Colibri® Electric expansion valves
Type ETS 12C, ETS 24C, ETS 25C, ETS 50C, ETS 100C

ETS Colibri® is an electric stepper motor valve. The valve has been designed for precise liquid injection into evaporators for air conditioning and refrigeration applications.

The valve in-line design includes balanced cage and slider assembly operated by the direct driven motor technology. This ensures solenoid tight shut-off in both flow directions, thus providing smooth operation of the system.

The valve incorporates a powerful bi-polar motor which precisely controls flow regulation.

ETS Colibri® valves are compatible with electronic control solutions from Danfoss and other manufacturers.

Applications:
Air Conditioning
- Chillers, heat pumps
- Rooftop and ducted split systems
- VRF and other split systems
- Close control cooling
Refrigeration
- Cold Rooms, Food retail and Transport

Features / Benefits

Precise control of liquid injection
- Optimum utilization of the evaporator
- Increased energy efficiency and COP
- Improved overall system performance

Linear Flow characteristic
- Repetitive operation of the valve at all conditions

Balanced cage design
- Higher MOPD and MWP
- Easily fits in various application and operating conditions

Direct driven valve motor technology
- Powerful motor that guarantees precise flow control and increased energy efficiency of the system

Supports variety of refrigerants, approved for oil free applications
- Wide application scope

Fast opening/closing time of 2.5 seconds
- Quick reaction to the operating condition
- Minimizes the risk of liquid refrigerant flowing into the compressor at shut down and low pressure cut out at start up

Solenoid tight shut-off
- Prevents migration of the refrigerant during stand still
- Reduced complexity by reducing number of components in the system

Sight glass / moisture indicator
- Fast troubleshooting during system diagnostics

Compact, lightweight and in-line design
- Flexible and easy integration in any system

Bi-metal connectors
- Fast and improved brazing process - no wet wrap needed

Stainless construction
- Internal and external corrosion resistant

Fully hermetic laser welded design
- Hermetic valve in accordance to EU F-gas Regulation EU 517/2014
- No external leakage which saves cost on maintenance and refrigerant loss
- Protecting the environment and climate

Manufactured according to ISO/TS16949
- Second – to – none quality and reliability

For more info
Data sheet | Colibri® Electric expansion valves, type ETS 12C, ETS 24C, ETS 25C, ETS 50C, ETS 100C

Application

Technical data


Refrigerant oil: POE, PVE, All mineral oils, ester oils and supports oil free.

Complies with PED: Yes, Fluid group 2 (flammables), article 4 paragraph 3 for all ETS Colibri.

MOPD: 40 bar / 580 psi (g).

Max. working pressure PS/MWP: 50 bar(g) / 725 psi(g).

Refrigerant temperature range (measured at the inlet of the valve): -40 – 70 °C / -40 – 158 °F.

Ambient temperature: -40 – 70 °C / -40 – 158 °F.

Capacity control range: 10% - 100% of total opening degree.

Initial opening: 5% = 30 full steps.

Material of construction: Body: Stainless Steel / Connector: Bimetal (stainless steel and copper).

Sightglass / moisture indicator: Type N moisture indicator.

Motor enclosure: IP67.

Step motor type: Bi-polar - permanent magnet.

Phase current: 800 mA peak / 600 mA RMS.

Holding current: No permanent holding current needed. Max. 20% permanent holding current allowed with refrigerant flow through valve.

Phase resistance: 10 Ω ±10% at +20 °C / +68 °F.

Duty cycle: 100% possible, requiring refrigerant flow through valve. Less than 50% over 120 sec period recommended.

Nominal Power consumption: 7.44 W RMS at 20 °C (total, both coils).

Step rate:
- Current control driver:
  - a. Step type: Microstep (1/4 th or higher): 240 full steps/sec. recommended.
  - b. Step type: Full step or Half steps: 240 full steps/sec. recommended.
  - Emergency close: 240 full steps/sec.
- OEMs with 3rd party controller, please contact Danfoss.

Step translation: 0.0167 mm / step.

Electrical connection: according to EN 61076-2-101.

