

Description

The DigiFlex® Performance™ (DP) Series digital servo drives are designed to drive brushed and brushless servomotors. These fully digital drives operate in torque, velocity, or position mode and employ Space Vector Modulation (SVM), which results in higher bus voltage utilization and reduced heat dissipation compared to traditional PWM. The drive can be configured for a variety of external command signals. Commands can also be configured using the drive's built-in Motion Engine, an internal motion controller used with distributed motion applications. In addition to motor control, these drives feature dedicated and programmable digital and analog inputs and outputs to enhance interfacing with external controllers and devices.

This DP Series drive features a single RS-232/RS-485 interface used for drive configuration and setup. Drive commissioning is accomplished using DriveWare® 7, available for download at www.a-m-c.com.

All drive and motor parameters are stored in non-volatile memory.

Power Range

Peak Current	60 A (42.4 A _{RMS})
Continuous Current	30 A (21.2 A _{RMS})
Supply Voltage	200 - 480 VAC



Features

- ▲ Four Quadrant Regenerative Operation
- ▲ Space Vector Modulation (SVM) Technology
- ▲ Fully Digital State-of-the-art Design
- ▲ Programmable Gain Settings
- ▲ Fully Configurable Current, Voltage, Velocity and Position Limits
- ▲ PIDF Velocity Loop
- ▲ PID + FF Position Loop
- ▲ Compact Size, High Power Density
- ▲ 16-bit Analog to Digital Hardware
- ▲ Built-in brake/shunt regulator
- ▲ On-the-Fly Mode Switching
- ▲ On-the-Fly Gain Set Switching

MODES OF OPERATION

- Current
- Position
- Velocity

COMMAND SOURCE

- PWM and Direction
- Encoder Following
- Over the Network
- ±10 V Analog
- 24V Step and Direction
- Sequencing
- Indexing
- Jogging

FEEDBACK SUPPORTED

- Resolver
- ±10 VDC Position
- Auxiliary Incremental Encoder
- Tachometer (±10 VDC)

