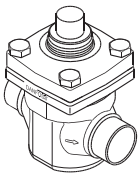
Actuator ICAD 600A *Table III*



Description	Code Number
ICAD 600A with 1.5 m. (60 in.) cables	**027H9075**
ICAD 600A without cables	**027H9120**

Ordering complete factory assembled valve without actuator

(body, function module/top cover) *Table A*



	Available connections							
	20 D (¾ in.)	25 D (1 in.)	32 D (1¼ in.)	40 D (1½ in.)	35 SD (1⅜ in. SA)	28 SA (1⅛ in.)	22 SA (⅞ in.)	28 SD (1⅛ in.)
ICM 25-A		**027H2000**		**027H2016**	**027H2014**	**027H2012**	**027H2010**	**027H2008**
ICM 25-B		**027H2001**			**027H2015**	**027H2013**	**027H2011**	**027H2009**

	22 SD (⅞ in.)	20 A (¾ in.)	25 A (1 in.)	32 A (1¼ in.)	20 SOC (¾ in.)	25 SOC (1 in.)	20 FPT (¾ in.)	25 FPT (1 in.)
ICM 25-A	**027H2006**		**027H2002**			**027H2004**		
ICM 25-B	**027H2007**		**027H2003**			**027H2005**		

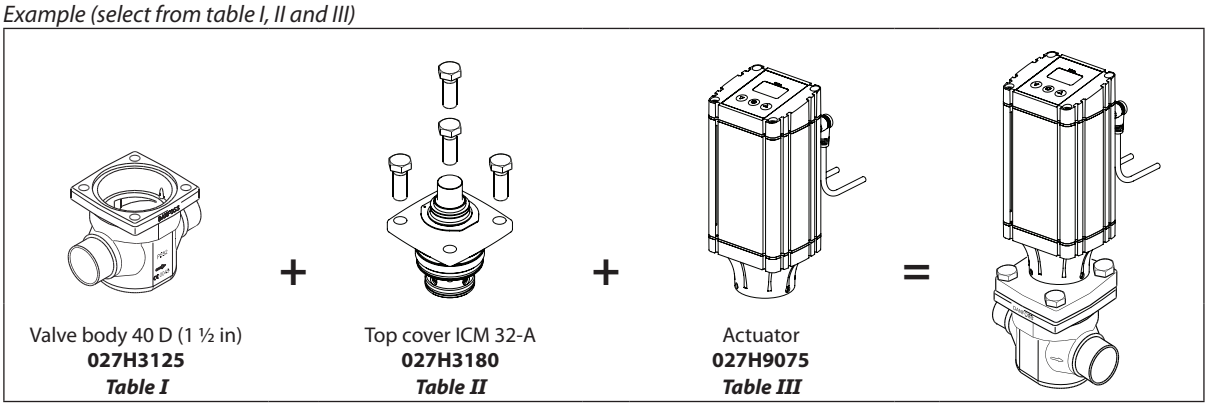
Select from parts programme

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ICM 32 / ICAD 600A

Ordering from the parts programme

Example (select from table I, II and III)

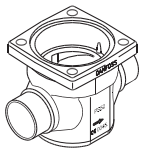


Valve body 40 D (1 ½ in)
027H3125
Table I

Top cover ICM 32-A
027H3180
Table II

Actuator
027H9075
Table III

ICV 32 valve body w/different connections *Table I*

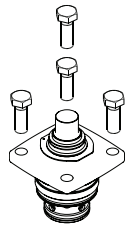


32 D (1 ¼ in)	40 D (1 ½ in)	42 SA (1 ⅝ in)	42 SD (1 ⅝ in)
027H3120	**027H3125**	**027H3127**	**027H3128**

35 SD (1 ⅜ in SA)	32 A (1 ¼ in)	32 SOC (1 ¼ in)	40 A (1 ½ in)
027H3123	**027H3121**	**027H3122**	**027H3126**

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ;
SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ;
FPT = Female Pipe Thread

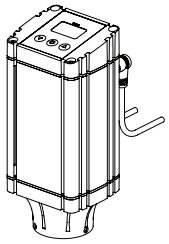
ICM 32 Function module / top cover *Table II*



Description	Code Number
ICM 32-A	**027H3180** *)
ICM 32-B	**027H3181** *)

*) Including gasket and O-rings

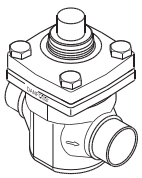
Actuator ICAD 600A *Table III*



Description	Code Number
ICAD 600A with 1.5 m. (60 in) cables	**027H9075**
ICAD 600A without cables	**027H9120**

Ordering complete factory assembled valve without actuator

(body, function module / top cover) *Table A*



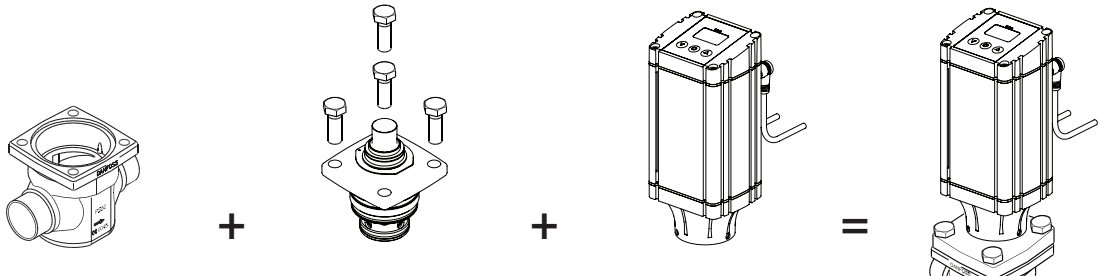
	Available connections							
	32 D (1 ¼ in)	40 D (1 ½ in)	42 SA (1 ⅝ in)	42 SD (1 ⅝ in)	35 SD (1 ⅜ in SA)	32 A (1 ¼ in)	32 SOC (1 ¼ in)	40 A (1 ½ in)
ICM 32-A	**027H3000**	**027H3012**	**027H3008**		**027H3006**	**027H3002**	**027H3004**	
ICM 32-B	**027H3001**				**027H3007**	**027H3003**	**027H3005**	

Select from parts programme

ICM 40 / ICAD 1200A

Ordering from the parts programme

Example (select from table I, II and III)

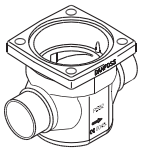


Valve body A 40 (1½ in)
027H4121
Table I

Top cover ICM 40-A
027H4180
Table II

Actuator
027H9077
Table III

ICV 40 valve body w/different connections *Table I*

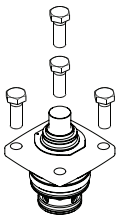


40 D (1 ½ in)	50 D (2 in)	42 SA (1 ⅝ in)	42 SD (1 ⅝ in)
027H4120	**027H4126**	**027H4124**	**027H4123**

40 A (1 ½ in)	40 SOC (1 ½ in)	50 A (2 in)	
027H4121	**027H4122**	**027H4127**	

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ;
SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ;
FPT = Female Pipe Thread

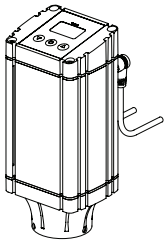
ICM 40 Function module / top cover *Table II*



Description	Code Number
ICM 40-A	**027H4180** *)
ICM 40-B	**027H4181** *)

*) Including gasket and O-rings

Actuator ICAD 1200A *Table III*

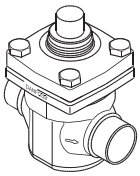


Description	Code Number
ICAD 1200A with 1.5 m. (60 in) cables	**027H9077**
ICAD 1200A without cables	**027H9122**

Ordering complete factory assembled valve without actuator

(body, function module/top cover)

Table A



	Available connections						
	40 D (1 ½ in)	50 D (2 in)	42 SA (1 ⅝ in)	42 SD (1 ⅝ in)	40 A (1 ½ in)	40 SOC (1 ½ in)	50 A (2 in)
ICM 40-A	**027H4000**	**027H4010**	**027H4006**	**027H4008**	**027H4002**	**027H4004**	
ICM 40-B	**027H4001**		**027H4007**	**027H4009**	**027H4003**	**027H4005**	

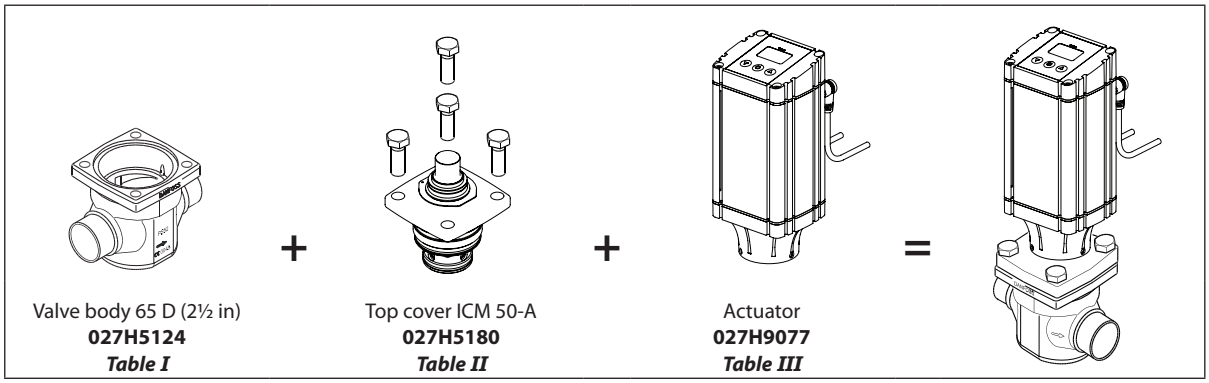
Select from parts programme

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ICM 50 / ICAD 1200A

Ordering from the parts programme

Example (select from table I, II and III)

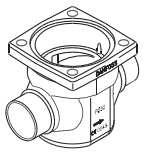


Valve body 65 D (2½ in)
027H5124
Table I

Top cover ICM 50-A
027H5180
Table II

Actuator
027H9077
Table III

ICV 50 valve body w/different connections *Table I*

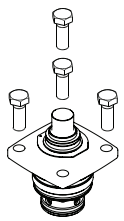


50 D (2 in)	65 D (2 ½ in)	54 SD (2 ⅛ in SA)	50 A (2 in)
027H5120	**027H5124**	**027H5123**	**027H5121**

50 SOC (2 in)	65 A (2 ½ in)		
027H5122	**027H5125**		

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ;
SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ;
FPT = Female Pipe Thread

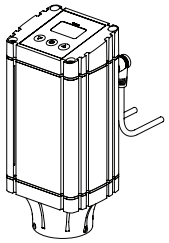
ICM 50 Function module / top cover *Table II*



Description	Code Number
ICM 50-A	**027H5180** *)
ICM 50-B	**027H5181** *)

*) Including gasket and O-rings

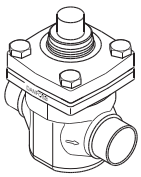
Actuator ICAD 1200A *Table III*



Description	Code Number
ICAD 1200A with 1.5 m. (60 in) cables	**027H9077**
ICAD 1200A without cables	**027H9122**

Ordering complete factory assembled valve without actuator

(body, function module/top cover) *Table A*



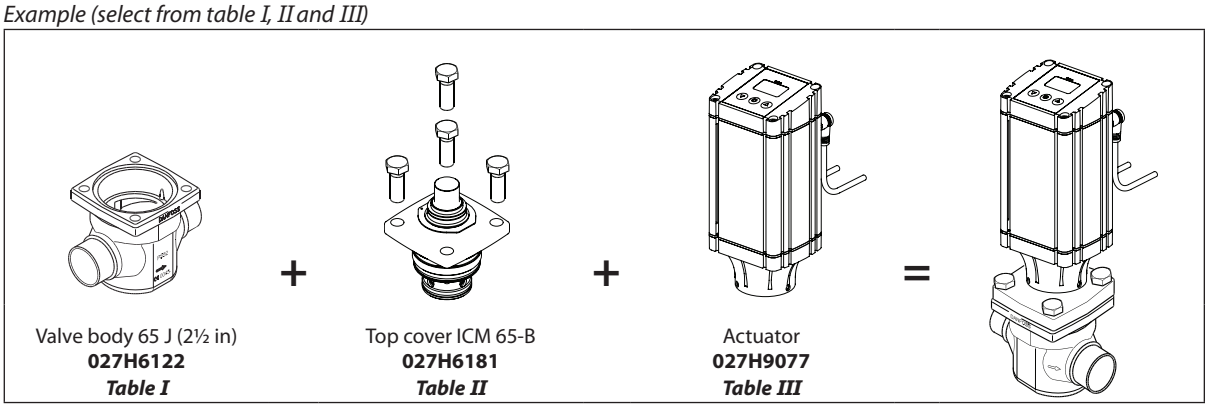
	Available connections					
	50 D (2 in)	65 D (2 ½ in)	54 SD (2 ⅛ in SA)	50 A (2 in)	50 SOC (2 in)	65 A (2 ½ in)
ICM 50-A	**027H5000**	**027H5008**	**027H5006**	**027H5002**	**027H5004**	
ICM 50-B	**027H5001**		**027H5007**	**027H5003**	**027H5005**	

Select from parts programme

ICM 65 / ICAD 1200A

Ordering from the parts programme

Example (select from table I, II and III)

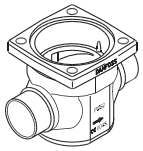


Valve body 65 J (2½ in)
027H6122
Table I

Top cover ICM 65-B
027H6181
Table II

Actuator
027H9077
Table III

ICV 65 valve body w/different connections *Table I*

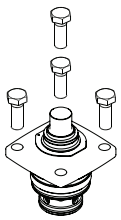


65 D (2 ½ in)	65 A (2 ½ in)	65 J (2 ½ in)	80 D (3 in)
027H6120	**027H6121**	**027H6122**	**027H6126**

80 A (3 in)	67 SA (2 ⅝ in)	76 SD (3 in)	65 SOC (2 ½ in)
027H6127	**027H6125**	**027H6124**	**027H6123**

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ;
SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ;
FPT = Female Pipe Thread

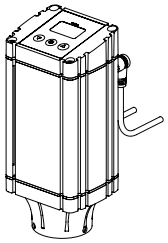
ICM 65 Function module / top cover *Table II*



Description	Code Number
ICM 65-A	**027H6180 *)**
ICM 65-B	**027H6181** *)

*) Including gasket and O-rings

Actuator ICAD 1200A *Table III*

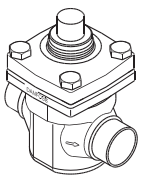


Description	Code Number
ICAD 1200A with 1.5 m. (60 in) cables	**027H9077**
ICAD 1200A without cables	**027H9122**

Ordering complete factory assembled valve without actuator

(body, function module/top cover)

Table A



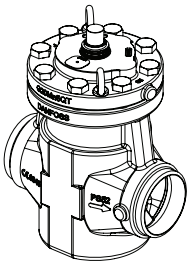
	Available connections							
	65 D (2 ½ in)	65 A (2 ½ in)	65 J (2 ½ in)	80 D (3 in)	80 A (3 in)	67 SA (2 ⅝ in)	76 SD (3 in)	65 SOC (2 ½ in)
ICM 65-A	**027H6010**	**027H6012**						
ICM 65-B	**027H6001**	**027H6003**				**027H6007**	**027H6009**	**027H6005**

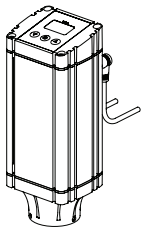
Select from parts programme

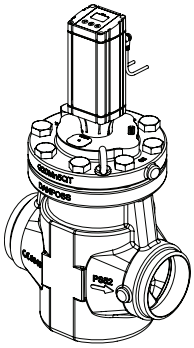
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ICM 100

Complete factory assembled valve without actuator
(body, function module / top cover)



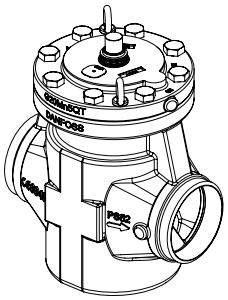


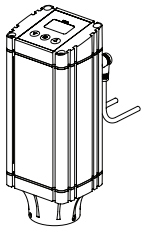


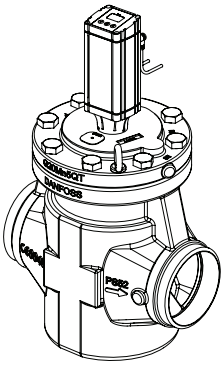
	Available connections		ICAD 1200A with 1.5 m. (60 in) cables	ICAD 1200A without cable
	100 D (4 in)	100 A (4 in)	**027H9077**	**027H9122**
ICM 100	**027H7130**	**027H7131**		

ICM 125

Complete factory assembled valve without actuator
(body, function module / top cover)



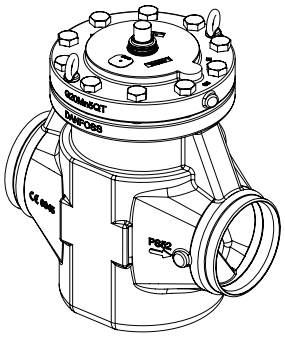


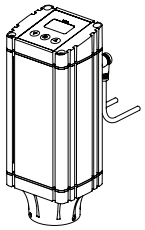


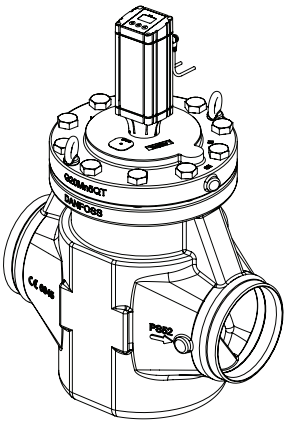
	Available connections		ICAD 1200A with 1.5 m. (60 in) cables	ICAD 1200A without cable
	125 D (5 in)	125 A (5 in)	**027H9077**	**027H9122**
ICM 125	**027H7150**	**027H7151**		

ICM 150

Complete factory assembled valve without actuator
(body, function module / top cover)





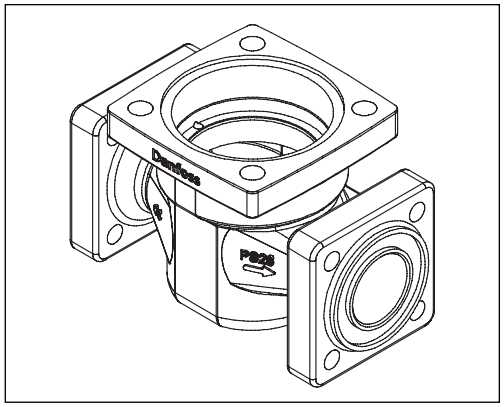


	Available connections		ICAD 1200A with 1.5 m. (60 in) cables	ICAD 1200A without cable
	150 D (6 in)	150 A (6 in)	**027H9077**	**027H9122**
ICM 150	**027H7170**	**027H7171**		

Spare parts and accessories

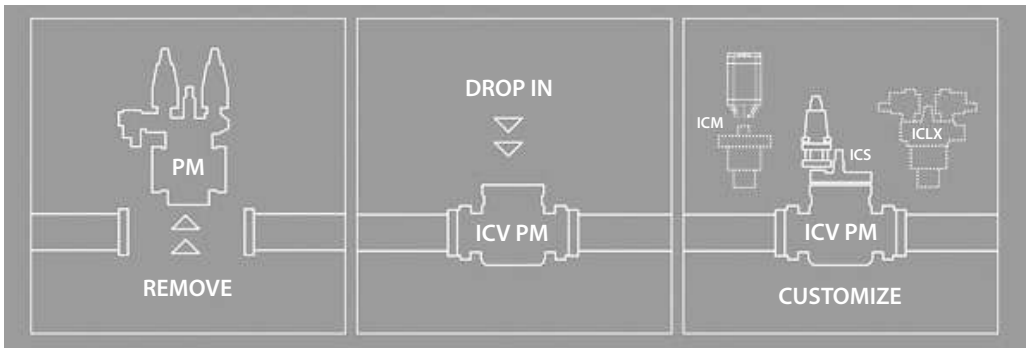
ICV PM flanged valve housings
ICV PM flanged valve housings can replace the PM valves on already installed refrigeration systems.

Pressure range
The ICV PM valve housing is designed for a max. working pressure of 28 bar g (406 psig) and therefore a suitable replacement for PM valves in the service market. They also offer the same drop-in dimensions as the PM valves.



Description	Code no.
ICV 25 PM Valve housing	**027H2119** *)
ICV 32 PM Valve housing	**027H3129** *)
ICV 40 PM Valve housing	**027H4128** *)
ICV 50 PM Valve housing	**027H5127** **)
ICV 65 PM Valve housing	**027H6128** **)

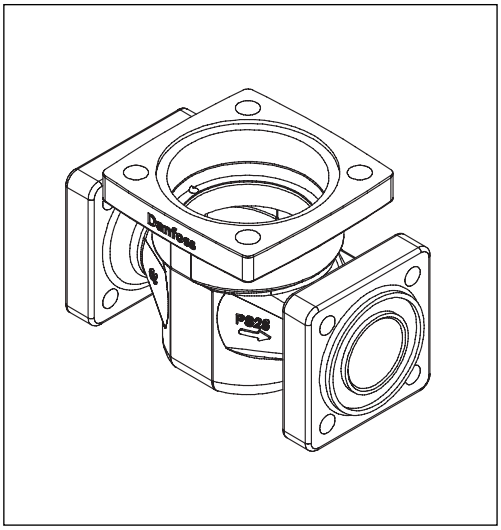
Function modules and top covers must be ordered separately (see the section "Ordering").



ICV (H)A4A flanged valve housings
ICV (H)A4A flanged valve housings can replace the (H)A4A valves on already installed refrigeration systems.

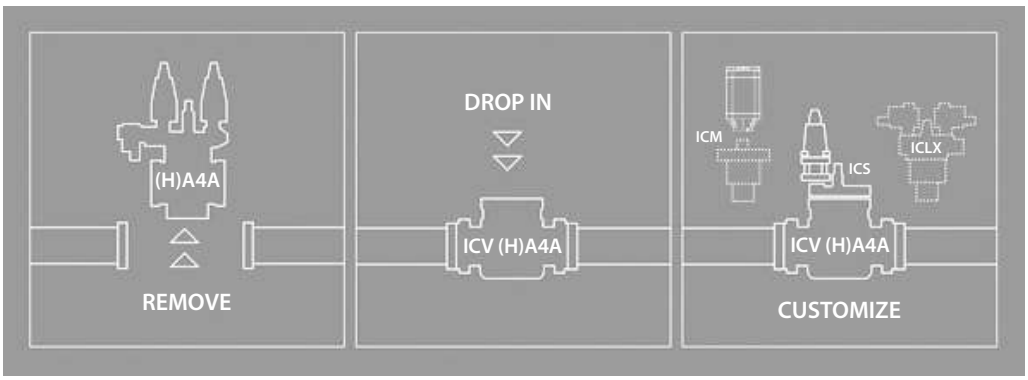
The ICV (H)A4A flanged valve housing provides an upgrade of the old motor valve types HMMR and HMMV to ICM motorized valve as a drop-in solution.

Pressure range
The ICV (H)A4A valve housing is designed for a max. working pressure of 28 bar g (406 psig) and therefore a suitable replacement for (H)A4A valves in the service market. They also offer the same drop-in dimensions as the (H)A4A valves.



Description	Code no.
ICV 25 (H)A4A Valve housing	**027H2304** *)
ICV 32 A4A Valve housing	**027H3130** *)
ICV 32 HA4A Valve housing	**027H3131** *)
ICV 40 (H)A4A Valve housing	**027H4129** *)
ICV 50 (H)A4A Valve housing	**027H5128** **)
ICV 65 (H)A4A Valve housing	**027H6129** **)

Function modules and top covers must be ordered separately (see the section "Ordering").



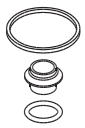
*) Includes ICV PM valve housing, flange gaskets and flange bolts.
**) Includes ICV PM valve housing, flange gaskets, flange bolts and flange nuts.

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ICM 20 / ICAD 600A

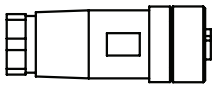
Spare parts and accessories

Spare parts



Description	Code Number
Repair kit ICM 20-A / ICM 20-A-33 (Metal with plastic seat) ICM 20-B / ICM 20-C (Plastic seat)	**027H1190**

Accessories



Connectors for ICAD 600A/1200A	
Connector type	**Code number**
Two Female Connectors with screw terminals: - connector for power - connector for control signals	**027H0430**

Accessories



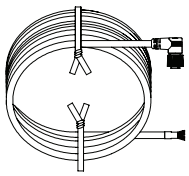
Description	Code Number
ICAD-UPS	**027H0182**

Accessories



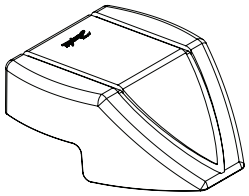
Description	Code Number
Multi-function tool	**027H0180**

Accessories



Cable for ICAD 600A/1200A	
Cable length	**Code number**
Cable set 1.5 m, female	**027H0426**
Cable set 3 m, female	**027H0438**
Cable set 10 m, female	**027H0427**
Cable set 15 m, female	**027H0435**

Accessories



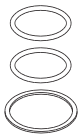
Protection cap ICAD 600A/1200A	
Description	**Code number**
Protection cap	**027H0431**

Please observe, when used in CO_2, that the o-rings 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.

ICM 25-32 / ICAD 600A

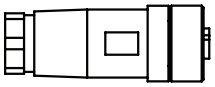
Spare parts and accessories

Spare parts



Description	Code Number
ICM 25 Inspection kit	**027H2218**
ICM 32 Inspection kit	**027H3016**

Accessories



Connectors for ICAD 600A/1200A

Connector type	Code number
Two Female Connectors with screw terminals: - connector for power - connector for control signals	**027H0430**

Accessories



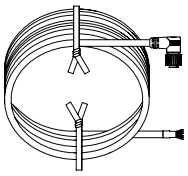
Description	Code Number
ICAD-UPS	**027H0182**

Accessories



Description	Code Number
Multi-function tool	**027H0180**

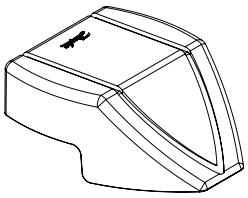
Accessories



Cable for ICAD 600A/1200A

Cable length	Code number
Cable set 1.5 m, female	**027H0426**
Cable set 3 m, female	**027H0438**
Cable set 10 m, female	**027H0427**
Cable set 15 m, female	**027H0435**

Accessories



Protection cap ICAD 600A/1200A

Description	Code number
Protection cap	**027H0431**

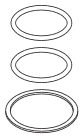
Please observe, when used in CO_2, that the o-rings on the ICM module can swell (grow). At service it is recommend that new o-rings are installed before the ICM functions module again is installed in the ICV valve body.

