

**Description**

The AZXBDC40A8 PWM servo drive is designed to drive brushless and brushed DC motors at a high switching frequency. To increase system reliability and to reduce cabling costs, the drive is designed for direct integration into your PCB. The AZXBDC40A8 is fully protected against over-voltage, under-voltage, over-current, over-heating and short-circuits. A single digital output indicates operating status. The drive interfaces with digital controllers that have digital PWM output. The PWM IN duty cycle determines the output current and DIR input determines the direction of rotation. This servo drive requires only a single unregulated isolated DC power supply, and is fully RoHS II (Reduction of Hazardous Substances) compliant.

The AZXBDC40A8 conforms to the following specifications and is designed to the Environmental Engineering Considerations as defined in MIL-STD-810F.

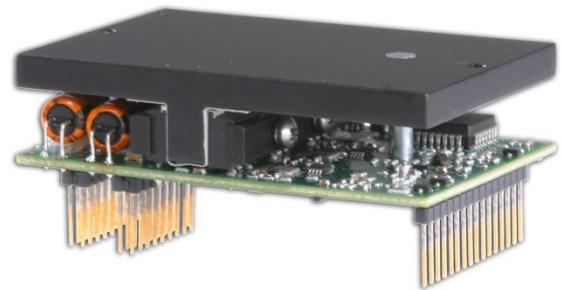
**Extended Environment Performance**

|                     |  |
|---------------------|--|
| Ambient Temperature | -40°C to +85°C (-40°F to +185°F)           |
| Storage Temperature | -50°C to +100°C (-58°F to +212°F)          |
| Thermal Shock       | -40°C to +85°C (-40°F to +185°F) in 2 min. |
| Relative Humidity   | 0 to 95% Non-Condensing                    |
| Vibration           | 30 Grms for 5 min. in 3 axes               |

See Part Numbering Information on last page of datasheet for additional ordering options. The AZX Series Hardware Installation Manual is available for download at [www.a-m-c.com](http://www.a-m-c.com).

**Power Range**

|                    |             |
|--------------------|-------------|
| Peak Current       | 40 A        |
| Continuous Current | 20 A        |
| Supply Voltage     | 10 - 80 VDC |



**Features**

- ▲ High Power Density
- ▲ Compact Size
- ▲ Direct Board-to-Board Integration
- ▲ Lightweight
- ▲ High Switching Frequency
- ▲ Four Quadrant Regenerative Operation
- ▲ Wide Temperature Range
- ▲ High Performance Thermal Dissipation
- ▲ Differential Input Command
- ▲ Current Monitor Output
- ▲ Digital Fault Output Monitor
- ▲ 12VDC Operation

**HARDWARE PROTECTION**

- Over-Voltage
- Under-Voltage
- Over-Current
- Over-Temperature
- Short-circuit (phase-phase)
- Short-circuit (phase-ground)

**INPUTS/OUTPUTS**

- Digital Fault Output
- Digital Inhibit Input
- Analog Current Monitor
- Analog Command Input
- Analog Current Reference

**FEEDBACK SUPPORTED**

- Hall Sensors

**MODES OF OPERATION**

- Current

**COMMUTATION**

- Trapezoidal

**MOTORS SUPPORTED**

- Three Phase (Brushless)
- Single Phase (Brushed, Voice Coil, Inductive Load)

