

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 valve

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 (CO₂)
- 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.

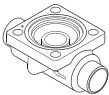
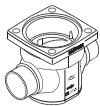
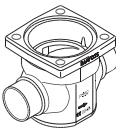
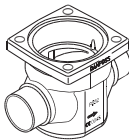
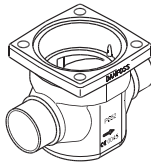
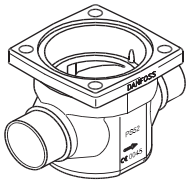
Please note: a fail safe supply (battery or UPS) is required.

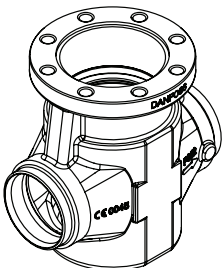
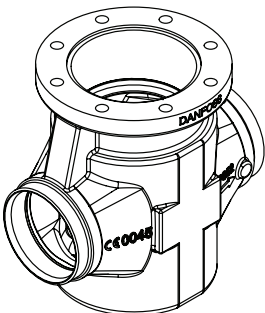
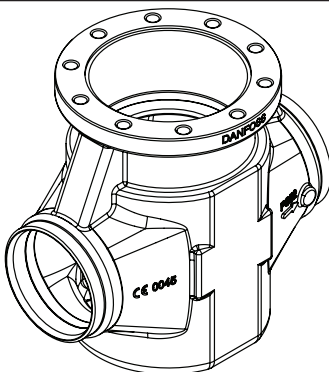
Motor operated valves, type ICM and actuators, type ICAD

The ICM Concept

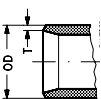
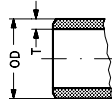
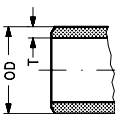
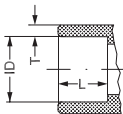
The ICM concept is developed around a modular principle. This gives the possibility of combining function modules and top covers with special valve body size that is available in a variety of connection possibilities.

- There are nine valve bodies available.

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

		
ICV 100	ICV 125	ICV 150

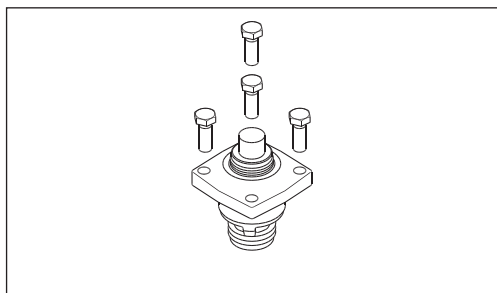
- Valve bodies in the sizes ICV 20 – ICV65 are available with a range of undersizes through oversized connection sizes and types.
ICV 100 – ICV 150 are available in butt-weld DIN and butt-weld ANSI nominal sizes

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

Motor operated valves, type ICM and actuators, type ICAD

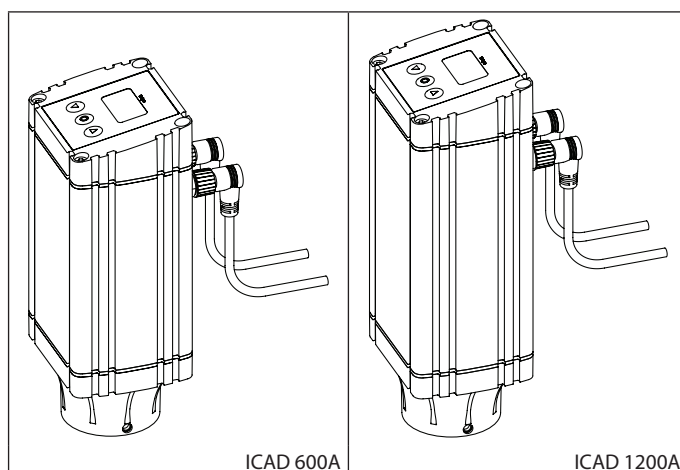
The ICM Concept (continued)

- 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



Motor operated valves, type ICM and actuators, type ICAD

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)

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

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.



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 (CO₂)
ICM 25-65:
Applicable to HCFC, non flammable HFC, R717 (Ammonia), R744 (CO₂) 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.

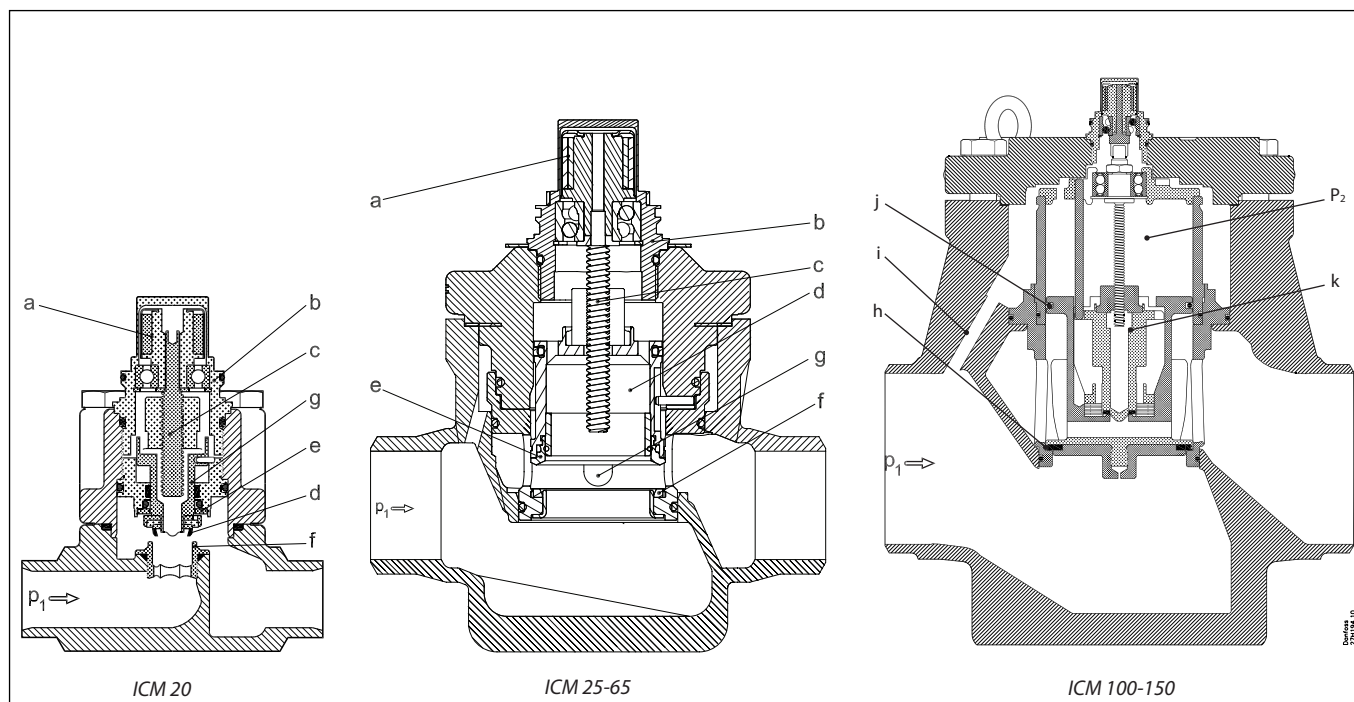


When used in liquid refrigerant above 75 °C / 167 °F, please contact Danfoss

- *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. opening 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, 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 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 (P_1) 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 P_1 and P_2 . 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 P_2 pressure to escape through the servo piston (j) to the outlet of the valve. The pressure P_1 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 P_1 and P_2 are equalized again. When there is no pressure difference between P_1 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.

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 accurate 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 mm² (3 x ~22 AWG)
Control cable with 8 poled M12 female connector: 7 x 0.25 mm² (7 x ~24 AWG)
Cable set with M12 female connectors in other lengths are available. See the section "Spare parts and accessories".

Motor operated valves, type ICM and actuators, type ICAD

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 (600A/1200A) [V DC]	Min. 21 Max. 26.4	22	23	24

* 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 k Ω

Analogue Output: 0/4 – 20 mA
Load : $\leq 250 \Omega$

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

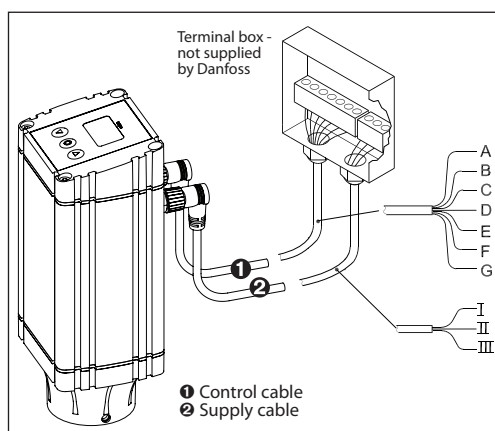
Digital Output - 3 pcs. NPN transistor output
External supply: 5 – 24 V DC
(Same supply as for ICAD can be used, but please note that the galvanically isolated system will then be spoiled)

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
B	Brown	–	ICM fully open
C	Red	–	ICM fully closed
D	Orange	–	GND ground
E	Yellow	+	0/4 – 20 mA Input ***
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

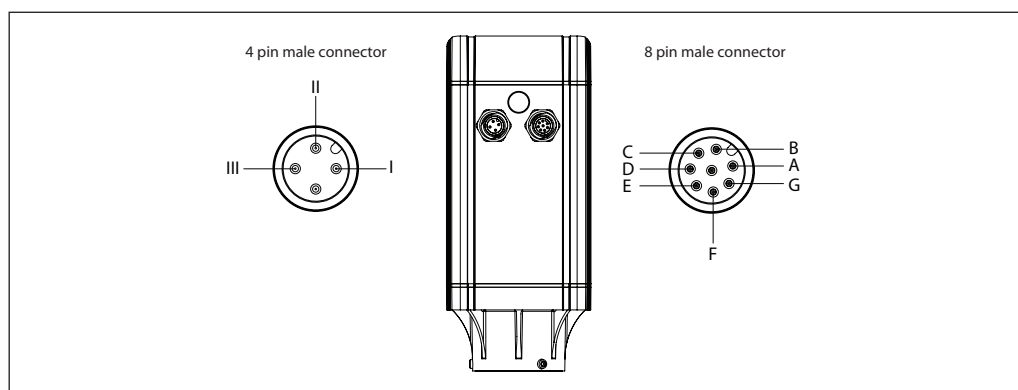
** Also used with D (GND, ground) for DI1 - Digital ON-OFF operation.

*** 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.

Motor operated valves, type ICM and actuators, type ICAD

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



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.

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

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

Many different parameters can be configured, 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.

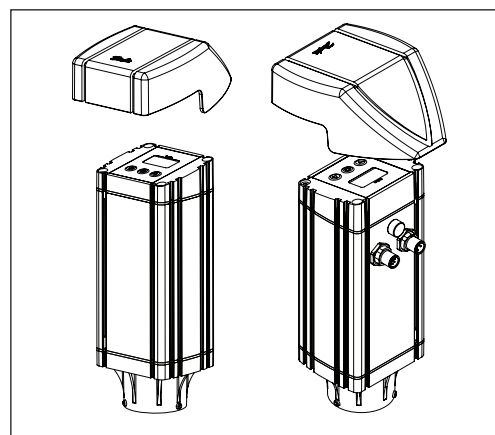
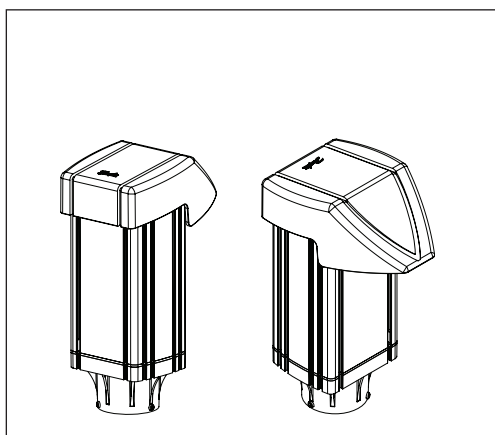
ICAD protection cap

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 specific 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 (Germanischer 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.

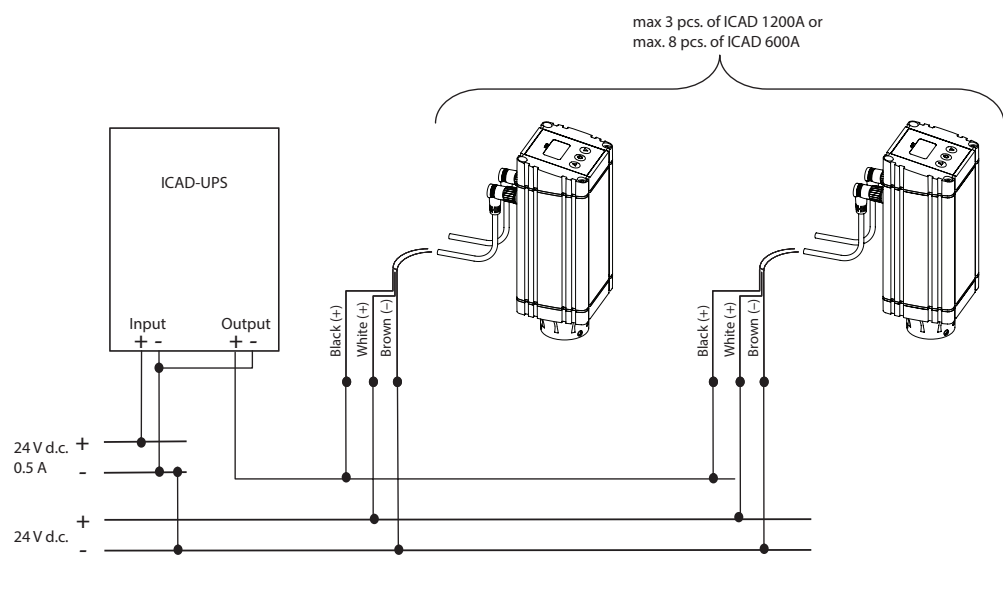
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For further information please see the instruction PI.HV0.B.

