XEV EX48 Superheat Controller

1.1. General Warning

Please read the following safety precautions and warnings before using this manual:

**CAUTION!**

- This manual is part of the product and should be kept near the controller for easy and quick reference.
- The controller should not be used for purposes different from those described in this manual. It cannot be used as a safety device.
- Check the application limits before proceeding.

**SAFETY PRECAUTIONS AND WARNINGS!**

- Check that the supply voltage is correct before connecting the controller.
- Do not expose to water or moisture: use the controller only within the operating limits and avoid sudden temperature changes with high humidity to prevent condensation from forming.
- Warning! Disconnect all electrical connections before performing any kind of maintenance.
- Mount the probe where it is not accessible by the end user. The controller must not be opened. In case of failure or faulty operation, send the controller back to Emerson Climate Technologies with a detailed description of the fault. Verify the maximum current that can be applied to each relay (see Section 15, Specifications).

2.1. General Description

The XEV EX48 superheat controllers are factory pre-programmed to drive the Emerson EX4,5,6,7,8* electronic stepper expansion valves. The controller regulates evaporator superheat (SH) to optimize performance independent of climate or load conditions. The XEV EX48 controllers have also been pre-set to operate with the Emerson PT5, (4 to 20mA) pressure transducer and the ECN-N60, NTC temperature probe. The LAN connection transmits the pressure signal to the other XEVs; this allows the use of only one pressure transducer in multiplexed cabinet applications. The controller can also have two (2) configurable digital inputs, the first one is “dry contact” d1S and the other one is at “high voltage” d2S to simplify connections with cooling demand signal. With the integrated display, it is possible to see the superheat (SH) value, the Percentage valve opening, or the probe values; the local keyboard enables the controller to be programmed without any other devices. An RS485 serial link connects the controller to other Emerson monitoring and supervising systems, such as the Einstein “E2” with software version 2.84 and above or Xweb. * If EX7 or EX8 Valves are used, change the “tEP” Code in Pr2 parameter setting (see p.8)

2.2 Ordering Code for Individual Controllers

<table>
<thead>
<tr>
<th>Emerson PCN</th>
<th>Description</th>
<th>Refrigerant</th>
</tr>
</thead>
<tbody>
<tr>
<td>900001</td>
<td>XEV EX48</td>
<td>R404A,507,407A, 22,134a, R410A,CO2 Sub</td>
</tr>
</tbody>
</table>

**Controllers Only**

- XEV EX48 controller
- XEV electrical connectors
### 2.21 Ordering Codes for Complete Kits

<table>
<thead>
<tr>
<th>Emerson PCN</th>
<th>Description</th>
<th>Refrigerant</th>
</tr>
</thead>
<tbody>
<tr>
<td>900004</td>
<td>XEV EX4 KIT</td>
<td>R404A,507,407A,22, 134a, R410A, CO2 Sub</td>
</tr>
<tr>
<td>900005</td>
<td>XEV EX5 KIT</td>
<td>R404A,507,407A,22, 134a, R410A, CO2 Sub</td>
</tr>
<tr>
<td>900006</td>
<td>XEV EX6 KIT</td>
<td>R404A,507,407A,22, 134a, R410A, CO2 Sub</td>
</tr>
<tr>
<td>900007</td>
<td>XEV EX7 KIT</td>
<td>R404A,507,407A,22, 134a, R410A, CO2 Sub</td>
</tr>
<tr>
<td>900008</td>
<td>XEV EX8 KIT</td>
<td>R404A,507,407A,22, 134a, R410A, CO2 Sub</td>
</tr>
</tbody>
</table>

#### Complete Kits
- XEV EX48 controller
- XEV Electrical connectors
- EX Valve (4, 5, 6, 7, 8)
- EXV-M60 Valve Cable
- PT5-18M Pressure Transducer
- PT4-M60 Transducer cable
- ECN-N60 Temperature sensor
- 90-T40F3 24V Transformer, 40VA 60HZ 120/208/240V

#### 2.22 Ordering Codes for Kits Less Valve

<table>
<thead>
<tr>
<th>Emerson PCN</th>
<th>Description</th>
<th>Refrigerant</th>
</tr>
</thead>
<tbody>
<tr>
<td>900003</td>
<td>XEV Kit Less Valve</td>
<td>R404A,507,407A,22, 134a, R410A, CO2 Sub</td>
</tr>
</tbody>
</table>

#### Kits Less Valve
- XEV EX48 controller
- XEV Electrical connectors
- EX Valve (4, 5, 6, 7, 8)
- EXV-M60 Valve Cable
- PT5-18M Pressure Transducer
- PT4-M60 Transducer cable
- ECN-N60 Temperature sensor
- 90-T40F3 24V Transformer, 40VA 60HZ 120/208/240V

### 3.0 Wiring Connections

**Note:** If the high voltage Digital Input d2S (cooling demand) is not used, then the dry contact d1S must be used for Cooling Demand. When d1S is used some PR2 parameters must be altered from factory default to:
- i1P set to CL
- i1F to CCL
- i2P set to 0
- i2F set to r1

### 4.0 Valve Connections and Configuration

**Note:** For the XEV EX48 Controller, the valve motor parameter has been pre-adjusted to the Emerson EX valve’s Bipolar motor.