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ICM 40-50-65 / ICAD 1200A

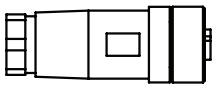
Spare parts and accessories

Spare parts



Description	Code Number
ICM 40 Inspection kit	**027H4014**
ICM 50 Inspection kit	**027H5014**
ICM 65 Inspection kit	**027H6016**

Accessories



Connectors for ICAD 600A/1200A	
Connector type	**Code number**
Two Female Connectors with screw terminals: - connector for power - connector for control signals	**027H0430**

Accessories



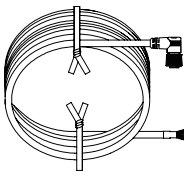
Description	Code Number
ICAD-UPS	**027H0182**

Accessories



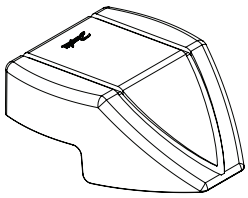
Description	Code Number
Multi-function tool	**027H0181**

Accessories



Cable for ICAD 600A/1200A	
Cable length	**Code number**
Cable set 1.5 m, female	**027H0426**
Cable set 3 m, female	**027H0438**
Cable set 10 m, female	**027H0427**
Cable set 15 m, female	**027H0435**

Accessories



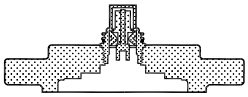
Protection cap ICAD 600A/1200A	
Description	**Code number**
Protection cap	**027H0431**

Please observe, when used in CO_2, that the o-rings 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.

ICM 100-125-150 / ICAD 1200A

Spare parts and accessories

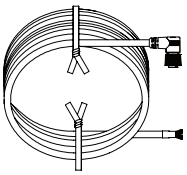
Accessories



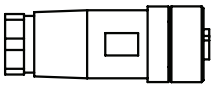
Top covers		
Consist of: Top cover complete with magnet coupling and gasket	Size	**Code number**
	ICM 100	**027H7133**
	ICM 125	**027H7153**
	ICM 150	**027H7173**



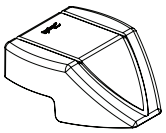
ICAD-UPS
Code Number
027H0182



Cable for ICAD 600A/1200A	
Cable length	**Code number**
Cable set 1.5 m, female	**027H0426**
Cable set 3 m, female	**027H0438**
Cable set 10 m, female	**027H0427**
Cable set 15 m, female	**027H0435**



Connectors for ICAD 600A/1200A	
Connector type	**Code number**
Two Female Connectors with screw terminals: - connector for power - connector for control signals	**027H0430**



Description	Code number
Protection cap ICAD 600A/1200A	**027H0431**



Description	Code Number
Multi-function tool	**027H0181**

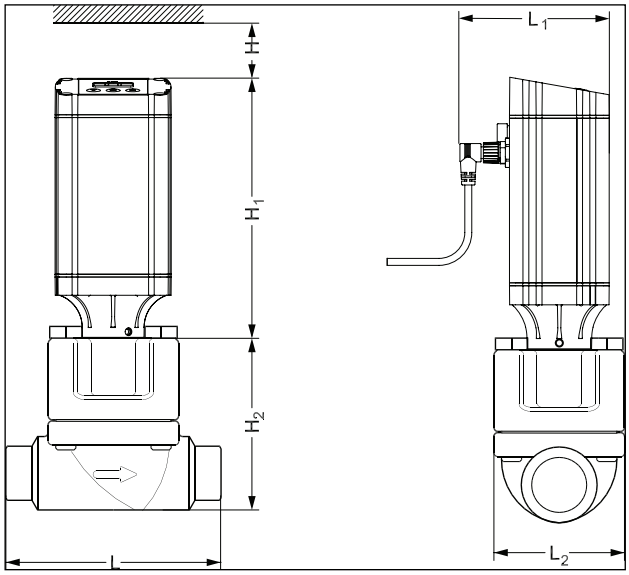
Spare parts

Please see AI245486497115

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ICM 20 / ICAD 600A

Dimensions

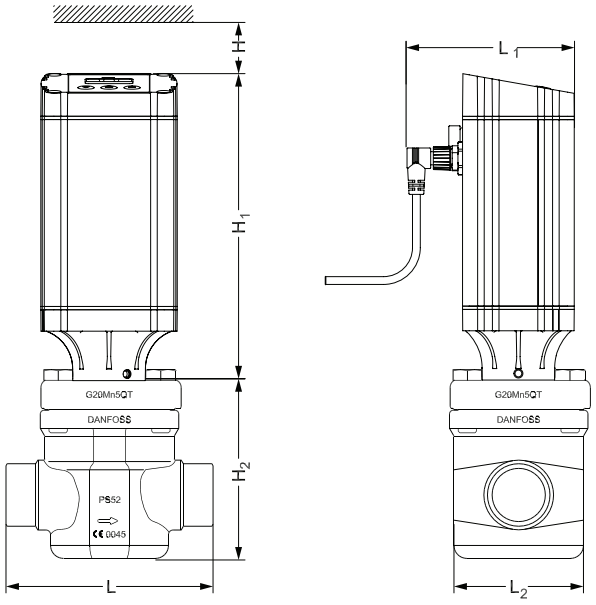


Connection		H	H_1	H_2	L	L_1	L_2	Weight ICM incl. ICAD
20 D (¾ in)	[mm]	40	195	85	107	102	65	3 kg
	[in]	1.58	7.68	3.35	4.21	4.02	2.56	6.6 lb.
25 D (1 in)	[mm]	40	195	85	107	102	65	3 kg
	[in]	1.58	7.68	3.35	4.21	4.02	2.56	6.6 lb.
25 A (1 in)	[mm]	40	195	85	107	102	65	3 kg
	[in]	1.58	7.68	3.35	4.21	4.02	2.56	6.6 lb.
20 A (¾ in)	[mm]	40	195	85	107	102	65	3 kg
	[in]	1.58	7.68	3.35	4.21	4.02	2.56	6.6 lb.
20 SOC (¾ in)	[mm]	40	195	85	107	102	65	3 kg
	[in]	1.58	7.68	3.35	4.21	4.02	2.56	6.6 lb.
16 SD (⅝ in)	[mm]	40	195	85	107	102	65	3 kg
	[in]	1.58	7.68	3.35	4.21	4.02	2.56	6.6 lb.
22 SD (⅞ in)	[mm]	40	195	85	107	102	65	3 kg
	[in]	1.58	7.68	3.35	4.21	4.02	2.56	6.6 lb.
16 SA (⅝ in)	[mm]	40	195	85	107	102	65	3 kg
	[in]	1.58	7.68	3.35	4.21	4.02	2.56	6.6 lb.
22 SA (⅞ in)	[mm]	40	195	85	107	102	65	3 kg
	[in]	1.58	7.68	3.35	4.21	4.02	2.56	6.6 lb.
20 FPT (¾ in)	[mm]	40	195	85	107	102	65	3 kg
	[in]	1.58	7.68	3.35	4.21	4.02	2.56	6.6 lb.

D = Butt-weld DIN ; A = Butt-weld ANSI ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

ICM 25 / ICAD 600A

Dimensions *(continued)*



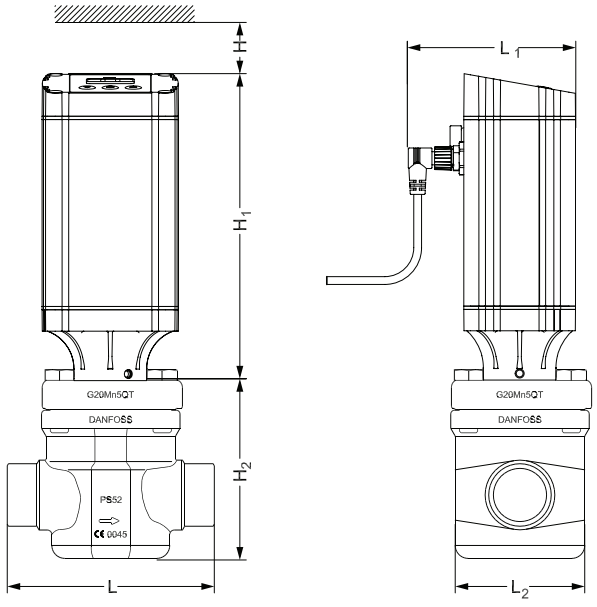
Connection		H	H_1	H_2	L	L_1	L_2	Weight ICM incl. ICAD
20 D (¾ in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
25 D (1 in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
32 D (1 ¼ in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
40 D (1½ in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
20 A (¾ in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
25 A (1 in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
32 A (1 ¼ in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
20 SOC (¾ in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
25 SOC (1 in)	[mm]	40	195	99	148	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.83	4.02	3.31	8.8 lb.
22 SD (⅞ in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
28 SD (1 ⅛ in)	[mm]	40	195	99	147	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.79	4.02	3.31	8.8 lb.
22 SA (⅞ in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
28 SA (1 ⅛ in)	[mm]	40	195	99	147	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.79	4.02	3.31	8.8 lb.
35 SD (1 ⅜ in SA)	[mm]	40	195	99	147	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.79	4.02	3.31	8.8 lb.
20 FPT (¾ in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
25 FPT (1 in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.

D = Butt-weld DIN ; A = Butt-weld ANSI ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

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ICM 32 / ICAD 600A

Dimensions *(continued)*

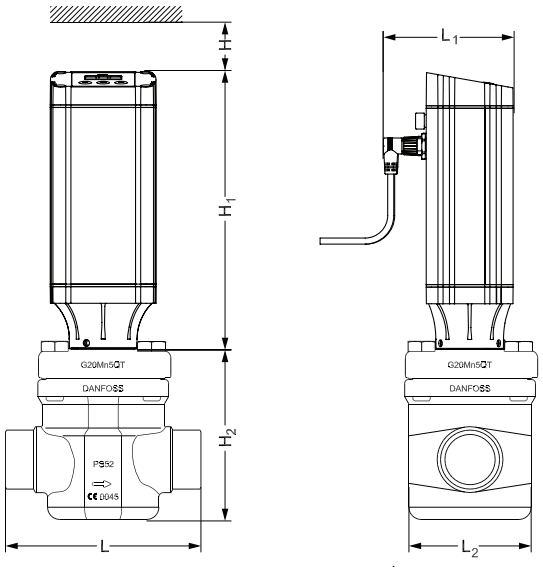


Connection		H	H_1	H_2	L	L_1	L_2	Weight ICM incl. ICAD
32 D (1 ¼ in)	[mm]	40	195	117	145	102	102	5.8 kg
	[in]	1.58	7.68	4.61	5.71	4.02	4.02	11.0 lb.
40 D (1 ½ in)	[mm]	40	195	117	145	102	102	5.8 kg
	[in]	1.58	7.68	4.61	5.71	4.02	4.02	11.0 lb.
32 A (1 ¼ in)	[mm]	40	195	117	145	102	102	5.8 kg
	[in]	1.58	7.68	4.61	5.71	4.02	4.02	11.0 lb.
40 A (1 ½ in)	[mm]	40	195	117	145	102	102	5.8 kg
	[in]	1.58	7.68	4.61	5.71	4.02	4.02	11.0 lb.
32 SOC (1 ¼ in)	[mm]	40	195	117	147	102	102	5.8 kg
	[in]	1.58	7.68	4.61	5.79	4.02	4.02	11.0 lb.
35 SD (1 ⅜ in SA)	[mm]	40	195	117	148	102	102	5.8 kg
	[in]	1.58	7.68	4.61	5.83	4.02	4.02	11.0 lb.
42 SD (1 ⅝ in)	[mm]	40	195	117	148	102	102	5.8 kg
	[in]	1.58	7.68	4.61	5.83	4.02	4.02	11.0 lb.
42 SA (1 ⅝ in)	[mm]	40	195	117	148	102	102	5.8 kg
	[in]	1.58	7.68	4.61	5.83	4.02	4.02	11.0 lb.

D = Butt-weld DIN ; A = Butt-weld ANSI ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI

ICM 40 / ICAD 1200A

Dimensions *(continued)*



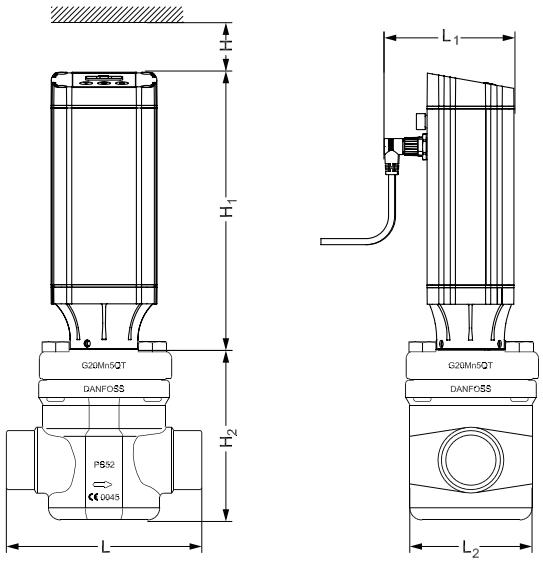
Connection		H	H_1	H_2	L	L_1	L_2	Weight ICM incl. ICAD
40 D (1 ½ in)	[mm]	45	219	131	160	102	107	7.8 kg
	[in]	1.77	8.62	5.16	6.30	4.02	4.21	17.2 lb.
50 D (2 in)	[mm]	45	219	131	180	102	107	7.8 kg
	[in]	1.77	8.62	5.16	7.09	4.02	4.21	17.2 lb.
40 A (1 ½ in)	[mm]	45	219	131	160	102	107	7.8 kg
	[in]	1.77	8.62	5.16	6.30	4.02	4.21	17.2 lb.
50 A (2 in)	[mm]	45	219	131	180	102	107	7.8 kg
	[in]	1.77	8.62	5.16	7.09	4.02	4.21	17.2 lb.
40 SOC (1 ½ in)	[mm]	45	219	131	180	102	107	7.8 kg
	[in]	1.77	8.62	5.16	7.09	4.02	4.21	17.2 lb.
42 SD (1 ⅝ in)	[mm]	45	219	131	180	102	107	7.8 kg
	[in]	1.77	8.62	5.16	7.09	4.02	4.21	17.2 lb.
42 SA (1 ⅝ in)	[mm]	45	219	131	180	102	107	7.8 kg
	[in]	1.77	8.62	5.16	7.09	4.02	4.21	17.2 lb.

D = Butt-weld DIN ; A = Butt-weld ANSI ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI

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ICM 50 / ICAD 1200A

Dimensions *(continued)*

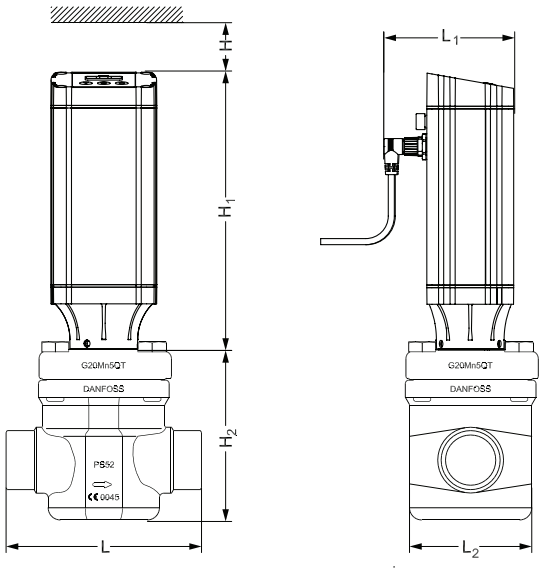


Connection		H	H_1	H_2	L	L_1	L_2	Weight ICM incl. ICAD
50 D (2 in)	[mm]	45	219	159	200	102	125	11.1 kg
	[in]	1.77	8.62	6.26	7.87	4.02	4.92	24.4 lb.
65 D (2 ½ in)	[mm]	45	219	159	210	102	125	11.1 kg
	[in]	1.77	8.62	6.26	8.27	4.02	4.92	24.4 lb.
50 A (2 in)	[mm]	45	219	159	200	102	125	11.1 kg
	[in]	1.77	8.62	6.26	7.87	4.02	4.92	24.4 lb.
65 A (2 ½ in)	[mm]	45	219	159	210	102	125	11.1 kg
	[in]	1.77	8.62	6.26	8.27	4.02	4.92	24.4 lb.
50 SOC (2 in)	[mm]	45	219	159	216	102	125	11.1 kg
	[in]	1.77	8.62	6.26	8.50	4.02	4.92	24.4 lb.
54 SD (2 ⅛ in SA)	[mm]	45	219	159	216	102	125	11.1kg
	[in]	1.77	8.62	6.26	8.50	4.02	4.92	24.4 lb.

D = Butt-weld DIN ; A = Butt-weld ANSI ; SOC = Socket weld ANSI ; SD = Solder DIN

ICM 65 / ICAD 1200A

Dimensions *(continued)*



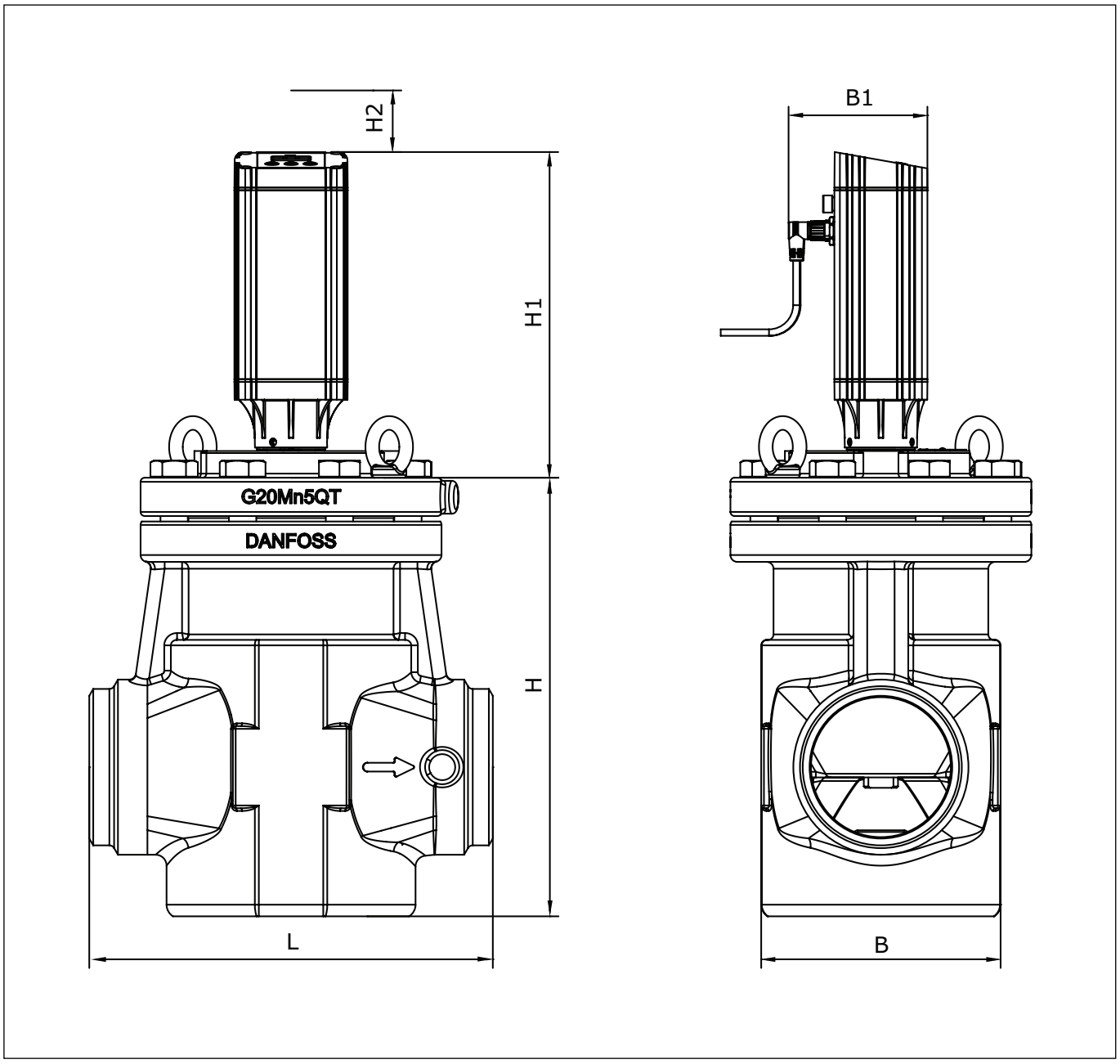
Connection		H	H_1	H_2	L	L_1	L_2	Weight ICM incl. ICAD
65 D (2 ½ in)	[mm]	45	219	188	230	102	139	16.6 kg
	[in]	1.77	8.62	7.40	9.06	4.02	5.47	36.5 lb
80 D (3 in)	[mm]	45	219	188	245	102	139	16.6 kg
	[in]	1.77	8.62	7.40	9.65	4.02	5.47	36.5 lb
65 A (2½ in)	[mm]	45	219	188	230	102	139	16.6 kg
	[in]	1.77	8.62	7.40	9.06	4.02	5.47	36.5 lb
80 A (3 in)	[mm]	45	219	188	245	102	139	16.6 kg
	[in]	1.77	8.62	7.40	9.65	4.02	5.47	36.5 lb
65 J (2 ½ in)	[mm]	45	219	188	230	102	139	16.6 kg
	[in]	1.77	8.62	7.40	9.06	4.02	5.47	36.5 lb
65 SOC (2 ½ in)	[mm]	45	219	188	230	102	139	16.6 kg
	[in]	1.77	8.62	7.40	9.06	4.02	5.47	36.5 lb
76 SD (3 in)	[mm]	45	219	188	245	102	139	16.6 kg
	[in]	1.77	8.62	7.40	9.65	4.02	5.47	36.5 lb
67 SA (2 ⅝ in)	[mm]	45	219	188	245	102	139	16.6 kg
	[in]	1.77	8.62	7.40	9.65	4.02	5.47	36.5 lb

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI

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ICM 100 / ICAD 1200A

Dimensions *(continued)*

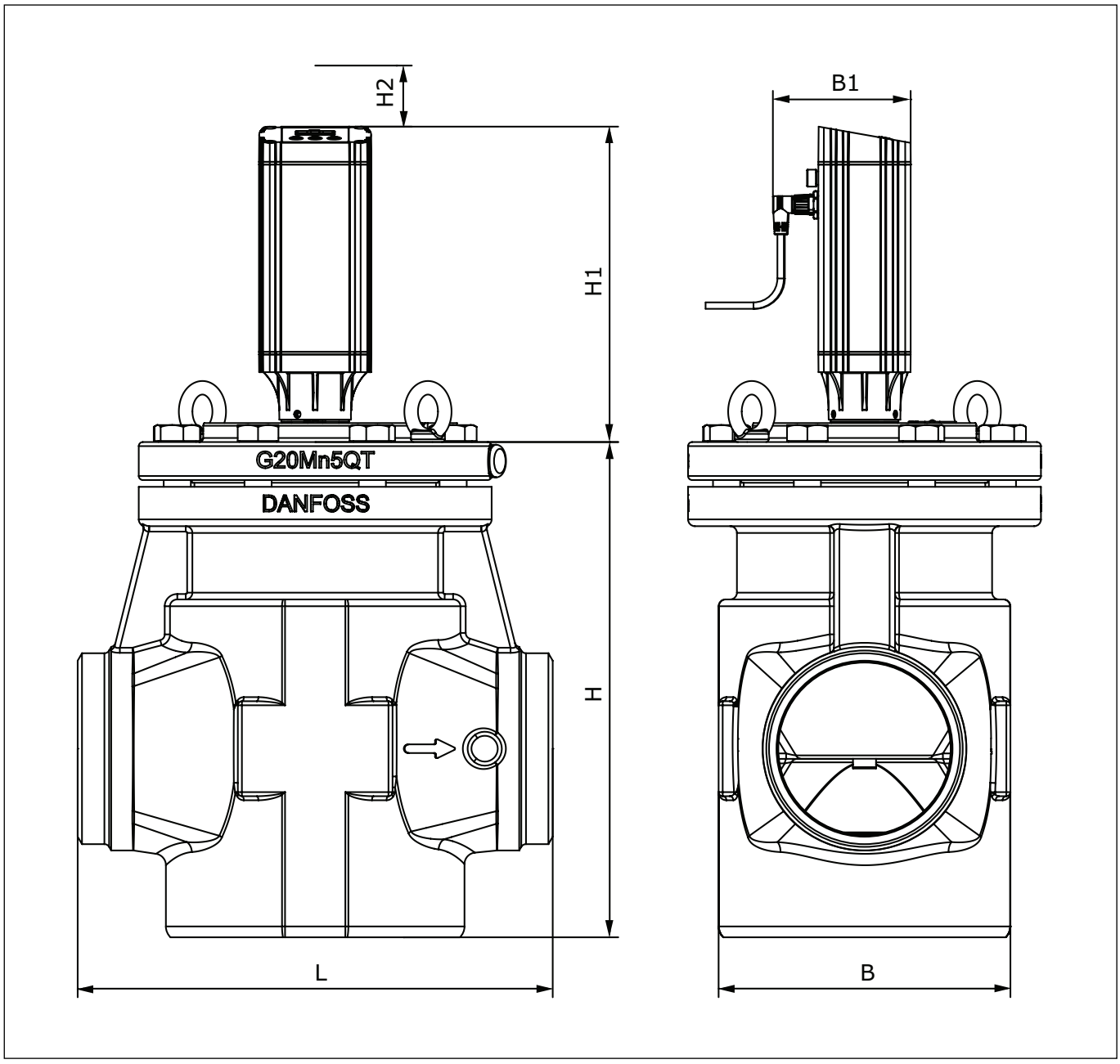


Connection		H	H_1	H_2	L	B	B_1	Weight ICM incl. ICAD
100 D/A (4 in)	[mm]	321	238	45	295	175	102	44 kg.
	[in]	12.64	9.37	1.77	11.61	6.89	4.02	97 lb.

