ELECTRONIC EXPANSION VALVE UPGRADE

For Centrifugal Chillers Models WSC, WDC, WCC
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Manufactured in an ISO certified facility.

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Introduction

This manual provides installation, operating, and troubleshooting information for Electronic Expansion Valve (EXV) upgrade on Daikin centrifugal chillers. It replaces existing Thermal Expansion Valves (TXV) on centrifugal chillers with greater than 700 tons capacity per compressor.

Installation involves mounting the EXV, field wiring it, and setup of the preprogrammed EXV driver.

Features of the EXV

- Control of leaving chilled water within a ±0.5°F (±0.3°C) tolerance (a MicroTech driver).
- Starting with colder water temperatures.
- Better regulation during low charge conditions.
- Better part-load control.
- Light load liquid control operation.
- Bolts up to an existing Pilot Expansion Valve location.
- Utilizes the existing MicroTech program.
- Sight glasses give instant diagnostics.
- M12 Feed-thru and cables for quick install.

Nominal Valve Tonnage Part Numbers

<table>
<thead>
<tr>
<th>Tonnage</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>650</td>
<td>334980829</td>
</tr>
<tr>
<td>900</td>
<td>334980830</td>
</tr>
<tr>
<td>1400</td>
<td>334980831</td>
</tr>
<tr>
<td>1800</td>
<td>334980832</td>
</tr>
<tr>
<td>2700</td>
<td>334980833</td>
</tr>
<tr>
<td>3000</td>
<td>334980834</td>
</tr>
</tbody>
</table>

Note: Check Daikin Applied for available and latest EXV Valve B/M.
Component Installation

*Figure 1, Component Installation*
Exv Greater Than 700 tons Option

![Diagram](image)

Note: ○ indicates knockouts.

**Table 1, EXV Kit Components**

<table>
<thead>
<tr>
<th>Qty</th>
<th>Component Name</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>EXV Valve Assembly purchased separately based on existing TXV size requirement.</td>
<td>3349808xx</td>
</tr>
<tr>
<td>1</td>
<td>Mini DC Power Supply</td>
<td>332815001</td>
</tr>
<tr>
<td>1</td>
<td>Programmable Drive (aka EXV Board)</td>
<td>334053401</td>
</tr>
<tr>
<td>2</td>
<td>PROTECTOR/FLANGE, 7.00 OD</td>
<td>074732227</td>
</tr>
<tr>
<td>1</td>
<td>WAGO DIN RAIL 12&quot;</td>
<td>330815301</td>
</tr>
<tr>
<td>4</td>
<td>SCREW, FH #8X.50</td>
<td>735032730</td>
</tr>
<tr>
<td>1</td>
<td>Cap/vinyl .375d_500h_.043t</td>
<td>910114633</td>
</tr>
<tr>
<td>1</td>
<td>Circuit Breaker: ABB S201-K6, 6 amp</td>
<td>330720909</td>
</tr>
<tr>
<td>0</td>
<td>Wire, Shielded Cable/Straight, 4 Pole (w-Val) Wire normally shipped attached to the EXV.</td>
<td>332777201</td>
</tr>
</tbody>
</table>
Mounting the EXV

1. Pump the refrigerant charge into the condenser.
2. Remove the existing Thermal Expansion Valve and pilot valve.
3. Seal the refrigerant feed line to the pilot valve.
4. Mount the EXV, matching up the connections to the TXV. Order the same gaskets used for the TXV on the new EXV.
5. Leak test the joints and prepare unit for operation.

Field Wiring

NOTES:

1. On WSC and WDC model chillers the unit controller operates the EXV and connections below referring to “controller” are made to it.
2. On WCC model chillers the compressor controller operates the EXV and connections below referring to “controller” are made to it.
3. The field wiring diagram is Figure 2.

The Cable running from the EXV will go to the Programmable Drive 334053401 loaded with the code: EXV_LBv4_2800mA.dup.