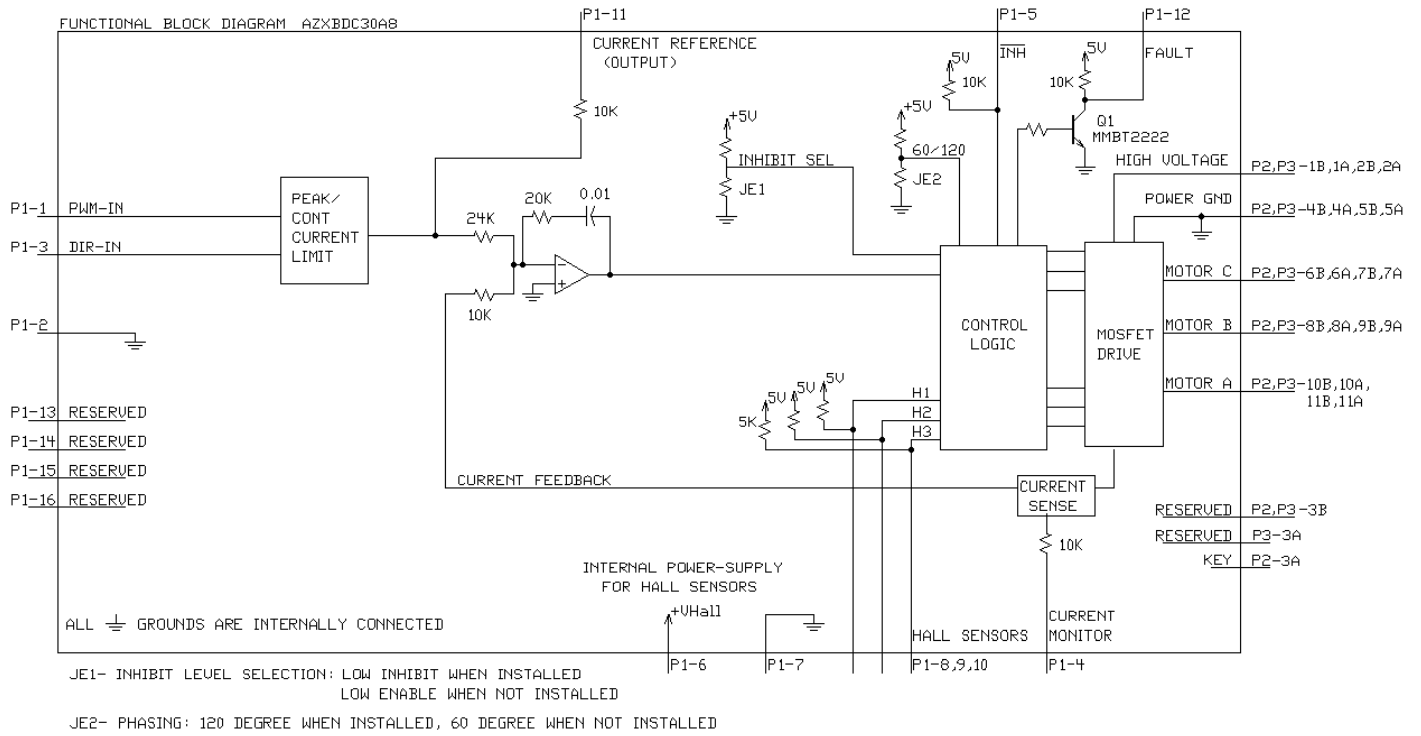
**COMMAND SOURCE**

- PWM

**COMPLIANCES & AGENCY APPROVALS**

- CE Class A (LVD)
- CE Class A (EMC)
- RoHS
- MIL-STD-810F (as stated)
- MIL-STD-1275D (optional)
- MIL-STD-461E (optional)
- MIL-STD-704F (optional)
- MIL-STD-HDBK-217 (optional)

**BLOCK DIAGRAM**



**Information on Approvals and Compliances**

|               |   |
|---------------|---|
|               | Compliant with European EMC Directive 2014/30/EU on Electromagnetic Compatibility (specifically EN 61000-6-4:2007/A1:2011 for Emissions, Class A and EN 61000-6-2:2005 for Immunity, Performance Criteria A). LVD requirements of Directive 2014/35/EU (specifically, EN 60204-1:2006/A1:2009, a Low Voltage Directive to protect users from electrical shock). |
| MIL-STD-810F  | Environmental Engineering Considerations and Laboratory Tests – (as stated)   |
| MIL-STD-1275D | Characteristics of 28 Volt DC Electrical Systems in Military Vehicles – (optional)  |
| MIL-STD-461E  | Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment – (optional)   |
| MIL-STD-704F  | Aircraft Electric Power Characteristics – (optional)  |
| MIL-HDBK-217  | Reliability Prediction of Electronic Equipment (MTBF) – (optional)  |
|               | The RoHS Directive restricts the use of certain substances including lead, mercury, cadmium, hexavalent chromium and halogenated flame retardants PBB and PBDE in electronic equipment.   |