D = Butt-weld DIN ; A = Butt-weld ANSI

ICM 125 / ICAD 1200A

Dimensions *(continued)*



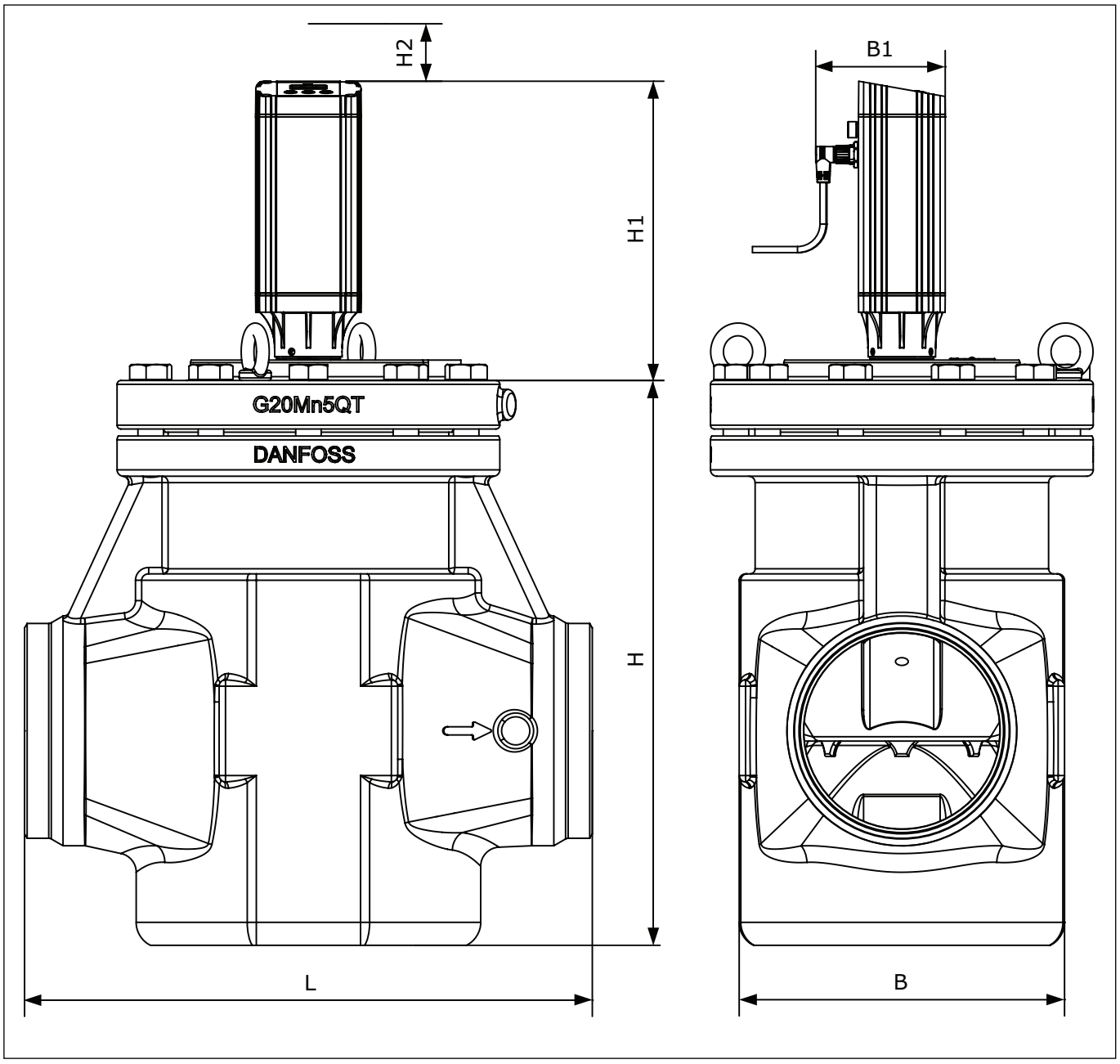
Connection		H	H_1	H_2	L	B	B_1	Weight ICM incl. ICAD
125 D/A (5 in)	[mm]	365	238	45	350	215	102	55 kg
	[in]	14.37	9.37	1.77	13.78	8.47	4.02	121 lb.

D = Butt-weld DIN ; A = Butt-weld ANSI

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ICM 150 / ICAD 1200A

Dimensions *(continued)*

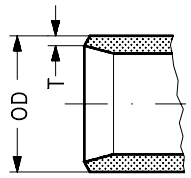


Connection		H	H_1	H_2	L	B	B_1	Weight ICM incl. ICAD
150 D/A (6 in)	[mm]	443	238	45	445	255	102	95 kg
	[in]	17.77	9.37	1.77	17.52	10.04	4.02	209 lb.

D = Butt-weld DIN ; A = Butt-weld ANSI

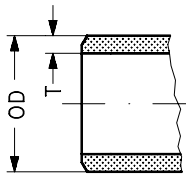
Connections

D: *Butt-weld DIN (2448)*



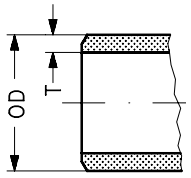
Size [mm]	Size [in]	OD [mm]	T [mm]	OD [in]	T [in]		
20	¾	26.9	2.3	1.059	0.091		
25	1	33.7	2.6	1.327	0.103		
32	1¼	42.4	2.6	1.669	0.102		
40	1½	48.3	2.6	1.902	0.103		
50	2	60.3	2.9	2.37	0.11		
65	2½	76.1	2.9	3	0.11		
80	3	88.9	3.2	3.50	0.13		
100	4	114.3	3.6	4.5	0.14		
125	5	140.7	4	5.5	0.16		
150	6	168.3	6.3	6.6	0.25		

A: *Butt-weld ANSI (B 36.10)*



Size [mm]	Size [in]	OD [mm]	T [mm]	OD [in]	T [in]	Schedule	
20	¾	26.9	4.0	1.059	0.158	80	
25	1	33.7	4.6	1.327	0.181	80	
32	1¼	42.4	4.9	1.669	0.193	80	
40	1½	48.3	5.1	1.902	0.201	80	
50	2	60.3	3.9	2.37	0.15	40	
65	2½	73.0	5.2	2.87	0.20	40	
80	3	88.9	5.5	3.50	0.22	40	
100	4	114.3	6	4.5	0.24		
125	5	140.7	6.5	5.5	0.26		
150	6	168.3	7.1	6.6	0.28		

J: *Butt-weld JIS*

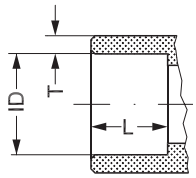


Size [mm]	Size [in]	OD [mm]	T [mm]	OD [in]	T [in]		
20	¾	26.9	4.0	1.059	0.158		
25	1	33.7	4.6	1.327	0.181		
32	1¼	42.4	4.9	1.669	0.193		
40	1½	48.3	5.1	1.902	0.201		
50	2	60.3	3.9	2.37	0.15		
65	2½	76.3	5.2	3.0	0.20		
80	3	88.9	5.5	3.50	0.22		

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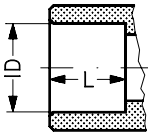
Connections

SOC:
Socket welding ANSI (B 16.11)



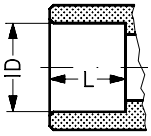
Size mm	Size [in]	ID mm	T mm	ID [in]	T [in]	L mm	L [in]
20	¾	27.2	4.6	1.071	0.181	13	0.51
25	1	33.9	7.2	1.335	0.284	13	0.51
32	1¼	42.7	6.1	1.743	0.240	13	0.51
40	1½	48.8	6.6	1.921	0.260	13	0.51
50	2	61.2	6.2	2.41	0.24	16	0.63
65	2½	74	8.8	2.91	0.344	16	0.63

SD: *Soldering (DIN 2856)*



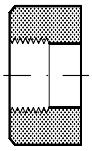
Size mm	Size [in]	ID mm		ID [in]		L mm	L [in]
16		16.07				15	
22		22.08				16.5	
28		28.08				26	
35		35.07				25	
42		42.07				28	
54		54.09				33	
76		76.1				33	

SA: Soldering (ANSI B 16.22)



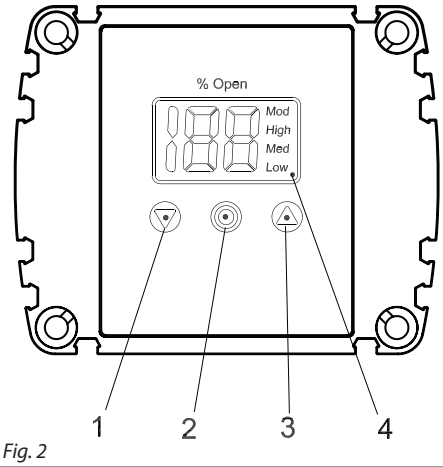
	⅝			0.625			0.591
	⅞			0.875			0.650
	1⅛			1.125			1.024
	1⅜			1.375			0.984
	1⅝			1.625			1.102
	2⅛			2.125			1.300
	2⅝			2.625			1.300

FPT:
Female pipe thread,
(ANSI/ASME B 1.20.1)



Size mm	Size [in]	Inside pipe thread		
20	¾	(¾ x 14 NPT)		
25	1	(1 x 11.5 NPT)		
32	1¼	(1¼ x 11.5 NPT)		

General operation



1. "Down" arrow push button
2. Enter
3. "Up" arrow push button
4. Display

Fig. 2

ICAD is equipped with an MMI (Man Machine Interface) from which it is possible to monitor and change the setting of parameters to adapt the ICAD and the corresponding ICM to the actual refrigeration application.

The setting of parameters is managed by means of the integrated ICAD MMI (see fig. 2 and fig. 3) and consists of:

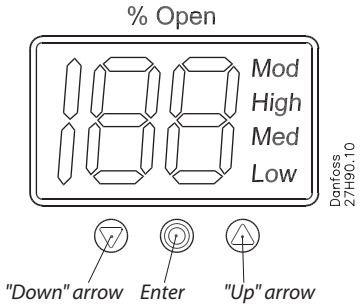


Fig. 3

- "Down" arrow push button (fig. 2, pos. 1)
  - Decreases parameter number by 1 at each activation
- "Up" arrow pushbutton (fig. 2, pos. 3)
  - Increases parameter number by 1 at 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** example is shown below (parameter **¡08**, fig. 4).

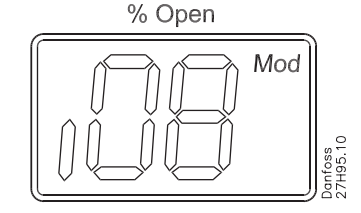


Fig. 4

  - 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.
- 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 (see fig. 5).

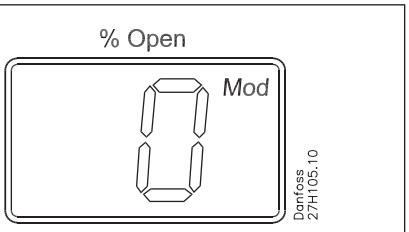


Fig. 5

- Displays the parameter.
- Displays the actual value of a parameter.
- Displays the function 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 (see fig. 6).

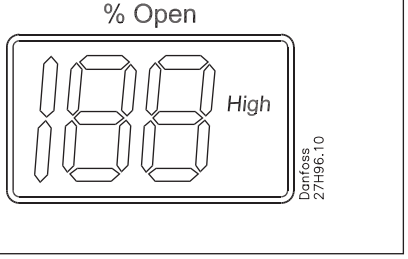


Fig. 6

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Alarms

ICAD can handle and display different alarms.

Description	ICAD alarm text	Definition of event	Comments
No Valve type selected	**A1**	Alarm ON	At start-up **A1** will be displayed
Controller fault	**A2**	Alarm ON	Internal fault inside electronics. Carry out: 1) Power OFF and Power ON If A2 still active. 2) Make a Reset to factory setting If A2 still active. Return ICAD to Danfoss
AI input error	**A3**	Alarm ON	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**	Alarm ON	If 5 V < fail safe supply <18 V. Enabled by **¡08**
Check supply to ICAD	**A5**	Alarm ON	If supply voltage < 18 V
Calibration extended failed	**A6**	Alarm ON	Check valve type selected. Check presence of foreign body internally in ICM valve
Internal temperature alarm	**A7**	Alarm ON	Temperature for stepper motor component too high.Ventilate / lower ambient ICAD temperature
	A8	Alarm ON	Temperature for stepper motor component too high. Ventilate/lower ambient ICAD temperature.
Valve locked	**A9**	Alarm ON	Only active if i16 = 1 If the valve is locked in more than 15 seconds. ICM stopped and hold position A9 flashing in display A9 alarm can only be reset by Power OFF / ON of ICAD

If an alarm has been detected the ICAD display (fig. 2) will alternate between showing Actual alarm and present Opening Degree.
If more than one alarm is active at the same time the alarm with the highest priority will take preference. **A1** has the highest priority, **A9** the lowest.

Any active alarm will activate the Common Digital Alarm output (Normally Open).
All alarms will automatically reset them-selves when they physically disappear.Old alarms (alarms that have been active, but have physically disappeared again) can be found in parameter **¡11**.

Parameter list - Valid from: (i58:11, i59:36) and onwards

The first parameter to be entered shall be: **¡26**

Description	ICAD parameter	Min	Max	Factory Setting	Stored	Unit	Pass word	Comments
OD (Opening degree)	-	0	100			%	-	ICM / ICMTS valve Opening Degree is displayed during normal operation. Running display value (see **¡01**, **¡05**).
Main Switch	**¡01**	1	2	1	✔	-	No	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	✔	-	No	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**. 3: Neutralzone / 3 point control. Increase/Decrease Opening Degree by Digital Input. See fig. 9
AI signal	**¡03**	1	4	2	✔	-	No	Type of AI signal from external controller 1: 0 – 20 mA 2: 4 – 20 mA 3: 0 – 10 V 4: 2 – 10 V
Speed In **Modulating Mode** Opening / closing speed In **ON / OFF Mode** Opening speed	**¡04**	1	100	50/ 100	✔	-	No	Speed can be decreased. Max. speed is 100% - Not active in manual operation (**¡01** = 2) If **¡26**= 1 - 3 then factory setting =100 If **¡26**= 4 - 9 then factory setting =50 If ICM is opening and (**¡04** < = 33) or ICM is closing and (**¡14** < = 33) => Low is displayed. If ICM is opening and (33 < If **¡04** < = 66) or ICM is closing and (33 < If **¡14** < = 66) => Med is displayed. If ICM is opening and (**¡04** > = 67) or ICM is closing and (**¡14** > = 67) => High is displayed"
Automatic calibration	**¡05**	0	2	0		-	No	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 0: No Calibration 1: Normal forced calibration - CA flashing slowly 2: Extended calibration – CA flashing rapidly"
AO signal	**¡06**	0	2	2	✔	-	No	Type of A0 signal for ICV valve position 0: No signal 1: 0 – 20 mA 2: 4 – 20 mA
Failsafe	**¡07**	1	4	1	✔	-	No	Define condition at power cut and fail safe supply is installed. 1: Close valve 2: Open Valve 3: Maintain valve position 4: Go to OD given by **¡12**"
Fail safe supply	**¡08**	0	1	0	✔		Yes	Fail safe supply connected and enable of A4 alarm: 0: No 1: Yes
DI function	**¡09**	1	2	1	✔		No	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	-		-	No	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 power cut.	**¡12**	0	100	50	✔		No	Only active if **¡07** = 4 If fail safe supply is connected and power cut occurs, the ICM will go to the specified OD.
Inverse operation	**¡13**	0	1	0	✔		No	When **¡02** = 1 0: Increasing Analog Input signal => Increasing ICM Opening Degree 1: Increasing Analog Input signal => Decreasing ICM Opening Degree When **¡02** = 3 0: DI1 = ON, DI2 = OFF => Increasing ICM Opening Degree. DI1 = OFF, DI2 = ON => Decreasing ICM Opening Degree DI1 = DI2 = OFF => ICAD/ICM maintain current position DI1 = DI2 = ON => ICAD/ICM maintain current position 1: DI1 = ON, DI2 = OFF => Decreasing ICM Opening Degree DI1 = OFF, DI2 = ON => Increasing ICM Opening Degree DI1 = DI2 = OFF => ICAD/ICM maintain current position DI1 = DI2 = ON => ICAD/ICM maintain current position
In **ON / OFF Mode** Closing speed	**¡14**	0	100	50/ 100	✔	-	No	See **¡04**. If **¡26**= 1 - 3 then factory settin qg = 100 If **¡26**= 4 - 9 then factory setting = 50
Manual set point	**¡15**	0	100	0			No	When **¡01**= 2, **¡15** determine the start up value.

to be continued....

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Parameter list
(continued)

Description	ICAD parameter	Min	Max	Factory Setting	Stored	Unit	Pass word	Comments
Encoder operation	**¡16**	0	1	1	✔		Yes	**NB:** Password protected. Password = 7 0: Encoder disabled. Means ICAD operation as ICAD 600A/ICAD 600A-TS/1200A without encoder 1: Encoder enabled
Forced closing when ICM valve Opening Degree < 3%	**i17**	0	1	0	✔	-	No	Enable/Disable forced closing 0: When ICM valve Opening Degree < 3% it will be forced to close regardless of requested ICM valve Opening Degree 1: When ICM valve Opening Degree < 3% no forced to closing will take place
ICM configuration	**¡26**	0	9	0	✔		Yes	**NB:** Password protected. Password = 11 0: No valve selected. Alarm A1 will become active. 1: ICM 20 with ICAD 600A / ICMTS 20 with ICAD 600A-TS 2: ICM 25 with ICAD 600A 3: ICM 32 with ICAD 600A 4: ICM 40 with ICAD 1200A 5: ICM 50 with ICAD 1200A 6: ICM 65 with ICAD 1200A 7: ICM 100 with ICAD 1200A 8: ICM 125 with ICAD 1200A 9: ICM 150 with ICAD 1200A

Service

Description	ICV Name	Min	Max	Factory Setting	Stored	Unit	Pass word	Comments
OD%	**¡50**	0	100	-		%	-	ICM valve Opening Degree
AI [mA]	**¡51**	0	100	-		mA	-	AI signal
AI [V]	**¡52**	0	100	-		V	-	AI signal
AO [mA]	**¡53**	0	100	-		mA	-	A0 signal
DI	**¡54**	0	1	-		-	-	DI signals. Depending of **¡02** If **¡02** = 2, one digits are shown. See fig. 8 0 : DI1 = OFF 1 : DI1 = ON If **¡02** = 3, two digits are shown. See fig. 9 00 : DI1 = OFF, DI2 = OFF 10 : DI1 = ON, DI2 = OFF 01 : DI1 = OFF, DI2 = ON 11 : DI1 = ON, DI2 = ON
DO Close	**¡55**	0	1	-		-	-	DO Closed status. ON when OD < 3%
DO Open	**¡56**	0	1	-		-	-	DO Open status. ON when OD > 97%
DO Alarm	**¡57**	0	1	-		-	-	DO alarm status. ON when a Alarm is detected
Display mP SW ver.	**¡58**	0	100	-		-	-	Software version for display microprocessor
Motor mP SW ver.	**¡59**	0	100	-		-	-	Software version for motor 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.

ENGINEERING
TOMORROW

Motor operated valve, type ICMTS **with actuator,** type ICAD 600A-TS

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ENGINEERING TOMORROW

Motor operated valve, type ICMTS **with actuator,** type ICAD 600A-TS



The ICMTS is a direct operated motorised valve driven by actuator type ICAD 600A-TS.

The ICMTS is designed to regulate the flow of transcritical gas or subcritical liquid from the gascooler in transcritical CO_2 systems. The ICMTS can also be used for other control functions in CO_2 systems.

The ICMTS valve is designed so that the opening and closing forces are balanced.

ICAD 600A-TS
ICAD 600A-TS actuators can be controlled using the following signals:
0-20 mA
4-20 mA (default)
0-10 V
2-10 V

ICAD 600A-TS actuators can also operate an ICMTS valve as an On/Off function supported by a digital input.

The ICMTS valve can be operated manually via the ICAD 600A-TS actuator or via the Multi-function tool for ICMTS (see the ordering section).

Features (valve)

- Designed for high pressure CO_2 systems with applications for a maximum working pressure of 140 bar / 2030 psig.
- Applicable to R744 (CO_2).
- Direct coupled connections.
- Connection types are DIN butt weld.
- Non-alloyed quality steel.
- Low weight and compact design.
- Regulating cone ensures optimum regulating accuracy, particularly at part load.
- Manual opening possible via ICAD 600A-TS or Multi-function tool.
- The PTFE seat provides excellent valve tightness.
- Magnet coupling - real hermetic sealing.
- ICAD 600A-TS include encoder function that will provide a true valve position feedback to Danfoss controller or non-Danfoss control systems.

Design (valve)

Connections
ICMTS valves are available with DIN butt weld connections.

Approvals
The ICMTS valve concept is designed to fulfil global refrigeration requirements.

The ICMTS valves are approved in accordance with the European standard specified in the Pressure Equipment Directive and are CE marked. For further details / restrictions - see Installation Instruction. The ICAD 600A-TS actuator is UL listed.

Valve body and top cover material
Low temperature steel

CE

ICMTS valves	
Nominal bore	DN≤ 25 (1 in)
Classified for	Fluid group I
Category	Article 3, paragraph 3

Fail Safe supply options

In the event of a power failure, multiple fail safe options are possible, provided that a ICAD-UPS or similar is used.
During power failure, ICAD 600A-TS can be selected to:
- Close ICMTS
- Open ICMTS
- Stay in the position it was in, prior to power failure.
- Go to a specific ICMTS valve opening degree.

See the section ICAD UPS for further information.

Please note:
a fail safe supply (battery or UPS) is required.



Technical data (valve)

Refrigerants
Applicable to R744 (CO_2).
ICMTS valves must not be used with flammable refrigerants. For further information, please contact your local Danfoss sales company.

- *Temperature range:*
  Media: -60 – 120 °C / -76 – 248 °F.
- *Pressure*
  The valve is designed for:
  Max. working pressure: 140 bar g / 2030 psig
- *Surface protection*
  ICMTS:
  The external surface is treated in order to provide good corrosion protection.
- Max. opening pressure differential (MOPD)
  ICMTS:
  90 bar / 1305 psi
- The time it takes to move from Closed to Open position or in reverse order with maximum selected speed at ICAD 600A-TS is 3 seconds.

Function (valve)

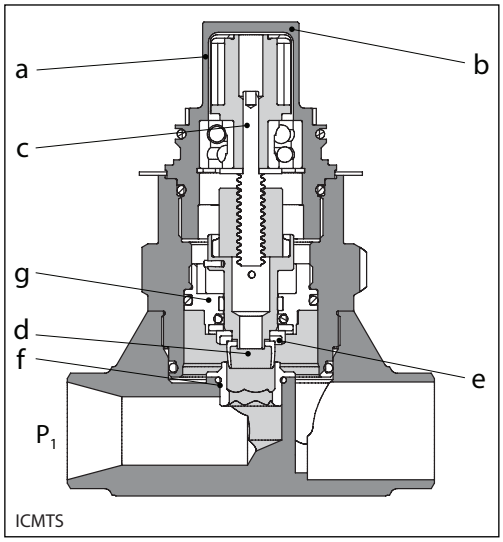
The ICMTS motor valve is designed for use with ICAD 600A-TS.

The driving force from the actuator is transferred via a magnetic coupling (a) through the stainless steel top housing (b), thus eliminating the need for a packing gland. The rotational movement of the magnetic coupling (a) is transferred to a spindle (c) which in turn provides the vertical movement of the cone (d) and PTFE valve plate (e), to open and close the valve. The closing force of the actuator combined with the PTFE valve plate (e) and valve seat (f) provides an effective seal to prevent leakage across the valve port, when the valve is in the closed position. To prevent damage to the PTFE valve plate (e) and seat (f) from system debris, it is recommended to install a filter in the system.

Valve inlet pressure (P_1) acting on the underside of the PTFE valve plate (e) also passes through the hollow cone assembly (d) on to the top of the piston (g) and balances the pressure acting on the piston (g). Any trapped liquid across the throttle cone (d) is equalised down to the valve outlet without affecting the valve performance.

The actuators have a fully weather protected enclosure with none of the moving parts exposed to the environment.

The fast acting actuators and balanced valve design results in the valve being able to move from the fully closed to the fully open position in about 3 seconds.



ICMTS

The smallest cones (A33 and A) are log-shaped in order to provide optimum regulation at small capacities and high pressure differentials.

The first version of the ICMTS valve features V-shaped A cones. Please contact your local Danfoss sales company for further info.

Bigger cones (B and C) are V-shaped in order to provide an optimum regulating curve for higher capacities.

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ICAD 600A-TS

The actuator type 600A-TS is designed specifically for ICMTS valves. The actuator type 900 can be used for ICMTS as well, however it consumes more energy than ICAD 600A-TS for similar applications.

The ICAD 600A-TS is controlled via a modulating analogue signal (e.g. 4 – 20 mA/2 – 10 V) or a digital ON / OFF signal. ICAD 600A-TS incorporates an advanced MMI (Man Machine Interface), including continuous display of Opening Degree, which gives the user a very advanced and flexible setup procedure that can meet many different applications. The ICMTS valve is typically controlled by the Danfoss EKC 326A controller.

Features (actuator)

- Specifically designed for ICMTS valve
- Advanced and high speed Digital Stepper Motor Technology
- Seven segment LCD display including three programming keys
- Valve opening degree can be observed continuously.
- Can easily be configured to different applications on-site. (change speed, ON/OFF, modulating valve)
- Open – Close time: 3 seconds
- Modulating or ON / OFF operation
- Multiple speed selection during operation
- Logging of old alarms
- Password protection
- Control input signal:
  4 – 20 mA, 0 – 20 mA, 0 – 10 V, 2 – 10 V
- Position feed back : 0 – 20 mA, 4 – 20 mA (ICMTS)
- 3 Digital ON / OFF feedback
- Resolution: 20 micron / step (0.02 mm stroke pr. step)
- Total steps: 250
- Auto Calibration, Neutral zone
- In the event of a power failure, multiple fail safe options are possible. During power failure, ICAD 600A-TS can be selected to:
  Close ICMTS
  Open ICMTS
  Stay in the position it was in, prior to power failure.
  Go to a specific ICMTS valve opening degree.
- Hermetic magnetic motor
- Enclosure: IP 67 (~NEMA 6)
- Approvals: CE, UL, CRN
- Connectors for easy installation and servicing
- Can be controlled by Danfoss EKC 326A controller and integrated into Danfoss ADAP-KOOL® system.

