

Description

The AB25A100 PWM servo drive is designed to drive brushless and brushed DC motors at a high switching frequency. A single red/green LED indicates operating status. The drive is fully protected against over-voltage, under-voltage, over-current, over-heating and short-circuits across motor, ground and power leads. Furthermore, the drive can interface with digital controllers or be used stand-alone, and requires only a single unregulated DC power supply. Loop gain, current limit, input gain and offset can be adjusted using 14-turn potentiometers. The offset adjusting potentiometer can also be used as an on-board input signal for testing purposes. This drive can use quadrature encoder inputs for velocity control.

See Part Numbering Information on last page of datasheet for additional ordering options. Download the installation manual for the AxCent™ Series drive family at www.a-m-c.com.

Power Range

Peak Current	25 A
Continuous Current	15 A
Supply Voltage	20 - 80 VDC



Features

- ▲ Four Quadrant Regenerative Operation
- ▲ DIP Switch Selectable Modes
- ▲ DIP Switch Configurable Loop Tuning
- ▲ Selectable Inhibit Logic
- ▲ Adjustable Current Limits
- ▲ High Switching Frequency
- ▲ Differential Input Command
- ▲ Digital Fault Output Monitor
- ▲ On-Board Test Potentiometer
- ▲ Offset Adjustment Potentiometer
- ▲ Adjustable Input Gain
- ▲ Selectable 120/60 Hall Commutation Phasing
- ▲ Encoder Velocity Mode
- ▲ Velocity Monitor Output
- ▲ Current Monitor Output
- ▲ Drive Status LED

MODES OF OPERATION

- Current
- Encoder Velocity
- Duty Cycle (Open Loop)

COMMAND SOURCE

- ±10 V Analog

FEEDBACK SUPPORTED

- Hall Sensors
- Incremental Encoder

MOTORS SUPPORTED

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

COMPLIANCES & AGENCY APPROVALS

- UL
- cUL
- CE Class A (LVD)
- CE Class A (EMC)
- RoHS II

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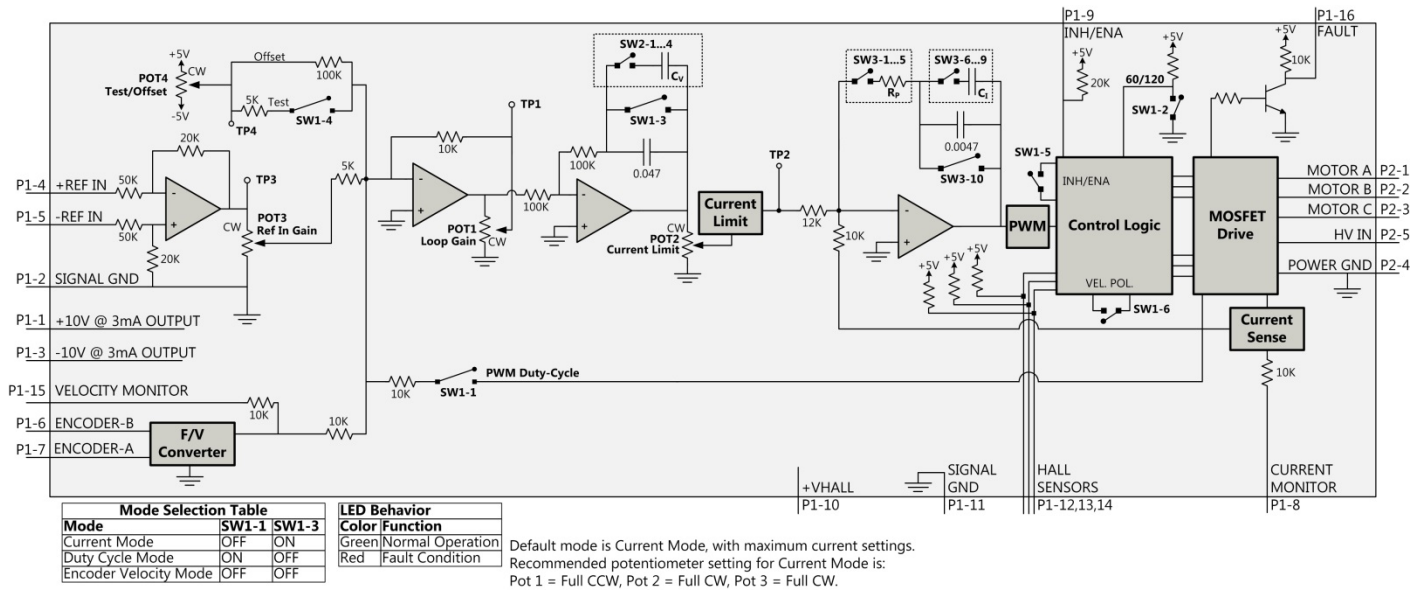
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BLOCK DIAGRAM