Compatible controllers / driver: Danfoss EKE 1A, EKE 1B, EKE 1C, MCX061V, MCX152V. Certain third party controllers / drivers. Contact Danfoss for details.

Approvals: ETS Colibri®

CE, REACH, UL, LLC CDC EURO TYSK, EAC.


Electrical data

Motor enclosure: IP67.

Step motor type: Bi-polar - permanent magnet.

Step mode: Microstepping (recommended), 2 phase full step or half step.

Step rate:
- Current control driver:
  - a. Step type: Microstep (1/4 th or higher): 240 full steps/sec. recommended.
  - b. Step type: Full step or Half steps: 240 full steps/sec. recommended.
  - Emergency close: 240 full steps/sec.
- OEMs with 3rd party controller, please contact Danfoss.

Step translation: 0.0167 mm / step.

Full travel time: 2.5 at 240 steps / sec.

Opening stroke: 10 mm / 0.4 in.

Reference position: Overdriving against the full close position.

Overdriving performance:
- 1% (6 full steps) Overdrive is recommended for optimum performance.
- 628 steps in closing direction recommended for initialisation.
- Overdriving in open position not recommended.

Electrical connection: according to EN 61076-2-101.

Compatible controllers / driver: Danfoss EKE 1A, EKE 1B, EKE 1C, MCX061V, MCX152V. Certain third party controllers / drivers. Contact Danfoss for details.
### Ordering

<table>
<thead>
<tr>
<th>Type</th>
<th>$K_v$ value (m³/h)</th>
<th>$C_v$ value (gpm)</th>
<th>Rated capacity¹</th>
<th>Connection</th>
<th>Code no.</th>
<th>Code no. l-pack 12 pcs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R410A</td>
<td>R407C</td>
<td>R1234ze</td>
<td>R134a</td>
<td>R290</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(KW)</td>
<td>(TR)</td>
<td>(KW)</td>
<td>(KW)</td>
<td>(KW)</td>
<td></td>
</tr>
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<td></td>
<td>(TR)</td>
<td>(TR)</td>
<td>(TR)</td>
<td>(TR)</td>
<td>(TR)</td>
<td></td>
</tr>
</tbody>
</table>

**Without sight glass**
- **ETS 12C**
  - 0.8, 0.9, 91.4, 26.4, 8.3, 23.9, 46.8, 13.5, 59.4, 17.1, 79.7, 23.0
- 0.8, 0.9, 98.1, 28.3, 89.1, 25.6, 50.3, 14.5, 63.7, 18.4, 85.6, 24.7
- 0.8, 0.9, 105.2, 95.1, 27.3, 53.6, 15.4, 68.0, 19.6, 91.3, 26.3
- **ETS 24C**
  - 1.3, 1.5, 129.3, 13.7, 117, 33.7, 66.2, 19.1, 83.9, 24.2, 113, 32.5
  - 1.3, 1.5, 138.7, 125.9, 70.4, 20.3, 89.3, 25.7, 120, 34.6

**With sight glass**
- **ETS 25C**
  - 1.3, 1.5, 170, 49.2, 155, 44.5, 87.3, 25.1, 111, 31.9, 149, 42.8
  - 2.4, 2.8, 323, 93.3, 294, 84.5, 166, 47.7, 210, 60.5, 282, 81.3
  - 2.4, 2.8, 323, 93.3, 294, 84.5, 166, 47.7, 210, 60.5, 282, 81.3

- **ETS 50C**
  - 5.0, 5.8, 635, 183, 577, 166, 325, 93.7, 413, 119, 554, 160
  - 5.0, 5.8, 635, 183, 577, 166, 325, 93.7, 413, 119, 554, 160

- **ETS 100C**
  - 5.0, 5.8, 635, 183, 577, 166, 325, 93.7, 413, 119, 554, 160
  - 5.0, 5.8, 635, 183, 577, 166, 325, 93.7, 413, 119, 554, 160

¹ The above estimated capacities are based on the following conditions:
- Evaporating temperature $t_e$: 5 °C / 40 °F
- Liquid temperature $t_l$: 28 °C / 82 °F
- Condensing temperature $t_c$: 32 °C / 90 °F
- Full stroke opening in normal flow direction
- Capacity is ± 10% in full open state in reverse flow direction
* For flammable refrigerants contact Danfoss