#### Table 4-1 - tEP Parameter Table

<table>
<thead>
<tr>
<th>tEP</th>
<th>Model</th>
<th>Let (steps*10)</th>
<th>uSt (steps*10)</th>
<th>CPP (mA*10)</th>
<th>CHd (mA*10)</th>
<th>Maximum Current</th>
<th>Sr (step/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Manual Setting</td>
<td>Par</td>
<td>Par</td>
<td>Par</td>
<td>Par</td>
<td>Par</td>
<td>Par</td>
</tr>
<tr>
<td>1</td>
<td>EX4</td>
<td>5</td>
<td>75</td>
<td>50</td>
<td>10</td>
<td>0.9A</td>
<td>325</td>
</tr>
<tr>
<td>1</td>
<td>EX5</td>
<td>5</td>
<td>75</td>
<td>50</td>
<td>10</td>
<td>0.9A</td>
<td>325</td>
</tr>
<tr>
<td>1</td>
<td>EX6</td>
<td>5</td>
<td>75</td>
<td>50</td>
<td>10</td>
<td>0.9A</td>
<td>325</td>
</tr>
<tr>
<td>2</td>
<td>EX7</td>
<td>10</td>
<td>160</td>
<td>75</td>
<td>25</td>
<td>0.9A</td>
<td>325</td>
</tr>
<tr>
<td>2</td>
<td>EX8</td>
<td>10</td>
<td>250</td>
<td>50</td>
<td>50</td>
<td>0.9A</td>
<td>325</td>
</tr>
</tbody>
</table>

#### Table 4-2 - 4-Wire Valves (Bipolar)

<table>
<thead>
<tr>
<th>Connection Numbering</th>
<th>Emerson EX</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Blue</td>
</tr>
<tr>
<td>2</td>
<td>Brown</td>
</tr>
<tr>
<td>3</td>
<td>Black</td>
</tr>
<tr>
<td>1</td>
<td>White</td>
</tr>
</tbody>
</table>
5.0 Absolute Maximum Power

The XEV EX48 controller is capable of driving EX4, EX5, EX6, EX7, EX8 stepper valves; listed in Table 4-1 are the maximum values of current that the actuator can supply to the stepper wiring. Use Minimum 20VA Class II transformers.

NOTE: After making the connection, switch the XEV controller OFF and ON to make sure that the valve is positioned properly.

Download EX Valve Selection Software by going to link below, http://www.emersonclimate.com/Documents/ECV-Selection_R07.xls

6.0 Front Panel

6.1 Keys and Functions

Table 6-1 shows the keys found on the front Panel of the XEV EX48 and their corresponding functions:

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>SET</td>
<td>To display and to modify the SUPERHEAT setpoint. In programming mode, it selects a parameter or confirms a value.</td>
</tr>
<tr>
<td></td>
<td>By pressing and releasing this key, you will display the Temperature and Pressure values. In programming mode, it scrolls through the parameters and/or increases their values.</td>
</tr>
<tr>
<td></td>
<td>In programming mode, it scrolls through the parameters and/or decreases their values.</td>
</tr>
<tr>
<td>Key Combinations</td>
<td>To lock and unlock the keyboard.</td>
</tr>
<tr>
<td>SET + UP</td>
<td>To enter programming mode.</td>
</tr>
</tbody>
</table>

6.2 XEV EX48 LEDs

Each LED function is described in Table 6-2:

<table>
<thead>
<tr>
<th>LED</th>
<th>Mode</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>🕏</td>
<td>ON</td>
<td>Low pressure alarm</td>
</tr>
<tr>
<td>🕏</td>
<td>ON</td>
<td>Maximum operating pressure alarm</td>
</tr>
<tr>
<td>🕏</td>
<td>OFF</td>
<td>Valve achieved setpoint or is completely closed</td>
</tr>
<tr>
<td>🕏</td>
<td>BLINKING</td>
<td>Valve is moving</td>
</tr>
<tr>
<td>🕏</td>
<td>ON</td>
<td>Valve is completely opened</td>
</tr>
<tr>
<td>🕏</td>
<td>BLINKING</td>
<td>Serial communication present</td>
</tr>
<tr>
<td>🕏</td>
<td>OFF</td>
<td>Serial communication absent</td>
</tr>
<tr>
<td>🕏</td>
<td>ON</td>
<td>Superheat alarm</td>
</tr>
</tbody>
</table>

7.0 USER INTERFACE

7.1 Read-Only Values

1. Press and release the UP arrow key.
2. The first read-only label is displayed.
3. Slide labels using the UP or DOWN arrow keys.
4. Press the SET key to see the read-only value.
5. To change and view the parameter, press SET.
6. To exit the fast access menu, press and release the SET + UP arrow keys or wait for the device timeout for 3 minutes.

7.2 Superheat Setpoint

1. Press the SET key until the setpoint is displayed.
2. To return and view the temperature, wait for 5 seconds or press the SET key again.

7.3 Modify Superheat Setpoint

1. Press the SET key until the set point is displayed.
2. Use the UP or DOWN arrow keys to change its value.
3. Press SET to store the new value.
### 7.4 Enter “Pr1” Parameters List

1. Press the SET + DOWN arrow keys for about 3 seconds.
2. The device will display the first parameter in Pr1 menu.
   - Only 3 parameters to set on Pr1 are Fty, oPE, SFd
     - **Fty** = Type of Refrigerant
     - **oPE** = Start Opening Percentage
     - **SFd** = Start Function Duration

### 7.5 Enter Pr2 Parameters List

1. Enter the Pr1 level menu.
2. Select Pr2 parameter and press SET.
3. The PAS label will be displayed followed by a blinking 0.
4. Insert 321 password using the UP and DOWN arrow keys.