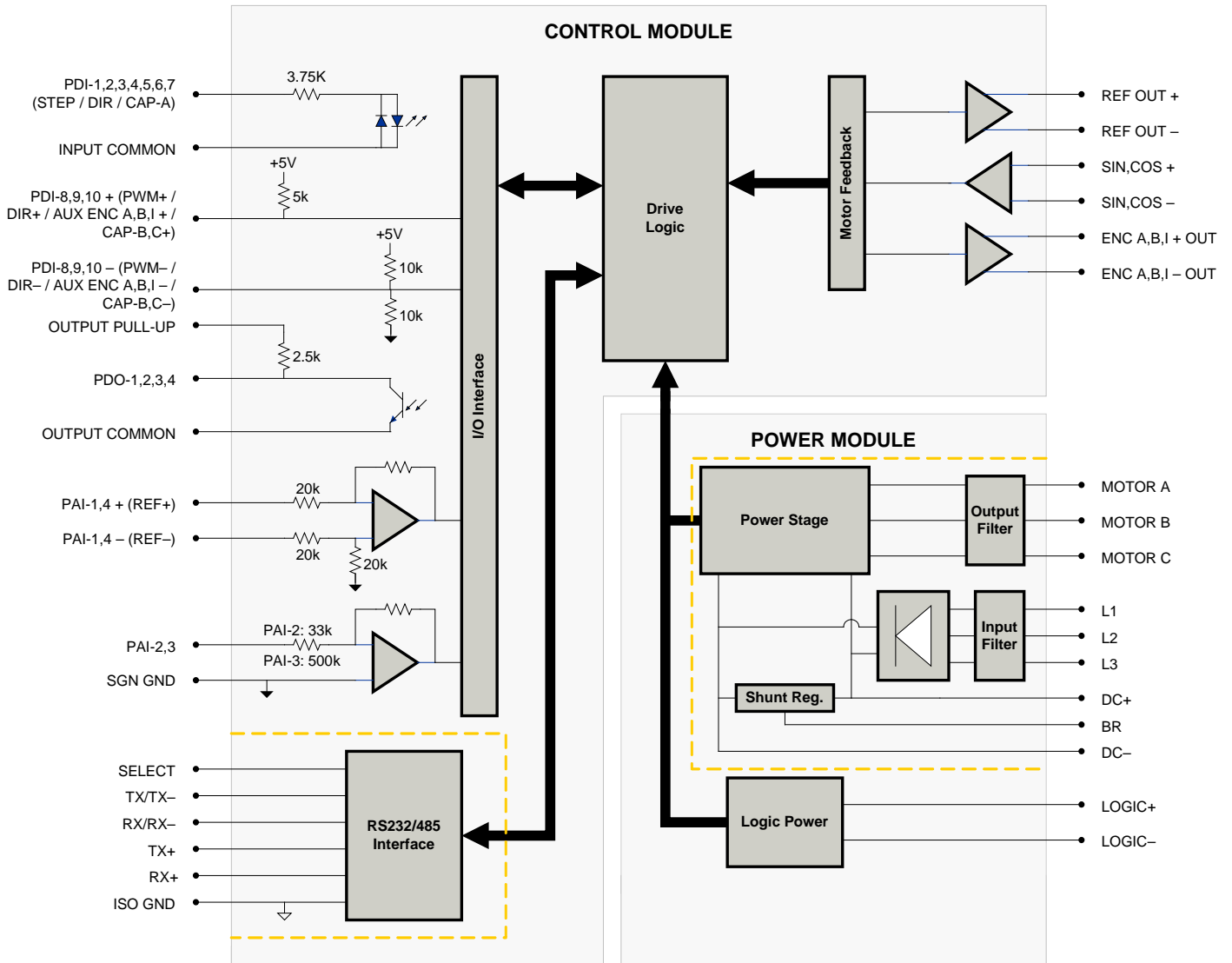
INPUTS/OUTPUTS

- 3 High Speed Captures
- 4 Programmable Analog Inputs (16-bit/12-bit Resolution)
- 3 Programmable Digital Inputs (Differential)
- 7 Programmable Digital Inputs (Single-Ended)
- 4 Programmable Digital Outputs (Single-Ended)

COMPLIANCES & AGENCY APPROVALS

- CE Class A (LVD)
- CE Class A (EMC)
- RoHS

BLOCK DIAGRAM



Information on Approvals and Compliances



Compliant with European CE for the Class A EMC Directive 2004/108/EC on Electromagnetic Compatibility (specifically EN 61000-6-4:2007 and EN 61000-6-2:2005) and LVD requirements of directive 2006/95/EC (specifically EN 60204-1:2006), a low voltage directive to protect users from electrical shock.



RoHS (Reduction of Hazardous Substances) is intended to prevent hazardous substances such as lead from being manufactured in electrical and electronic equipment.