Technical data (actuator)

- *Materials*
  Housing
  Aluminium
  Top part of ICAD 600A-TS:
  PBT thermo plastic
- *Weight*
  ICAD 600A-TS: 1.2 kg (2.64 lb)
- *Temperature range (ambient)*
  -30 – 50 °C / -22 – 122 °F
- *Enclosure*
  IP 67 (~NEMA 6)
- *Cable connection*
  Can be ordered with or without cables included.

  If ordered with cables:
  2 cables in length of 1.5 m length (60 in) with M12 connectors included

  Supply cable
  3 × 0.34 mm² (3 × ~22 AWG)
  Ø4.8 mm (diameter 0.19")

  Control cable
  7 × 0.25 mm² (7 × ~24 AWG)
  Ø6 mm (diameter 0.24")

Electrical data
Supply voltage is galvanic isolated from Input/ Output.

Supply voltage:	24 V DC, 10% / -15%
Load:	ICAD 600A-TS: 1.2 A
Fail safe supply:	Min. 19 V DC, max. 26.4 V DC
Load:	ICAD 600A-TS: 1.2 A

Battery capacity:
For each open/closed cycle
ICAD 600A-TS:
Speed Parameter i04=100 (Max. Speed) : 2 mAh
Speed Parameter i04=1 (Min. Speed) : 200 mAh

Analogue Input - Current or Voltage

Current:	0/4-20 mA
Load:	200 Ω
Voltage:	0/2-10 V DC
Load:	10 kΩ

Analogue Output:	0/4-20 mA
Load:	≤ 250 Ω

Digital input - Digital ON / OFF input by means of volt-free contact (Signal / Telecom relays with gold-plated contacts recommended) – Voltage input used

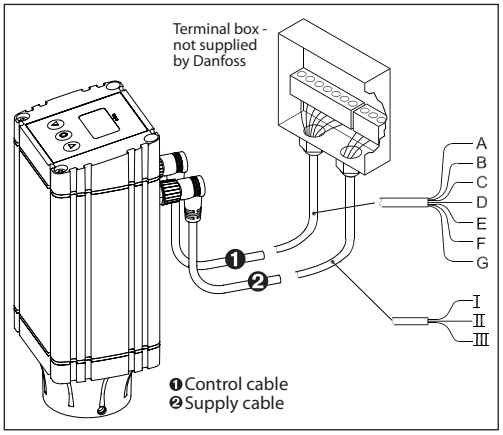
ON:	contact impedance < 50 Ω)
OFF:	contact impedance > 100 kΩ

Digital Output - 3 pcs. NPN transistor output

External supply:	5-24 V DC (Same supply as for ICAD 600A-TS can be used, but please note that the galvanically isolated system will then be spoiled).
Output load:	50 Ω
Load:	Max. 50 mA

Technical data *(cont.)*

Cable connection - Two 1.5 m (60 in) cables premounted

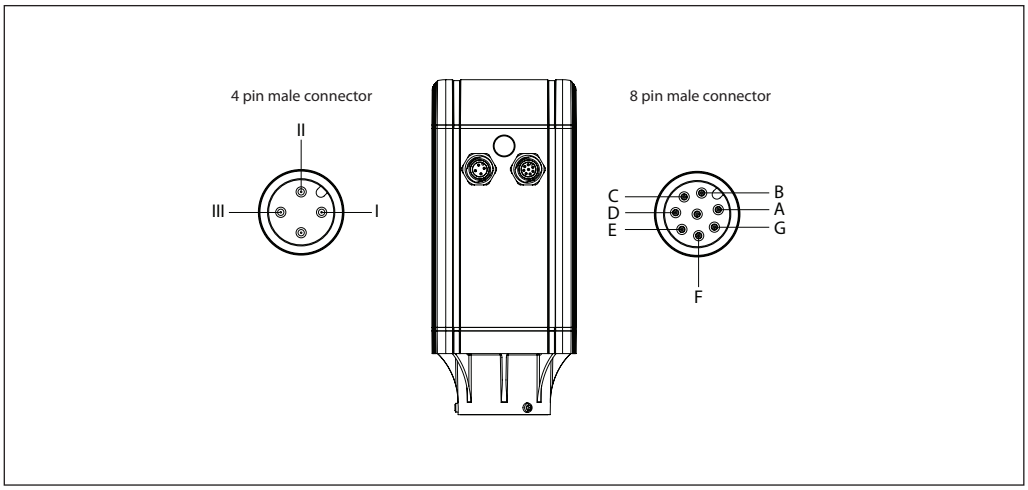


Ref.	Colour		Description	
A	Black	–	Common Alarm	Digital Ouput
B	Brown	–	ICMTS fully open	
C	Red	–	ICMTS fully closed	
D	Orange	–	GND ground	
E	Yellow	+	0/4 - 20 mA Input	Analogue In/Output
F	Green	+	0/2 - 10 V Input	
G	Blue	+	0/4 - 20 mA Output	

I	Black	+	Fail safe supply Battery / UPS* 19 V DC
II	White	+	Supply voltage 24 V DC
III	Brown	–	

* Uninterruptable Power Supply

Note: Colour code changed when compared to older colour wiring diagram.



Approvals

CE according to 89/336 EEC (EMC)
Emission: EN61000-6-3
Immunity:EN61000-6-2
UL
CRN

Function (actuator)

The design of ICAD 600A-TS is based on a digital stepper motor technology combined with an advanced MMI (Man Machine Interface), that gives excellent possibilities for having a high degree of flexibility with the same type of ICAD 600A-TS actuator.

The Opening Degree (0-100 %) of the actual ICMTS valve installed can be continuously observed on the ICAD 600A-TS display.

The advanced menu system will allow several parameters to be adjusted to obtain the required function. Many different parameters can be configurated, among these:

- Modulating and ON/OFF control
- Analogue input
  0 – 20 mA or 4 – 20 mA
  0 – 10 V or 2 – 10 V
- Analogue output
  0 – 20 mA or 4 – 20 mA
- Automatic or manual control
- Change of ICMTS valve speed
- Automatic calibration
- Multiple Fail Safe set-up options during power cut

For service all Input and Output signals can be recalled and observed from the ICAD 600A-TS display.

A password protection has been linked to the parameter of entering the correct ICMTS valve to avoid unintentional and non-authorised operation.

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Function (actuator)
(continued)

The design of ICAD 600A-TS is based on a digital stepper motor technology combined with an advanced MMI (Man Machine Interface), that gives excellent possibilities for having a high degree of flexibility with the same type of ICAD 600A-TS actuator.

The Opening Degree (0-100 %) of the actual ICMTS valve installed can be continuously observed on the ICAD 600A-TS display.

The advanced menu system will allow several parameters to be adjusted to obtain the required function. Many different parameters can be configurated, among these:

- Modulating and ON/OFF control
- Analogue input
  0 – 20 mA or 4 – 20 mA
  0 – 10 V or 2 – 10 V
- Analogue output
  0 – 20 mA or 4 – 20 mA
- Automatic or manual control
- Change of ICMTS valve speed
- Automatic calibration
- Multiple Fail Safe set-up options during power cut

ICAD-UPS for ICMTS



ICAD-UPS is designed for using with ICMTS valve.

In the event of power failure, there is a need to make sure that the ICMTS goes to a safe position. ICAD-UPS can be connected to the ICAD 600A-TS.

The solution of connecting ICMTS with ICAD 600A-TS to ICAD-UPS will give one of the following possibilities in the event of power failure:
– close ICMTS
– open ICMTS
– stay
– go to a specific ICMTS Opening Degree.

When power supply has been re-established the system will automatically return to normal operation.

Facts and features

- Industrial product.
- *Can support up to*
  –
  8 pcs. of ICAD 600A-TS
- Integrated solution - battery and UPS.
- *Industrial approvals:*
  CE, UL, GL (Germanisher Lloyd).
- DIN rail mounting.
  – *LED indication*
  – Green (Power ON)
  – Yellow (Flashing: charging, Constant: Buffer mode (Failsafe supply to ICAD 600A-TS))
  – Red (Battery fully discharged/Battery faulty)
- 24 V DC supply → Same transformer as for ICAD 600A-TS can be used. Only +0.5 A extra load on the transformer.
- Check of battery every 60 sec.
- Adjustable buffer time*. (1, 2, 3, 5, 10, 15, 20, 30 or infinity) = Ensures longer battery life time.
- Forced remote shutdown in buffer mode via digital input.
- 3 digital volt free relay change over contacts for signals to PLC systems. (Power OK, Buffer mode (failsafe supply to ICAD 600A-TS), Alarm).

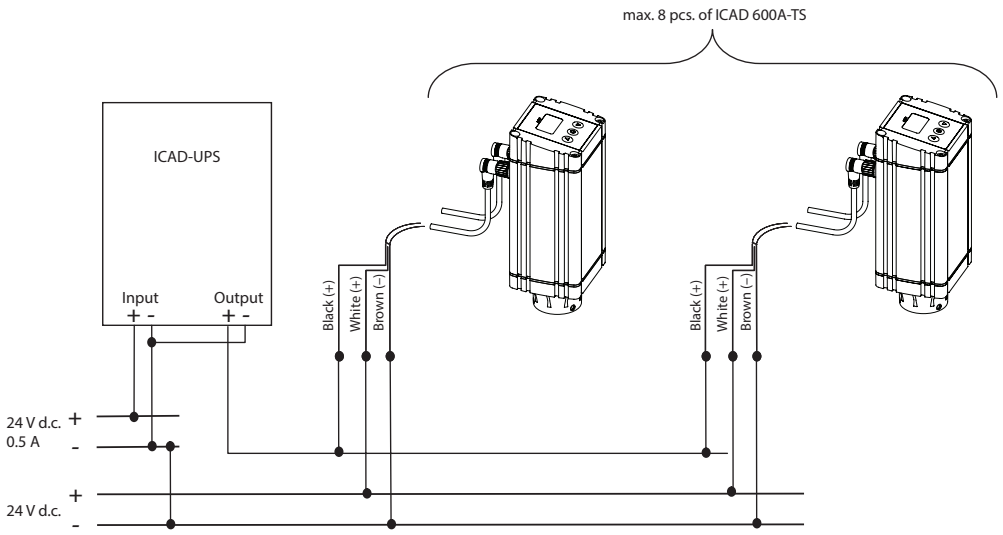
* Buffer time is defined as the period whereICAD 600A-TS is only powered from the ICAD-UPS (i.e. not from main supply). On ICAD-UPS there is an adjustable buffer time setting (1, 2, 3, 5, 10, 15, 20, 30 min. or infinity). If set to 3, ICAD-UPS will switch off power to connected ICAD 600A-TS, 3 minutes after the power failure occurs. This ensures that the internal battery inside ICAD-UPS does not fully discharge.

Code number: **027H0182**

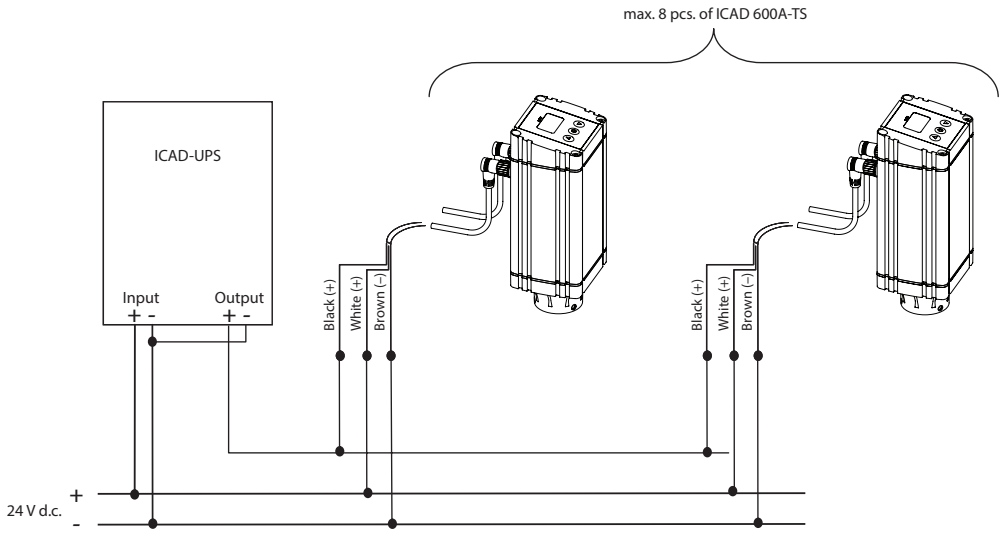
For further information, please see the instruction AN000086416706

ICAD-UPS applications

Seperate 24 V DC tranformer for both ICAD-UPS and ICAD 600A-TS

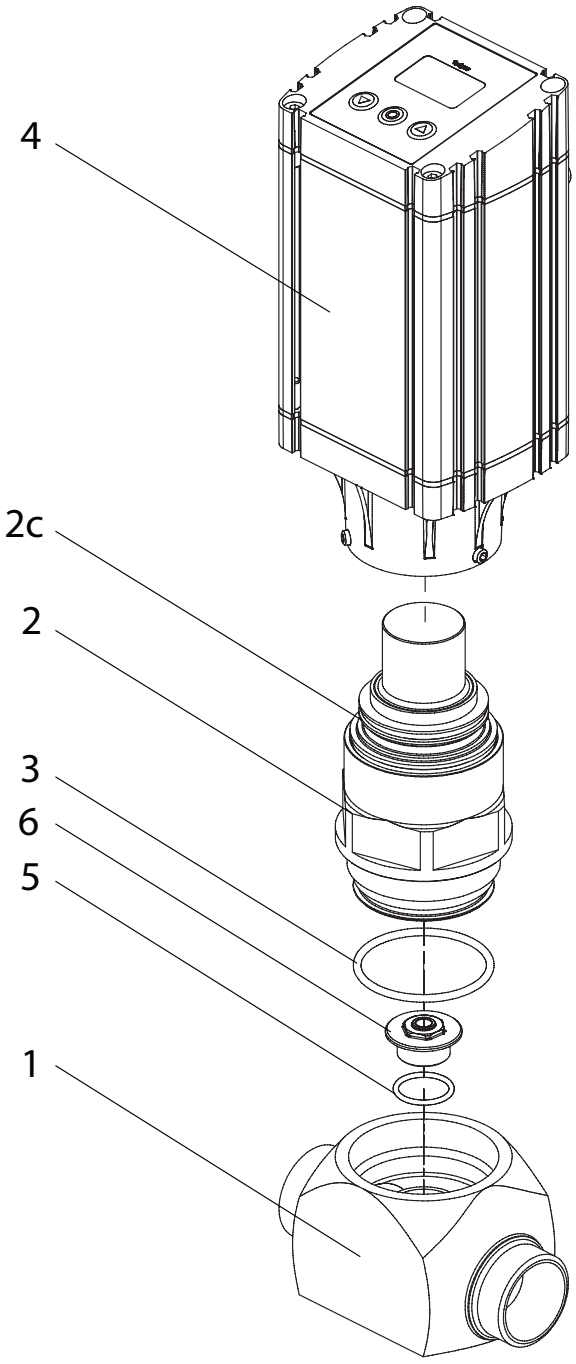


One 24 V DC tranformer for ICAD-UPS and ICAD 600A-TS



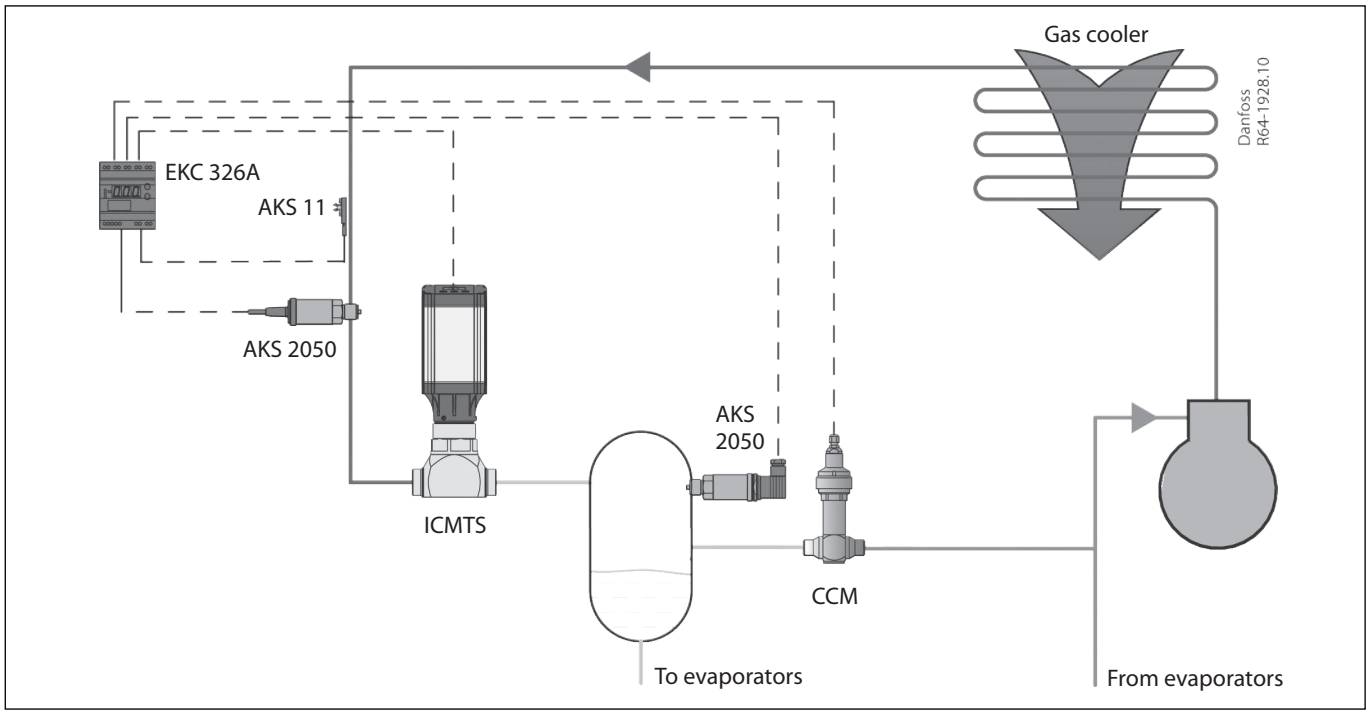
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Material specification



No.	Part	Material	EN	ASTM
1	Housing	Low temperature steel	S235J2, EN10025	A515
2	Top cover / function module	Low temperature steel	S355J2, EN10025	LCC, A352
2c	O-ring	Cloroprene (Neoprene)		
3	O-ring	Cloroprene (Neoprene)		
4	Actuator			
5	O-ring	Cloroprene (Neoprene)		
6	Seat	stainless steel		

ICMTS Application



The ICMTS valve is developed for transcritical CO_2 applications. The ICMTS valve can be used in systems with flash gas bypass, parallel compression as well as in stand-alone application. The ICMTS valve can be used in transcritical and subcritical conditions.

The most typical application is with flash gas bypass.

Pressure optimisation is performed by the Danfoss EKC 326A controller and the ICMTS valve which is installed at the outlet of the gas cooler (see the figure above). This design provides the possibility to optimise gas cooler pressure and intermediate receiver pressure independently.

The pressure in the receiver is one important parameter, but the design of the receiver is also important. It typically acts as a liquid separator as well.

In order to keep the intermediate pressure low, flash gas is expelled through a gas bypass valve to the suction side of the compressor. The two phase mixture from the ICMTS valve has to be separated before gas enters the gas bypass.

Please refer to the Danfoss Application guide, DKRCE.PA.R1.A for more information on CO_2 systems.

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ICMTS capacities

It is relatively complex to correctly size a valve for transcritical applications, especially as the mass flow of the refrigerant changes, drastically moving from transcritical to subcritical conditions. At the same time, temperature variations in the intermediate vessel downstream of the valve, will not significantly affect the sizing the valve.
It is recommended to calculate the ICMTS valve using Danfoss DIRcalc™ software following these steps:

- Calculate the ICMTS valve as an expansion valve in the liquid line with the following conditions: T_{cond} = 30 °C, T_{evap} = temperature in the intermediate vessel, 0 K subcooling.
- Check the selected valve for the winter conditions: e.g. T_{cond} = 15 °C with 5 K subcooling
- Possible part load of the system at T_{cond} = 30 °C, T_{evap} = temperature in the intermediate vessel, 10 K subcooling. (night operation or the smallest capacity step of the power pack).
  The part load of the valve should be above 10%.

Quick capacity selection could be done using the following table:

Table 1

	0 K subcooling in the subcritical mode		
	+15/+5 °C [kW]	+30/+5 °C [kW]	**+38 (100 bar)/ +5 °C** [kW]
ICMTS 20-A33	16.7	16.1	25
ICMTS 20-A	50	48	75
ICMTS 20-B	291	278	423
ICMTS 20-C	479	454	675

Table 2

	5 K subcooling in the subcritical mode		
	+15/+5 °C [kW]	+30/+5 °C [kW]	**+38 (100 bar)/ +5 °C** [kW]
ICMTS 20-A33	18.5	23	25
ICMTS 20-A	56	69	75
ICMTS 20-B	325	400	423
ICMTS 20-C	540	655	675

Table 3

	10 K subcooling in the subcritical mode		
	+15/+5 °C [kW]	+30/+5 °C [kW]	**+38 (100 bar)/ +5 °C** [kW]
ICMTS 20-A33	20.4	26.5	25
ICMTS 20-A	61	80	75
ICMTS 20-B	355	470	423
ICMTS 20-C	585	760	675

Please contact your local Danfoss sales office if you need assistance in your selection of ICMTS valves.

Ordering

Type	**Code number**
ICMTS 20-A33	**027H1084**
ICMTS 20-A	**027H1085**
ICMTS 20-B66	**027H1093**
ICMTS 20-B	**027H1086**
ICMTS 20-C	**027H1087**

ICAD 600A-TS with cables	**027H9078**
ICAD 600A-TS without cables	**027H9123**

Accessories



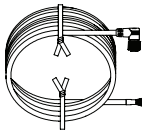
Service kit 1 - valve orifice

Code number	**027H1192 - Gasket kit with orifice for B and C cones**
Code number	**027H1193 - Gasket kit with orifice for A33 and A (new design) cones**



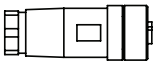
Service kit 2 – Top part with cone complete

Type	Code number
ICMTS 20-A33 top part with cone and orifice kit	**027H1088**
ICMTS 20-A top part with cone and orifice kit	**027H1080**
ICMTS 20-B66 top part with cone and orifice kit	**027H1094**
ICMTS 20-B top part with cone and orifice kit	**027H1081**
ICMTS 20-C top part with cone and orifice kit	**027H1082**



Cable for ICAD 600A-TS

Cable length	Code number
Cable set 1.5 m, female	**027H0426**
Cable set 10 m, female	**027H0427**



Connectors for ICAD 600A-TS

Connector type	Code number
Two Female Connectors with screw terminals: - connector for power - connector for control signals	**027H0430**



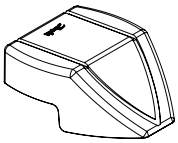
ICAD-UPS

Code number	**027H0182**



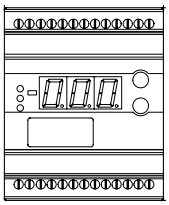
Multi-function tool

Code number	**027H0181**



ICAD 600A-TS Protection Cap

Code number	**027H0431**



EKC 326A

Code number	**084B7252**

Technical data

Supply voltage	24 V AC ±15% 50/60 Hz (the supply voltage is galvanically separated from the input and output signals)	
Power consumption	Controller	8 VA
Input signal	Pressure transmitter	Ratiometric, AKS 2050
	Pressure transmitter	Ratiometric, AKS 2050
	Digital input from external contact function	
	Voltage signal	0 – 10 V Signal range = 2 – 10 V
Sensor input	1 pcs. Pt 1000 ohm	
Alarm relay	1 pcs. SPST	250 V AC AC-1: 4 A (ohmic) AC-15: 3 A (inductive)
Actuator	ICAD 600A-TS mounted on ICMTS	Voltage signal 0 – 10 mA
	CCM	Step motor
Data communication	Possible to connect a data communication module type AKA 174	
Environments	-10 – 55 °C, during operations -40 – 70 °C, during transport	
	20 - 80% Rh, not condensed	
	No shock influence / vibrations	
Enclosure	IP 20	
Weight	300 g	
Mounting	DIN rail	
Display	LED, 3 digits	
Terminals	max. 2.5 mm^2 multicore	
Approvals	EMC acc. EN 61000-6-3 and EN 61000-6-2 LVD acc. EN 60730-1 and EN 60730-2-9	

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Accessories (continued)

AKS 2050

Code number	**060G5750 (-1 to 59 bar)**
Code number	**060G5751 (-1 to 99 bar)**
Code number	**060G5752 (-1 to 159 bar)**



Technical data

Operating range	as mentioned above
Permissible working pressure (PB)	250 bar
Compensated temperature range	0 – 80 °C
Connection	G 3/8 A 2) - Thread ISO 228/1 - G 3/8 A (BSP).

