Motor operated valves and Actuators
ICM 20-150 and ICAD 600A-1200A

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 three 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.
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<td>45</td>
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<td>ICM 32 / ICAD 600 A</td>
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</tr>
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<td>ICM 40 / ICAD 1200A</td>
<td>47</td>
</tr>
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Introduction

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

<table>
<thead>
<tr>
<th>Actuator</th>
<th>ICAD 600A</th>
<th>ICAD 1200A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICM 20</td>
<td>ICM 40</td>
<td></td>
</tr>
<tr>
<td>ICM 25</td>
<td>ICM 50</td>
<td></td>
</tr>
<tr>
<td>ICM 32</td>
<td>ICM 65</td>
<td></td>
</tr>
<tr>
<td>ICM 100</td>
<td></td>
<td>ICM 125</td>
</tr>
<tr>
<td>ICM 150</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 an 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.

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)

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DKRCI.PD:HT0.B8.22 / 520H5716 3
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.

<table>
<thead>
<tr>
<th>ICV 20</th>
<th>ICV 25</th>
<th>ICV 32</th>
<th>ICV 40</th>
<th>ICV 50</th>
<th>ICV 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>![I]</td>
<td><img src="image" alt="ICV 25" /></td>
<td><img src="image" alt="ICV 32" /></td>
<td><img src="image" alt="ICV 40" /></td>
<td><img src="image" alt="ICV 50" /></td>
<td><img src="image" alt="ICV 65" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ICV 100</th>
<th>ICV 125</th>
<th>ICV 150</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="ICV 100" /></td>
<td><img src="image" alt="ICV 125" /></td>
<td><img src="image" alt="ICV 150" /></td>
</tr>
</tbody>
</table>

- 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.

<table>
<thead>
<tr>
<th>A</th>
<th>SOC</th>
<th>SA</th>
<th>FPT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butt-weld ANSI</td>
<td>Socket weld ANSI</td>
<td>Solder ANSI</td>
<td>Female Pipe Thread</td>
</tr>
</tbody>
</table>
The ICM Concept (continued)

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>K_v (m³/h)</th>
<th>C_v (USgal/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20A-33</td>
<td>20</td>
<td>0.2</td>
<td>0.23</td>
</tr>
<tr>
<td>ICM 20-A</td>
<td></td>
<td>0.6</td>
<td>0.7</td>
</tr>
<tr>
<td>ICM 20-B</td>
<td></td>
<td>2.4</td>
<td>2.8</td>
</tr>
<tr>
<td>ICM 20-C</td>
<td></td>
<td>4.6</td>
<td>5.3</td>
</tr>
<tr>
<td>ICM 25-A</td>
<td>25</td>
<td>6</td>
<td>7.0</td>
</tr>
<tr>
<td>ICM 25-B</td>
<td></td>
<td>12</td>
<td>13.9</td>
</tr>
<tr>
<td>ICM 32-A</td>
<td>32</td>
<td>9</td>
<td>10.4</td>
</tr>
<tr>
<td>ICM 32-B</td>
<td></td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>ICM 40-A</td>
<td>40</td>
<td>15</td>
<td>17</td>
</tr>
<tr>
<td>ICM 40-B</td>
<td></td>
<td>26</td>
<td>30</td>
</tr>
<tr>
<td>ICM 50-A</td>
<td>50</td>
<td>23</td>
<td>27</td>
</tr>
<tr>
<td>ICM 50-B</td>
<td></td>
<td>40</td>
<td>46</td>
</tr>
<tr>
<td>ICM 65-A</td>
<td>65</td>
<td>35</td>
<td>41</td>
</tr>
<tr>
<td>ICM 65-B</td>
<td></td>
<td>70</td>
<td>81</td>
</tr>
<tr>
<td>ICM 100-B</td>
<td>100</td>
<td>142</td>
<td>167</td>
</tr>
<tr>
<td>ICM 125-B</td>
<td>125</td>
<td>223</td>
<td>260</td>
</tr>
<tr>
<td>ICM 150-B</td>
<td>150</td>
<td>370</td>
<td>430</td>
</tr>
</tbody>
</table>

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

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.

<table>
<thead>
<tr>
<th>ICM valves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal bore</td>
</tr>
<tr>
<td>Classified for</td>
</tr>
<tr>
<td>Category</td>
</tr>
</tbody>
</table>

Refrigerants
- ICM 20, ICM 100, ICM 125 and ICM 150:
  Applicable to HCFC, non flammable HFC, R717 (Ammonia) and R744 (CO₂)
- ICM 25-65:
  Applicable to HCFC, non flammable HFC, R717 (Ammonia), R744 (CO₂) and R1234ze

Use with flammable hydrocarbons cannot be recommended. For further information please contact your local Danfoss sales company.

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

When used in liquid refrigerant above +75°C (+167°F), please contact Danfoss

Pressure
The valve is designed for:
Max. working pressure: 52 bar g (754 psi g)

Surface protection
ICM 20-150:
The external surface is zinc-chromated to provide good corrosion protection.

Max. opening pressure differential (MOPD)
- ICM 20-32: 52 bar (750 psi)
- ICM 40: 40 bar (580 psi)
- ICM 50: 30 bar (435 psi)
- ICM 65: 20 bar (290 psi)
- ICM 100: 20 bar (290 psi)
- ICM 125: 20 bar (290 psi)
- ICM 150: 20 bar (290 psi)

Time to move from Closed to Open position or in reverse order with maximum selected speed at ICAD.
- ICM 20: 3 Sec.
- ICM 25: 7 Sec.
- ICM 32: 8 Sec.
- ICM 40: 10 Sec.
- ICM 50: 13 Sec.
- ICM 65: 13 Sec.
- ICM 100: 25 Sec.
- ICM 125: 35 Sec.
- ICM 150: 45 Sec.
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

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 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 (P₁) acting on the underside of the PTFE valve seat (e) also passes through the hollow piston assembly (d) on to the top of the piston (d) and balances the pressure acting on the piston (d). Any trapped liquid across the throttle cone (g) is allowed to equalise down to the valve outlet without affecting the valve performance.

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

ICAD
There are two sizes of ICAD actuator that covers the range of valves from ICM 20 to ICM 150.
The actuators have a fully weather protected enclosure with none of the moving parts exposed to the environment.
The fast acting actuators and balanced valve design results in the valve being able to move from the fully closed to the fully open position in between 3 to 45 seconds depending on valve size and ICAD setup.
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

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.

<table>
<thead>
<tr>
<th>ICM 20</th>
<th>ICM 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM 25</td>
<td>ICM 50</td>
</tr>
<tr>
<td>ICM 32</td>
<td>ICM 65</td>
</tr>
<tr>
<td>ICM 100</td>
<td></td>
</tr>
<tr>
<td>ICM 125</td>
<td></td>
</tr>
<tr>
<td>ICM 150</td>
<td></td>
</tr>
</tbody>
</table>

Materials
- Housing: Aluminium
- Top part of ICAD: PBT thermo plastic

Weight
- ICAD 600A: 1.2 kg (2.64 lb)
- ICAD 1200A: 1.9 kg (4.19 lb)

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

Enclosure
- IP 67 (~NEMA 6)

Electrical data
Supply voltage is galvanic isolated from Input/Output.

Supply voltage:
- Load: 24 V d.c., + 10% / -15%
- ICAD 600A: 1.2 A
- ICAD 1200A: 2.0 A

Fail safe supply:
- Load: Min. 19 V d.c., max. 26.4 V d.c.
- 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 d.c
- Load: 10 kΩ

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

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

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

Battery capacity:
For each open/closed cycle

Electrical data

<table>
<thead>
<tr>
<th>Speed Parameter i04</th>
<th>ICM 20</th>
<th>ICM 25</th>
<th>ICM 32</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICAD 600A</td>
<td>Max. (i04 = 100)</td>
<td>2 mAh</td>
<td>5 mAh</td>
</tr>
<tr>
<td></td>
<td>Min. (i04 = 1)</td>
<td>200 mAh</td>
<td>467 mAh</td>
</tr>
<tr>
<td>Speed Parameter i04</td>
<td>ICM 40</td>
<td>ICM 50</td>
<td>ICM 65</td>
</tr>
<tr>
<td>ICAD 1200A</td>
<td>Max. (i04 = 100)</td>
<td>17 mAh</td>
<td>22 mAh</td>
</tr>
<tr>
<td></td>
<td>Min. (i04 = 1)</td>
<td>1667 mAh</td>
<td>2167 mAh</td>
</tr>
<tr>
<td>Speed Parameter i04</td>
<td>ICM 100</td>
<td>ICM 125</td>
<td>ICM 150</td>
</tr>
<tr>
<td>ICAD 1200A</td>
<td>Max. (i04 = 100)</td>
<td>54 mAh</td>
<td>65 mAh</td>
</tr>
<tr>
<td></td>
<td>Min. (i04 = 1)</td>
<td>5318 mAh</td>
<td>6351 mAh</td>
</tr>
</tbody>
</table>

Cable connections

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Black</td>
<td>Common Alarm</td>
</tr>
<tr>
<td>B</td>
<td>Brown</td>
<td>ICM fully open</td>
</tr>
<tr>
<td>C</td>
<td>Red</td>
<td>ICM fully closed</td>
</tr>
<tr>
<td>D</td>
<td>Orange</td>
<td>GND ground</td>
</tr>
<tr>
<td>E</td>
<td>Yellow</td>
<td>+ 0/4 - 20 mA Input*</td>
</tr>
<tr>
<td>F</td>
<td>Green</td>
<td>+ 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</td>
</tr>
<tr>
<td>G</td>
<td>Blue</td>
<td>+ 0/4 - 20 mA Output*</td>
</tr>
</tbody>
</table>

Power connector/cable (3 wires)

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

* 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
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

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.

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.

<table>
<thead>
<tr>
<th>Description</th>
<th>ICAD alarm text</th>
<th>Definition of event</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Valve type selected</td>
<td>A1</td>
<td>Alarm ON</td>
<td>At start-up A1 will be displayed until parameter ¡26 is set</td>
</tr>
<tr>
<td>Controller fault</td>
<td>A2</td>
<td>Alarm ON</td>
<td>Internal fault inside electronics. Carry out:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1) Power OFF and Power ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If A2 still active: -</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2) Make a Reset to factory setting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If A2 still active. Return ICAD to Danfoss</td>
</tr>
<tr>
<td>Analog input error</td>
<td>A3</td>
<td>Alarm ON</td>
<td>Not active if ¡01 = 2, or ¡02 = 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>When ¡03 = 1 and AI A &gt; 22 mA</td>
</tr>
<tr>
<td>Low voltage of fail safe</td>
<td>A4</td>
<td>Alarm ON</td>
<td>If 5 V &lt; fail safe supply &lt; 18 V. Enabled by ¡08</td>
</tr>
<tr>
<td>Supply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check supply to ICAD</td>
<td>A5</td>
<td>Alarm ON</td>
<td>If supply voltage &lt; 18 V</td>
</tr>
<tr>
<td>Calibration extended failed</td>
<td>A6</td>
<td>Alarm ON</td>
<td>Check valve type selected.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check presence of foreign debris inside ICM valve</td>
</tr>
<tr>
<td>Valve locked</td>
<td>A9</td>
<td>Alarm ON</td>
<td>Only active if ¡16 = 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>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</td>
</tr>
</tbody>
</table>

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

If more than one alarm is active at the same time the alarm with the highest priority will take preference. A1 has the highest priority, A9 the lowest.

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

All alarms will automatically reset them-selves when they physically disappear.

