BT300 HVAC Drives Electronic Bypass (E-Bypass) Options

Description
The BT300 Electronic Bypass (E-Bypass) Options are companion packages for the family of BT300 Variable Frequency Drives (VFDs).

For information on the family of BT300 VFDs, see the BT300 HVAC Drives Submittal Sheet (154-126), and BT300 HVAC Drives Technical Specification Sheet (149-711).

BT300 E-Bypass Features
- Bypass Start-up Wizard
- Diagnostic board with test points
- Control logic short circuit protection
- 100,000 AIC short circuit rating
- Auto Bypass
- Damper Interlock
- Essential Service Mode
- Remote Bypass
- Electronic Override
- View/Monitor bypass parameters
- Multiple Safeties
- Monitor and display which safety interlock is open
- Control external devices via serial communication
- Pass through I/O capabilities command up to 8 output points
- View status of I/O points
- Supports APOGEE P1, BACnet and Modbus protocols in bypass
- IBC 2012 Seismic Certified
- OSHPD Certified
- Compact design

E-Bypass Power Features
2-Contactor: Output and Bypass
- Overload protection in bypass mode
- Electrically interlocked

Drive Isolation
Drive Service Switch allows the drive to be disconnected from power during troubleshooting without disrupting bypass operation.

Input Device
- Disconnect with fuses.
- (Optional) Circuit breaker.
- All doors are interlocked and can be padlocked

5% Input Impedance
- Internal reactors lower harmonics that the drive produces.
- BT300 E-Bypass requires no additional input reactors

E-Bypass Control Features
Auto Bypass
- Relay logic allows the user to send the motor to bypass mode based on the drive’s programmable fault list.
- Customer defines the events which will transfer to bypass.
- The drive’s programmable relay can be set up for applications that run full speed for an extended period of time.

Damper Interlock
- Generally used for safety tie-ins; the motor will not operate the drive or bypass when open.
- Enables a circuit signaling the system is ready for bypass.

Essential Service Mode
- Also used for smoke purge; the motor goes to bypass regardless of the selected mode.
- No call to stop will have an effect, including open safety or stop commands.
- Only turning the power off or opening this contact will stop the motor.

Remote Bypass
Customer-supplied start/stop controls when running in bypass.

Electronic Override
- Full bypass control, even if the control module (intelligence) fails. As long as power is supplied to the bypass, you have full bypass capability.
- Maintains all system safeties in bypass.
### Product Numbers

<table>
<thead>
<tr>
<th>Bypass Model(s)</th>
<th>Example: BTC</th>
<th>Example: BTE</th>
<th>HP</th>
<th>Voltage</th>
<th>Separator</th>
<th>Disconnect</th>
<th>NEMA</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>BTC</td>
<td>- 0 0 1</td>
<td>0 0 7</td>
<td>X</td>
<td>2</td>
<td>F</td>
<td>0 1 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BTE</td>
<td>- 0 0 7</td>
<td>0 0 1</td>
<td>B</td>
<td>1</td>
<td>B</td>
<td>0 1 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **BTC** (Conventional): 0.1, 1, 1.5, 2, 3, 5, 7.5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 125, 150, 200, 250
- **BTE** (Electronic) 

**Separator**
- **HP:** 1, 1.5, 2, 3, 5, 7.5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 125, 150, 200, 250

**Voltage:**
- 2: 208 Vac to 240 Vac
- 4: 380 Vac to 500 Vac

**Separator**
- **Connectors:**
  - F: Fused Disconnect
  - B: Circuit Breaker

**NEMA**
- **Type:** 01

**Type**
- 2: 2 contactors (output and bypass) w/service switch
- 34: 3 contactors (input, output, and bypass)

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**Example Product Numbers:**

- **BTC-001X2-F013**
  - Conventional Bypass, 1 HP, 208-240 Vac, Fused Disconnect, NEMA Type 1, with 3 contactors.

- **BTE-00754-B012**
  - Electronic Bypass, 7.5 HP, 380-500 Vac, Circuit Breaker, NEMA Type 1, with 2 contactors and service switch.