SPECIFICATIONS

Description		Power Specifications		Value
		Units		
Rated Voltage		VAC (VDC)	480 (678)	
AC Supply Voltage Range		VAC	200 - 480	
AC Supply Minimum		VAC	180	
AC Supply Maximum		VAC	528	
AC Input Phases		-	3	
AC Supply Frequency		Hz	50 - 60	
DC Supply Voltage Range ¹		VDC	255 - 747	
DC Bus Over Voltage Limit		VDC	850	
DC Bus Under Voltage Limit		VDC	230	
Logic Supply Voltage		VDC	20 - 30 (@ 850 mA)	
Maximum Peak Output Current ²		A (Arms)	60 (42.4)	
Maximum Continuous Output Current		A (Arms)	30 (21.2)	
Max. Continuous Output Power @ Rated Voltage ³		W	13680	
Max. Continuous Power Dissipation @ Rated Voltage		W	720	
Internal Bus Capacitance		µF	330	
External Shunt Resistor Minimum Resistance ⁴		Ω	40	
Minimum Load Inductance (Line-To-Line) ⁵		µH	3000	
Switching Frequency		kHz	10	
Maximum Output PWM Duty Cycle		%	100	
Low Voltage Supply Outputs		-	+5 VDC (250 mA)	
Description		Control Specifications		Value
		Units		
Communication Interfaces		-	RS-485/232	
Command Sources		-	±10 V Analog, 24V Step and Direction, Encoder Following, Over the Network, PWM and Direction, Sequencing, Indexing, Jogging	
Feedback Supported		-	±10 VDC Position, Auxiliary Incremental Encoder, Resolver, Tachometer (±10 VDC)	
Commutation Methods		-	Sinusoidal	
Modes of Operation		-	Current, Position, Velocity	
Motors Supported		-	Closed Loop Vector, Single Phase (Brushed, Voice Coil, Inductive Load), Three Phase (Brushless)	
Hardware Protection		-	40+ Configurable Functions, Over Current, Over Temperature (Drive & Motor), Over Voltage, Short Circuit (Phase-Phase & Phase-Ground), Under Voltage	
Programmable Digital Inputs/Outputs (PDIs/PDOs)		-	10/4	
Programmable Analog Inputs/Outputs (PAIs/PAOs)		-	4/0	
Primary I/O Logic Level		-	24 VDC	
Current Loop Sample Time		µs	100	
Velocity Loop Sample Time		µs	200	
Position Loop Sample Time		µs	200	
Resolver Reference/Excitation Signal		Vrms	4 Vrms @ 5 kHz	
Expected Resolver Transformation Ratio		Vrms	0.5	
Feedback Resolution / Emulated Encoder Resolution ⁶		bit	High Res: 14 (16384 counts/resolver cycle), Low Res: 12 (4096 counts/resolver cycle)	
Maximum Motor Speed Per Feedback Resolution		RPM	High Res: 5000, Low Res: 20000	
Internal Shunt Regulator		-	Yes	
Internal Shunt Resistor		-	No	
Description		Mechanical Specifications		Value
		Units		
Agency Approvals		-	CE Class A (EMC), CE Class A (LVD), RoHS	
Size (H x W x D)		mm (in)	300.5 x 232.1 x 139.3 (11.8 x 9.1 x 5.5)	
Weight		g (oz)	6165 (217.5)	
Heatsink (Base) Temperature Range ⁷		°C (°F)	0 - 75 (32 - 167)	
Storage Temperature Range		°C (°F)	-40 - 85 (-40 - 185)	
Form Factor		-	Panel Mount	
Cooling System		-	Natural Convection	
IP Rating		-	IP10	
+24V LOGIC Connector		-	2-port, 5.08 mm spaced, enclosed, friction lock header	
AUX ENCODER Connector		-	15-pin, high-density, male D-sub	
COMM Connector		-	9-pin, female D-sub	
DC BUS Connector		-	4-port, 7.62 mm spaced, enclosed, friction lock header	
FEEDBACK Connector		-	15-pin, high-density, female D-sub	
I/O Connector		-	26-pin, high-density, female D-sub	
MOTOR POWER Connector		-	4-port, 7.62 mm spaced, enclosed, friction lock header	
POWER Connector		-	3-port, 7.62 mm spaced, enclosed, friction lock header	

Notes

- DC supply operation through the L1, L2, or L3 terminals will reduce peak/cont. current ratings by 30%. See installation manual for details.
- Capable of supplying drive rated peak current for 2 seconds with 10 second foldback to continuous value. Longer times are possible with lower current limits.
- $P = (\text{DC Rated Voltage}) * (\text{Cont. RMS Current}) * 0.95$.
- ADVANCED Motion Controls recommends using an external fuse in series with the shunt resistor. A 3 amp motor delay fuse is typical.
- Lower inductance is acceptable for bus voltages well below maximum. Use external inductance to meet requirements.
- Higher and lower resolution options are available. Contact Applications Engineering for more information.
- Additional cooling and/or heatsink may be required to achieve rated performance.

PIN FUNCTIONS

+24V LOGIC - Logic Power Connector			
Pin	Name	Description / Notes	I/O
1	LOGIC PWR	Logic Supply Input	I
2	LOGIC GND	Logic Supply Ground	GND