Information on Approvals and Compliances

	<p>US and Canadian safety compliance with UL 61800-5-1, the industrial standard for adjustable speed electrical power drive systems. UL registered under file number E140173. Note that machine components compliant with UL are considered UL registered as opposed to UL listed as would be the case for commercial products.</p>
	<p>Compliant with European EMC Directive 2004/108/EC on Electromagnetic Compatibility (specifically EN 61000-6-4:2007 for Emissions, Class A and EN 61000-6-2:2005 for Immunity, Performance Criteria A). LVD requirements of Directive 2006/95/EC (specifically, EN 60204-1:2004, a Low Voltage Directive to protect users from electrical shock).</p>
	<p>The RoHS II Directive 2011/65/EU restricts the use of certain substances including lead, mercury, cadmium, hexavalent chromium and halogenated flame retardants PBB and PBDE in electronic equipment.</p>

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SPECIFICATIONS

Description		Power Specifications		Value
		Units		
DC Supply Voltage Range		VDC	20 - 80	
DC Bus Over Voltage Limit		VDC	88	
DC Bus Under Voltage Limit		VDC	15	
Maximum Peak Output Current ¹		A	25	
Maximum Continuous Output Current		A	15	
Maximum Continuous Output Power at Continuous Current		W	1140	
Maximum Power Dissipation at Continuous Current		W	60	
Minimum Load Inductance (Line-To-Line) ²		μH	200	
Internal Bus Capacitance		μF	141	
Low Voltage Supply Outputs		-	±10 VDC (3 mA), +6 VDC (30 mA)	
Switching Frequency		kHz	22	
Description		Control Specifications		Value
		Units		
Command Sources		-	±10 V Analog	
Feedback Supported		-	Hall Sensors, Incremental Encoder	
Commutation Methods		-	Trapezoidal	
Modes of Operation		-	Current, Encoder Velocity, Duty Cycle (Open Loop)	
Motors Supported		-	Three Phase (Brushless), Single Phase (Brushed, Voice Coil, Inductive Load)	
Hardware Protection		-	Over-Current, Over-Temperature, Over-Voltage, Under-Voltage, Short-Circuit (Phase-Phase & Phase-Ground)	
Primary I/O Logic Level		-	5V TTL	
Description		Mechanical Specifications		Value
		Units		
Agency Approvals		-	CE Class A (EMC), CE Class A (LVD), cUL, RoHS II, UL	
Size (H x W x D)		mm (in)	129.3 x 75.8 x 25.1 (5.09 x 2.98 x 0.99)	
Weight		g (oz)	249.5 (8.8)	
Heatsink (Base) Temperature Range ³		°C (°F)	0 - 65 (32 - 149)	
Storage Temperature Range		°C (°F)	-40 - 85 (-40 - 185)	
Form Factor		-	Panel Mount	
P1 Connector		-	16-pin, 2.54 mm spaced, friction lock header	
P2 Connector		-	5-port, 5.08 mm spaced, quick disconnect terminal	

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. 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	+10V 3mA OUT	±10 V @ 3 mA low power supply for customer use. Short circuit protected. Reference ground common with signal ground.	O
2	SIGNAL GND		GND
3	-10V 3mA OUT		O
4	+REF IN	Differential Reference Input (±10 V Operating Range, ±15 V Maximum Input)	I
5	-REF IN		I
6	ENCODER-B IN	Single-ended encoder channel B input. +5 V logic level.	I
7	ENCODER-A IN	Single-ended encoder channel A input. +5 V logic level.	I
8	CURRENT MONITOR	Current Monitor. Analog output signal proportional to the actual current output. Scaling is 4.4 A/V. Measure relative to signal ground.	O
9	INHIBIT / ENABLE	TTL level (+5 V) inhibit/enable input. Pull to ground to inhibit drive (SW1-5 ON). Pull to ground to enable drive (SW1-5 OFF). Inhibit turns off all power devices.	I
10	+V HALL 30mA OUT	Low Power Supply For Hall Sensors (+6 V @ 30 mA). Referenced to signal ground. Short circuit protected.	O
11	GND	Signal Ground	GND
12	HALL 1	Single-ended Hall/Commutation Sensor Inputs (+5 V logic level). Leave open for brushed motors.	I
13	HALL 2		I
14	HALL 3		I
15	VEL MONITOR OUT	Velocity Monitor. Analog output proportional to motor speed. In Encoder Velocity mode, output is proportional to the encoder line frequency. Encoder Velocity scaling is 22 kHz/V.	O
16	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