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

Parameter list - Valid for software versions ¡58=9 and parameter ¡59=18 and onwards

<table>
<thead>
<tr>
<th>Description</th>
<th>ICAD parameter</th>
<th>Min</th>
<th>Max</th>
<th>Factory Setting</th>
<th>Setting stored</th>
<th>Pass word</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD (Opening degree)</td>
<td>¡01 ¡05</td>
<td></td>
<td>0</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>ICM valve Opening Degree in % is displayed during normal operation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Running display value (see ¡01 , ¡05).</td>
</tr>
<tr>
<td>Main switch for manual</td>
<td>¡01 ¡05</td>
<td></td>
<td>2</td>
<td>1</td>
<td>Yes</td>
<td>No</td>
<td>Internal main switch</td>
</tr>
<tr>
<td>operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1: Normal operation. Valve Opening Degree will be flashing. With the down</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>arrow and the up arrow push buttons the OD can be entered manually.</td>
</tr>
<tr>
<td>Operation mode</td>
<td>¡02 ¡05</td>
<td></td>
<td>2</td>
<td>1</td>
<td>Yes</td>
<td>No</td>
<td>Operation mode</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1: Modulating – ICM positioning according to Analog Input (see ¡03)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2: ON/OFF - operating the ICM valve like an ON/OFF solenoid valve</td>
</tr>
<tr>
<td>Analog input signal</td>
<td>¡03 ¡05</td>
<td></td>
<td>4</td>
<td>2</td>
<td>Yes</td>
<td>No</td>
<td>Type of AI signal from external controller</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1: 0-20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2: 4-20 mA</td>
</tr>
<tr>
<td>Speed</td>
<td>¡04 ¡05</td>
<td></td>
<td>1</td>
<td>100</td>
<td>50/ 100</td>
<td>Yes</td>
<td>Speed can be set in % of full speed. Max. speed is 100 % - Not active in</td>
</tr>
<tr>
<td>In Modulating Mode</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>manual operation ¡01 = 2</td>
</tr>
<tr>
<td>Opening/closing speed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>If ¡26= 1 - then factory setting =100</td>
</tr>
<tr>
<td>In ON/OFF Mode</td>
<td>¡04 ¡05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>If ¡26= 4 - when factory setting &lt;50</td>
</tr>
<tr>
<td>Opening speed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>If ICM is opening and ¡04 &lt; 33 or ICM is closing and ¡14 &lt; 33 =&gt; Low</td>
</tr>
<tr>
<td>Automatic calibration</td>
<td>¡05 ¡05</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>No</td>
<td>No</td>
<td>Not active before ¡26 has been operated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Always resets to 0 after calibration. CA will flash in the display</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>during calibration, if Enter push button has been activated for two</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>seconds 0: No Calibration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1: Normal forced calibration - CA flashing slowly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2: Extended calibration – CA flashing rapidly</td>
</tr>
</tbody>
</table>

to be continued...
### Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

<table>
<thead>
<tr>
<th>Description</th>
<th>ICAD parameter</th>
<th>Min</th>
<th>Max</th>
<th>Factory Setting</th>
<th>Setting stored</th>
<th>Pass word</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog output signal</td>
<td>¡06</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>Yes</td>
<td>No</td>
<td>Type of A0 signal for ICM valve position</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0: No signal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1: 0-20 mA</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2: 4-20 mA</td>
</tr>
<tr>
<td>Fail safe</td>
<td>¡07</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>Yes</td>
<td>No</td>
<td>Define condition at power cut and fail safe supply is installed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1: Close valve</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2: Open Valve</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>3: Maintain valve position</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4: Go to OD given by ¡12</td>
</tr>
<tr>
<td>Fail safe supply</td>
<td>¡08</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>Yes</td>
<td>Yes</td>
<td>Fail safe supply connected and enable of A4 alarm:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0: No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1: Yes</td>
</tr>
<tr>
<td>DI function for on/off</td>
<td>¡09</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>Yes</td>
<td>No</td>
<td>Define function when DI is ON (short circuited DI terminals) when ¡02 = 2</td>
</tr>
<tr>
<td>operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1: Open ICM valve (DI = OFF = &gt; Close ICM valve)</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>2: Close ICM valve (DI = OFF = &gt; Open ICM valve)</td>
</tr>
<tr>
<td>Password</td>
<td>¡10</td>
<td>0</td>
<td>199</td>
<td>0</td>
<td>No</td>
<td>-</td>
<td>Enter number to access password protected parameters: ¡26</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Password = 11</td>
</tr>
<tr>
<td>Old Alarms</td>
<td>¡11</td>
<td>A1</td>
<td>A99</td>
<td>-</td>
<td>No</td>
<td>No</td>
<td>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.</td>
</tr>
<tr>
<td>OD at power cut.</td>
<td>¡12</td>
<td>0</td>
<td>100</td>
<td>50</td>
<td>Yes</td>
<td>No</td>
<td>Only active if ¡07 = 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>If fail safe supply is connected and power cut occurs, the ICM will go to the specified OD.</td>
</tr>
<tr>
<td>Inverse operation</td>
<td>¡13</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>Yes</td>
<td>No</td>
<td>When ¡02 = 1</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td>0: Increasing Analog Input signal =&gt; Increasing ICM Opening Degree</td>
</tr>
<tr>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td>1: Increasing Analog Input signal =&gt; Decreasing ICM Opening Degree</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>When ¡02 = 3</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>0: DI1 = ON, DI2 = OFF =&gt; Increasing ICM Opening Degree</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DI1 = OFF, DI2 = ON =&gt; Decreasing ICM Opening Degree</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>DI1 = DI2 = OFF =&gt; ICAD/ICM maintain current position</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>DI1 = DI2 = ON =&gt; ICAD/ICM maintain current position</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>DI1 = DI2 = OFF =&gt; ICAD/ICM maintain current position</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DI1 = DI2 = ON =&gt; ICAD/ICM maintain current position</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>DI1 = DI2 = OFF =&gt; ICAD/ICM maintain current position</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DI1 = DI2 = ON =&gt; ICAD/ICM maintain current position</td>
</tr>
<tr>
<td>In ON/OFF Mode</td>
<td>¡14</td>
<td>0</td>
<td>100</td>
<td>50/ 100</td>
<td>Yes</td>
<td>No</td>
<td>See ¡04.</td>
</tr>
<tr>
<td>Closing speed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>If ¡26= 1 - 3 then factory setting = 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>If ¡26= 4 - 9 then factory setting = 50</td>
</tr>
<tr>
<td>Manual mode OD</td>
<td>¡15</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>No</td>
<td>No</td>
<td>When ¡01 = 2, ¡15 is initial OD % when put in manual mode.</td>
</tr>
<tr>
<td>Encoder operation (only valid for ICM 1200A)</td>
<td>¡16</td>
<td>0</td>
<td>1</td>
<td>0/1</td>
<td>Yes</td>
<td>Yes</td>
<td>Note: Password protected. Password = 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>If ¡26= 1 - 3 then factory setting = 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>If ¡26= 4 - 6</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>If ¡26= 7 - 9 then factory setting = 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0: Encoder disabled</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1: Encoder enabled</td>
</tr>
<tr>
<td>ICM configuration</td>
<td>¡26</td>
<td>0</td>
<td>9</td>
<td>0</td>
<td>Yes</td>
<td>Yes</td>
<td>Note: Password protected. Password = 11 (see parameter ¡10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0: No valve selected. Alarm A1 will become active.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1: ICM 20 with ICAD 600A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2: ICM 25 with ICAD 600A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3: ICM 32 with ICAD 600A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4: ICM 40 with ICAD 1200A</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>5: ICM 50 with ICAD 1200A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6: ICM 65 with ICAD 1200A</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7: ICM 100 with ICAD 1200A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8: ICM 125 with ICAD 1200A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9: ICM 150 with ICAD 1200A</td>
</tr>
</tbody>
</table>
### Service parameters (view only)

<table>
<thead>
<tr>
<th>Description</th>
<th>ICAD parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD %</td>
<td>i50</td>
<td>0</td>
<td>100</td>
<td>%</td>
<td>ICM valve Opening Degree</td>
</tr>
<tr>
<td>AI [mA]</td>
<td>i51</td>
<td>0</td>
<td>100</td>
<td>mA</td>
<td>Analog input signal</td>
</tr>
<tr>
<td>AI [V]</td>
<td>i52</td>
<td>0</td>
<td>100</td>
<td>V</td>
<td>Analog input signal</td>
</tr>
<tr>
<td>AO [mA]</td>
<td>i53</td>
<td>0</td>
<td>100</td>
<td>mA</td>
<td>Analog output signal</td>
</tr>
<tr>
<td>DI Digital input Status</td>
<td>i54</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>DI signals. Depending of i02</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>If i02 = 2, one digit is shown.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 : DI1 = OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 : DI1 = ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>If i02 = 3, two digits are shown.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>00 : DI1 = OFF, DI2 = OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10 : DI1 = ON, DI2 = OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>01 : DI1 = OFF, DI2 = ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11 : DI1 = ON, DI2 = ON</td>
</tr>
<tr>
<td>DO Status for ICM closed</td>
<td>i55</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>1 : DO = ON when OD &lt; 3 %;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 : DO = OFF</td>
</tr>
<tr>
<td>DO status for ICM opened</td>
<td>i56</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>1 : DO = ON when OD &gt; 97 %;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 : DO = OFF</td>
</tr>
<tr>
<td>DO Alarm status</td>
<td>i57</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>1 : DO = ON when a Alarm is detected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 : DO = OFF</td>
</tr>
<tr>
<td>Display mP SW ver.</td>
<td>i58</td>
<td>0</td>
<td>100</td>
<td>-</td>
<td>Software version for display microprocessor</td>
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<tr>
<td>Motor mP SW ver.</td>
<td>i59</td>
<td>0</td>
<td>100</td>
<td>-</td>
<td>Software version for motor microprocessor</td>
</tr>
</tbody>
</table>

### 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.
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

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 (Germanisher Lloyd).
- DIN rail mounting.
- LED indication
  - Green (Power ON)
  - Yellow (Flashing: charging, Constant: Buffer mode (Failsafe supply to ICAD))
  - Red (Battery fully discharged/Battery faulty)
- 24 V d.c 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).

Code number: 027H0182

For further information please see the instruction PIHV0B.

* 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.
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

ICAD-UPS applications

Separate 24 V d.c transformer for both ICAD-UPS and ICAD 600A/1200A

One 24 V d.c transformer for ICAD-UPS and ICAD 600A/1200A
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

Material specification

<table>
<thead>
<tr>
<th>No.</th>
<th>Part</th>
<th>Material</th>
<th>EN</th>
<th>ASTM</th>
<th>JIS</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Housing</td>
<td>Low temperature steel</td>
<td>G20MnSQT, EN 10213-3</td>
<td>LCC, A352</td>
<td>SCPL1, G5151</td>
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<td>2</td>
<td>Top cover</td>
<td>Low temperature steel</td>
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<td>LCC, A352</td>
<td>SCPL1, G5151</td>
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<td>2a</td>
<td>O-ring</td>
<td>Cloroprene (Neoprene)</td>
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<td></td>
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<tr>
<td>2b</td>
<td>O-ring</td>
<td>Cloroprene (Neoprene)</td>
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<td></td>
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<tr>
<td>2c</td>
<td>O-ring</td>
<td>Cloroprene (Neoprene)</td>
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<td></td>
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<tr>
<td>3</td>
<td>Function module</td>
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<td></td>
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<tr>
<td>4</td>
<td>Gasket</td>
<td>Cloroprene (Neoprene)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>Gasket</td>
<td>Fiber, non-asbestos</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Bolts</td>
<td>Stainless steel</td>
<td>A-70, EN 1515-1</td>
<td>Grade B8 A320</td>
<td>A2-70, B 1054</td>
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<tr>
<td>11</td>
<td>Actuator</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>12</td>
<td>O-ring</td>
<td>Cloroprene (Neoprene)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>O-ring</td>
<td>Cloroprene (Neoprene)</td>
<td></td>
<td></td>
<td></td>
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<td>14</td>
<td>Seat</td>
<td>High density polymer</td>
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Bolt sizes (pos. 5)

<table>
<thead>
<tr>
<th>Type</th>
<th>Screw</th>
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</thead>
<tbody>
<tr>
<td>ICM 20</td>
<td>M10 × 50 A2-70 DIN 931</td>
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</tr>
<tr>
<td>ICM 25</td>
<td>M12 × 30 A2-70 DIN 933</td>
<td></td>
</tr>
<tr>
<td>ICM 32</td>
<td>M14 × 35 A2-70 DIN 933</td>
<td></td>
</tr>
<tr>
<td>ICM 40</td>
<td>M14 × 35 A2-70-933</td>
<td></td>
</tr>
<tr>
<td>ICM 50</td>
<td>M16 × 40 A2-70-933</td>
<td></td>
</tr>
<tr>
<td>ICM 65</td>
<td>M16 × 40 A2-70-933</td>
<td></td>
</tr>
</tbody>
</table>
ICM Application

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

Valve capacities for different refrigerants and applications are given in the following tables. Selection of ICM / ICS valves will be available with the DIRcalc 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/Liquid Make-up Applications

Correction factors
When dimensioning, multiply the evaporator capacity by a correction factor for subcooling $k$ dependent on the subcooling $\Delta t_{\text{sub}}$ just ahead of the valve. The corrected capacity* can then be found in the capacity table.

<table>
<thead>
<tr>
<th>Subcooling °F</th>
<th>3.6</th>
<th>7.2</th>
<th>18</th>
<th>27</th>
<th>36</th>
<th>45</th>
<th>54</th>
<th>63</th>
<th>72</th>
</tr>
</thead>
<tbody>
<tr>
<td>R717</td>
<td>1.01</td>
<td>1</td>
<td>0.98</td>
<td>0.96</td>
<td>0.94</td>
<td>0.92</td>
<td>0.91</td>
<td>0.89</td>
<td>0.87</td>
</tr>
<tr>
<td>R744</td>
<td>1.02</td>
<td>1</td>
<td>0.95</td>
<td>0.90</td>
<td>0.86</td>
<td>0.82</td>
<td>0.79</td>
<td>0.75</td>
<td>0.73</td>
</tr>
<tr>
<td>R134a</td>
<td>1.03</td>
<td>1</td>
<td>0.93</td>
<td>0.88</td>
<td>0.84</td>
<td>0.80</td>
<td>0.76</td>
<td>0.73</td>
<td>0.70</td>
</tr>
<tr>
<td>R404A</td>
<td>1.04</td>
<td>1</td>
<td>0.91</td>
<td>0.83</td>
<td>0.78</td>
<td>0.73</td>
<td>0.68</td>
<td>0.65</td>
<td>0.61</td>
</tr>
<tr>
<td>R22</td>
<td>1.03</td>
<td>1</td>
<td>0.94</td>
<td>0.90</td>
<td>0.87</td>
<td>0.83</td>
<td>0.80</td>
<td>0.77</td>
<td>0.74</td>
</tr>
</tbody>
</table>

*The capacity table is based on nominal conditions of subcooling just ahead of the valve of 7.2°F.

