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 command source can be generated internally or can be supplied externally. 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 CANopen interface for networking and a RS-232 interface for drive configuration and setup. Drive commissioning is accomplished using DriveWare, available at www.a-m-c.com.

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

Power Range

Power Range	
Peak Current	16 A (11.3 A$_{RMS}$)
Continuous Current	8 A (5.7 A$_{RMS}$)
Supply Voltage	20 - 80 VDC

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

MODES OF OPERATION
- Current
- Position
- Velocity

COMMAND SOURCE
- ±10 V Analog
- PWM and Direction
- Encoder Following
- Over the Network

FEEDBACK SUPPORTED
- Halls
- Incremental Encoder
- Auxiliary Incremental Encoder
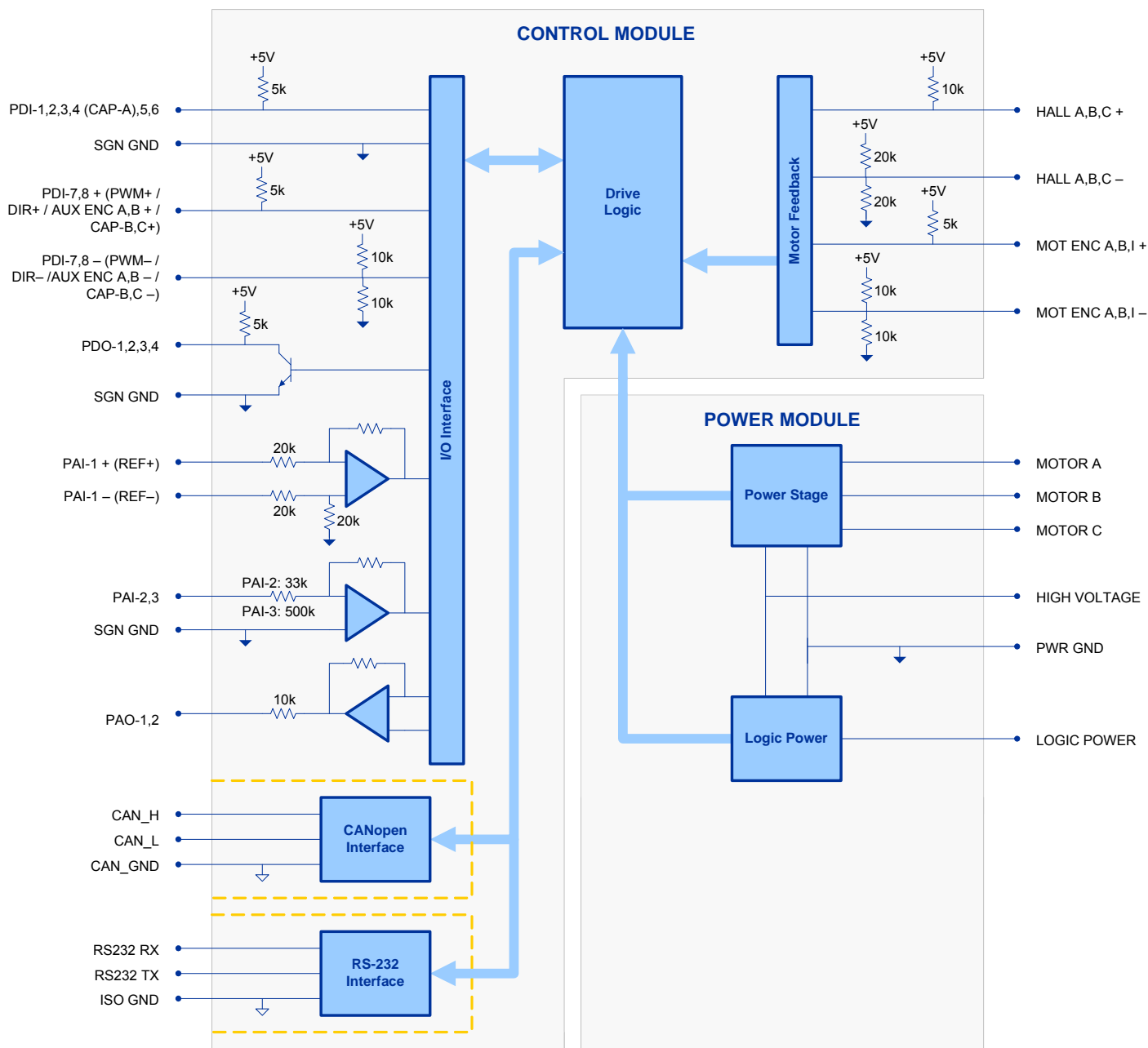- Tachometer (±10 VDC)