### 7.6 Modify the Parameters Value

1. Enter the programming mode by pressing the SET and DOWN arrow keys for about 3 seconds.
2. Select the required parameter.
3. Press the SET key to display its value.
4. Use the UP or DOWN arrow keys to change its value.
5. Press the SET key to store the new value and move to the next parameter.
6. To exit, press SET + UP or wait 30 seconds without pressing a key.

**Note:** The set value is stored even when the time-out expires and ends the procedure.

### 7.7 How to Assign a MODBUS Address

1. To enter the programming mode, press and hold the SET and DOWN arrow keys together for about 3 seconds or until the dots at the top of the display start flashing.
2. Arrow down to PR2 and press SET to select.
3. PAS for password will display and flash.
4. Use the arrow keys to set the 321 password. Press SET to save.

**Note:** If a time-out occurs while setting the password (PR2 flashes), press SET to resume entering the password.

5. Use the arrow keys to scroll through and locate Nod. Press SET. Use the arrow keys to scroll through and locate Std. Press SET.
6. Use the arrow keys to scroll through and locate Adr Press SET. Use the arrow keys to choose the address number of the device. Press SET to save.
7. To exit, press the SET and UP arrow keys together or wait 15 seconds without pressing a key.
## 8.0 Parameters

**Note:** All pressure parameters are relatives or absolutes depending on the PrM parameter.

<table>
<thead>
<tr>
<th>Code</th>
<th>REGULATION</th>
<th>Min</th>
<th>Max</th>
<th>Default</th>
<th>Parameter Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fty</td>
<td>Type of Refrigerant ([R404A, 507, 22, 134, 407A, 410A, CO2]) Type of Refrigerant. Fundamental parameter for correct functioning of all systems.</td>
<td></td>
<td></td>
<td>R404A</td>
<td>Pr1</td>
</tr>
<tr>
<td>oPE</td>
<td>Start opening percentage 0 to 100% Opening valve percentage when the start function is active and during post defrost phase. This phase duration is Sfd time.</td>
<td>0</td>
<td>100</td>
<td>50</td>
<td>Pr1</td>
</tr>
<tr>
<td>Sfd</td>
<td>Start function duration (0.0 to 42.0 min: tens of seconds) It sets start function duration and post-defrost duration. During this phase, the alarms are neglected.</td>
<td>0 sec</td>
<td>42 min</td>
<td>5 sec</td>
<td>Pr1</td>
</tr>
<tr>
<td>PEo</td>
<td>Probe error opening percentage (0 to 100%) If a temporary probe error occurs, valve opening percentage is PEo until PED time is elapsed. If PED is different from 0, it ensures cooling also with probe error, because even if the device cannot calculate superheat, the valve can work at PEo.</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>Pr2</td>
</tr>
<tr>
<td>PEd</td>
<td>Probe error delay before stopping regulation (0 to 239 sec = On = unlimited) If the probe error duration is longer than PED, valve closes completely. The PE message is displayed. If PED = On, valve opening is PEo until probe error finishes.</td>
<td>0</td>
<td>239</td>
<td>5</td>
<td>Pr2</td>
</tr>
<tr>
<td>tUE</td>
<td>Type of stepper motor (uP = 5 to 6 wires unipolar valves bP = 4 wires bipolar valves CAUTION! By changing this parameter, the valve has to be re-initialized)</td>
<td>_</td>
<td>_</td>
<td>bp</td>
<td>Pr2</td>
</tr>
<tr>
<td>tEP</td>
<td>Predefined valve selection (1-10), (1-EX4,5,6) (2-EX7) (3-EX8) If tEP = 0, the user has to modify all the parameters of configuration in order to use the valve. If tEP is different from 0, the controller performs a fast configuration of the following parameters: LSt, Ust, Sr, CPP, and Chd. If tEP is different from 0, previous configuration of LSt, Ust, Sr, CPP, and Chd are overwritten.</td>
<td>1</td>
<td>10</td>
<td>1</td>
<td>Pr2</td>
</tr>
<tr>
<td>HFS</td>
<td>Kind of motor movement: ![HAF; FUL] <img src="image" alt="HAF = half step. Use this setting for the unipolar valve. FUL = half step. Use this setting for the bipolar valve." /></td>
<td>HAF</td>
<td>FUL</td>
<td>FUL</td>
<td>Pr2</td>
</tr>
<tr>
<td>LSt</td>
<td>Minimum number of steps (0 to Ust) Selects the minimum number of steps. At this number of steps, the valve should be closed. Read the manufacturer datasheet to set this parameter correctly. The number of steps should be set within the advised range of functioning. CAUTION! When this parameter is changed, the valve must be re-initialized. The controller performs this procedure automatically and restarts its normal functioning when the programming mode ends.</td>
<td>0</td>
<td>Ust</td>
<td>See tEP</td>
<td>Pr2</td>
</tr>
</tbody>
</table>
# 8.0 Parameters

