

Data sheet

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)

- Low temperature direct-weld steel body.
- Low weight and compact design.
- V-port regulating cone ensures optimum regulating accuracy particularly at part load.
- 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.

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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
- Digital input for ON / OFF function
- Two digital inputs for floating 3-point control (open - neutral - close)

ICAD actuators can also operate an ICM valve as an ON / OFF function supported by a digital input.

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:

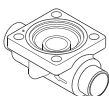
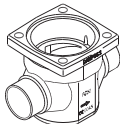
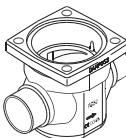
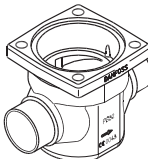
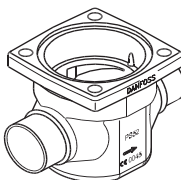
- Close ICM
 - Open ICM
 - Stay in the same position, as when power failure occurs
 - Go to a specific ICM valve opening degree
- See the section ICAD UPS for further information.

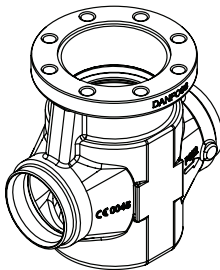
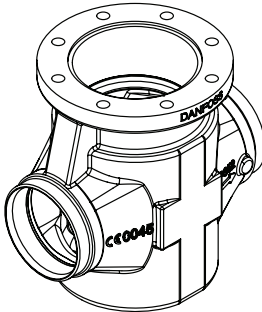
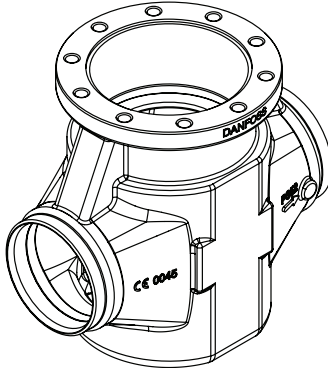
Please note: a fail safe supply (battery or UPS) is required.

The ICM Concept

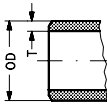
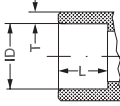
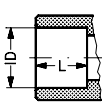
The ICM concept is developed around a modular principle. This gives the possibility of combining function modules and top covers with special valve body size that is available in a variety of connection possibilities.

- There are nine valve bodies available.

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

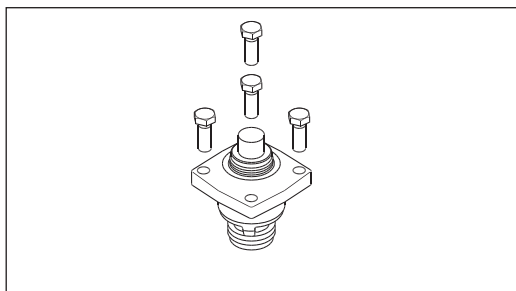
		
ICV 100	ICV 125	ICV 150

- 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 ANSI nominal sizes

A	SOC	ODS	FPT
			
Butt-weld ANSI	Socket weld ANSI	Solder ANSI	Female Pipe Thread

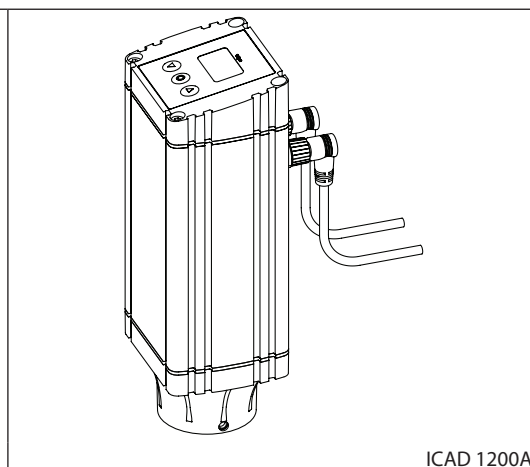
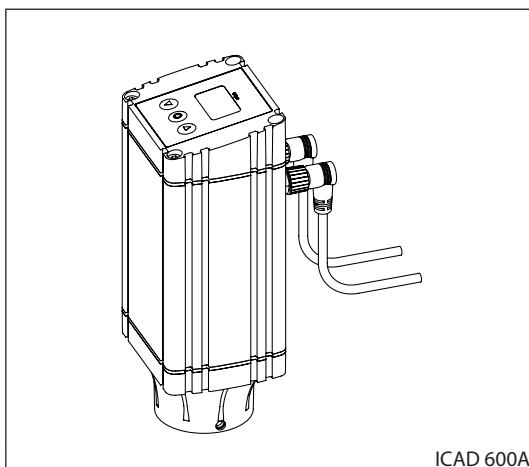
The ICM Concept
(continued)

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



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

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



Design (valve)

Connections

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

- BW: Butt weld, ANSI (B 36.10)
- SOC: Socket weld, ANSI (B 16.11)
- ODS: 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.

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.

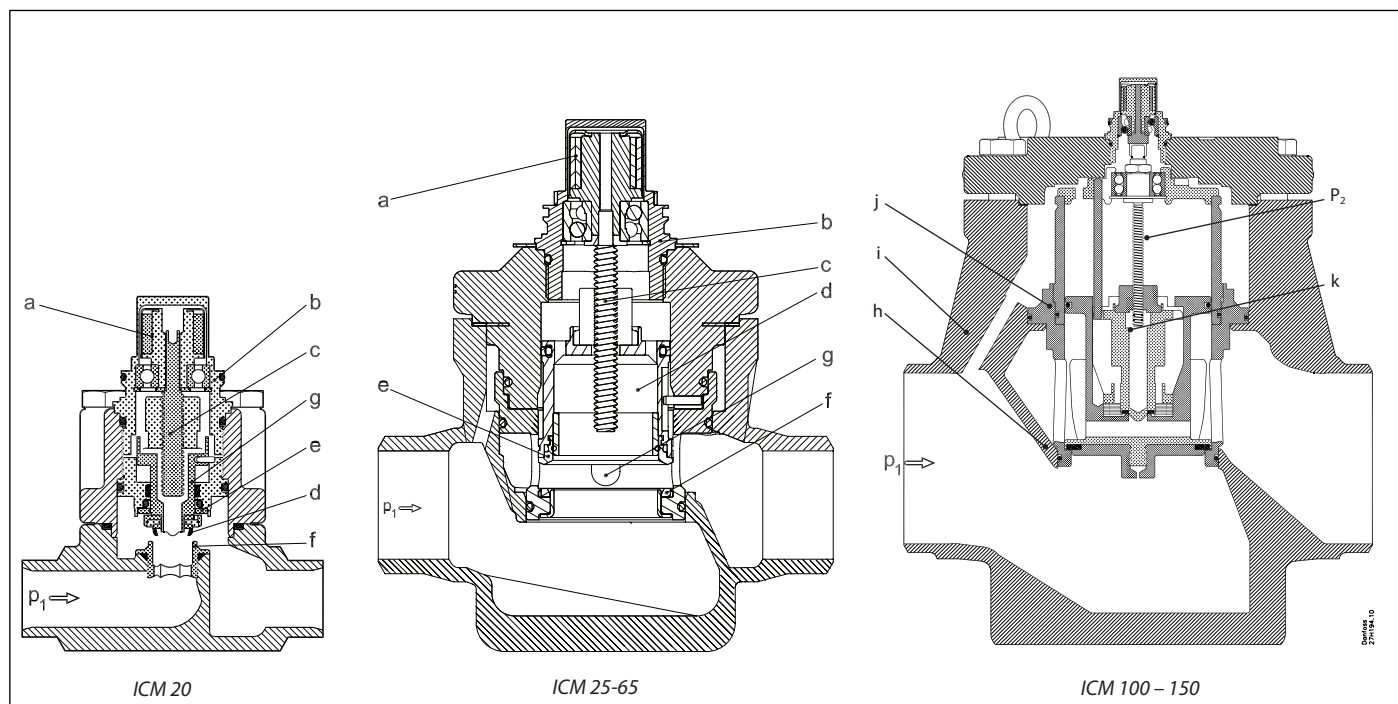
- **Max. opening pressure differential (MOPD)**

– 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 IC AD.**

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, Industrial Control Actuator with Display.

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

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, etc.)
- Modulating, ON / OFF operation
- Multiple speed selection during operation
- Logging of old alarms
- Password protection
- Control input signal :
4 – 20 mA, 0 – 20 mA, 0 – 10 V, 2 – 10 V, one or two digital inputs.
- Position feed back : 0 – 20 mA, 4 – 20 mA (ICM)
- 3 Digital outputs for feedback
- Resolution: 20 micron/step (0.02 mm stroke pr. step)
- 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
- 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 – 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".

Technical data (cont.)

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 kΩ

Analogue Output: 0/4 – 20 mA

Load : ≤ 250 Ω

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

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

Output load: 50 Ω
Load: Max. 50 mA

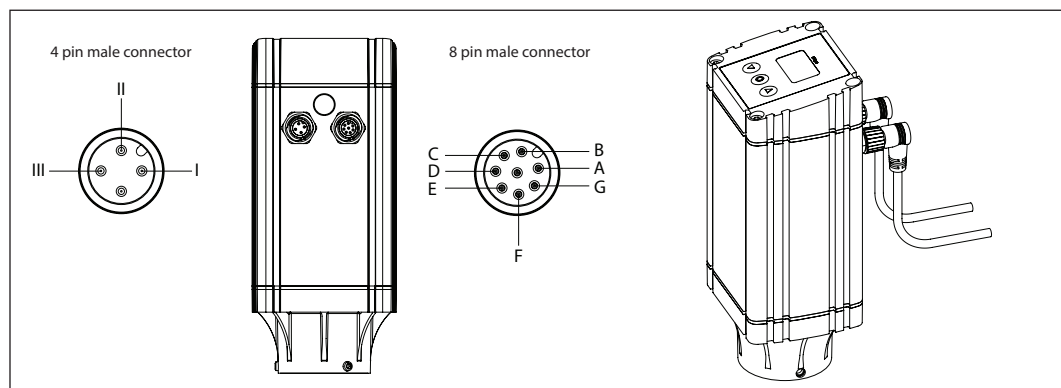
Battery capacity: For each open/closed cycle

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

Technical data (cont.)

Electrical data (continued)

Cable connections



Communication connector / cable

Ref.	Color		Description	
A	Black	-	Common Alarm	} Digital Output
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. Also used with GND (orange wire) as a digital input #1 for on-off operation or floating 3-point control	
G	Blue	+	0/4 - 20 mA Output*	

Power connector/cable (3 wires)

I	Black	+	Fail safe supply Battery / UPS (uninterruptable power supply) 19 V DC
II	White	+	Supply voltage
III	Brown	-	24 V DC

* If using floating 3-point control (parameter i02=3) then wire colors yellow and blue are combined to make the 2nd digital input

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 ICAD display will continuously display the ICM valve opening degree in % unless there is an alarm or the parameter list is being viewed. The display will also indicate **Mod** if being controlled by an analog input signal (modulating mode) or if being controlled by digital inputs the display will indicate **Low**, **Med** or **High** depending on the speed setting.

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

- Analog input for modulating control
0 – 20 mA or 4 – 20 mA
0 – 10 V or 2 – 10 V
- Digital Inputs
ICAD can be configured to support one or two digital inputs.
When using one digital input for ON / OFF control, 0 – 10 V can not be used at the same time.
When using two digital inputs for floating 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

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.

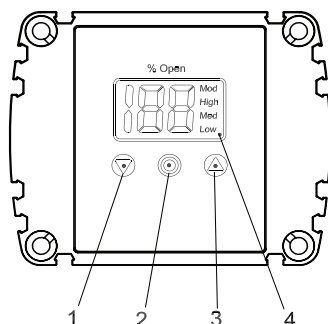
Previous alarms can be recalled for traceability and service purposes.

Any active alarm will activate the common digital alarm output.

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.

Operating the ICAD menu

1. To access the ICAD actuator menu, press and hold the middle button (2) until the menu appears.



1. Down arrow push button
2. Enter
3. Up arrow push button
4. Display

2. Once you are in the menu, use the UP (3) and DOWN (1) arrows to move through the list of parameters.
3. To display and/or change the value of the parameter, press the middle button (2) to view the current settings.
4. a) To change the value of a parameter, use the up or down arrow to establish the new value for that parameter.
5. b) Once the new value for the parameter has been selected, press the middle button to save the change and return to the menu.
6. Repeat this procedure for all parameters.
7. Exit from the parameter list by pressing and holding the middle button for 2 seconds or simply wait for the ICAD to return to the main display (approx. 20 seconds).

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 until parameter i26 is set
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
Analog 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 debris inside ICM valve
Thermal overload	A8	Alarm ON	ICAD stepper motor temperature too high
Valve locked	A9	Alarm ON	Only active if i16 = 1 If the ICM valve is locked for more than 15 seconds (unable to reach its requested position) A9 will flash 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**.

Parameter list - Valid for software versions i58=9 and parameter i59=18 and onwards

Description	ICAD parameter	Min	Max	Factory Setting	Setting stored	Pass word	Comments
OD (Opening degree)	-	0	100			-	ICM valve Opening Degree in % is displayed during normal operation. Running display value (see i01 , i05).
Main switch for manual operation	i01	1	2	1	Yes	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.
Operation mode	i02	1	2	1	Yes	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 ICAD instructions for wiring diagram
Analog input signal	i03	1	4	2	Yes	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	Yes	No	Speed can be set in % of full speed. 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	No	Not active before i26 has been operated. Always resets to 0 after calibration. 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

to be continued ...