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**SPECIFICATIONS**

| Power Specifications                                |         |   |
|---|---------|---|
| Description   | Units   | Value   |
| DC Supply Voltage Range                             | VDC     | 10 - 80   |
| DC Bus Under Voltage Limit                          | VDC     | 9   |
| DC Bus Over Voltage Limit                           | VDC     | 88  |
| Maximum Peak Output Current <sup>1</sup>            | A       | 40  |
| Maximum Continuous Output Current                   | A       | 20  |
| Maximum Continuous Output Power                     | W       | 1520  |
| Maximum Power Dissipation at Continuous Current     | W       | 80  |
| Minimum Load Inductance (Line-To-Line) <sup>2</sup> | µH      | 100   |
| Internal Bus Capacitance <sup>3</sup>               | µF      | 30  |
| Low Voltage Supply Outputs                          | -       | +6 VDC (30 mA)  |
| Switching Frequency                                 | kHz     | 31  |
| Control Specifications                              |         |   |
| Description   | Units   | Value   |
| Command Sources                                     | -       | PWM   |
| PWM Input Frequency Range                           | kHz     | 10 - 25   |
| Feedback Supported                                  | -       | Halls   |
| Commutation Methods                                 | -       | Trapezoidal   |
| Modes of Operation                                  | -       | Current   |
| Motors Supported                                    | -       | Three Phase (Brushless), Single Phase (Brushed, Voice Coil, Inductive Load)   |
| Hardware Protection                                 | -       | Invalid Commutation Feedback, Over Current, Over Temperature, Over Voltage, Under Voltage, Short Circuit (Phase-Phase & Phase-Ground)   |
| Mechanical Specifications                           |         |   |
| Description   | Units   | Value   |
| Agency Approvals                                    | -       | CE Class A (EMC), CE Class A (LVD), RoHS, MIL-STD-810F (as stated), MIL-STD-1275D (optional), MIL-STD-461E (optional), MIL-STD-704F (optional), MIL-HDBK-217 (optional), UL/cUL Pending |
| Size (H x W x D)                                    | mm (in) | 76.2 x 50.8 x 22.86 (3 x 2 x 0.9)   |
| Weight  | g (oz)  | 119.7 (4.2)   |
| Baseplate Operating Temperature Range <sup>4</sup>  | °C (°F) | -40 - 105 (-40 - 221)   |
| Ambient Temperature Range                           | °C (°F) | -40 - 85 (-40 - 185)  |
| Storage Temperature Range                           | °C (°F) | -50 - 100 (-58 - 212)   |
| Thermal Shock                                       | °C (°F) | -40 - 85 (-40 - 185) in 2 minutes   |
| Vibration   | Grms    | 30 for 5 minutes in 3 axes  |
| Relative Humidity                                   | -       | 0 - 95% Non-Condensing  |
| Form Factor   | -       | PCB Mounted   |
| P1 Connector  | -       | 16-pin, 2.54 mm spaced header   |
| P2 Connector  | -       | 22-pin, 2.54 mm spaced, dual-row header   |
| P3 Connector  | -       | 22-pin, 2.54 mm spaced, dual-row header   |

**Notes**

1. Maximum duration of peak current is ~2 seconds. Peak RMS value must not exceed continuous current rating of the drive.
2. Lower inductance is acceptable for bus voltages well below maximum. Use external inductance to meet requirements.
3. Requires a 470µF/100V electrolytic capacitor near the P2 Power Connector between High Voltage and Power Ground pins.
4. Additional cooling and/or heatsink may be required to achieve rated performance.