<table>
<thead>
<tr>
<th>Code</th>
<th>REGULATION</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Default</th>
<th>Parameter Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ust</td>
<td>Maximum number of steps</td>
<td>Lst to 800°*10</td>
<td>Lst</td>
<td>See tEP</td>
<td>Pr2</td>
</tr>
<tr>
<td>Est</td>
<td>Extra step in closing phase</td>
<td>0 to 255 (*10)</td>
<td>0 to 255 (*10)</td>
<td>2</td>
<td>Pr2</td>
</tr>
<tr>
<td>Sr</td>
<td>Step rate</td>
<td>10 to 600 step/sec</td>
<td>0 to 100 * 10mA</td>
<td>See tEP</td>
<td>Pr2</td>
</tr>
<tr>
<td>CPP</td>
<td>Current per phase (Only bipolar valves)</td>
<td>0 to 100 * 10mA</td>
<td>0 to 100 * 10mA</td>
<td>See tEP</td>
<td>Pr2</td>
</tr>
<tr>
<td>CHd</td>
<td>Holding current per phase (Only bipolar valves)</td>
<td>0 to 100 * 10mA</td>
<td>0 to 100 * 10mA</td>
<td>See tEP</td>
<td>Pr2</td>
</tr>
<tr>
<td>Sti</td>
<td>Stop regulation interval</td>
<td>0.0 to 24.0 hours: tens of minutes</td>
<td>0 min 24 hrs</td>
<td>0</td>
<td>Pr2</td>
</tr>
<tr>
<td>Std</td>
<td>Stop duration</td>
<td>0 to 60 min</td>
<td>0 to 60 min</td>
<td>0</td>
<td>Pr2</td>
</tr>
<tr>
<td>MnF</td>
<td>Maximum opening percentage at normal functioning</td>
<td>0 to 100%</td>
<td>0 to 100%</td>
<td>100</td>
<td>Pr2</td>
</tr>
<tr>
<td>FoP</td>
<td>Forced opening percentage</td>
<td>0 to 100 - not used; nU</td>
<td>0 to 100 - not used; nU</td>
<td>nU</td>
<td>Pr2</td>
</tr>
<tr>
<td>Pb</td>
<td>Proportional band (0.1 to 50.0 C/ 1 to 90°F)</td>
<td>Proportional band. A value bigger than 5°C is advised.</td>
<td>Proportional band. A value bigger than 5°C is advised.</td>
<td>50°F</td>
<td>Pr2</td>
</tr>
<tr>
<td>rS</td>
<td>Band offset (-12.0 to 12.0°C / -21 to 21°F)</td>
<td>PI band offset. It moves the proportional band of the PI. With rS = 0, the band is between [SET to SET + Pb].</td>
<td>PI band offset. It moves the proportional band of the PI. With rS = 0, the band is between [SET to SET + Pb].</td>
<td>1°F</td>
<td>Pr2</td>
</tr>
<tr>
<td>InC</td>
<td>Integration time</td>
<td>0 to 255 sec</td>
<td>0 to 255 sec</td>
<td>200</td>
<td>Pr2</td>
</tr>
</tbody>
</table>
# 8.0 Parameters

## PROBE PARAMETERS

<table>
<thead>
<tr>
<th>Code</th>
<th>REGULATION</th>
<th>Min</th>
<th>Max</th>
<th>Default</th>
<th>Parameter Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>tPP</td>
<td>Type of pressure transducer</td>
<td>(420 – 5V – LAn)</td>
<td></td>
<td>420</td>
<td>Pr2</td>
</tr>
<tr>
<td></td>
<td>Sets the type of pressure transducer to use: 420 = 4 to 20mA pressure transducer; 5V = 0 to 5V ratiometric transducer; LAn = the pressure signal comes from another XEV module.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPP</td>
<td>Enable pressure probe sending in LAN</td>
<td>(n to Y)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If LPP = Y, the value of pressure read by device is sent in LAN. Only one device of the LAN can have LPP = Y.</td>
<td>n</td>
<td>Y</td>
<td>n</td>
<td>Pr2</td>
</tr>
<tr>
<td>PA4</td>
<td>Probe value At 4mA or At 0V</td>
<td>(-1.0 bar/ -14psi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure value measured by probe at 4mA or at 0V (related to PrM parameter).</td>
<td>0 psi</td>
<td>261 psi</td>
<td>Pr2</td>
<td></td>
</tr>
<tr>
<td>P20</td>
<td>Probe value 20mA or At 5V</td>
<td>(PA4 to 50.0 bar/ 725 psi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure value measured by probe at 20mA or at 5V (related to PrM parameter).</td>
<td>PrM</td>
<td>PrM</td>
<td>Pr2</td>
<td></td>
</tr>
<tr>
<td>OPr</td>
<td>Pressure probe calibration</td>
<td>(-12.0 to 12.0 bar/ -174 to 174 psi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Value of pressure probe in calibration</td>
<td>0</td>
<td>0</td>
<td>Pr2</td>
<td></td>
</tr>
<tr>
<td>tTE</td>
<td>Type of temperature probe</td>
<td>(PtM to NTC)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sets the kind of probe used by the controller: PtM = Pt1000, nTC = NTC probe.</td>
<td>PtM</td>
<td>nTC</td>
<td>nTC</td>
<td>Pr2</td>
</tr>
<tr>
<td>tTE</td>
<td>Temperature probe calibration</td>
<td>(-12.0 to 12.0°C/ -21 to 21°F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Value of temperature in calibration</td>
<td>0</td>
<td>0</td>
<td>Pr2</td>
<td></td>
</tr>
</tbody>
</table>