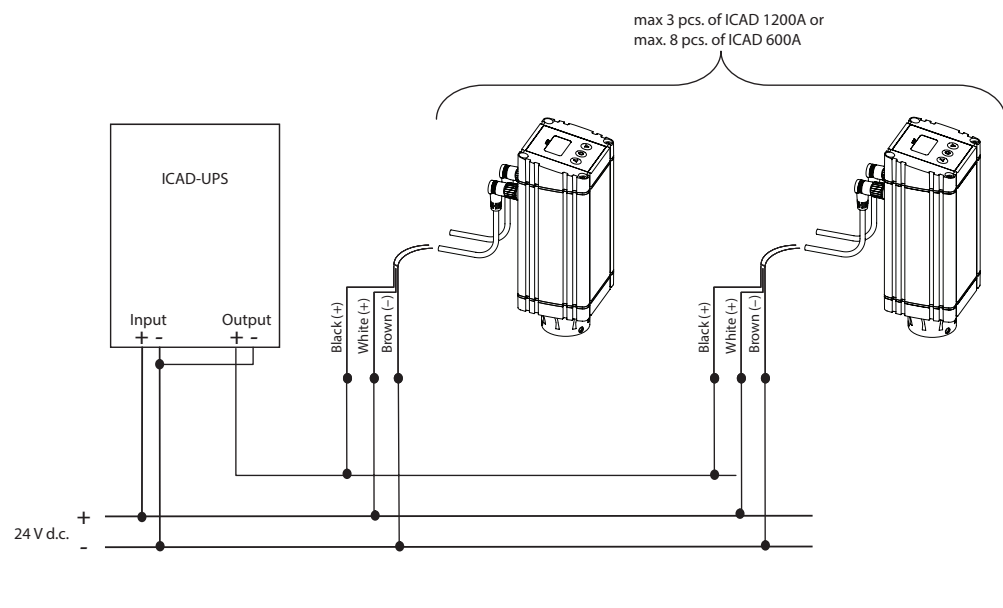
Motor operated valves, type ICM and actuators, type ICAD

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

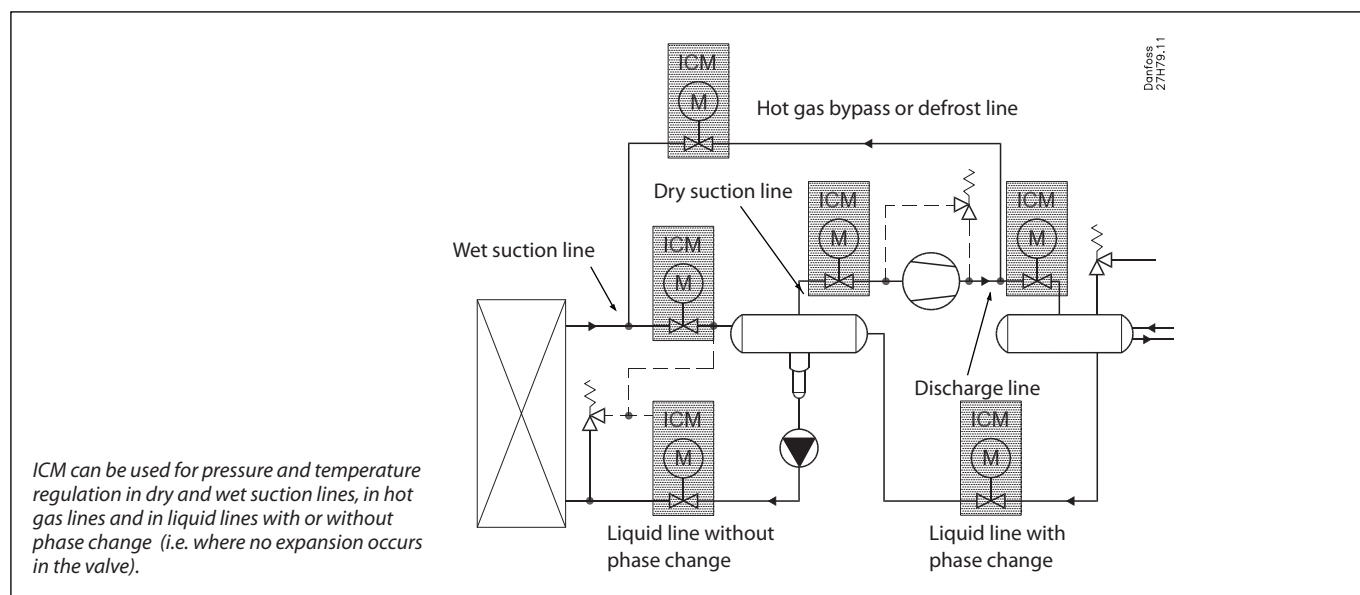
ICM 100-150

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			

ICM Application



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.

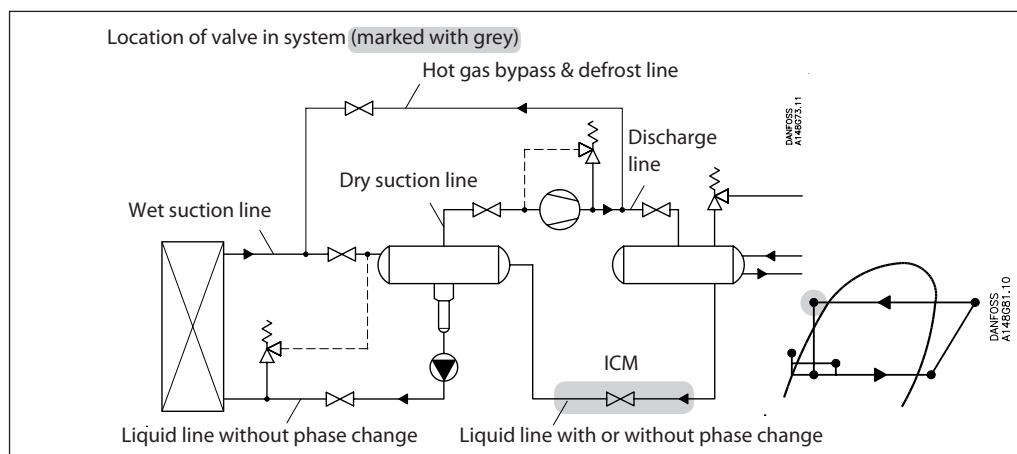
For ICM 20-65 applications it is recommended that the valve opening degree at the minimum operating conditions is greater than 5%.

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:

$T_e = -20\text{ °C}$
 $Q_o = 250\text{ kW}$
 $T_{liq} = 10\text{ °C}$
 Max. $\Delta p = 0.3\text{ bar}$
 Connection: DN20

The capacity table is based on nominal condition
 (pressure drop $\Delta p = 0.2\text{ bar}$, $T_{liq} = 30\text{ °C}$)

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

Correction factor for $\Delta p\ 0.3\text{ bar}$ $f_{\Delta p} = 0.82$
 Correction factor for liquid temperature
 $f_{T_{liq}} = 0.92$

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

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:

$T_e = -20\text{ °F}$
 $Q_o = 130\text{ TR}$
 $T_{liq} = 50\text{ °F}$
 Max. $\Delta p = 3.5\text{ psi}$
 Connection: $\frac{3}{4}"$

The capacity table is based on nominal condition
 (pressure drop $\Delta p = 3\text{ psi}$, $T_{liq} = 90\text{ °F}$)

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

Correction factor for $\Delta p\ 3.5\text{ psi}$ $f_{\Delta p} = 0.91$
 Correction factor for liquid temperature
 $f_{T_{liq}} = 0.92$

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

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

Nominal capacities

Liquid line with / without phase change

SI units

Capacity table for nominal conditions, Q_N [kW],
 $T_{liq} = 30\text{ }^{\circ}\text{C}$,
 $\Delta P = 0.2\text{ bar}$

R 717

Type	Valve body size	K_v [m ³ /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	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],
 $T_{liq} = 90\text{ }^{\circ}\text{F}$,
 $\Delta P = 3\text{ psi}$

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	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

SI units

Capacity table for nominal conditions, Q_N [kW],
 $T_{liq} = 10\text{ °C}$,
 $\Delta P = 0.2\text{ bar}$

R 744

Liquid line with / without phase change

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],
 $T_{liq} = 50\text{ °F}$,
 $\Delta P = 3\text{ psi}$

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

Nominal capacities

Liquid line with / without phase change

SI units

Capacity table for nominal conditions, Q_N [kW],
 $T_{liq} = 30\text{ °C}$,
 $\Delta P = 0.2\text{ bar}$

R 134a

Type	Valve body size	K_v [m ³ /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 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

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

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
 $T_{liq} = 90\text{ °F}$,
 $\Delta P = 3\text{ psi}$

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 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

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

Nominal capacities

SI units

Capacity table for nominal conditions, Q_N [kW],
 $T_{liq} = 30\text{ }^{\circ}\text{C}$,
 $\Delta P = 0.2\text{ bar}$

R 404A

Liquid line with / without phase change

Type	Valve body size	K_v [m ³ /h]	Evaporating temperature [°C]							
			-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],
 $T_{liq} = 90\text{ }^{\circ}\text{F}$,
 $\Delta P = 3\text{ psi}$

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	0.6	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

Nominal capacities

SI units

Capacity table for nominal conditions, Q_N [kW],
 $T_{liq} = 30\text{ }^{\circ}\text{C}$,
 $\Delta P = 0.2\text{ bar}$

R 22

Liquid line with / without phase change

Type	Valve body size	K_v [m ³ /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	25	4.6	91.3	94.2	97.0	100	102	105	107	109
ICM25-A		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		15	298	307	316	325	333	341	348	354
ICM40-B	40	26	516	532	548	563	578	591	603	614
ICM50-A		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],
 $T_{liq} = 90\text{ }^{\circ}\text{F}$,
 $\Delta P = 3\text{ psi}$

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	25	5.3	25.5	26.4	27.4	28.2	29.0	29.7	30.4	30.9
ICM25-A		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		17	81.9	84.8	87.7	90.5	93.0	95.3	97.4	99.1
ICM40-B	40	30	144	150	155	160	164	168	172	175
ICM50-A		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 ($f_{\Delta P}$)

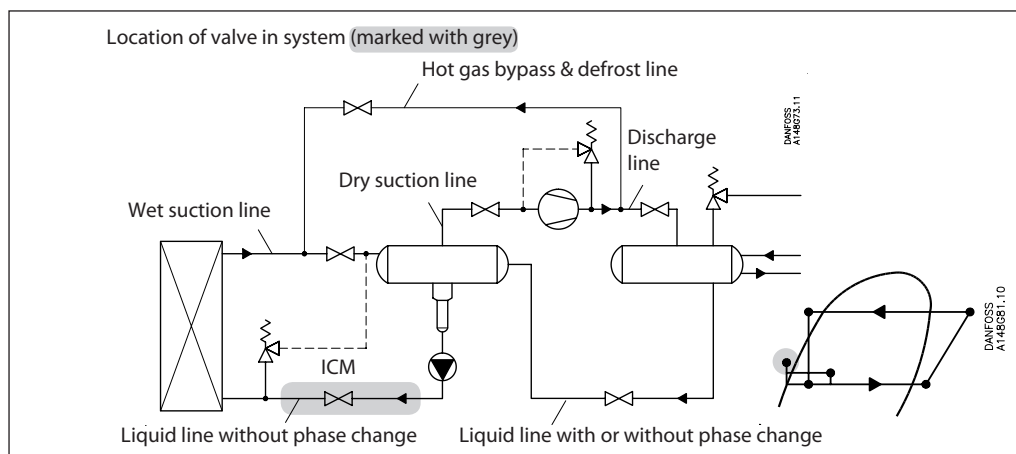
ΔP (psi)	Correction factor
3	1.00
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

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:

$T_e = -20\text{ °C}$
 $Q_o = 180\text{ kW}$
 Circulation rate = 3
 Max. $\Delta p = 0.3\text{ bar}$
 Connection: DN20

The capacity table is based on nominal condition (pressure drop $\Delta p = 0.2\text{ bar}$, circulation rate = 4)

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

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

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

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:

$T_e = -20\text{ °F}$
 $Q_o = 130\text{ TR}$
 Circulation rate = 3
 Max. $\Delta p = 3.5\text{ psi}$
 Connection: 1 1/4"

The capacity table is based on nominal condition (pressure drop $\Delta p = 3\text{ psi}$, circulation rate = 4)

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

Correction factor for $\Delta p\ 3.5\text{ psi}$ $f_{\Delta p} = 0.91$
 Correction factor for circulation rate $f_{rec} = 0.75$

$$Q_n = Q_o \times f_{\Delta p} \times f_{rec} = 130 \times 0.91 \times 0.75 = 89\text{ TR}$$

From the capacity table a ICM 32-B with Q_n capacity 171 TR is selected.

Nominal capacities

Liquid line without phase change

SI units

Capacity table at nominal conditions, Q_N [kW],
Circulation rate = 4,
 $\Delta p = 0.2$ bar

R 717

Type	Valve body size	K_v [m ³ /h]	Evaporating temperature [°C]							
			-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,
 $\Delta p = 3$ 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	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

SI units

Capacity table at nominal conditions, Q_N [kW],
Circulation rate = 4,
 $\Delta p = 0.2$ bar

R 744

Liquid line without phase change

Type	Valve body size	K_v [m ³ /h]	Evaporating temperature [°C]						
			-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,
 $\Delta p = 3$ 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	0.7	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

Nominal capacities

SI units

Capacity table at nominal conditions, Q_N [kW],
Circulation rate = 4,
 $\Delta p = 0.2$ bar

R 134a

Type	Valve body size	K_v [m ³ /h]	Evaporating temperature [°C]						
			-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

Liquid line without phase change

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,
 $\Delta p = 3$ 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	0.5	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,
 $\Delta p = 0.2$ bar

R 404A

Type	Valve body size	K_v [m ³ /h]	Evaporating temperature [°C]							
			-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,
 $\Delta p = 3$ 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	0.4	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

Nominal capacities

Liquid line without phase change

SI units

Capacity table at nominal conditions, Q_N [kW],
Circulation rate = 4,
 $\Delta p = 0.2$ 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,
 $\Delta p = 3$ 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 ($f_{\Delta P}$)

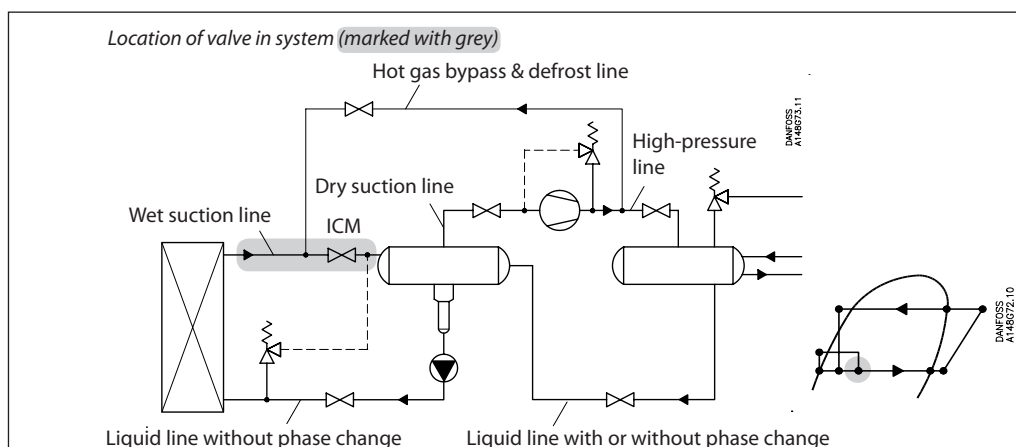
ΔP (psi)	Correction factor
3	1.00
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

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:

$T_e = -20\text{ °C}$
 $Q_o = 80\text{ kW}$
 Circulation rate = 3
 Max. $\Delta p = 0.3\text{ bar}$
 Connection: DN32

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

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

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

The capacity table is based on nominal condition (pressure drop $\Delta p = 0.2\text{ bar}$, recirculation rate = 4)

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:

$T_e = -20\text{ °F}$
 $Q_o = 8\text{ TR}$
 Circulation rate = 3
 Max. $\Delta p = 3.5\text{ psi}$
 Connection: 1"

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

Correction factor for $\Delta p\ 3.5\text{ psi}$ $f_{\Delta p} = 0.91$
 Correction factor for circulation rate $f_{rec} = 0.9$

$$Q_n = Q_o \times f_{\Delta p} \times f_{rec} = 8 \times 0.91 \times 0.9 = 6.6\text{ TR}$$

The capacity table is based on nominal condition (pressure drop $\Delta p = 3\text{ psi}$, recirculation rate = 4)

From the capacity table a ICM 25-B with Q_n capacity 10.2 TR is selected.