Data sheet | Motor operated valves, type ICM and actuators type ICAD

Description	ICAD parameter	Min	Max	Factory Setting	Setting stored	Pass word	Comments
Analog output signal	j06	0	2	2	Yes	No	Type of A0 signal for ICM valve position 0: No signal 1: 0 – 20 mA 2: 4 – 20 mA
Failsafe	j07	1	4	1	Yes	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 j12
Fail safe supply	j08	0	1	0	Yes	Yes	Fail safe supply connected and enable of A4 alarm: 0: No 1: Yes
DI function for ON / OFF operation	j09	1	2	1	Yes	No	Define function when DI is ON (short circuited DI terminals) when j02 = 2 1: Open ICM valve (DI = OFF => Close ICM valve) 2: Close ICM valve (DI = OFF => Open ICM valve)
Password	j10	0	199	0	No	-	Enter number to access password protected parameters: j26 Password = 11
Old Alarms	j11	A1	A99	-	No	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.	j12	0	100	50	Yes	No	Only active if j07 = 4 If fail safe supply is connected and power cut occurs, the ICM will go to the specified OD.
Inverse operation	j13	0	1	0	Yes	No	When j02 = 1 0: Increasing Analog Input signal => Increasing ICM Opening Degree 1: Increasing Analog Input signal => Decreasing ICM Opening Degree When j02 = 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	j14	0	100	50/100	Yes	No	See j04 . If j26 = 1 – 3 then factory setting = 100 If j26 = 4 – 9 then factory setting = 50
Closing speed	j15	0	100	0	No	No	When j01 = 2, j15 is initial OD % when put in manual mode.
Encoder operation (only valid for ICAD 1200A)	j16	0	1	0/1	Yes	Yes	Note: Password protected. Password = 7 If j26 = 1 – 3 then factory setting = 0 If j26 = 4 – 6 If j26 = 7 – 9 then factory setting = 1 0: Encoder disabled 1: Encoder enabled
ICM configuration	j26	0	9	0	Yes	Yes	Note: Password protected. Password = 11 (see parameter j10) 0: No valve selected. Alarm A1 will become active. 1: ICM 20 with ICAD 600A 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 parameters (view only)

Description	ICAD parameter	Min	Max	Unit	Comments
OD %	i50	0	100	%	ICM valve Opening Degree
AI [mA]	i51	0	100	mA	Analog input signal
AI [V]	i52	0	100	V	Analog input signal
AO [mA]	i53	0	100	mA	Analog output signal
DI Digital input Status	i54	0	1	-	DI signals. Depending of i02 If i02 = 2, one digit is shown. 0 : DI1 = OFF 1 : DI1 = ON If i02 = 3, two digits are shown. 00 : DI1 = OFF, DI2 = OFF 10 : DI1 = ON, DI2 = OFF 01 : DI1 = OFF, DI2 = ON 11 : DI1 = ON, DI2 = ON
DO Status for ICM closed	i55	0	1	-	1: DO = ON when OD < 3 %; 0: DO = OFF
DO status for ICM opened	i56	0	1	-	1: DO = ON when OD > 97 % 0: DO = OFF
DO Alarm status	i57	0	1	-	1: DO = ON when a Alarm is detected 0: DO = OFF
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 is alternating between showing: **CA** and **A1** the factory resetting is complete.

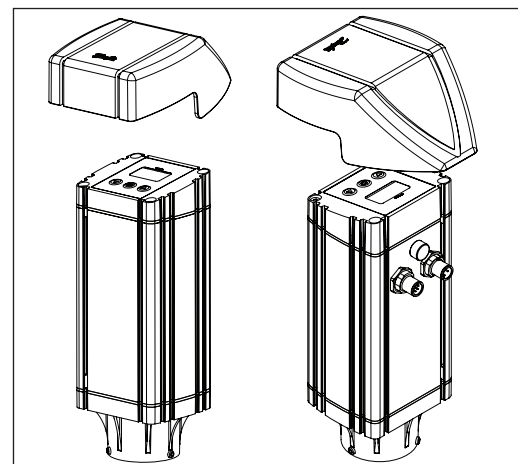
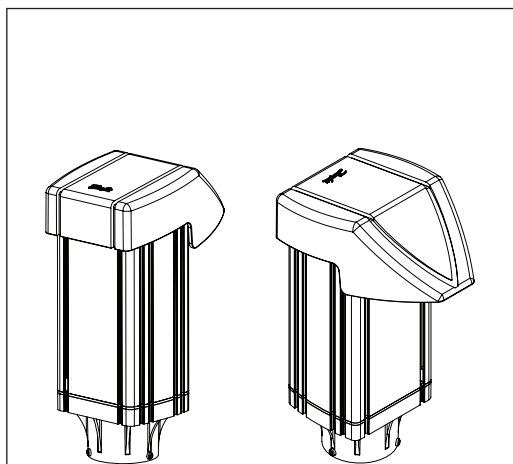
ICAD protection cap

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

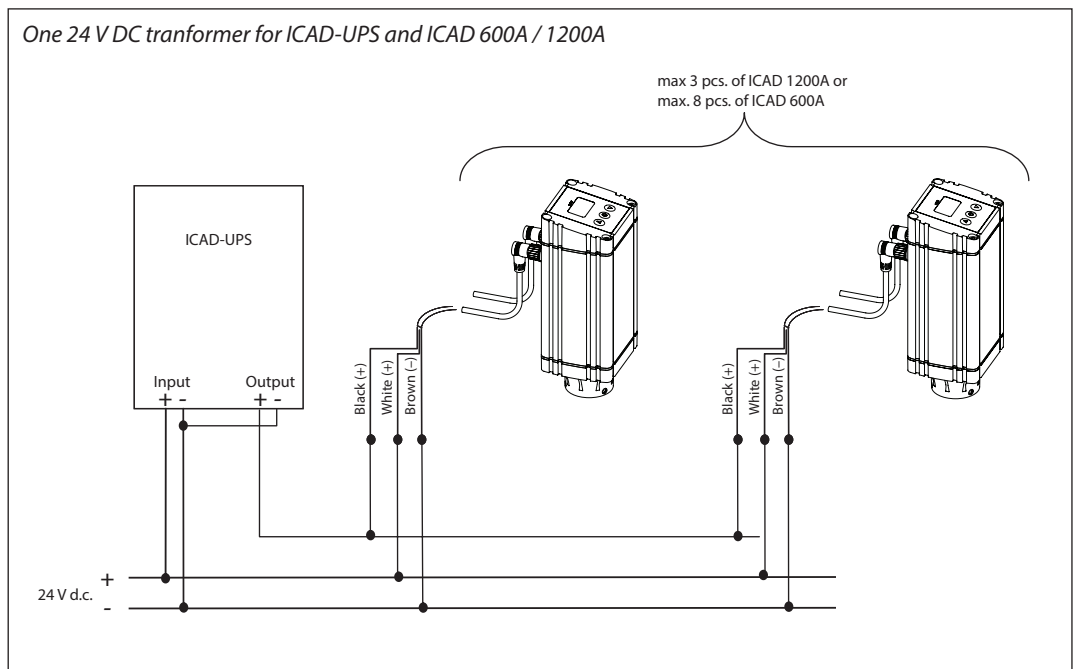
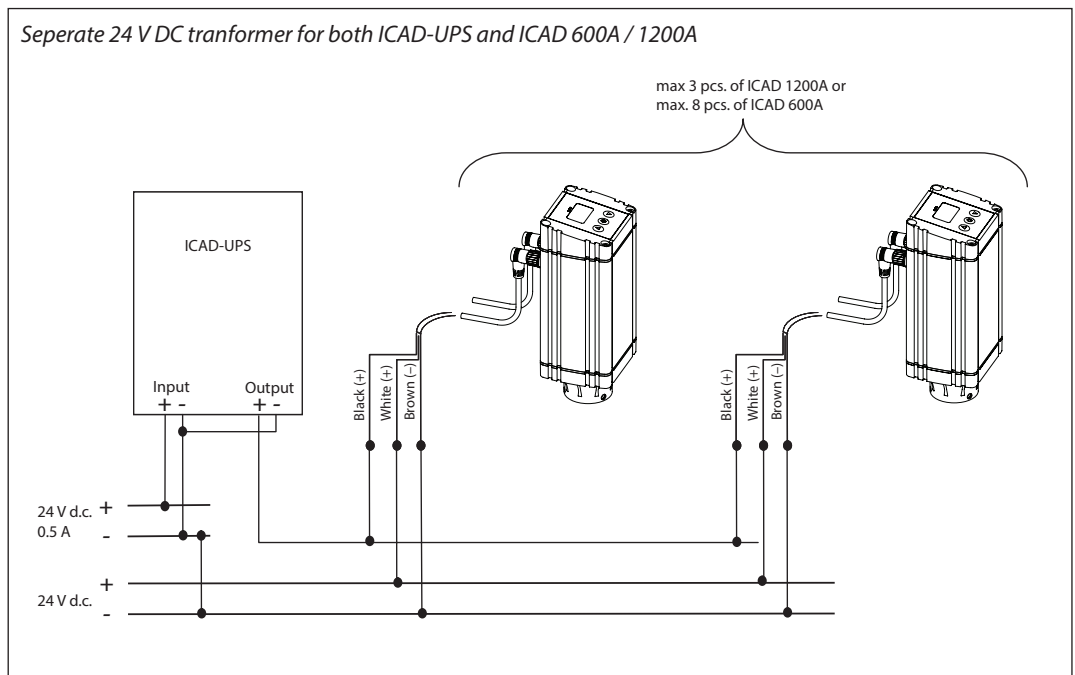
- Industrial product.
- Can support up to
 - 3 pcs. of ICAD 1200A or
 - 8 pcs. of ICAD 600A
- Integrated solution - battery and UPS.
- Industrial approvals: CE, UL, GL (Germanischer Lloyd).
- DIN rail mounting.
- LED indication
 - Green (Power ON)
 - Yellow (Flashing:charging, Constant: Buffer mode (Failsafe 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.

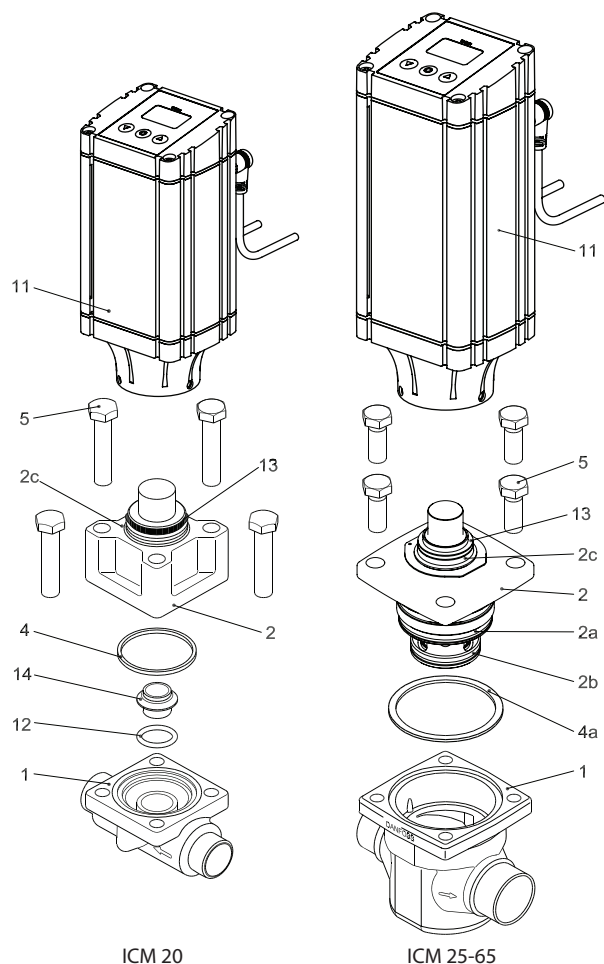
Code number: **027H0182**

For further information please see the instruction PIHV0B.

ICAD-UPS applications



Material specification

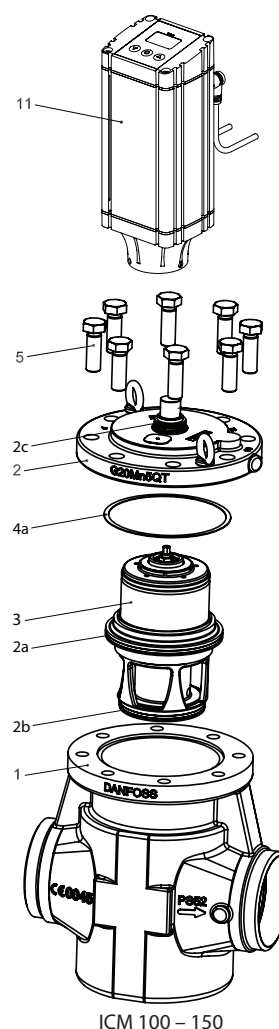


ICM 20

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



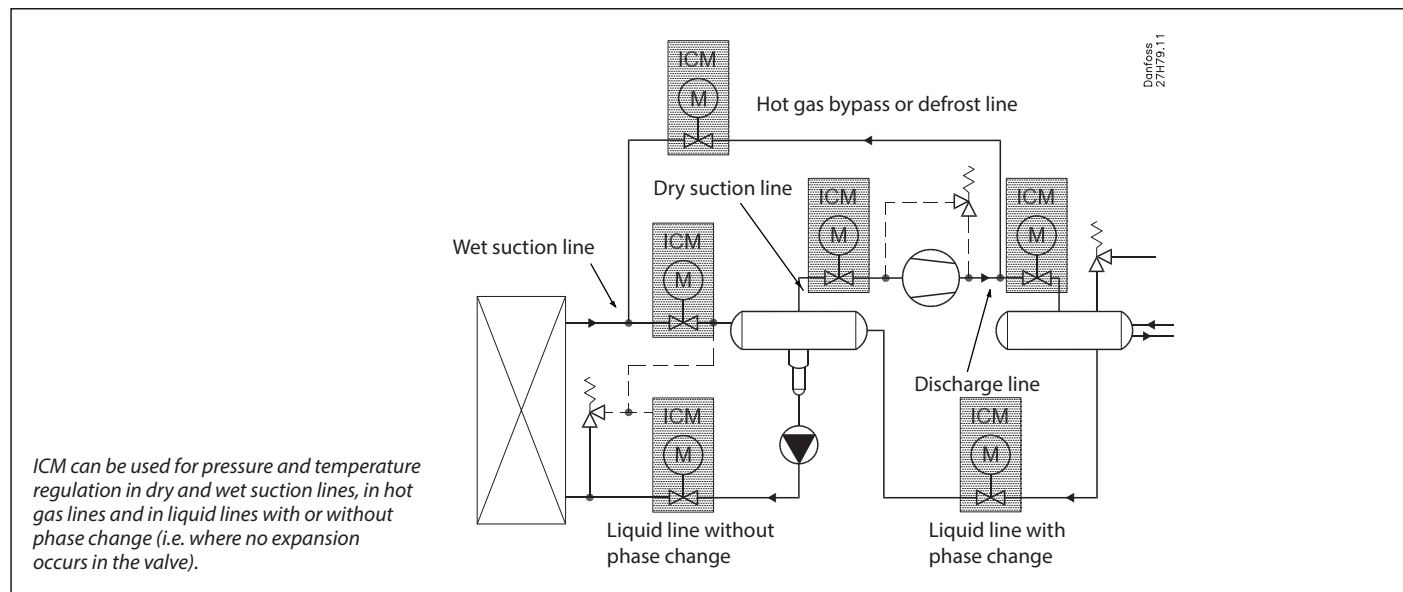
ICM 100 – 150

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 selection program. 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:

