Mode of Operation

Sensorless Vector Control (SVC)

Sensorless vector control provides exceptional speed regulation and very high levels of torque across the entire speed range of the drive.

- The Autotune feature allows the Bulletin 284 (SVC) to adapt to individual motor characteristics.
- Timer, Counter, Basic Logic and StepLogic™ functions can reduce hardware design costs and simplify control schemes.
- Integral PID functionality enhances application flexibility.
- Develops high torque over a wide speed range and adapts to individual motor characteristics.

Overload Protection

The Bulletin 284 ArmorStart Distributed Motor Controller incorporates, as standard, electronic motor overload protection. This overload protection is accomplished electronically with an $I^2t$ algorithm. The ArmorStart's overload protection is programmable via the communication network providing the user with flexibility. The overload trip class allows for class 10 overload protection. Ambient insensitivity is inherent in the electronic design of the overload.

Fault Diagnostics

Fault diagnostics capabilities built into the Bulletin 284 ArmorStart Distributed Motor Controller help you pinpoint a problem for easy troubleshooting and quick re-starting.

- Short Circuit
- Overload
- Phase Short
- Ground Fault
- Stall
- Control Power Loss
- Control Power Fuse Protection
- I/O Fault
- Overcurrent
- Overtemperature
- Output Fuse Protection
- Brake Fuse Protection
- Internal Communication Fault
- DC Bus Fault
- EEPROM Fault
- Hardware Fault
- Restart Retries
- Miscellaneous Fault
Factory Installed Options

HOA Selector Keypad with Jog Function
The HOA Selector Keypad with Jog Function allows for local start/stop control with capabilities to JOG and to Forward/Reverse motor direction.

EMI Filter
The EMI Filter is required to be CE compliant. When selected, a 3-meter shielded 4-conductor motor cordset is provided as standard. This is only available with sensorless vector control.

Source Brake Contactor
An internal contactor is used to switch an electromechanical motor brake On/Off. The motor brake contactor is powered from the main power circuit. The configuration of the R1 relay controls the function of the brake. A customer accessible 2.5 A fuse is provided to protect the brake cable. Included is a 3-meter 3-pin cordset for connection to the motor brake as standard.

Shielded Motor Cable
A 3-meter shielded 4-conductor cordset is provided instead of the 3-meter unshielded 4-conductor cordset, when the EMI Filter is selected.

Dynamic Brake Connector
This includes a 3-meter, 3-pin cordset for connection to an IP20 dynamic brake module. See Accessories on page 29 for available modules.

IP67 Dynamic Brake Connector
The IP67 Dynamic Brake Resistor design offers simplicity in wiring and installation. The DB1 option must be selected in order to have the quick disconnect connectivity. The cable length of the IP67 Dynamic Brake Resistor is available in 0.5 and 1.0 m. See Accessories on page 30 for available IP67 Dynamic Brake Resistors.

Output Contactor
An internal contactor is sourced from control voltage to isolate the load side of the VFD. Control voltage or the at-motor disconnect controls the ON/OFF of the output contactor. A sequenced stop involving the output contact cannot be performed.
**Catalog Number Explanation**

Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; not all combinations will produce a valid catalog number.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>284</td>
<td>VFD Starter</td>
<td>25</td>
<td>25 A Rated Device</td>
<td>10</td>
<td>10 A Rated Device</td>
<td>3</td>
<td>Hand/Off/Auto Selector Keypad with Jog Function</td>
</tr>
<tr>
<td>380...480V</td>
<td>Sensorless Vector Control and Volts per Hertz</td>
<td>D1P4</td>
<td>1.4 A, 0.4 kW, 0.5 Hp</td>
<td>D10</td>
<td>10 A Rated Device</td>
<td></td>
<td></td>
</tr>
<tr>
<td>380...480V</td>
<td>Sensorless Vector Control and Volts per Hertz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Example Numbers:**

- **284 E – F V D2P3 D – 10 – CR – Option 1 – Option 2 – Option 3**

**Option 1**

- **DB** blank DB Brake Connector
- **DB1** blank Connectivity to IP67 DB Resistor
- **SB** blank Source Brake Contactor
- **SB W** no cable

**Option 2**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>Conduit Entrance</td>
</tr>
<tr>
<td>CR N</td>
<td>Conduit Entrance</td>
</tr>
<tr>
<td>CR W</td>
<td>Conduit Entrance</td>
</tr>
<tr>
<td>RR</td>
<td>Round Media (Male Receptacle)</td>
</tr>
<tr>
<td>RR N</td>
<td>Round Media (Male Receptacle)</td>
</tr>
<tr>
<td>RR W</td>
<td>Round Media (Male Receptacle)</td>
</tr>
</tbody>
</table>

**Option 3**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMI</td>
<td>EMI Filter</td>
</tr>
<tr>
<td>OC</td>
<td>Output Contactor</td>
</tr>
</tbody>
</table>