Calculation example:
An application has the following operating conditions:

- Refrigerant R717
- $T_r = +20°F$
- $T_e = +85°F$
- $Q_0 = 426$ TR
- $\Delta t_{\text{sub}} = 36°F$

Correction factor for subcooling: 0.94
Pressure drop across the valve: 167 psig - 48 psig = 119 psi
Corrected capacity: $426 \times 0.94 = 400$ TR
From the R717 capacity table ICM 20-C is selected with $Q_{\text{nom}}$ capacity 574 TR at 120 psi.

Note: It is common to select a valve with at 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

<table>
<thead>
<tr>
<th>Type</th>
<th>Cv</th>
<th>15</th>
<th>30</th>
<th>60</th>
<th>120</th>
<th>180</th>
<th>240</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20-A33</td>
<td>0.2</td>
<td>8.1</td>
<td>11.2</td>
<td>15.3</td>
<td>20.4</td>
<td>23.8</td>
<td>26.3</td>
</tr>
<tr>
<td>ICM20-A</td>
<td>0.7</td>
<td>24.5</td>
<td>33.9</td>
<td>46.3</td>
<td>61.8</td>
<td>72</td>
<td>79.3</td>
</tr>
<tr>
<td>ICM20-B</td>
<td>2.8</td>
<td>142</td>
<td>196</td>
<td>265</td>
<td>352</td>
<td>410</td>
<td>451</td>
</tr>
<tr>
<td>ICM20-C</td>
<td>5.3</td>
<td>235</td>
<td>321</td>
<td>432</td>
<td>570</td>
<td>660</td>
<td>730</td>
</tr>
<tr>
<td>ICM25-A</td>
<td>7</td>
<td>363</td>
<td>497</td>
<td>670</td>
<td>880</td>
<td>1025</td>
<td>1130</td>
</tr>
<tr>
<td>ICM32-A</td>
<td>10</td>
<td>523</td>
<td>720</td>
<td>970</td>
<td>1280</td>
<td>1490</td>
<td>1645</td>
</tr>
<tr>
<td>ICM40-A</td>
<td>17</td>
<td>975</td>
<td>1325</td>
<td>1780</td>
<td>2330</td>
<td>2705</td>
<td>3000</td>
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<tr>
<td>ICM50-A</td>
<td>27</td>
<td>1695</td>
<td>2310</td>
<td>3070</td>
<td>4030</td>
<td>4690</td>
<td>5170</td>
</tr>
<tr>
<td>ICM65-A</td>
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<td>3789</td>
<td>5061</td>
<td>6643</td>
<td>7708</td>
<td>8517</td>
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</table>

### Evaporating temperature 60°F

<table>
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<th>Type</th>
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<th>30</th>
<th>60</th>
<th>120</th>
<th>180</th>
<th>240</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20-A33</td>
<td>0.2</td>
<td>8.7</td>
<td>12</td>
<td>16.2</td>
<td>21.2</td>
<td>24.5</td>
<td>26.9</td>
</tr>
<tr>
<td>ICM20-A</td>
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<td>ICM20-B</td>
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<td>206</td>
<td>275</td>
<td>360</td>
<td>416</td>
<td>459</td>
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<tr>
<td>ICM20-C</td>
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<td>248</td>
<td>332</td>
<td>439</td>
<td>574</td>
<td>665</td>
<td>734</td>
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<tr>
<td>ICM25-A</td>
<td>7</td>
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<td>515</td>
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<td>ICM32-A</td>
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<td>553</td>
<td>746</td>
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<td>1657</td>
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<td>ICM40-A</td>
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<td>27</td>
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</table>

### Evaporating temperature 20°F

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<th>30</th>
<th>60</th>
<th>120</th>
<th>180</th>
<th>240</th>
</tr>
</thead>
<tbody>
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<td>16.6</td>
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<td>37.5</td>
<td>50</td>
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<td>81</td>
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<tr>
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### Evaporating temperature 0°F

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<th>30</th>
<th>60</th>
<th>120</th>
<th>180</th>
<th>240</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20-A33</td>
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<td>9.4</td>
<td>12.6</td>
<td>16.5</td>
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<td>26.2</td>
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<td>37.6</td>
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### Selection tables for expansion/liquid make-up applications

**Capacities for nominal conditions, $Q_n \,(TR)$**

#### R 744

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Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

Selection tables for expansion/liquid make-up applications

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<th>Pressure drop across valve Δp psi Evaporating temperature 0°F</th>
<th>Pressure drop across valve Δp psi Evaporating temperature –40°F</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>15     30    60   120   180   240</td>
<td>15     30    60   120   180   240</td>
</tr>
<tr>
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<td>2.04    2.61   3.18   3.57   3.58   3.4</td>
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<tr>
<td>ICM20-B</td>
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<td>33.6    44.3   55.5   65.5   68     66.7</td>
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<tr>
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<tr>
<td>ICM25-A</td>
<td>7</td>
<td>85      110    138    162    169    167</td>
<td>80.7    103.3  128    148    151    145</td>
</tr>
<tr>
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<td>123     160    201    237    247    243</td>
<td>119     153    189    217    220    212</td>
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<td>390     503    625    737    770    760</td>
<td>362     463    575    667    685    660</td>
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<tr>
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<td>640     824    1029   1211   1264   1249</td>
<td>594     762    948    1098   1123   1082</td>
</tr>
</tbody>
</table>
## Selection tables for expansion/liquid make-up applications

**Capacities for nominal conditions, \( Q_n \) (TR)**

### R 404A

<table>
<thead>
<tr>
<th>Pressure drop across valve ( \Delta p ) psi</th>
<th>Evaporating temperature 60°F</th>
<th>Evaporating temperature 40°F</th>
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<tbody>
<tr>
<td>15</td>
<td>30</td>
<td>60</td>
</tr>
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</tr>
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<td>41.8</td>
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<tr>
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### Evaporating temperature 0°F

<table>
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<th>Evaporating temperature 0°F</th>
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### Evaporating temperature –20°F

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### Evaporating temperature –60°F

<table>
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<tbody>
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</tr>
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<tr>
<td>ICM20-A</td>
<td>0.7</td>
</tr>
<tr>
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</tr>
<tr>
<td>ICM20-C</td>
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</tr>
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</tr>
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<td>ICM50-A</td>
<td>27</td>
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<tr>
<td>ICM65-A</td>
<td>41</td>
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</table>
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

Selection tables for expansion/liquid make-up applications
Capacities for nominal conditions, $Q_n (TR)$

<table>
<thead>
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<th>Cv</th>
<th>Pressure drop across valve $\Delta p$ psi</th>
</tr>
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<tr>
<td></td>
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</tr>
<tr>
<td>R 22</td>
<td></td>
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<td>Evaporating temperature 60°F</td>
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<td>60.5</td>
</tr>
<tr>
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<td>94</td>
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<td>138</td>
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<td>428</td>
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<td>37.7</td>
</tr>
<tr>
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<td>240</td>
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<tr>
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</tr>
</tbody>
</table>
Calculation example (R717 capacities):

An application has following running conditions:

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

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

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

- Correction factor for $\Delta p$ 3.5 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$ TR

From the capacity table a ICM 20-C with $Q_n$ capacity 134 TR is selected.
Selection tables for solenoid function and pressure regulator function in the liquid line with/without phase change

### R 717

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>Cv (USgal/min)</th>
<th>Evaporating temperature [°F]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20-A33</td>
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<td>5.6 5.7 5.8 5.9 6.0 6.0 6.1 6.1</td>
</tr>
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<td>17.1 17.4 17.7 17.9 18.1 18.3 18.4 18.5</td>
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</tr>
<tr>
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<td>5.3</td>
<td>129 132 134 136 137 139 140 140</td>
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<td>259</td>
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### R 744

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<th>Cv (USgal/min)</th>
<th>Evaporating temperature [°F]</th>
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</thead>
<tbody>
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<td>ICM40-A</td>
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<td>17</td>
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### Capacity corrections

**Correction factor for ΔP (f_{ΔP})**

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<th>Correction factor</th>
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<td>1.39</td>
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<tr>
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<td>0.81</td>
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</table>

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

<table>
<thead>
<tr>
<th>Liquid temperature</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10°F</td>
<td>0.82</td>
</tr>
<tr>
<td>10°F</td>
<td>0.85</td>
</tr>
<tr>
<td>30°F</td>
<td>0.88</td>
</tr>
<tr>
<td>50°F</td>
<td>0.92</td>
</tr>
<tr>
<td>70°F</td>
<td>0.96</td>
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<tr>
<td>90°F</td>
<td>1.00</td>
</tr>
<tr>
<td>110°F</td>
<td>1.04</td>
</tr>
<tr>
<td>130°F</td>
<td>1.09</td>
</tr>
</tbody>
</table>

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DKRLCPD:HT0.B8.22 / 520H5716
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

**Nominal capacities**

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

### R 134a

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>$C_v$ (USgal/min)</th>
<th>Evaporating temperature [°F]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20-A33</td>
<td>20</td>
<td>0.23</td>
<td>-40 0 20 40 60 80</td>
</tr>
<tr>
<td>ICM20-A</td>
<td>2.8</td>
<td>0.7</td>
<td>-20 0 20 40 60 80</td>
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<td>5.3</td>
<td>1.0</td>
<td>-20 0 20 40 60 80</td>
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<tr>
<td>ICM25-A</td>
<td>7.0</td>
<td>1.0</td>
<td>0 20 40 60 80</td>
</tr>
<tr>
<td>ICM25-B</td>
<td>14.0</td>
<td>1.0</td>
<td>0 20 40 60 80</td>
</tr>
<tr>
<td>ICM32-A</td>
<td>10.0</td>
<td>1.0</td>
<td>0 20 40 60 80</td>
</tr>
<tr>
<td>ICM32-B</td>
<td>20.0</td>
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<td>0 20 40 60 80</td>
</tr>
<tr>
<td>ICM40-A</td>
<td>17.0</td>
<td>1.0</td>
<td>0 20 40 60 80</td>
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<tr>
<td>ICM40-B</td>
<td>40.0</td>
<td>1.0</td>
<td>0 20 40 60 80</td>
</tr>
<tr>
<td>ICM50-A</td>
<td>50.0</td>
<td>1.0</td>
<td>20 40 60 80 100</td>
</tr>
<tr>
<td>ICM50-B</td>
<td>100.0</td>
<td>1.0</td>
<td>20 40 60 80 100</td>
</tr>
<tr>
<td>ICM65-A</td>
<td>125.0</td>
<td>1.0</td>
<td>20 40 60 80 100</td>
</tr>
<tr>
<td>ICM100</td>
<td>150.0</td>
<td>1.0</td>
<td>20 40 60 80 100</td>
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### Correction factor for $\Delta P (f_{\Delta P})$

<table>
<thead>
<tr>
<th>$\Delta P$ (psi)</th>
<th>Correction factor</th>
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<tbody>
<tr>
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<td>1.5</td>
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<tr>
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<td>0.91</td>
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<td>4</td>
<td>0.81</td>
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### Correction factor for liquid temperature ($T_{in}$)

<table>
<thead>
<tr>
<th>Liquid temperature</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10°F</td>
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<tr>
<td>0°F</td>
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<td>10°F</td>
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<tr>
<td>20°F</td>
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<td>0.85</td>
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<td>50°F</td>
<td>0.81</td>
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<tr>
<td>60°F</td>
<td>0.77</td>
</tr>
<tr>
<td>70°F</td>
<td>0.73</td>
</tr>
<tr>
<td>80°F</td>
<td>0.69</td>
</tr>
<tr>
<td>90°F</td>
<td>0.65</td>
</tr>
<tr>
<td>100°F</td>
<td>0.61</td>
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<tr>
<td>110°F</td>
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<td>130°F</td>
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**R 404A**

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>$C_v$ (USgal/min)</th>
<th>Evaporating temperature [°F]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20-A33</td>
<td>20</td>
<td>0.23</td>
<td>-40 0 20 40 60 80</td>
</tr>
<tr>
<td>ICM20-A</td>
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<tr>
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</tr>
<tr>
<td>ICM25-A</td>
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<td>1.0</td>
<td>0 20 40 60 80</td>
</tr>
<tr>
<td>ICM25-B</td>
<td>14.0</td>
<td>1.0</td>
<td>0 20 40 60 80</td>
</tr>
<tr>
<td>ICM32-A</td>
<td>10.0</td>
<td>1.0</td>
<td>0 20 40 60 80</td>
</tr>
<tr>
<td>ICM32-B</td>
<td>20.0</td>
<td>1.0</td>
<td>0 20 40 60 80</td>
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<tr>
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<td>0 20 40 60 80</td>
</tr>
<tr>
<td>ICM40-B</td>
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<td>1.0</td>
<td>20 40 60 80 100</td>
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<td>1.0</td>
<td>20 40 60 80 100</td>
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<td>ICM50-B</td>
<td>100.0</td>
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<tr>
<td>ICM65-A</td>
<td>125.0</td>
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<td>ICM100</td>
<td>150.0</td>
<td>1.0</td>
<td>20 40 60 80 100</td>
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### Correction factor for $\Delta P (f_{\Delta P})$

<table>
<thead>
<tr>
<th>$\Delta P$ (psi)</th>
<th>Correction factor</th>
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<tbody>
<tr>
<td>0.75</td>
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<td>1.5</td>
<td>1.39</td>
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<tr>
<td>3.5</td>
<td>0.91</td>
</tr>
<tr>
<td>4.5</td>
<td>0.85</td>
</tr>
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### Correction factor for liquid temperature ($T_{in}$)