## DIGITAL INPUTS

<table>
<thead>
<tr>
<th>Code</th>
<th>REGULATION</th>
<th>Min</th>
<th>Max</th>
<th>Default</th>
<th>Parameter Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>i1P</td>
<td>Digital input 1 (free of voltage)</td>
<td>(CL, OP)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>digital input polarity</td>
<td>CL = activated when closed; OP = activated when opened</td>
<td>CL</td>
<td>OP</td>
<td>CL</td>
</tr>
<tr>
<td>i1F</td>
<td>Digital input 1 (free of voltage)</td>
<td>(CCL, rL)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>digital input function</td>
<td>CCL = cooling call; rL = digital input activates relay</td>
<td>CCL</td>
<td>rL</td>
<td>rL</td>
</tr>
<tr>
<td>d1d</td>
<td>Digital input 1 (free of voltage)</td>
<td>(0 to 255 min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>activation delay</td>
<td>This activation delay is used only if digital input is configured as A1</td>
<td>0</td>
<td>255</td>
<td>0</td>
</tr>
<tr>
<td>i2P</td>
<td>Digital input 2 (high voltage)</td>
<td>(CL, OP)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>digital input polarity</td>
<td>CL = activated when closed; OP = activated when opened</td>
<td>CL</td>
<td>OP</td>
<td>CL</td>
</tr>
<tr>
<td>i2F</td>
<td>Digital input 2 (high voltage)</td>
<td>(CCL, rL)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>digital input function</td>
<td>CCL = cooling call; rL = digital input activates relay</td>
<td>CCL</td>
<td>rL</td>
<td>rL</td>
</tr>
<tr>
<td>d2d</td>
<td>Digital input 2 (high voltage)</td>
<td>(0 to 255 min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>activation delay</td>
<td>This activation delay is used only if digital input is configured as A2</td>
<td>0</td>
<td>255</td>
<td>1</td>
</tr>
</tbody>
</table>

## ALARMS

<table>
<thead>
<tr>
<th>Code</th>
<th>REGULATION</th>
<th>Min</th>
<th>Max</th>
<th>Default</th>
<th>Parameter Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>dAo</td>
<td>Alarm delay after restarting regulation</td>
<td>(0.0 to 42.0 min: tens of seconds)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time between digital input activation (configured as CCL) and alarm signaling. The LSH alarm is always signaled also during this time.</td>
<td>0</td>
<td>42</td>
<td>15</td>
<td>Pr2</td>
</tr>
<tr>
<td>tDA</td>
<td>Type of alarm signaled by relay (ALL, SH, PrE, di)</td>
<td>(PA4 to P20 bar/ psi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ALL = all alarm; SH = superheat alarm; PrE = pressure alarm; di = activation only when digital input configured as rL is activated.</td>
<td>SH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPL</td>
<td>Lower pressure limit for superheat regulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>When the suction pressure comes down to LPL, the regulation is performed with a LPL fixed value for pressure; when the pressure comes back to LPL, the normal pressure value is used. (related to PrM parameter).</td>
<td></td>
<td>-10</td>
<td></td>
<td>Pr2</td>
</tr>
<tr>
<td>MoP</td>
<td>Maximum operating pressure threshold</td>
<td>(PA4 to P20 bar/ psi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If the suction pressure exceeds the maximum operating pressure value, the controller signals a condition with a High Pressure alarm LED (related to PrM parameter).</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# 8.0 Parameters

## ALARMS

<table>
<thead>
<tr>
<th>Code</th>
<th>REGULATION</th>
<th>MIN</th>
<th>MAX</th>
<th>Default</th>
<th>PR Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOP</td>
<td>Lowest operating pressure</td>
<td>(PA4 to 920 bar/psi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHy</td>
<td>Pressure alarm hysteresis</td>
<td>(0.1 to 5.0 bar/1 to 72 PSI)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dML</td>
<td>delta MOP-LOP</td>
<td>(0 to 100%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSH</td>
<td>Maximum superheat alarm</td>
<td>(LSH to 32.0°C/LSH to 97°F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSH</td>
<td>Lowest superheat alarm</td>
<td>(0.0 to MSH°C/32 to MSH°F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHy</td>
<td>Superheat alarm hysteresis</td>
<td>(0.0 to 25.5°C/1 to 77°F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHd</td>
<td>Superheat alarm activation delay</td>
<td>(0 to 255 sec)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FrC</td>
<td>Fast-recovery constant</td>
<td>(0 to 100 sec)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## DISPLAY

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>MIN</th>
<th>MAX</th>
<th>Default</th>
<th>PR Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lod</td>
<td>Local display</td>
<td>Display: (SH, PEr, P1, P2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CF</td>
<td>Temperature measurement units (°C to °F)</td>
<td>°C = Celsius degree; °F = Fahrenheit degree</td>
<td>C</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>PMU</td>
<td>Pressure measurement units</td>
<td>bAr = bar; PSI = psi</td>
<td>PSI</td>
<td>PSI</td>
<td>Pr2</td>
</tr>
<tr>
<td>rES</td>
<td>Resolution (only °C)</td>
<td>(dE to in)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PrM</td>
<td>Pressure visualization mode</td>
<td>(rEL to ABS)</td>
<td>rEL</td>
<td>Abs</td>
<td>rEL</td>
</tr>
<tr>
<td>CLP</td>
<td>Cooling percentage</td>
<td>Displays the percentage of time during which the cooling coil was active in the time interval defined by parameter Clt.</td>
<td></td>
<td></td>
<td>Pr2</td>
</tr>
<tr>
<td>tP1</td>
<td>Temperature probe value</td>
<td>(Read only)</td>
<td>Shows the temperature probe value from P1.</td>
<td></td>
<td>Pr2</td>
</tr>
<tr>
<td>PPr</td>
<td>Pressure probe value</td>
<td>(Read only)</td>
<td>The value depends on PrM.</td>
<td></td>
<td>Pr2</td>
</tr>
<tr>
<td>tP2</td>
<td>Temperature from P2</td>
<td>Shows the temperature obtained from conversion of pressure value.</td>
<td></td>
<td></td>
<td>Pr2</td>
</tr>
</tbody>
</table>
8.0 Parameters