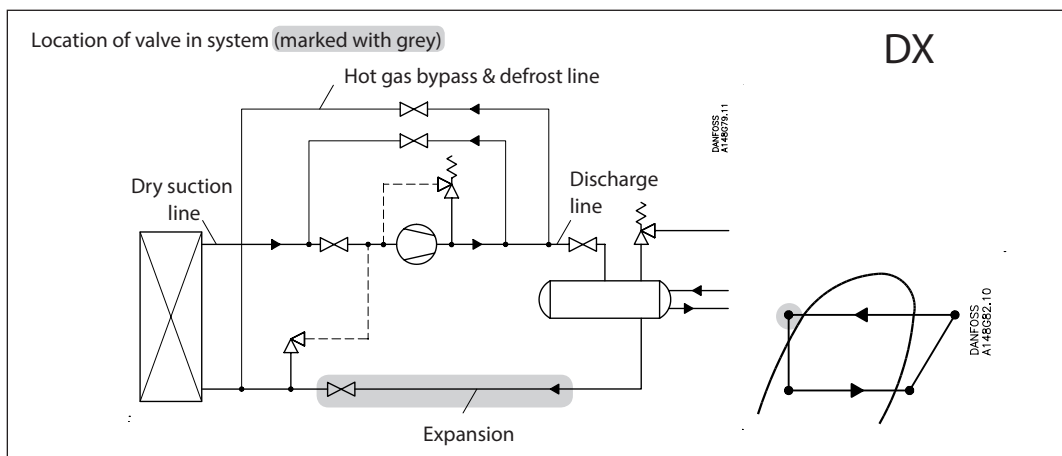
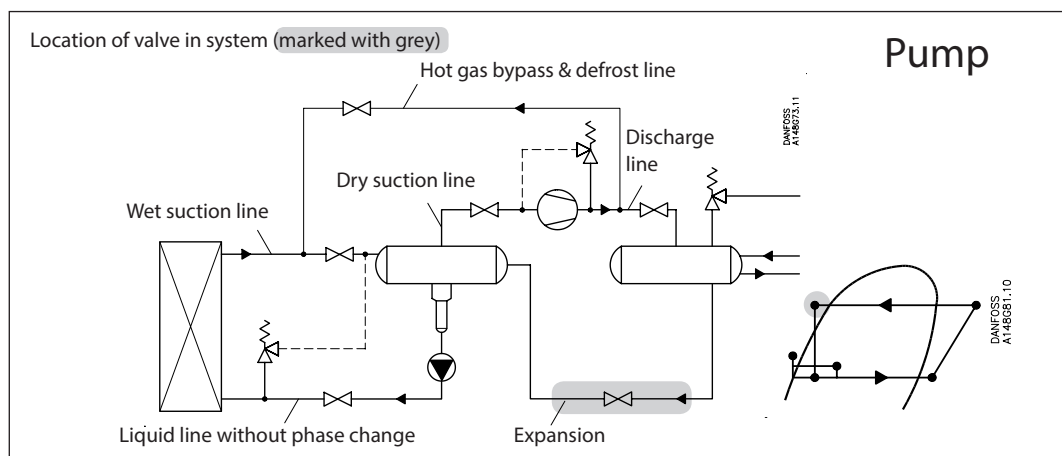
ICM valves should be sized to suit required capacity and operating conditions. ICM valves should not be line sized.

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%.

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 °F	3.6	7.2	18	27	35	45	54	63	72
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

$T_e = 20^\circ\text{F}$

$T_c = 85^\circ\text{F}$

$Q_0 = 426 \text{ TR}$

$\Delta t_{sub} = 36^\circ\text{F}$

Correction factor for subcooling: 0.94

Pressure drop across the valve:
167 psig - 48 psig = 119 psi

Corrected capacity: $426 \times 0.94 = 400 \text{ TR}$

From the R717 capacity table ICM 20-C is selected with Q_{nom} capacity 574 TR at 120 psi.

Note: It is common to select a valve with a least 15% additional capacity for superheat control and at least 25% additional capacity for liquid level control applications.

Selection tables for expansion/liquid make-up applications

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

Selection tables for expansion/liquid make-up applications

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

Selection tables for expansion/liquid make-up applications

Capacities for nominal conditions, Q_n (TR)

R 134a

Type		Pressure drop across valve Δp psi					
		15	30	60	120	180	240
C_v		Evaporating temperature 60 °F					
ICM20-A33	DN20	0.2	1.8	2.42	3.13	3.76	3.93
ICM20-A	DN20	0.7	5.5	7.3	9.5	11.4	12
ICM20-B	DN20	2.8	31.5	42	54.1	65	68.5
ICM20-C	DN20	5.3	52	69	88	105	111
ICM25-A	DN25	7	80.3	106	136	163	171
ICM32-A	DN32	10	116	154	198	237	250
ICM40-A	DN40	17	214	284	360	431	455
ICM50-A	DN50	27	373	493	625	745	787
ICM65-A	DN65	41	612	808	1026	1225	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
ICM20-A	DN20	0.7	5.9	7.8	9.9	11.6	12
ICM20-B	DN20	2.8	33.6	44.3	55.5	65.5	68
ICM20-C	DN20	5.3	54.8	71	88.5	105	109
ICM25-A	DN25	7	85	110	138	162	169
ICM32-A	DN32	10	123	160	201	237	247
ICM40-A	DN40	17	225	291	363	428	447
ICM50-A	DN50	27	390	503	625	737	770
ICM65-A	DN65	41	640	824	1029	1211	1264
		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
ICM20-A	DN20	0.7	6.1	7.9	9.8	11.2	11.3
ICM20-B	DN20	2.8	34	43.9	54.3	62.6	64
ICM20-C	DN20	5.3	53.5	68.5	85.3	99	102
ICM25-A	DN25	7	83.5	107	132	154	158
ICM32-A	DN32	10	122	157	195	225	231
ICM40-A	DN40	17	219	280	347	405	416
ICM50-A	DN50	27	377	480	597	695	720
ICM65-A	DN65	41	618	790	981	1144	1179
		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

Selection tables for expansion/liquid make-up applications

Capacities for nominal conditions, Q_n (TR)

R 404A

Type		Pressure drop across valve Δp psi					
		15	30	60	120	180	240
C_v		Evaporating temperature 60 °F					
ICM20-A33	DN20	0.2	1.44	1.95	2.54	3.07	3.18
ICM20-A	DN20	0.7	4.4	5.9	7.7	9.3	9.7
ICM20-B	DN20	2.8	25.2	34.1	44.5	53.5	55.5
ICM20-C	DN20	5.3	41.8	56.3	73	87.5	91
ICM25-A	DN25	7	64.5	87	113	135	141
ICM32-A	DN32	10	93	125	163	196	204
ICM40-A	DN40	17	173	233	300	360	373
ICM50-A	DN50	27	300	405	522	625	647
ICM65-A	DN65	41	494	664	856	1022	1059
		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
ICM20-A	DN20	0.7	4.9	6.6	8.6	10.2	10.6
ICM20-B	DN20	2.8	28.7	38.4	49.1	58.2	60.5
ICM20-C	DN20	5.3	47.3	62.6	79.8	94.5	97.5
ICM25-A	DN25	7	73	97	123	146	151
ICM32-A	DN32	10	105	140	179	212	220
ICM40-A	DN40	17	195	259	327	387	402
ICM50-A	DN50	27	340	448	567	670	694
ICM65-A	DN65	41	558	736	931	1098	1137
		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
ICM20-A	DN20	0.7	5.4	7.1	8.9	10.4	10.5
ICM20-B	DN20	2.8	30.8	40.2	50.5	58.7	60
ICM20-C	DN20	5.3	50	64.5	80.5	93.5	96
ICM25-A	DN25	7	77.5	100	125	145	149
ICM32-A	DN32	10	112	146	183	212	217
ICM40-A	DN40	17	205	265	330	383	394
ICM50-A	DN50	27	355	457	567	660	678
ICM65-A	DN65	41	584	751	933	1085	1113
		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
ICM20-A	DN20	0.7	5.6	7.1	8.8	9.9	9.9
ICM20-B	DN20	2.8	31.1	39.5	48.8	55.6	55.6
ICM20-C	DN20	5.3	49	61.5	76.7	87.8	89
ICM25-A	DN25	7	76.3	96	119	137	138
ICM32-A	DN32	10	111	141	175	200	201
ICM40-A	DN40	17	200	250	312	360	363
ICM50-A	DN50	27	344	430	535	620	628
ICM65-A	DN65	41	564	708	881	1016	1027

Selection tables for expansion/liquid make-up applications

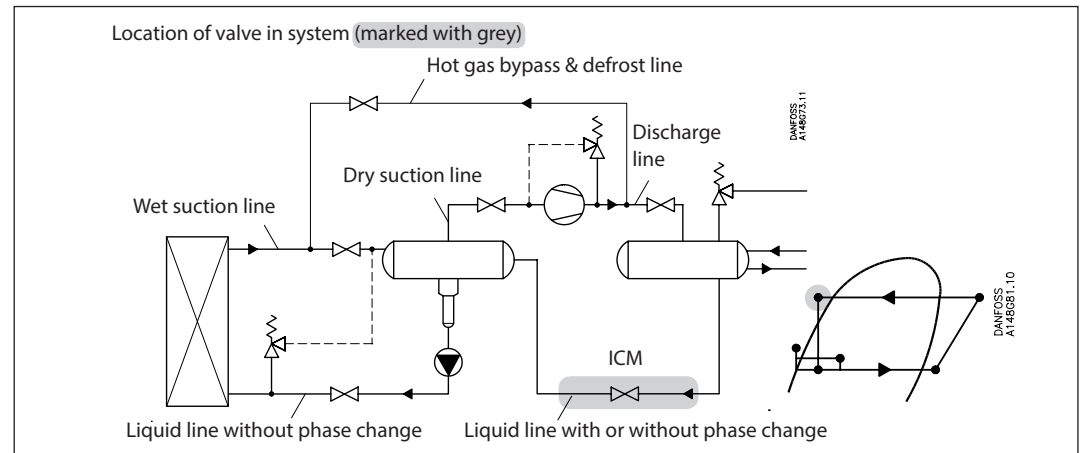
Capacities for nominal conditions, Q_n (TR)

R 22

Type		Pressure drop across valve Δp psi					
		15	30	60	120	180	240
C_v		Evaporating temperature 60 °F					
ICM20-A33	DN20	0.2	1.86	2.55	3.41	4.33	4.8
ICM20-A	DN20	0.7	5.6	7.7	10.3	13.1	14.5
ICM20-B	DN20	2.8	32.5	44.6	59.5	75.5	83.6
ICM20-C	DN20	5.3	54	73.5	97.5	123	136
ICM25-A	DN25	7	83.2	114	151	190	210
ICM32-A	DN32	10	120	164	218	275	305
ICM40-A	DN40	17	223	303	400	505	560
ICM50-A	DN50	27	388	528	695	878	970
ICM65-A	DN65	41	638	868	1144	1439	1590
		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
ICM20-A	DN20	0.7	6.3	8.5	11.2	13.9	15.2
ICM20-B	DN20	2.8	36	48.7	63.6	79	87
ICM20-C	DN20	5.3	59.5	79.5	103	128	140
ICM25-A	DN25	7	92	123	160	198	218
ICM32-A	DN32	10	133	178	232	289	317
ICM40-A	DN40	17	245	326	423	525	575
ICM50-A	DN50	27	427	565	730	905	995
ICM65-A	DN65	41	700	930	1201	1489	1637
		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
ICM20-A	DN20	0.7	6.7	8.9	11.5	14.1	15.2
ICM20-B	DN20	2.8	37.9	50.3	64.5	79.2	86.2
ICM20-C	DN20	5.3	61.3	80.1	103	127	138
ICM25-A	DN25	7	95	125	160	197	215
ICM32-A	DN32	10	138	182	233	287	314
ICM40-A	DN40	17	251	329	421	518	567
ICM50-A	DN50	27	435	565	725	895	980
ICM65-A	DN65	41	714	932	1192	1470	1608
		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
ICM20-A	DN20	0.7	6.9	9	11.4	13.7	14.7
ICM20-B	DN20	2.8	37.7	49.5	63	76.8	83
ICM20-C	DN20	5.3	59	77	99	122	132
ICM25-A	DN25	7	92	120	154	189	205
ICM32-A	DN32	10	135	177	227	276	300
ICM40-A	DN40	17	240	314	403	498	540
ICM50-A	DN50	27	412	540	695	855	935
ICM65-A	DN65	41	679	888	1143	1408	1534

Nominal capacities

Selection tables for solenoid function and pressure regulator function in the liquid line with / without phase change



Calculation example (R717 capacities):

An application has following running conditions:

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

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

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

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

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

Selection tables for solenoid function and pressure regulator function in the liquid line with / without phase change

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

R 744

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
 $T_{liq} = 50^\circ\text{F}$,
 $\Delta P = 3$ psi

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	Correction factor
-10 °F	0.48
10 °F	0.64
30 °F	0.88
50 °F	1.00

Nominal capacities

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

Selection tables for solenoid function and pressure regulator function in the liquid line with / without phase change

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	Correction factor
-10 °F	0.64
10 °F	0.68
30 °F	0.74
50 °F	0.81
70 °F	0.89
90 °F	1.00
110 °F	1.15
130 °F	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

R 404A

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

Type	Valve body size	C _v (USgal/min)	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.6	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 liquid temperature (T_{liq})

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

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

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

Selection tables for solenoid function and pressure regulator function in the liquid line with / without phase change