AUX ENCODER - Auxiliary Feedback Connector			
Pin	Name	Description / Notes	I/O
1	RESERVED	Reserved	-
2	RESERVED	Reserved	-
3	RESERVED	Reserved	-
4	PDI-8 + (PWM+ / AUX ENC A+ / CAP-B+)	Programmable Digital Input or PWM or Auxiliary Encoder or High Speed Capture (For Single-Ended Signals Leave Negative Terminal Open)	I
5	PDI-8 - (PWM- / AUX ENC A- / CAP-B-)	Programmable Digital Input or PWM or Auxiliary Encoder or High Speed Capture (For Single-Ended Signals Leave Negative Terminal Open)	I
6	PDI-9 + (DIR+ / AUX ENC B+ / CAP-C+)	Programmable Digital Input or Direction Input or Auxiliary Encoder or High Speed Capture (For Single-Ended Signals Leave Negative Terminal Open)	I
7	PDI-9 - (DIR- / AUX ENC B- / CAP-C-)	Programmable Digital Input or Direction Input or Auxiliary Encoder or High Speed Capture (For Single-Ended Signals Leave Negative Terminal Open)	I
8	PDI-10 +	Programmable Digital Input (For Single-Ended Signals Leave Negative Terminal Open)	I
9	PDI-10 -	Programmable Digital Input (For Single-Ended Signals Leave Negative Terminal Open)	I
10	SGN GND	Signal Ground	SGND
11	SGN GND	Signal Ground	SGND
12	SGN GND	Signal Ground	SGND
13	+5V OUT	+5V Encoder Supply Output (Short Circuit Protected)	O
14	PAI-4 +	Differential Programmable Analog Input (12-bit Resolution)	I
15	PAI-4 -	Differential Programmable Analog Input (12-bit Resolution)	I

COMM - RS232/RS485 Communication Connector			
Pin	Name	Description / Notes	I/O
1	SELECT	RS232/485 selection. Pull to ground (CN1-5) for RS485.	I
2	RS232 TX / RS485 TX-	Transmit Line (RS-232 or RS-485)	O
3	RS232 RX / RS485 RX-	Receive Line (RS-232 or RS-485)	I
4	RESERVED	Reserved	-
5	ISO GND	Isolated Signal Ground	IGND
6	RS485 TX+	Transmit Line (RS-485)	O
7	RESERVED	Reserved	-
8	RS485 RX+	Receive Line (RS-485)	I
9	RESERVED	Reserved	-

DC BUS - Power Connector			
Pin	Name	Description / Notes	I/O
1	DC-	Internal DC Bus Voltage (Can Be Used To Connect External Shunt Regulator)	I/O
2	BR	External Brake Resistor Connection	-
3	DC+	Brake Resistor DC+. Connection for brake resistor.	O
4	DC+	Internal DC Bus Voltage (Can Be Used To Connect External Shunt Regulator)	I/O

FEEDBACK - Feedback Connector			
Pin	Name	Description / Notes	I/O
1	RESERVED	Reserved	-
2	RESERVED	Reserved	-
3	RESERVED	Reserved	-
4	REF OUT +	Resolver Reference/Excitation Output	O
5	REF OUT -	Resolver Reference/Excitation Output	O
6	SIN+	Resolver Sine Input	I
7	SIN-	Resolver Sine Input	I
8	COS+	Resolver Cosine Input	I
9	COS-	Resolver Cosine Input	I
10	RESERVED	Reserved	-
11	RESERVED	Reserved	-
12	SGN GND	Signal Ground	SGND
13	+5V OUT	+5V Encoder Supply Output (Short Circuit Protected)	O
14	PAI-3	Programmable Analog Input (12-bit Resolution)	I
15	RESERVED	Reserved	-

I/O - Signal Connector

Pin	Name	Description / Notes	I/O
1	PDO-1	Isolated Programmable Digital Output	O
2	OUTPUT COMMON	Digital Output Common	OGND
3	PDO-2	Isolated Programmable Digital Output	O
4	PAI-1 + (REF+)	Differential Programmable Analog Input or Reference Signal Input (16-bit Resolution)	I
5	PAI-1 - (REF-)		I
6	PAI-2	Programmable Analog Input (12-bit Resolution)	I
7	SGN GND	Signal Ground	SGND
8	OUTPUT PULL-UP	Digital Output Pull-Up For User Outputs	I
9	PDI-5	Isolated Programmable Digital Input	I
10	PDO-3	Isolated Programmable Digital Output	O
11	PDI-1	Isolated Programmable Digital Input	I
12	PDI-2	Isolated Programmable Digital Input	I
13	PDI-3	Isolated Programmable Digital Input	I
14	PDO-4	Isolated Programmable Digital Output	O
15	INPUT COMMON	Digital Input Common (Can Be Used To Pull-Up Digital Inputs)	IGND
16	SGN GND	Signal Ground	SGND
17	PDI-4 (STEP)	Isolated Programmable Digital Input or Step	I
18	PDI-6 (DIR)	Isolated Programmable Digital Input or Direction	I
19	PDI-7 (CAP-A)	Isolated Programmable Digital Input or High Speed Capture	I
20	ENC A+ OUT	Emulated Encoder Channel A Output	O
21	ENC A- OUT		O
22	ENC B+ OUT	Emulated Encoder Channel B Output	O
23	ENC B- OUT		O
24	ENC I+ OUT	Emulated Encoder Index Output	O
25	ENC I- OUT		O
26	SGN GND	Signal Ground	SGND