AC power to DC power supply
From L1 (or 85) and L2 (or 86) See Figure 2.

To Two Pin Connector CN1 (DC power supply to programmable driver)
(from Mini Power Supply (PN 332815001)
- 1:+Vp: +24 VDC from Power Supply
- 2:GND: - or Ground from Power Supply

To Five Pin Connector CN2 (M-12 cable from EXV to programmable driver CN2)
- 1: Brown to FA-
- 2: White to FA+
- 3: Blue to FB+
- 4: Black to FB-
  Note: Measured OHMS through cable for phase A and B is approximately 2.4 OHMS and at the motor is 1.9 OHMS.

Digital Input from controller J14 to programmable driver CN3 for Calibration
(From Controller J14)
- 1: +DI0: +24 VDC from Power Supply
- 2: -DI0: - or Ground from Power Supply through J14

Analog Input Signal: CN4
(From controller J4 AI-Y3 signal)
- 1:GND: - or Ground from Power Supply (terminal 71 on UTB1)
- 2:AI0: 0-10Vdc from Controller J4-Y3
Field Wiring Diagram

Figure 2, Field Wiring Diagram

Note: Lead number in schematic may vary by application.

Table 2, Wiring from EXV to Programmable Controller (EXV Board)

<table>
<thead>
<tr>
<th>EXV Control Terminals</th>
<th>Cable Mfg</th>
<th>Pin</th>
<th>Connector Mfg</th>
<th>EXV Motor Located in EXV</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN2</td>
<td>MURR</td>
<td>1</td>
<td>MENCOM</td>
<td>ORIENTAL</td>
</tr>
<tr>
<td>FA:-1</td>
<td>Brown</td>
<td>1</td>
<td>Brown</td>
<td>Black</td>
</tr>
<tr>
<td>FA:+2</td>
<td>White</td>
<td>2</td>
<td>White</td>
<td>Green</td>
</tr>
<tr>
<td>FB:+3</td>
<td>Blue</td>
<td>3</td>
<td>Blue</td>
<td>Red</td>
</tr>
<tr>
<td>FB:-4</td>
<td>Black</td>
<td>4</td>
<td>Black</td>
<td>Blue</td>
</tr>
</tbody>
</table>
Operating the EXV

Changing Setpoints
Set points are changed on the unit controller for WSC and WDC units or compressor controller for the WCC units.

Basic Theory of Operation
When the chiller starts the expansion valve will operate based on Evaporator Pressure (EP) control. When the Evap Leaving Water Temperature (ELWT) pulls down to within a selected degree above the ELWT target set point, the control switches to a “Programmed” solution based on capacity.

Typical Operation

General:
1. Just prior to the chiller starting the compressor (first compressor on dual units), the expansion valve will close and then open fully. This is a means of recalibrating the valve’s position.
2. Working under Evap Pressure control, the valve will start fully open, and as the chiller pulls down the valve will close down and then slowly re-open as the pull-down progresses.
3. When the Evap leaving water temp has been pulled below the Drop Out (DO XX.X°F) set point, the valve will switch to Program control.
4. If the chiller is off, and the evaporator entering water temp equals the condenser entering water temp the expansion valve will open 30% to allow refrigerant to drain back into the condenser vessel.

LAM Technologies EXV DS3044 with Code Loaded:
   A. Green LED indicates power is on the Driver Bd.
   B. Yellow LED indicates the Driver (on: is Ready) and flashing: is attempting to move the Motor.
   C. Red LED flash is flashing a code that indicates a problem with the driver or motor. Count number of Flashes; example 1 flash is ”Under Vdc”:
      1) Under Vdc
      2) Over Vdc
      3) Over Temperature
      4) Short Phase
      5) Short GND
      6) Short VDC
      7) Phase A Break
      8) Phase B Break
      9) System Error