<table>
<thead>
<tr>
<th>Code</th>
<th>REGULATION</th>
<th>Min</th>
<th>Max</th>
<th>Default</th>
<th>Parameter Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>oPP</td>
<td>Opening percentage</td>
<td></td>
<td></td>
<td></td>
<td>Pr2</td>
</tr>
<tr>
<td>d1S</td>
<td>Free of voltage digital input state</td>
<td>(Read only)</td>
<td></td>
<td></td>
<td>Pr2</td>
</tr>
<tr>
<td>d2S</td>
<td>High voltage digital input state</td>
<td>(Read only)</td>
<td></td>
<td></td>
<td>Pr2</td>
</tr>
<tr>
<td>Adr</td>
<td>RS485 serial address</td>
<td>(1 to 247)</td>
<td></td>
<td></td>
<td>Pr2</td>
</tr>
<tr>
<td>Mod</td>
<td>MODBUS</td>
<td></td>
<td></td>
<td>std</td>
<td>Pr2</td>
</tr>
<tr>
<td>Ptb</td>
<td>Parameters map</td>
<td>(Read only)</td>
<td></td>
<td></td>
<td>Pr2</td>
</tr>
<tr>
<td>rEL</td>
<td>Release firmware</td>
<td>(Read only)</td>
<td></td>
<td></td>
<td>Pr2</td>
</tr>
<tr>
<td>Pf</td>
<td>Pressure and / or Temperature Fault</td>
<td></td>
<td></td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>Pr2</td>
<td>Second level menu</td>
<td></td>
<td></td>
<td></td>
<td>Pr2</td>
</tr>
</tbody>
</table>

9.0 Digital Inputs

The XEV EX48 comes with two (2) digital inputs: a voltage-free input and a high voltage input; Both can be configured as cooling call. In this way the cooling signal can come from the controllers with direct load outputs or via the Controllers with voltage-free outputs. One of these inputs must be configured as the cooling call.

10.0 Forced Opening

If necessary, change the FoP parameter to force the valve to open. For example, if FoP is set to 50 (FoP = 50), the valve will be opened at half of full scale. To disable this function, set the FoP to default value (FoP = not used).

The valve opening is enabled only when CCL digital input is enabled.

11.0 Electrical Connections

The controller comes with a screw terminal block to connect cables with a cross section up to 2.5 mm². Heat-resistant cables have to be used. Before connecting the cables, verify that the power supply complies with the controller’s requirements. Separate the probe cables from the power supply cables, from the outputs and the power connections. Do not exceed the maximum current allowed on each relay, in case of heavier loads, use a suitable external relay.

11.1 Probes

The recommended temperature probe placement is illustrated in Figure 11-1. For Suction Lines less than 7/8” Diameter, bulb placement should be at 12 o’clock position. For Suction lines greater than 7/8” Dia. The preferred bulb placement is at 4 or 8 o’clock. For suction pressure probes, there is no particular recommendation.

Temperature Sensor Must Be insulated

Figure 11-1 - Recommended Temperature Probe Placement
12.0 RS485 Serial Line

All models can be connected to the monitoring and supervising system XWEB500. If Mod = Std, the standard MODBUS-RTU protocol is used; if Mod = AdU, the custom XWEB library is required. This last configuration makes it possible to use the same serial address of the thermostat that gives the cooling request to XEV. In this way, it is possible to reduce the number of addresses used.

13.0 How to Use the Hot Key

13.1 How to Program a Hot Key From the Controller (Upload)

1. Program one controller using the front keypad.
2. When the controller is ON, insert the Hot Key and press the UP arrow key; the uPL message will appear followed by a flashing End LED.
3. Push the SET key and the End LED will stop flashing.
4. Turn OFF the controller, remove the Hot Key, then turn it ON again.

Note: The Err message is displayed in case an error or failure in programming occurs. In this case, push the UP arrow key again if you want to restart the upload or remove the Hot Key to abort the operation.

13.2 How to Program the Controller Using a Hot Key (Download)

1. Turn OFF the controller.
2. Insert a programmed Hot Key into the 5-pin connector and then turn the controller ON.
3. Automatically the parameter list of the Hot Key is downloaded into the controller memory, the dOL message will blink followed by a flashing End LED.
4. After 10 seconds, the controller will restart work with the new parameters.
5. Remove the Hot Key.

Note: The Err message is displayed in case an error or failure in programming occurs. In this case, turn the unit OFF and then ON if you want to restart the download or remove the Hot Key to abort the operation.