Connecting plug with 5 m cable
(a pressure transducer with the cap gets a IP67 rating)



Code number	**060G1034**

Plug Pg 9



Code number	**060G0008**

AKS 11

Code number	**084N0003 – cable length: 3.50 m**
Code number	**084N0005 – cable length: 5.50 m**
Code number	**084N0008 - cable length: 8.50 m**

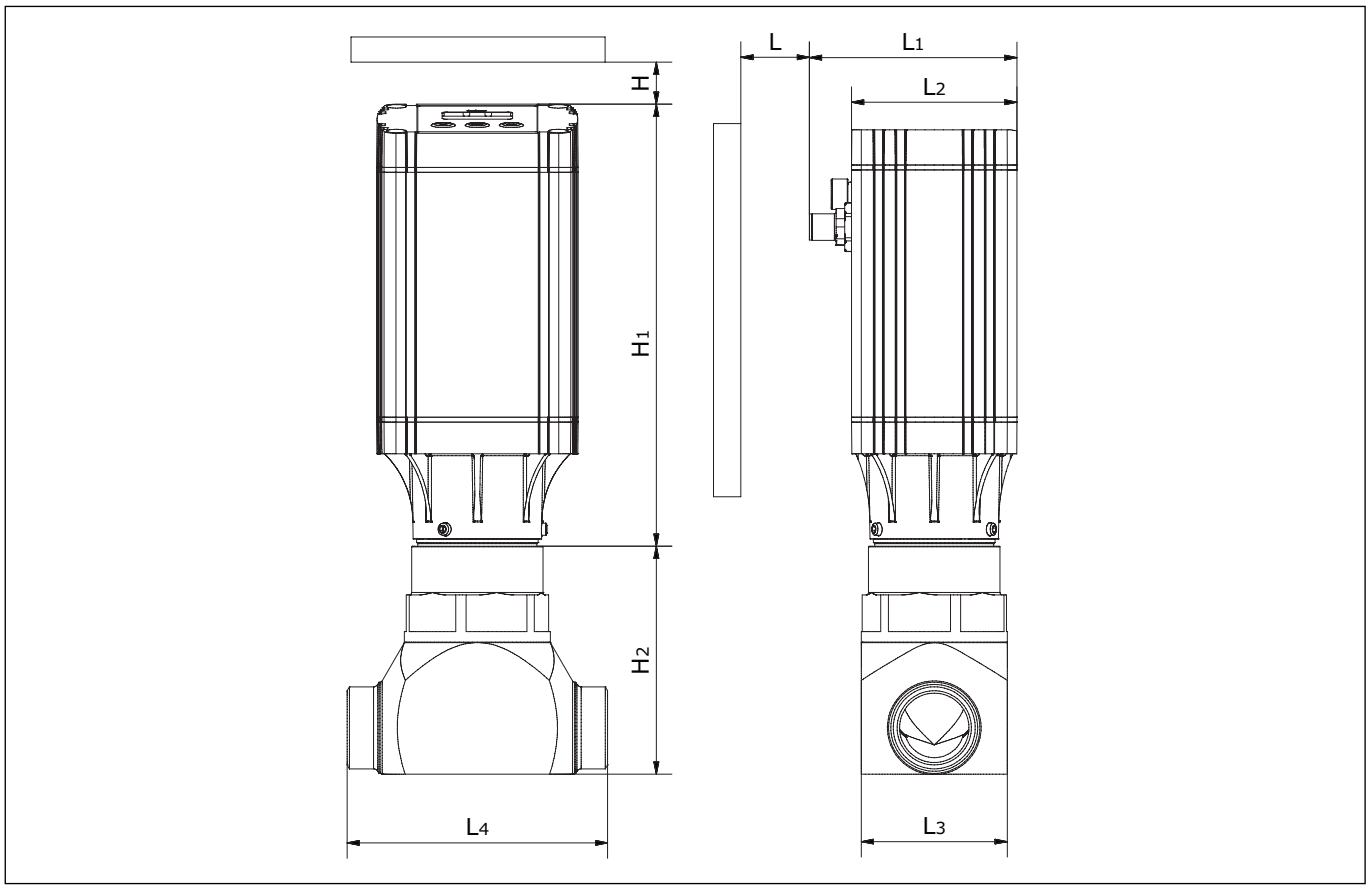


Technical data

Max. ambient temperature	100 °C
Cable type	PVC
Electrical connection	Cable
Measuring range	-50 – 100 °C
Resistance value	1 x Pt 1000
Tolerance	EN 60751 Class B
Wires	2 pcs.

For selection of CCM motorised valves for CO_2 gas bypass application please see AI213386426013

Dimensions

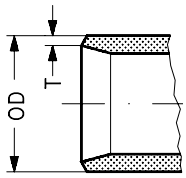


Connection		H	H_1	H_2	L*	L_1	L_2	L_3	L_4	Weight ICMTS incl. ICAD 600A-TS
25 D (1 in)	[mm]	40	195	94	65	86	68	60	107	3.3 kg
	[in]	1.58	7.68	3.7	2.56	3.39	2.68	2.36	4.21	6 lb.

* include space for ICAD Protection cap

Connections

D: *Butt weld DIN (EN 10220)*



Size [mm]	Size [in]	OD [mm]	T [mm]	OD [in]	T [in]		
25	(1)	33.7	2.6	1.327	0.103		

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General operation

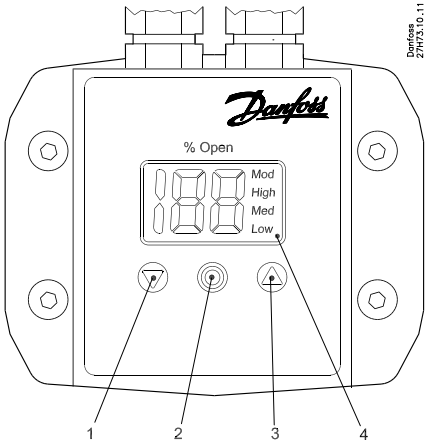


Fig. 2

1. "Down" arrow push button
2. Enter
3. "Up" arrow push button
4. Display

ICAD 600A-TS is equipped with an MMI (Man Machine Interface) from which it is possible to monitor and change the setting of parameters to adapt the ICAD 600A-TS and the corresponding ICMTS to the actual refrigeration application.

The setting of parameters is managed by means of the integrated ICAD 600A-TS MMI (see fig. 2 and fig. 3) and consists of:

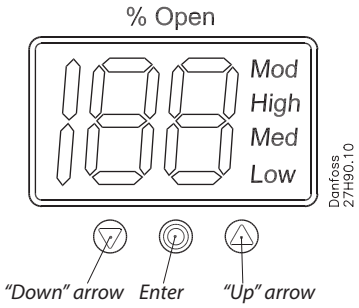


Fig. 3

- "Down" arrow push button (fig. 2, pos. 1)
  - Decreases parameter number by 1 at each activation.
- "Up" arrow pushbutton (fig. 2, pos. 3)
  - Increases parameter number by 1 at 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** example is shown below (parameter **¡08**, fig. 4).

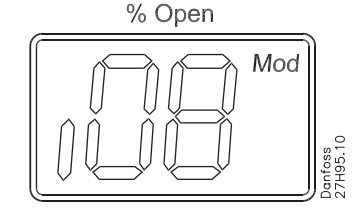


Fig. 4

  - 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 Enter button activated for 2 seconds.
- Display (fig. 2, pos. 4)
  - The Opening Degree (OD) 0 – 100 % of the ICMTS valve is normally displayed. When the push buttons are not activated for 20 seconds, the display will return to OD (see fig. 5).

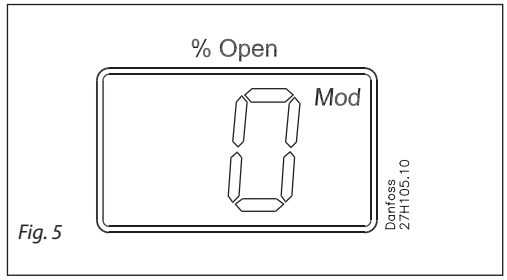


Fig. 5

- Displays the parameter.
- Displays the actual value of a parameter.
- Displays the function status by means of text (fig. 2, pos. 4).
  - Mod represents that ICAD 600A-TS is positioning the ICMTS valve according to an analogue input signal (Current or Voltage).
  - ***Low*** represents that ICAD 600A-TSS is operating the ICMTS valve like an ON/OFF solenoid valve with low speed according to a digital input signal.
  - ***Med*** represents that ICAD 600A-TS is operating the ICMTS valve like an ON/OFF solenoid valve with medium speed according to a digital input signal.
  - ***High*** represents that ICAD 600A-TS is operating the ICMTS valve like an ON/OFF solenoid valve with high speed according to a digital input signal (see fig. 6).

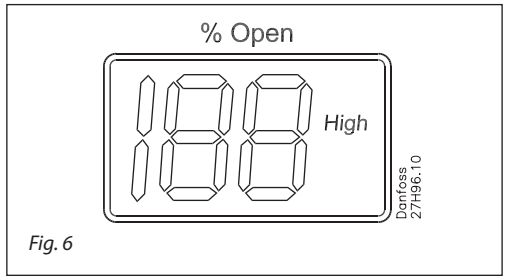


Fig. 6

Alarms

Description	ICAD alarm text	Definition of event	Comments
No Valve type selected	**A1**	Alarm ON	At start-up **A1** will be displayed
Controller fault	**A2**	Alarm ON	Internal fault inside electronics. Carry out: 1) Power OFF and Power ON If A2 still active. 2) Make a Reset to factory setting If A2 still active. Return ICAD to Danfoss
AI input error	**A3**	Alarm ON	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**	Alarm ON	If 5 V < fail safe supply <18 V. Enabled by **¡08**
Check supply to ICAD	**A5**	Alarm ON	If supply voltage < 18 V
Calibration extended failed	**A6**	Alarm ON	Check valve type selected. Check presence of foreign body internally in ICMTS valve
Internal temperature alarm	**A7**	Alarm ON	Temperature for stepper motor component too high.Ventilate/lower ambient ICAD temperature
	A8	Alarm ON	Temperature for stepper motor component too high. Ventilate/lower ambient ICAD temperature.
Valve locked	**A9**	Alarm ON	Only active if i16 = 1 If the valve is locked in more than 15 seconds. ICMTS stopped and hold position A9 flashing in display A9 alarm can only be reset by Power OFF/ON of ICAD

If an alarm has been detected, the ICAD 600A-TS display (fig. 2) will alternate between showing Actual alarm and Present Opening Degree.

If more than one alarm is active at the same time, the alarm with the highest priority will take preference. **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**.

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Parameter list - Valid from: (i58:11, i59:36) and onwards

The first parameter to be entered shall be: **¡26**

Description	ICAD parameter	Min	Max	Factory Setting	Stored	Unit	Pass word	Comments
OD (Opening degree)	-	0	100			%	-	ICMTS valve Opening Degree is displayed during normal operation. Running display value (see **¡01**, **¡05**).
Main Switch	**¡01**	1	2	1	✓	-	No	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	✓	-	No	Operation mode 1: Modulating – ICMTS positioning according to Analog Input (see **¡03**) 2: ON/OFF - operating the ICMTS valve like an ON/OFF solenoid valve controlled via Digital Input. See also **¡09**. 3: Neutralzone / 3 point control. Increase/Decrease Opening Degree by Digital Input. See fig. 9
AI signal	**¡03**	1	4	2	✓	-	No	Type of AI signal from external controller 1: 0-20 mA 2: 4-20 mA 3: 0-10 V 4: 2-10 V
Speed In **Modulating Mode** Opening/closing speed In **ON/OFF Mode** Opening speed	**¡04**	1	100	50/ 100	✓	-	No	Speed can be decreased. Max. speed is 100 % - Not active in manual operation (**¡01** = 2) If **¡26**= 1 - 3 then factory setting =100 If **¡26**= 4 - 9 then factory setting =50 If ICMTS is opening and (**¡04** < = 33) or ICMTS is closing and (**¡14** < = 33) => Low is displayed. If ICMTS is opening and (33 < If **¡04** < = 66) or ICMTS is closing and (33 < If **¡14** < = 66) => Med is displayed. If ICMTS is opening and (**¡04** > = 67) or ICMTS is closing and (**¡14** > = 67) => High is displayed"
Automatic calibration	**¡05**	0	2	0		-	No	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 0: No Calibration 1: Normal forced calibration - CA flashing slowly 2: Extended calibration – CA flashing rapidly"
AO signal	**¡06**	0	2	2	✓	-	No	Type of A0 signal for ICV valve position 0: No signal 1: 0-20 mA 2: 4-20 mA
Failsafe	**¡07**	1	4	1	✓	-	No	Define condition at power cut and fail safe supply is installed. 1: Close valve 2: Open Valve 3: Maintain valve position 4: Go to OD given by **¡12**"
Fail safe supply	**¡08**	0	1	0	✓		Yes	Fail safe supply connected and enable of A4 alarm: 0: No 1: Yes
DI function	**¡09**	1	2	1	✓		No	Define function when DI is ON (short circuited DI terminals) when **¡02** = 2 1: Open ICMTS valve (DI = OFF = > Close ICMTS valve) 2: Close ICMTS valve (DI = OFF = > Open ICMTS valve)
Password	**¡10**	0	199	0		-	-	Enter number to access password protected parameters: **¡26** Password = 11
Old Alarms	**¡11**	A1	A99	-		-	No	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 power cut.	**¡12**	0	100	50	✓		No	Only active if **¡07** = 4 If fail safe supply is connected and power cut occurs, the ICMTS will go to the specified OD.
Inverse operation	**¡13**	0	1	0	✓		No	When **¡02** = 1 0: Increasing Analog Input signal => Increasing ICMTS Opening Degree 1: Increasing Analog Input signal => Decreasing ICMTS Opening Degree When **¡02** = 3 0: DI1 = ON, DI2 = OFF => Increasing ICMTS Opening Degree. DI1 = OFF, DI2 = ON => Decreasing ICMTS Opening Degree DI1 = DI2 = OFF => ICAD/ICMTS maintain current position DI1 = DI2 = ON => ICAD/ICMTS maintain current position 1: DI1 = ON, DI2 = OFF => Decreasing ICMTS Opening Degree DI1 = OFF, DI2 = ON => Increasing ICMTS Opening Degree DI1 = DI2 = OFF => ICAD/ICMTS maintain current position DI1 = DI2 = ON => ICAD/ICMTS maintain current position
In **ON/OFF Mode** Closing speed	**¡14**	0	100	50/ 100	✓	-	No	See **¡04**. If **¡26**= 1 - 3 then factory settin qg = 100 If **¡26**= 4 - 9 then factory setting = 50
Manual set point	**¡15**	0	100	0			No	When **¡01**= 2, **¡15** determine the start up value.

to be continued....

Parameter list
(continued)

Description	ICAD parameter	Min	Max	Factory Setting	Stored	Unit	Pass word	Comments
Encoder operation	**¡16**	0	1	0/1	✓		Yes	**NB:** Password protected. Password = 7 If **¡26** = 1 - 3 then factory setting = 0 If **¡26** = 4 - 6 then factory setting = 0 If **¡26** = 7 - 9 then factory setting = 1 0: Encoder disabled. Means ICAD operation as ICAD 600A-TS 1: Encoder enabled
Forced closing when ICMTS valve Opening Degree < 3%	**i17**	0	1	0	✓	-	No	Enable/Disable forced closing 0: When ICMTS valve Opening Degree < 3% it will be forced to close regardless of requested ICMTS valve Opening Degree 1: When ICMTS valve Opening Degree < 3% no forced to closing will take place
ICMTS configuration	**¡26**	0	9	0	✓		Yes	**NB:** Password protected. Password = 11 0: No valve selected. Alarm A1 will become active. 1: ICMTS 20 with ICAD 600A-TS

Service

Description	ICAD Parameter	Min	Max	Factory Setting	Stored	Unit	Pass word	Comments
OD %	**¡50**	0	100	-		%	-	ICMTS valve Opening Degree
AI [mA]	**¡51**	0	100	-		mA	-	AI signal
AI [V]	**¡52**	0	100	-		V	-	AI signal
AO [mA]	**¡53**	0	100	-		mA	-	A0 signal
DI	**¡54**	0	1	-		-	-	DI signals. Depending of **¡02** If **¡02** = 2, one digits are shown. 0 : DI1 = OFF 1 : DI1 = ON If **¡02** = 3, two digits are shown. 00 : DI1 = OFF, DI2 = OFF 10 : DI1 = ON, DI2 = OFF 01 : DI1 = OFF, DI2 = ON 11 : DI1 = ON, DI2 = ON
DO Close	**¡55**	0	1	-		-	-	DO Closed status. ON when OD < 3 %
DO Open	**¡56**	0	1	-		-	-	DO Open status. ON when OD > 97 %
DO Alarm	**¡57**	0	1	-		-	-	DO alarm status. ON when a Alarm is detected
Display mP SW ver.	**¡58**	0	100	-		-	-	Software version for display microprocessor
Motor mP SW ver.	**¡59**	0	100	-		-	-	Software version for motor 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.

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ENGINEERING
TOMORROW

Pressure control valve
Type KDC 65-200

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ENGINEERING TOMORROW

Pressure control valve
Type KDC 65-200



The KDC valve is a pressure control valve . The valve controls the discharge pressure of the compressor to ensure fast build-up of pressure and lubrication pressure. The valve also acts as a check valve in the discharge line of the compressor.

The KDC valve is force-controlled so that when pressure in the oil separator becomes 2 bar (29 psi) higher than the suction pressure, the spring is compressed and the valve opens. In low-pressure units (boosters), the spring requires a differential pressure of 0.5 bar (7 psi) for the valve to open.

Features

- Applicable to HCFC, HFC, R717(Ammonia) and R744 (CO_2).
- Each valve type is clearly marked with type, size and performance range
- Angle valves with weld connections
- Fast build-up of oil pressure in oil separator during start-up.
- High closing force on the cone during standstill, even without differential pressure across the valve
- Very low pressure drop because of spring force
- Low part-load without risk of valve chattering
- Stainless steel bolts
- Housing and bonnet material is in low temperature steel according to requirements of the Pressure Equipment Directive and other international classification authorities
- *Pressure range:*
  40 bar g (580 psig)
- *Temperature range:*
  –50/+150°C (–58/+302°F)
- Classification: DNV, CRN, BV, EAC etc.
  To get an updated list of certification on the products please contact your local Danfoss Sales Company.

Technical data

- *Refrigerants*
  Applicable to HCFC, HFC, R717(Ammonia) and R744 (CO_2).
  For further information please see installation instruction for KDC.
- *Temperature range*
  –50/+150°C (–58/+302°F).
- *Pressure range*
  The valves are designed for max. working pressure 40 bar g (580 psig).

Design

Connections
Available with the following connections:
- Butt-weld DIN (2448)
- Butt-weld ANSI (B 36.10 Schedule 40),
  – DN 65 - 200 (2½ - 8 in.)

Housing
Made of special, cold resistant steel approved for low temperature operations.

Valve cone
The valve cone has two teflon tightening rings with built-in metallic stops to prevent damage to the teflon rings in case of an extreme pressure difference.

Spindle
The spindle is made of gas-tempered steel. Consequently the valve spindle has an extremely hard and smooth surface. The valve rod has an internal weak spring (fig. 1, pos. 13), which is active when the servo piston is in upright position.

Actuator
The KDC actuator has one chamber. It is separated from the main flow by a piston (fig. 1, pos. 6). The chamber has a spring (fig. 1, pos. 14) which provides differential opening of the valve. The chamber of the actuator is connected to the suction line of the compressor.

Installation
The valve must be mounted vertically with the cone in downward position.
On top of the bonnet the actuator has one threaded (NPT 1/4 in.) connection (fig. 1, pos. A) for the pilot line. Fittings for connection of steel pipe DN 10 (d_o/d_i = 10/6 mm) by means of cutting rings. The valve is designed to resist very high internal pressure, but as to the pipe system in general, hydraulic pressure caused by thermal expansions in entrapped refrigerants should be avoided.

For further information please refer to KDC installation instruction.

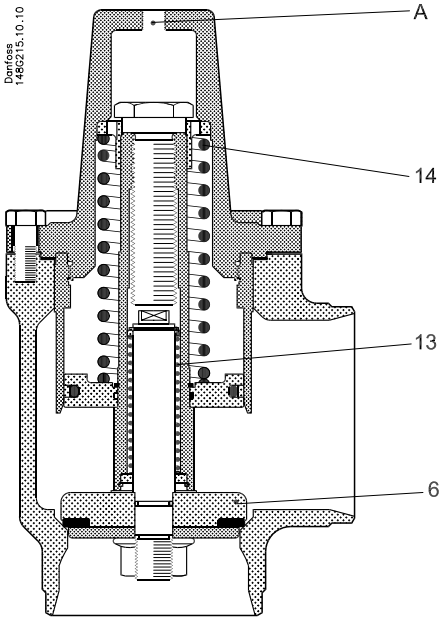
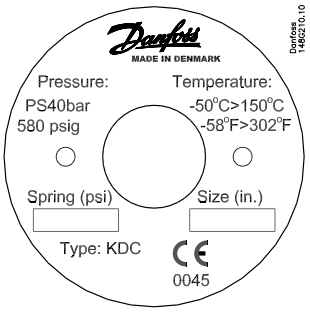


Fig. 1



Example of ID-plate for KDC

Pressure Equipment Directive (PED)
KDC valves are approved according to the European standard specified in the Pressure Equipment Directive and are CE marked.

For further details / restrictions - see Installation Instruction.

KDC valves			
Nominal bore		DN65-80 mm (1¼ - 3 in.)	DN100 - 200 mm (4-8 in.)
Classified for	Fluid group I		
Category		II	III

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Function

The KDC valve opens in a 3 step sequence. The sequence of steps depends on the start-up situation (see fig. 2).

Step 1
The valve is always closed by a minimum differential pressure of 1.5 to 2.0 bar (0.3 to 0.5 bar in a booster system). Step 1 will occur when the compressor is stopped and the discharge pressure has equalized to the top of the valve through the suction side of the compressor.

$p_c - p_1 < 2$ bar (0.5 bar for booster) and $p_c > p_2$

Step 2
Step 2 will occur as soon as the condensing pressure becomes higher than the pressure in the oil separator, and when the differential pressure between suction side and condensing pressure is bigger than the spring force.

$p_c - p_1 > 2$ bar (0.5 bar for booster) and $p_c > p_2$

When the compressor starts the valve will either be in step 1 or step 2 position, depending on the pressure difference between the oil separator and the condensing pressure.

Start up situation 1
Condensing pressure is lower than oil separator pressure.

Start up will occur from step 1 position and go to step 3 as soon as a differential pressure between suction side and oil separator that can overcome the spring force is present.

Start up situation 2
Condensing pressure is higher than oil separator pressure but the differential pressure is lower than the spring force.

Start up will occur from step 1 and go to step 2 when differential pressure between suction side and condensing pressure is bigger than the spring force. When oil separator pressure comes close to the condensing pressure the valve will start opening and the small spring will open the valve completely. The valve will then be in step 3 position.

Start up situation 3
Condensing pressure is higher than oil separator pressure + spring force pressure.
Start up will occur from step 2 position.

When oil separator pressure comes close to the condensing pressure the valve will start opening and the small spring will open the valve completely. The valve will then be in step 3 position.

When the compressor stops, the valve will be in step 3 position and as soon as the condensing pressure has equalized to the suction side the spring force will close the valve. The valve will be in step 1 position until enough differential pressure between condensing pressure and oil separator/suction side pressure occurs for the valve to enter into step 2 position.

NOTE:
The KDC valve cannot be used on compressor units where the non-return valve is placed between compressor and oil separator instead of on the suction side of the compressor. The reason for this is that the KDC valve needs to have the pilot pipe connected to a point on the compressor unit, where the pressure is low during running and high during standstill.

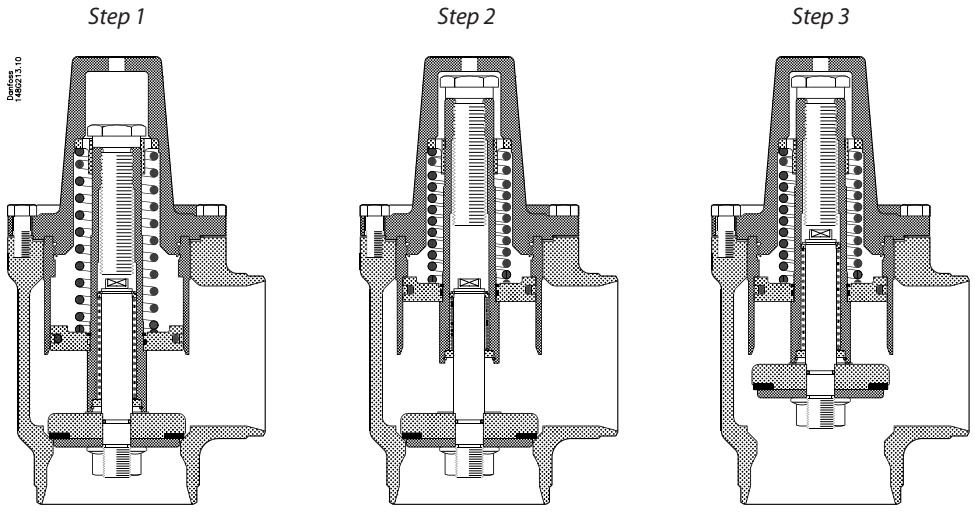
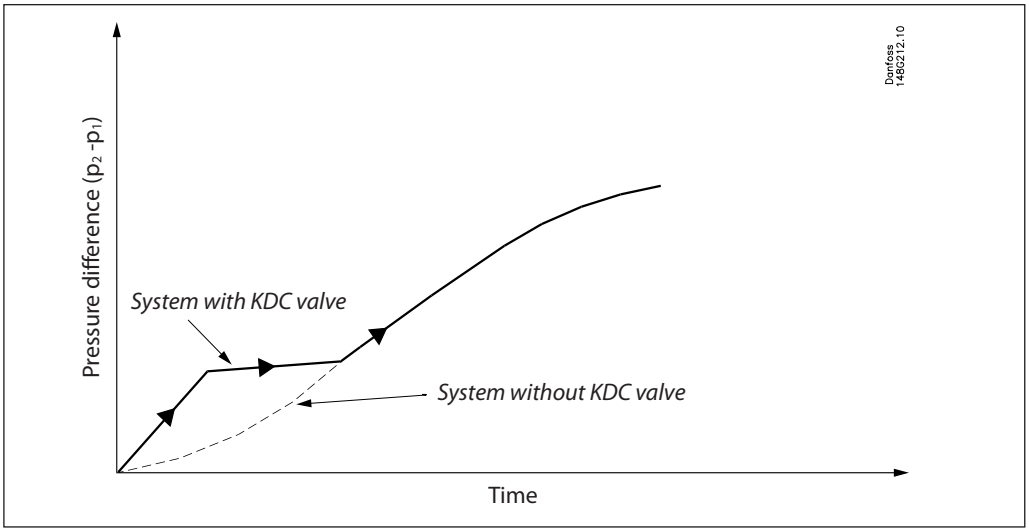


Fig. 2

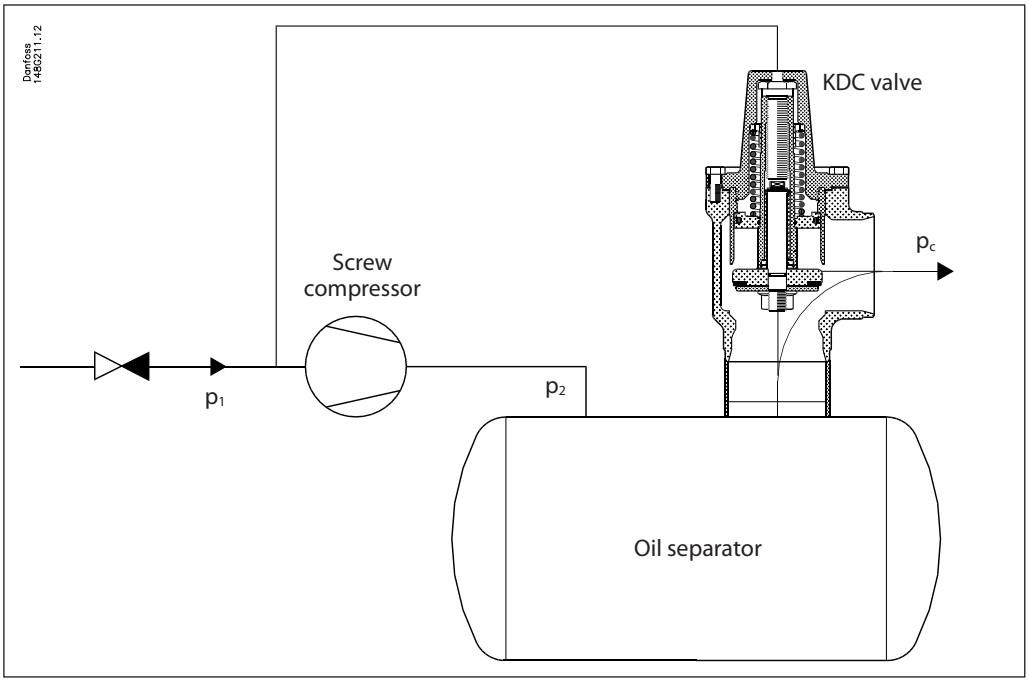
To be continued.....