R 22

Type	Valve body size	C_v (USgal/min)	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.3
ICM20-A		0.7	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1
ICM20-B		2.8	13.5	14.0	14.4	14.9	15.3	15.7	16.0	16.3
ICM20-C		5.3	25.5	26.4	27.4	28.2	29.0	29.7	30.4	30.9
ICM25-A	25	7	33.7	34.9	36.1	37.2	38.3	39.2	40.1	40.8
ICM25-B		14	67.4	69.8	72.2	74.5	76.6	78.5	80.2	81.6
ICM32-A	32	10	48.1	49.9	51.6	53.2	54.7	56.0	57.3	58.3
ICM32-B		20	96.3	100	103	106	109	112	115	117
ICM40-A	40	17	81.9	84.8	87.7	90.5	93.0	95.3	97.4	99.1
ICM40-B		30	144	150	155	160	164	168	172	175
ICM50-A	50	27	130	135	139	144	148	151	155	157
ICM50-B		46	221	229	237	245	252	258	264	268
ICM65-A	65	41	197	205	211	218	224	230	235	239
ICM65-B		81	390	404	418	431	443	454	464	472
ICM100	100	165	795	824	851	878	902	924	946	962
ICM125	125	259	1247	1293	1335	1377	1416	1450	1484	1510
ICM150	150	430	2071	2146	2217	2287	2350	2408	2464	2507

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

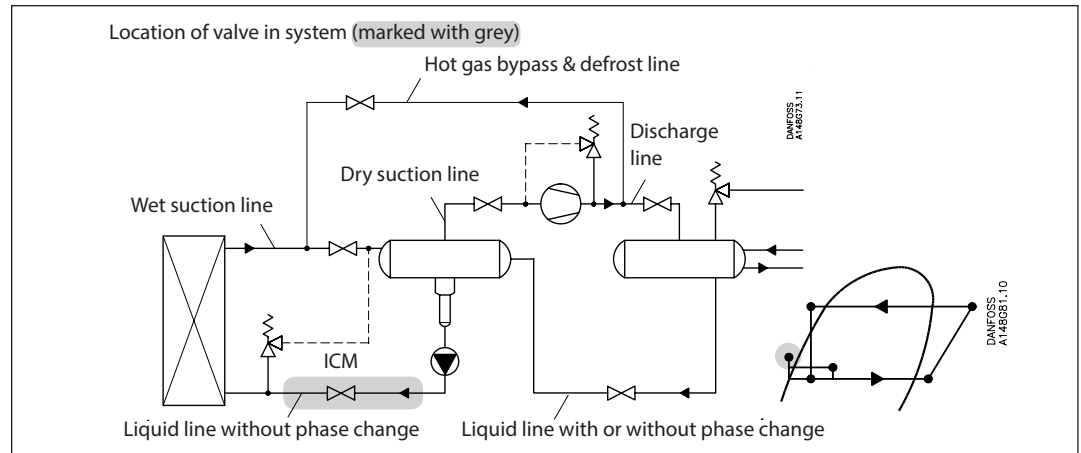
ΔP (psi)	Correction factor
3	1.00
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for liquid temperature (T_{liq})

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

Nominal capacities

Selection tables for solenoid function and pressure regulator function in the pumped liquid line without phase change



Calculation example (R717 capacities):

An application has following running conditions:

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

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

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

Selection tables for solenoid function and pressure regulator function in the pumped liquid line without phase change

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

R 744

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	0.7	0.6	0.6	0.5	0.4	0.4	0.3	0.3
ICM20-A		0.7	2.0	1.8	1.7	1.5	1.3	1.1	0.9	0.9
ICM20-B		2.8	7.9	7.4	6.8	6.1	5.4	4.5	3.4	3.4
ICM20-C		5.3	15.0	13.9	12.8	11.6	10.1	8.5	6.5	6.5
ICM25-A	25	7	19.8	18.4	16.9	15.3	13.4	11.2	8.6	8.6
ICM25-B		14	39.5	36.8	33.9	30.5	26.8	22.5	17.2	17.2
ICM32-A	32	10	28.2	26.3	24.2	21.8	19.1	16.1	12.3	12.3
ICM32-B		20	56.4	52.6	48.4	43.6	38.3	32.1	24.6	24.6
ICM40-A	40	17	48.0	44.7	41.1	37.1	32.5	27.3	20.9	20.9
ICM40-B		30	84.7	78.9	72.6	65.4	57.4	48.2	37.0	37.0
ICM50-A	50	27	76.2	71.0	65.3	58.9	51.7	43.4	33.3	33.3
ICM50-B		46	130	121	111	100	88.0	73.9	56.7	56.7
ICM65-A	65	41	116	108	99	89	78	66	51	51
ICM65-B		81	229	213	196	177	155	130	100	100
ICM100	100	165	466	433	399	359	315	264	204	204
ICM125	125	259	732	680	627	564	495	415	320	320
ICM150	150	430	1216	1129	1040	937	821	689	531	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

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

Selection tables for solenoid function and pressure regulator function in the pumped liquid line without phase change

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

R 404A

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	0.4	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

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

Selection tables for solenoid function and pressure regulator function in the pumped liquid line without phase change

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 ($f_{\Delta P}$)

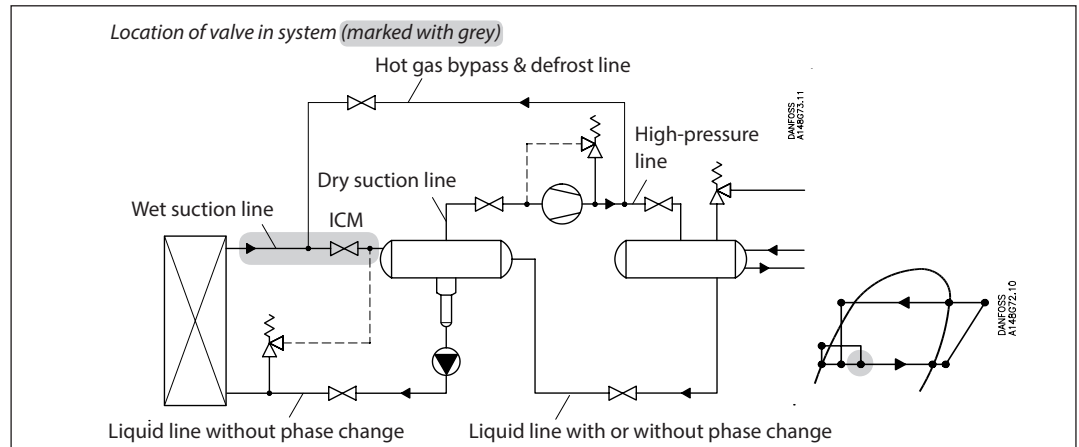
ΔP (psi)	Correction factor
3	1.00
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

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

Selection tables for solenoid or pressure regulator function in wet suction line



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"

The capacity table is based on nominal condition
 (pressure drop $\Delta p = 3\text{ psi}$, recirculation 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 $f_{rec} = 0.9$

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

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

Nominal capacities

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

Selection tables for solenoid or pressure regulator function in wet suction line

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

R 744

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	0.17	0.20	0.23	0.25	0.27	0.28	0.27	0.27
ICM20-A		0.7	0.5	0.6	0.7	0.8	0.8	0.9	0.8	0.8
ICM20-B		2.8	2.1	2.4	2.8	3.1	3.3	3.4	3.3	3.3
ICM20-C		5.3	4.0	4.6	5.3	5.8	6.3	6.5	6.3	6.3
ICM25-A	25	7	5.2	6.1	7.0	7.7	8.3	8.6	8.4	8.4
ICM25-B		14	10.5	12.2	13.9	15.4	16.6	17.2	16.7	16.7
ICM32-A	32	10	7.5	8.7	9.9	11.0	11.9	12.3	11.9	11.9
ICM32-B		20	14.9	17.4	19.9	22.0	23.7	24.6	23.9	23.9
ICM40-A	40	17	12.7	14.8	16.9	18.7	20.1	20.9	20.3	20.3
ICM40-B		30	22.4	26.1	29.8	33.0	35.6	36.9	35.8	35.8
ICM50-A	50	27	20.2	23.5	26.8	29.7	32.0	33.2	32.2	32.2
ICM50-B		46	34.4	40.1	45.7	50.7	54.5	56.6	54.9	54.9
ICM65-A	65	41	31	36	41	45	48	51	49	49
ICM65-B		81	60.5	70.6	80.5	89.2	96.0	100	97	97
ICM100	100	165	123	143	164	182	195	203	196	196
ICM125	125	259	193	225	258	286	306	319	308	308
ICM150	150	430	320	373	428	475	508	530	511	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

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

Selection tables for solenoid or pressure regulator function in wet suction line

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

R 404A

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	0.05	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

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

Selection tables for solenoid or pressure regulator function in wet suction line

R 22

Type	Valve body size	C_v (USgal/min)	Evaporating temperature [°F]							
			-60	-40	-20	0	20	40	60	80
ICM20-A33	20	0.23	0.04	0.06	0.07	0.09	0.11	0.12	0.14	0.15
ICM20-A		0.7	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5
ICM20-B		2.8	0.5	0.7	0.9	1.1	1.3	1.5	1.7	1.8
ICM20-C		5.3	1.0	1.4	1.7	2.1	2.4	2.8	3.1	3.5
ICM25-A	25	7	1.3	1.8	2.3	2.8	3.2	3.7	4.1	4.6
ICM25-B		14	2.7	3.6	4.6	5.5	6.4	7.4	8.3	9.2
ICM32-A	32	10	1.9	2.6	3.3	3.9	4.6	5.3	5.9	6.5
ICM32-B		20	3.8	5.2	6.5	7.9	9.2	10.5	11.9	13.1
ICM40-A	40	17	3.2	4.4	5.6	6.7	7.8	9.0	10.1	11.1
ICM40-B		30	5.7	7.8	9.8	11.8	13.8	15.8	17.8	19.6
ICM50-A	50	27	5.1	7.0	8.8	10.6	12.4	14.2	16.0	17.7
ICM50-B		46	8.7	12.0	15.0	18.1	21.2	24.2	27.3	30.1
ICM65-A	65	41	8	11	13	16	19	22	24	27
ICM65-B		81	15.4	21.1	26.5	31.9	37.3	42.7	48.0	53.0
ICM100	100	165	30	43	53	65	75	88	98	109
ICM125	125	259	48	68	84	103	118	138	153	171
ICM150	150	430	79	112	139	171	196	229	254	283

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

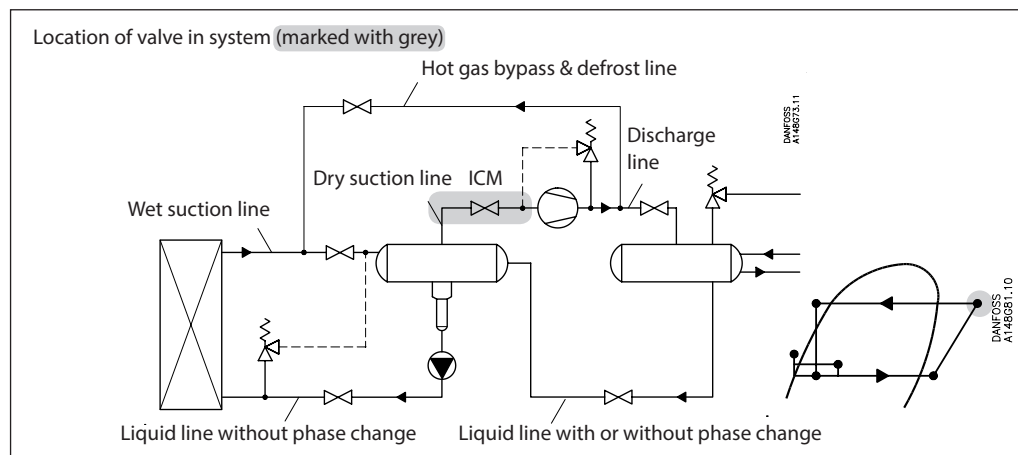
ΔP (psi)	Correction factor
3	1.00
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

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

Nominal capacities

Selection tables for solenoid or pressure regulator function in dry suction line



Calculation example (R717 capacities):

An application has following running conditions:

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

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

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

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

Selection tables for solenoid or pressure regulator function in dry suction line

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	Correction factor
10 °F	1.00
14 °F	1.00
18 °F	1.00
20 °F	1.00

Correction factor for liquid temperature (T_{liq})

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

R 744

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
 $T_{liq} = 50^\circ\text{F}$,
 $\Delta p = 3 \text{ psi}$
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	0.20	0.24	0.30	0.36	0.43	0.50	0.57	0.64
ICM20-A		0.7	0.6	0.7	0.9	1.1	1.3	1.5	1.7	1.9
ICM20-B		2.8	2.4	3.0	3.7	4.4	5.2	6.0	6.9	7.9
ICM20-C		5.3	4.5	5.7	6.9	8.3	9.8	11.4	13.0	14.8
ICM25-A	25	7	6.0	7.5	9.1	11.0	13.0	15.1	17.2	19.5
ICM25-B		14	11.9	14.9	18.3	22.0	26.0	30.2	34.5	39.1
ICM32-A	32	10	8.5	10.7	13.1	15.7	18.5	21.5	24.6	28.0
ICM32-B		20	17.0	21.3	26.1	31.4	37.1	43.1	49.2	55.6
ICM40-A	40	17	14.5	18.1	22.2	26.7	31.5	36.6	41.8	47.2
ICM40-B		30	25.5	32.0	39.2	47.1	55.6	64.6	73.9	83.6
ICM50-A	50	27	23.0	28.8	35.3	42.4	50.1	58.2	66.5	75.2
ICM50-B		46	39.1	49.1	60.1	72.2	85.3	99.1	113	128
ICM65-A	65	41	35	44	54	64	76	88	101	115
ICM65-B		81	68.9	86.4	106	127	150	175	199	225
ICM100	100	165	141	175	215	259	306	355	405	457
ICM125	125	259	221	275	338	407	480	558	636	716
ICM150	150	430	366	457	561	675	797	926	1057	1197

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	Correction factor
10 °F	1.00
14 °F	1.00
18 °F	1.00
20 °F	1.00

Correction factor for liquid temperature (T_{liq})

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

Nominal capacities

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

Selection tables for solenoid or pressure regulator function in dry suction line

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	Correction factor
10 °F	1.00
14 °F	1.00
18 °F	1.00
20 °F	1.00

Correction factor for liquid temperature (T_{liq})