INPUTS/OUTPUTS
- 3 High Speed Captures
- 3 Programmable Analog Inputs (16-bit/12-bit Resolution)
- 2 Programmable Analog Outputs (10-bit Resolution)
- 2 Programmable Digital Inputs (Differential)
- 6 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

CONTROL MODULE

- PDI-1,2,3,4 (CAP-A),5,6 — +5V 5k
- SGN GND
- PDI-7,8 + (PWM+ / DIR+ / AUX ENC A,B + / CAP-B,C+) — +5V 5k
- PDI-7,8 – (PWM– / DIR– /AUX ENC A,B – / CAP-B,C –) — +5V 10k / 10k
- PDO-1,2,3,4 — +5V 5k
- SGN GND
- PAI-1 + (REF+) — 20k
- PAI-1 – (REF–) — 20k / 20k
- PAI-2,3 — PAI-2: 33k / PAI-3: 500k
- SGN GND
- PAO-1,2 — 10k

I/O Interface

Drive Logic

Motor Feedback
- HALL A,B,C + — +5V 10k
- HALL A,B,C – — +5V 20k / 20k
- MOT ENC A,B,I + — +5V 5k
- MOT ENC A,B,I – — +5V 10k / 10k

POWER MODULE

Power Stage
- MOTOR A
- MOTOR B
- MOTOR C
- HIGH VOLTAGE
- PWR GND

Logic Power
- LOGIC POWER

CANopen Interface
- CAN_H
- CAN_L
- CAN_GND

RS-232 Interface
- RS232 RX
- RS232 TX
- ISO GND

Information on Approvals and Compliances	
CE	Compliant with European CE for both the Class A EMC Directive 89/336/EEC on Electromagnetic Compatibility (specifically EN 61000-6-4:2001, EN 61000-6-2:2001, EN 61000-3-2:2000, and EN 61000-3-3:1995/A1:2001) and LVD requirements of directive 73/23/EEC (specifically EN 60204-1), a low voltage directive to protect users from electrical shock.
RoHS COMPLIANCE	RoHS (Reduction of Hazardous Substances) is intended to prevent hazardous substances such as lead from being manufactured in electrical and electronic equipment.

SPECIFICATIONS

Power Specifications		
Description	Units	Value
DC Supply Voltage Range	VDC	20 - 80
DC Bus Over Voltage Limit	VDC	89
DC Bus Under Voltage Limit	VDC	17.5
Logic Supply Voltage	VDC	20 - 80
Maximum Peak Output Current	A (Arms)	16 (11.3)
Maximum Continuous Output Current	A (Arms)	8 (5.7)
Maximum Continuous Output Power	W	608
Maximum Power Dissipation at Continuous Current	W	32
Internal Bus Capacitance	µF	66
Minimum Load Inductance (Line-To-Line)[1]	µH	250
Switching Frequency	kHz	20
Low Voltage Supply Outputs	-	+5 VDC (250 mA)

Control Specifications		
Description	Units	Value
Communication Interfaces	-	CANopen (RS-232 for configuration)
Command Sources	-	±10 V Analog, Encoder Following, Over the Network, PWM and Direction
Feedback Supported	-	Auxiliary Incremental Encoder, Halls, Incremental Encoder, Tachometer (±10 VDC)
Commutation Methods	-	Sinusoidal, Trapezoidal
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)	-	8/4
Programmable Analog Inputs/Outputs (PAIs/PAOs)	-	3/2
Primary I/O Logic Level	-	5V TTL
Current Loop Sample Time	µs	50
Velocity Loop Sample Time	µs	100
Position Loop Sample Time	µs	100
Maximum Encoder Frequency	MHz	20 (5 pre-quadrature)