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### Coolselector*²

is a Danfoss calculation and selection software, designed to make selection processes for all refrigeration projects easier and less time consuming. For fast and precise selection of valve, use Danfoss’ CoolSelector² software. You can download it from [http://coolselector.danfoss.com](http://coolselector.danfoss.com)

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### Identification (laser engraved data)

- **Made in Denmark**
- **Colibri® Electric Expansion valve**
  - **ETS XXXC**
  - N0317A (Manufacturing no.)
  - 10 Ω, 800 mA peak
  - PS 50 bar / MWP 725 psig
  - -40/+70 °C / -40/+158 °F
  - 034GXXXX

- **Country of origin**
- **Valve name**
- **Valve type**
- **N = Nordborg, Denmark**
- **03 = week**
- **17 = 2017**
- **A = Monday**
- **Motor resistence, current**
- **Max. working pressure**
- **Refrigerant temperature**
- **Code number**
- **Approvals**
- **QR code**
  - (with traceable serial no.)

- **Danfoss, 6430 Nordborg, Denmark**
- **Manufacturer address**

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Accessories:
M12 angle cable

M12 angle female connector is intended for use with a standard M12 male connector, available on stepper motor valves. This cable is designed to offer high flexibility and small outer diameters with tensile strength. The angle way M12 cable consist of paired, twisted wires, which decreases mutual influence between signals transmitted along the cable and reduces influence of external sources of interference. The cables thus provides a higher degree of protection against lost steps compared to other cables.

Approvals for cable

Specification

<table>
<thead>
<tr>
<th>Jacket</th>
<th>PVC - black</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable outer sheath</td>
<td>Oil - resistant</td>
</tr>
<tr>
<td>Water proof rating</td>
<td>IP 67</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-40 – 80 °C</td>
</tr>
<tr>
<td>Wire type</td>
<td>Twisted pair, cross section 20 AWG / 0.5 mm²</td>
</tr>
<tr>
<td>Cable outer diameter</td>
<td>7.0 mm</td>
</tr>
<tr>
<td>Minimum bending radius</td>
<td>10 x cable diameter</td>
</tr>
<tr>
<td>Cable combustibility / test</td>
<td>Flame retardant / VW-1 / CSA FT - 1</td>
</tr>
<tr>
<td>M12 standard</td>
<td>EN 61076-2-101</td>
</tr>
<tr>
<td>Reference standard</td>
<td>UL style 2464 and DIN VDE 0812</td>
</tr>
<tr>
<td>LVD directive</td>
<td>2014/35/EU</td>
</tr>
</tbody>
</table>

Ordering

<table>
<thead>
<tr>
<th>Cable</th>
<th>Insulation</th>
<th>Packing format</th>
<th>Code no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC - black</td>
<td>SR-PVC</td>
<td>Single pack</td>
<td>034G7073</td>
</tr>
<tr>
<td>2 m / 6.6 ft</td>
<td>SR-PVC</td>
<td>Single pack</td>
<td>034G7074</td>
</tr>
<tr>
<td>8 m / 26.2 ft</td>
<td>SR-PVC</td>
<td>Single pack</td>
<td></td>
</tr>
</tbody>
</table>

Identification

Connections

Dimensions

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Data sheet | Colibri® Electric expansion valves, type ETS 12C, ETS 24C, ETS 25C, ETS 50C, ETS 100C

**Design and function**

The ETS Colibri® in-line electronic expansion valve regulates refrigerant flow by means of an internal cage slider which moves in a linear motion. This occurs by the rotation of a spindle assembly which moves when electrical pulses are applied to the motor. The direction of the rotation of the spindle depends on the phase relationship of the power pulses.

The valve design is pressure balanced, giving identical bi-flow performance capabilities and nearly identical maximum capacities.

Operating the ETS Colibri® series requires a controller that can provide 800mA peak/ 600mA RMS current per phase in order to achieve the operational temperature and MOPD envelope of the valve.