MOTOR POWER - Power Connector

Pin	Name	Description / Notes	I/O
1	SHIELD	Motor cable shield. Internally connected to protective earth ground.	-
2	MOTOR C	Motor Phase C	O
3	MOTOR B	Motor Phase B	O
4	MOTOR A	Motor Phase A	O

POWER - Power Connector

Pin	Name	Description / Notes	I/O
1	L3	AC Supply Input (Three Phase)	I
2	L2		I
3	L1		I

HARDWARE SETTINGS

Switch Functions

Switch	Description	Setting	
		On	Off
1	Bit 0 of binary RS-485 drive address. Does not affect RS-232 settings.	1	0
2	Bit 1 of binary RS-485 drive address. Does not affect RS-232 settings.	1	0
3	Bit 2 of binary RS-485 drive address. Does not affect RS-232 settings.	1	0
4	Bit 3 of binary RS-485 drive address. Does not affect RS-232 settings.	1	0
5	Bit 4 of binary RS-485 drive address. Does not affect RS-232 settings.	1	0
6	Bit 5 of binary RS-485 drive address. Does not affect RS-232 settings.	1	0
7	Bit 0 of drive RS-485 baud rate setting. Does not affect RS-232 settings.	1	0
8	Bit 1 of drive RS-485 baud rate setting. Does not affect RS-232 settings.	1	0

Additional Details

The drive can be configured to use the address and/or bit rate stored in non-volatile memory by setting the address and/or bit rate value to 0. Use the table below to map actual bit rates to a bit rate setting.

Baud Rate (kbps)	Value For Bit Rate Setting
Load from non-volatile memory	0
9.6	1
38.4	2
115.2	3

MECHANICAL INFORMATION

+24V LOGIC - Logic Power Connector

Connector Information		2-port, 5.08 mm spaced, enclosed, friction lock header
Mating Connector	Details	Phoenix Contact: P/N 1757019
	Included with Drive	Yes

AUX ENCODER - Auxiliary Feedback Connector

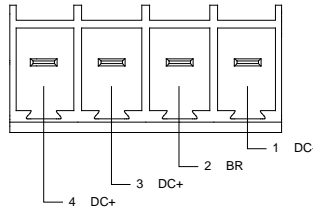
Connector Information		15-pin, high-density, male D-sub
Mating Connector	Details	TYCO: Plug P/N 1658681-1; Housing P/N 5748677-1; Terminals P/N 1658686-2 (loose) or 1658686-1 (strip)
	Included with Drive	No

COMM - RS232/RS485 Communication Connector

Connector Information		9-pin, female D-sub
Mating Connector	Details	TYCO: Plug P/N 205204-4; Housing P/N 5748677-1; Terminals P/N 1658540-5 (loose) or 1658540-4 (strip)
	Included with Drive	No

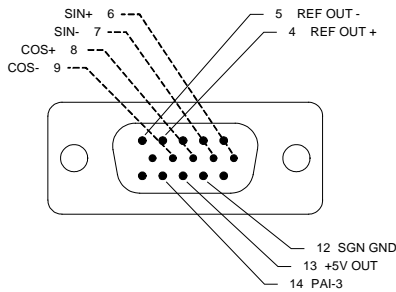
DC BUS - Power Connector

Connector Information		4-port, 7.62 mm spaced, enclosed, friction lock header
Mating Connector	Details	Phoenix Contact: P/N 1804920
	Included with Drive	Yes