*See Accessories on page 26 for extended motor and brake cable lengths.*
IP67/NEMA Type 4 with conduit entrance, Sensorless Vector Control, and Volts per Hertz torque performance, Up to 480V AC

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>3-Phase kW Rating</th>
<th>3-Phase Hp Rating</th>
<th>Output Current</th>
<th>24V DC Control Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>380…480V, 50/60 Hz 3-Phase</td>
<td>0.4</td>
<td>0.5</td>
<td>1.4</td>
<td>284E-FVD1P4Z-10-RR</td>
</tr>
<tr>
<td></td>
<td>0.75</td>
<td>1</td>
<td>2.3</td>
<td>284E-FVD2P3Z-10-RR</td>
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<tr>
<td></td>
<td>1.5</td>
<td>2</td>
<td>4</td>
<td>284E-FVD4P0Z-10-RR</td>
</tr>
<tr>
<td></td>
<td>2.2</td>
<td>3</td>
<td>6</td>
<td>284E-FVD6P0Z-25-RR</td>
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<tr>
<td></td>
<td>3</td>
<td>5</td>
<td>7.6</td>
<td>284E-FVD7P6Z-25-RR</td>
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EtherNet/IP Network Communication

Options – Factory Installed

<table>
<thead>
<tr>
<th>Description</th>
<th>Cat. No. Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand/Off/Auto Selector and Jog Keypad</td>
<td>-3</td>
</tr>
<tr>
<td>EMI Filter</td>
<td>-EMI</td>
</tr>
<tr>
<td>Output Contactor</td>
<td>-OC</td>
</tr>
<tr>
<td>Shielded motor cable</td>
<td>-CRN</td>
</tr>
<tr>
<td>Supplied without motor cable</td>
<td>-CRW</td>
</tr>
<tr>
<td>Source brake supplied with cable</td>
<td>-SB</td>
</tr>
<tr>
<td>Source brake supplied without cable</td>
<td>-SBW</td>
</tr>
<tr>
<td>Dynamic Brake Connector (IP20 brake)</td>
<td>-DB</td>
</tr>
<tr>
<td>Dynamic Brake Connector (IP67 brake)</td>
<td>-DB1</td>
</tr>
<tr>
<td>ArmorConnect Power Media Connectivity, ArmorStart supplied with shielded motor cable</td>
<td>-RRN</td>
</tr>
<tr>
<td>ArmorConnect Power Media Connectivity, ArmorStart supplied without motor cable</td>
<td>-RRW</td>
</tr>
</tbody>
</table>
ArmorStart® Distributed Motor Controller
Specifications

ArmorStart Receptacle Pin Outs

Receptacle Connections for EtherNet/IP (M12)

Pin 1: Tx+
Pin 2: Rx+
Pin 3: Tx-
Pin 4: Rx-

Receptacle Connections for Input (M12)

Pin 1: +24V (A3 or DNET)
Pin 2: Input 0
Pin 3: Common
Pin 4: Input 1
Pin 5: NC (no connection)

Receptacle Connections for Output, EtherNet/IP Version (M12)

Pin 1: NC (no connection)
Pin 2: NC (no connection)
Pin 3: Common
Pin 4: Output +24V DC (A1)
Pin 5: NC (no connection)

Receptacle Connections for Dynamic Brake (M22) — Bulletin 284E only

Pin 1: GND (green/yellow)
Pin 2: BR+ (black)
Pin 3: BR- (white)

Receptacle Connections for Motor Connector - 10 Hp or greater (M35) — Bulletin 280E/281E only

Receptacle Connections for Source or Control Brake — Bulletin 284E only

Pin 1: L1 (black)
Pin 2: GND (green/yellow)
Pin 3: L2 (white)

Receptacle Connections for Motor Connector - (M22) Bulletin 280E/281E: 3 Hp or less Bulletin 284E: 5 Hp or less

Pin 1: T1 (black)
Pin 2: T2 (white)
Pin 3: T3 (red)
Pin 4: Ground (green/yellow)

Receptacle Connections for Motor Connector - 10 A Short Circuit Protection (M22)

Pin 1: L1 (black)
Pin 2: L2 (white)
Pin 3: L3 (red)
Pin 4: Ground (green/yellow)

Receptacle Connections for incoming 3-phase Power - 25 A Short Circuit Protection (M35)

Pin 1: L1 (black)
Pin 2: Ground (green/yellow)
Pin 3: L3 (red)
Pin 4: L2 (white)

Receptacle Connections for incoming Control Power - 24V DC Only

Pin 1: +24V DC unswitched (A3)(red)
Pin 2: Common (A2)(black)
Pin 3: PE (green)
Pin 4: Not used (blank)
Pin 5: +24V DC switched (A1)(blue)
Pin 6: Not used (white)