Nominal capacities

SI units

Capacity table at nominal conditions, Q_N [kW],
Circulation rate = 4,
 $\Delta p = 0.2$ bar

R 717

Wet suction line

Type	Valve body size	K_v [m ³ /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,
 $\Delta p = 3$ 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,
 $\Delta p = 0.2$ 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,
 $\Delta p = 3$ 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

Nominal capacities

Wet suction line

SI units

Capacity table at nominal conditions, Q_N [kW],
Circulation rate = 4,
 $\Delta p = 0.2$ 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,
 $\Delta p = 3$ 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,
 $\Delta p = 0.2$ 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,
 $\Delta p = 3$ 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

Nominal capacities

Wet suction line

R 22

SI units

Capacity table at nominal conditions, Q_N [kW],
Circulation rate = 4,
 $\Delta p = 0.2$ bar

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

R 22

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
Circulation rate = 4,
 $\Delta p = 3$ psi

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 ($f_{\Delta P}$)

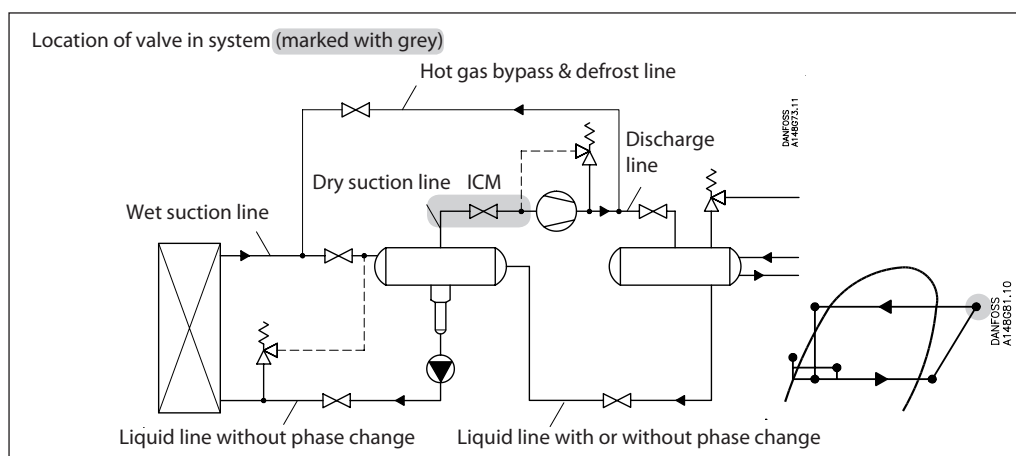
ΔP (psi)	Correction factor
3	1.00
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

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:

$T_e = -20\text{ °C}$
 $Q_o = 90\text{ kW}$
 $T_{liq} = 10\text{ °C}$
 Max. $\Delta p = 0.3\text{ bar}$
 Connection: DN32

The capacity table is based on nominal condition
 (pressure drop $\Delta p = 0.2\text{ bar}$, $T_{liq} = 30\text{ °C}$)

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

Correction factor for $\Delta p\ 0.3\text{ bar}$ $f_{\Delta p} = 0.82$

Correction factor for liquid temperature $f_{T_{liq}} = 0.92$

$$Q_n = Q_o \times f_{\Delta p} \times f_{T_{liq}} = 90 \times 0.82 \times 0.92 = 68\text{ kW}$$

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:

$T_e = 0\text{ °F}$
 $Q_o = 20\text{ TR}$
 $T_{liq} = 50\text{ °F}$
 Max. $\Delta p = 3.5\text{ psi}$
 Connection: 1 1/4"

The capacity table is based on nominal condition
 ($\Delta p = 3\text{ psi}$, $T_{liq} = 90\text{ °F}$)

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

Correction factor for $\Delta p\ 3.5\text{ psi}$ $f_{\Delta p} = 0.91$

Correction factor for liquid temperature $f_{T_{liq}} = 0.92$

$$Q_n = Q_o \times f_{\Delta p} \times f_{T_{liq}} = 20 \times 0.91 \times 0.92 = 16.7\text{ TR}$$

From the capacity table a ICM 32-B with Q_n
 capacity 28.2 TR is selected.

Nominal capacities

SI units

Capacity table at nominal conditions, Q_N [kW],
 $T_{liq} = 30\text{ }^{\circ}\text{C}$,
 $\Delta p = 0.2\text{ bar}$
 Superheating = $8\text{ }^{\circ}\text{C}$

R 717

Dry suction line

Type	Valve body size	K_v [m ³ /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],
 $T_{liq} = 90\text{ }^{\circ}\text{F}$,
 $\Delta p = 3\text{ psi}$
 Superheating = $12\text{ }^{\circ}\text{F}$

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

SI units

Capacity table at nominal conditions, Q_N [kW],
 $T_{liq} = 10\text{ °C}$,
 $\Delta p = 0.2\text{ bar}$
 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	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

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
 $T_{liq} = 50\text{ °F}$,
 $\Delta p = 3\text{ psi}$
 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	0.20	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

Nominal capacities

Dry suction line

SI units

Capacity table at nominal conditions, Q_N [kW],
 $T_{liq} = 30^\circ\text{C}$,
 $\Delta p = 0.2$ bar
 Superheating = 8°C

R 134a

Type	Valve body size	K_v [m ³ /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

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
 $T_{liq} = 90$,
 $\Delta p = 3$ psi
 Superheating = 12

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	0.05	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],
 $T_{liq} = 30\text{ °C}$,
 $\Delta p = 0.2\text{ bar}$
 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

R 404A

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
 $T_{liq} = 90\text{ °F}$,
 $\Delta p = 3\text{ psi}$
 Superheating = 12 °F

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

Nominal capacities

SI units

Capacity table at nominal conditions, Q_N [kW],
 $T_{liq} = 30\text{ °C}$,
 $\Delta p = 0.2\text{ bar}$
 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],
 $T_{liq} = 90\text{ °F}$,
 $\Delta p = 3\text{ psi}$
 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)

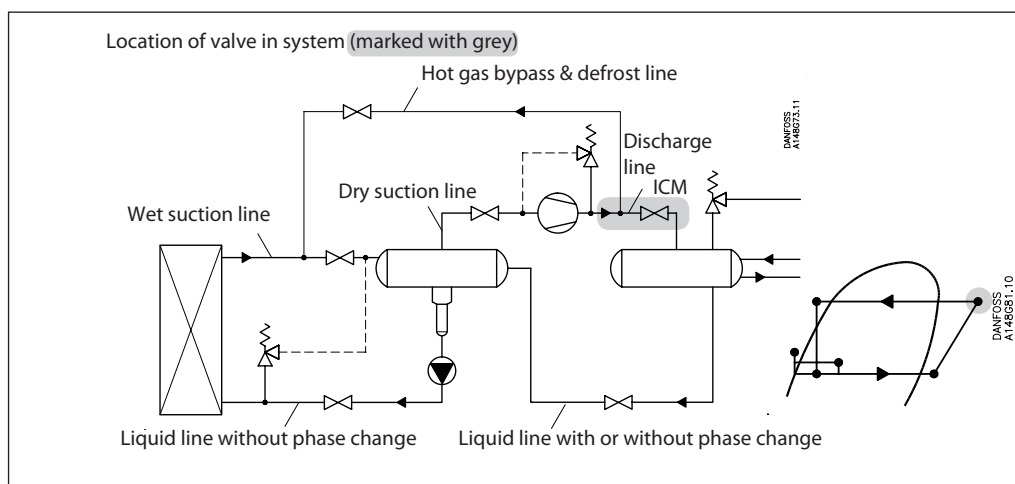
T_s [°F]	Correction factor
10	1.00
14	1.00
18	1.00
20	1.00

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:

$T_e = -20\text{ °C}$
 $Q_o = 90\text{ kW}$
 $T_{liq} = 10\text{ °C}$
 $\text{Max. } \Delta p = 0.4\text{ bar}$
 $T_{disch.} = 60\text{ °C}$
 Connection: DN25

The capacity table is based on nominal condition ($\Delta p = 0.2\text{ bar}$, $T_{liq} = 30\text{ °C}$, $P_{disch.} = 12\text{ bar}$, $T_{disch.} = 80\text{ °C}$)

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

$\text{Correction factor for } \Delta p\text{ } 0.4\text{ bar } f_{\Delta p} = 0.72$
 $\text{Correction factor for liquid temperature } f_{T_{liq}} = 0.92$
 $\text{Correction factor for } T_{disch.}\text{ } 60\text{ °C, } f_{disch.} = 0.97$

$$Q_n = Q_o \times f_{\Delta p} \times f_{T_{liq}} \times f_{T_{disch.}} = 90 \times 0.72 \times 0.92 \times 0.97 = 58\text{ kW}$$

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:

$T_e = 0\text{ °F}$
 $Q_o = 8\text{ TR}$
 $T_{liq} = 50\text{ °F}$
 $\text{Max. } \Delta p = 4.5\text{ psi}$
 $T_{disch.} = 120\text{ °F}$
 $\text{Connection: } 3/4''$

The capacity table is based on nominal condition ($\Delta p = 3\text{ psi}$, $T_{liq} = 90\text{ °F}$, $P_{disch.} = 185\text{ psi}$, $T_{disch.} = 180\text{ °F}$)

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

$\text{Correction factor for } \Delta p\text{ } 4.5\text{ psi } f_{\Delta p} = 0.81$
 $\text{Correction factor for liquid temperature } f_{T_{liq}} = 0.92$
 $\text{Correction factor for } T_{disch.}\text{ } 120\text{ °F, } f_{disch.} = 0.95$

$$Q_n = Q_o \times f_{\Delta p} \times f_{T_{liq}} \times f_{T_{disch.}} = 8 \times 0.81 \times 0.92 \times 0.95 = 5.7\text{ TR}$$

From the capacity table a ICM 20-B with Q_n capacity 8.4 TR is selected.

Nominal capacities

SI units

Capacity table at nominal conditions, Q_N [kW],

$T_{liq} = 30\text{ °C}$,

$\Delta p = 0.2\text{ bar}$,

$P_{disch.} = 12\text{ bar}$,

$T_{disch.} = 80\text{ °C}$

Superheating = 8 °C

R 717

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	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],

$T_{liq} = 90\text{ °F}$,

$\Delta p = 2.9\text{ psi}$,

$P_{disch.} = 185\text{ psi}$,

$T_{disch.} = 180\text{ °F}$

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	0.66	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],

$T_{liq} = 10\text{ °C}$,

$\Delta p = 0.2\text{ bar}$,

$P_{disch.} = 10\text{ bar}$,

$T_{disch.} = 80\text{ °C}$

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 discharge temperature ($T_{disch.}$).

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

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

R 744

US units

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],

$T_{liq} = 90\text{ °F}$,

$\Delta p = 3\text{ psi}$,

$P_{disch.} = 120\text{ psi}$,

$T_{disch.} = 180\text{ °F}$

Superheating = 12 °F

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 discharge temperature ($T_{disch.}$).

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

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

Nominal capacities

SI units

Capacity table at nominal conditions, Q_N [kW],
 $T_{liq} = 30\text{ °C}$,
 $\Delta p = 0.2\text{ bar}$,
 $P_{disch.} = 8\text{ bar}$,
 $T_{disch.} = 80\text{ °C}$
 Superheating = 8 °C

R 134a

Discharge line

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],
 $T_{liq} = 90\text{ °F}$,
 $\Delta p = 3\text{ psi}$,
 $P_{disch.} = 120\text{ psi}$,
 $T_{disch.} = 180\text{ °F}$
 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

SI units

Capacity table at nominal conditions, Q_N [kW],
 $T_{liq} = 30\text{ °C}$,
 $\Delta p = 0.2\text{ bar}$,
 $P_{disch.} = 12\text{ bar}$,
 $T_{disch.} = 80\text{ °C}$
 Superheating = 8 °C

R 404A

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	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],
 $T_{liq} = 90\text{ °F}$,
 $\Delta p = 3\text{ psi}$,
 $P_{disch.} = 120\text{ psi}$,
 $T_{disch.} = 180\text{ °F}$
 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

Nominal capacities

SI units

Capacity table at nominal conditions, Q_N [kW],
 $T_{liq} = 30\text{ °C}$,
 $\Delta p = 0.2\text{ bar}$,
 $P_{disch.} = 12\text{ bar}$,
 $T_{disch.} = 80\text{ °C}$
 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],
 $T_{liq} = 90\text{ °F}$,
 $\Delta p = 3\text{ psi}$,
 $P_{disch.} = 120\text{ psi}$,
 $T_{disch.} = 180\text{ °F}$
 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 ($T_{disch.}$)

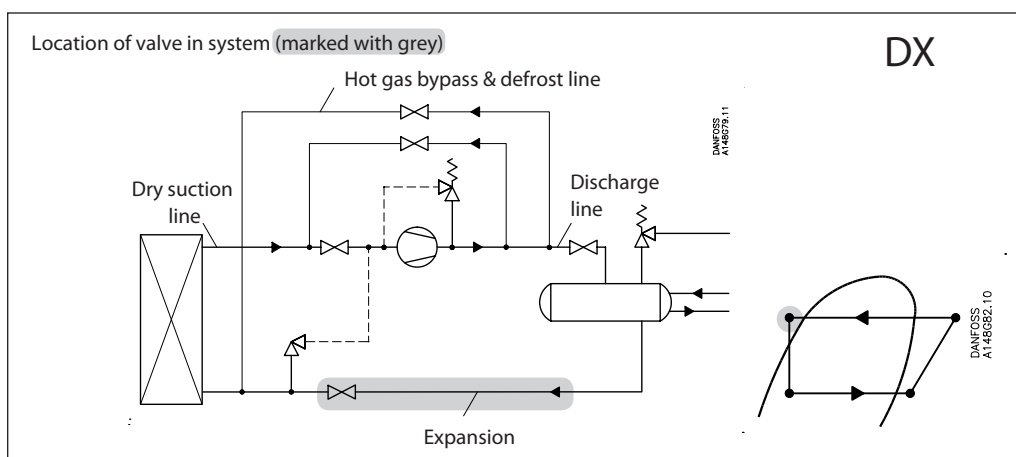
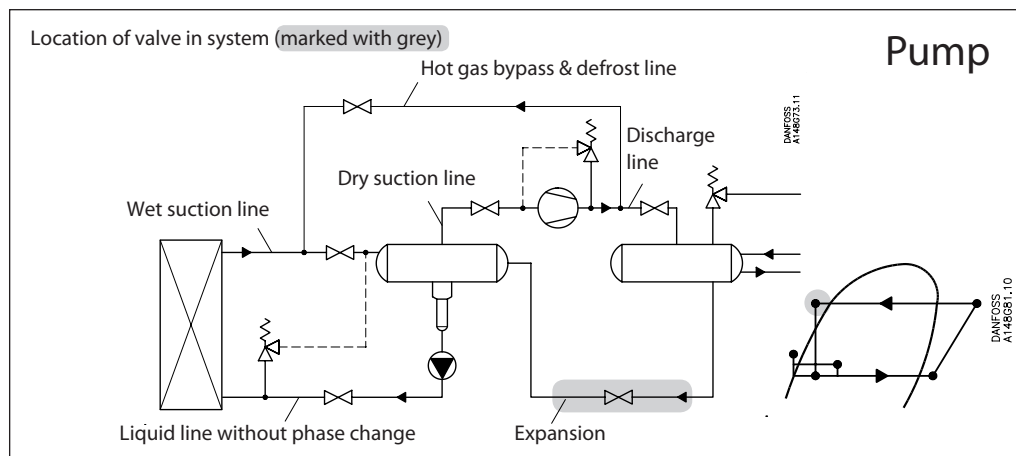
Discharge temperature [°F]	Correction factor
120	0.95
140	0.97
180	1.00
200	1.02
210	1.02
230	1.04
250	1.05

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

$T_e = -10^\circ\text{C}$

$T_c = 30^\circ\text{C}$

$Q_0 = 1500\text{ kW}$

$\Delta t_{\text{sub}} = 20^\circ\text{K}$

Correction factor for subcooling: 0.94

Pressure drop across the valve:
11.7 bar - 2.9 bar = 8.8 bar

Corrected capacity: $1500 \times 0.94 = 1410\text{ kW}$

From the R717 capacity table ICM 20-C is selected with Q_{nom} capacity 1990 kW at 8 bar.