Function
(Cont.)



Application example

Compressor discharge line after oil separator:



Nominal capacities

High pressure compressor

Capacity table at t_c / t_o = +35/–15°C,
Q_N [kW],
Δp = 0.05 bar

	KDC 65	KDC 80	KDC 100	KDC 125	KDC 150	KDC 200
R717	434	656	1128	1851	2829	4207
R404A	132	200	344	564	863	1283
R22	157	238	410	672	1028	1528

Booster compressor

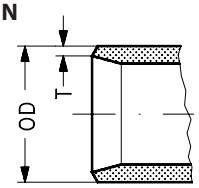
Capacity table at t_c / t_o = –18 / –40°C,
Q_N [kW],
Δp = 0.05 bar

	KDC 65	KDC 80	KDC 100	KDC 125	KDC 150	KDC 200
R717	229	347	597	978	1496	2225
R404A	101	153	263	432	661	983
R22	102	154	265	435	665	990

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Connections

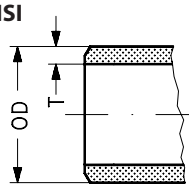
DIN



Butt-weld DIN (2448)

Size mm	Size in.	OD mm	T mm	OD in.	T in.			k_v-angle m^3/h	C_v-angle USgal/min
65	2½	76.1	2.9	3	0.11			78	90
80	3	88.9	3.2	3.50	0.13			118	137
100	4	114.3	3.6	4.50	0.14			203	235
125	5	139.7	4.0	5.50	0.16			333	386
150	6	168.3	4.5	6.63	0.18			509	590
200	8	219.1	6.3	8.63	0.25			757	878

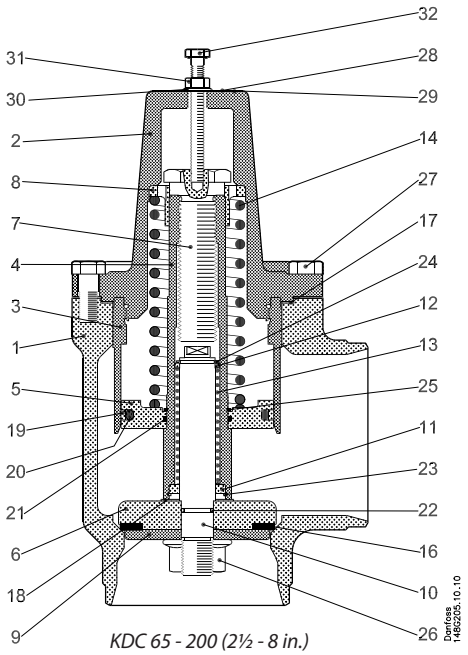
ANSI



Butt-weld ANSI (B 36.10 Schedule 40)

Size mm	Size in.	OD mm	T mm	OD in.	T in.			k_v-angle m^3/h	C_v-angle USgal/min
65	2½	73.0	5.2	2.87	0.20			78	90
80	3	88.9	5.5	3.50	0.22			118	137
100	4	114.3	6.0	4.50	0.24			203	235
125	5	141.3	6.6	5.56	0.26			333	386
150	6	168.3	7.1	6.63	0.28			509	590
200	8	219.1	8.2	8.63	0.32			757	878

Material specification



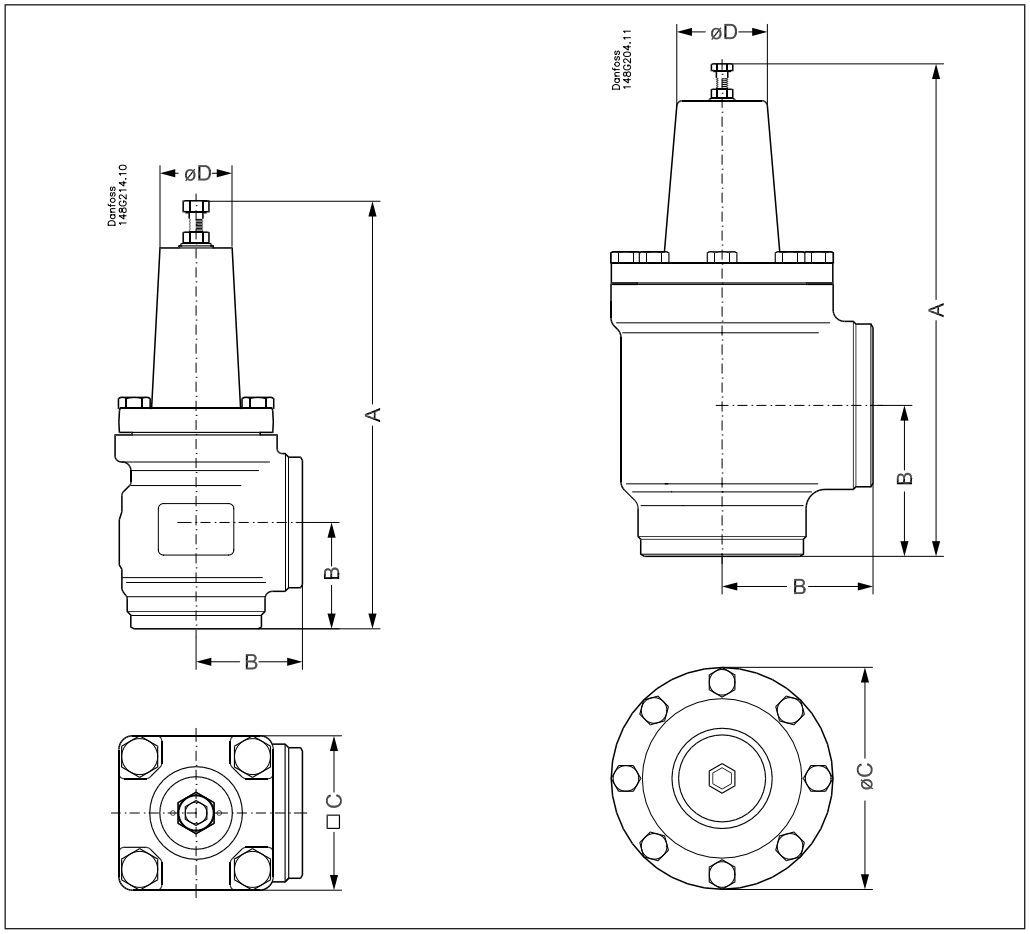
KDC 65 - 200 (2½ - 8 in.)

No.	Part	Material	EN	ISO	ASTM
1	Valve House	Steel	G20Mn5QT EN10213-3		LCC A352
2	Bonnet	Steel	P285QH EN10222-4		LF2 A350
3	Piston	Steel	S235JRG2 EN10025	Fe260B 630	Grade C A283
4	Piston rod	Steel	S235JRG2 EN10025	Fe260B 630	Grade C A283
5	Piston	Steel	11SMn30 EN10087	Type 2 R683/9	Grade 1213 A29
6	Cone	Steel	11SMn30 EN10087	Type 2 R683/9	Grade 1213 A29
7	Screw for spring	Steel	11SMn30 EN10087	Type 2 R683/9	Grade 1213 A29
8	Bushing for spring	Cast iron			
9	Cone plate	Steel	11SMn30 EN10087	Type 2 R683/9	Grade 1213 A29
10	Cone rod	Steel	11SMn30 EN10087	Type 2 R683/9	Grade 1213 A29
11	Rear bushing	Cast iron			
12	Front bushing	Cast iron			
13	Spring for cone	Steel			
14	Spring	Steel			
16	Teflon ring	PTFE			
17	Gasket	Fiber gasket non-asbestos			
18	Washer	Nylon			
19	Glide ring	PTFE			
20	O-ring	Cloroprene (Neoprene) (Standard KDC)			
		FKM (Hydrocarbon KDC)			
21	O-ring	Cloroprene (Neoprene) (Standard KDC)			
		FKM (Hydrocarbon KDC)			
22	O-ring	Cloroprene (Neoprene) (Standard KDC)			
		FKM (Hydrocarbon KDC)			
23	Retaining ring bore	Steel			
24	Spring ring	Steel			
25	Spring ring	Steel			
26	Nut	Steel			
27	Bolts	Steel	A2-70 EN1515-1	A2-70 3506	Grade B8 A320
28	ID plate	Aluminium			
29	Driv screw	Steel			
30	Washer	Steel			
31	Nut	Steel			
32	Screw	Steel			

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Dimensions and weights

KDC 65 - 200 (2½ - 8 in.)



Valve size		A	B	C	ØD	Weight
KDC						
KDC 65	mm	250	62	90	42	7.3 kg
KDC 2½	in.	9.84	2.44	3.54	1.65	16.1 lb
KDC 80	mm	298	90	129	51	11.1 kg
KDC 3	in.	11.73	3.54	5.08	2.01	24.5 lb
KDC 100	mm	346	106	156	64	17.3 kg
KDC 4	in.	13.62	4.17	6.14	2.52	38.1 lb
KDC 125	mm	407	128	192	64	36.9 kg
KDC 5	in.	16.02	5.04	7.56	2.52	81.3 lb
KDC 150	mm	471	145	219	75	49.9 kg
KDC 6	in.	18.54	5.71	8.62	2.95	110.0 lb
KDC 200	mm	539	180	276	75	99.6 kg
KDC 8	in.	21.22	7.09	10.87	2.95	219.6 lb

Specified weights are approximate values only.

Bolt in top of the valve is for transportation purposes only.
For further information please see installation instruction.

Ordering

Important!
Where products need to be certified according to specific certification societies or where higher pressures are required, the relevant information should be included at the time of ordering.

Standard KDC with welding branches - *DIN*

Size		Type	bar	Code no.
mm	in.			
65	2½	KDC 65	0.5 2 3	**148G3585** **148G3586** **148G3713**
80	3	KDC 80	0.5 2 3	**148G3589** **148G3590** **148G3714**
100	4	KDC 100	0.5 2 3	**148G3593** **148G3594** **148G3715**
125	5	KDC 125	0.5 2 3	**148G3597** **148G3598** **148G3716**
150	6	KDC 150	0.5 2	**148G3601** **148G3602**
200	8	KDC 200	0.5 2	**148G3605** **148G3606**

Standard KDC with welding branches - *ANSI*

Size		Type	bar	Code no.
mm	in.			
65	2½	KDC 65	0.5 2 3	**148G3587** **148G3588** **148G3811**
80	3	KDC 80	0.5 2 3	**148G3591** **148G3592** **148G3812**
100	4	KDC 100	0.5 2 3	**148G3595** **148G3596** **148G3813**
125	5	KDC 125	0.5 2	**148G3599** **148G3600**
150	6	KDC 150	0.5 2	**148G3603** **148G3604**
200	8	KDC 200	0.5 2	**148G3607** **148G3608**

Note!
The HYDROCARBON versions of the KDC valves are not compatiable with Ammonia as refrigerant.
They can only be used in systems with HYDROCARBON as refrigerant.

HYDROCARBON *KDC with welding branches - **ANSI***

Size		Type	bar	Code no.
mm	in.			
65	2½	KDC 65	0.5 2	**148G3825** **148G3831**
80	3	KDC 80	0.5 2	**148G3826** **148G3832**
100	4	KDC 100	0.5 2	**148G3827** **148G3833**
125	5	KDC 125	0.5 2	**148G3828** **148G3834**
150	6	KDC 150	0.5 2	**148G3829** **148G3835**
200	8	KDC 200	0.5 2	**148G3830** **148G3836**

Spare parts and accessories

Type	Code no.
GASKET BONNET/HOUSING KDC/GVD 65	**148G3048**
GASKET BONNET/HOUSING KDC/GVD 80	**148G3049**
GASKET BONNET/HOUSING KDC/GVD 100	**148G3050**
GASKET BONNET/HOUSING KDC/GVD 125	**148G3051**
GASKET BONNET/HOUSING KDC/GVD 150	**148G3052**
GASKET BONNET/HOUSING KDC/GVD 200	**148G3053**

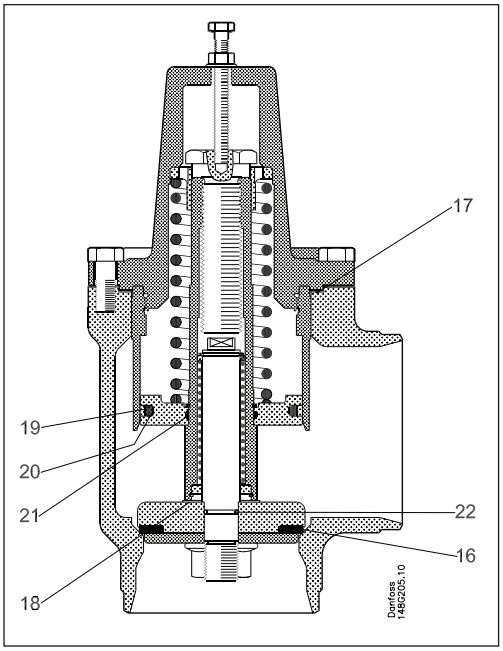
Type	Code no.
SEAL KIT SET KDC/GVD 65	**148G3054**
SEAL KIT SET KDC/GVD 80	**148G3055**
SEAL KIT SET KDC/GVD 100	**148G3056**
SEAL KIT SET KDC/GVD 125	**148G3057**
SEAL KIT SET KDC/GVD 150	**148G3058**
SEAL KIT SET KDC/GVD 200	**148G3059**

Type	Code no.
SEAL KIT SET KDC/GVD 65 Hydrocarbon	**148G3837**
SEAL KIT SET KDC/GVD 80 Hydrocarbon	**148G3838**
SEAL KIT SET KDC/GVD 100 Hydrocarbon	**148G3839**
SEAL KIT SET KDC/GVD 125 Hydrocarbon	**148G3840**
SEAL KIT SET KDC/GVD 150 Hydrocarbon	**148G3841**
SEAL KIT SET KDC/GVD 200 Hydrocarbon	**148G3842**

Note!
The HYDROCARBON versions of the seal kits are not compatible with Ammonia as refrigerant.
They can only be used in systems with HYDROCARBON as refrigerant.

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The seal kit



No.	Part	Material
16	Teflon ring	PTFE
17	Gasket	Fiber gasket non-asbestos
18	Washer	Nylon
19	Glide ring	PTFE
20-22	O-ring - Standard valve - Hydrocarbon valve	 Cloroprene (Neoprene) Viton

ENGINEERING
TOMORROW

Temperature regulating valve
Type ORV

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ENGINEERING
TOMORROW

Temperature regulating valve
Type ORV



ORV are 3-way industrial valves for maintaining a constant oil temperature in gas compressor systems, by mixing hot and cold oil in the lubricating system of e.g. screw or turbo type compressors.

The ORV valves are with few components and with extended cylindrical connections, to ensure ease of installation and service.

Features

- Stainless steel nickel plated thermostatic element
- Butt-weld (DIN, ANSI) or socket weld (SOC) connection
- No manual adjustment
- Plug and Play design
- Optimised flow characteristics
- Sturdy construction
- High resistance against vibrations or shock
- Can be mounted in any direction
- Service friendly. Easy to dismantle and service when required
- Classification: DNV, CRN, BV, EAC etc.
  To get an updated list of certification on the products please contact your local Danfoss Sales Company

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Technical data

Oils:
Applicable to all common refrigeration oils.

Refrigerants:
Applicable to HC, HCFC, HFC, R717 (Ammonia) and R744 (CO_2).
For further information please refer to installation instruction for ORV.

Temperature range:
Minimum operating temperature:
≥ -10 °C / 14 °F

Max. temperature limit based on the element temperature settings:

Types	Max limit
43 °C / 110 °F	77 °C / 170 °F
49 °C / 120 °F	82 °C / 180 °F
60 °C / 140 °F	93 °C / 200 °F
77 °C / 170 °F	110 °C / 230 °F

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

Design

Connections
Available with the following connections:

- Butt weld DIN (EN 10220), DN 25-80 (1–3 in)
- Butt weld ANSI (B 36.10 Schedule 80), DN 25 - 40 (1 – 1 ½ in)
- Butt weld ANSI (B 36.10 Schedule 40), DN 50 - 80 (2 – 3 in)
- Socket Weld (ANSI B 16.11), DN 25 - 50 (1 – 2 in)

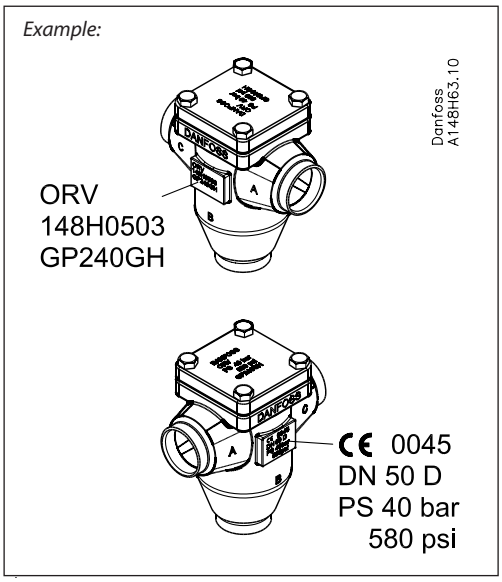
Housing
Made of special, cold resistant steel approved for low temperature operations.

Installation
Installation of the valve depends on the way it should operate.

Pressure Equipment Directive (PED)
ORV valves are approved according to the European standard specified in the Pressure Equipment Directive and are CE marked.
For further details / restrictions - see Installation Instruction.

Identification

Example:



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Function

Mixing operation

ORV valve can work as a mixing or diverting valve. The ORV temperature regulating valve utilises the high coefficient of thermal expansion of wax to create the internal movement necessary to have a cold and a hot inlet mixing to a common outlet. The outlet temperature will correspond to the nominal temperature of the thermostatic element.

The valve house has three ports:

- Port A is used for the common outlet
- Port B is for the hot inlet
- Port C is for the cold inlet

When the compressor unit is cold at start up, the thermostatic element will be contracted to let the full flow from port B pass until the nominal temperature (minus 5 K / 10 °F) is reached (fig. 1.1). The thermostatic element will then begin to extract to let the outlet become a mixture of hot and cold oil.

When the nominal temperature is reached, the element is positioned in approximately half open position (fig. 1.2). If the temperature is reaching approximately the nominal temperature plus 5 K, the thermostatic element has been extracted to its fully open position (fig. 1.3). In this position the oil temperature will only come from the cold inlet port (C) from oil cooler.

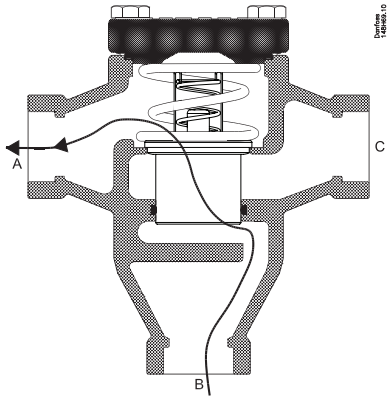


Fig 1.1

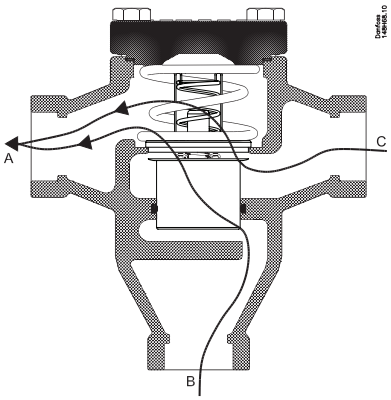


Fig. 1.2

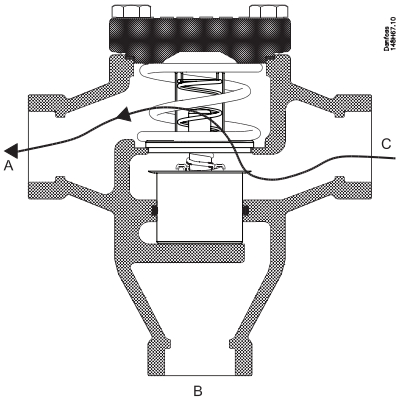


Fig. 1.3

From figure 1, it can be seen how the sleeve on the element is sliding in a vertical movement. The thermostatic element is kept in position by a spring.

Diverting operation

Diverting operation is similar to the mixing operation. It is carried out with separation in to two of the fluid with single temperature. Due to that the temperature on the inlet is very stable fact the regulation is very smooth. The inlet temperature would correspond to the nominal temperature of the thermostatic element.

The valve house has three ports:

- Port A is used for the common inlet
- Port B is for the cold outlet
- Port C is for the warm outlet

The diverting operation otherwise is similar to the mixing operation.

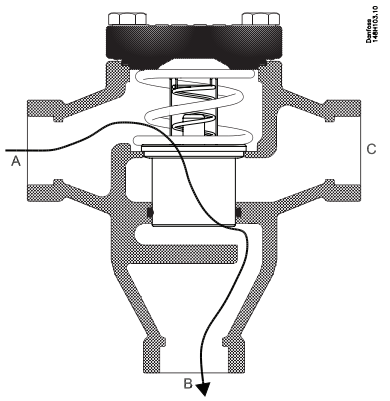


Fig. 1.1

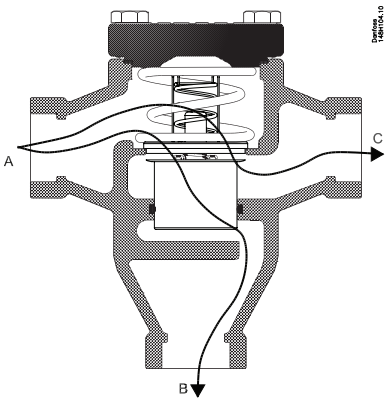


Fig. 1.2

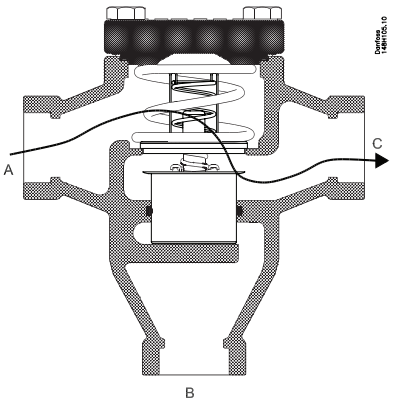
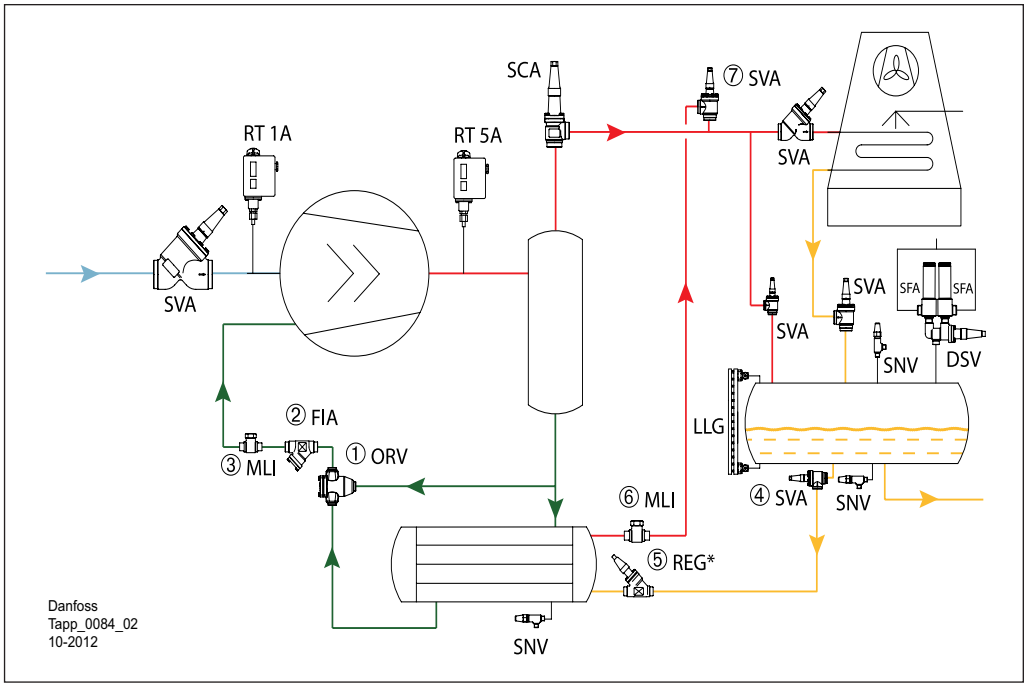
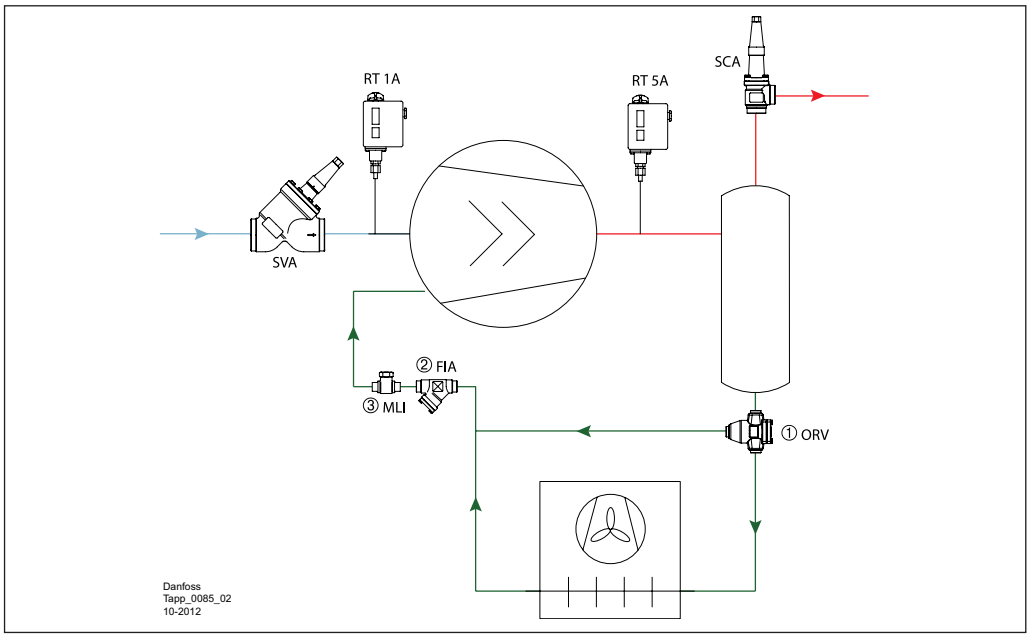


Fig. 1.3

Application examples



Example of the system with ORV for mixing operation.