Mechanical Specifications		
Description	Units	Value
Agency Approvals	-	CE Class A (EMC), CE Class A (LVD), RoHS
Size (H x W x D)	mm (in)	127 x 79.9 x 36.5 (5 x 3.1 x 1.4)
Weight	g (oz)	410 (14.5)
Heatsink (Base) Temperature Range[2]	°C (°F)	0 - 65 (32 - 149)
Storage Temperature Range	°C (°F)	-40 - 85 (-40 - 185)
Cooling System	-	Natural Convection
Form Factor	-	Panel Mount
IP Rating	-	IP10
AUX COMM Connector	-	3-pin, 2.5 mm spaced, enclosed, friction lock header
COMM Connector	-	Shielded, dual RJ-45 socket with LEDs
FEEDBACK Connector	-	15-pin, high-density, female D-sub
I/O Connector	-	26-pin, high-density, female D-sub
POWER Connector	-	6-pin, 3.96 mm spaced, friction lock header

Notes

1. Lower inductance is acceptable for bus voltages well below maximum. Use external inductance to meet requirements.
2. Additional cooling and/or heatsink may be required to achieve rated performance.

PIN FUNCTIONS

AUX COMM - RS232 Communication Connector			
Pin	**Name**	**Description / Notes**	**I/O**
1	RS232 RX	Receive Line (RS-232)	I
2	RS232 TX	Transmit Line (RS-232)	O
3	ISO GND	Isolated Signal Ground	IGND

COMM - CAN Communication Connector			
Pin	**Name**	**Description / Notes**	**I/O**
1	CAN_H	CAN_H Line (Dominant High)	I
2	CAN_L	CAN _L Line (Dominant Low)	I
3	CAN_GND	CAN Ground	CGND
4	RESERVED	Reserved	-
5	RESERVED	Reserved	-
6	RESERVED	Reserved	-
7	CAN_GND	CAN Ground	CGND
8	RESERVED	Reserved	-

FEEDBACK - Feedback Connector			
Pin	**Name**	**Description / Notes**	**I/O**
1	HALL A+	Commutation Sensor Inputs	I
2	HALL B+		I
3	HALL C+		I
4	MOT ENC A+	Differential Encoder A Channel Input (For Single Ended Signals Use Only The Positive Input)	I
5	MOT ENC A-		I
6	MOT ENC B+	Differential Encoder B Channel Input (For Single Ended Signals Use Only The Positive Input)	I
7	MOT ENC B-		I
8	MOT ENC I+	Differential Encoder Index Input (For Single Ended Signals Use Only The Positive Input)	I
9	MOT ENC I-		I
10	HALL A-	Commutation Sensor Input (For Differential Signals Only)	I
11	HALL B-	Commutation Sensor Input (For Differential Signals Only)	I
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	HALL C-	Commutation Sensor Input (For Differential Signals Only)	I

I/O - Signal Connector			
Pin	Name	Description / Notes	I/O
1	PDO-1	Programmable Digital Output	O
2	SGN GND	Signal Ground	SGND
3	PDO-2	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	PAO-1	Programmable Analog Output (10-bit Resolution)	O
8	PAO-2	Programmable Analog Output (10-bit Resolution)	O
9	PDI-8 - (DIR- / AUX ENC B- / CAP-C-)	Programmable Digital Input or Direction or Auxiliary Encoder or High Speed Capture (Leave Open for Single-Ended Signal)	I
10	PDO-3	Programmable Digital Output	O
11	PDI-1	Programmable Digital Input	I
12	PDI-2	Programmable Digital Input	I
13	PDI-3	Programmable Digital Input	I
14	PDO-4	Programmable Digital Output	O
15	+5V OUT	+5V Encoder Supply Output (Short Circuit Protected)	O
16	SGN GND	Signal Ground	SGND
17	PDI-7 + (PWM + / AUX ENC A+ / CAP-B+)	Programmable Digital Input or PWM or Auxiliary Encoder or High Speed Capture	I
18	PDI-8 + (DIR+ / AUX ENC B+ / CAP-C+)	Programmable Digital Input or Direction or Auxiliary Encoder or High Speed Capture	I
19	PDI-4 (CAP-A)	Programmable Digital Input or High Speed Capture	I
20	PDI-5	Programmable Digital Input	I
21	PDI-6	Programmable Digital Input	I
22	SGN GND	Signal Ground	SGND
23	RESERVED	Reserved	-
24	RESERVED	Reserved	-
25	RESERVED	Reserved	-
26	PDI-7 - (PWM- / AUX ENC A- / CAP-B-)	Programmable Digital Input or PWM or Auxiliary Encoder or High Speed Capture (Leave Open for Single-Ended Signals)	I