Motor operated valves, type ICM and actuators, type ICAD

Expansion

Capacities for nominal conditions, Q_n (kW)

R 717

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	29.6	40.8	55.4	73.1	84.7	93.3
ICM20-A	DN20	0.6	85.9	119	163	217	253	89	123	167	221	256	282
ICM20-B	DN20	2.4	498	686	930	1230	1435	515	705	950	1245	1450	1594
ICM20-C	DN20	4.6	824	1124	1507	1990	2310	850	1145	1525	2000	2320	2560
ICM25-A	DN25	6	1274	1739	2337	3080	3575	1310	1773	2370	3100	3600	3980
ICM32-A	DN32	9	1834	2515	3400	4490	5220	1890	2580	3450	4530	5250	5790
ICM40-A	DN40	15	3410	4630	6200	8150	9450	3500	4700	6250	8170	9480	10450
ICM50-A	DN50	23	5960	8050	10750	14100	16300	6100	8150	10800	14100	16300	18100
ICM65-A	DN65	35	9793	13270	17686	23178	26940	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	31.3	42.7	57.2	74.5	85.6	93.8
ICM20-A	DN20	0.6	92	127	170	224	258	94.5	129	172	224	258	284
ICM20-B	DN20	2.4	527	715	955	1253	1452	535	718	957	1250	1450	1594
ICM20-C	DN20	4.6	859	1152	1520	1990	2310	860	1140	1505	1975	2290	2525
ICM25-A	DN25	6	1332	1780	2360	3090	3590	1332	1770	2345	3070	3570	3940
ICM32-A	DN32	9	1930	2600	3450	4520	5240	1935	2590	3440	4510	5220	5750
ICM40-A	DN40	15	3550	4715	6220	8140	9450	3520	4650	6140	8050	9350	10350
ICM50-A	DN50	23	6150	8150	10700	14000	16300	6070	8000	10550	13850	16100	17800
ICM65-A	DN65	35	10118	13393	17640	23065	26784	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	32.3	43.5	57.5	74.2	84.8	92.5
ICM20-A	DN20	0.6	96	130	173	225	258	97	131	173	224	256	280
ICM20-B	DN20	2.4	532	716	950	1240	1435	527	705	940	1230	1420	1555
ICM20-C	DN20	4.6	840	1111	1480	1950	2270	815	1085	1448	1920	2230	2470
ICM25-A	DN25	6	1310	1740	2310	3030	3530	1270	1690	2270	2990	3480	3830
ICM32-A	DN32	9	1920	2560	3400	4460	5150	1870	2500	3350	4400	5100	5630
ICM40-A	DN40	15	3430	4530	6030	7950	9250	3300	4400	5900	7820	9120	10100
ICM50-A	DN50	23	5900	7800	10350	13650	15900	5670	7550	10150	13400	15700	17400
ICM65-A	DN65	35	9732	12842	17045	22491	26193	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						
ICM20-A	DN20	0.6	97.5	131	172	222	253						
ICM20-B	DN20	2.4	512	690	925	1210	1400						
ICM20-C	DN20	4.6	780	1055	1425	1890	2200						
ICM25-A	DN25	6	1220	1650	2220	2950	3420						
ICM32-A	DN32	9	1810	2450	3280	4325	5030						
ICM40-A	DN40	15	3170	4280	5800	7710	8950						
ICM50-A	DN50	23	5430	7350	9900	13200	15400						
ICM65-A	DN65	35	8659	12096	16354	21774	25423						

Motor operated valves, type ICM and actuators, type ICAD

Expansion

Capacities for nominal conditions, Q_n (TR)

R 717

Type	Pressure drop across valve Δp psi					
	15	30	60	120	180	240

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 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 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 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 -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 -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

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

Expansion

Capacities for nominal conditions, Q_n (kW)

Type		Pressure drop across valve Δp bar						
		1	2	4	8	12	16	
		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

Motor operated valves, type ICM and actuators, type ICAD

Expansion

Capacities for nominal conditions, Q_n (TR)

R 744

Type	Pressure drop across valve Δp psi					
	15	30	60	120	180	240

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 40 °F					
1.93	2.71	3.74	5.01	5.8	6.32
5.8	8.2	11.3	15.2	17.6	19.2
33.9	47.6	66	88.3	102	111
56	79	109	146	169	184
87	122	169	226	261	285
125	176	242	325	376	410
232	326	450	603	699	760
405	570	785	1050	1215	1320
664	933	1288	1720	1986	2159

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 0 °F					
2.55	3.55	4.86	6.49	7.53	8.23
7.7	10.7	14.7	19.7	22.8	25
44.7	62.3	85.5	114	132	144
74.3	103	141	188	217	237
115	159	218	290	335	367
165	230	315	418	485	528
307	426	585	775	895	975
535	745	1015	1350	1555	1700
879	1221	1668	2210	2551	2783

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 -40 °F					
3.02	4.17	5.68	7.52	8.64	9.41
9.1	12.6	17.2	22.7	26.2	28.5
53	73.3	99	131	150	164
87.8	121	163	214	245	267
135	187	253	331	380	414
195	270	365	480	549	600
362	500	675	878	1010	1100
633	870	1170	1530	1750	1900
1040	1431	1923	2510	2877	3129

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

Motor operated valves, type ICM and actuators, type ICAD

Expansion

Capacities for nominal conditions, Q_n (kW)

R 134a

Type		Pressure drop across valve Δp bar					
		1	2	4	8	12	16
		Evaporating temperature 10 °C					
ICM20-A33	DN20	0.2	6.4	8.6	11.1	13.4	14.1
ICM20-A	DN20	0.6	19.4	26	33.6	40.5	42.7
ICM20-B	DN20	2.4	112	149	192	230	243
ICM20-C	DN20	4.6	184	243	310	370	392
ICM25-A	DN25	6	285	377	480	575	607
ICM32-A	DN32	9	410	545	699	835	885
ICM40-A	DN40	15	760	1000	1270	1520	1610
ICM50-A	DN50	23	1320	1730	2200	2620	2770
ICM65-A	DN65	35	2169	2847	3606	4304	4551
		Evaporating temperature 0 °C					
ICM20-A33	DN20	6.6	8.9	11.3	13.5	14.1	14
ICM20-A	DN20	20.1	26.8	34.3	40.8	42.5	42.1
ICM20-B	DN20	116	153	194	231	242	240
ICM20-C	DN20	189	247	311	370	389	388
ICM25-A	DN25	292	383	482	575	604	602
ICM32-A	DN32	422	555	703	835	880	875
ICM40-A	DN40	775	1015	1270	1515	1596	1590
ICM50-A	DN50	1350	1750	2200	2610	2750	2740
ICM65-A	DN65	2215	2877	3612	4285	4508	4492
		Evaporating temperature -10 °C					
ICM20-A33	DN20	0.2	6.9	9.1	11.5	13.4	13.9
ICM20-A	DN20	0.6	20.7	27.4	34.5	40.5	42
ICM20-B	DN20	2.4	118	154	194	229	238
ICM20-C	DN20	4.6	191	247	310	365	381
ICM25-A	DN25	6	296	383	481	568	593
ICM32-A	DN32	9	430	559	702	826	865
ICM40-A	DN40	15	785	1013	1265	1490	1565
ICM50-A	DN50	23	1360	1740	2180	2570	2700
ICM65-A	DN65	35	2229	2866	3579	4222	4420
		Evaporating temperature -20 °C					
ICM20-A33	DN20	7	9.2	11.4	13.3	13.6	13.3
ICM20-A	DN20	21.1	27.6	34.5	40	41.1	40.1
ICM20-B	DN20	119	154	193	225	233	228
ICM20-C	DN20	190	244	305	357	372	365
ICM25-A	DN25	295	380	474	555	575	568
ICM32-A	DN32	430	555	695	810	840	826
ICM40-A	DN40	775	995	1240	1460	1520	1495
ICM50-A	DN50	1340	1710	2130	2510	2620	2590
ICM65-A	DN65	2203	2818	3509	4124	4296	4235
		Evaporating temperature -30 °C					
ICM20-A33	DN20	0.2	7.1	9.2	11.3	13	13.2
ICM20-A	DN20	0.6	21.3	27.6	34.2	39.1	40
ICM20-B	DN20	2.4	118	152	189	219	225
ICM20-C	DN20	4.6	186	238	297	347	357
ICM25-A	DN25	6	290	372	463	540	555
ICM32-A	DN32	9	425	545	680	790	812
ICM40-A	DN40	15	760	970	1210	1415	1465
ICM50-A	DN50	23	1305	1670	2080	2440	2530
ICM65-A	DN65	35	2146	2744	3417	3998	4141
		Evaporating temperature -40 °C					
ICM20-A33	DN20	7.1	9.1	11.1	12.6	12.7	12.1
ICM20-A	DN20	21.4	27.5	33.6	38	38.3	36.8
ICM20-B	DN20	116	149	184	211	216	208
ICM20-C	DN20	180	231	288	335	342	333
ICM25-A	DN25	280	361	448	520	532	516
ICM32-A	DN32	415	532	660	760	780	755
ICM40-A	DN40	730	940	1175	1360	1410	1358
ICM50-A	DN50	1260	1610	2010	2350	2420	2350
ICM65-A	DN65	2068	2654	3310	3853	3964	3849

Motor operated valves, type ICM and actuators, type ICAD

Expansion

Capacities for nominal conditions, Q_n (TR)

R 134a

Type	Pressure drop across valve Δp psi					
	15	30	60	120	180	240

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 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 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 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 -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

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

Motor operated valves, type ICM and actuators, type ICAD

Expansion

Capacities for nominal conditions, Q_n (kW)

R 404A

Type		Pressure drop across valve Δp bar					
		1	2	4	8	12	16
		Evaporating temperature 10 °C					
ICM20-A33	DN20	0.2	5.2	7.1	9.2	11.2	11.7
ICM20-A	DN20	0.6	15.7	21.3	27.8	33.8	35.3
ICM20-B	DN20	2.4	91	123	160	194	203
ICM20-C	DN20	4.6	150	203	263	315	330
ICM25-A	DN25	6	233	313	406	490	510
ICM32-A	DN32	9	335	452	589	710	740
ICM40-A	DN40	15	621	835	1080	1300	1360
ICM50-A	DN50	23	1085	1455	1880	2250	2350
ICM65-A	DN65	35	1779	2388	3075	3687	3848
		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 -10 °C					
ICM20-A33	DN20	0.2	5.8	7.8	10	11.9	12.4
ICM20-A	DN20	0.6	17.4	23.5	30.3	36.1	37.5
ICM20-B	DN20	2.4	101	135	173	206	214
ICM20-C	DN20	4.6	166	220	280	333	345
ICM25-A	DN25	6	257	340	435	515	535
ICM32-A	DN32	9	370	493	629	748	778
ICM40-A	DN40	15	685	904	1150	1360	1420
ICM50-A	DN50	23	1190	1570	1990	2350	2450
ICM65-A	DN65	35	1958	2581	3266	3864	4019
		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 -30 °C					
ICM20-A33	DN20	0.2	6.2	8.3	10.4	12	12.3
ICM20-A	DN20	0.6	18.7	24.7	31.3	36.5	37.3
ICM20-B	DN20	2.4	107	140	176	205	211
ICM20-C	DN20	4.6	173	225	281	329	338
ICM25-A	DN25	6	269	349	437	510	525
ICM32-A	DN32	9	389	508	637	745	765
ICM40-A	DN40	15	711	922	1150	1345	1385
ICM50-A	DN50	23	1235	1590	1980	2320	2390
ICM65-A	DN65	35	2029	2611	3253	3801	3920
		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
		Evaporating temperature -50 °C					
ICM20-A33	DN20	0.2	6.5	8.3	10.2	11.6	11.6
ICM20-A	DN20	0.6	19.5	25	30.9	35	35.1
ICM20-B	DN20	2.4	108	138	171	196	198
ICM20-C	DN20	4.6	170	215	268	310	315
ICM25-A	DN25	6	265	335	418	484	490
ICM32-A	DN32	9	388	493	613	705	715
ICM40-A	DN40	15	695	875	1090	1270	1290
ICM50-A	DN50	23	1195	1505	1880	2180	2230
ICM65-A	DN65	35	1968	2475	3088	3585	3650

Expansion

Capacities for nominal conditions, Q_n (TR)

R 404A

Type	Pressure drop across valve Δp psi					
	15	30	60	120	180	240

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 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 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 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 -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 -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

				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

Motor operated valves, type ICM and actuators, type ICAD

Expansion

Capacities for nominal conditions, Q_n (kW)

R 22

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	6.7	9.2	12.2	15.5	17.1	18	7	9.5	12.6	15.9	17.5	18.3
ICM20-A	DN20	0.6	20.1	27.6	36.8	46.7	51.7	54.2	21.1	28.8	38.1	48	53	55.4
ICM20-B	DN20	2.4	117	160	212	268	297	312	122	166	218	274	303	316
ICM20-C	DN20	4.6	193	263	346	435	482	505	201	271	355	443	490	513
ICM25-A	DN25	6	299	406	535	675	746	785	312	420	550	687	760	795
ICM32-A	DN32	9	430	585	777	980	1085	1140	448	606	798	998	1100	1155
ICM40-A	DN40	15	798	1080	1420	1790	1980	2080	830	1115	1460	1820	2005	2110
ICM50-A	DN50	23	1390	1880	2470	3100	3430	3600	1450	1940	2530	3150	3480	3650
ICM65-A	DN65	35	2286	3090	4057	5097	5638	5918	2378	3187	4149	5179	5714	5989
			Evaporating temperature -10 °C						Evaporating temperature -20 °C					
ICM20-A33	DN20	0.2	7.3	9.9	13	16.2	17.7	18.5	7.5	10.1	13.2	16.3	17.8	18.4
ICM20-A	DN20	0.6	21.9	29.8	39	48.8	53.7	55.8	22.7	30.5	39.8	49.3	53.7	55.7
ICM20-B	DN20	2.4	126	170	223	278	305	318	130	174	225	279	305	317
ICM20-C	DN20	4.6	208	277	360	448	493	514	212	280	361	447	490	510
ICM25-A	DN25	6	321	430	557	695	764	796	328	435	559	693	760	792
ICM32-A	DN32	9	463	621	809	1010	1110	1157	475	630	815	1012	1105	1151
ICM40-A	DN40	15	855	1140	1472	1830	2012	2112	870	1150	1475	1830	2005	2100
ICM50-A	DN50	23	1490	1970	2550	3170	3480	3650	1510	1980	2550	3150	3460	3630
ICM65-A	DN65	35	2449	3247	4192	5205	5730	5999	2490	3264	4190	5185	5697	5952
			Evaporating temperature -30 °C						Evaporating temperature -40 °C					
ICM20-A33	DN20	0.2	7.7	10.3	13.3	16.3	17.7	18.3	7.9	10.4	13.2	16.2	17.5	18
ICM20-A	DN20	0.6	23.2	31	40	49.3	53.5	55.3	23.6	31.3	40.1	48.8	52.8	54.3
ICM20-B	DN20	2.4	132	175	225	277	302	313	133	174	223	274	298	308
ICM20-C	DN20	4.6	212	279	357	443	485	505	210	275	353	436	475	495
ICM25-A	DN25	6	329	433	556	685	752	783	327	428	550	676	740	765
ICM32-A	DN32	9	478	631	812	1000	1095	1140	478	626	805	990	1075	1120
ICM40-A	DN40	15	873	1140	1465	1810	1980	2070	860	1120	1440	1780	1940	2020
ICM50-A	DN50	23	1510	1970	2520	3110	3420	3560	1480	1930	2480	3070	3350	3500
ICM65-A	DN65	35	2479	3235	4147	5127	5623	5865	2443	3178	4078	5041	5520	5743
			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						