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

R 404A

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
 $T_{liq} = 90^\circ\text{F}$,
 $\Delta p = 3 \text{ psi}$
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	Correction factor
10 °F	1.00
14 °F	1.00
18 °F	1.00
20 °F	1.00

Correction factor for liquid temperature (T_{liq})

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

Nominal capacities

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

Selection tables for solenoid or pressure regulator function in dry suction line

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)

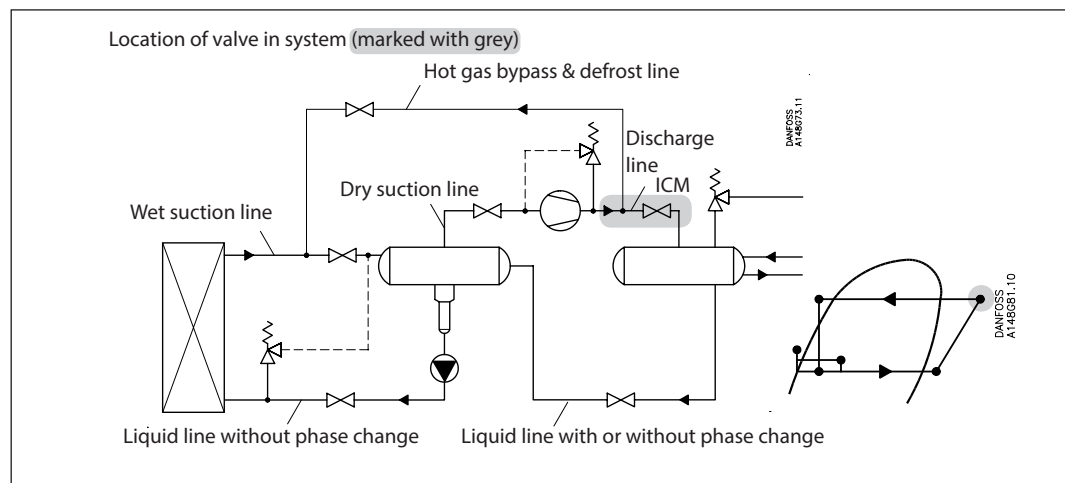
T_s	Correction factor
10 °F	1.00
14 °F	1.00
18 °F	1.00
20 °F	1.00

Correction factor for liquid temperature (T_{liq})

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

Nominal capacities

Selection tables for discharge line



Calculation example (R717 capacities):

An application has following running conditions:

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

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

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.
 Correction factor for Δp 4.5 psi $f_{\Delta p} = 0.81$
 Correction factor for liquid temperature $f_{T_{liq}} = 0.92$
 Correction factor for $T_{disch.}$ 120 °F, $f_{T_{disch.}} = 0.95$

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

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

Nominal capacities

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
 $T_{liq} = 90^\circ\text{F}$,
 $\Delta p = 2.9 \text{ psi}$,
 $P_{disch.} = 185 \text{ psi}$,
 $T_{disch.} = 180^\circ\text{F}$
Superheating = 12°F

Selection tables for discharge line

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

Correction factor for liquid temperature (T_{liq})

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

R 744

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
 $T_{liq} = 90^\circ\text{F}$,
 $\Delta p = 3 \text{ psi}$,
 $P_{disch.} = 120 \text{ psi}$,
 $T_{disch.} = 180^\circ\text{F}$
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 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 °F	0.95
140 °F	0.97
180 °F	1.00
200 °F	1.02
210 °F	1.02
230 °F	1.04
250 °F	1.05

Correction factor for liquid temperature (T_{liq})

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

Nominal capacities

Selection tables for discharge line

R 134a

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
 $T_{liq} = 90^\circ\text{F}$,
 $\Delta p = 3 \text{ psi}$,
 $P_{disch.} = 120 \text{ psi}$,
 $T_{disch.} = 180^\circ\text{F}$
Superheating = 12°F

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

Correction factor for liquid temperature (T_{liq})

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

R 404A

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
 $T_{liq} = 90^\circ\text{F}$,
 $\Delta p = 3 \text{ psi}$,
 $P_{disch.} = 120 \text{ psi}$,
 $T_{disch.} = 180^\circ\text{F}$
Superheating = 12°F

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 °F	0.95
140 °F	0.97
180 °F	1.00
200 °F	1.02
210 °F	1.02
230 °F	1.04
250 °F	1.05

Correction factor for liquid temperature (T_{liq})

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

Nominal capacities

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
 $T_{liq} = 90^\circ\text{F}$,
 $\Delta p = 3 \text{ psi}$,
 $P_{disch.} = 120 \text{ psi}$,
 $T_{disch.} = 180^\circ\text{F}$
Superheating = 12°F

Selection tables for discharge line

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

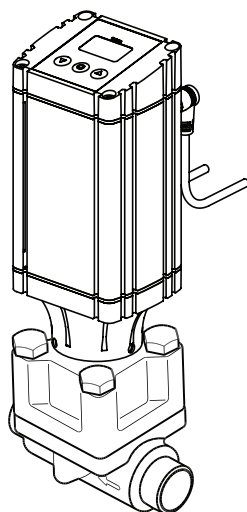
Correction factor for liquid temperature ($T_{liq.}$)

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

ICM 20 / ICAD 600A

Ordering complete valve with actuator

Valve type	Connection type/size	Code number*
ICM 20-A33	¾" FPT	148X0874
ICM 20-A33	¾" SOC	148X0148
ICM 20-A33	¾" BW	148X0753
ICM 20-A	¾" FPT	148X0931
ICM 20-A	¾" SOC	148X0144
ICM 20-A	¾" BW	148X0279
ICM 20-A	1" BW	148X0467
ICM 20-A	¾" ODS	148X0444
ICM 20-B66	¾" SOC	148X0297
ICM 20-B66	¾" BW	148X0340
ICM 20-B	¾" FPT	148X0344
ICM 20-B	¾" SOC	148X0145
ICM 20-B	¾" BW	148X0321
ICM 20-B	1" BW	148X0143
ICM 20-B	¾" ODS	148X0445
ICM 20-C	¾" SOC	148X0406
ICM 20-C	¾" BW	148X0754
ICM 20-C	1" BW	148X0300
ICM 20-C	¾" ODS	148X0446



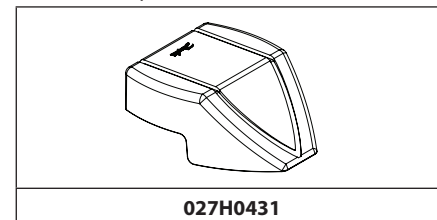
BW= Butt-weld ANSI ; SOC = Socket weld ANSI ; ODS = Solder ANSI ; FPT = Female Pipe Thread
 * Code number for ICM with ICAD actuator with 3 m / 9.8 ft cables

Multi-function tool for ICM 20 – 32



The multi-function tool can be used for:
 - Motor operated valve type ICM
 - Removing the ICS function module
 - Operating the ICS manual spindle
 For further information please see the instruction **PI-HU0A**

Protection cap ICAD 600A / 1200A



ICM 20 valve body

Connection size/type	Code Number
¾ in. SOC	027H1151
¾ in. FPT	027H1157
¾ in. BW	027H1148
1 in. BW	027H1166
¾ in. ODS	027H1129
¾ in. ODS	027H1160

ICM 20 Function module / top cover

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)

ICAD 600A actuator

Description	Code Number
ICAD 600A with 3 m / 9.8 ft cables	027X0166
ICAD 600A without cables	027H9120

* see accessories for other lengths

Spare parts

Spare Parts	Code Number
Repair kit	027H1190

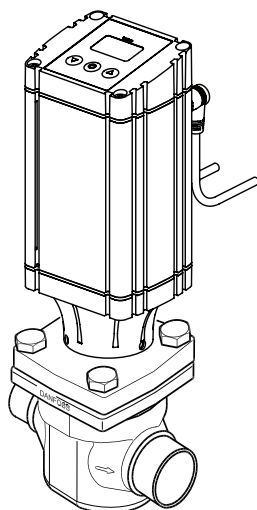
ICM 25 / ICAD 600A

Ordering complete valve with actuator

Valve type	Connection type/size	Code number*
ICM 25-A	1" SOC	148X0149
ICM 25-A	1" BW	148X0755
ICM 25-A	1¼" BW	148X0152
ICM 25-A	1½" ODS	148X0151
ICM 25-B	¾" SOC	148X0465
ICM 25-B	1" SOC	148X0150
ICM 25-B	¾" BW	148X0746
ICM 25-B	1" BW	148X0747
ICM 25-B	1¼" BW	148X0298

BW= Butt-weld ANSI ; SOC = Socket weld ANSI ;
ODS = Solder ANSI

* Code number for ICM with ICAD actuator
with 3 m / 9.8 ft cables

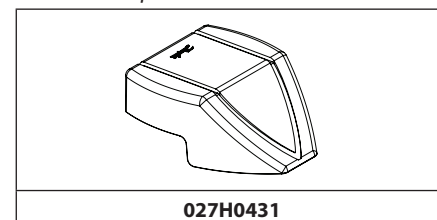


Multi-function tool for ICM 20 – 32



The multi-function tool can be used for:
- Motor operated valve type ICM
- Removing the ICS function module
- Operating the ICS manual spindle
For further information please see the instruction **PIHU®A**.

Protection cap ICAD 600A / 1200A



ICM 25 valve body

Connection size/type	Code Number
¾ in. SOC	027H2132
1 in. SOC	027H2122
¾ in. FPT	027H2133
1 in. FPT	027H2127
¾ in. BW	027H2131
1 in. BW	027H2121
1 ¼ in. BW	027H2130
¾ in. ODS	027H2125
1 ½ in. ODS	027H2126
1 ¾ in. ODS	027H2134

ICM 25 Function module / top cover

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

*) Including gaskets and O-rings

ICAD 600A actuator

Description	Code Number
ICAD 600A with 3 m / 9.8 ft cables	027X0166
ICAD 600A without cables	027H9120

* see accessories for other lengths

Spare parts

Spare Parts	Code Number
Inspection kit	027H2218

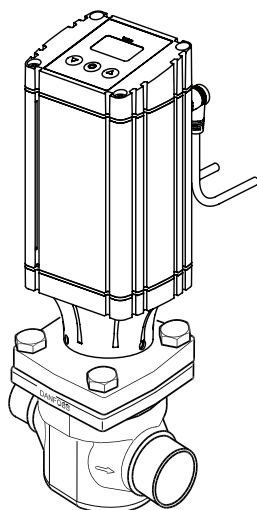
ICM 32 / ICAD 600A

Ordering complete valve with actuator

Valve type	Connection type/size	Code number*
ICM 32-A	1 ¼" SOC	148X0153
ICM 32-A	1 ¼" BW	148X0756
ICM 32-A	1 ½" BW	148X0155
ICM 32-B	1 ¼" SOC	148X0311
ICM 32-B	1 ¼" BW	148X0748
ICM 32-B	1 ½" BW	148X0156

BW= Butt-weld ANSI ; SOC = Socket weld ANSI

* Code number for ICM with ICAD actuator with 3 m / 9.8 ft cables

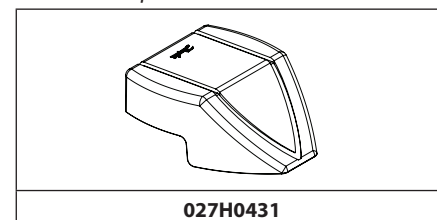


Multi-function tool for ICM 20 – 32

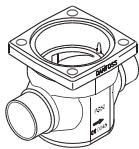


The multi-function tool can be used for:
 - Motor operated valve type ICM
 - Removing the ICS function module
 - Operating the ICS manual spindle
 For further information please see the instruction **PIHU°A**.

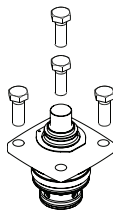
Protection cap ICAD 600A / 1200A



ICM 32 valve body

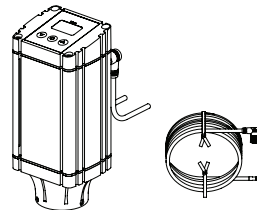
	
Connection size/type	Code Number
1 ¼ in. SOC	027H3122
1 ¼ in. BW	027H3121
1 ½ in. BW	027H3126
1 ¾ in. ODS	027H3123
1 ¾ in. ODS	027H3127

ICM 32 Function module / top cover

	
Description	Code Number
ICM 32-A	027H3180 *)
ICM 32-B	027H3181 *)

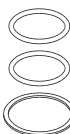
*) Including gaskets and O-rings

ICAD 600A actuator

	
Description	Code Number
ICAD 600A with 3 m / 9.8 ft cables	027X0166
ICAD 600A without cables	027H9120

* see accessories for other lengths

Spare parts

	
Spare Parts	Code Number
Inspection kit	027H3016

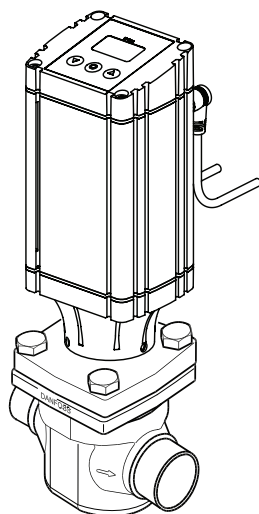
ICM 40 / ICAD 1200A

Ordering complete valve with actuator

Valve type	Connection type/size	Code number*
ICM 40-A	1 ½" SOC	148X0757
ICM 40-A	1 ½" BW	148X0758
ICM 40-A	2" BW	148X0759
ICM 40-B	1 ½" SOC	148X0397
ICM 40-B	1 ½" BW	148X0749
ICM 40-B	2" BW	148X0750

BW= Butt-weld ANSI ; SOC = Socket weld ANSI

* Code number for ICM with ICAD actuator with 3 m / 9.8 ft cables

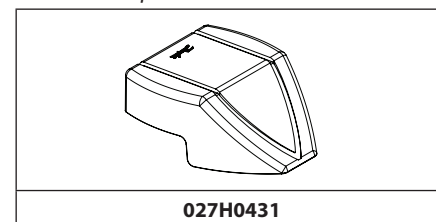


Multi-function tool for ICM 40 – 65



The multi-function tool can be used for:
- Motor operated valve type ICM
- Removing the ICS function module
- Operating the ICS manual spindle
For further information please see the instruction **PIHU®A**.