<table>
<thead>
<tr>
<th>Liquid temperature</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10°F</td>
<td>0.52</td>
</tr>
<tr>
<td>0°F</td>
<td>1.0</td>
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<tr>
<td>30°F</td>
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<td>40°F</td>
<td>0.85</td>
</tr>
<tr>
<td>50°F</td>
<td>0.81</td>
</tr>
<tr>
<td>60°F</td>
<td>0.77</td>
</tr>
<tr>
<td>70°F</td>
<td>0.73</td>
</tr>
<tr>
<td>80°F</td>
<td>0.69</td>
</tr>
<tr>
<td>90°F</td>
<td>0.65</td>
</tr>
<tr>
<td>100°F</td>
<td>0.61</td>
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<tr>
<td>110°F</td>
<td>0.57</td>
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<td>120°F</td>
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</tr>
<tr>
<td>130°F</td>
<td>0.50</td>
</tr>
</tbody>
</table>

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Nominal capacities

Capacity table for nominal conditions, $Q_n$ (Tons of Refrigeration), $T_{in} = 90^\circ F$, $\Delta P = 3$ psi

### R 22

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
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<th>$-20$</th>
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<th>40</th>
<th>60</th>
<th>80</th>
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<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
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<td>81.6</td>
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<td>115</td>
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<td>ICM32-B</td>
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<td>99.1</td>
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<td>150</td>
<td>155</td>
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<td>168</td>
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<td>175</td>
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**Correction factor for $\Delta P$ ($f_{\Delta P}$)**

<table>
<thead>
<tr>
<th>$\Delta P$ (psi)</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
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</tr>
<tr>
<td>4</td>
<td>0.87</td>
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<tr>
<td>5</td>
<td>0.79</td>
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<tr>
<td>6</td>
<td>0.72</td>
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<td>7</td>
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<td>0.62</td>
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**Correction factor for liquid temperature ($T_{liq}$)**

<table>
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<th>Liquid temperature</th>
<th>Correction factor</th>
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<tr>
<td>$-10^\circ F$</td>
<td>0.73</td>
</tr>
<tr>
<td>$0^\circ F$</td>
<td>0.77</td>
</tr>
<tr>
<td>$30^\circ F$</td>
<td>0.82</td>
</tr>
<tr>
<td>$50^\circ F$</td>
<td>0.87</td>
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<td>0.93</td>
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<tr>
<td>$90^\circ F$</td>
<td>1.00</td>
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<td>$110^\circ F$</td>
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<tr>
<td>$130^\circ F$</td>
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</tbody>
</table>
Nominal capacities

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

Calculation example (R717 capacities):

An application has following running conditions:

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

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

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

From the capacity table a ICM 32-B with \( Q_n \) capacity 171 TR is selected.
Selection tables for solenoid or pressure regulator function in pumped liquid line without phase change

### Capacity table at nominal conditions, QN [Tons of Refrigeration], Circulation rate = 4, \( \Delta p = 3 \) psi

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>C(_v) (USgal/min)</th>
<th>-60</th>
<th>-40</th>
<th>-20</th>
<th>0</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICM20-A33</td>
<td>20</td>
<td>0.23</td>
<td>2.1</td>
<td>2.0</td>
<td>2.0</td>
<td>1.9</td>
<td>1.8</td>
<td>1.7</td>
<td>1.7</td>
<td>1.6</td>
</tr>
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### Capacity table at nominal conditions, QN [Tons of Refrigeration], Circulation rate = 4, \( \Delta p = 3 \) psi

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### Correction factor for \( \Delta p \) (\( \Delta P \) / \( f_{\Delta P} \))

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## Nominal capacities

### Capacity table at nominal conditions, Qn [Tons of Refrigeration], Circulation rate = 4, Δp = 3 psi

### Selection tables for solenoid or pressure regulator function in pumped liquid line without phase change

#### R 134a

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#### Capacity table at nominal conditions, Qn [Tons of Refrigeration], Circulation rate = 4, Δp = 3 psi

### R 404A

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### 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 pumped liquid line without phase change

**R 22**

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

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<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1.00</td>
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<tr>
<td>4</td>
<td>0.87</td>
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<td>5</td>
<td>0.79</td>
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<tr>
<td>6</td>
<td>0.72</td>
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<tr>
<td>7</td>
<td>0.66</td>
</tr>
<tr>
<td>8</td>
<td>0.62</td>
</tr>
</tbody>
</table>

#### Correction factor for circulation rate ($f_{circ}$)

<table>
<thead>
<tr>
<th>Circulation rate</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.5</td>
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<tr>
<td>3</td>
<td>0.75</td>
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<td>8</td>
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</tr>
<tr>
<td>10</td>
<td>2.5</td>
</tr>
</tbody>
</table>

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### Nominal capacities

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

![Diagram](attachment:Diagram.png)

**Location of valve in system (marked with grey)**

- Hot gas bypass & defrost line
- High-pressure line
- Wet suction line
- Dry suction line
- Liquid line without phase change
- Liquid line with or without phase change

---

**Calculation example (R717 capacities):**

An application has following running conditions:

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

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

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

- Correction factor for $\Delta p = 3.5$ 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.
### R 717

**Nominal capacities**

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>$C_r$ (USgal/min)</th>
<th>Evaporating temperature [°F]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20-A33</td>
<td>20</td>
<td>0.23, 0.08, 0.12, 0.17, 0.21, 0.26, 0.30, 0.35, 0.40</td>
<td></td>
</tr>
<tr>
<td>ICM20-A</td>
<td>7</td>
<td>0.2, 0.4, 0.5, 0.6, 0.8, 0.9, 1.1, 1.2</td>
<td></td>
</tr>
<tr>
<td>ICM20-B</td>
<td>2.8</td>
<td>0.9, 1.5, 2.0, 2.6, 3.1, 3.7, 4.3, 4.9</td>
<td></td>
</tr>
<tr>
<td>ICM20-C</td>
<td>5.3</td>
<td>1.8, 2.8, 3.9, 4.9, 5.9, 7.0, 8.1, 9.3</td>
<td></td>
</tr>
<tr>
<td>ICM25-A</td>
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<tr>
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</tr>
<tr>
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<td>9.9, 16.1, 21.9, 27.6, 33.5, 39.7, 46.1, 52.5</td>
<td></td>
</tr>
<tr>
<td>ICM32-B</td>
<td>50</td>
<td>27, 8.9, 14.5, 19.7, 24.8, 30.2, 35.8, 41.5, 47.3</td>
<td></td>
</tr>
<tr>
<td>ICM40-A</td>
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<td>15.2, 24.7, 33.5, 42.3, 51.4, 60.9, 70.7, 80.5</td>
<td></td>
</tr>
<tr>
<td>ICM40-B</td>
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<tr>
<td>ICM45-B</td>
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<tr>
<td>ICM50-A</td>
<td>50</td>
<td>27, 8.9, 14.5, 19.7, 24.8, 30.2, 35.8, 41.5, 47.3</td>
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</tr>
<tr>
<td>ICM50-B</td>
<td>100</td>
<td>46, 15.2, 24.7, 33.5, 42.3, 51.4, 60.9, 70.7, 80.5</td>
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<tr>
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<tr>
<td>ICM100</td>
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<td>165, 54, 89, 120, 151, 185, 218, 254, 289</td>
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</tr>
<tr>
<td>ICM125</td>
<td>125</td>
<td>259, 84, 140, 188, 237, 290, 342, 399, 453</td>
<td></td>
</tr>
<tr>
<td>ICM150</td>
<td>150</td>
<td>430, 140, 232, 313, 394, 481, 568, 662, 752</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>$\Delta P$ (psi)</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75</td>
<td>1.97</td>
</tr>
<tr>
<td>1.5</td>
<td>1.39</td>
</tr>
<tr>
<td>3</td>
<td><strong>1.00</strong></td>
</tr>
<tr>
<td>3.5</td>
<td>0.91</td>
</tr>
<tr>
<td>4</td>
<td>0.85</td>
</tr>
<tr>
<td>4.5</td>
<td>0.81</td>
</tr>
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</table>

**Correction factor for circulation rate (f$_{circ}$)**

<table>
<thead>
<tr>
<th>Circulation rate</th>
<th>Correction factor</th>
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<tbody>
<tr>
<td>2</td>
<td>0.77</td>
</tr>
<tr>
<td>3</td>
<td>0.90</td>
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<tr>
<td>4</td>
<td><strong>1</strong></td>
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<tr>
<td>6</td>
<td>1.13</td>
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<tr>
<td>8</td>
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<tr>
<td>10</td>
<td>1.25</td>
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</table>

### R 744

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>$C_r$ (USgal/min)</th>
<th>Evaporating temperature [°F]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20-A33</td>
<td>20</td>
<td>0.23, 0.17, 0.20, 0.23, 0.25, 0.27, 0.28, 0.27</td>
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</tr>
<tr>
<td>ICM20-A</td>
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<td>0.5, 0.6, 0.7, 0.8, 0.8, 0.9, 0.9, 0.8</td>
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</tr>
<tr>
<td>ICM20-B</td>
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<td>2.4, 2.8, 3.1, 3.3, 3.4, 3.5, 3.6, 3.3</td>
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</tr>
<tr>
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<tr>
<td>ICM25-A</td>
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<td>5.2, 6.1, 7.0, 7.7, 8.3, 8.6, 8.4</td>
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</tr>
<tr>
<td>ICM25-B</td>
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<tr>
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<tr>
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<tr>
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<tr>
<td>ICM40-B</td>
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<tr>
<td>ICM50-A</td>
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<td>ICM150</td>
<td>150</td>
<td>430, 320, 373, 428, 475, 508, 530, 511</td>
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</table>

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

<table>
<thead>
<tr>
<th>$\Delta P$ (psi)</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75</td>
<td>1.97</td>
</tr>
<tr>
<td>1.5</td>
<td>1.39</td>
</tr>
<tr>
<td>3</td>
<td><strong>1.00</strong></td>
</tr>
<tr>
<td>3.5</td>
<td>0.91</td>
</tr>
<tr>
<td>4</td>
<td>0.85</td>
</tr>
<tr>
<td>4.5</td>
<td>0.81</td>
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</table>

**Correction factor for circulation rate (f$_{circ}$)**

<table>
<thead>
<tr>
<th>Circulation rate</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.77</td>
</tr>
<tr>
<td>3</td>
<td>0.90</td>
</tr>
<tr>
<td>4</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td>6</td>
<td>1.13</td>
</tr>
<tr>
<td>8</td>
<td>1.20</td>
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<tr>
<td>10</td>
<td>1.25</td>
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</tbody>
</table>
### Nominal capacities

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>Cₐr (USgal/min)</th>
<th>Evaporating temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20-A33</td>
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<td>0.1</td>
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<tr>
<td>ICM20-B</td>
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<td>2.3</td>
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<td>ICM22-A</td>
<td>32</td>
<td>0.33</td>
<td>0.47</td>
</tr>
<tr>
<td>ICM22-B</td>
<td>40</td>
<td>0.7</td>
<td>0.1</td>
</tr>
<tr>
<td>ICM25-A</td>
<td>50</td>
<td>7.6</td>
<td>7.6</td>
</tr>
<tr>
<td>ICM25-B</td>
<td>65</td>
<td>13.4</td>
<td>13.9</td>
</tr>
<tr>
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<td>21.9</td>
</tr>
<tr>
<td>ICM32-B</td>
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<td>165</td>
<td>34</td>
</tr>
<tr>
<td>ICM40-A</td>
<td>125</td>
<td>259</td>
<td>43</td>
</tr>
<tr>
<td>ICM40-B</td>
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<td>430</td>
<td>71</td>
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</table>

### Correction factors for ΔP (fΔP)

<table>
<thead>
<tr>
<th>ΔP (psi)</th>
<th>Correction factor</th>
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</thead>
<tbody>
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<td>4</td>
<td>0.87</td>
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<tr>
<td>5</td>
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<td>0.72</td>
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<td>7</td>
<td>0.66</td>
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</table>

### R 134a

<table>
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<tr>
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<th>Valve body size</th>
<th>Cₐr (USgal/min)</th>
<th>Evaporating temperature (°F)</th>
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<tbody>
<tr>
<td>ICM20-A33</td>
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<td>0.1</td>
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<td>ICM20-B</td>
<td>25</td>
<td>4.7</td>
<td>2.3</td>
</tr>
<tr>
<td>ICM22-A</td>
<td>32</td>
<td>0.33</td>
<td>0.47</td>
</tr>
<tr>
<td>ICM22-B</td>
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<td>0.1</td>
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<td>ICM25-A</td>
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<td>ICM32-A</td>
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<td>16.9</td>
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<tr>
<td>ICM32-B</td>
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<td>165</td>
<td>34</td>
</tr>
<tr>
<td>ICM40-A</td>
<td>125</td>
<td>259</td>
<td>43</td>
</tr>
<tr>
<td>ICM40-B</td>
<td>150</td>
<td>430</td>
<td>71</td>
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</table>

### Correction factors for ΔP (fΔP)

<table>
<thead>
<tr>
<th>ΔP (psi)</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75</td>
<td>1.97</td>
</tr>
<tr>
<td>1.5</td>
<td>1.39</td>
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</table>