Expansion

Capacities for nominal conditions, Q_n (TR)

R 22

Type	Pressure drop across valve Δp psi					
	15	30	60	120	180	240

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 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 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 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 -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

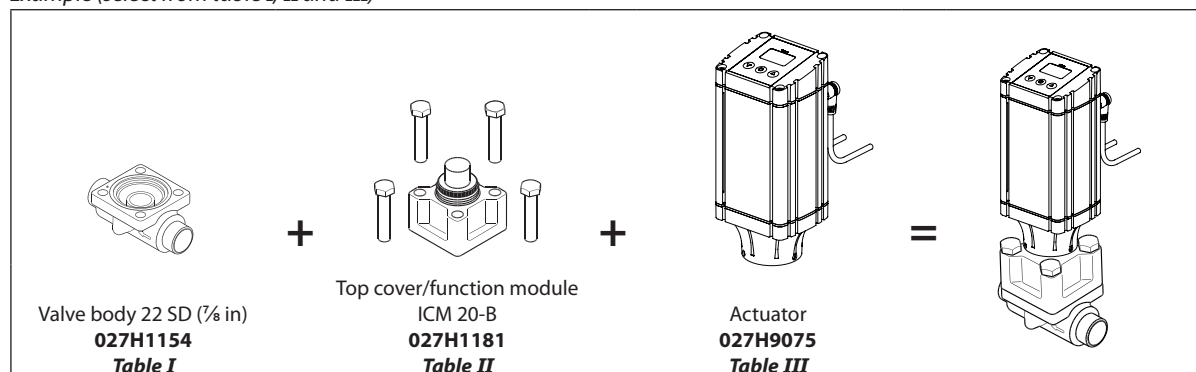
Evaporating temperature -40 °F					
2.25	2.98	3.81	4.61	4.97	5.1
6.8	9	11.5	13.9	15	15.4
38.1	50.2	64	78.5	85	87.6
60.5	79	101	125	136	140
94	123	157	193	211	218
138	180	231	283	307	318
248	323	413	510	555	575
428	555	710	875	960	995
702	913	1170	1443	1575	1634

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

ICM 20 / ICAD 600A

Ordering from the parts programme

Example (select from table I, II and III)



ICV 20 valve body w/different connections

Table I

20 D (3/4 in)	25 D (1 in)	20 A (3/4 in)	20 SOC (3/4 in)
027H1145	027H1163	027H1148	027H1151
16 SA (5/8 in)	22 SA (7/8 in)	16 SD (5/8 in)	22 SD (7/8 in)
027H1129	027H1160	027H1132	027H1154
20 FPT (3/4 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

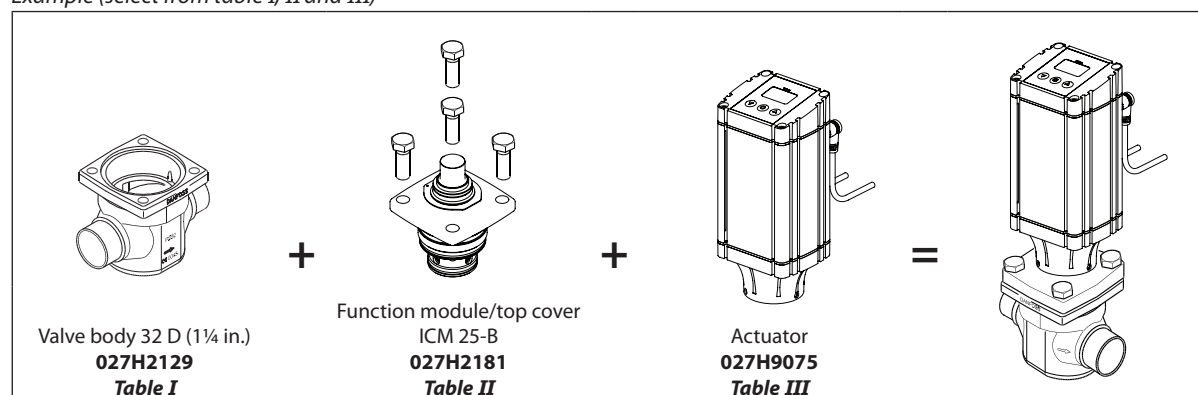
Available connections									
	20 D (3/4 in)	25 D (1 in)	20 A (3/4 in)	20 SOC (3/4 in)	16 SA (5/8 in)	22 SA (7/8 in)	16 SD (5/8 in)	22 SD (7/8 in)	20 FPT (3/4 in)
ICM 20-A	027H1030	027H1020	027H1035	027H1040		027H1050		027H1045	
ICM 20-B	027H1031	027H1021	027H1036	027H1041		027H1051		027H1046	
ICM 20-C	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)



ICV 25 valve body w/different connections

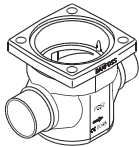
Table I

ICM 25 Function module / top cover

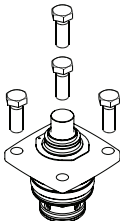
Table II

Actuator ICAD 600A

Table III

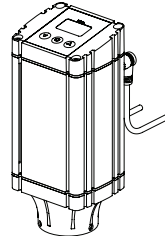


20 D (3/4 in.)	25 D (1 in.)	32 D (1 1/4 in.)	40 D (1 1/2 in.)
027H2128	027H2120	027H2129	027H2135
35 SD (1 1/8 in. SA)	28 SA (1 1/8 in.)	22 SA (7/8 in.)	28 SD (1 1/8 in.)
027H2134	027H2126	027H2125	027H2124
22 SD (7/8 in.)	20 A (3/4 in.)	25 A (1 in.)	32 A (1 1/4 in.)
027H2123	027H2131	027H2121	027H2130
20 SOC (3/4 in.)	25 SOC (1 in.)	20 FPT (3/4 in.)	25 FPT (1 in.)
027H2132	027H2122	027H2133	027H2127



Description	Code Number
ICM 25-A	027H2180 *
ICM 25-A33	027H2190 *
ICM 25-B	027H2181 *

*) Including gasket and O-rings



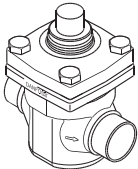
Description	Code Number
ICAD 600A with 1.5 m. (60 in.) cables	027H9075
ICAD 600A without cables	027H9120

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 without actuator

(body, function module/top cover)

Table A



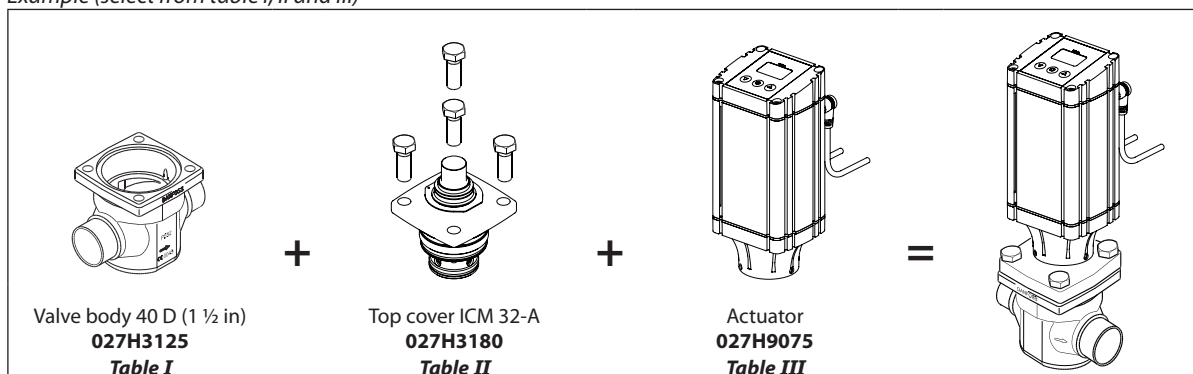
Available connections								
	20 D (3/4 in.)	25 D (1 in.)	32 D (1 1/4 in.)	40 D (1 1/2 in.)	35 SD (1 1/8 in. SA)	28 SA (1 1/8 in.)	22 SA (7/8 in.)	28 SD (1 1/8 in.)
ICM 25-A		027H2000		027H2016	027H2014	027H2012	027H2010	027H2008
ICM 25-B		027H2001			027H2015	027H2013	027H2011	027H2009
	22 SD (7/8 in.)	20 A (3/4 in.)	25 A (1 in.)	32 A (1 1/4 in.)	20 SOC (3/4 in.)	25 SOC (1 in.)	20 FPT (3/4 in.)	25 FPT (1 in.)
ICM 25-A	027H2006		027H2002			027H2004		
ICM 25-B	027H2007		027H2003			027H2005		

Select from parts programme

ICM 32 / ICAD 600A

Ordering from the parts programme

Example (select from table I, II and III)



ICV 32 valve body w/different connections

Table I

027H3120	027H3125	027H3127	027H3128
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

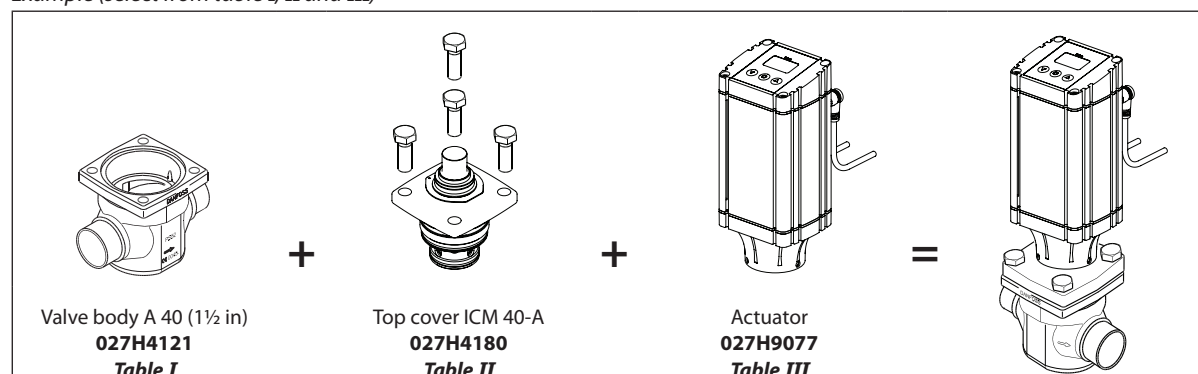
	Available connections							
	32 D (1 ¼ in)	40 D (1 ½ in)	42 SA (1 ¼ in)	42 SD (1 ¼ in)	35 SD (1 ¾ in SA)	32 A (1 ¼ in)	32 SOC (1 ¼ in)	40 A (1 ½ in)
ICM 32-A	027H3000	027H3012	027H3008		027H3006	027H3002	027H3004	
ICM 32-B	027H3001				027H3007	027H3003	027H3005	

Select from parts programme

ICM 40 / ICAD 1200A

Ordering from the parts programme

Example (select from table I, II and III)



ICV 40 valve body w/different connections

Table I

40 D (1 1/2 in)	50 D (2 in)	42 SA (1 1/2 in)	42 SD (1 1/2 in)
027H4120	027H4126	027H4124	027H4123
40 A (1 1/2 in)	40 SOC (1 1/2 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

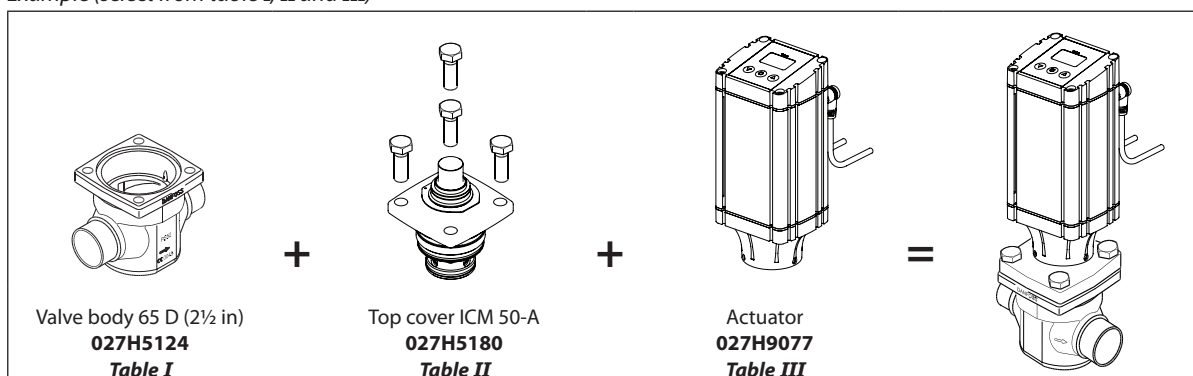
Available connections							
	40 D (1 1/2 in)	50 D (2 in)	42 SA (1 1/2 in)	42 SD (1 1/2 in)	40 A (1 1/2 in)	40 SOC (1 1/2 in)	50 A (2 in)
ICM 40-A	027H4000	027H4010	027H4006	027H4008	027H4002	027H4004	
ICM 40-B	027H4001		027H4007	027H4009	027H4003	027H4005	

Select from parts programme

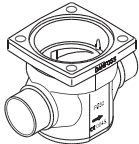
ICM 50 / ICAD 1200A

Ordering from the parts programme

Example (select from table I, II and III)

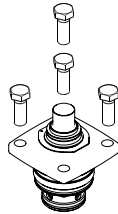


ICV 50 valve body w/different connections *Table I*

			
50 D (2 in)	65 D (2 1/2 in)	54 SD (2 1/4 in SA)	50 A (2 in)
027H5120	027H5124	027H5123	027H5121
50 SOC (2 in)	65 A (2 1/2 in)		
027H5122	027H5125		

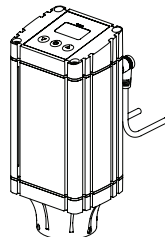
D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ;
SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ;
FPT = Female Pipe Thread