Protection cap ICAD 600A / 1200A



ICM 40 valve body

Connection size/type	Code Number
1 ½ in. SOC	027H4122
1 ½ in. BW	027H4121
2 in. BW	027H4127
1 ¾ in. ODS	027H4124

ICM 40 Function module / top cover

Description	Code Number
ICM 40-A	027H4180 *)
ICM 40-B	027H4181 *)

*) Including gaskets and O-rings

ICAD 1200A actuator

Description	Code Number
ICAD 1200A with 3 m / 9.8 ft cables	027X0168
ICAD 1200A without cables	027H9122

* see accessories for other lengths

Spare parts

Spare Parts	Code Number
Inspection kit	027H4014

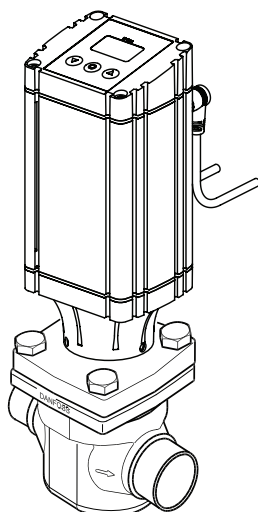
ICM 50 / ICAD 1200A

Ordering complete valve with actuator

Valve type	Connection type/size	Code number*
ICM 50-A	2" SOC	148X0760
ICM 50-A	2" BW	148X0761
ICM 50-A	2½" BW	148X0166
ICM 50-B	2" SOC	148X0396
ICM 50-B	2" BW	148X0751
ICM 50-B	2½" BW	148X0168
ICM 50-B	2 ⅝" ODS	148X0878

BW= Butt-weld ANSI ; SOC = Socket weld ANSI ;
ODS = Solder ANSI

* Code number for ICM with ICAD actuator
with 3 m / 9.8 ft cables

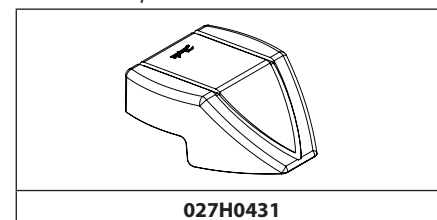


Multi-function tool for ICM 40 – 65

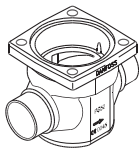


The multi-function tool can be used for:
- Motor operated valve type ICM
- Removing the ICS function module
- Operating the ICS manual spindle
For further information please see the instruction **PIHU®A**.

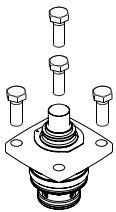
Protection cap ICAD 600A / 1200A



ICM 50 valve body

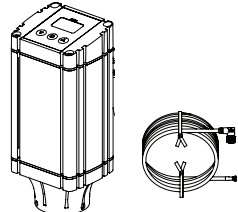
	
Connection size/type	Code Number
2 in. SOC	027H5122
2 in. BW	027H5121
2½ in. BW	027H5125
2 ⅝ in. ODS	027H5123

ICM 50 Function module / top cover

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

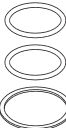
*) Including gaskets and O-rings

ICAD 1200A actuator

	
Description	Code Number
ICAD 1200A with 3 m / 9.8 ft cables	027X0168
ICAD 1200A without cables	027H9122

* see accessories for other lengths

Spare parts

	
Spare Parts	Code Number
Inspection kit	027H5014

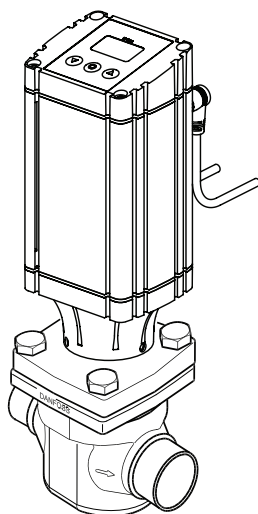
ICM 65 / ICAD 1200A

Ordering complete valve with actuator

Valve type	Connection type/size	Code number*
ICM 65-A	2 ½" SOC	148X0466
ICM 65-A	2 ½" BW	148X0762
ICM 65-A	3" BW	148X0169
ICM 65-B	2 ½" SOC	148X0442
ICM 65-B	2 ½" BW	148X0752
ICM 65-B	3" BW	148X0304
ICM 65-B	2 ¾" ODS	148X0951

BW= Butt-weld ANSI ; SOC = Socket weld ANSI ;
ODS = Solder ANSI

* Code number for ICM with ICAD actuator
with 3 m / 9.8 ft cables

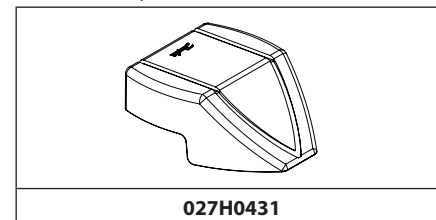


Multi-function tool for ICM 40 – 65

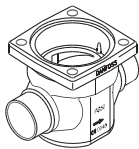


The multi-function tool can be used for:
- Motor operated valve type ICM
- Removing the ICS function module
- Operating the ICS manual spindle
For further information please see the instruction **PIHU[®]A**.

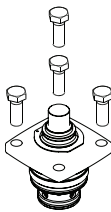
Protection cap ICAD 600A / 1200A



ICM 65 valve body

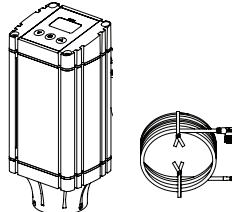
	
Connection size/type	Code Number
2 ½ in. SOC	027H6123
2 ½ in. BW	027H6121
3 in. BW	027H6127
2 ¾ in. ODS	027H6125

ICM 65 Function module / top cover

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

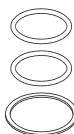
*) Including gaskets and O-rings

ICAD 1200A actuator

	
Description	Code Number
ICAD 1200A with 3 m / 9.8 ft cables	027X0168
ICAD 1200A without cables	027H9122

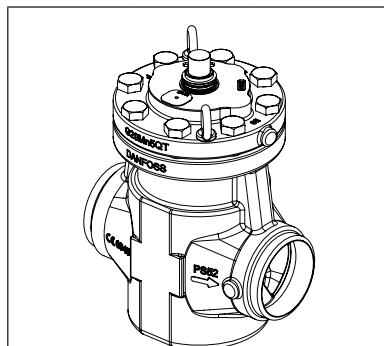
* see accessories for other lengths

Spare parts

	
Spare Parts	Code Number
Inspection kit	027H6016

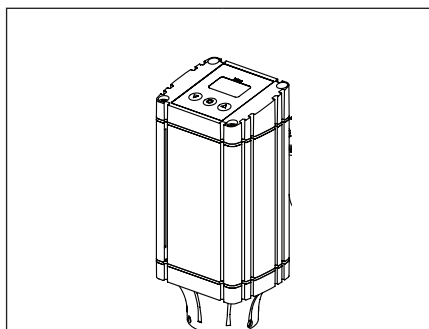
ICM 100 – 125 – 150

Ordering complete valve without actuator

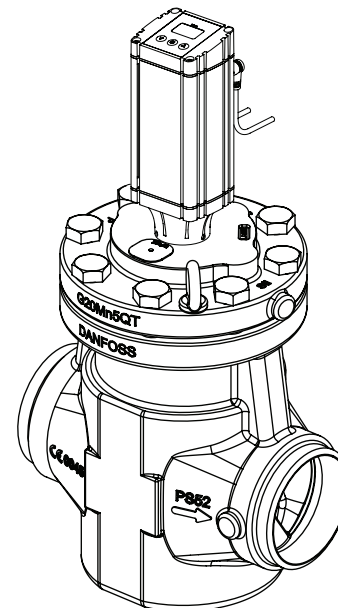


Valve type	Connection type/size	Code number*
ICM 100-B	4" BW	027H7131
ICM 125-B	5" BW	027H7151
ICM 150-B	6" BW	027H7171

* Code number for ICM valve only.
ICAD 1200A must be ordered separately.



ICAD 1200A with 3 m / 9.8 ft cables	ICAD 1200A without cable
027X0168	027H9122



Spare parts

Please see DKRCI.PY.HS0.C

Accessories

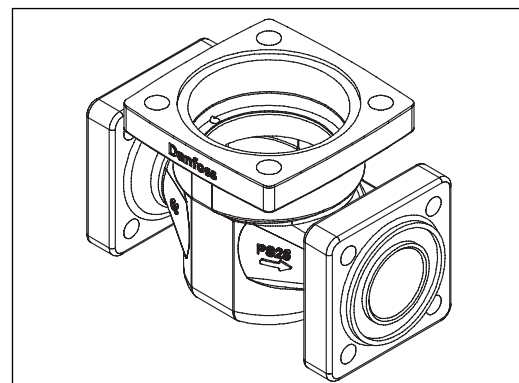
ICV PM flanged valve housings

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

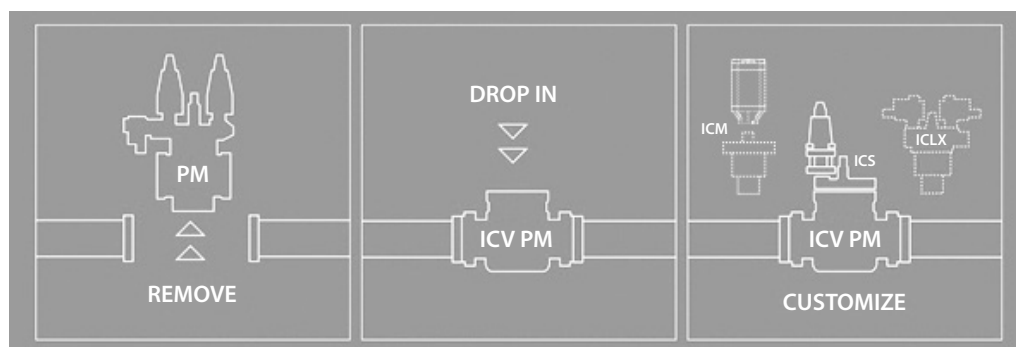
Pressure range

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

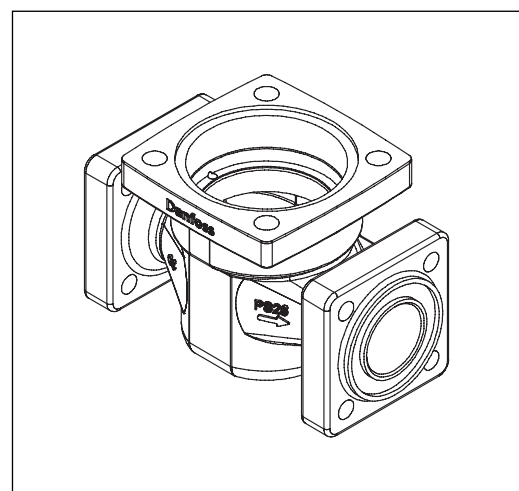
ICV (H)A4A flanged valve housings can replace the (H)A4A valves on already installed refrigeration systems.

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.

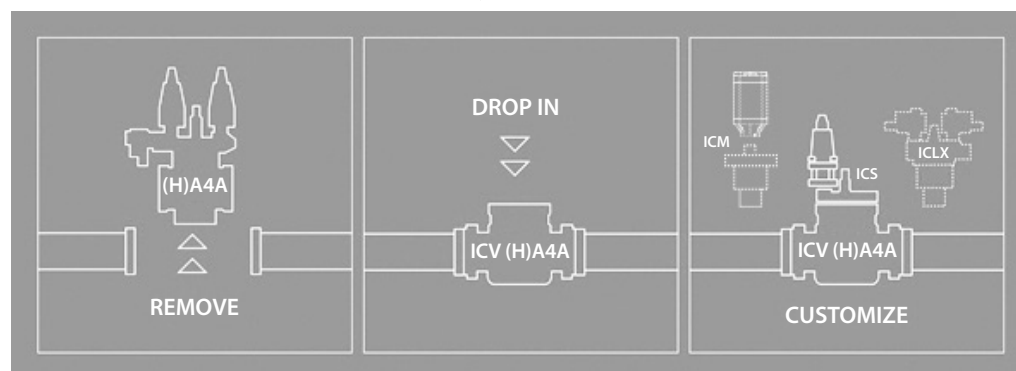
Pressure range

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.

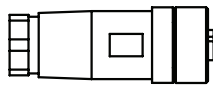
**) Includes ICV PM valve housing, flange gaskets, flange bolts and flange nuts.