14.0 Display Messages

<table>
<thead>
<tr>
<th>Message</th>
<th>Cause</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>nA</td>
<td>None of the digital inputs configured as CCL are activated</td>
<td>Valve closed</td>
</tr>
<tr>
<td>Pf</td>
<td>The PEd time is elapsed and the regulation is stopped.</td>
<td>Valve closed after PEd. There is a probe error.</td>
</tr>
<tr>
<td>P1</td>
<td>Temperature probe fault</td>
<td>According to PEo and Ped</td>
</tr>
<tr>
<td>P2</td>
<td>Pressure transducer fault</td>
<td>According to PEo and Ped</td>
</tr>
<tr>
<td>HSH</td>
<td>High superheat alarm</td>
<td>Bi PI</td>
</tr>
<tr>
<td>LSH</td>
<td>Low superheat alarm</td>
<td>Valve closed</td>
</tr>
<tr>
<td>LPL</td>
<td>Low Pressure Limit</td>
<td>See LPL parameter</td>
</tr>
<tr>
<td>MoP</td>
<td>Maximum Operating Pressure</td>
<td>See dML parameter</td>
</tr>
<tr>
<td>Lop</td>
<td>Lowest Operating Pressure</td>
<td>See dML parameter</td>
</tr>
<tr>
<td>StF</td>
<td>Start Function enabled</td>
<td>See SFd parameter</td>
</tr>
<tr>
<td>StP</td>
<td>Regulation stop caused by Std and Stl</td>
<td>Valve closed</td>
</tr>
<tr>
<td>EE</td>
<td>Memory anomaly</td>
<td>Valve closed</td>
</tr>
<tr>
<td>PF</td>
<td>Lockout cause by P20 being exceeded by PEd</td>
<td>Valve closed</td>
</tr>
</tbody>
</table>

14.1 Alarm Recovery

Probe alarms P1 and P2 start a few seconds after the fault in the probe; they automatically stop few seconds after the probe restarts normal operation. Check the connections before replacing the probe. Maximum and minimum alarms HSH, LSH, MoP, and LoP automatically stop as soon as the variable returns to normal values.

The controller is provided with an internal check to verify memory integrity. Alarm EE flashes when a failure in the internal memory is detected. In this case, call for service.
15.0 Specifications

<table>
<thead>
<tr>
<th>Housing</th>
<th>Self extinguishing ABS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>Case Front: 4 DIN modules, 70 mm x 135 mm with male and female connectors</td>
</tr>
<tr>
<td></td>
<td>Depth: 60 mm</td>
</tr>
<tr>
<td></td>
<td>Mounting: DIN RAIL mounted in a omega (3) din rail</td>
</tr>
<tr>
<td>Protection</td>
<td>IP20</td>
</tr>
<tr>
<td>Connections</td>
<td>Detachable screw terminal block ≤ 2.5 mm² wiring</td>
</tr>
<tr>
<td>Power Supply</td>
<td>24VAC/DC ±10%</td>
</tr>
<tr>
<td>Power Absorption (depending on the valve)</td>
<td>20VA max</td>
</tr>
<tr>
<td>Display</td>
<td>Three (3) digits with icons, red LEDs, height 14.2 mm</td>
</tr>
<tr>
<td>Inputs</td>
<td>1 temperature probe Pt1000 or NTC (For EX Valves)</td>
</tr>
<tr>
<td></td>
<td>1 pressure transducer 4 to 20mA (For EX Valves) or 0 to 5V</td>
</tr>
<tr>
<td>Digital Inputs</td>
<td>1 free of voltage</td>
</tr>
<tr>
<td></td>
<td>1 at high voltage</td>
</tr>
<tr>
<td>Outputs for Valve</td>
<td>Bipolar or unipolar valves</td>
</tr>
<tr>
<td>Data Storage</td>
<td>On the non-volatile memory (EEPROM)</td>
</tr>
<tr>
<td>Kind of Action</td>
<td>1B</td>
</tr>
<tr>
<td>Pollution Grade</td>
<td>Normal</td>
</tr>
<tr>
<td>Software Class</td>
<td>A</td>
</tr>
<tr>
<td>Temperature</td>
<td>Operating: 0 to 60°C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>20 to 85% (no condensing)</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.1°C or 1°F</td>
</tr>
<tr>
<td>Precision at 25°C</td>
<td>±0.7°C ±1 digit</td>
</tr>
</tbody>
</table>

16.0 E2 MODBUS Network Wiring

- Connect MODBUS Network to the RS485 Connector on the E2 PIB board (Belden 8641 recommended).
- Note to wire the RS485 +/- polarity at the E2 in the reverse of the XEV devices.
- Position the three termination jumpers to the UP (terminated) position to provide RS485 termination at the E2.
- Do not connect the shield of the MODBUS network to the E2 PIB center terminal. Instead, use a 100 ohm 1/2 watt resistor to connect the MODBUS cable shield to earth ground.
- At each XEV device, wire the MODBUS cable to the RS485 +/- terminals and connect the MODBUS shield to the pin 16 terminal.
- Terminate the end of the MODBUS network at the last XEV device on the daisy chain with the MODBUS termination block (P/N 535-2711), or by connecting a 150 ohm resistor between the MODBUS +/- terminals.
17.0 ECT MODBUS Networking to E2s

Connecting an XEV controller to an E2 requires the E2 to be version 2.84 or above. Contact Retail Solutions for upgrade information if the controller is a version before 2.84.