ICM 50 Function module / top cover *Table II*

	
Description	Code Number
ICM 50-A	027H5180 *
ICM 50-B	027H5181 *

*) Including gasket and O-rings

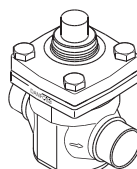
Actuator ICAD 1200A *Table III*

	
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



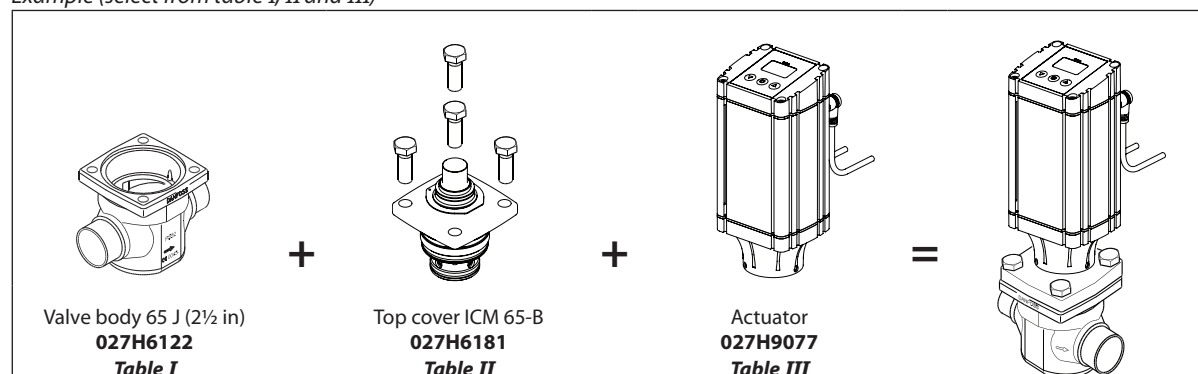
Available connections						
	50 D (2 in)	65 D (2 ½ in)	54 SD (2 ¼ in SA)	50 A (2 in)	50 SOC (2 in)	65 A (2 ½ in)
ICM 50-A	027H5000	027H5008	027H5006	027H5002	027H5004	
ICM 50-B	027H5001		027H5007	027H5003	027H5005	

Select from parts programme

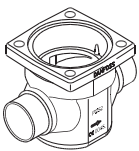
ICM 65 / ICAD 1200A

Ordering from the parts programme

Example (select from table I, II and III)

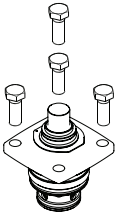


ICV 65 valve body w/different connections *Table I*

			
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 ½ in)	76 SD (3 in)	65 SOC (2 ½ in)
027H6127	027H6125	027H6124	027H6123

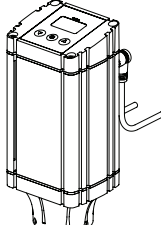
D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ;
SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ;
FPT = Female Pipe Thread

ICM 65 Function module / top cover *Table II*

	
Description	Code Number
ICM 65-A	027H6180 *)
ICM 65-B	027H6181 *)

*) Including gasket and O-rings

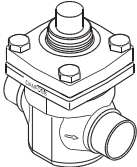
Actuator ICAD 1200A *Table III*

	
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)

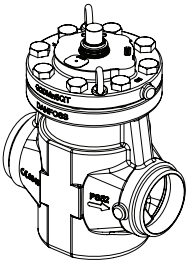
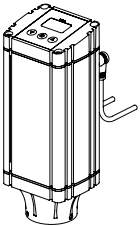
Table A

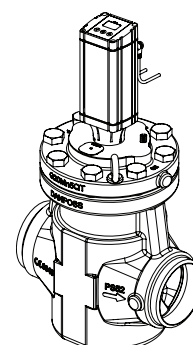
	Available connections							
	65 D (2 ½ in)	65 A (2 ½ in)	65 J (2 ½ in)	80 D (3 in)	80 A (3 in)	67 SA (2 ½ in)	76 SD (3 in)	65 SOC (2 ½ in)
ICM 65-A	027H6010	027H6012						
ICM 65-B	027H6001	027H6003				027H6007	027H6009	027H6005

 Select from parts programme

ICM 100

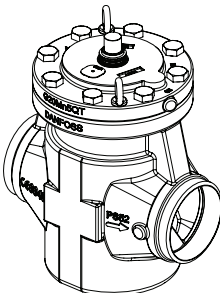
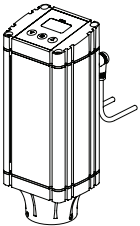
**Complete factory assembled
valve without actuator**
(body, function module / top cover)

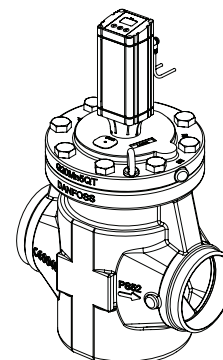
			
Available connections		ICAD 1200A with 1.5 m. (60 in) cables	ICAD 1200A without cable
	100 D (4 in)	100 A (4 in)	
ICM 100	027H7130	027H7131	027H9077 027H9122



ICM 125

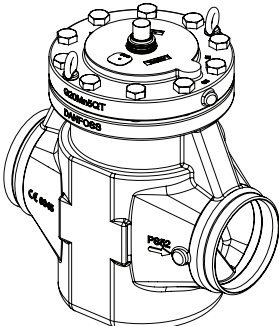
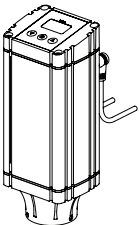
**Complete factory assembled
valve without actuator**
(body, function module / top cover)

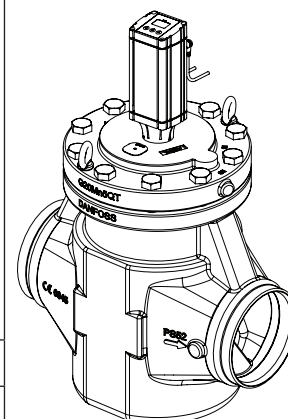
			
Available connections		ICAD 1200A with 1.5 m. (60 in) cables	ICAD 1200A without cable
	125 D (5 in)	125 A (5 in)	
ICM 125	027H7150	027H7151	027H9077 027H9122



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)	
ICM 150	027H7170	027H7171	027H9077 027H9122



Motor operated valves, type ICM and actuators, type ICAD

Spare parts and accessories

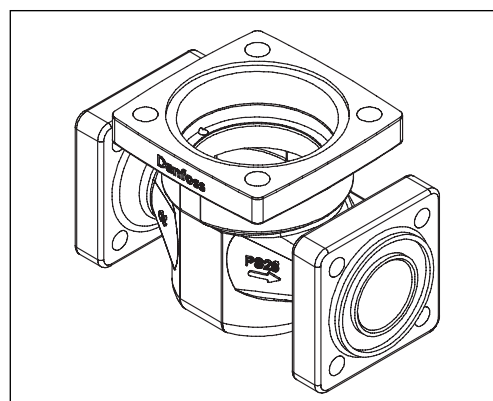
ICV PM flanged valve housings

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

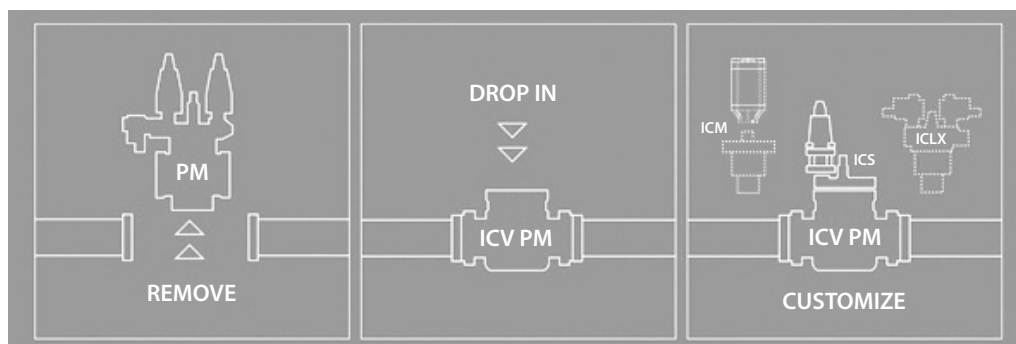
Pressure range

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

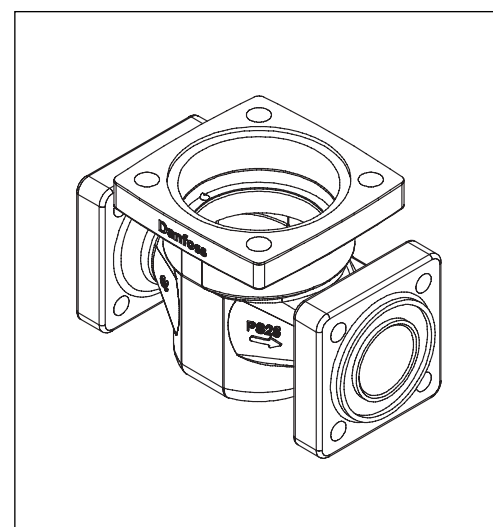
ICV (H)A4A flanged valve housings can replace the (H)A4A valves on already installed refrigeration systems.

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.

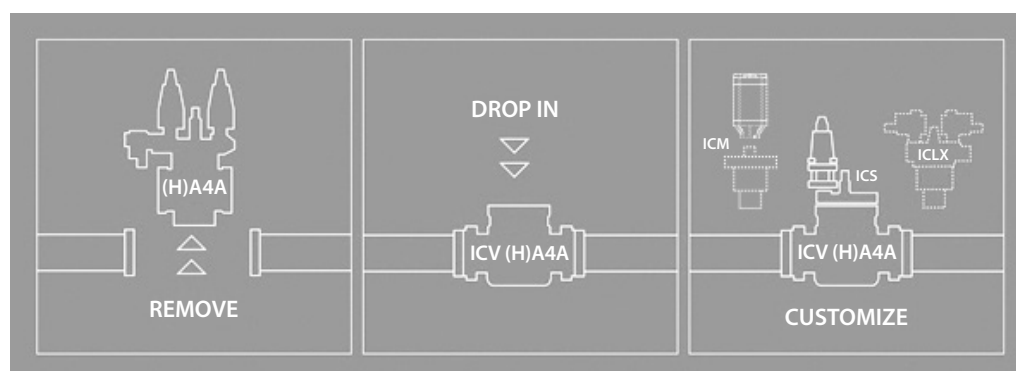
Pressure range

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").



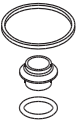
*) Includes ICV PM valve housing, flange gaskets and flange bolts.

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

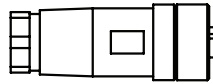
ICM 20 / ICAD 600A

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

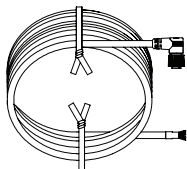
Accessories

	
Description	Code Number
ICAD-UPS	027H0182

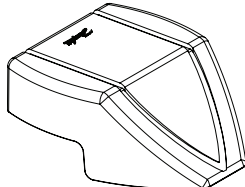
Accessories

	
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

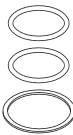
	
Protection cap ICAD 600A/1200A	
Description	Code number
Protection cap	027H0431

Please observe, when used in CO₂, 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

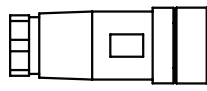
Spare parts and accessories

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



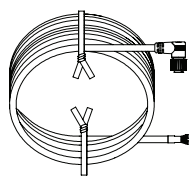
Description	Code Number
ICAD-UPS	027H0182

Accessories



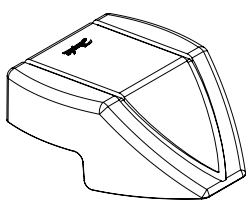
Description	Code Number
Multi-function tool	027H0180

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



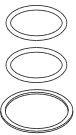
Protection cap ICAD 600A/1200A	
Description	Code number
Protection cap	027H0431

Please observe, when used in CO₂, 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.

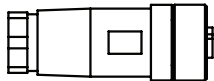
ICM 40-50-65 / ICAD 1200A

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

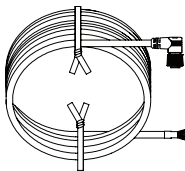
Accessories

	
Description	Code Number
ICAD-UPS	027H0182

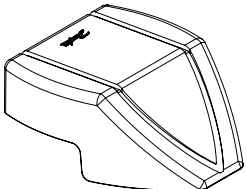
Accessories

	
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

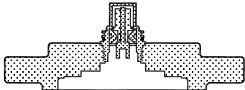
	
Protection cap ICAD 600A/1200A	
Description	Code number
Protection cap	027H0431

Please observe, when used in CO₂, 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.

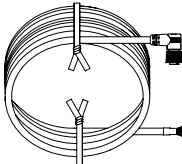
ICM 100-125-150 / ICAD 1200A

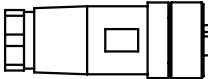
Spare parts and accessories

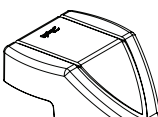
Accessories

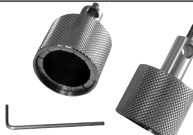
		
Top covers		
Consist of:	Size	Code number
Top cover complete with magnet coupling and gasket	ICM 100	027H7133
	ICM 125	027H7153
	ICM 150	027H7173


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

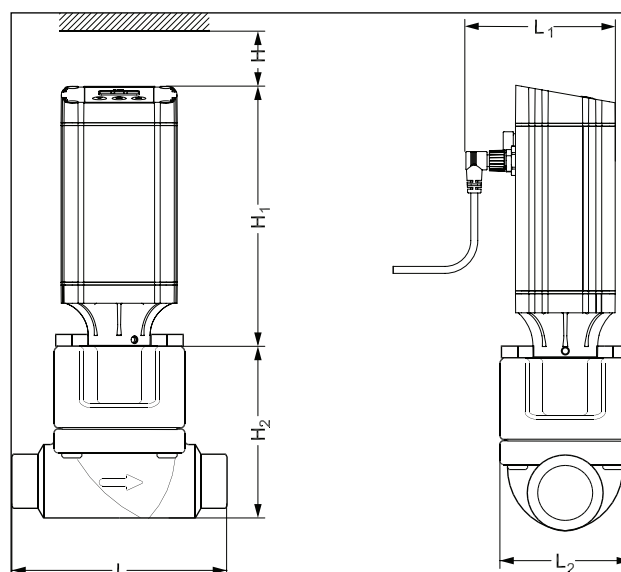
	
Description	Code Number
Multi-function tool	027H0181

Spare parts

Please see AI245486497115

ICM 20 / ICAD 600A

Dimensions

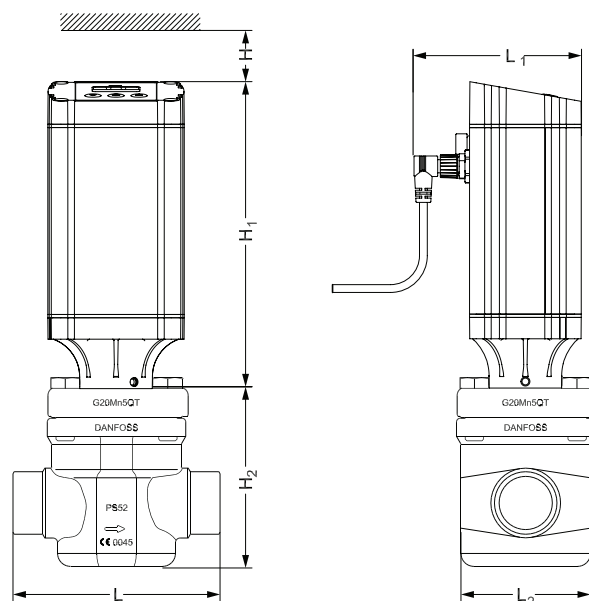


Connection		H	H ₁	H ₂	L	L ₁	L ₂	Weight ICM incl. ICAD
20 D (¾ in)	[mm]	40	195	85	107	102	65	3 kg
	[in]	1.58	7.68	3.35	4.21	4.02	2.56	6.6 lb.
25 D (1 in)	[mm]	40	195	85	107	102	65	3 kg
	[in]	1.58	7.68	3.35	4.21	4.02	2.56	6.6 lb.
25 A (1 in)	[mm]	40	195	85	107	102	65	3 kg
	[in]	1.58	7.68	3.35	4.21	4.02	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)