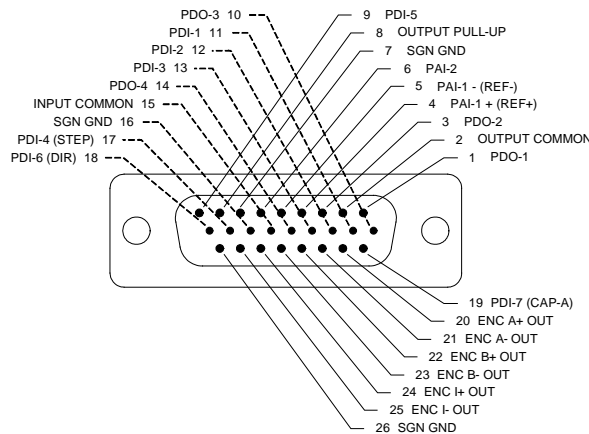
FEEDBACK - Feedback Connector

Connector Information		15-pin, high-density, female D-sub
Mating Connector	Details	TYCO: Plug P/N 748364-1; Housing P/N 5748677-1; Terminals P/N 1658670-2 (loose) or 1658670-1 (strip)
	Included with Drive	No



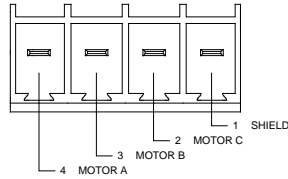
I/O - Signal Connector

Connector Information		26-pin, high-density, female D-sub
Mating Connector	Details	TYCO: Plug P/N 1658671-1; Housing P/N 5748677-2; Terminals P/N 1658670-2 (loose) or 1658670-1 (strip)
	Included with Drive	No



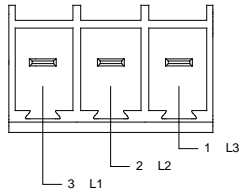
MOTOR POWER - Power Connector

Connector Information		4-port, 7.62 mm spaced, enclosed, friction lock header
Mating Connector	Details	Phoenix Contact: P/N 1804920
	Included with Drive	Yes