ICM / ICAD Accessories

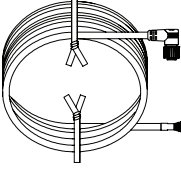
Multi/function tool

	
Description	Code Number
For ICM sizes 20, 25, and 32	027H0180
For ICM sizes 40, 50, 65, 100, 125 and 150	027H0181

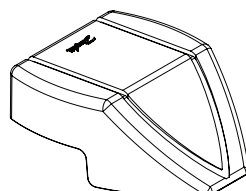
Connectors for ICAD 600A / 1200A

	
Connector type	Code number
Two Female Connectors with screw terminals: - connector for power - connector for control signals	027H0430

Cable for ICAD 600A / 1200A

	
Cable length	Code number
Cable set 1.5 m, female (4.9 ft.)	027H0426
Cable set 3 m, female (9.8 ft.)	027H0438
Cable set 10 m, female (32.8 ft.)	027H0427
Cable set 15 m, female (49 ft.)	027H0435

Protection cap ICAD 600A / 1200A

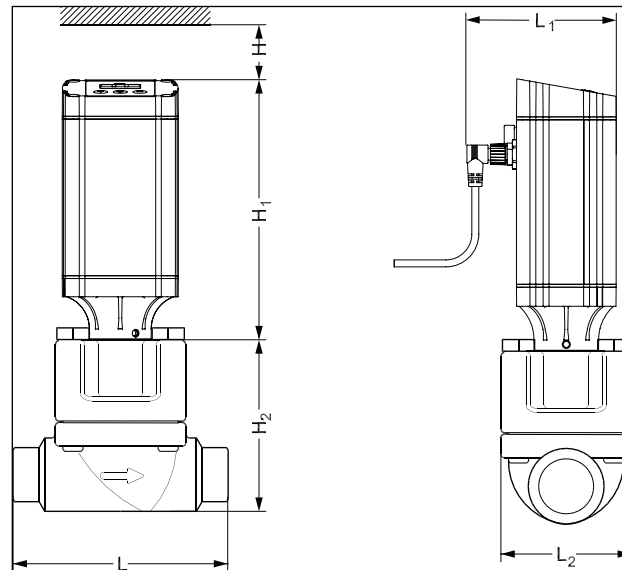
	
Description	Code number
Protection cap	027H0431

ICAD-UPS

	
Description	Code Number
ICAD-UPS	027H0182

ICM 20 / ICAD 600A

Dimensions

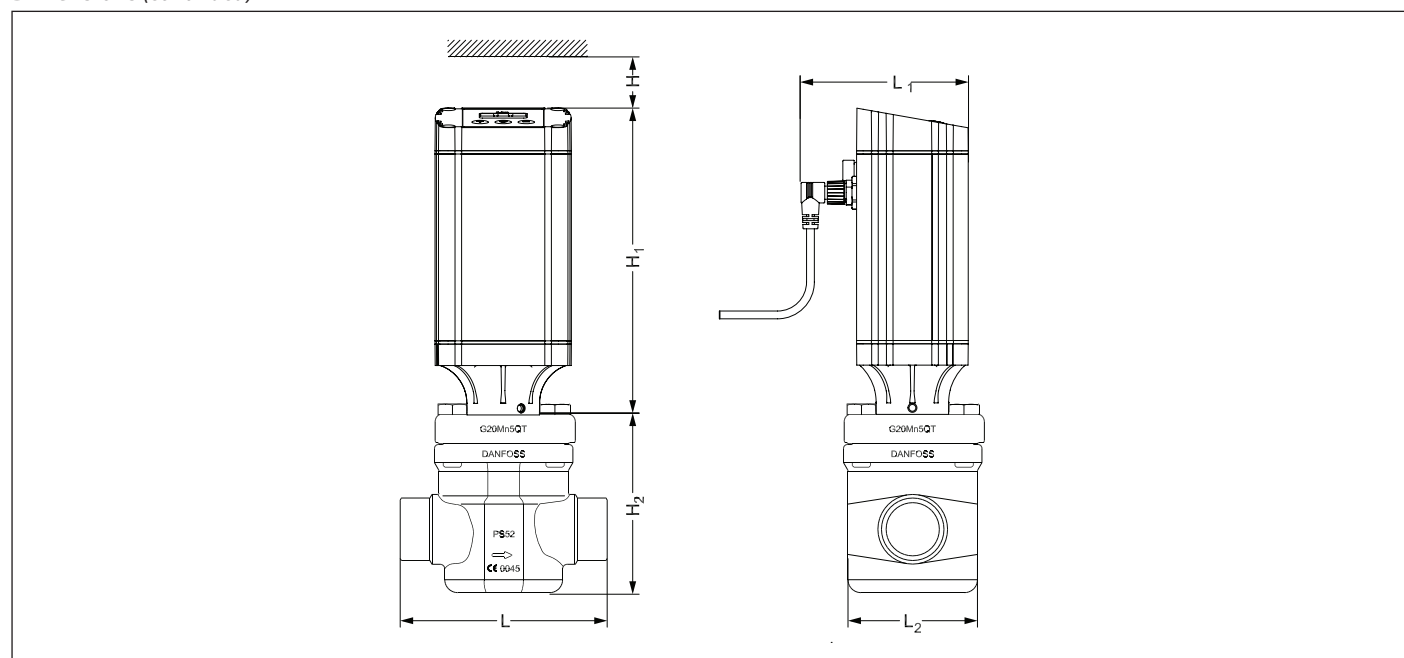


Connection		H	H ₁	H ₂	L	L ₁	L ₂	Weight ICM incl. ICAD
25 A (1 in.)	mm	40	195	85	107	102	65	3 kg
	in.	1.58	7.68	3.35	4.21	4.02	2.56	6.6 lb.
20 A (¾ in.)	mm	40	195	85	107	102	65	3 kg
	in.	1.58	7.68	3.35	4.21	4.02	2.56	6.6 lb.
20 SOC (¾ in.)	mm	40	195	85	107	102	65	3 kg
	in.	1.58	7.68	3.35	4.21	4.02	2.56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

A = Butt-weld ANSI; SOC = Socket weld ANSI; ODS = Solder ANSI; FPT = Female Pipe Thread

ICM 25 / ICAD 600A

Dimensions (continued)

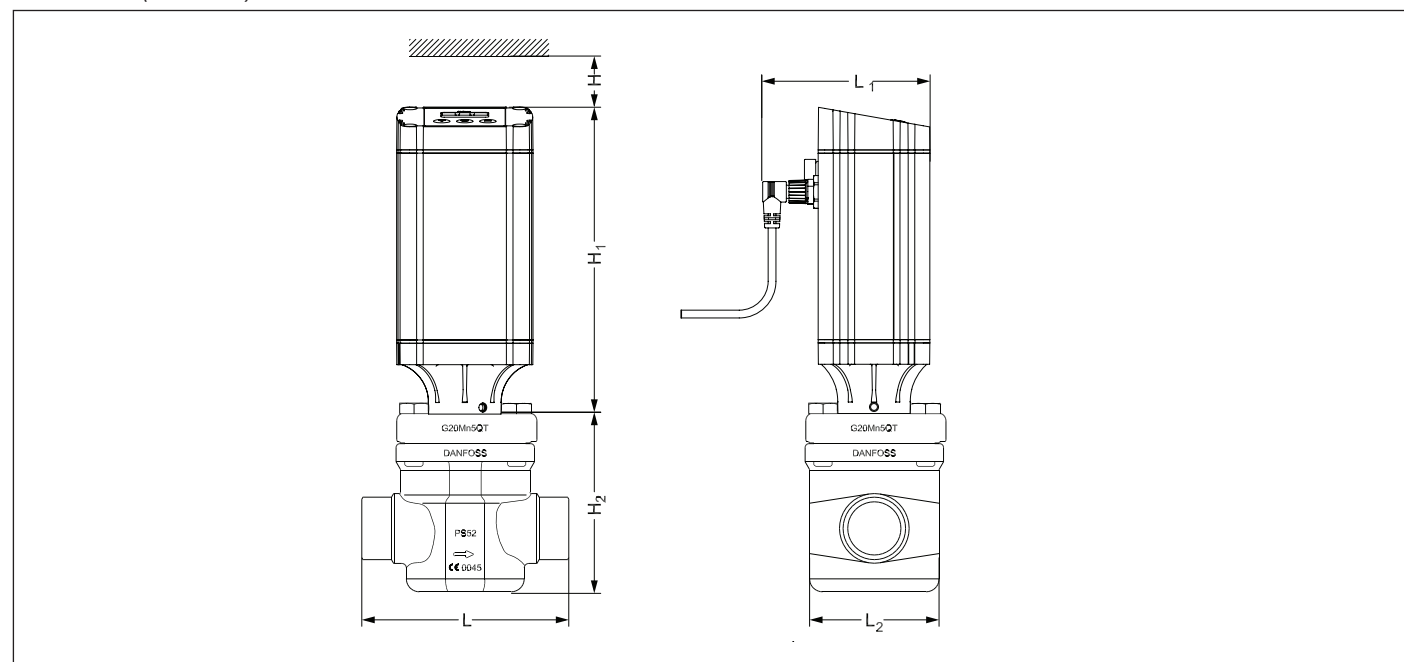


Connection		H	H ₁	H ₂	L	L ₁	L ₂	Weight ICM incl. ICAD
20 A (¾ in.)	mm	40	195	99	135	102	84	4.1 kg
	in.	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
25 A (1 in.)	mm	40	195	99	135	102	84	4.1 kg
	in.	1.58	7.68	3.90	5.31	4.02	3.31	8.8 lb.
32 A (1 ¼ in.)	mm	40	195	99	135	102	84	4.1 kg
	in.	1.58	7.68	3.90	5.31	4.02	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 ODS (7/8 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 ODS (1 1/8 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 ODS (1 ¾ 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.
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.

A = Butt-weld ANSI; SOC = Socket weld ANSI; ODS = Solder ANSI; FPT = Female Pipe Thread

ICM 32 / ICAD 600A

Dimensions (continued)

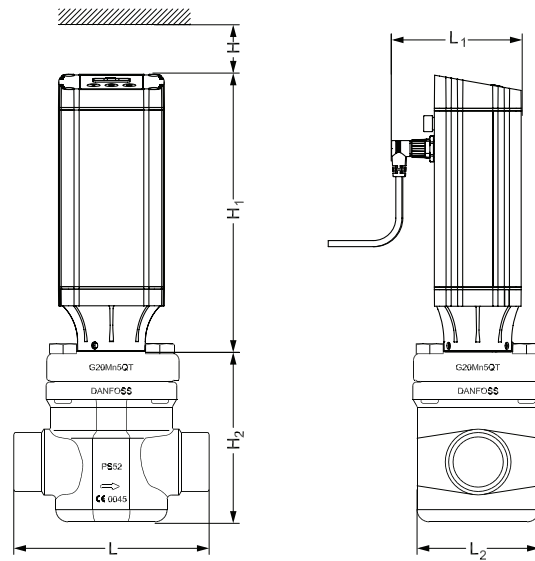


Connection		H	H ₁	H ₂	L	L ₁	L ₂	Weight ICM incl. ICAD
32 A (1 ¼ in.)	mm	40	195	117	145	102	102	5.8 kg
	in.	1.58	7.68	4.61	5.71	4.02	4.02	11.0 lb.
40 A (1 ½ in.)	mm	40	195	117	145	102	102	5.8 kg
	in.	1.58	7.68	4.61	5.71	4.02	4.02	11.0 lb.
32 SOC (1 ¼ in.)	mm	40	195	117	147	102	102	5.8 kg
	in.	1.58	7.68	4.61	5.79	4.02	4.02	11.0 lb.
35 ODS (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 ODS (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.

A = Butt-weld ANSI; SOC = Socket weld ANSI; ODS = Solder ANSI

ICM 40 / ICAD 1200A

Dimensions (continued)

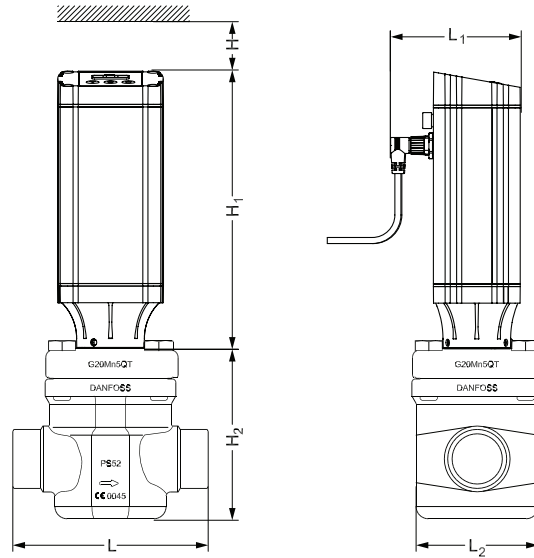


Connection		H	H ₁	H ₂	L	L ₁	L ₂	Weight ICM incl. ICAD
40 A (1 ½ in.)	mm	45	219	131	160	102	107	7.8 kg
	in.	1.77	8.62	5.16	6.30	4.02	4.21	17.2 lb.
50 A (2 in.)	mm	45	219	131	180	102	107	7.8 kg
	in.	1.77	8.62	5.16	7.09	4.02	4.21	17.2 lb.
40 SOC (1 ½ in.)	mm	45	219	131	180	102	107	7.8 kg
	in.	1.77	8.62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

A = Butt-weld ANSI; SOC = Socket weld ANSI; ODS = Solder ANSI

ICM 50 / ICAD 1200A

Dimensions (continued)

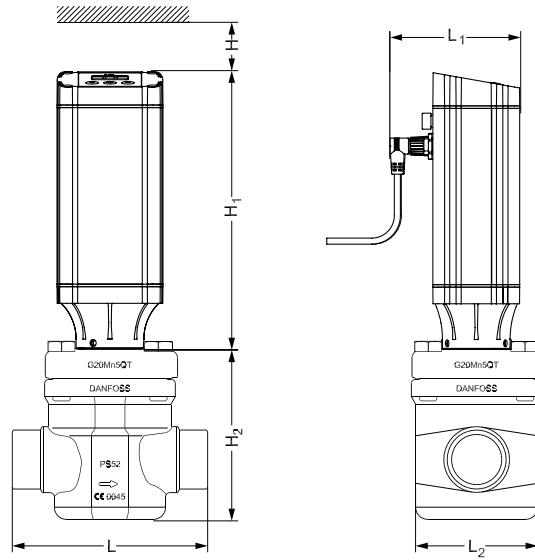


Connection		H	H ₁	H ₂	L	L ₁	L ₂	Weight ICM incl. ICAD
50 A (2 in.)	mm	45	219	159	200	102	125	11.1 kg
	in.	1.77	8.62	6.26	7.87	4.02	4.92	24.4 lb.
65 A (2 ½ in.)	mm	45	219	159	210	102	125	11.1 kg
	in.	1.77	8.62	6.26	8.27	4.02	4.92	24.4 lb.
50 SOC (2 in.)	mm	45	219	159	216	102	125	11.1 kg
	in.	1.77	8.62	6.26	8.50	4.02	4.92	24.4 lb.
54 ODS (2 ⅛ 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.