### R 404A

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<th>Valve body size</th>
<th>Cₐr (USgal/min)</th>
<th>Evaporating temperature (°F)</th>
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<td>ICM20-A</td>
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<td>ICM20-B</td>
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<td>ICM22-A</td>
<td>32</td>
<td>0.33</td>
<td>0.47</td>
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<tr>
<td>ICM22-B</td>
<td>40</td>
<td>0.7</td>
<td>0.1</td>
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<tr>
<td>ICM25-A</td>
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</tr>
<tr>
<td>ICM32-B</td>
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<td>34</td>
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</tr>
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<td>ICM40-B</td>
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<td>430</td>
<td>71</td>
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</table>

### Correction factors for ΔP (fΔP)

<table>
<thead>
<tr>
<th>ΔP (psi)</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75</td>
<td>1.97</td>
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</tr>
<tr>
<td>3.5</td>
<td>0.91</td>
</tr>
<tr>
<td>4</td>
<td>0.85</td>
</tr>
<tr>
<td>4.5</td>
<td>0.81</td>
</tr>
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### Correction factors for circulation rate (frec)

<table>
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<th>Correction factor</th>
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<td>1.20</td>
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<tr>
<td>10</td>
<td>1.25</td>
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</tbody>
</table>
Nominal capacities

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

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>$C_r$ (USgal/min)</th>
<th>Evaporating temperature [°F]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20-A33</td>
<td>20</td>
<td>0.23 0.04 0.06 0.07 0.09 0.11 0.12 0.14 0.15</td>
<td></td>
</tr>
<tr>
<td>ICM20-A</td>
<td>7</td>
<td>0.1 0.2 0.2 0.3 0.3 0.4 0.4 0.5</td>
<td></td>
</tr>
<tr>
<td>ICM20-B</td>
<td>5.3</td>
<td>0.5 0.7 0.9 1.1 1.3 1.5 1.7 1.8</td>
<td></td>
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<tr>
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<tr>
<td>ICM150</td>
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</table>

Correction factor for $\Delta P$ (f$\Delta P$)

<table>
<thead>
<tr>
<th>$\Delta P$ (psi)</th>
<th>Correction factor</th>
</tr>
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<tbody>
<tr>
<td>3</td>
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</tr>
<tr>
<td>4</td>
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<td>8</td>
<td>0.62</td>
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Correction factor for circulation rate (f$rec$)

<table>
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<th>Circulation rate</th>
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<td>2</td>
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<td>6</td>
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<td>8</td>
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<tr>
<td>10</td>
<td>1.25</td>
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</tbody>
</table>
Nominal capacities

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

Calculation example (R717 capacities):

An application has following running conditions:

\[
\begin{align*}
T_e &= 0^\circ F \\
Q_o &= 20 \text{ TR} \\
T_{liq} &= 50^\circ F \\
\text{Max. } \Delta p &= 3.5 \text{ psi} \\
\text{Connection: } 1^{\frac{1}{4}}''
\end{align*}
\]

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

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.
Correction factor for \(\Delta p \) 3.5 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, Qn [Tons of Refrigeration],
Tliq = 90°F,
Δp = 3 psi
Superheating = 12°F

R 717

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>Cn (USgal/min)</th>
<th>Evaporating temperature [°F]</th>
</tr>
</thead>
<tbody>
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<td></td>
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<td>-40</td>
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<td>0.20</td>
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<td>0.23</td>
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<td>ICM20-C</td>
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<td>48.0</td>
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R 744

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<th>Evaporating temperature [°F]</th>
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<td>ICM20-C</td>
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<td>0.75</td>
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Correction factor for ΔP (fΔP)

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<th>∆P (psi)</th>
<th>Correction factor</th>
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</thead>
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<td>1.00</td>
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<tr>
<td>1.5</td>
<td>1.00</td>
</tr>
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<td>3</td>
<td>1.00</td>
</tr>
<tr>
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<td>0.81</td>
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</table>

Correction factor for liquid temperature (Tliq)

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<th>Liquid temperature</th>
<th>Correction factor</th>
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<td>10°F</td>
<td>0.85</td>
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<tr>
<td>20°F</td>
<td>0.88</td>
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<td>30°F</td>
<td>0.92</td>
</tr>
<tr>
<td>40°F</td>
<td>0.96</td>
</tr>
<tr>
<td>50°F</td>
<td>1.00</td>
</tr>
<tr>
<td>60°F</td>
<td>1.04</td>
</tr>
<tr>
<td>70°F</td>
<td>1.07</td>
</tr>
<tr>
<td>80°F</td>
<td>1.09</td>
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</tbody>
</table>

Correction factor for ΔP (fΔP)

<table>
<thead>
<tr>
<th>∆P (psi)</th>
<th>Correction factor</th>
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</thead>
<tbody>
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<td>0.75</td>
<td>1.00</td>
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<td>0.91</td>
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<td>0.85</td>
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<td>4.5</td>
<td>0.81</td>
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Correction factor for liquid temperature (Tliq)

<table>
<thead>
<tr>
<th>Liquid temperature</th>
<th>Correction factor</th>
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<tbody>
<tr>
<td>-10°F</td>
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<tr>
<td>10°F</td>
<td>0.85</td>
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<tr>
<td>20°F</td>
<td>0.88</td>
</tr>
<tr>
<td>30°F</td>
<td>0.92</td>
</tr>
<tr>
<td>40°F</td>
<td>0.96</td>
</tr>
<tr>
<td>50°F</td>
<td>1.00</td>
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</table>

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DKRCI.PD.HT0.B8.22 / 520H5716
## Nominal capacities

Capacity table at nominal conditions, \( Q_n \) [Tons of Refrigeration], \( T_{in} = 90°F \), \( \Delta p = 3 \) psi
Superheating = 12°F

### R 134a

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>Cv</th>
<th>Evaporating temperature [°F]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20-A33</td>
<td>20</td>
<td>0.23</td>
<td>-40  0.05 -20  0.07  0.09  0.12  0.15  0.18  0.23</td>
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<td>3</td>
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<tr>
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<td>3.7</td>
<td>-20  5.0  6.6  8.6 10.9 13.6 16.6</td>
</tr>
<tr>
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<td>6.5</td>
<td>-20  8.8  11.7 15.1 19.2 23.9 29.4</td>
</tr>
<tr>
<td>ICM50-A</td>
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</tr>
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</tr>
<tr>
<td>ICM65-B</td>
<td>81</td>
<td>17.4</td>
<td>-20  23.8 31.5 40.8 51.8 64.6 79.3</td>
</tr>
<tr>
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</tr>
<tr>
<td>ICM125</td>
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</tr>
<tr>
<td>ICM150</td>
<td>150</td>
<td>95</td>
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#### Correction factor for liquid temperature (Tliq)

<table>
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<th>Correction factor</th>
</tr>
</thead>
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<tr>
<td>10°F</td>
<td>0.68</td>
</tr>
<tr>
<td>20°F</td>
<td>0.81</td>
</tr>
<tr>
<td>30°F</td>
<td>0.89</td>
</tr>
<tr>
<td>40°F</td>
<td>1.00</td>
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<tr>
<td>50°F</td>
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</tr>
<tr>
<td>60°F</td>
<td>1.35</td>
</tr>
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</table>

### R 404A

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>Cv</th>
<th>Evaporating temperature [°F]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20-A33</td>
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<td>3.7</td>
<td>-20  5.1  6.8  8.9 11.4 14.3 17.8 21.7</td>
</tr>
<tr>
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<td>8.4</td>
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#### Correction factor for liquid temperature (Tliq)

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<tr>
<th>Liquid temperature</th>
<th>Correction factor</th>
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</thead>
<tbody>
<tr>
<td>-10°F</td>
<td>0.53</td>
</tr>
<tr>
<td>0°F</td>
<td>0.57</td>
</tr>
<tr>
<td>10°F</td>
<td>0.63</td>
</tr>
<tr>
<td>20°F</td>
<td>0.72</td>
</tr>
<tr>
<td>30°F</td>
<td>0.83</td>
</tr>
<tr>
<td>40°F</td>
<td>1.00</td>
</tr>
<tr>
<td>50°F</td>
<td>1.29</td>
</tr>
<tr>
<td>60°F</td>
<td>1.92</td>
</tr>
</tbody>
</table>
### Nominal capacities

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

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>$C_v$ (USgal/min)</th>
<th>Evaporating temperature [°F]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>-60</td>
</tr>
<tr>
<td>ICM20-A33</td>
<td>20</td>
<td>0.23</td>
<td>0.06</td>
</tr>
<tr>
<td>ICM20-A</td>
<td>25</td>
<td>0.7</td>
<td>0.2</td>
</tr>
<tr>
<td>ICM20-B</td>
<td>32</td>
<td>2.8</td>
<td>0.7</td>
</tr>
<tr>
<td>ICM20-C</td>
<td>40</td>
<td>5.3</td>
<td>1.3</td>
</tr>
<tr>
<td>ICM25-A</td>
<td>50</td>
<td>7</td>
<td>1.7</td>
</tr>
<tr>
<td>ICM25-B</td>
<td>65</td>
<td>14</td>
<td>3.4</td>
</tr>
<tr>
<td>ICM25-C</td>
<td>80</td>
<td>27</td>
<td>6.6</td>
</tr>
<tr>
<td>ICM32-A</td>
<td>100</td>
<td>46</td>
<td>11.2</td>
</tr>
<tr>
<td>ICM32-B</td>
<td>125</td>
<td>65</td>
<td>41</td>
</tr>
<tr>
<td>ICM32-C</td>
<td>150</td>
<td>81</td>
<td>19.7</td>
</tr>
<tr>
<td>ICM40-A</td>
<td>175</td>
<td>165</td>
<td>41</td>
</tr>
<tr>
<td>ICM40-B</td>
<td>200</td>
<td>259</td>
<td>64</td>
</tr>
<tr>
<td>ICM50-A</td>
<td>250</td>
<td>380</td>
<td>106</td>
</tr>
<tr>
<td>ICM50-B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICM65-A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICM65-B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICM100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICM125</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICM150</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Liquid temperature</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10°F</td>
<td>0.73</td>
</tr>
<tr>
<td>-10°F</td>
<td>0.77</td>
</tr>
<tr>
<td>-10°F</td>
<td>0.82</td>
</tr>
<tr>
<td>-10°F</td>
<td>0.87</td>
</tr>
<tr>
<td>0°F</td>
<td>0.93</td>
</tr>
<tr>
<td>0°F</td>
<td>1.00</td>
</tr>
<tr>
<td>0°F</td>
<td>1.09</td>
</tr>
<tr>
<td>0°F</td>
<td>1.20</td>
</tr>
<tr>
<td>0°F</td>
<td>1.29</td>
</tr>
<tr>
<td>0°F</td>
<td>1.42</td>
</tr>
<tr>
<td>0°F</td>
<td>1.60</td>
</tr>
<tr>
<td>0°F</td>
<td>1.79</td>
</tr>
<tr>
<td>0°F</td>
<td>2.00</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>$\Delta P$ (psi)</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1.00</td>
</tr>
<tr>
<td>4</td>
<td>0.87</td>
</tr>
<tr>
<td>5</td>
<td>0.79</td>
</tr>
<tr>
<td>6</td>
<td>0.72</td>
</tr>
<tr>
<td>7</td>
<td>0.66</td>
</tr>
<tr>
<td>8</td>
<td>0.62</td>
</tr>
</tbody>
</table>
Calculation example (R717 capacities):

An application has following running conditions:

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

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

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.
Correction factor for \( \Delta p = 4.5 \) 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], $T_{in} = 90°F$, $\Delta p = 3$ psi, $P_{disch} = 185$ psi, $T_{disch} = 180°F$

Superheating $= 12°F$

### Selection tables for discharge line

#### R 717

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>$C_n$ (USgal/min)</th>
<th>Evaporating temperature $[°F]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20-A</td>
<td>20</td>
<td>0.23</td>
<td>–60: 0.66  –40: 0.67  –20: 0.68  0: 0.69  20: 0.70  40: 0.71  60: 0.72</td>
</tr>
<tr>
<td>ICM20-B</td>
<td>2.8</td>
<td>15.2</td>
<td>15.4: 15.7  15.9: 16.1  16.3: 16.4  16.5: 16.7</td>
</tr>
<tr>
<td>ICM25-A</td>
<td>7</td>
<td>20.0</td>
<td>20.4: 20.7  21.0: 21.3  21.5: 21.7  21.8: 22.0</td>
</tr>
<tr>
<td>ICM32-B</td>
<td>10</td>
<td>26.8</td>
<td>29.1: 29.6  30.0: 30.4  30.7: 31.1  31.2: 31.5</td>
</tr>
</tbody>
</table>

#### Correction factor for discharge temperature ($T_{disch}$)

<table>
<thead>
<tr>
<th>Discharge temperature $[°F]$</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>120°F</td>
<td>0.95</td>
</tr>
<tr>
<td>140°F</td>
<td>0.97</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Liquid temperature $[°F]$</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>10°F</td>
<td>0.82</td>
</tr>
</tbody>
</table>

#### R 744

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve body size</th>
<th>$C_n$ (USgal/min)</th>
<th>Evaporating temperature $[°F]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM20-A</td>
<td>20</td>
<td>0.23</td>
<td>–60: 0.40  –40: 0.41  –20: 0.42  0: 0.43  20: 0.44  40: 0.45  60: 0.46</td>
</tr>
<tr>
<td>ICM20-B</td>
<td>2.8</td>
<td>4.9</td>
<td>5.0: 5.1  5.1: 5.1  5.2: 5.2  5.3: 5.3  5.4: 5.4  5.5: 5.5  5.6: 5.6</td>
</tr>
<tr>
<td>ICM32-B</td>
<td>10</td>
<td>17.6</td>
<td>18.0: 18.1  18.2: 18.3  18.4: 18.5  18.6: 18.7  18.8: 18.9  19.0: 19.1  19.2: 19.3</td>
</tr>
</tbody>
</table>