Valve Motor Rotation
Looking from the top of the valve through to the shaft, the motor rotates clockwise, which will lift the piston to its closed position in about 30 seconds. If the motor is rotating incorrectly (counter-clockwise) switch two wires on one phase and the direction will switch to clockwise. This may be done at the EXV driver or inside between the motor and the feed-through connector.
Expansion Valve Adjustments

Refer to the “Set Unit Ex-Val(15)” Screen found in recent centrifugal code WCFU3UU0xx. Changes may be made with the Manager Level password access.

| SET UNIT EX-Val (15) | Ex-Valve Gain = 78 | Offset(Slope) = 700 | Prs Ctrl DOut = 10.0°F |

**Pre-conditions:**

Before setting these values, the unit refrigerant charge should be correct and tubes clean. If the above values are changed with these conditions not met then they will likely be incorrect when the true conditions are met.

**Expansion-Valve Gain:**

Default is 78 (%). This value is changed to match the unit size, and directly multiplies the valve position generated by the Equation that develops the valve position. Increasing this value makes the Evaporator run wetter and likewise decreasing it makes it run drier. The range of change is 50 to 400 %: If a change is needed this is the most important to change.

For setting this value you should be running in excess of 50% load and for best results at 100% in steady state operation. See Figure 3 for detail.

**Expansion Valve Offset (Slope):**

Default is 700, is a constant adder in the Equation for valve position. Changing this value influences the slope of the equation for valve position, and its biggest influence is when the valve is running fairly closed at a light load setting. This is changed only after you have defined the full load Gain setting above. The range of this setpoint is 100 to 999. See Figure 4 for detail:

**Prs Ctrl DOut: (Pressure Control Dropout)**

Default is DO = 10.0 °F, which defines the point that a starting chiller drops out of Suction Press control to the normal Program Based Control. As the Evap Leaving Water Temperature ELWT approaches set point, when the water temperature falls under the value of (DO + Chilled Water setpoint), then it switches control to Program based control. The range of this setpoint is 00.0 to 99.0.
Troubleshooting

Oscillating Evap pressure, usually at light loads
This is indication that the EXV is not feeding enough to the Evaporator at this load condition. If you are running light load the solution is to increase the Offset(Slope) from where it is (700 default) to a higher value. If the unit is running with a higher capacity 70 to 100% then increasing the Gain will improve the situation.

Evap is running wet and Liquid line is flashing
This is indication that the EXV is feeding too much to the Evaporator at this load condition. If you are running light load the solution is to decrease the Offset(Slope) from where it is (700 default) to a lower value. If the unit is running and a higher capacity 70 to 100% then decreasing the Gain will improve the situation.

Variable Condenser Flow
The temperature across the condenser, (Cond-Delta-T) is a parameter used in the Program Based Control. However, if the water flow rate is variable, then an alternate control parameter must be selected. The following choices as found in the Advanced Set series of Unit Controller masks are; Condenser Delta-T (C dT), Evaporator Delta-T (E dT), or Power (%RLA).

Electronic Expansion Valve Configuration
C_dT, E_dT, or Pwr (WMC default)
KW(Quasi) matched to motor/s performance
Combined %RLAs from all running compressors on common refrigeration circuit.

Compressor drives that do not provide KW feedback can use the %RLA parameter as a rough equivalent. For WDC chillers the full load Max value should be 200 (2*100), for WSC chillers the Max value should be 100. The Min(minimum capacity) value should be the lowest %RLA of one compressor running with vanes nearly closed.
**Figure 3, Gain Effect on Valve Position**

Gain Effect

Default Equation is:

- Increasing the Gain Moves the Equation up.
- Decreasing the Gain Moves the Equation down.

**Figure 4, Offset (Slope) Effect on Valve Position**

Offset (Slope) Effect

Default Equation is:

- Increasing the Offset (Slope) Moves the Equation up.
- Decreasing the Offset (Slope) Moves the Equation down.
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