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**PIN FUNCTIONS**

| P1 - Signal Connector |                   |  |     |
|-----------------------|-------------------|--|-----|
| Pin                   | Name              | Description / Notes  | I/O |
| 1                     | PWM / IN          | 10 – 25 kHz pulse width modulated digital input command (+5V). Input duty cycle commands the output current.   | I   |
| 2                     | SIGNAL GND        | Signal Ground  | GND |
| 3                     | DIRECTION         | Direction Input (+5 V)   | I   |
| 4                     | CURRENT MONITOR   | Current Monitor. Analog output signal proportional to the actual current output. Polarity is reversed from command voltage. Scaling is 13.5 A/V. Measure relative to signal ground.                                      | O   |
| 5                     | INHIBIT IN        | TTL level (+5 V) inhibit/enable input. Leave open to enable drive. Pull to ground to inhibit drive. Inhibit turns off all power devices.   | I   |
| 6                     | +V HALL OUT       | Low Power Supply For Hall Sensors (+6 V @ 30 mA). Referenced to signal ground. Short circuit protected.  | O   |
| 7                     | SIGNAL GND        | Signal Ground  | GND |
| 8                     | HALL 1            | Single-ended Hall/Commutation Sensor Inputs (+5 V logic level)   | I   |
| 9                     | HALL 2*           |  | I   |
| 10                    | HALL 3            |  | I   |
| 11                    | CURRENT REFERENCE | Measures the command signal to the internal current-loop. This pin has a maximum output of $\pm 7.3$ V when the drive outputs maximum peak current. Measure relative to signal ground.                                   | O   |
| 12                    | FAULT OUT         | TTL level (+5 V) output becomes high when power devices are disabled due to at least one of the following conditions: inhibit, invalid Hall state, output short circuit, over voltage, over temperature, power-up reset. | O   |
| 13                    | RESERVED          | Reserved   | -   |
| 14                    | RESERVED          |  | -   |
| 15                    | RESERVED          |  | -   |
| 16                    | RESERVED          |  | -   |

| P2 and P3 - Power Connector |      |   |     |
|-----------------------------|------|---|-----|
| Pin                         | Name | Description / Notes   | I/O |
| 1b                          | 1a   | DC Power Input. 3A Continuous Current Rating Per Pin. Requires a 470 $\mu$ F / 100 V external capacitor between High Voltage and Power Ground.                      | I   |
| 2b                          | 2a   |   | I   |
| 3b                          |      | Not Connected (Reserved)  | -   |
|                             | 3a   |   | -   |
|                             | 3a   | Key: No Connection (pin removed) for P2. Not Connected (Reserved) for P3.   | -   |
| 4b                          | 4b   | Power Ground (Common With Signal Ground). 3A Continuous Current Rating Per Pin.   | GND |
| 5b                          | 5a   |   | GND |
| 6b                          | 6a   | Motor Phase Outputs. Current output distributed equally across both P2 and P3 connectors – 8 pins per motor phase, 3A continuous current carrying capacity per pin. | O   |
| 7b                          | 7a   |   | O   |
| 8b                          | 8a   |   | O   |
| 9b                          | 9a   |   | O   |
| 10b                         | 10a  |   | O   |
| 11b                         | 11a  |   | O   |

\*For use with Single Phase (Brushed) motors, ground Hall 2 and only connect motor leads to Motor A and Motor B.

**HARDWARE SETTINGS**

**Jumper Settings**

The drive PCB is conformal coated, thereby making it difficult to change jumper settings. Jumpers are SMT 0 ohm resistors located on the underside of the drive PCB. By default, the drive is configured with the jumpers installed. Typical drive operation will not require the jumpers to be removed. Please contact the factory before jumper removal.

| Jumper | Description   | Configuration                    |             |
|--------|---|----------------------------------|-------------|
|        |   | SMT Jumper (0 $\Omega$ Resistor) |             |
|        |   | Not Installed                    | Installed   |
| JE1    | Inhibit logic. Sets the logic level of inhibit pins. Labeled JE1 on the PCB of the drive.               | Low Enable                       | Low Inhibit |
| JE2    | Hall sensor phasing. Selects 120 or 60 degree commutation phasing. Labeled JE2 on the PCB of the drive. | 60 degree                        | 120 degree  |