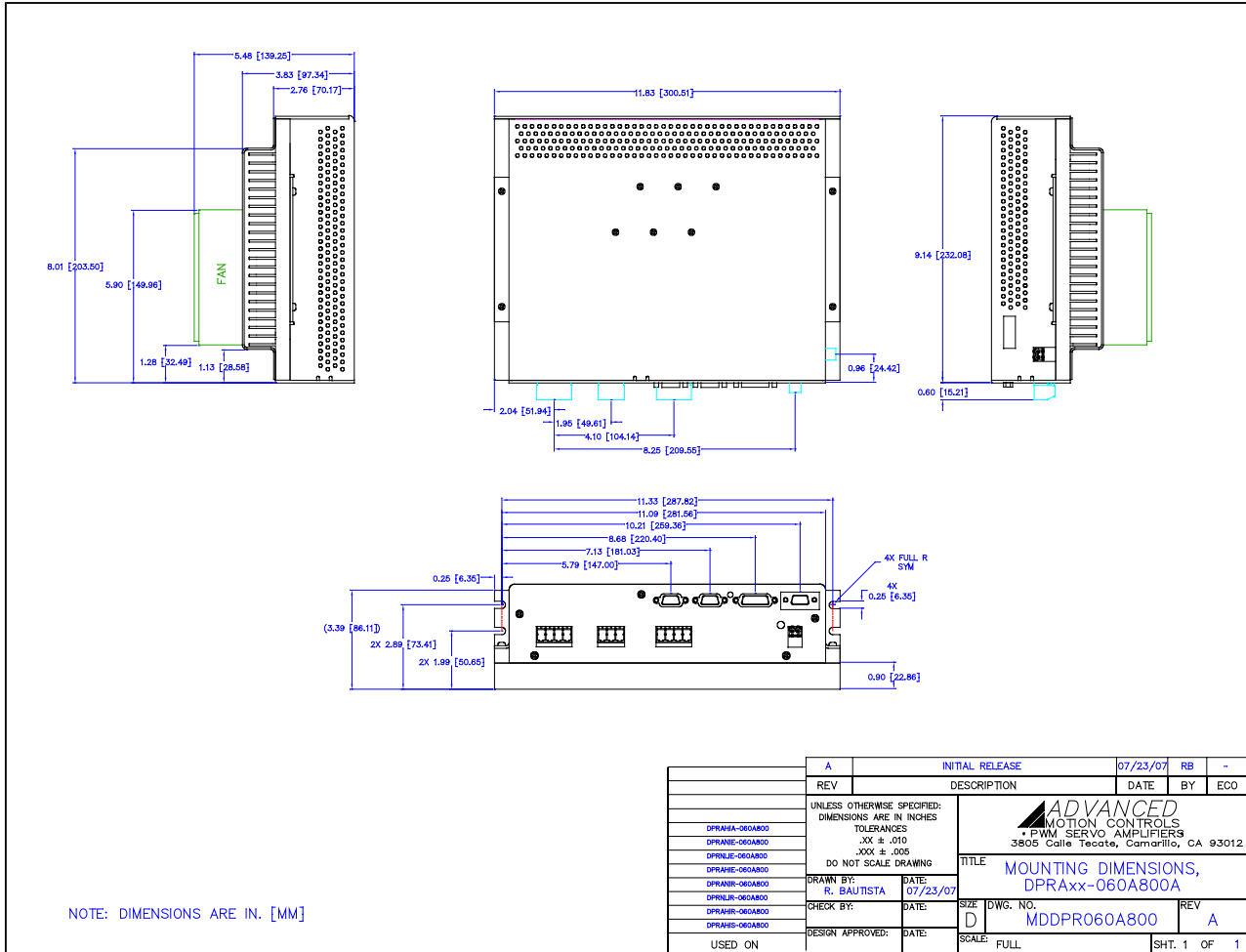


POWER - Power Connector

Connector Information		3-port, 7.62 mm spaced, enclosed, friction lock header
Mating Connector	Details	Phoenix Contact: P/N 1804917
	Included with Drive	Yes



MOUNTING DIMENSIONS



PART NUMBERING INFORMATION

Example: **D P R A H I R - 0 6 0 A 8 0 0 -**

Drive Series

DP	DigiFlex Performance
----	----------------------

Communication

R	RS232/RS485
C	CANopen or RS232
E	EtherCAT
P	Ethernet Powerlink or TCP/IP

Command Inputs

AN	Analog (±10V) No Step & Direction
AL	Analog (±10V) Low Voltage Step & Direction (5V)
AH	Analog (±10V) High Voltage Step & Direction (24V)
NL	No Analog Low Voltage Step & Direction (5V)
NN	No Analog, No Step & Direction (Communication Interface Only)

Digital I/O

I	Isolated (24V)
T	TTL (5V) Non-Isolated

Motor Feedback

E	Incremental Encoder and/or Halls
R	Resolver
A	Absolute Sin/Cos (Hiperface & Endat)
S	Sin/Cos with Halls
U	Universal (Halls, Inc. Enc., Abs. Enc., 1Vp-p Sin/Cos Enc.)

Customer Special

Code used to identify customer specials

Max DC Bus Voltage (V_{DC})

080	80
200	200
400	400
800	800

Power and Logic Supply

A	AC Input +24V _{DC} User Logic Supply Required
S	AC Input Single Phase Only +24V _{DC} User Logic Supply Required
B	DC Input Both Logic Supply Options (Internal or User)
L	DC Input Logic Supply Required

Peak Current (A₀ to Peak)

015	15
016	16
020	20
025	25
030	30
040	40
060	60
C060	60
C100	100

DigiFlex® Performance™ series of products 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. Feel free to contact Applications Engineering for further information and details.

Examples of Customized Products

- ▲ Optimized Footprint
- ▲ Private Label Software
- ▲ OEM Specified Connectors
- ▲ No Outer Case
- ▲ Increased Current Resolution
- ▲ Increased Temperature Range
- ▲ Custom Control Interface
- ▲ Integrated System I/O
- ▲ Tailored Project File
- ▲ Silkscreen Branding
- ▲ Optimized Base Plate
- ▲ Increased Current Limits
- ▲ Increased Voltage Range
- ▲ Conformal Coating
- ▲ Multi-Axis Configurations
- ▲ Reduced Profile Size and Weight

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.



→
To Motor

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Toll Free Fax (877) SERV099
www.electromate.com
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