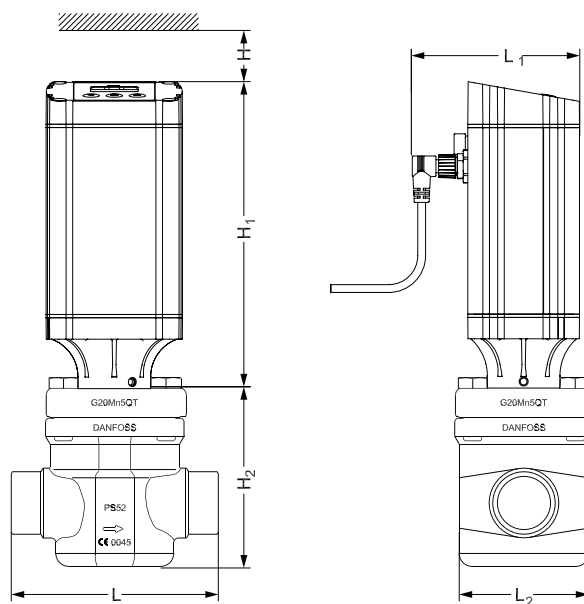


Connection		H	H ₁	H ₂	L	L ₁	L ₂	Weight ICM incl. ICAD
20 D (¾ in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
25 D (1 in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
32 D (1 ¼ in)	[mm]	40	195	99	135	102	84	4.1 kg
	[in]	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
40 D (1 ½ 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

ICM 32 / ICAD 600A

Dimensions (continued)

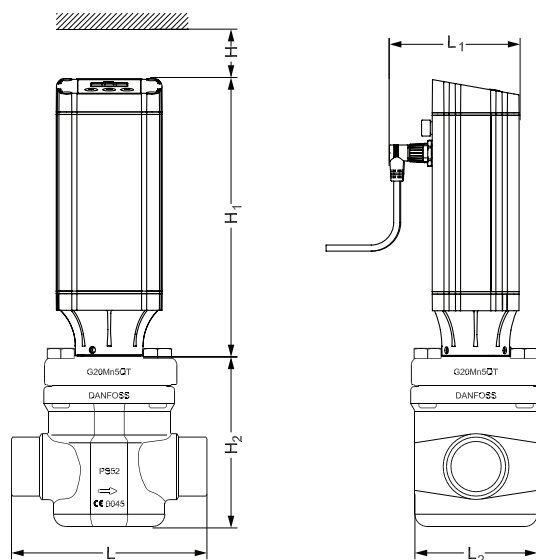


Connection		H	H ₁	H ₂	L	L ₁	L ₂	Weight ICM incl. ICAD
32 D (1 ¼ in)	[mm]	40	195	117	145	102	102	5.8 kg
	[in]	1.58	7.68	4.61	5.71	4.02	4.02	11.0 lb.
40 D (1 ½ in)	[mm]	40	195	117	145	102	102	5.8 kg
	[in]	1.58	7.68	4.61	5.71	4.02	4.02	11.0 lb.
32 A (1 ¼ in)	[mm]	40	195	117	145	102	102	5.8 kg
	[in]	1.58	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 ⅝ 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)

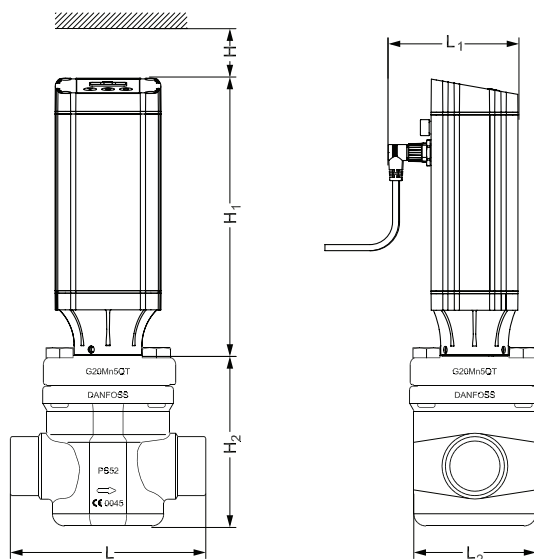


Connection		H	H ₁	H ₂	L	L ₁	L ₂	Weight ICM incl. ICAD
40 D (1 ½ in)	[mm]	45	219	131	160	102	107	7.8 kg
	[in]	1.77	8.62	5.16	6.30	4.02	4.21	17.2 lb.
50 D (2 in)	[mm]	45	219	131	180	102	107	7.8 kg
	[in]	1.77	8.62	5.16	7.09	4.02	4.21	17.2 lb.
40 A (1 ½ in)	[mm]	45	219	131	160	102	107	7.8 kg
	[in]	1.77	8.62	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

ICM 50 / ICAD 1200A

Dimensions (continued)

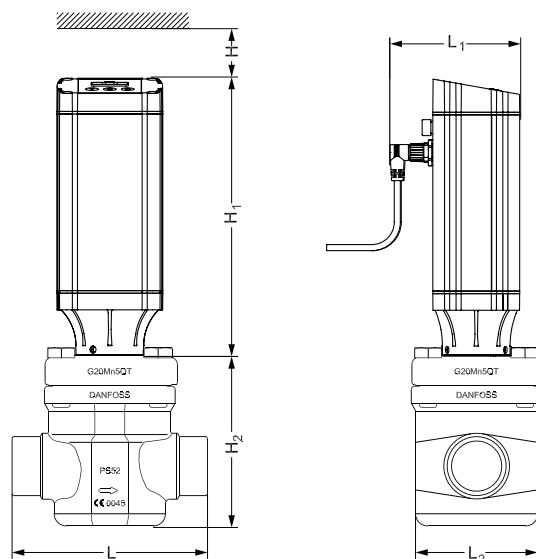


Connection		H	H ₁	H ₂	L	L ₁	L ₂	Weight ICM incl. ICAD
50 D (2 in)	[mm]	45	219	159	200	102	125	11.1 kg
	[in]	1.77	8.62	6.26	7.87	4.02	4.92	24.4 lb.
65 D (2 ½ in)	[mm]	45	219	159	210	102	125	11.1 kg
	[in]	1.77	8.62	6.26	8.27	4.02	4.92	24.4 lb.
50 A (2 in)	[mm]	45	219	159	200	102	125	11.1 kg
	[in]	1.77	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 ⅝ in SA)	[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.

D = Butt-weld DIN ; A = Butt-weld ANSI ; SOC = Socket weld ANSI ; SD = Solder DIN

ICM 65 / ICAD 1200A

Dimensions (continued)

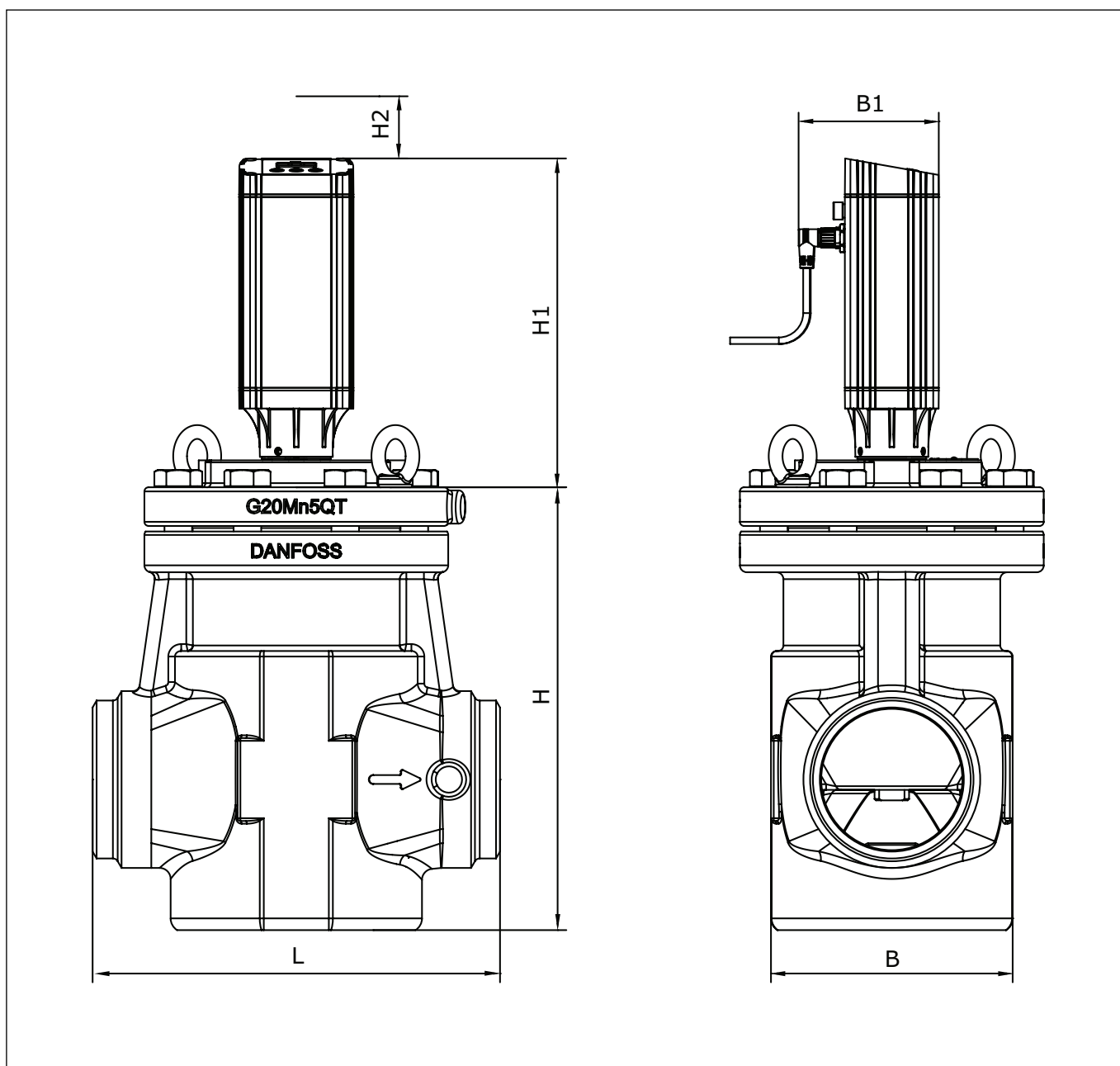


Connection		H	H ₁	H ₂	L	L ₁	L ₂	Weight ICM incl. ICAD
65 D (2 ½ in)	[mm]	45	219	188	230	102	139	16.6 kg
	[in]	1.77	8.62	7.40	9.06	4.02	5.47	36.5 lb
80 D (3 in)	[mm]	45	219	188	245	102	139	16.6 kg
	[in]	1.77	8.62	7.40	9.65	4.02	5.47	36.5 lb
65 A (2 ½ in)	[mm]	45	219	188	230	102	139	16.6 kg
	[in]	1.77	8.62	7.40	9.06	4.02	5.47	36.5 lb
80 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 ¾ 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

ICM 100 / ICAD 1200A

Dimensions (continued)

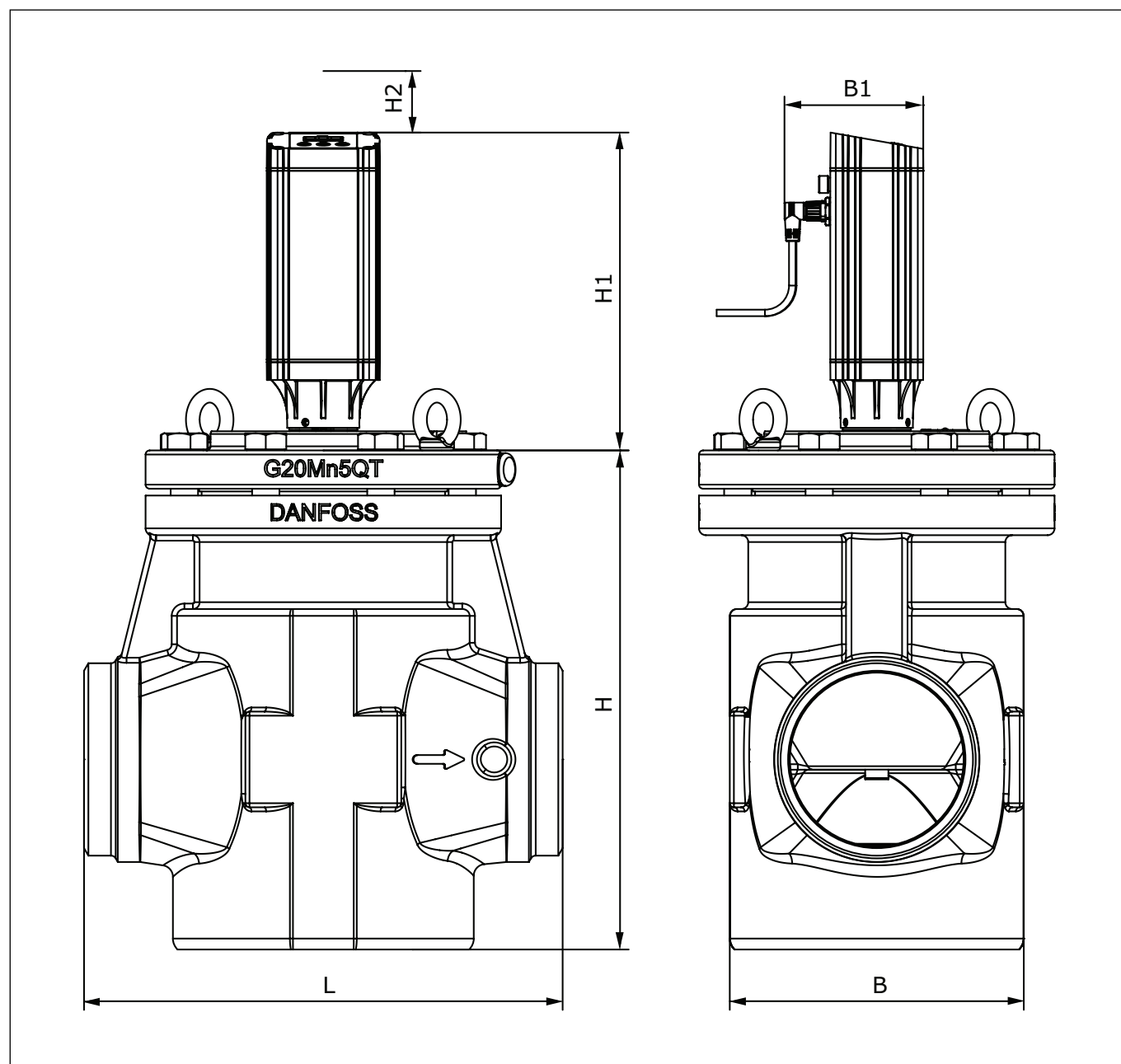


Connection		H	H ₁	H ₂	L	B	B ₁	Weight ICM incl. ICAD
100 D/A (4 in)	[mm]	321	238	45	295	175	102	44 kg.
	[in]	12.64	9.37	1.77	11.61	6.89	4.02	97 lb.