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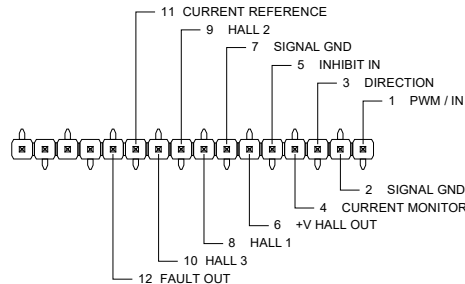


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**MECHANICAL INFORMATION**

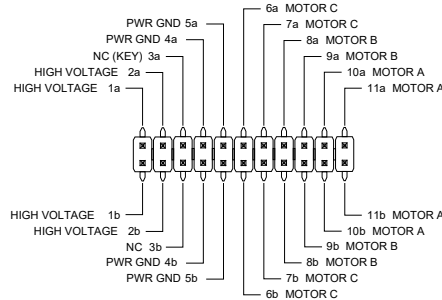
**P1 - Signal Connector**

|                       |                     |                               |
|-----------------------|---------------------|-------------------------------|
| Connector Information |                     | 16-pin, 2.54 mm spaced header |
| Mating Connector      | Details             | Samtec: BCS-116-L-S-PE        |
|                       | Included with Drive | No                            |



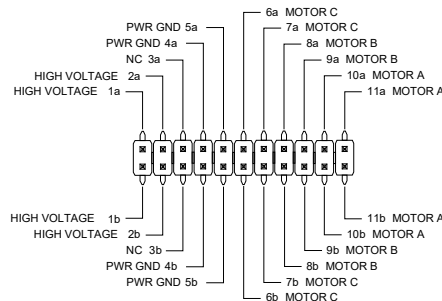
**P2 - Power Connector**

|                       |                     |   |
|-----------------------|---------------------|---|
| Connector Information |                     | 22-pin, 2.54 mm spaced, dual-row header |
| Mating Connector      | Details             | Samtec: BCS-111-L-D-PE                  |
|                       | Included with Drive | No                                      |



**P3 - Power Connector**

|                       |                     |   |
|-----------------------|---------------------|---|
| Connector Information |                     | 22-pin, 2.54 mm spaced, dual-row header |
| Mating Connector      | Details             | Samtec: BCS-111-L-D-PE                  |
|                       | Included with Drive | No                                      |