#### Correction factor for discharge temperature ($T_{disch}$)

<table>
<thead>
<tr>
<th>Discharge temperature $[°F]$</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>120°F</td>
<td>0.95</td>
</tr>
<tr>
<td>140°F</td>
<td>0.97</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Liquid temperature $[°F]$</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>10°F</td>
<td>0.85</td>
</tr>
</tbody>
</table>

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DKRCLPD:HT0.B8.22 / 520H5716
### Nominal capacities

Capacity table at nominal conditions, 
\( Q_{n} \) (Tons of Refrigeration), 
\( T_{liq} = 90°F \), 
\( \Delta p = 3 \) psi, 
\( P_{disch} = 120 \) psi, 
\( T_{disch} = 180°F \) 
Superheating = 12°F

#### Type ICM 20-150 and actuators type ICAD 600A, 900 and 1200A

**Selection tables for discharge line**

**Type ICM 20-150 and actuators type ICAD 600A, 900 and 1200A**

**Correction factor for \( \Delta p \) (\( f_{\Delta p} \))**

<table>
<thead>
<tr>
<th>( \Delta p ) (psi)</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75</td>
<td>1.97</td>
</tr>
<tr>
<td>1.5</td>
<td>1.39</td>
</tr>
<tr>
<td>3</td>
<td>1.00</td>
</tr>
<tr>
<td>4</td>
<td>0.85</td>
</tr>
<tr>
<td>4.5</td>
<td>0.81</td>
</tr>
</tbody>
</table>

**Correction factor for discharge temperature (\( T_{disch} \))**

<table>
<thead>
<tr>
<th>Discharge temperature</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>120°F</td>
<td>0.95</td>
</tr>
<tr>
<td>140°F</td>
<td>0.97</td>
</tr>
<tr>
<td>180°F</td>
<td>1.00</td>
</tr>
<tr>
<td>200°F</td>
<td>1.02</td>
</tr>
<tr>
<td>210°F</td>
<td>1.02</td>
</tr>
<tr>
<td>230°F</td>
<td>1.04</td>
</tr>
<tr>
<td>250°F</td>
<td>1.05</td>
</tr>
</tbody>
</table>

**Correction factor for liquid temperature (\( T_{liq} \))**

<table>
<thead>
<tr>
<th>Liquid temperature</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>–10°F</td>
<td>0.64</td>
</tr>
<tr>
<td>10°F</td>
<td>0.68</td>
</tr>
<tr>
<td>30°F</td>
<td>0.74</td>
</tr>
<tr>
<td>50°F</td>
<td>0.81</td>
</tr>
<tr>
<td>70°F</td>
<td>0.89</td>
</tr>
<tr>
<td>90°F</td>
<td>1.00</td>
</tr>
<tr>
<td>110°F</td>
<td>1.15</td>
</tr>
<tr>
<td>130°F</td>
<td>1.35</td>
</tr>
</tbody>
</table>

**Capacity table at nominal conditions, \( Q_{n} \) (Tons of Refrigeration), \( T_{liq} = 90°F \), \( \Delta p = 3 \) psi, \( P_{disch} = 120 \) psi, \( T_{disch} = 180°F \) Superheating = 12°F**

**Type ICM 20-150 and actuators type ICAD 600A, 900 and 1200A**

**Correction factor for \( \Delta p \) (\( f_{\Delta p} \))**

<table>
<thead>
<tr>
<th>( \Delta p ) (psi)</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75</td>
<td>1.97</td>
</tr>
<tr>
<td>1.5</td>
<td>1.39</td>
</tr>
<tr>
<td>3</td>
<td>1.00</td>
</tr>
<tr>
<td>4</td>
<td>0.85</td>
</tr>
<tr>
<td>4.5</td>
<td>0.81</td>
</tr>
</tbody>
</table>

**Correction factor for discharge temperature (\( T_{disch} \))**

<table>
<thead>
<tr>
<th>Discharge temperature</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>120°F</td>
<td>0.95</td>
</tr>
<tr>
<td>140°F</td>
<td>0.97</td>
</tr>
<tr>
<td>180°F</td>
<td>1.00</td>
</tr>
<tr>
<td>200°F</td>
<td>1.02</td>
</tr>
<tr>
<td>210°F</td>
<td>1.02</td>
</tr>
<tr>
<td>230°F</td>
<td>1.04</td>
</tr>
<tr>
<td>250°F</td>
<td>1.05</td>
</tr>
</tbody>
</table>

**Correction factor for liquid temperature (\( T_{liq} \))**

<table>
<thead>
<tr>
<th>Liquid temperature</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>–10°F</td>
<td>0.52</td>
</tr>
<tr>
<td>10°F</td>
<td>0.57</td>
</tr>
<tr>
<td>30°F</td>
<td>0.63</td>
</tr>
<tr>
<td>50°F</td>
<td>0.72</td>
</tr>
<tr>
<td>70°F</td>
<td>0.83</td>
</tr>
<tr>
<td>90°F</td>
<td>1.00</td>
</tr>
<tr>
<td>110°F</td>
<td>1.29</td>
</tr>
<tr>
<td>130°F</td>
<td>1.92</td>
</tr>
</tbody>
</table>

**Type ICM 20-150 and actuators type ICAD 600A, 900 and 1200A**

**Correction factor for \( \Delta p \) (\( f_{\Delta p} \))**

<table>
<thead>
<tr>
<th>( \Delta p ) (psi)</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75</td>
<td>1.97</td>
</tr>
<tr>
<td>1.5</td>
<td>1.39</td>
</tr>
<tr>
<td>3</td>
<td>1.00</td>
</tr>
<tr>
<td>4</td>
<td>0.85</td>
</tr>
<tr>
<td>4.5</td>
<td>0.81</td>
</tr>
</tbody>
</table>

**Correction factor for discharge temperature (\( T_{disch} \))**

<table>
<thead>
<tr>
<th>Discharge temperature</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>120°F</td>
<td>0.95</td>
</tr>
<tr>
<td>140°F</td>
<td>0.97</td>
</tr>
<tr>
<td>180°F</td>
<td>1.00</td>
</tr>
<tr>
<td>200°F</td>
<td>1.02</td>
</tr>
<tr>
<td>210°F</td>
<td>1.02</td>
</tr>
<tr>
<td>230°F</td>
<td>1.04</td>
</tr>
<tr>
<td>250°F</td>
<td>1.05</td>
</tr>
</tbody>
</table>

**Correction factor for liquid temperature (\( T_{liq} \))**

<table>
<thead>
<tr>
<th>Liquid temperature</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>–10°F</td>
<td>0.52</td>
</tr>
<tr>
<td>10°F</td>
<td>0.57</td>
</tr>
<tr>
<td>30°F</td>
<td>0.63</td>
</tr>
<tr>
<td>50°F</td>
<td>0.72</td>
</tr>
<tr>
<td>70°F</td>
<td>0.83</td>
</tr>
<tr>
<td>90°F</td>
<td>1.00</td>
</tr>
<tr>
<td>110°F</td>
<td>1.29</td>
</tr>
<tr>
<td>130°F</td>
<td>1.92</td>
</tr>
</tbody>
</table>
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

Nominal capacities

Capacity table at nominal conditions, Qn [Tons of Refrigeration], Tliq = 90°F, ∆p = 3 psi, Pdisch = 120 psi, Tdisch = 180°F
Superheating = 12°F

<table>
<thead>
<tr>
<th>Typ</th>
<th>Valve body size</th>
<th>C, (USgal/min)</th>
<th>Evaporating temperature [°F]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>-60</td>
</tr>
<tr>
<td>ICM20-A</td>
<td>20</td>
<td>0.23</td>
<td>0.21</td>
</tr>
<tr>
<td>ICM20-B</td>
<td>2.8</td>
<td>2.6</td>
<td>2.6</td>
</tr>
<tr>
<td>ICM20-C</td>
<td>5.3</td>
<td>4.8</td>
<td>5.0</td>
</tr>
<tr>
<td>ICM25-A</td>
<td>7</td>
<td>6.4</td>
<td>6.6</td>
</tr>
<tr>
<td>ICM25-B</td>
<td>14</td>
<td>12.8</td>
<td>13.2</td>
</tr>
<tr>
<td>ICM32-A</td>
<td>20</td>
<td>18.2</td>
<td>18.9</td>
</tr>
<tr>
<td>ICM32-B</td>
<td>10</td>
<td>9.1</td>
<td>9.5</td>
</tr>
<tr>
<td>ICM40-A</td>
<td>17</td>
<td>15.5</td>
<td>16.1</td>
</tr>
<tr>
<td>ICM40-B</td>
<td>30</td>
<td>27.4</td>
<td>28.4</td>
</tr>
<tr>
<td>ICM50-A</td>
<td>50</td>
<td>27</td>
<td>24.6</td>
</tr>
<tr>
<td>ICM50-B</td>
<td>46</td>
<td>42.0</td>
<td>43.5</td>
</tr>
<tr>
<td>ICM65-A</td>
<td>65</td>
<td>37</td>
<td>39</td>
</tr>
<tr>
<td>ICM65-B</td>
<td>81</td>
<td>73.9</td>
<td>75.6</td>
</tr>
<tr>
<td>ICM100</td>
<td>100</td>
<td>150</td>
<td>157</td>
</tr>
<tr>
<td>ICM125</td>
<td>125</td>
<td>259</td>
<td>235</td>
</tr>
<tr>
<td>ICM150</td>
<td>150</td>
<td>430</td>
<td>391</td>
</tr>
</tbody>
</table>

Correction factor for ∆P (f∆P)

<table>
<thead>
<tr>
<th>∆P (psi)</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1.00</td>
</tr>
<tr>
<td>4</td>
<td>0.87</td>
</tr>
<tr>
<td>5</td>
<td>0.79</td>
</tr>
<tr>
<td>6</td>
<td>0.72</td>
</tr>
<tr>
<td>7</td>
<td>0.66</td>
</tr>
<tr>
<td>8</td>
<td>0.62</td>
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Correction factor for discharge temperature (Tdisch).

<table>
<thead>
<tr>
<th>Discharge temperature</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>120°F</td>
<td>0.95</td>
</tr>
<tr>
<td>140°F</td>
<td>0.97</td>
</tr>
<tr>
<td>160°F</td>
<td>1.00</td>
</tr>
<tr>
<td>180°F</td>
<td>1.00</td>
</tr>
<tr>
<td>200°F</td>
<td>1.02</td>
</tr>
<tr>
<td>220°F</td>
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</tr>
<tr>
<td>240°F</td>
<td>1.04</td>
</tr>
<tr>
<td>260°F</td>
<td>1.05</td>
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</table>

Correction factor for liquid temperature (Tliq).

<table>
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<th>Liquid temperature</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10°F</td>
<td>0.73</td>
</tr>
<tr>
<td>0°F</td>
<td>0.77</td>
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<tr>
<td>30°F</td>
<td>0.82</td>
</tr>
<tr>
<td>50°F</td>
<td>0.87</td>
</tr>
<tr>
<td>70°F</td>
<td>0.93</td>
</tr>
<tr>
<td>90°F</td>
<td>1.00</td>
</tr>
<tr>
<td>110°F</td>
<td>1.09</td>
</tr>
<tr>
<td>130°F</td>
<td>1.20</td>
</tr>
</tbody>
</table>
### ICM 20 / ICAD 600A

**Ordering complete valve with actuator**

<table>
<thead>
<tr>
<th>Valve type</th>
<th>Connection type/size</th>
<th>Code number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM 20-A33</td>
<td>3/4&quot; SOC</td>
<td>027H1043NA</td>
</tr>
<tr>
<td>ICM 20-A</td>
<td>3/4&quot; FPT</td>
<td>027H1055NA</td>
</tr>
<tr>
<td>ICM 20-A</td>
<td>3/4&quot; SOC</td>
<td>027H1040NA</td>
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<tr>
<td>ICM 20-A</td>
<td>3/4&quot; BW</td>
<td>027H1035NA</td>
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<tr>
<td>ICM 20-A</td>
<td>1&quot; BW</td>
<td>027H1023NA</td>
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<tr>
<td>ICM 20-A</td>
<td>5/8&quot; ODS</td>
<td>027H1015NA</td>
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<tr>
<td>ICM 20-A</td>
<td>7/8&quot; ODS</td>
<td>027H1050NA</td>
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<td>ICM 20-B66</td>
<td>3/4&quot; SOC</td>
<td>027H1044NA</td>
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<td>ICM 20-B</td>
<td>3/4&quot; FPT</td>
<td>027H1056NA</td>
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<td>3/4&quot; SOC</td>
<td>027H1041NA</td>
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<td>3/4&quot; BW</td>
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<td>1&quot; BW</td>
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<td>5/8&quot; ODS</td>
<td>027H1016NA</td>
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<tr>
<td>ICM 20-B</td>
<td>7/8&quot; ODS</td>
<td>027H1051NA</td>
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<td>3/4&quot; FPT</td>
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<tr>
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<td>027H1042NA</td>
</tr>
<tr>
<td>ICM 20-C</td>
<td>3/4&quot; BW</td>
<td>027H1037NA</td>
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<td>ICM 20-C</td>
<td>1&quot; BW</td>
<td>027H1025NA</td>
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<tr>
<td>ICM 20-C</td>
<td>5/8&quot; ODS</td>
<td>027H1017NA</td>
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<tr>
<td>ICM 20-C</td>
<td>7/8&quot; ODS</td>
<td>027H1052NA</td>
</tr>
</tbody>
</table>