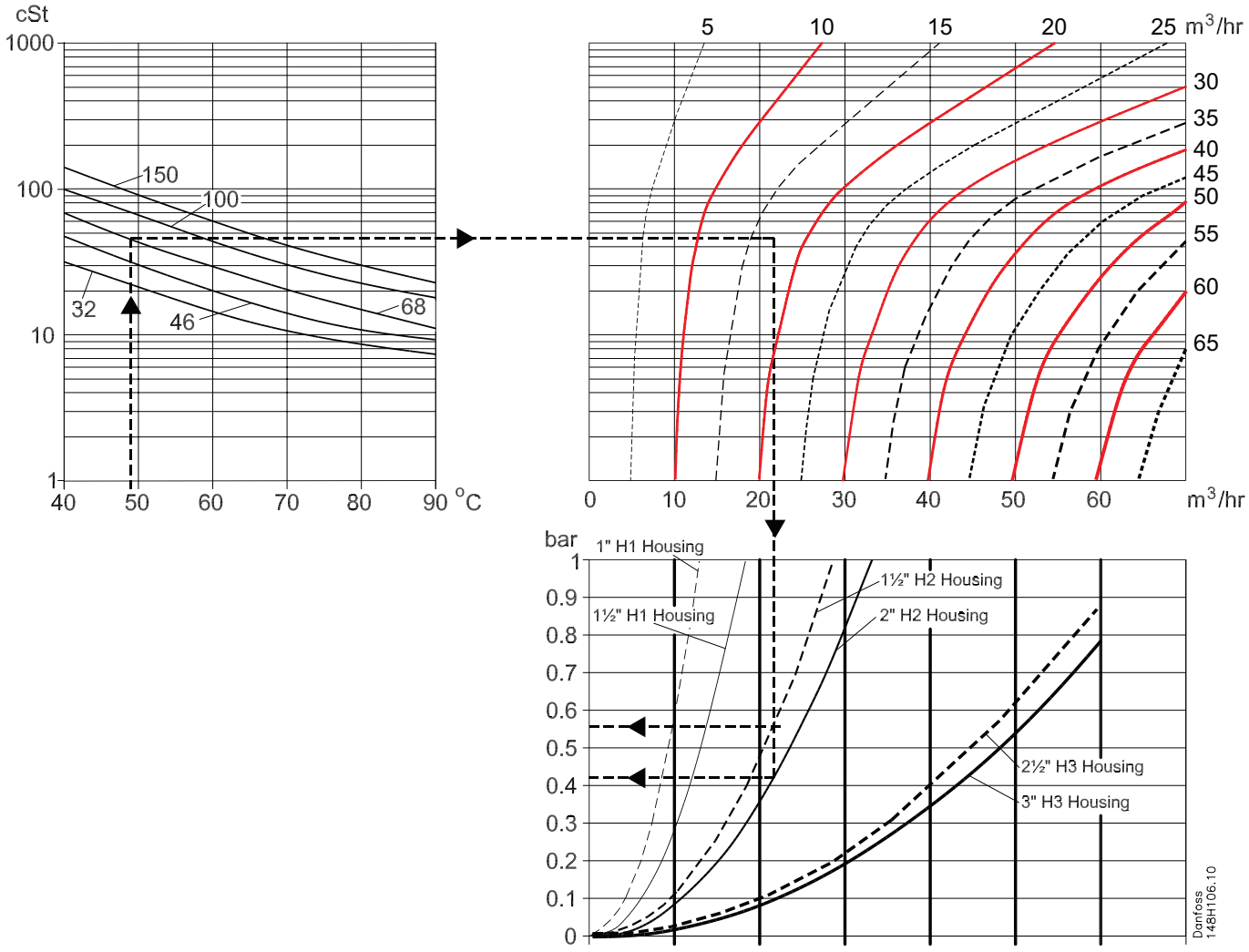


Example of the system with ORV for diverting operation

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Capacities

SI units



Selection example

Oil type:	Grade 68
Required flow:	17 m³/h
Nominal oil temperature:	49 °C
Pipe dimension:	40 mm

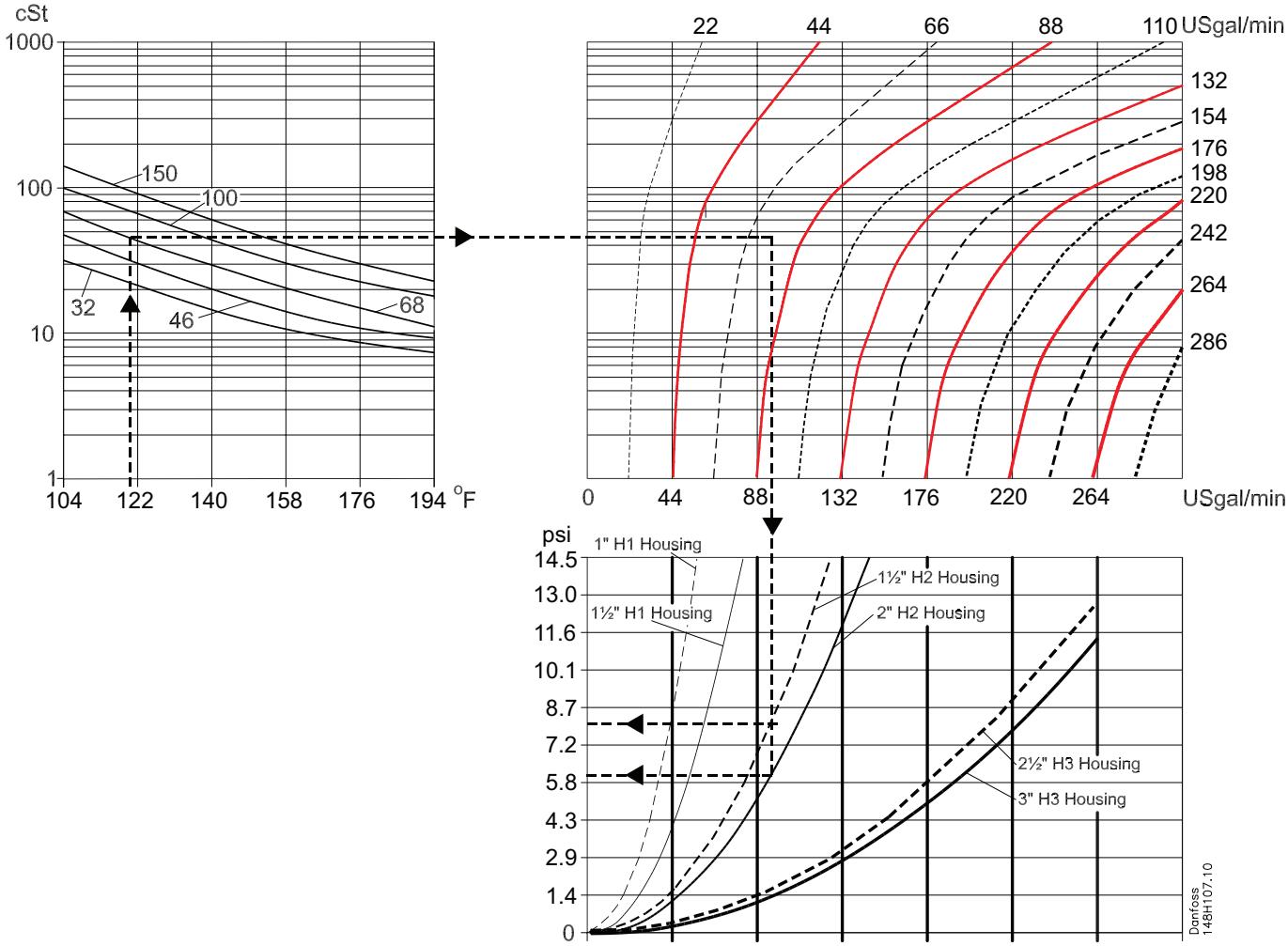
The upper left curve shows the viscosity of different grades of oil as a function of the temperature. The viscosity is continued into the upper right curve where the 17 m³/h must be found. The line is drawn vertically downwards into the capacity table for the ORV valve models.

As shown two selections can be made:
Either ORV 40 H2 with pressure drop at approx. 0.56 bar or ORV 50 H2 with pressure drop at 0.42 bar.

The final selection will depend on the available pressures in the system. If the pressures are low (or can be low at certain loads) the ORV 50 H2 might be preferred. If the pressures are constantly available the pipe dimension may be taken into account and the ORV 40 H2 might be preferred.

Capacities

US units



Selection example

Oil type:	Grade 68
Required flow:	75 USgal/min.
Nominal oil temperature:	120 °F
Pipe dimension:	1 ½ in

The upper left curve shows the viscosity of different grades of oil as a function of the temperature. The viscosity is continued into the upper right curve where the 75 USgal/min. must be found. The line is drawn vertically downwards into the capacity table for the ORV valve models.

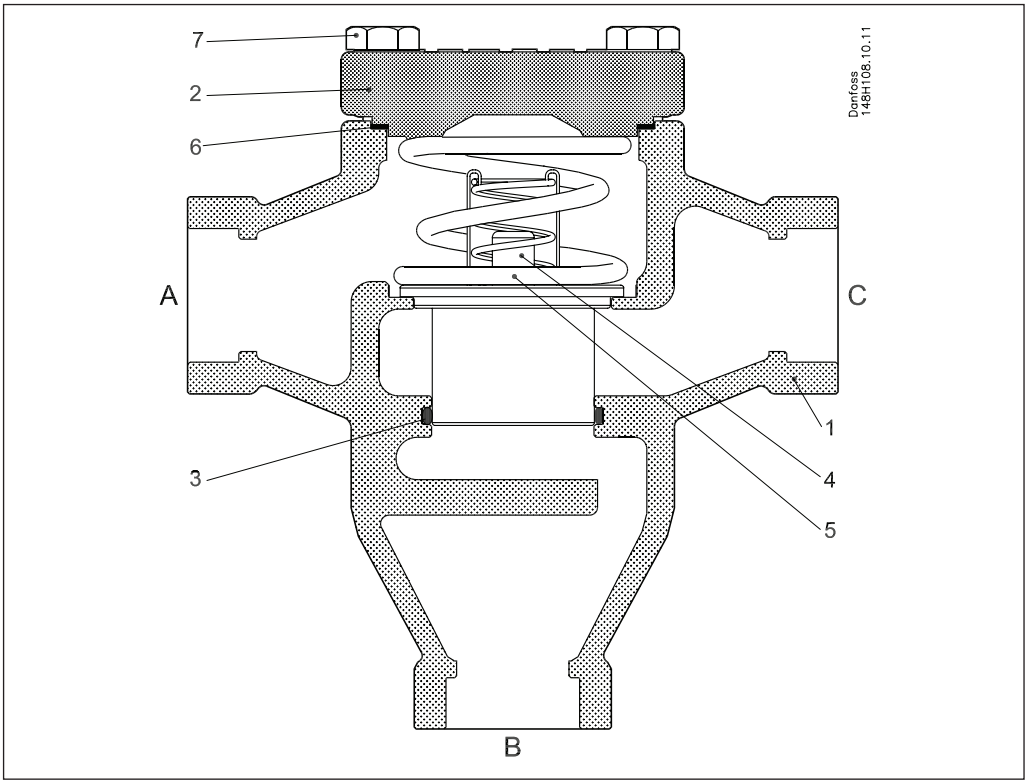
As shown two selections can be made:
Either
- ORV 1½H2 with pressure drop 8.2 psi or
- ORV 2"H2 with pressure drop 6.2 psi

The final selection will depend on the available pressures in the system. If the pressures are low (or can be low at certain loads) the ORV 2" H2 might be preferred. If the pressures are constantly available the pipe dimension may be taken into account and the ORV 1½" H2 might be preferred.

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Material specification

ORV 25-80

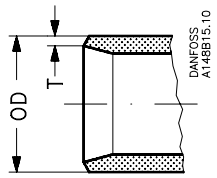


No.	Part	Material	EN		ASTM standard	
1	Housing	Steel	GP240GH	10213-2	WCB	A 216
2	Cover	Steel	GP240GH --- P285QH	10213-2 --- 10222-4	WCB	A 216 --- A 350
3	Glide ring	PTFE				
4	Element*)	Stainless steel and NI plated parts				
5	Spring	Steel	DIN17223	10270-1		
6	Gasket	Non asbestos				
7	Bolts	Steel	Quality 8.8	ISO4017	Grade 5	

*) The thermostatic element may look differently from one shown on the picture. All types of thermostats used by Danfoss have the same function, temperature setting and P-band.

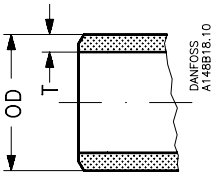
Connections

DIN



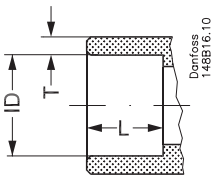
Size [mm]	Size [in]	OD [mm]	T [mm]	OD [in]	T [in]			K_v / C_v H1 housing		K_v / C_v H2 housing		K_v / C_v H3 housing	
Butt-weld DIN (EN10220)								K_v [m³/h]	C_v [Usgal/min]	K_v [m³/h]	C_v [USgal/min]	K_v [m³/h]	C_v [USgal/min]
25	1	33.7	2.6	1.327	0.103			15	17	-	-	-	-
40	1½	48.3	2.6	1.902	0.103			22	26	30	35	-	-
50	2	60.3	2.9	2.37	0.11			-	-	36	42	-	-
65	2½	76.1	2.9	3	0.11			-	-	-	-	65	75
80	3	88.9	3.2	3.5	0.13			-	-	-	-	75	87

ANSI



Size [mm]	Size [in]	OD [mm]	T [mm]	OD [in]	T [in]			K_v / C_v H1 housing		K_v / C_v H2 housing		K_v / C_v H3 housing	
Butt-weld ANSI (B 36.10 Schedule 80)								K_v [m³/h]	C_v [USgal/min]	K_v [m³/h]	C_v [USgal/min]	K_v [m³/h]	C_v [USgal/min]
25	1	33.7	4.6	1.327	0.181			15	17	-	-	-	-
40	1½	48.3	5.1	1.902	0.201			22	26	30	35	-	-
Butt-weld ANSI (B 36.10 Schedule 40)								K_v [m³/h]	C_v [USgal/min]	K_v [m³/h]	C_v [USgal/min]	K_v [m³/h]	C_v [USgal/min]
50	2	60.3	3.9	2.37	0.15			-	-	36	42	-	-
65	2½	73	5.2	2.87	0.2			-	-	-	-	65	75
80	3	88.9	5.5	3.5	0.22			-	-	-	-	75	87

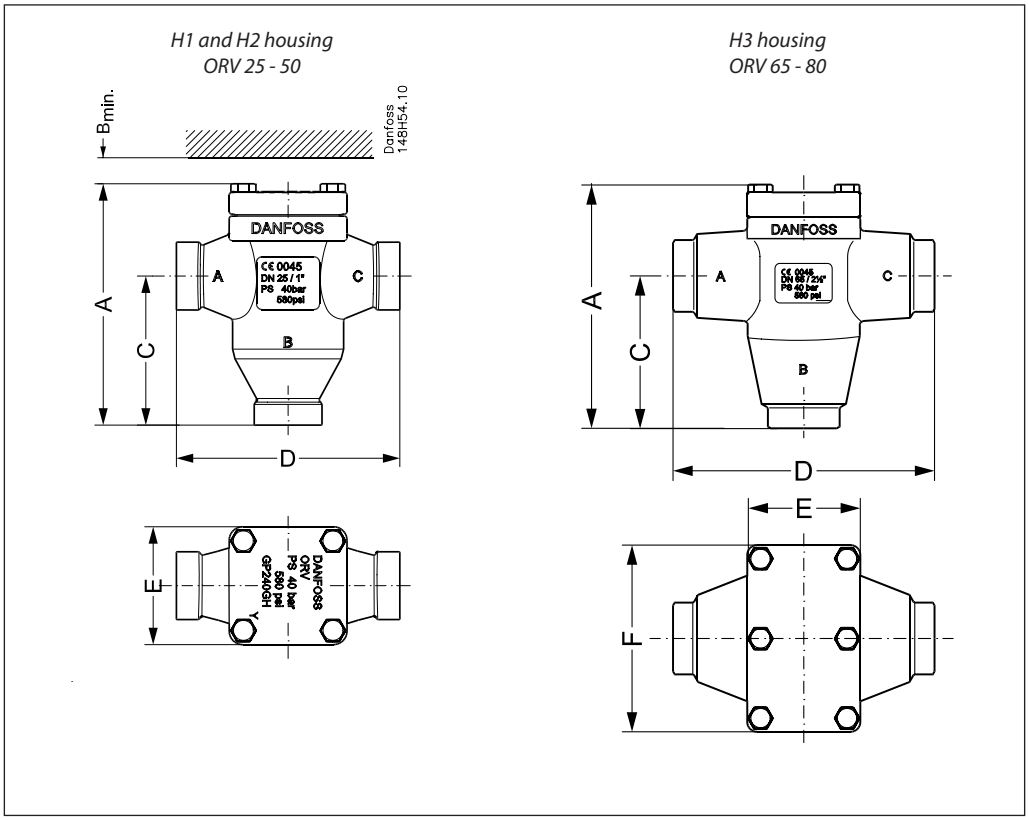
SOC



Size [mm]	Size [in]	ID [mm]	T [mm]	ID [in]	T [in]	L [mm]	L [in]	K_v / C_v H1 housing		K_v / C_v H2 housing		K_v / C_v H3 housing	
Socket welding ANSI (B 16.11)								K_v [m³/h]	C_v [USgal/min]	K_v [m³/h]	C_v [USgal/min]	K_v [m³/h]	C_v [USgal/min]
25	1	33.9	7.2	1.335	0.284	13	0.51	15	17	-	-	-	-
40	1½	48.8	6.6	1.921	0.26	13	0.51	-	-	30	35	-	-
50	2	61.2	6.2	2.41	0.24	16	0.63	-	-	36	42	-	-

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Dimensions and weights



Valve size	Valve size		A	$B_{MIN.}$	C	D	E	F	Weight
H1 housing	ORV 25-40	[mm]	178	75	110	165	87	-	4.5 kg
	(1-1½)	[in]	7.00	3.00	4.33	6.50	3.43	-	10 lb
H2 housing	ORV 40-50	[mm]	215	80	138	196	110	-	9.0 kg
	(1½-2)	[in]	8.46	3.15	5.43	7.72	4.33	-	20 lb
H3 housing	ORV 65-80	[mm]	252	80	155	266	115	190	18 kg
	(2½-3)	[in]	9.92	3.15	6.10	10.47	4.53	7.48	40 lb

Temperature regulating valve, type ORV

Type codes

Valve type	ORV	Oil regulating valve, high specification				
Nominal size in mm (valve size measured on the connection diameter)			Available connections			
			DIN	ANSI	SOC	
	25		X	X	X	
	40		X	X	X	
	50		X	X	X	
	65		X	X		
	80		X	X		
Connection	**A** **D** **SOC**	Butt weld connection: ANSI Butt weld connection: DIN Socket welding				
Valve housing	**3-WAY**	3-WAY				

Important!
Where products need to be certified according to specific certification societies or where higher pressures are required, the relevant information should be included at the time of ordering.

Ordering ORV valves from the parts programme

Example:
ORV 40 DIN H2 49 °C/120 °F:
Thermostat element and cover gasket code number 148H3464
and
Complete valve housing code number 148H3402

Please note:
The thermostat code numbers do not include guide ring.

Gasket and guide ring are included when ordering the complete valve housing but can also be ordered separately as spare parts.

ORV parts programme

Thermostat		Code no.
Thermostat 43°C / 110°F	ORV 25 and ORV 40 H1	**148H3466**
	ORV 40 and ORV 50 H2	**148H3467**
	ORV 65 and ORV 80 H3	**148H3468**[1)]
Thermostat 49°C / 120°F	ORV 25 and ORV 40 H1	**148H3463**
	ORV 40 and ORV 50 H2	**148H3464**
	ORV 65 and ORV 80 H3	**148H3465**[1)]
Thermostat 60°C / 140°F	ORV 25 and ORV 40 H1	**148H3469**
	ORV 40 and ORV 50 H2	**148H3470**
	ORV 65 and ORV 80 H3	**148H3471**[1)]
Thermostat 77°C / 170°F	ORV 25 and ORV 40 H1	**148H3472**
	ORV 40 and ORV 50 H2	**148H3473**
	ORV 65 and ORV 80 H3	**148H3474**[1)]

Complete valve housing including gasket and guide ring but without thermostat	Code no.
ORV 25 DIN H1	**148H3399**
ORV 25 SOC H1	**148H3400**
ORV 25 ANSI H1	**148H3401**
ORV 40 DIN H1	**148H3361**
ORV 40 DIN H2	**148H3402**
ORV 40 SOC H2	**148H3403**
OVR 40 ANSI H1	**148H3404**
ORV 40 ANSI H2	**148H3405**
ORV 50 DIN H2	**148H3406**
ORV 50 SOC H2	**148H3407**
ORV 50 ANSI H2	**148H3408**
ORV 65 DIN H3	**148H3409**
ORV 65 ANSI H3	**148H3410**
ORV 80 DIN H3	**148H3362**
ORV 80 ANSI H3	**148H3411**

[1)] For valve housing size H3 the code number includes two H2 thermostats.

ORV spare parts

Part	Spare parts for	Code no.
Gasket and guide ring	ORV 25 and ORV 40 H1	**148H3246**
	ORV 40 and ORV 50 H2	**148H3247**
	ORV 65 and ORV 80 H3	**148H3248**[2)]

[2)] Including two guide rings and one gasket.

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ENGINEERING
TOMORROW

Pressure regulating valves
Types OFV, OFV-SS

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ENGINEERING TOMORROW

Pressure regulating valves
Types OFV, OFV-SS



OFV are angle-way pressure regulating valves, which have ajustable opening pressure and cover the differential pressure range (ΔP): 2 – 8 bar / 29 – 116 psi. The valve can be closed manually, e.g. during plant service and have backseating, enabling the spindle seal to be replaced with the valve still under pressure.

The valves are especially designed to prevent fluttering due to low velocity and / or low density. In consequence it is possible to apply the valves with wide fluctuations in capacity demands, i.e. from maximum performance to part load. A flexible O-ring provides perfect sealing over the seat.

Features

- Applicable to HCFC, HFC, R717(Ammonia) and R744 (CO_2)
- Full temperature range packing gland
- -50 – 150 °C / -58 – 302 °F
- Maximum operating pressure: 40 bar g / 580 psig
- Three functions in one valve. The OFV valve combines the functions of a pressure reegulating valve, a check valve and a shut-off valve
- Classification: DNV, CRN, BV, EAC etc. To get an updated list of certification on the products please contact your local Danfoss Sales Company
- Special features for OFV-SS
  - Low temperature stainless steel housing and bonnet
  - Low temperature packing gland -60 – 150 °C / -76 – 302 °F
  - Maximum operating pressure 52 bar / 754 psi g

Design

Connections
Available with the following connections:
- Welding DIN (EN 10220)
- Welding ANSI (B 36.19M)

Packing gland OFV
The "full temperature range" packing gland consists of a double O-ring sealing arrangement combined with permanent lubrication from a grease reservoir. This ensures perfect tightness throughout the whole range: -50 – 150 °C / -58 – 302 °F.
Flexible O-ring provides perfect sealing over the seat.

Packing gland OFV-SS
The stainless steel packing gland comprises a spring loaded seal packing gland which ensures a perfect tightness in the range:
-60 – 150 °C / -76 – 302 °F.
The packing glands are equipped with a scraper ring to prevent penetration of dirt and ice into the packing gland.

Pressure Equipment Directive (PED)
OFV valves are approved and CE-marked in accordance with the Pressure Equipment Directive - 97/23/EC.