P2 - Power Connector			
Pin	Name	Description / Notes	I/O
1	A	Motor Phase A	O
2	B	Motor Phase B	O
3	C	Motor Phase C (leave open for brushed motors)	O
4	POWER GND	Power Ground (Common With Signal Ground)	PGND
5	HIGH VOLTAGE	DC Power Input	I

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HARDWARE SETTINGS

Configuration Switch Functions

SW1	Description	Setting	
		On	Off
1	Duty Cycle mode selector. Activates internal PWM feedback. OFF by default.	Duty Cycle mode	Other modes
2	60/120 degree commutation phasing setting. ON by default. For brushed motors, set to 60 degree phasing.	120 degrees	60 degrees
3	Outer loop integration. Activates or deactivates integration. ON for current mode and OFF for other modes. ON by default.	Inactive	Active
4	Test/Offset. Switches the function of the Test/Offset pot between an on-board command input for testing or a command offset adjustment. OFF by default.	Test	Offset
5	Inhibit logic. Sets the logic level of inhibit pins. ON by default.	Drive Inhibit is active low	Drive Inhibit is active high
6	Velocity feedback polarity. Changes the polarity of the internal feedback signal and the velocity monitor output signal. Inversion of the feedback polarity may be required to prevent a motor run-away condition. ON by default.	Standard	Inverted

Mode Selection Table

	SW1	SW3	Encoder
CURRENT	OFF	ON	Not Connected
DUTY CYCLE	ON	OFF	Not Connected
ENCODER VELOCITY*	OFF	OFF	Connected

*Note: Use SW1-6 to change the feedback polarity if necessary. This may be required to prevent a run-away condition.

Potentiometer Functions

Potentiometer	Description	Turning CW
1	Loop gain adjustment for duty cycle / velocity modes. Turn this pot fully CCW in current mode.	Increases gain
2	Current limit. It adjusts both continuous and peak current limit while maintaining their ratio.	Increases limit
3	Reference gain. Adjusts the ratio between input signal and output variables (voltage, current, or velocity).	Increases gain
4	Offset / Test. Used to adjust any imbalance in the input signal or in the amplifier. Can also be used as an on-board signal source for testing purposes.	Adjusts offset in negative direction

Note: Potentiometers are approximately linear and have 12 active turns with 1 inactive turn on each end. Test points are provided on the drive PCB near each potentiometer to measure the potentiometer value.

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Loop Tuning Switch Functions

In general, the drive will not need to be further tuned beyond the default configuration. However, for applications requiring more precise tuning, DIP switches can be used to adjust the current and velocity loop tuning values. Some general rules of thumb to follow when tuning the drive are:

- A larger resistor value will increase the proportional gain, and therefore create a faster response time.
- A larger capacitor value will increase the integration time, and therefore create a slower response time.

Proper tuning will require careful observation of the loop response on a digital oscilloscope to find optimal DIP switch settings for the specific application.

(Note: Drive cover must be removed to access SW2 and SW3)

SW2 DIP switches 1-4 add additional parallel capacitance to the velocity loop integrator capacitor (see Block Diagram). The resulting velocity loop capacitance values are given in the table below along with the appropriate DIP switch settings. By default, all SW2 switches are OFF (shaded in the SW2 table below).

SW2																
Switch	Velocity Loop Integrator Capacitance Options (μF)															
	.047	.147	.267	.367	.517	.617	.737	.837	1.047	1.147	1.267	1.367	1.517	1.617	1.737	1.837
SW2-1	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON
SW2-2	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON
SW2-3	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON
SW2-4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON

Note: The velocity loop integrator capacitor can be shorted entirely by setting SW1-3 to ON.

SW3 DIP switches add additional resistance and capacitance to the current loop tuning circuitry. SW3 switches 1-5 add additional series resistance to the current loop gain resistor, and SW3 switches 6-10 add additional parallel capacitance to the current loop integrator capacitor (see Block Diagram). The resulting capacitance and resistance values are given in the tables below along with the appropriate DIP switch settings. The default switch settings are shaded in the SW3 tables below.