**Cable length**

Depending on the type of controller or driver, there will be limitations in cable length between the controller / driver and the valve. Both the actual cable length, the level of EMC emission on the location and the driver circuit have an impact on the actual distortion of the current to the motor. On using 3rd party longer cable, make sure that the valve receives the exact current as defined in the specification.

1. Valve body in stainless steel
2. Connections in bi-metal
3. Sight glass with moisture indicator
4. M12 electrical connection
5. Stepper motor
6. Cage and slider

**Flow direction**

Flow direction from A to B refers the normal flow.
Sightglass for flash gas detection can only be used in normal flow direction.

**Valve design**

**Sight glass and indicator**

ETS 25C, ETS 50C and ETS 100C have integrated sight glass with moisture indicator. The presence of the sight glass provides the availability to check the physical position of the slider in the valve. It also helps to determine the flow direction of the refrigerant in the system. Insufficient sub cooling can produce flash gas which is visible through the sight glass. The moisture indicator in the sight glass indicates dry or wet state of the refrigerant by changing colour.

**Valve opening position**

(Valid for ETS 25C - ETS 100C)

The colors of the grooves are only for illustration purposes.
Flow curve

ETS Colibri. Capacity Vs Opening %

For R134a
The above estimated capacities are based on the following conditions:
- Evaporating temperature tₑ: 5 °C / 40 °F
- Liquid temperature tₗ: 28 °C / 82 °F
- Condensing temperature tᶜ: 32 °C / 90 °F

Full stroke opening in normal flow direction. Capacity is ± 10% in full open state in reverse flow direction.

Driving Colibri® valve

ETS Colibri valves use a bipolar, 2-phase, permanent magnet stepper motor.
ETS valves can be driven using various electronic control techniques i.e: Full step excitation mode, half step excitation mode, micro stepping mode (recommended).
On selecting controller from other manufacturer than Danfoss, it is necessary to set the following correct valve data into the controller setting. The wrong settings may impair the performance of the valve.
- Total no. of steps
- Step rate
- Phase current
- Overdriving against closing position

If the controller driving the ETS Colibri valve is from another manufacturer than Danfoss or a custom design, the following points must be considered in order to overcome potential step loss.
To ensure total closing of the valve, and to compensate the lost steps after a defined number of changes in opening degree the controller should have a function to overdrive the valve in the closing direction. It is recommended to overdrive the valve at appropriate intervals as specified in the specification table.

At power failure the ETS valve will remain in the actual opening position it has at the moment of power failure, unless a device in the form of a battery backup to the controller is installed.

Stepper motor switch sequence

The following table shows the full step excitation switching sequence

<table>
<thead>
<tr>
<th>Pin</th>
<th>A 1</th>
<th>A 2</th>
<th>B 1</th>
<th>B 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire color</td>
<td>White</td>
<td>Black</td>
<td>Red</td>
<td>Green</td>
</tr>
<tr>
<td>STEP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
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<tr>
<td>4</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

Color code is only valid for Danfoss M12 cable

Electrical check of stepper motor and wiring: coil A and coil B = 10 Ω at 20 °C / 68 °F

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**Operation principle**

This section explains the operation of the two phase full step excitation method in a bipolar stepper motor. Fig. 1 shows the simplified diagram of a rotor and a stator. The Full stepping operation is summarized below.

When a current in a form of a pulse flows to a given phase, that phase of the stator is excited as shown in Fig. 2.

1. On exciting Phases B1 and A1 simultaneously, the permanent magnets on the rotor are moved in the intermediate position between phase B1 and phase A1.
2. When phases A1 and B2 are excited simultaneously, the rotor is then positioned between phases A1 and B2.
3. Next, by exciting the successive adjacent pairs of phases sequentially i.e. phases B2 and A2, phases A2 and B1, and phases B1 and A1, the rotor rotates through two phase excitations.
4. By completely reversing the cycle in the following sequence phases B1 and A1 to phases A2 and B1 to phases B2 and A2 to phases A1 and B2, the stepper motor then reverses its rotation.
5. The stepper motor is stopped by holding the phase excitation for a specified period at the last phase of forward or reverse rotation.