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

*Code number for ICM with ICAD actuator with 9.8 ft. (3 m) cables

---

**ICM 20 Function module / top cover**

<table>
<thead>
<tr>
<th>Description</th>
<th>Code Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM 20-A33</td>
<td>027H1186 *</td>
</tr>
<tr>
<td>ICM 20-A</td>
<td>027H1180 *</td>
</tr>
<tr>
<td>ICM 20-B66</td>
<td>027H1194 *</td>
</tr>
<tr>
<td>ICM 20-B</td>
<td>027H1181 *</td>
</tr>
<tr>
<td>ICM 20-C</td>
<td>027H1182 *</td>
</tr>
</tbody>
</table>

*) 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**

<table>
<thead>
<tr>
<th>Description</th>
<th>Code Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICAD 600A with 1.5 m. (60 in.) cables</td>
<td>027H9075</td>
</tr>
<tr>
<td>ICAD 600A without cables</td>
<td>027H9120</td>
</tr>
</tbody>
</table>

* see accessories for other lengths

---

**Spare Parts**

<table>
<thead>
<tr>
<th>Spare Parts</th>
<th>Code Number</th>
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<tbody>
<tr>
<td>Service kit</td>
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ICM 25 / ICAD 600A

Ordering complete valve with actuator

<table>
<thead>
<tr>
<th>Valve type</th>
<th>Connection type/size</th>
<th>Code number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM 25-A</td>
<td>1&quot; FPT</td>
<td>027H2282NA</td>
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<tr>
<td>ICM 25-A</td>
<td>1&quot; SOC</td>
<td>027H2004NA</td>
</tr>
<tr>
<td>ICM 25-A</td>
<td>1&quot; BW</td>
<td>027H2002NA</td>
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<tr>
<td>ICM 25-A</td>
<td>1-1/4&quot; BW</td>
<td>027H276NA</td>
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<tr>
<td>ICM 25-A</td>
<td>7/8&quot; ODS</td>
<td>027H2010NA</td>
</tr>
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<td>ICM 25-A</td>
<td>1-1/8&quot; ODS</td>
<td>027H2012NA</td>
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<tr>
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<td>3/4&quot; FPT</td>
<td>027H2281NA</td>
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<tr>
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<td>1&quot; FPT</td>
<td>027H2283NA</td>
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<td>3/4&quot; SOC</td>
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<td>3/4&quot; BW</td>
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<td>7/8&quot; ODS</td>
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<td>ICM 25-B</td>
<td>1-1/8&quot; ODS</td>
<td>027H2013NA</td>
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<tr>
<td>ICM 25-B</td>
<td>1-3/8&quot; ODS</td>
<td>027H2015NA</td>
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ICM 25 valve body

<table>
<thead>
<tr>
<th>Connection size/type</th>
<th>Code Number</th>
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</thead>
<tbody>
<tr>
<td>3/4 in. SOC</td>
<td>027H2132</td>
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<tr>
<td>1 in. SOC</td>
<td>027H2122</td>
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<tr>
<td>3/4 in. FPT</td>
<td>027H2133</td>
</tr>
<tr>
<td>1 in. FPT</td>
<td>027H2127</td>
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<tr>
<td>3/4 in. BW</td>
<td>027H2131</td>
</tr>
<tr>
<td>1 in. BW</td>
<td>027H2121</td>
</tr>
<tr>
<td>1-1/4 in. BW</td>
<td>027H2130</td>
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<tr>
<td>7/8 in. ODS</td>
<td>027H2125</td>
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<tr>
<td>1-1/8 in. ODS</td>
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<tr>
<td>1-3/8 in. ODS</td>
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ICM 25 Function module / top cover

<table>
<thead>
<tr>
<th>Description</th>
<th>Code Number</th>
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<tbody>
<tr>
<td>ICM 25-A</td>
<td>027H2180 *</td>
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<tr>
<td>ICM 25-B</td>
<td>027H2181 *</td>
</tr>
</tbody>
</table>

*) Including gaskets and O-rings

ICAD 600A actuator

<table>
<thead>
<tr>
<th>Description</th>
<th>Code Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM 25-32</td>
<td>027H0180</td>
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</table>

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 9A.

Protection cap ICAD 600A/1200A

<table>
<thead>
<tr>
<th>Code Number</th>
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<tbody>
<tr>
<td>027H0431</td>
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</table>

Spare Parts

<table>
<thead>
<tr>
<th>Description</th>
<th>Code Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service kit</td>
<td>027H2220</td>
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</tbody>
</table>

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

*Code number for ICM with ICAD actuator with 9.8 ft. (3 m) cables

* see accessories for other lengths
ICM 32 / ICAD 600A

Ordering complete valve with actuator

<table>
<thead>
<tr>
<th>Valve type</th>
<th>Connection type/size</th>
<th>Code number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM 32-A</td>
<td>1-1/4&quot; SOC</td>
<td>027H3004NA</td>
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<tr>
<td>ICM 32-A</td>
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</tr>
<tr>
<td>ICM 32-A</td>
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<td>ICM 32-A</td>
<td>1-5/8&quot; ODS</td>
<td>027H3008NA</td>
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<td>ICM 32-B</td>
<td>1-1/4&quot; SOC</td>
<td>027H3005NA</td>
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<tr>
<td>ICM 32-B</td>
<td>1-1/4&quot; BW</td>
<td>027H3003NA</td>
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<tr>
<td>ICM 32-B</td>
<td>1-1/2&quot; BW</td>
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<tr>
<td>ICM 32-B</td>
<td>1-3/8&quot; ODS</td>
<td>027H3007NA</td>
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ICM 32 valve body

<table>
<thead>
<tr>
<th>Connection size/type</th>
<th>Code Number</th>
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<tbody>
<tr>
<td>1-1/4 in. SOC</td>
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<tr>
<td>1-1/4 in. BW</td>
<td>027H3121</td>
</tr>
<tr>
<td>1-1/2 in. BW</td>
<td>027H3126</td>
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<tr>
<td>1-3/8 in. ODS</td>
<td>027H3123</td>
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<tr>
<td>1-5/8 in. ODS</td>
<td>027H3127</td>
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</table>

ICM 32 Function module / top cover

<table>
<thead>
<tr>
<th>Description</th>
<th>Code Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM 32-A</td>
<td>027H3180 (*)</td>
</tr>
<tr>
<td>ICM 32-B</td>
<td>027H3181 (*)</td>
</tr>
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*) Including gaskets and O-rings

ICAD 600A actuator

<table>
<thead>
<tr>
<th>Description</th>
<th>Code Number</th>
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<tbody>
<tr>
<td>ICAD 600A with 1.5 m. (60 in.) cables</td>
<td>027H9075</td>
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<tr>
<td>ICAD 600A without cables</td>
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Spare parts

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<thead>
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<th>Code Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service kit</td>
<td>027H3220</td>
</tr>
</tbody>
</table>

Multi-function tool for ICM 20-32

027H0180

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

027H0431

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

* see accessories for other lengths
ICM 40 / ICAD 1200A

Ordering complete valve with actuator

<table>
<thead>
<tr>
<th>Valve type</th>
<th>Connection type/size</th>
<th>Code number with ICAD 1200A*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM 40-A</td>
<td>1-1/2&quot; SOC</td>
<td>027H4004NE</td>
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<tr>
<td>ICM 40-A</td>
<td>1-1/2&quot; BW</td>
<td>027H4002NE</td>
</tr>
<tr>
<td>ICM 40-A</td>
<td>2&quot; BW</td>
<td>027H4012NE</td>
</tr>
<tr>
<td>ICM 40-A</td>
<td>1-5/8&quot; ODS</td>
<td>027H4006NE</td>
</tr>
<tr>
<td>ICM 40-B</td>
<td>1-1/2&quot; SOC</td>
<td>027H4005NE</td>
</tr>
<tr>
<td>ICM 40-B</td>
<td>1-1/2&quot; BW</td>
<td>027H4003NE</td>
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<tr>
<td>ICM 40-B</td>
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<tr>
<td>ICM 40-B</td>
<td>1-5/8&quot; ODS</td>
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</tbody>
</table>

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

Multi-function tool for ICM 40-65

027H0181

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 PIHU0A.

Protection cap ICAD 600A/1200A

027H0431

ICM 40 valve body

ICM Function module / top cover

<table>
<thead>
<tr>
<th>Description</th>
<th>Code Number</th>
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<tbody>
<tr>
<td>ICM 40-A</td>
<td>027H4180 *)</td>
</tr>
<tr>
<td>ICM 40-B</td>
<td>027H4181 *)</td>
</tr>
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</table>

*) Including gaskets and O-rings

ICM 40 valve body

ICM Function module / top cover

ICAD 1200A actuator

<table>
<thead>
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<th>Description</th>
<th>Code Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICAD 1200A with</td>
<td>027H9077</td>
</tr>
<tr>
<td>1.5 m. (60 in.)</td>
<td>cables</td>
</tr>
<tr>
<td>ICAD 1200A</td>
<td>027H9122</td>
</tr>
<tr>
<td>without cables</td>
<td></td>
</tr>
</tbody>
</table>

*) see accessories for other lengths

Spare parts

<table>
<thead>
<tr>
<th>Spare Parts</th>
<th>Code Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service kit</td>
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</table>
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

ICM 50 / ICAD 1200A

Ordering complete valve with actuator

<table>
<thead>
<tr>
<th>Valve type</th>
<th>Connection type/size</th>
<th>Code number with ICAD 1200A*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM 50-A</td>
<td>2&quot; SOC</td>
<td>027H5004NE</td>
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<tr>
<td>ICM 50-A</td>
<td>2&quot; BW</td>
<td>027H5002NE</td>
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<tr>
<td>ICM 50-A</td>
<td>2-1/2&quot; BW</td>
<td>027H5010NE</td>
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<td>ICM 50-A</td>
<td>2-1/8&quot; ODS</td>
<td>027H5006NE</td>
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<td>2&quot; BW</td>
<td>027H5003NE</td>
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<tr>
<td>ICM 50-B</td>
<td>2-1/2&quot; BW</td>
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<tr>
<td>ICM 50-B</td>
<td>2-1/8&quot; ODS</td>
<td>027H5007NE</td>
</tr>
</tbody>
</table>

* Code number for ICM with ICAD actuator with 9.8 ft. (3 m) cables

** Code number for ICM with ICAD actuator with 9.8 ft. (3 m) cables

ICM 50 valve body

ICM 50 Function module / top cover

ICM 50-A

ICM 50-B

*) Including gaskets and O-rings

Multi-function tool for ICM 40-65

027H0181

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

027H0431

ICAD 1200A actuator

Description                                      Code Number

ICAD 1200A with 1.5 m. (60 in.) cables           027H9077
ICAD 1200A without cables                        027H9122

*) see accessories for other lengths

Spare parts

<table>
<thead>
<tr>
<th>Spare Parts</th>
<th>Code Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service kit</td>
<td>027H5220</td>
</tr>
</tbody>
</table>

** Danfoss | DCS (MWA) | 2015.05

DKRCI.PD.HT0.B8.22 / 520H5716
ICM 65 / ICAD 1200A

Ordering complete valve with actuator

<table>
<thead>
<tr>
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<th>Connection type/size</th>
<th>Code number with ICAD 1200A*</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2-1/2” SOC</td>
<td>027H6004NE</td>
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<tr>
<td>ICM 65-A</td>
<td>2-1/2” BW</td>
<td>027H6012NE</td>
</tr>
<tr>
<td>ICM 65-A</td>
<td>3” BW</td>
<td>027H6002NE</td>
</tr>
<tr>
<td>ICM 65-A</td>
<td>2-5/8” ODS</td>
<td>027H6006NE</td>
</tr>
<tr>
<td>ICM 65-B</td>
<td>2-1/2” SOC</td>
<td>027H6005NE</td>
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<tr>
<td>ICM 65-B</td>
<td>2-1/2” BW</td>
<td>027H6003NE</td>
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<tr>
<td>ICM 65-B</td>
<td>3” BW</td>
<td>027H6013NE</td>
</tr>
<tr>
<td>ICM 65-B</td>
<td>2-5/8” ODS</td>
<td>027H6007NE</td>
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</table>

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

ICM 65 valve body

<table>
<thead>
<tr>
<th>Connection size/type</th>
<th>Code Number</th>
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<tbody>
<tr>
<td>2-1/2 in. SOC</td>
<td>027H6123</td>
</tr>
<tr>
<td>2-1/2 in. BW</td>
<td>027H6121</td>
</tr>
<tr>
<td>3 in. BW</td>
<td>027H6127</td>
</tr>
<tr>
<td>2-5/8 in. ODS</td>
<td>027H6125</td>
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ICM 65 Function module / top cover

<table>
<thead>
<tr>
<th>Description</th>
<th>Code Number</th>
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</table>
| ICM 65-A            | 027H6180    *
| ICM 65-B            | 027H6181    *

*) Including gaskets and O-rings

ICAD 1200A actuator

<table>
<thead>
<tr>
<th>Description</th>
<th>Code Number</th>
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<tbody>
<tr>
<td>ICAD 1200A with 1.5 m. (60 in.) cables</td>
<td>027H9077</td>
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<tr>
<td>ICAD 1200A without cables</td>
<td>027H9122</td>
</tr>
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</table>

*) see accessories for other lengths

Multi-function tool for ICM 40-65

Spare parts

<table>
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<tr>
<th>Spare Parts</th>
<th>Code Number</th>
</tr>
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<tbody>
<tr>
<td>Service kit</td>
<td>027H6220</td>
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Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

ICM 100-125-150

Ordering complete valve without actuator

<table>
<thead>
<tr>
<th>Valve type</th>
<th>Connection type/size</th>
<th>Code number*</th>
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<tr>
<td>ICM 100-B</td>
<td>4” BW</td>
<td>027H7131</td>
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<tr>
<td>ICM 125-B</td>
<td>5” BW</td>
<td>027H7151</td>
</tr>
<tr>
<td>ICM 150-B</td>
<td>6” BW</td>
<td>027H7171</td>
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* Code number for ICM valve only.
ICAD 1200A must be ordered separately.