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

ICM 125 / ICAD 1200A

Dimensions (continued)

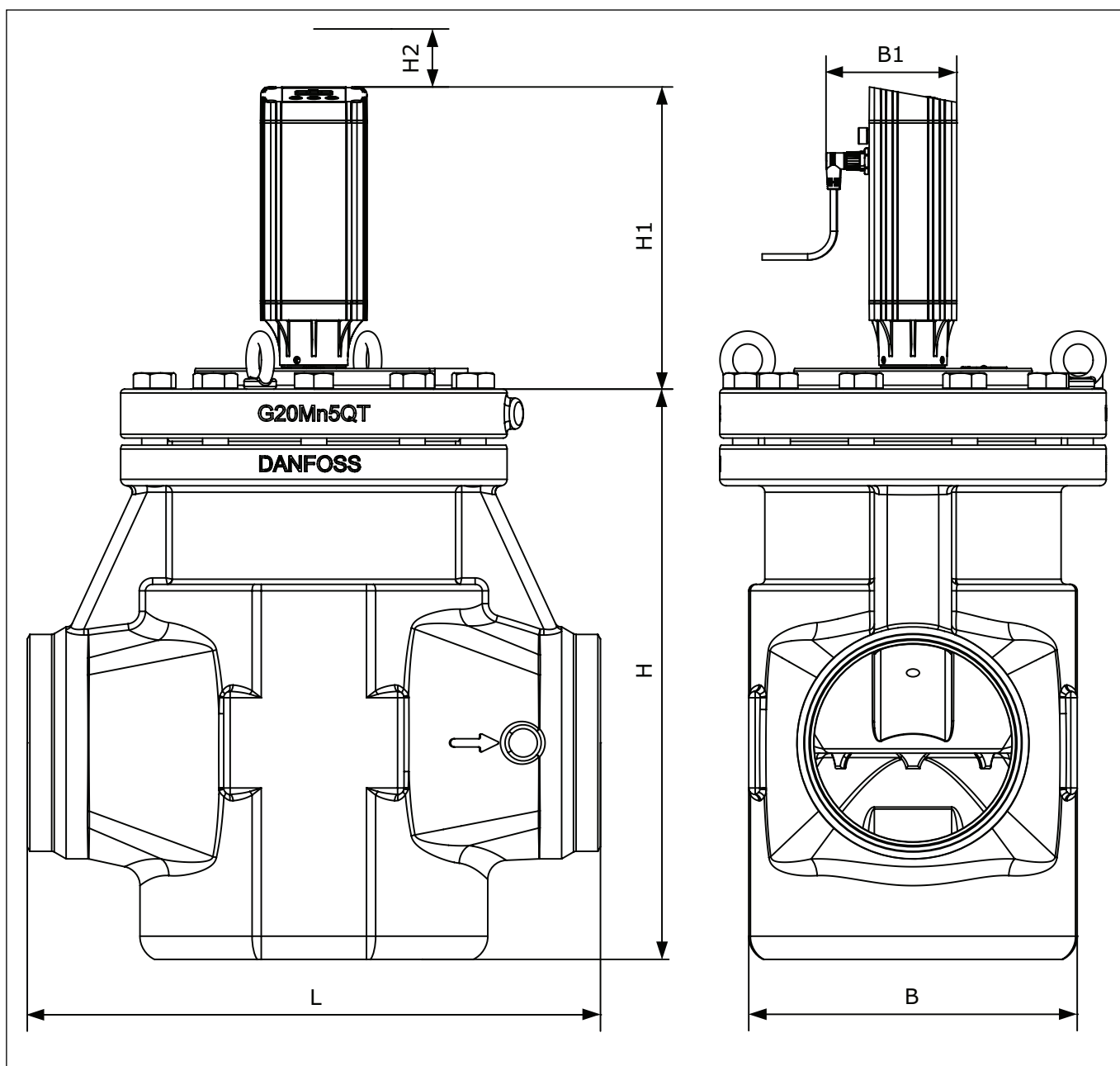


Connection		H	H ₁	H ₂	L	B	B ₁	Weight ICM incl. ICAD
125 D/A (5 in)	[mm]	365	238	45	350	215	102	55 kg
	[in]	14.37	9.37	1.77	13.78	8.47	4.02	121 lb.

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

ICM 150 / ICAD 1200A

Dimensions (continued)



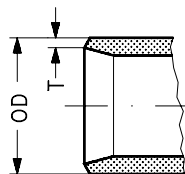
Connection		H	H ₁	H ₂	L	B	B ₁	Weight ICM incl. ICAD
150 D/A (6 in)	[mm]	443	238	45	445	255	102	95 kg
	[in]	17.77	9.37	1.77	17.52	10.04	4.02	209 lb.

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

Motor operated valves, type ICM and actuators, type ICAD

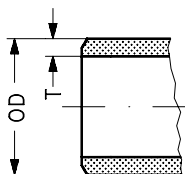
Connections

D: Butt-weld DIN (2448)



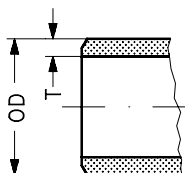
Size [mm]	Size [in]	OD [mm]	T [mm]	OD [in]	T [in]		
20	¾	26.9	2.3	1.059	0.091		
25	1	33.7	2.6	1.327	0.103		
32	1¼	42.4	2.6	1.669	0.102		
40	1½	48.3	2.6	1.902	0.103		
50	2	60.3	2.9	2.37	0.11		
65	2½	76.1	2.9	3	0.11		
80	3	88.9	3.2	3.50	0.13		
100	4	114.3	3.6	4.5	0.14		
125	5	140.7	4	5.5	0.16		
150	6	168.3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

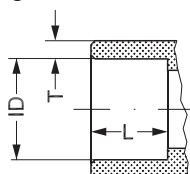


Size [mm]	Size [in]	OD [mm]	T [mm]	OD [in]	T [in]		
20	¾	26.9	4.0	1.059	0.158		
25	1	33.7	4.6	1.327	0.181		
32	1¼	42.4	4.9	1.669	0.193		
40	1½	48.3	5.1	1.902	0.201		
50	2	60.3	3.9	2.37	0.15		
65	2½	76.3	5.2	3.0	0.20		
80	3	88.9	5.5	3.50	0.22		

Motor operated valves, type ICM and actuators, type ICAD

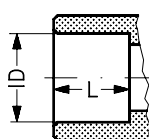
Connections

SOC:
Socket welding ANSI (B 16.11)



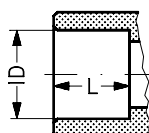
Size mm	Size [in]	ID mm	T mm	ID [in]	T [in]	L mm	L [in]
20	¾	27.2	4.6	1.071	0.181	13	0.51
25	1	33.9	7.2	1.335	0.284	13	0.51
32	1¼	42.7	6.1	1.743	0.240	13	0.51
40	1½	48.8	6.6	1.921	0.260	13	0.51
50	2	61.2	6.2	2.41	0.24	16	0.63
65	2½	74	8.8	2.91	0.344	16	0.63

SD: Soldering (DIN 2856)



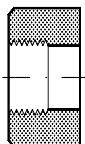
Size mm	Size [in]	ID mm		ID [in]		L mm	L [in]
16		16.07				15	
22		22.08				16.5	
28		28.08				26	
35		35.07				25	
42		42.07				28	
54		54.09				33	
76		76.1				33	

SA: Soldering (ANSI B 16.22)



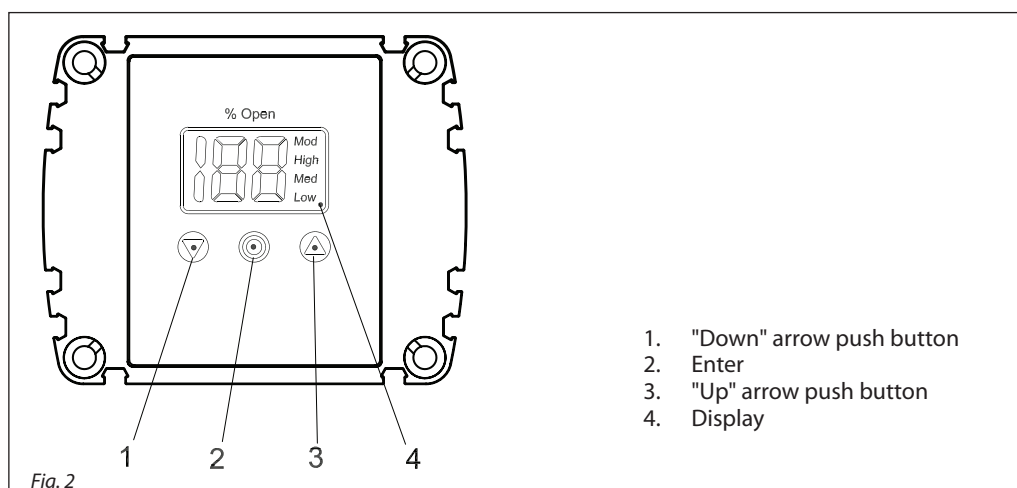
	5/8			0.625			0.591
	7/8			0.875			0.650
	1¼			1.125			1.024
	1½			1.375			0.984
	1¾			1.625			1.102
	2¼			2.125			1.300
	2½			2.625			1.300

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)		

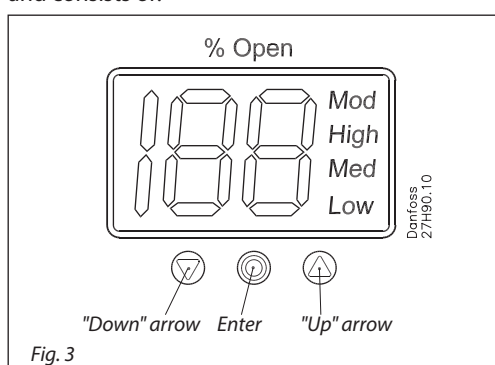
General operation



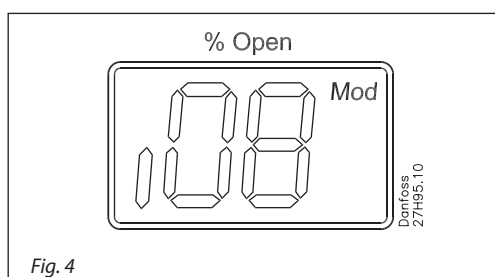
ICAD is equipped with an MMI (Man Machine Interface) from which it is possible to monitor and change the setting of parameters to adapt the ICAD and the corresponding ICM to the actual refrigeration application.

The setting of parameters is managed by means of the integrated ICAD MMI (see fig. 2 and fig. 3) and consists of:

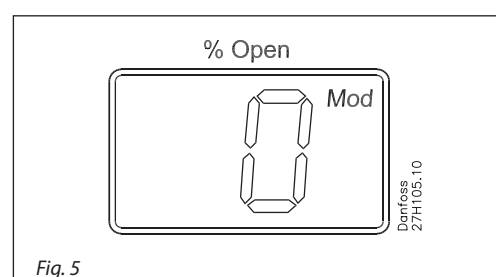
- To exit from the **Parameter list** and return to the display of Opening Degree (OD) keep the push button activated for 2 seconds.
- Display (fig. 2, pos. 4)
 - Normally the Opening Degree (OD) 0 – 100% of the ICM valve is displayed. No activation of push buttons for 20 seconds means that the display will always show OD (see fig. 5).



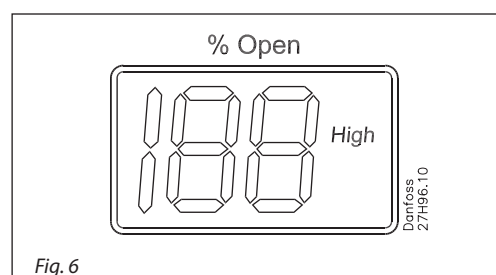
- "Down" arrow push button (fig. 2, pos. 1)
 - Decreases parameter number by 1 at each activation
- "Up" arrow pushbutton (fig. 2, pos. 3)
 - Increases parameter number by 1 at each activation
- Enter push button (fig. 2, pos. 2)
 - Gives access to the **Parameter list** by keeping the push button activated for 2 seconds. A **Parameter list** example is shown below (parameter **i08**, fig. 4).



- Gives access to change a value once the **Parameter list** has been accessed
- Acknowledge and save change of value of a parameter.



- 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).



Motor operated valves, type ICM and actuators, type ICAD

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 i01 = 2, or i02 = 2 When i03 = 1 and AI A > 22 mA When i03 = 2 and AI A > 22 mA or AI A < 2 mA When i03 = 3 and AI A > 12 V When i03 = 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 i08
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 **i11**.

Motor operated valves, type ICM and actuators, type ICAD

Parameter list - Valid from: (i58:11, i59:36) and onwards



The first parameter to be entered shall be: **i26**

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 i01 , i05).
Main Switch	i01	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	i02	1	2	1	✓	-	No	Operation mode 1: Modulating – ICM positioning according to Analog Input (see i03) 2: ON / OFF - operating the ICM valve like an ON/OFF solenoid valve controlled via Digital Input. See also i09 . 3: Neutralzone / 3 point control. Increase/Decrease Opening Degree by Digital Input. See fig. 9
AI signal	i03	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	i04	1	100	50/ 100	✓	-	No	Speed can be decreased. Max. speed is 100% - Not active in manual operation (i01 = 2) If i26 = 1 - 3 then factory setting = 100 If i26 = 4 - 9 then factory setting = 50 If ICM is opening and (i04 <= 33) or ICM is closing and (i14 <= 33) => Low is displayed. If ICM is opening and (33 < i04 <= 66) or ICM is closing and (33 < i14 <= 66) => Med is displayed. If ICM is opening and (i04 >= 67) or ICM is closing and (i14 >= 67) => High is displayed"
Automatic calibration	i05	0	2	0		-	No	Not active before i26 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	i06	0	2	2	✓	-	No	Type of AO signal for ICV valve position 0: No signal 1: 0 – 20 mA 2: 4 – 20 mA
Failsafe	i07	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 i12 "
Fail safe supply	i08	0	1	0	✓		Yes	Fail safe supply connected and enable of A4 alarm: 0: No 1: Yes
DI function	i09	1	2	1	✓		No	Define function when DI is ON (short circuited DI terminals) when i02 = 2 1: Open ICM valve (DI = OFF => Close ICM valve) 2: Close ICM valve (DI = OFF => Open ICM valve)
Password	i10	0	199	0		-	-	Enter number to access password protected parameters: i26 Password = 11
Old Alarms	i11	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.	i12	0	100	50	✓		No	Only active if i07 = 4 If fail safe supply is connected and power cut occurs, the ICM will go to the specified OD.
Inverse operation	i13	0	1	0	✓		No	When i02 = 1 0: Increasing Analog Input signal => Increasing ICM Opening Degree 1: Increasing Analog Input signal => Decreasing ICM Opening Degree When i02 = 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	i14	0	100	50/ 100	✓	-	No	See i04 . If i26 = 1 - 3 then factory setting = 100 If i26 = 4 - 9 then factory setting = 50
Manual set point	i15	0	100	0			No	When i01 = 2, i15 determine the start up value.

to be continued...

Motor operated valves, type ICM and actuators, type ICAD

Parameter list

(continued)

Description	ICAD parameter	Min	Max	Factory Setting	Stored	Unit	Pass word	Comments
Encoder operation	i16	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	i26	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%	i50	0	100	-		%	-	ICM valve Opening Degree
AI [mA]	i51	0	100	-		mA	-	AI signal
AI [V]	i52	0	100	-		V	-	AI signal
AO [mA]	i53	0	100	-		mA	-	AO signal
DI	i54	0	1	-		-	-	DI signals. Depending of i02 If i02 = 2, one digits are shown. See fig. 8 0 : DI1 = OFF 1 : DI1 = ON If i02 = 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	i55	0	1	-		-	-	DO Closed status. ON when OD < 3%
DO Open	i56	0	1	-		-	-	DO Open status. ON when OD > 97%
DO Alarm	i57	0	1	-		-	-	DO alarm status. ON when a Alarm is detected
Display mP SW ver.	i58	0	100	-		-	-	Software version for display microprocessor
Motor mP SW ver.	i59	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.