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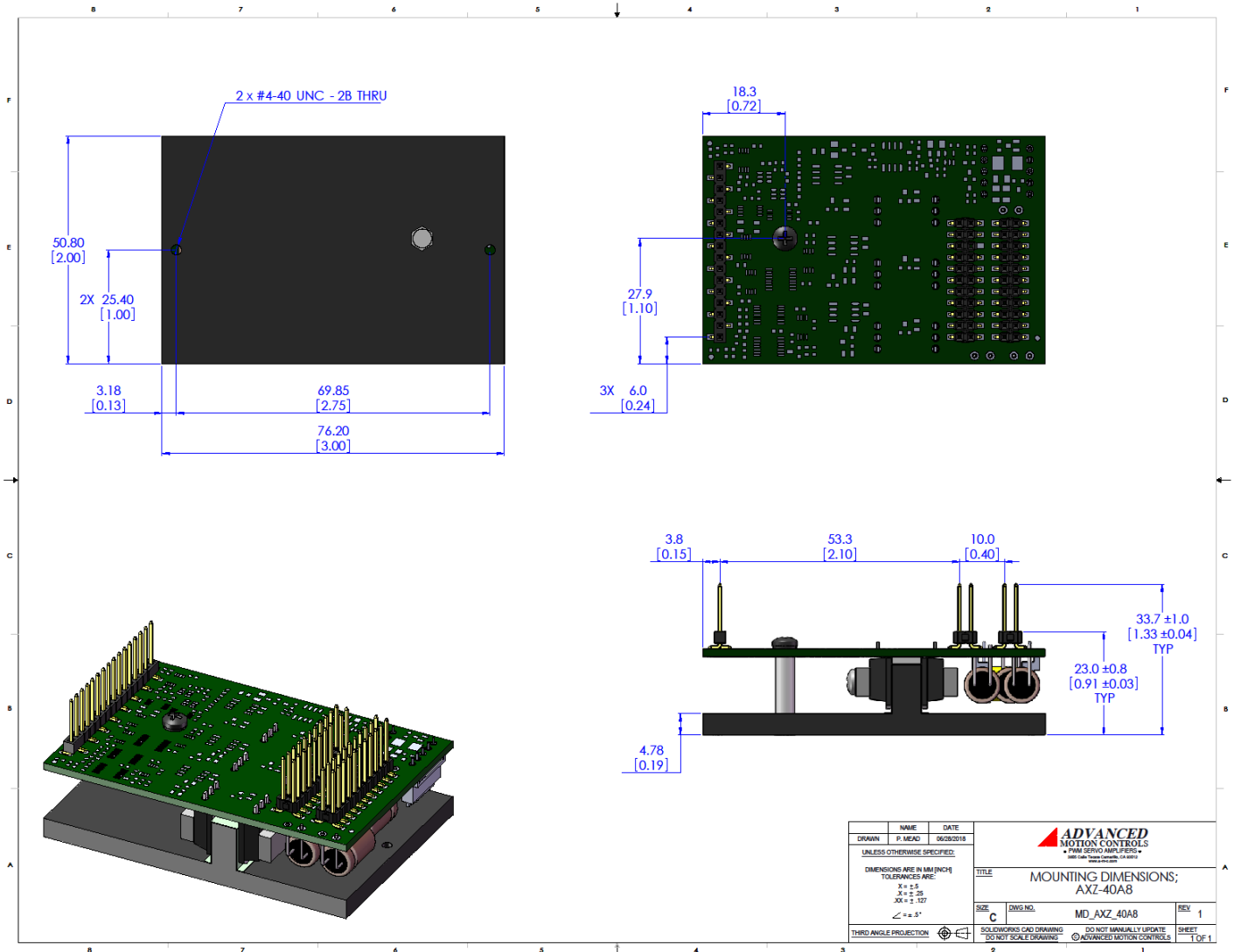


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**MOUNTING DIMENSIONS**



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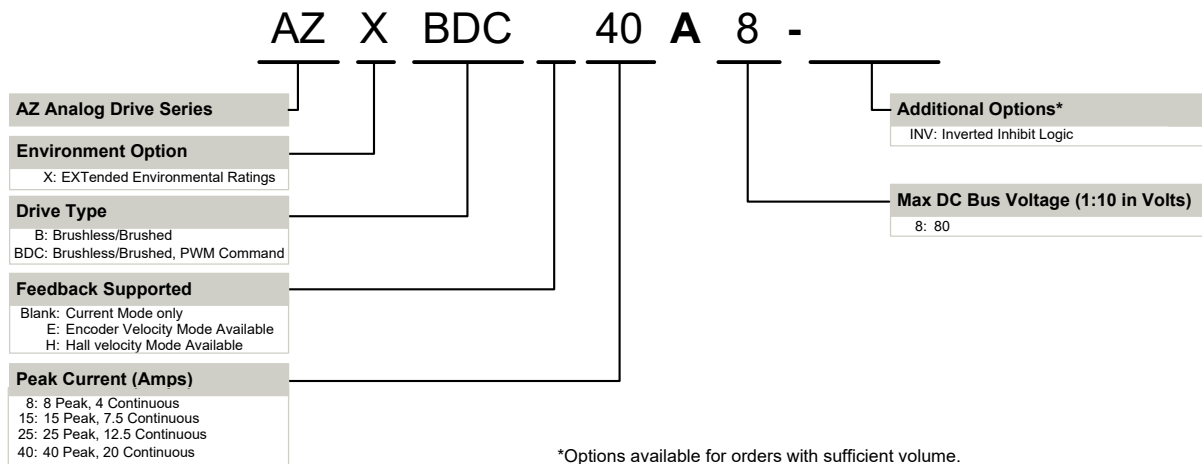
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**PART NUMBERING INFORMATION**



\*Options available for orders with sufficient volume. Contact **ADVANCED** Motion Controls for more information.