ETS Colibri valves can also be driven by micro stepping excitation method (preferred) in addition to the one explained above.
**Dimensions**

**ETS 12C / ETS 24C**

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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<th></th>
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<tbody>
<tr>
<td>ETS 12C</td>
<td>( \frac{5}{8} ) x ( \frac{1}{2} )</td>
<td>49.9</td>
<td>2</td>
<td>122</td>
<td>4.8</td>
<td>41.6</td>
<td>1.6</td>
<td>9.5</td>
<td>0.3</td>
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<tr>
<td></td>
<td>( \frac{3}{16} ) x ( \frac{5}{16} )</td>
<td>49.9</td>
<td>2</td>
<td>132</td>
<td>5.2</td>
<td>46.6</td>
<td>1.8</td>
<td>14.7</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>( \frac{3}{8} ) x ( \frac{5}{8} )</td>
<td>49.9</td>
<td>2</td>
<td>135</td>
<td>5.3</td>
<td>48.4</td>
<td>1.9</td>
<td>20.0</td>
<td>0.8</td>
</tr>
<tr>
<td>ETS 24C</td>
<td>( \frac{7}{8} ) x ( \frac{5}{8} )</td>
<td>49.9</td>
<td>2</td>
<td>122</td>
<td>4.8</td>
<td>41.6</td>
<td>1.6</td>
<td>9.5</td>
<td>0.3</td>
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<tr>
<td></td>
<td>( \frac{15}{16} ) x ( \frac{7}{16} )</td>
<td>49.9</td>
<td>2</td>
<td>132</td>
<td>5.2</td>
<td>46.6</td>
<td>1.8</td>
<td>14.7</td>
<td>0.6</td>
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<tr>
<td></td>
<td>( \frac{7}{8} ) x ( \frac{7}{8} )</td>
<td>49.9</td>
<td>2</td>
<td>135</td>
<td>5.3</td>
<td>48.4</td>
<td>1.9</td>
<td>20.0</td>
<td>0.8</td>
</tr>
</tbody>
</table>

*) For the equivalent industrial packed code number see the ordering section.

**ETS 25C, ETS 50C and ETS 100C**

<table>
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<tr>
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<td>ETS 25C</td>
<td>( \frac{7}{8} ) x ( \frac{5}{8} )</td>
<td>49.9</td>
<td>2</td>
<td>135</td>
<td>5.3</td>
<td>50.4</td>
<td>2</td>
<td>20.0</td>
<td>0.8</td>
<td>65.6</td>
</tr>
<tr>
<td></td>
<td>( \frac{3}{16} ) x ( \frac{5}{16} )</td>
<td>49.9</td>
<td>2</td>
<td>139</td>
<td>5.5</td>
<td>50.4</td>
<td>2</td>
<td>20.0</td>
<td>0.8</td>
<td>65.6</td>
</tr>
<tr>
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<td>( \frac{7}{8} ) x ( \frac{7}{8} )</td>
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<td>5.8</td>
<td>50.4</td>
<td>2</td>
<td>20.0</td>
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<td>65.6</td>
</tr>
<tr>
<td>ETS 50C</td>
<td>( \frac{7}{8} ) x ( \frac{7}{8} )</td>
<td>49.9</td>
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<td>139</td>
<td>5.5</td>
<td>58.4</td>
<td>2.3</td>
<td>25.0</td>
<td>1.0</td>
<td>65.6</td>
</tr>
<tr>
<td></td>
<td>( \frac{11}{16} ) x ( \frac{5}{8} )</td>
<td>49.9</td>
<td>2</td>
<td>155</td>
<td>6.1</td>
<td>58.4</td>
<td>2.3</td>
<td>25.0</td>
<td>1.0</td>
<td>65.6</td>
</tr>
<tr>
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<td>( \frac{11}{16} ) x ( \frac{7}{8} )</td>
<td>49.9</td>
<td>2</td>
<td>169</td>
<td>6.7</td>
<td>65.4</td>
<td>2.3</td>
<td>30.0</td>
<td>1.2</td>
<td>65.6</td>
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</tbody>
</table>