POWER - Power Connector			
Pin	Name	Description / Notes	I/O
1	MOTOR A	Motor Phase A	O
2	MOTOR B	Motor Phase B	O
3	MOTOR C	Motor Phase C	O
4	HIGH VOLTAGE	DC Power Input	I
5	PWR GND	Power Ground (Common With Signal Ground)	PGND
6	LOGIC PWR	Logic Supply Input	I

HARDWARE SETTINGS

Switch Functions

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

Bit Rate (kbits/sec)	Value For Bit Rate Setting
Load from non-volatile memory	0
500	1
250	2
125	3

Jumper Settings

Jumper	Description	Configuration		
	Header Jumper	Not Installed	Pins 1-2	Pins 2-3
J1	CAN bus termination. Install this jumper on the last drive in a CAN network. This jumper is located on a 4-pin header adjacent to the RS-232 connector. It consists of the two pins furthest from the connector.	Non-terminating Node	Terminating Node	N/A
J2	Reserved.	-	-	N/A

MECHANICAL INFORMATION

AUX COMM - RS232 Communication Connector		
Connector Information		3-pin, 2.5 mm spaced, enclosed, friction lock header
Mating Connector	Details	Phoenix: Plug P/N 1881338
	Included with Drive	Yes

```
3  ISO GND
2  RS232 TX
1  RS232 RX
```
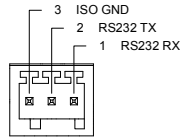
COMM - CAN Communication Connector		
Connector Information		Shielded, dual RJ-45 socket with LEDs
Mating Connector	Details	AMP: Plug P/N 5-569552-3
	Included with Drive	No

```
A                               B

CAN_GND  7            1  CAN_H
                      2  CAN_L
                      3  CAN_GND
CAN_GND  3
CAN_L    2            7  CAN_GND
CAN_H    1
```
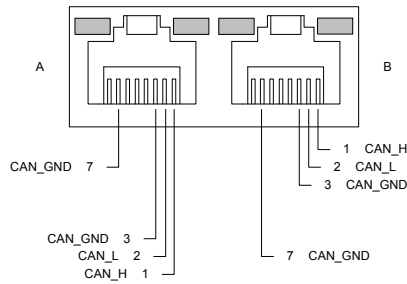
FEEDBACK - Feedback Connector		
Connector Information		15-pin, high-density, female D-sub
Mating Connector	Details	TYCO: Plug P/N 748364-1; Housing P/N 5748677-2; Terminals P/N 1658670-2 (loose) or 1658670-1 (strip)
	Included with Drive	No

```
MOT ENC B+  6          5  MOT ENC A-
MOT ENC B-  7          4  MOT ENC A+
MOT ENC I+  8          3  HALL C+
MOT ENC I-  9          2  HALL B+
HALL A-  10            1  HALL A+

                      11  HALL B-
                      12  SGN GND
                      13  +5V OUT
                      14  PAI-3
                      15  HALL C-
```
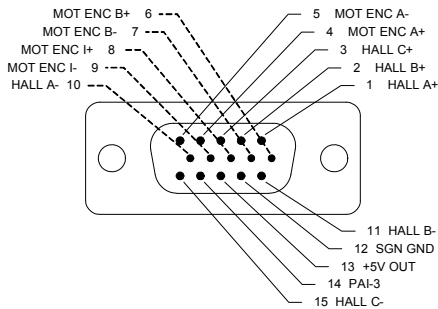
I/O - Signal Connector

Connector Information		26-pin, high-density, female D-sub
Mating Connector	Details	TYCO: Plug P/N 1658671-1; Housing P/N 5748677-3; Terminals P/N 1658670-2 (loose) or 1658670-1 (strip)
	Included with Drive	No

PDO-3 10
PDI-1 11
PDI-2 12
PDI-3 13
PDO-4 14
+5V OUT 15
SGN GND 16
PDI-7 + (PWM + / AUX ENC A+ / CAP-B+) 17
PDI-8 + (DIR+ / AUX ENC B+ / CAP-C+) 18