A = Butt-weld ANSI ; SOC = Socket weld ANSI ; ODS = Solder ANSI

ICM 65 / ICAD 1200A

Dimensions (continued)

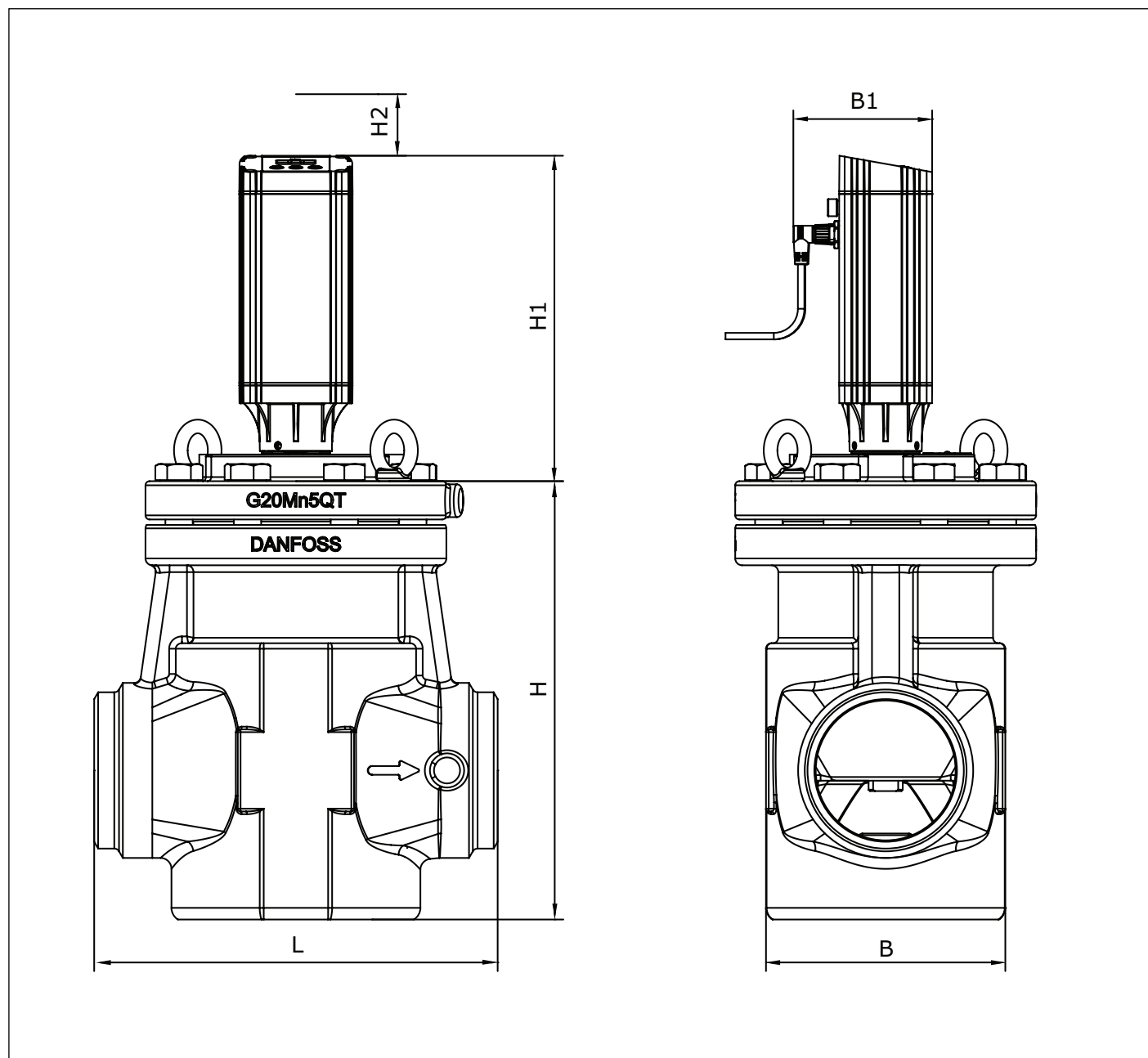


Connection		H	H ₁	H ₂	L	L ₁	L ₂	Weight ICM incl. ICAD
65 A (2 ½ in.)	mm	45	219	188	230	102	139	16.6 kg
	in.	1.77	8.62	7.40	9.06	4.02	5.47	36.5 lb
80 A (3 in.)	mm	45	219	188	245	102	139	16.6 kg
	in.	1.77	8.62	7.40	9.65	4.02	5.47	36.5 lb
65 SOC (2 ½ in.)	mm	45	219	188	230	102	139	16.6 kg
	in.	1.77	8.62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

A = Butt-weld ANSI; SOC = Socket weld ANSI; ODS = Solder ANSI

ICM 100 / ICAD 1200A

Dimensions (continued)

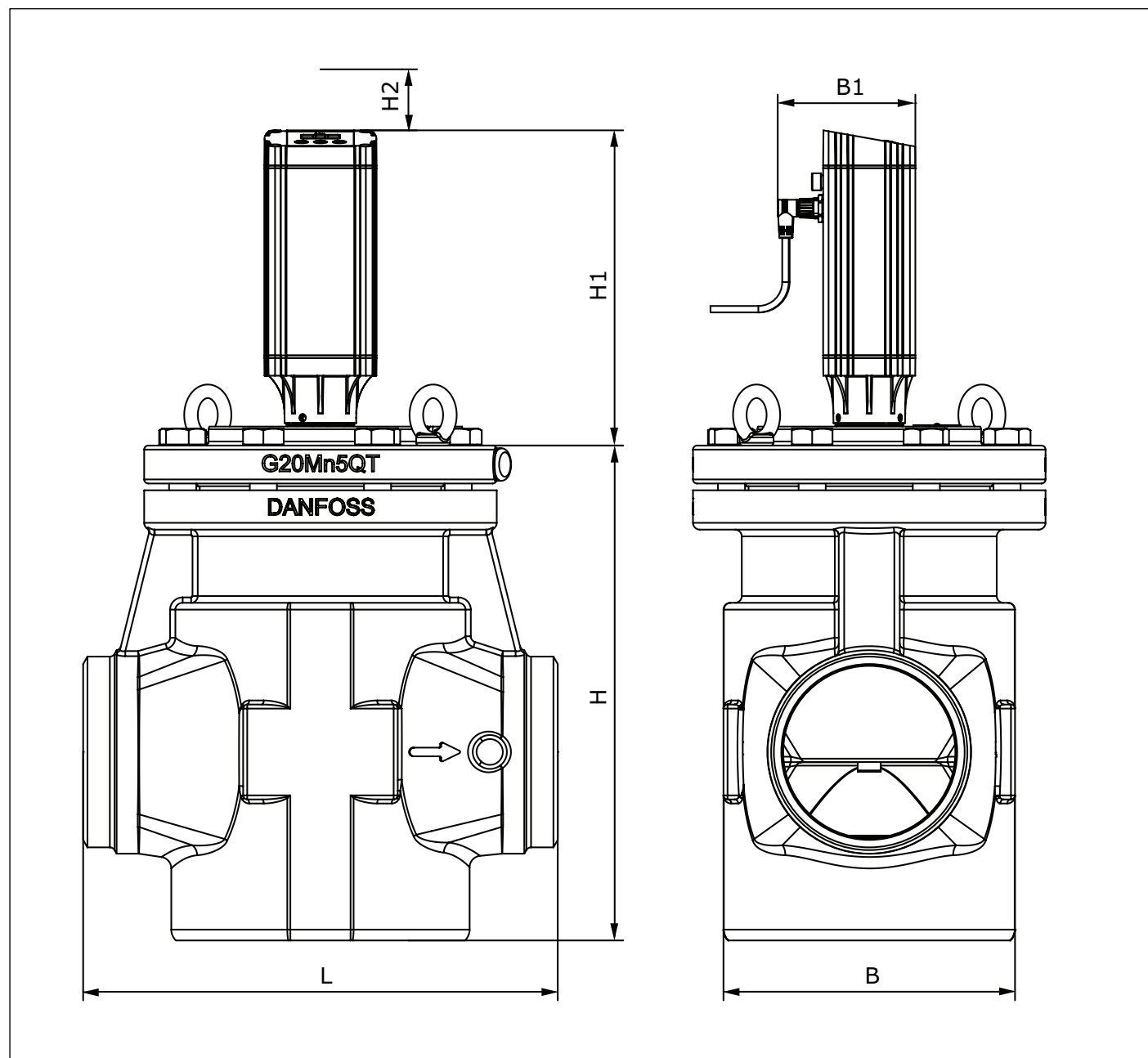


Connection		H	H ₁	H ₂	L	B	B ₁	Weight ICM incl. ICAD
100 A (4 in.)	mm	321	238	45	295	175	102	44 kg.
	in.	12.64	9.37	1.77	11.61	6.89	4.02	97 lb.

A = Butt-weld ANSI

ICM 125 / ICAD 1200A

Dimensions (continued)

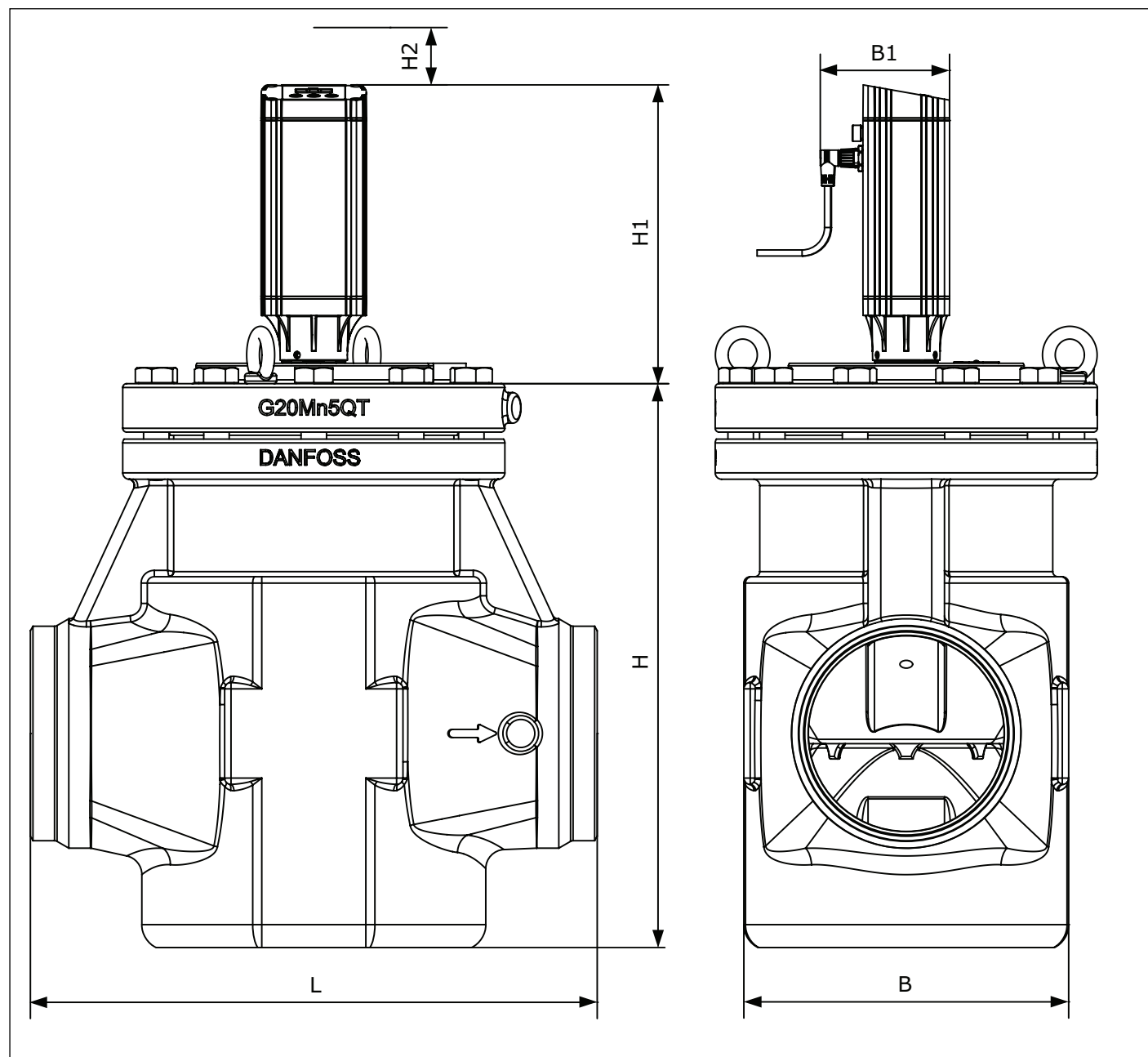


Connection		H	H ₁	H ₂	L	B	B ₁	Weight ICM incl. ICAD
125 A (5 in.)	mm	365	238	45	350	215	102	55 kg
	in.	14.37	9.37	1.77	13.78	8.47	4.02	121 lb.

A = Butt-weld ANSI

ICM 150 / ICAD 1200A

Dimensions (continued)

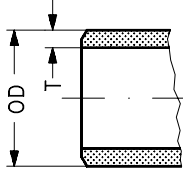


Connection		H	H ₁	H ₂	L	B	B ₁	Weight ICM incl. ICAD
150 A (6 in.)	mm	443	238	45	445	255	102	95 kg
	in.	17.77	9.37	1.77	17.52	10.04	4.02	209 lb.

A = Butt-weld ANSI

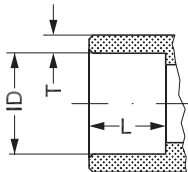
Connections

BW: Butt-weld ANSI (B 36.10)



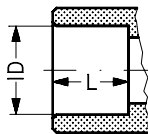
Size mm	Size in.	OD mm	T mm	OD in.	T in.	Schedule	
(20)	¾	26.9	4.0	1.059	0.158	80	
(25)	1	33.7	4.6	1.327	0.181	80	
(32)	1 ¼	42.4	4.9	1.669	0.193	80	
(40)	1 ½	48.3	5.1	1.902	0.201	80	
(50)	2	60.3	3.9	2.37	0.15	40	
(65)	2 ½	73.0	5.2	2.87	0.20	40	
(80)	3	88.9	5.5	3.50	0.22	40	
(100)	4	114.3	6	4.5	0.24		
(125)	5	140.7	6.5	5.5	0.26		
(150)	6	168.3	7.1	6.6	0.28		

*SOC:
Socket welding ANSI (B 16.11)*



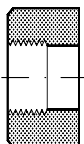
Size mm	Size in.	ID mm	T mm	ID in.	T in.	L mm	L in.
(20)	¾	27.2	4.6	1.071	0.181	13	0.51
(25)	1	33.9	7.2	1.335	0.284	13	0.51
(32)	1 ¼	42.7	6.1	1.743	0.240	13	0.51
(40)	1 ½	48.8	6.6	1.921	0.260	13	0.51
(50)	2	61.2	6.2	2.41	0.24	16	0.63
(65)	2 ½	74	8.8	2.91	0.344	16	0.63

ODS: Soldering (ANSI B 16.22)



	⅝			0.625			0.591
	⅞			0.875			0.650
	1 ⅝			1.125			1.024
	1 ⅜			1.375			0.984
	1 ⅝			1.625			1.102
	2 ⅝			2.125			1.300
	2 ⅝			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)	1 ¼	(1 ¼ x 11.5 NPT)	