**ADVANCED** Motion Controls AZ series of servo drives are available in many configurations. Note that not all possible part number combinations are offered as standard drives. All models listed in the selection tables of the website are readily available, standard product offerings.

**ADVANCED** Motion Controls also has the capability to promptly develop and deliver specified products for OEMs with volume requests. Our Applications and Engineering Departments will work closely with your design team through all stages of development in order to provide the best servo drive solution for your system. Equipped with on-site manufacturing for quick-turn customs capabilities, **ADVANCED** Motion Controls utilizes our years of engineering and manufacturing expertise to decrease your costs and time-to-market while increasing system quality and reliability.

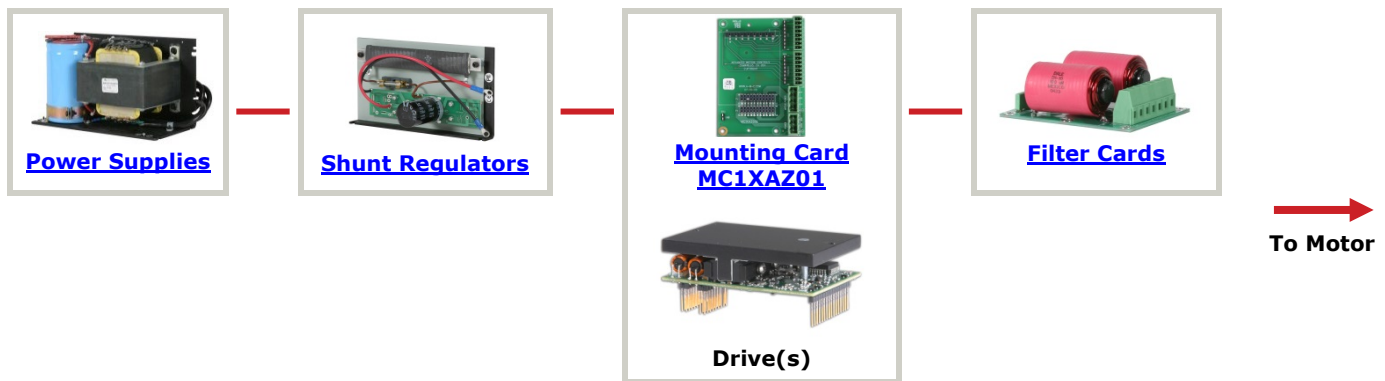
**Examples of Modifications and Customized Products**

- ▲ Integration of Drive into Motor Housing
- ▲ Mount OEM PCB onto Drive Without Cables
- ▲ Multi-axis Configuration for Compact System
- ▲ Custom PCB and Baseplate for Optimized Footprint
- ▲ RTV/Epoxy Components for High Vibration
- ▲ OEM Specified Connectors for Instant Compatibility
- ▲ OEM Specified Silkscreen for Custom Appearance
- ▲ Increased Thermal Limits for High Temp. Operation
- ▲ Integrate OEM Circuitry onto Drive PCB
- ▲ Custom Control Loop Tuned to Motor Characteristics
- ▲ Custom I/O Interface for System Compatibility
- ▲ Preset Switches and Pots to Reduce User Setup
- ▲ Optimized Switching Frequency
- ▲ Ramped Velocity Command for Smooth Acceleration
- ▲ Remove Unused Features to Reduce OEM Cost
- ▲ Application Specific Current and Voltage Limits

Feel free to contact Applications Engineering for further information and details.

**Available Accessories**

**ADVANCED** Motion Controls offers a variety of accessories designed to facilitate drive integration into a servo system. Visit [www.a-m-c.com](http://www.a-m-c.com) to see which accessories will assist with your application design and implementation.



All specifications in this document are subject to change without written notice. Actual product may differ from pictures provided in this document.