ICM 100-125-150 Spare Parts

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<tbody>
<tr>
<td><strong>Top covers</strong></td>
<td></td>
</tr>
<tr>
<td>Consist of:</td>
<td></td>
</tr>
<tr>
<td>Top cover complete with magnet coupling and gasket</td>
<td>Size</td>
</tr>
<tr>
<td>ICM 100</td>
<td>027H7133</td>
</tr>
<tr>
<td>ICM 125</td>
<td>027H7153</td>
</tr>
<tr>
<td>ICM 150</td>
<td>027H7173</td>
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<td>Consist of:</td>
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<tr>
<td>Gasket (pos. 2)</td>
<td>Size</td>
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<td>027H7134</td>
</tr>
<tr>
<td>ICM 125</td>
<td>027H7154</td>
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<td>ICM 150</td>
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<td><strong>Maintenance set B</strong></td>
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<tr>
<td>Consist of:</td>
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</tr>
<tr>
<td>Gasket (pos. 2)</td>
<td>Size</td>
</tr>
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<td>ICM 125</td>
<td>027H7155</td>
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<td>ICM 150</td>
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<td><strong>Replacement set C</strong></td>
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<td>Gasket (pos. 2)</td>
<td>Size</td>
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<td>ICM 125</td>
<td>027H7156</td>
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<td>ICM 150</td>
<td>027H7176</td>
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ICAD 1200A with 1.5 m. (60 in.) cables
ICAD 1200A without cable
027H9077
027H9122
ICM / ICAD 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.

<table>
<thead>
<tr>
<th>Description</th>
<th>Code no.</th>
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<tbody>
<tr>
<td>ICV 25 PM Valve housing</td>
<td>027H2119</td>
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<tr>
<td>ICV 32 PM Valve housing</td>
<td>027H3129</td>
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<tr>
<td>ICV 40 PM Valve housing</td>
<td>027H4128</td>
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<tr>
<td>ICV 50 PM Valve housing</td>
<td>027H5127</td>
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<tr>
<td>ICV 65 PM Valve housing</td>
<td>027H6128</td>
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</table>

Note!
The above code numbers are for the ICV PM valve housings only. Function modules and top covers must be ordered separately (see the section “Ordering”).
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

ICM / ICAD Accessories

**Multi/function tool**

<table>
<thead>
<tr>
<th>Description</th>
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<tbody>
<tr>
<td>For ICM sizes 20, 25, and 32</td>
<td>027H0180</td>
</tr>
<tr>
<td>For ICM sizes 40, 50, 65, 100, 125 and 150</td>
<td>027H0181</td>
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</table>

**Cable for ICAD 600A/1200A**

<table>
<thead>
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<th>Cable length</th>
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<tbody>
<tr>
<td>Cable set 1.5 m, female (4.9 ft.)</td>
<td>027H0426</td>
</tr>
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<td>Cable set 3 m, female (9.8 ft.)</td>
<td>027H0438</td>
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<tr>
<td>Cable set 10 m, female (32.8 ft.)</td>
<td>027H0427</td>
</tr>
<tr>
<td>Cable set 15 m, female (49 ft.)</td>
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**Protection cap ICAD 600A/1200A**

<table>
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<td>Protection cap</td>
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**ICM blank top covers including bolts and gasket**

<table>
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<tr>
<td>ICM 20 blank top cover</td>
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<tr>
<td>ICM 25 blank top cover</td>
<td>027H2174</td>
</tr>
<tr>
<td>ICM 32 blank top cover</td>
<td>027H3174</td>
</tr>
<tr>
<td>ICM 40 blank top cover</td>
<td>027H4174</td>
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<tr>
<td>ICM 50 blank top cover</td>
<td>027H5174</td>
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<td>ICM 65 blank top cover</td>
<td>027H6174</td>
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**Connectors for ICAD 600A/1200A**

<table>
<thead>
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<th>Connector type</th>
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<td>Two Female Connectors with screw terminals:</td>
<td>027H0430</td>
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<tr>
<td>- connector for power</td>
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<tr>
<td>- connector for control signals</td>
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**ICAD-UPS**

<table>
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<td>ICAD-UPS</td>
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## ICM 20 / ICAD 600A

### Dimensions

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<th>Connection</th>
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<th>H₁</th>
<th>H₂</th>
<th>L</th>
<th>L₁</th>
<th>L₂</th>
<th>Weight ICM incl. ICAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 D ((\frac{3}{4}) in.)</td>
<td>mm</td>
<td>40</td>
<td>195</td>
<td>85</td>
<td>107</td>
<td>102</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>in.</td>
<td>1.58</td>
<td>7.68</td>
<td>3.35</td>
<td>4.21</td>
<td>4.02</td>
<td>2.56</td>
</tr>
<tr>
<td>25 D (1 in.)</td>
<td>mm</td>
<td>40</td>
<td>195</td>
<td>85</td>
<td>107</td>
<td>102</td>
<td>65</td>
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<tr>
<td></td>
<td>in.</td>
<td>1.58</td>
<td>7.68</td>
<td>3.35</td>
<td>4.21</td>
<td>4.02</td>
<td>2.56</td>
</tr>
<tr>
<td>25 A (1 in.)</td>
<td>mm</td>
<td>40</td>
<td>195</td>
<td>85</td>
<td>107</td>
<td>102</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>in.</td>
<td>1.58</td>
<td>7.68</td>
<td>3.35</td>
<td>4.21</td>
<td>4.02</td>
<td>2.56</td>
</tr>
<tr>
<td>20 A ((\frac{3}{4}) in.)</td>
<td>mm</td>
<td>40</td>
<td>195</td>
<td>85</td>
<td>107</td>
<td>102</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>in.</td>
<td>1.58</td>
<td>7.68</td>
<td>3.35</td>
<td>4.21</td>
<td>4.02</td>
<td>2.56</td>
</tr>
<tr>
<td>20 SOC ((\frac{3}{4}) in.)</td>
<td>mm</td>
<td>40</td>
<td>195</td>
<td>85</td>
<td>107</td>
<td>102</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>in.</td>
<td>1.58</td>
<td>7.68</td>
<td>3.35</td>
<td>4.21</td>
<td>4.02</td>
<td>2.56</td>
</tr>
<tr>
<td>16 SD ((\frac{5}{8}) in.)</td>
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<td>40</td>
<td>195</td>
<td>85</td>
<td>107</td>
<td>102</td>
<td>65</td>
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<tr>
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<td>1.58</td>
<td>7.68</td>
<td>3.35</td>
<td>4.21</td>
<td>4.02</td>
<td>2.56</td>
</tr>
<tr>
<td>22 SD ((\frac{7}{8}) in.)</td>
<td>mm</td>
<td>40</td>
<td>195</td>
<td>85</td>
<td>107</td>
<td>102</td>
<td>65</td>
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<tr>
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<td>in.</td>
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<td>7.68</td>
<td>3.35</td>
<td>4.21</td>
<td>4.02</td>
<td>2.56</td>
</tr>
<tr>
<td>16 SA ((\frac{5}{8}) in.)</td>
<td>mm</td>
<td>40</td>
<td>195</td>
<td>85</td>
<td>107</td>
<td>102</td>
<td>65</td>
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<td>3.35</td>
<td>4.21</td>
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<td>2.56</td>
</tr>
<tr>
<td>22 SA ((\frac{7}{8}) in.)</td>
<td>mm</td>
<td>40</td>
<td>195</td>
<td>85</td>
<td>107</td>
<td>102</td>
<td>65</td>
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<td>3.35</td>
<td>4.21</td>
<td>4.02</td>
<td>2.56</td>
</tr>
</tbody>
</table>

D = Butt-weld DIN ; A = Butt-weld ANSI ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread
### ICM 25 / ICAD 600A

**Dimensions (continued)**

<table>
<thead>
<tr>
<th>Connection</th>
<th>H</th>
<th>H₁</th>
<th>H₂</th>
<th>L</th>
<th>L₁</th>
<th>L₂</th>
<th>Weight ICM incl. ICAD</th>
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<td>135</td>
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<tr>
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<td>1.58</td>
<td>7.68</td>
<td>3.90</td>
<td>5.31</td>
<td>4.02</td>
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<td>25 D (1 in.)</td>
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<td>195</td>
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<td>102</td>
<td>84</td>
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<td>7.68</td>
<td>3.90</td>
<td>5.31</td>
<td>4.02</td>
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</tr>
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<td>32 D (1 1/4 in.)</td>
<td>mm</td>
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<td>135</td>
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<td>84</td>
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<tr>
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<td>7.68</td>
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<td>3.90</td>
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<td>3.90</td>
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<td>84</td>
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<td>102</td>
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<tr>
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<td>3.90</td>
<td>5.31</td>
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<td>147</td>
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<td>84</td>
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<td>7.68</td>
<td>3.90</td>
<td>5.79</td>
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<td>3.31</td>
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<tr>
<td>22 SA (7/8 in.)</td>
<td>mm</td>
<td>40</td>
<td>195</td>
<td>99</td>
<td>135</td>
<td>102</td>
<td>84</td>
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<tr>
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<td>in.</td>
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<td>7.68</td>
<td>3.90</td>
<td>5.31</td>
<td>4.02</td>
<td>3.31</td>
</tr>
<tr>
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<td>mm</td>
<td>40</td>
<td>195</td>
<td>99</td>
<td>147</td>
<td>102</td>
<td>84</td>
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<td>in.</td>
<td>1.58</td>
<td>7.68</td>
<td>3.90</td>
<td>5.79</td>
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<td>3.31</td>
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<td>84</td>
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<td></td>
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D = Butt-weld DIN ; A = Butt-weld ANSI ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

ICM 32 / ICAD 600A

Dimensions (continued)

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<td>117</td>
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D = Butt-weld DIN ; A = Butt-weld ANSI ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI
ICM 40 / ICAD 1200A

Dimensions (continued)

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<tr>
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<td>5.16</td>
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<td>107</td>
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D = Butt-weld DIN; A = Butt-weld ANSI; SOC = Socket weld ANSI; SD = Solder DIN; SA = Solder ANSI
## Dimensions (continued)

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<tr>
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<th>H₂</th>
<th>L</th>
<th>L₁</th>
<th>L₂</th>
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<td>65 A (2'/₂₈ in.)</td>
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D = Butt-weld DIN; A = Butt-weld ANSI; SOC = Socket weld ANSI; SD = Solder DIN
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

ICM 65 / ICAD 1200A

Dimensions (continued)

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<td>9.65</td>
<td>4.02</td>
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D = Butt-weld DIN; A = Butt-weld ANSI; J = Butt-weld JIS; SOC = Socket weld ANSI; SD = Solder DIN; SA = Solder ANSI
ICM 100 / ICAD 1200A

Dimensions (continued)

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D = Butt-weld DIN ; A = Butt-weld ANSI
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A

ICM 125 / ICAD 1200A

Dimensions (continued)

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D = Butt-weld DIN ; A = Butt-weld ANSI
ICM 150 / ICAD 1200A

Dimensions (continued)

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

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

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<td>mm</td>
<td>mm</td>
<td>in.</td>
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<tr>
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<td>60.3</td>
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<td>(65)</td>
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<td>73.0</td>
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<td>(80)</td>
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<tr>
<td>(100)</td>
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<td>114.3</td>
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<td>(125)</td>
<td>5</td>
<td>140.7</td>
<td>6.5</td>
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<tr>
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<td>7.1</td>
<td>6.6</td>
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**SOC: Socket welding ANSI (B 16.11)**

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<td>mm</td>
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<td>mm</td>
<td>mm</td>
<td>in.</td>
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**ODS: Soldering (ANSI B 16.22)**

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<tr>
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<tr>
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<td>2.625</td>
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**FPT: Female pipe thread, (ANSI/ASME B 1.20.1)**

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<td>⅛</td>
<td>(⅛ x 14 NPT)</td>
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<tr>
<td>(25)</td>
<td>1</td>
<td>(1 x 11.5 NPT)</td>
</tr>
<tr>
<td>(32)</td>
<td>1⅛</td>
<td>(1⅛ x 11.5 NPT)</td>
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</tbody>
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Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A
Motor operated valves, type ICM 20-150 and actuators type ICAD 600A and 1200A