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**Table 1. E-Bypass Approximate Weights.**

<table>
<thead>
<tr>
<th>Frame</th>
<th>Weight lb (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS4</td>
<td>50 (23)</td>
</tr>
<tr>
<td>FS5</td>
<td>69 (31)</td>
</tr>
<tr>
<td>FS6</td>
<td>112 (51)</td>
</tr>
<tr>
<td>FS7</td>
<td>187 (85)</td>
</tr>
<tr>
<td>FS8</td>
<td>400 (181)</td>
</tr>
<tr>
<td>FS9</td>
<td>900 (408)</td>
</tr>
</tbody>
</table>

**NOTE:** Exact weight will be affected by actual horsepower/voltage and selected power options.

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**Typical Specifications**

BT300 E-Bypass Options shall send the motor to bypass mode based on an easily accessible door-mounted selector or based on User's desired conditions. The bypass mode shall provide overload protection. Contactors shall be electrically interlocked. An essential services mode shall send the motor to bypass regardless of the selected mode. When in safety modes it should provide indication of return state. It should indicate interlock sequence state during transition. Visually indicate faults for VFD safety/overload. In case of catastrophic failure, bypass and safeties must be provided.

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Table 2. E-Bypass Frame Sizes and Power Ranges per NEC Motor Tables.

<table>
<thead>
<tr>
<th>HP</th>
<th>kW</th>
<th>Frame Size</th>
<th>Output Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.75</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>1.5</td>
<td>1.1</td>
<td></td>
<td>6.7</td>
</tr>
<tr>
<td>2</td>
<td>1.5</td>
<td></td>
<td>8.0</td>
</tr>
<tr>
<td>3</td>
<td>2.2</td>
<td></td>
<td>11.0</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td></td>
<td>18.0</td>
</tr>
<tr>
<td>7.5</td>
<td>5.5</td>
<td></td>
<td>24.2</td>
</tr>
<tr>
<td>10</td>
<td>7.5</td>
<td></td>
<td>31.0</td>
</tr>
<tr>
<td>15</td>
<td>11</td>
<td></td>
<td>48.0</td>
</tr>
<tr>
<td>20</td>
<td>15</td>
<td></td>
<td>62.0</td>
</tr>
<tr>
<td>25</td>
<td>18.5</td>
<td></td>
<td>75.0</td>
</tr>
<tr>
<td>30</td>
<td>22</td>
<td></td>
<td>88.0</td>
</tr>
<tr>
<td>40</td>
<td>30</td>
<td></td>
<td>105.0</td>
</tr>
<tr>
<td>50</td>
<td>37</td>
<td></td>
<td>143.0</td>
</tr>
<tr>
<td>60</td>
<td>45</td>
<td></td>
<td>170.0</td>
</tr>
<tr>
<td>75*</td>
<td>55</td>
<td></td>
<td>208.0</td>
</tr>
<tr>
<td>100*</td>
<td>75</td>
<td></td>
<td>261.0</td>
</tr>
<tr>
<td>125*</td>
<td>90</td>
<td></td>
<td>310.0</td>
</tr>
<tr>
<td>150</td>
<td>110</td>
<td></td>
<td>205.0</td>
</tr>
<tr>
<td>200</td>
<td>132</td>
<td></td>
<td>261.0</td>
</tr>
<tr>
<td>250</td>
<td>160</td>
<td></td>
<td>310.0</td>
</tr>
</tbody>
</table>

*Available for 230 Vac and above.

**NOTE:** Drives are current (amperage) rated devices. Verify that the listed ratings are > the motor full load current rating.
Dimensions

Figure 1. Dimensions in Inches (cm) for UL (NEMA) Type 1 FS4 through FS7.

NOTE: USE MOUNTING HOLES INSTEAD OF SLOTS IN INSTALLATIONS THAT ARE PRONE TO SEISMIC ACTIVITY.
Dimensions, Continued

Figure 2. Dimensions in Inches (cm) for UL (NEMA) Type 1 FS8.