An E2 has up to three COM ports that can be assigned for MODBUS communication: COM2, an RS485 port on the E2 power interface board, and COM4 and COM6, which are optional ports requiring expansion cards. COM4 is recommended for MODBUS connection of Emerson units.

COM ports can only be used for one function; in other words, if COM2 is set up as the I/O network, you cannot connect MODBUS devices to COM2. Ensure your E2 is equipped with an RS485 COM Card (P/N 637-4890) and configured in E2 General Services (Serial tab) to enable COM4 or an E2 Expansion COM Card (P/N 637-4871) to enable COM6.

Connect the MODBUS network cable to the three terminal connector on the COM port you wish to assign as MODBUS. Reverse polarity of +/- on RS485 cable from E2 to the device.

17.1 E2 Setup of Devices

17.1.1 Set Up Network Ports

Before setting up device, the port on the E2 that has the MODBUS cable connected must be set up as a MODBUS port.

1. Log in to the E2 with Level 4 access.
2. Press General Controller Info followed by Controller Info.
3. Press to open the Serial tab of the General Controller Info setup screens:

4. This screen will have a “Connection” field for all COM ports on the E2. Highlight the COM port connection field that will be used for the device, and press LOOK UP. From the list of network types, select MODBUS.

5. Four fields will become visible underneath the COM port connection field, which pertain to the way the device communicates:
   - **Baud** - Default setting is 19.2k. The baud rate setting should be set to match the baud rate of the device (9600). (All devices connected to the same COM port should be set to the same baud rate.)
   - **Data Size** - Leave this field at the default value (8)
   - **Parity** - Leave this field at the default value (None)
   - **Stop Bits** - Leave this field at the default value (1).

6. Press to save changes and exit.

17.1.2 Add and Connect the Device

To enable communications between E2 and the units, the devices must be added and addressed in E2.

1. Log in to the E2 with Level 4 access.

---

**Figure 17.1** - Location of E2 COM Parts (E2 Versions 3.xx and below)

**Figure 17.2** - MODBUS Networking

**Figure 17.3** - Serial Communications Manager Screen

**Figure 17.4** - Num Network Ctrls NetSetup Screen
3. In the Num Network Ctrlrs: NetSetup screen, under the **ECT tab**, enter the number of devices in the **Quantity field**. (Max shows the maximum number of devices allowed on the network.)

4. Press to return to the **Network Setup** menu, then select **Network Summary**.

5. Locate the units you added to the network list (press and to scroll through the list). If desired, enter new name for each device in the **Name** field.

6. By default, each device in the network list has a board number of 0. To set the address and begin communication, choose the device and press 

   In the list of MODBUS devices, choose the address number corresponding to the address set up through the front display, and press to select it. A window will open where you can specify the address of the controller. If a network ID has already been selected, its name will be shown next to the network ID in this list. If the network ID you are trying to assign has already been used, you must set the address on this device to a different number that is not being used.

7. Repeat Steps 5 and 6 until each device has a name and address.

8. When finished, press to return to the Network set up menu, then press Network Summary (Figure 17.7). Locate the devices you set up, and look at each device's status in the **Status field**. You will see one of the following messages:

   - **Online** - The device is communicating normally.
   - **Offline** - The device is not communicating, has not been commissioned, or is not functional and has the proper address, baud rate, and parity.
   - **Unknown** - The device is not communicating or has not been commissioned. Verify the device is powered up, verify the device is powered up, wired correctly, and has the proper network address, baud rate, and parity.
   - **No Port** - No port is set up in the E2 Serial Configuration Manager to be a MODBUS port.
   - **Wrong FW Rev** - This message is likely caused by the device having a firmware version older than the minimum revision required by E2 for communication. Replace the device with a new one or a device that has the latest version of firmware on it.

---

**17.2 Wiring Types**

Retail Solutions specifies Belden #8761 shielded twisted pair cables for use as MODBUS wiring (or Belden #82761 and Belden #88761 for plenum installations).

For MODBUS network wiring of XEV series of controllers to E2, Belden #8641 (CPC P/N 135-8641) is the recommended wire type to use.

If the recommended cable is not available in your area, be sure the wiring meets or exceeds the following table:

<table>
<thead>
<tr>
<th>Shielded?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductor Type</td>
<td>Twisted Pair</td>
</tr>
<tr>
<td>Gauge</td>
<td>18-24 AWG</td>
</tr>
<tr>
<td>Capacitance between signal wires</td>
<td>31pF/ft or less (9.45m) or less</td>
</tr>
<tr>
<td>Capacitance between signal and shield</td>
<td>59 pF/ft or less (17.98m) or less</td>
</tr>
<tr>
<td>Maximum Length</td>
<td>4000ft 18 to 22 AWG (1219.2m) (762m)</td>
</tr>
<tr>
<td>Nominal Impedance</td>
<td>120 50</td>
</tr>
</tbody>
</table>
17.3 MODBUS Termination Box

Because the XEV device has no on-board means of termination, use the MODBUS termination block (P/N 535-2711) for termination that can be wired to the end of the cable segment using the three pin connector. Wire the two signal wires to the outside terminals, and connect the shield to pin 16, keeping the exposed shield wire length as short as possible (3 inches ideal maximum length).

![MODBUS Termination Block (P/N 535-2711)](image)

Figure 17.8 - MODBUS Termination Block (P/N 535-2711)