For further details / restrictions - see Installation Instruction
Installation

	OFV
Nominal bore	DN≤ 25 mm (1 in)
Classified for	Fluid group I
Category	Article 3, paragraph 3

The valve is designed to resist very high internal pressure, but as to the pipe system in general, hydraulic pressure caused by thermal expansions in entrapped refrigerants should be avoided. For further information please see OFV installation instruction.



Example of Marking Ring, Valve type OFV.

Technical data

- *Refrigerants*
  Applicable to HCFC, HFC, R717(Ammonia) and R744 (CO_2).
- Flammable hydrocarbons are not recommended. For further information please contact your local Danfoss Sales Company.
- *Temperature range*
  OFV: -50 – 150 °C / -58 – 302 °F
  OFV-SS: -60 – 150 °C / -76 – 302 °F
- *Pressure range*
  Maximum operating pressure:
  OFV: 40 bar g / 580 psig
  OFV-SS: 52 bar / 754 psi g
  Set pressure (Δp):
  2 - 8 bar / 29 – 116 psi.

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Understanding the OFV in practice
(when working in a defrosting application)

How the OFV works
The opening pressure of the OFV can be adjusted to a specific differential pressure ΔP_{set} by turning the spindle. ΔP_{set} indirectly determines the defrosting pressure. As illustrated in fig. 1 the OFV will work at a pressure somewhat higher than ΔP_{set}, namely the ΔP_{total} which will be situated somewhere in the area marked with grey in fig. 1.

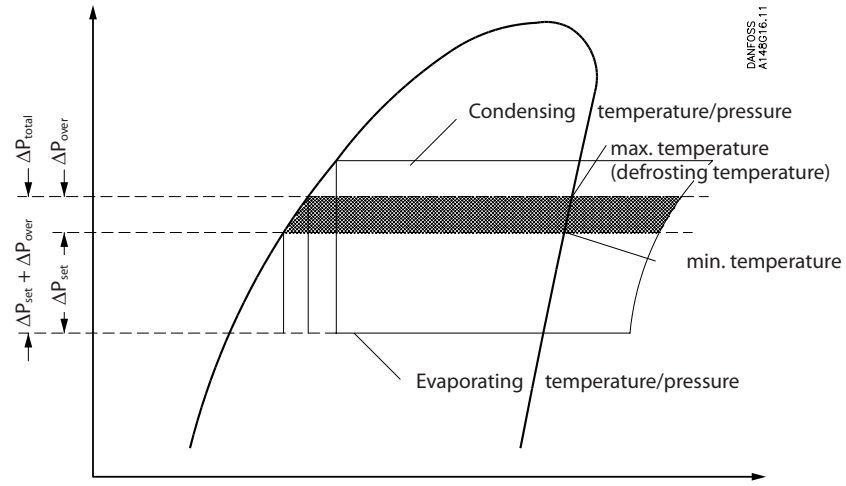


Fig. 1

As ΔP_{over} is plant specific, it follows that the total working pressure ($\Delta P_{total} = \Delta P_{set} + \Delta P_{over}$) is plant specific too. By adjusting the opening differential pressure ΔP_{set} it is possible to adjust the working pressure $\Delta P_{set} + \Delta P_{over}$ until you get the required defrosting pressure.

Defrosting pressure ≈ Evaporating pressure + $\Delta P_{set} + \Delta P_{over}$.

Important!
The OFV valve is **back pressure** dependent.

Adjusting set pressure

The set pressure is the pressure at which the valve starts to open.

The set pressure is adjustable in the range 2 - 8 bar differential pressure. When the valve is delivered, a distance piece is supplied seperately with the valve. The distance piece can be mounted under the spring, thus increasing the initial tension of the spring. Therefore the valve covers the complete range 2 - 8 bar differential pressure, as follows:

2 - 6.5 bar differential pressure without distance piece.
3.5 - 8 bar differential pressure with distance piece.

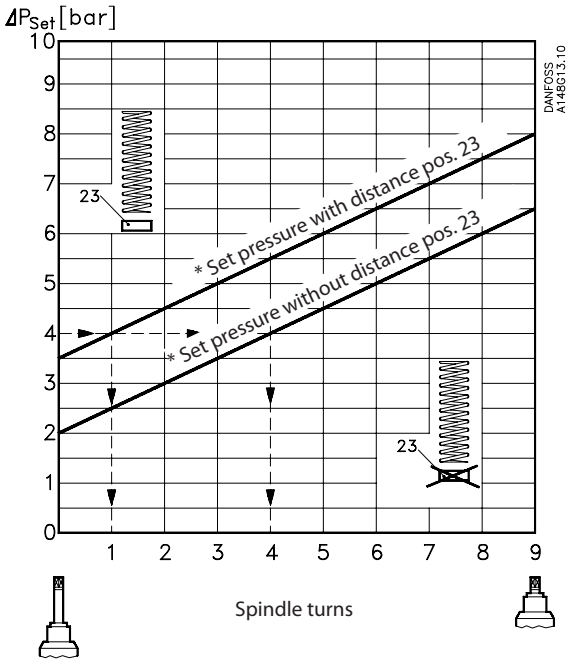


Fig. 2
Set pressure as a function of the spindle turns

* see material specification and installation an maintenance instruction for OFV.

Computation and selection

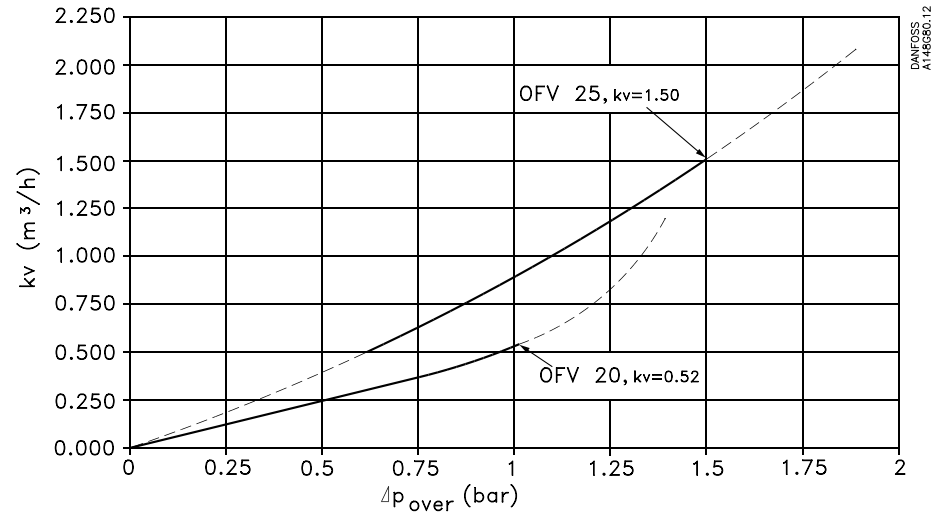


Fig. 3.
k_v values for OFV 20 - 25

The capacity of the OFV valves can be calculated by the following formulas:

Liquids without phase change

$$G = k_v \sqrt{r \times \Delta P_{total} \times 1000}$$

Liquids with phase change (e.g. pressure control during defrost)

$$G = k_v \times 0.78 \sqrt{r \times \Delta P_{total} \times 1000}$$

G: mass flow (kg/h)

k_v: flow rate (m^3/h) (the k_v value is dependent on ΔP_{over}, see fig. 3).

ρ: density, liquid (kg/m^3)

ΔP_{bar} = differential pressure (bar)
$\Delta P_{bar} = \Delta P_{set} + \Delta P_{over}$

Defrosting pressure ≈ Evaporating pressure + $\Delta P_{set} + \Delta P_{over}$

Capacity calculation for defrost pressure regulating

Table 1: Max. mass flow (G_{OFV}) for OFV 20 and OFV 25 with R717

Evaporating temperature	-10 °C	-20 °C	-30 °C	-40 °C	-50 °C
Defrosting temperature	10 °C				
OFV 20					
Mass flow $G_{OFV\ 20}$ (kg/h) (ΔP_{over} = 1 bar □ k_v = 0.52 m^3/h)	577	661	714	747	768
OFV 25					
Mass flow $G_{OFV\ 25}$ (kg/h) (ΔP_{over} = 1.5 bar □ k_v = 1.5 m^3/h)	1666	1906	2059	2156	2216

Note: the calculation is based on formula for "liquids with phase change" in the paragraph "Computation and selection".

Table 2: Calculating of refrigerant mass flow G_0

Evaporating temperature	-10 °C	-20 °C	-30 °C	-40 °C	-50 °C
Mass flow G_0 (kg/h)	2.780 × Q_0	2.712 × Q_0	2.651 × Q_0	2.595 × Q_0	2.544 × Q_0

Q_0: Capacity of the evaporator (kW)
Note: the calculation is based on pump circulating system (Liquid temperature = Evaporating temperature)

Guide line: Defrost capacity $G_{OFV} \sim (2 - 3) \times G_0$

Example:
An evaporator in a refrigerant plant has a capacity of Q_o = 150 kW and a evaporating temperature of -40 °C.
The defrosting temperature has to be controlled with an OFV valve.

Table 2: $G_0 = 2.595 \times Q_0 = 389$ kg/h
The defrosting capacity in this example is 2.5 × G_0.
$G_{OFV} \geq 2.5 \times 389 = 972$ kg/h.
OFV 25 is selected ($G_{OFV\ 25\ max.}$ = 2156 kg/h (table 1)).

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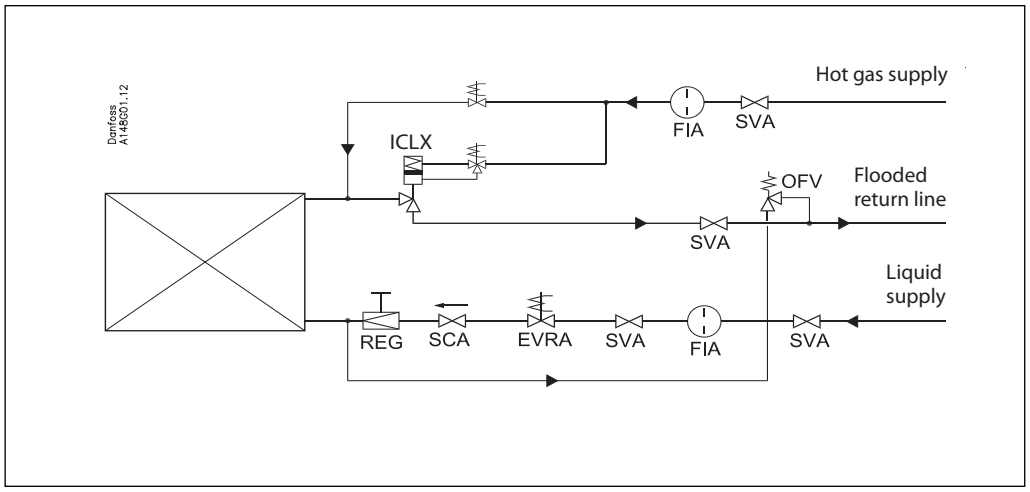
Plant applications

Pressure/temperature control during hot gas defrosting

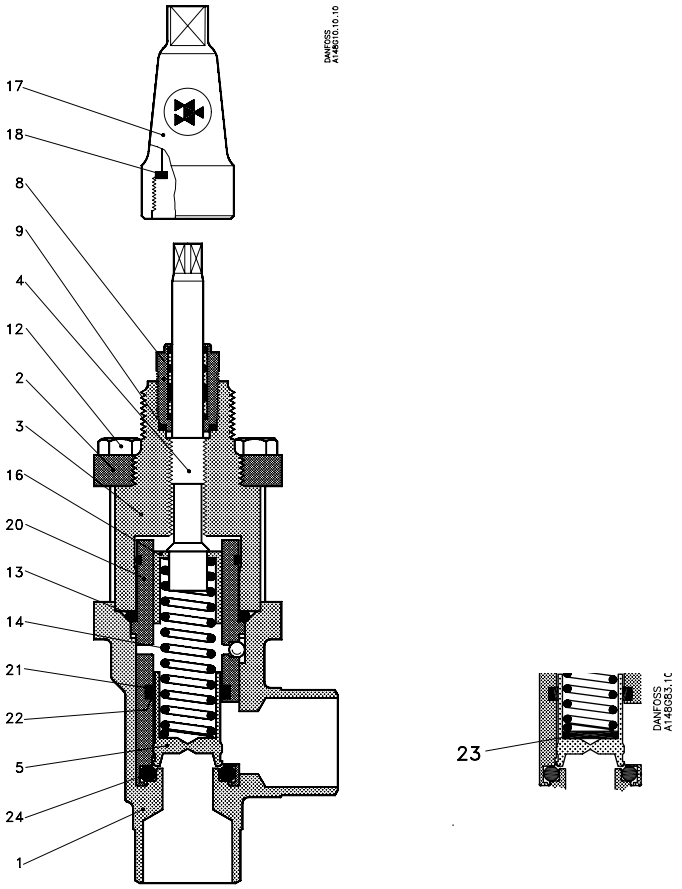
In order to obtain efficient hot gas defrosting the temperature (pressure) must be increased to approx. 10°C (50°F). The OFV is the optimal solution for controlling the defrosting pressure and thus the corresponding temperature. It is recommended to start the defrosting cycle by closing the ICLX valve in the liquid supply line and allowing some of the cold liquid contained in the evaporator to return to the liquid separator.

Close the ICLX valve in the suction line and after a delay open the solenoid valve in the hot gas supply in order to build up the defrosting pressure in the evaporator. When the defrosting pressure reaches the set OFV-pressure, the OFV will open and the defrosting pressure will increase to the working pressure $\Delta P_{set} + \Delta P_{over}$.

After defrosting, it is normal practice to open the ICLX in the return line to equalize the pressure to the suction side before opening to the pump side.



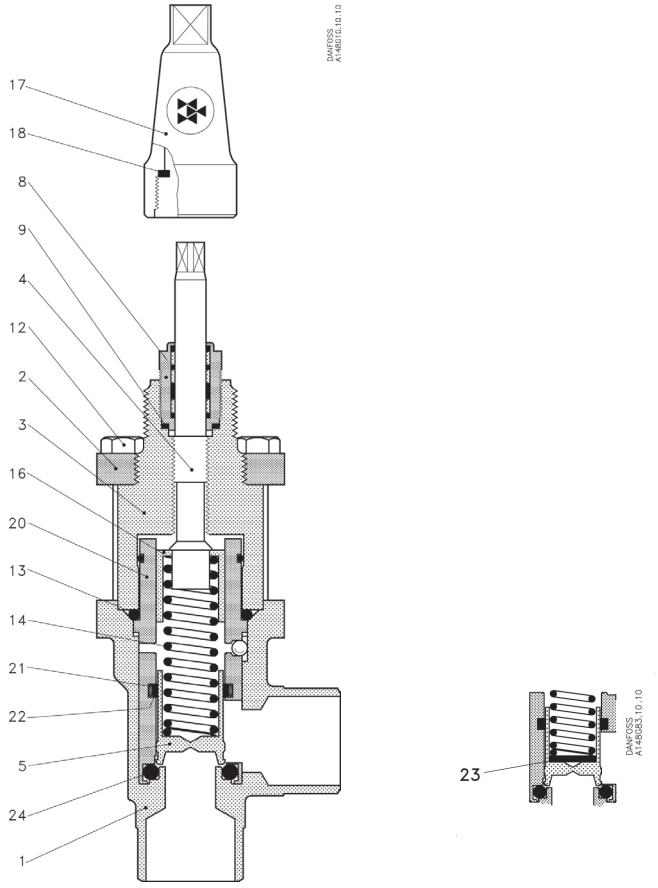
Material specification



No.	Part	Material	EN	ISO	ASTM
1	Housing	Steel	P285 QH EN10222-4		LFA350
2	Bonnet, Flange	Steel	P275 NL1 EN10028-3		
3	Bonnet, Insert	Steel			
4	Spindle	Stainless steel	X10 CrNi S18-9 17440	Type 17 683/13	AISI 303
5	Cone	Steel			
8	Packing gland	Steel			
9	Packing washer	Aluminium			
12	Bolts	Stainless steel	A2-70	A2-70	Type 308
13	O-ring	Cloroprene (Neoprene)			
14	Spring	Steel			
16	Spring washer	Steel			
17	Cap	Aluminium			
18	Gasket for cap	Nylon			
20	Guide piece	Steel			
21	O-ring	Cloroprene (Neoprene)			
22	Sealing ring	PTFE (Teflon)			
23	Distance piece	Steel			
24	O-ring	Cloroprene (Neoprene)			

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Material specification

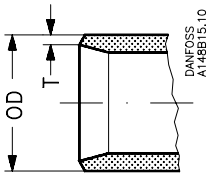


OFV-SS 20 - 25 (¾ - 1")

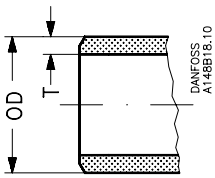
No.	Part	Material	DIN/EN	ISO	ASTM
1	Housing	Stainless steel	X5CrNi18-10 EN10088		AISI 304
2	Bonnet, Flange	Stainless steel	X5CrNi18-10 EN10088		AISI 304
3	Bonnet, Insert	Stainless steel			
4	Spindle	Stainless steel	X8CrNiS18-9 DIN 17440	Type 17, 683/13	AISI 303
5	Cone	Steel	9SMn28	Type 2	1213
8	Packing gland	Stainless steel			
9	Packing washer	Non asbestos			
12	Bolts	Stainless steel	A2-70	A2-70	Type 308
13	O-ring	Cloroprene (Neoprene)			
14	Spring	Steel			
16	Spring washer	Steel	Steel		
17	Spindle seal cap	Aluminium			
18	Seal cap gasket	Nylon			
20	Guide piece	Steel			
21	O-ring	Cloroprene (Neoprene)			
22	Sealing ring	PTFE (Teflon)			
23	Distance piece	Steel			
24	O-ring	Cloroprene (Neoprene)			

Connections

DIN



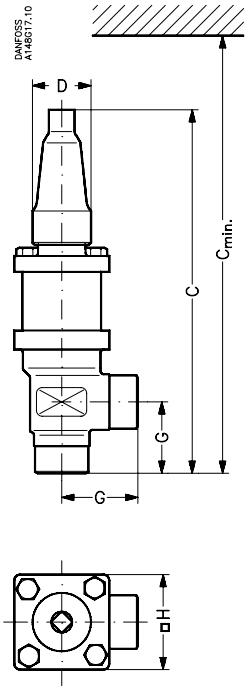
ANSI



Size mm	Size in.	OD mm	T mm	OD in.	T in.			k_v-angle m^3/h		C_v-angle USgal/min	
Butt-weld DIN (EN 10220)											
20 25	¾ 1	26.9 33.7	2.3 2.6	1.06 1.33	0.09 0.10			0 - 0.52 0 - 1.50		0 - 0.60 0 - 1.74	
Butt-weld ANSI (B 36.10M)											
20 25	3/4 1	26.9 33.7	4.0 4.6	1.06 1.33	0.16 0.18			0 - 0.52 0 - 1.50		0 - 0.60 0 - 1.74	
Butt-weld ANSI (B 36.19M, SCHEDULE 40)											
20 25	¾ 1	26.9 33.7	2.9 3.5	1.06 1.33	0.11 0.14			0 - 0.52 0 - 1.50		0 - 0.60 0 - 1.74	

Dimensions and weights

OFV 20 - 25



Valve size			G	C	C_{min}		∅D		□H		Weight
OFV 20 - 25											
OFV 20 (¾ in)	[mm] [in]		45 1.77	230 9.1	290 11.4		38 1.5		60 2.4		2.0 kg
OFV 25 (1 in)	[mm] [in]		45 1.77	230 9.1	290 11.4		38 1.5		60 2.4		2.0 kg

Specified weights are approximate values only.

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Ordering

How to order
The table below is used to identify the valve required.

Please note that the type codes only serve to identify the valves, some of which may not form part of the standard product range.

For further information please contact your local Danfoss Sales Company.

Example for type codes

OFV	25	D	1	3	3

Type codes

Valve type	**OFV** **OFV-SS**	Over Flow Valve in carbon steel Over Flow Valve in stainless steel
Nominal size in mm	**20** **25**	DN 20 DN 25
Connections	**D** **A**	Butt-weld connection: DIN EN 10220 Butt-weld connection: ANSI B 36.19M
Valve housing	**1**	Angle flow
Materials	**3**	Housing: P285 QH, Bonnet: P275 NL1
Other equipment	**3**	Cap, short spindle with Cloroprene (Neoprene) O-ring

Important!
Where products need to be certified according to specific certification societies or where higher pressures are required, the relevant information should be included at the time of order.

Opening differential pressure
2-8 bar (29-116 psi):

Size		Type	**Code No.**
mm	in		
20	¾	OFV 20 A 133	**2412+185**
20	¾	OFV 20 D 133	**2412+183**
20	¾	OFV-SS 20 D ANG OVER FLOW VALVE 52BAR	**148G3194**
25	1	OFV 25 A 133	**2412+186**
25	1	OFV 25 D 133	**2412+184**
25	1	OFV-SS 25 A ANG OVER FLOW VALVE 52BAR	**148G3843**
25	1	OFV-SS 25 D ANG OVER FLOW VALVE 52BAR	**148G3195**

ENGINEERING
TOMORROW

Constant pressure valve
Type CVMD

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Constant pressure valve
Type CVMD



CVMD is a constant pressure regulator for refrigeration and freezing plant in applications such as;

- Hot gas defrosting (drain lines)
- Refrigerant pump bypass (to ensure min. flow in refrigerant pumps).

Technical data

- *Refrigerants*
  HCFC, HFC, R717 (Ammonia)
- *Range*
  0-7 Bar (0-102 psi)
- *Max. working pressure*
  PB = 28 bar (406 psi)
- *Temperature range*
  -50 °C – 120 °C / -58 – 248 °F
- *k_v value*
  1.5
- *C_v value*
  1.7
- Classification: DNV, CRN, BV, EAC etc.
  To get an updated list of certification on the products please contact your local Danfoss Sales Company.

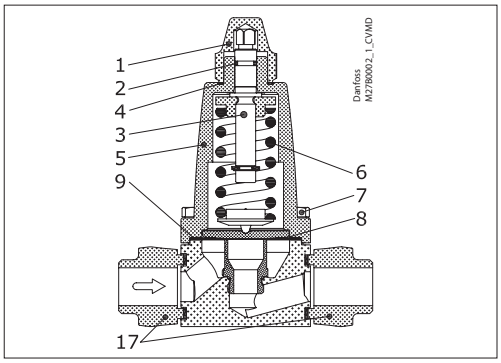
Ordering

CVMD incl. $^1/_2$ in weld flange, code no. **027B1038**.

Materials

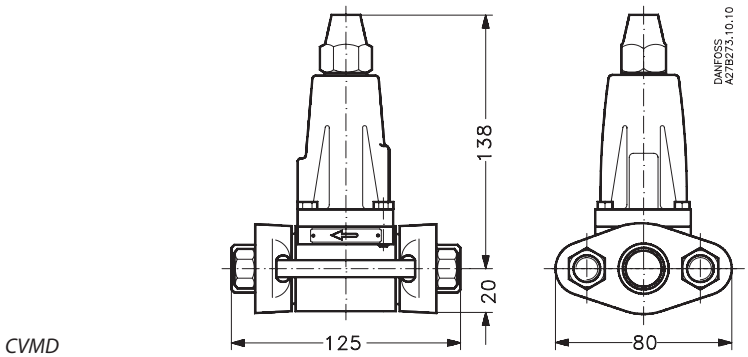
- Gaskets are non asbestos
- Valve housing made of EN-GJS-400-18

Construction



1. Protection cap
2. O-ring
3. Spindle
4. Gasket
5. Cover
6. Spring
7. Screw
8. Diaphragm
9. Gasket
17. Flanges

Dimensions and weight



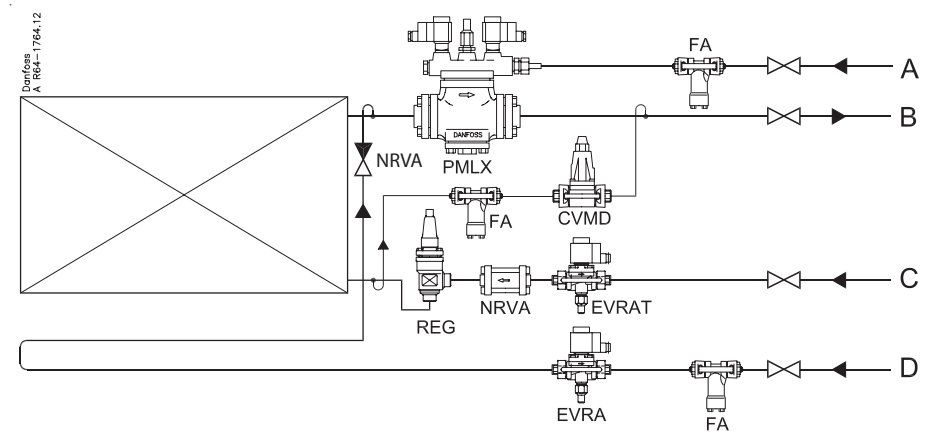
CVMD

Weight:
2.7 kg

Application

Example

Hot gas defrosting of evaporator with pump circulation



The figure shows the low pressure side of an R 717 refrigeration plant with flooded evaporator with pump circulation.

In this application, the constant pressure valve, type CVMD, is mounted as a pressure regulator in the bypass line between evaporator and downstream wet suction line after the solenoid valve, type PMLX.

Pos. A on the drawing is the pilot line from the high pressure side to PMLX.
Pos. B is the liquid/gas return line.
Pos. C is the liquid line to the evaporator.
Pos. D is the hot gas line for hot gas defrosting of the evaporator.

The CVMD can be used in this application for evaporators with capacities up to:

R 717

Defrost temperature	10 °C				
Evaporating temperature	-10 °C	-20 °C	-30 °C	-40 °C	-50 °C
(Drainline capacity kg/h)	(1666)	(1906)	(2059)	(2156)	(2216)
Max. $Q_{Evaporator}$ (kW)	240	281	311	333	349

Based on:
$\Delta P_{over} = 1$, $k_v = 1.5$ m³/h
Defrost capacity (kW) = 2.5 × $Q_{Evaporator}$

Use PM + CVP (HP) valves for higher capacities.

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