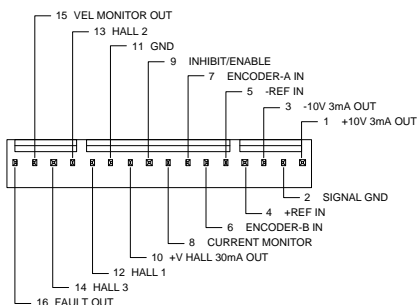
SW3																
Switch	Current Loop Proportional Gain Resistance Options (kΩ)															
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160
SW3-1	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
SW3-2	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF
SW3-3	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF
SW3-4	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
SW3-5	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Switch (continued)	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320
SW3-1	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
SW3-2	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF
SW3-3	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF
SW3-4	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
SW3-5	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

SW3																	
Switch	Current Loop Integrator Capacitance Options (μF)																
	.0047	.0094	.0247	.0294	.0517	.0564	.0717	.0764	.0987	.1034	.1187	.1234	.1457	.1504	.1647	.1694	SHORT
SW3-6	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	ON
SW3-7	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	ON
SW3-8	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON
SW3-9	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON
SW3-10	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON

MECHANICAL INFORMATION

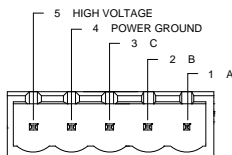
P1 - Signal Connector

Connector Information	16-pin, 2.54 mm spaced, friction lock header	
Mating Connector	Details	Molex: P/N 22-01-3167 (connector) and P/N 08-50-0114 (insert terminals)
	Included with Drive	Yes



P2 - Power Connector

Connector Information	5-port, 5.08 mm spaced, quick-disconnect terminal	
Mating Connector	Details	Phoenix: P/N 1911994
	Included with Drive	Yes



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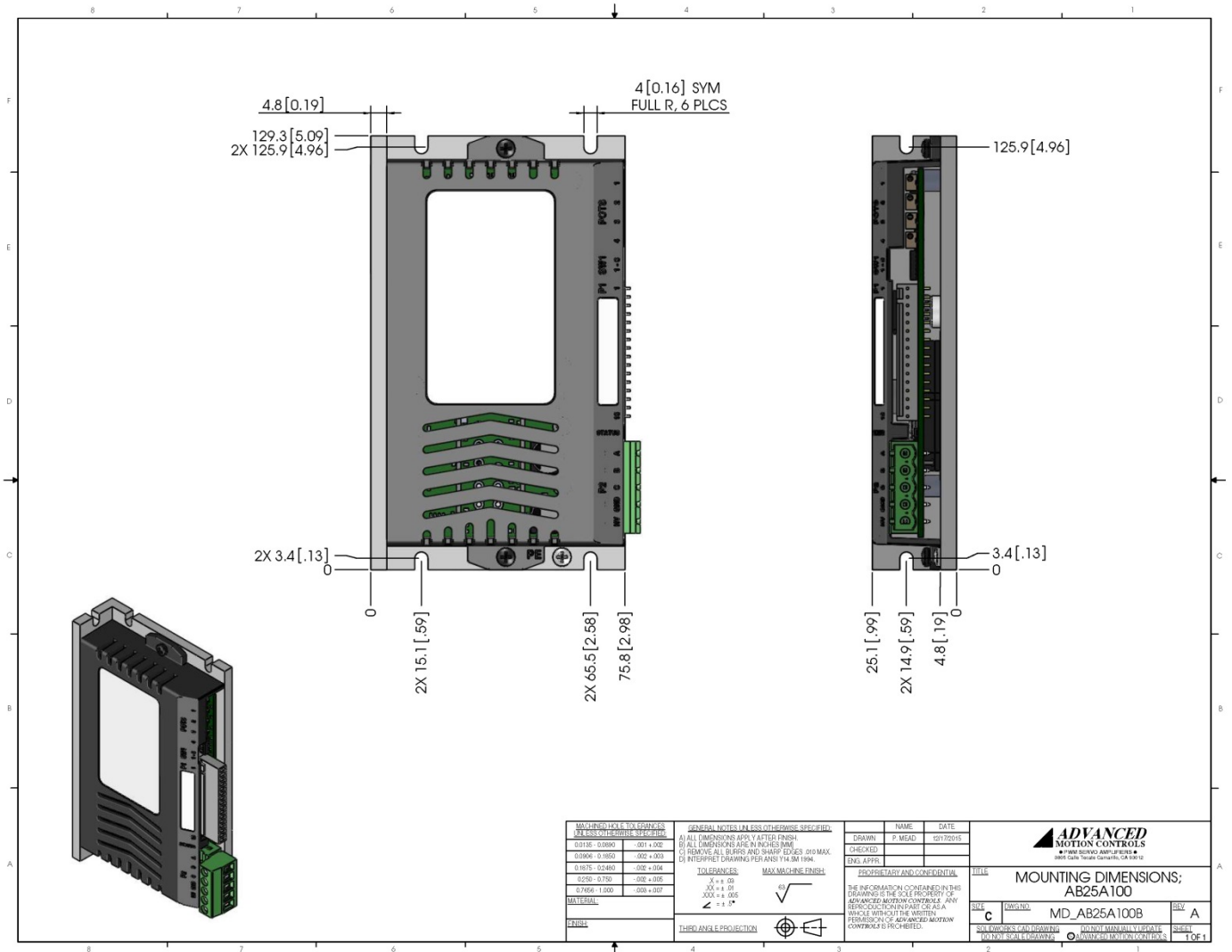
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MOUNTING DIMENSIONS