9 PDI-8 - (DIR- / AUX ENC B- / CAP-C-)
8 PAO-2
7 PAO-1
6 PAI-2
5 PAI-1 - (REF-)
4 PAI-1 + (REF+)
3 PDO-2
2 SGN GND
1 PDO-1

19 PDI-4 (CAP-A)
20 PDI-5
21 PDI-6
22 SGN GND

26 PDI-7 - (PWM- / AUX ENC A- / CAP-B-)
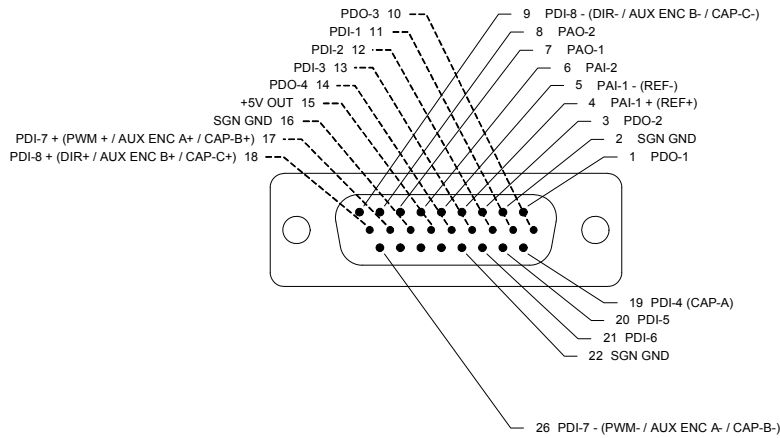
POWER - Power Connector

Connector Information		6-pin, 3.96 mm spaced, friction lock header
Mating Connector	Details	AMP: Plug P/N 770849-6; Terminals P/N 770522-1 (loose) or 770476-1 (strip)
	Included with Drive	Yes

6 LOGIC PWR
5 PWR GND
4 HIGH VOLTAGE
3 MOTOR C
2 MOTOR B
1 MOTOR A
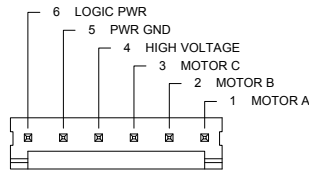
PART NUMBERING INFORMATION

Example: **D P R A N I E - 0 1 5 A 4 0 0 -**

Drive Series

DP	**Di**giFlex **P**erformance

Communication

R	**R**S232/RS485
C	**CA**Nopen or RS232
Q	Syn**q**Net

Command Inputs

AN	**A**nalog (±10V) **N**o Step & Direction
AL	**A**nalog (±10V) **L**ow Voltage Step & Direction (5V)
AH	**A**nalog (±10V) **H**igh Voltage Step & Direction (24V)
NL	**N**o Analog **L**ow Voltage Step & Direction (5V)
NN	**N**o Analog, **N**o Step & Direction (Communication Interface Only)

Digital I/O

I	**I**solated (24V)
T	**T**TL (5V) Non-Isolated

Motor Feedback

E	Incremental **E**ncoder and/or Halls
R	**R**esolver
A	**A**bsolute Sin/Cos (Hiperface & Endat)
S	**S**in/Cos with Halls

Customer Special

Code used to identify customer specials

Revision

A through Z (letters may be skipped)

Max DC Bus Voltage (V_{DC})

080	80
200	200
400	400
800	800

Power and Logic Supply

A	**A**C Input +24V_{DC} User Logic Supply Required
N	AC Input Only **N**o Logic Supply Required (Internal Supply)
B	DC Input **B**oth Logic Supply Options (Internal or User)
L	DC Input **L**ogic Supply Required
D	**D**C Input Only Internal Logic Supply

Peak Current ($A_{0 \text{ to Peak}}$)

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

DigiFlex® Performance™ series of products are available in many configurations. 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	▲ Tailored Project File
▲ Private Label Software	▲ Silkscreen Branding
▲ OEM Specified Connectors	▲ Optimized Base Plate
▲ No Outer Case	▲ Increased Current Limits
▲ Increased Current Resolution	▲ Increased Voltage Range
▲ Increased Temperature Range	▲ Conformal Coating
▲ Custom Control Interface	▲ Multi-Axis Configurations
▲ Integrated System I/O	▲ 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.

Power Supplies — **Shunt Regulators** — **Drive(s)** — **Filter Cards** → **To Motor**

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