Figure 3. Dimensions in Inches (cm) for UL (NEMA) Type 1 FS9.
NOTES:
1. Branch circuit protection to be provided by installer, per UL508A, if not provided with drive.
2. Control and communication wiring should be 300V UL minimum.
3. Communication wiring should be run with maximum separation possible from all other wiring.
4. Essential service mode operates the motor full speed (bypass) with no protection for the motor or system.
5. Ensure that automatic bypass will not damage the system before activating.
7. See Siemens BT300 Operator's Manual (DPD01149) for BT300 input/output control signal wiring details.

Figure 4. Factory As-Built of Power Wiring

Motor Rotation Correction Wiring

If correct rotation in VFD mode, but incorrect rotation in Bypass mode
Swap incoming power (L2 and L3) at the fuse block or circuit breaker

Figure 5. Rotation Correction – VFD Correct, Bypass Reversed.
Motor Rotation Correction Wiring, Continued

If incorrect rotation in VFD mode, but correct rotation in Bypass mode
Swap incoming power (L2 and L3) at the fuse block or circuit breaker and swap motor output (U & V) at the output of the overload.

Figure 6. Rotation Correction – VFD Reversed, Bypass Correct.

If incorrect rotation in VFD mode and in Bypass mode
Swap motor output (U & V) at the output of the overload.

Figure 7. Rotation Correction – VFD Reversed, Bypass Reversed.
## Table 3. E-Bypass Specifications.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Input Voltages and Power Ranges (3-phase)**      | 208 to 240 Vac (-10% to +10%):  
1 HP to 125 HP (0.75 kW to 90 kW)  
4.2 amps to 301 amps  
380 to 500 Vac (-10% to +10%):  
1.5 HP to 250 HP (1.1 kW to 160 kW)  
3.4 amps to 303 amps |
| **Short circuit withstand rating**                  | Disconnect with Fuses: 100,000 AIC  
Circuit Breaker - 65,000 AIC @ 208/240 Vac  
18,000 AIC @ 480 Vac |
| **Frequency Reference**                            | **Analog Input**: Resolution 0.01 - 0.1% (10 bit), accuracy ±1%  
**Keypad**: Resolution 0.01 Hz |
| **Ambient Operating Temperature**                  | 14°F (-10°C) (no frost) to 104°F (40°C) up to 122°F (50°C) with derating |
| **Storage Temperature**                            | -40°F (-40°C) (no frost) to 158°F (70°C) |
| **Relative Humidity**                              | 0 to 95% rh, non-condensing, non-corrosive |
| **Air quality**                                    | Chemical vapors: IEC 60068-2-60 (H₂S [hydrogen sulfide] and SO₂ [sulfur dioxide]).  
Mechanical particles: IEC 60721-3-3, unit in operation, class 3C2  
IEC 60721-3-3, unit in operation, class 3S3. |
| **Altitude**                                       | 100% load capacity (no-derating) up to 3,280 ft (1,000 m)  
-1% derating for each 328 ft (100 m) above 3,280 ft (1,000 m) |
| **Maximum altitude**:                               | 208 to 240 Vac: 13,123 ft (4,000 m)  
380 to 500 Vac: 13,123 ft (4,000 m) |
| **Voltage for relay outputs**:                      | 240 Vac: ≤9,842 ft (3,000 m)  
120 Vac: ≤13,123 ft (4,000 m) |
| **Corner-grounding (380 to 500 Vac systems only)** | ≤6,562 ft (2,000 m) |
| **Vibration**                                      | EN61800-5-1  
EN60068-2-6 |
| **Seismic**                                        | 2012 International Building Code (IBC), OSHPD |
| **Shock**                                          | EN61800-5-1  
EN60068-2-27 |
| **Enclosure Class**                                | UL Type 1/IP 21 standard in entire HP/kW range. |
| **Agency Approvals/Conformity**                    | UL 508C (FS4 through FS7); UL-508A (FS8 and FS9); UL; cUL; CE; RoHS compliant; EN61800-5-1 (2007), BTL and OSHPD |
| **Country Of Origin (COO)**                        | United States of America |
| **Control I/O: (Programmable)**                    | 2 - voltage (0/2 to 10 Vdc) or current (0/4 to 20 mA)  
Resolution 0.1%; Accuracy ±1%  
1 - voltage (0/2 to 10 Vdc) or current (0/4 to 20 mA)  
< 500 Vdc: Resolution 0.1%; Accuracy ±1% |
| **Analog Inputs**                                  | 6 - programmable and isolated  
Positive or Negative logic; 5 kΩ; 0 to 5 Vdc = 0; 15 to 30 Vdc = 1 |
| **Analog Outputs**                                 | 2 - Form C and 2 Normally Open (programmable)  
24 Vdc @ 8A; 250 Vac @ 8A; 125 Vac @ 0.4A |
| **Digital Inputs**                                 | 24 Vdc ±10%, 250 mA |
| **Relay Outputs**                                  | 10 Vdc ±3%, 10 mA (short-circuit protected)  
24 Vdc ±10%, 250 mA (short-circuit protected) |