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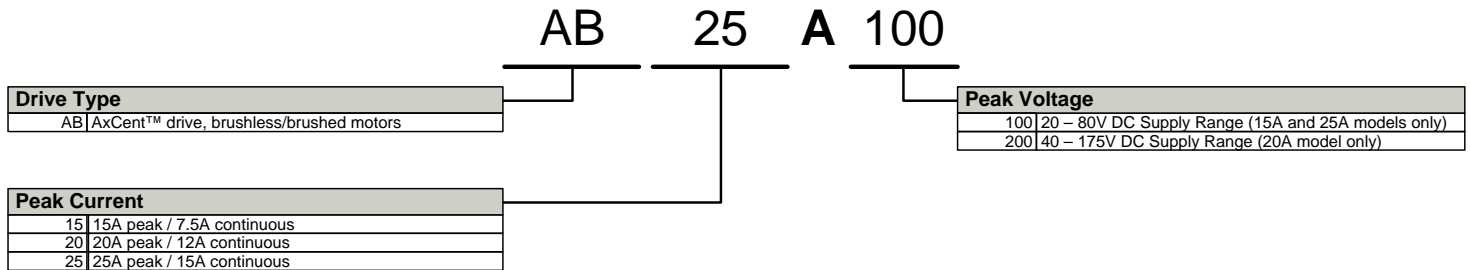
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PART NUMBERING INFORMATION



ADVANCED Motion Controls analog 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.

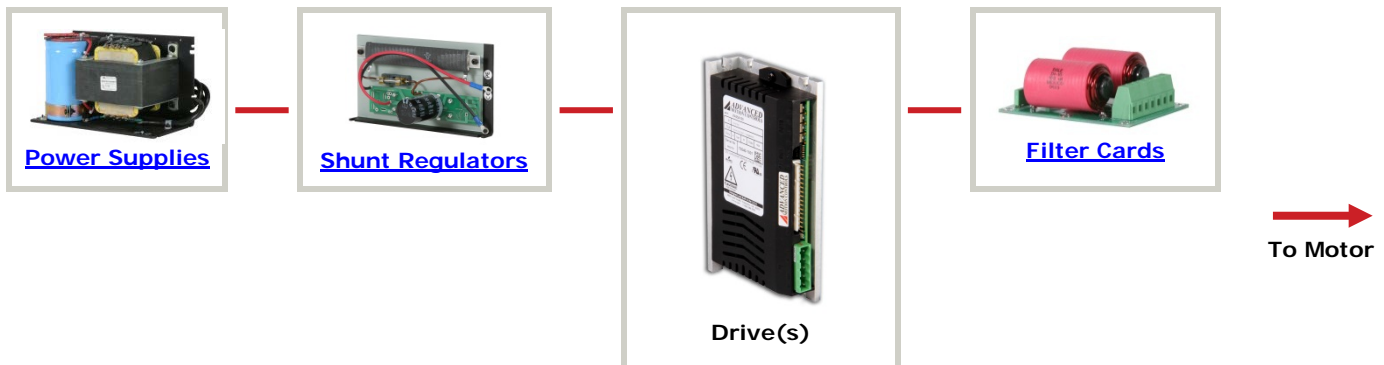
Examples of Modifications and Customized Products

- | | |
|---|--|
| <ul style="list-style-type: none"> ▲ 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 | <ul style="list-style-type: none"> ▲ 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 to see which accessories will assist with your application design and implementation.



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