*) For the equivalent industrial packed code number see the ordering section.
## Troubleshooting

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>No valve movement</td>
<td>Lack of proper electrical connection</td>
<td>• Check the connection between valve and a controller</td>
</tr>
<tr>
<td></td>
<td>Wrong parameter setting in controller</td>
<td>• Check valve settings in controller i.e pre-selected valves, no. of steps, phase current, direction of valve rotation, steps per second</td>
</tr>
<tr>
<td></td>
<td>Broken motor/ short circuit</td>
<td>• Check the resistance between coil A and coil B. Resistance in each coil should be 10 ohms @20°C. Details on page 4 • Replace a complete valve</td>
</tr>
<tr>
<td></td>
<td>Insufficient power supply to valve</td>
<td>• Check the current/voltage supply from controller to valve</td>
</tr>
<tr>
<td>Internal leakage (due to 'Step Loss')</td>
<td>Control pulse to valve is influenced by high external electrical noise</td>
<td>• Separate the cable from high power lines</td>
</tr>
<tr>
<td></td>
<td>Longer cable length between valve and controller</td>
<td>• Check the maximum cable length allowed between the controller and the valve • For longer cable distance, use cable with bigger wire diameter • Use cable filter</td>
</tr>
<tr>
<td></td>
<td>Accumulated backlash in valve</td>
<td>• Controller should overdrive the valve to compensate the lost steps after a number of changes in opening degree</td>
</tr>
<tr>
<td></td>
<td>Insufficient power supply to the valve</td>
<td>• Check the current/voltage supply from controller to valve • Check the supply power to controller</td>
</tr>
<tr>
<td>Insufficient capacity</td>
<td>Expansion valve too small</td>
<td>• Check refrigeration system capacity and compare with expansion valve capacity. Replace with larger valve if necessary</td>
</tr>
<tr>
<td></td>
<td>Suction pressure too low</td>
<td>• Check superheat performance, the settings SH min and SH max. in the super heat controller • Check valve capacity • Check 'total number of steps' defined in the controller • Also check section 'High Superheat'</td>
</tr>
<tr>
<td></td>
<td>Evaporator superheat too high</td>
<td>Expansion valve blocked with foreign material</td>
</tr>
<tr>
<td></td>
<td>Evaporator wholly or partly iced up</td>
<td>• De-ice evaporator</td>
</tr>
<tr>
<td>High superheat</td>
<td>Lack of sub-cooling</td>
<td>• Check refrigerant • Also refer to section Insufficient capacity</td>
</tr>
<tr>
<td></td>
<td>Controller is not setup/tuned properly</td>
<td>• Check the controller superheat settings and sensors connected to it • Tune PID parameters in the controller</td>
</tr>
<tr>
<td>Flash gas</td>
<td>Lack of sub-cooling ahead of expansion valve</td>
<td>• Check refrigerant for flash gas ahead of expansion valve / external subcooler • If the valve is placed much higher than condenser outlet, check pressure difference</td>
</tr>
<tr>
<td></td>
<td>Oversized valve selected</td>
<td>Oversized valve selected</td>
</tr>
</tbody>
</table>

## Related products (for more details, click the image below)

- EKE 1A, EKE 1B, EKE 1C
  - EKE 1A, EKE 1B, EKE 1C superheat controller
- EKS 221, ACCPBT, AKS 11 / AKS 12
  - EKS 221, ACCPBT, AKS 11 / AKS 12 temperature sensor
- AKS 32R, AKS 32, AKS 33, NSK
  - AKS 32R, AKS 32, AKS 33, NSK pressure transmitter
- AST-G service driver
  - Code no. 034G0013

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**All Danfoss products fulfill the requirements in REACH.**

One of the obligations in REACH is to inform customers about presence of Candidate list substances if any, we hereby inform you about one substance on the candidate list:

A moist indicator in the sight glass contains a paper which is impregnated with Cobalt Dichloride (CAS no: 7646-79-9) in a concentration above 0.1% w/w.

Avoid skin contact with the paper - Do not inhale the dust from the paper - The paper must be disposed as hazardous waste.

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