Auxiliary input: 24 Vdc ±10%, 250 mA
### Specification Description

<table>
<thead>
<tr>
<th>Embedded Protocols</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Embedded Protocols** | **RS-485:** APOGEE P1, BACnet MS/TP, Modbus RTU, Metasys N2  
|                     | **Ethernet:** BACnet IP, Modbus TCP |

<table>
<thead>
<tr>
<th>Protection features</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Protection features** | **Under-voltage trip limit**  
|                     | **Over-voltage trip limit**  
|                     | **Ground fault protection**  
|                     | **Input (mains) supervision**  
|                     | **Motor phase supervision**  
|                     | **Over-current protection**  
|                     | **Unit over-temperature protection**  
|                     | **Motor overload protection**  
|                     | **Motor stall protection**  
|                     | **Motor underload protection**  
|                     | **Short-circuit protection of 10 Vdc and 24 Vdc reference voltages** |

### Table 4. Accessories.

<table>
<thead>
<tr>
<th>Accessory Description</th>
<th>Frame Size</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frame Size</strong></td>
<td><strong>4</strong></td>
</tr>
</tbody>
</table>
| EMC Filter Kit         | BT300-EMCKIT-FS4  
|                       | BT300-EMCKIT-FS5  
|                       | BT300-EMCKIT-FS6 |

<table>
<thead>
<tr>
<th>Accessory Description</th>
<th>Frame Size</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frame Size</strong></td>
<td><strong>7</strong></td>
</tr>
</tbody>
</table>
| EMC Filter Kit         | BT300-EMCKIT-FS7  
|                       | N/A  
|                       | BT300-EMCKIT-FS9 |

### Part Number

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
</table>
| **BT300-DIAGBD-BTE** | Electronic Bypass Diagnostic Board  
| **BTE-SW-KIT** | Electronic Bypass Override Switch Kit |

### Table 5. Dimensions in Inches (Millimeters).

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FS4</strong></td>
<td>35 (901)</td>
<td>7 (173)</td>
<td>10.09 (256)</td>
</tr>
<tr>
<td><strong>FS5</strong></td>
<td>44 (1,120)</td>
<td>11.32 (288)</td>
<td></td>
</tr>
<tr>
<td><strong>FS6</strong></td>
<td>55 (1,391)</td>
<td>9 (224)</td>
<td>11.88 (302)</td>
</tr>
<tr>
<td><strong>FS7</strong></td>
<td>59 (1486)</td>
<td>14 (368)</td>
<td>12.7 (323)</td>
</tr>
<tr>
<td><strong>FS8</strong></td>
<td>48 (1,219)</td>
<td>36 (914)</td>
<td>16.79 (426)</td>
</tr>
<tr>
<td><strong>FS9</strong></td>
<td>72 (1,830)</td>
<td>48 (1,221)</td>
<td>25.21 (640)</td>
</tr>
</tbody>
</table>
### Table 6. Order Worksheet.

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty.</th>
<th>Designation</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
</table>

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