

### 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 CANopen interface for networking and a RS-232 interface for drive configuration and setup. Drive commissioning is accomplished using DriveWare® 7, available for download at [www.a-m-c.com](http://www.a-m-c.com).

All drive and motor parameters are stored in non-volatile memory. The DPC 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 (28.3 A <sub>RMS</sub> ) |
| Continuous Current | 20 A (20 A <sub>RMS</sub> )   |
| Supply Voltage     | 20 - 80 VDC                   |



CANopen

### Features

- ▲ Follows the CAN in Automation (CiA) 301 Communications Profile and 402 Device Profile
- ▲ 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
- ▲ On-the-Fly Mode Switching
- ▲ On-the-Fly Gain Set Switching

### MODES OF OPERATION

- Profile Current
- Profile Velocity
- Profile Position
- Interpolated Position Mode (PVT)

### COMMAND SOURCE

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

### FEEDBACK SUPPORTED

- ±10 VDC Position
- Auxiliary Incremental Encoder
- EnDat® 2.1
- Hiperface®
- 1Vp-p Sine/Cosine Encoder
- Tachometer (±10 VDC)

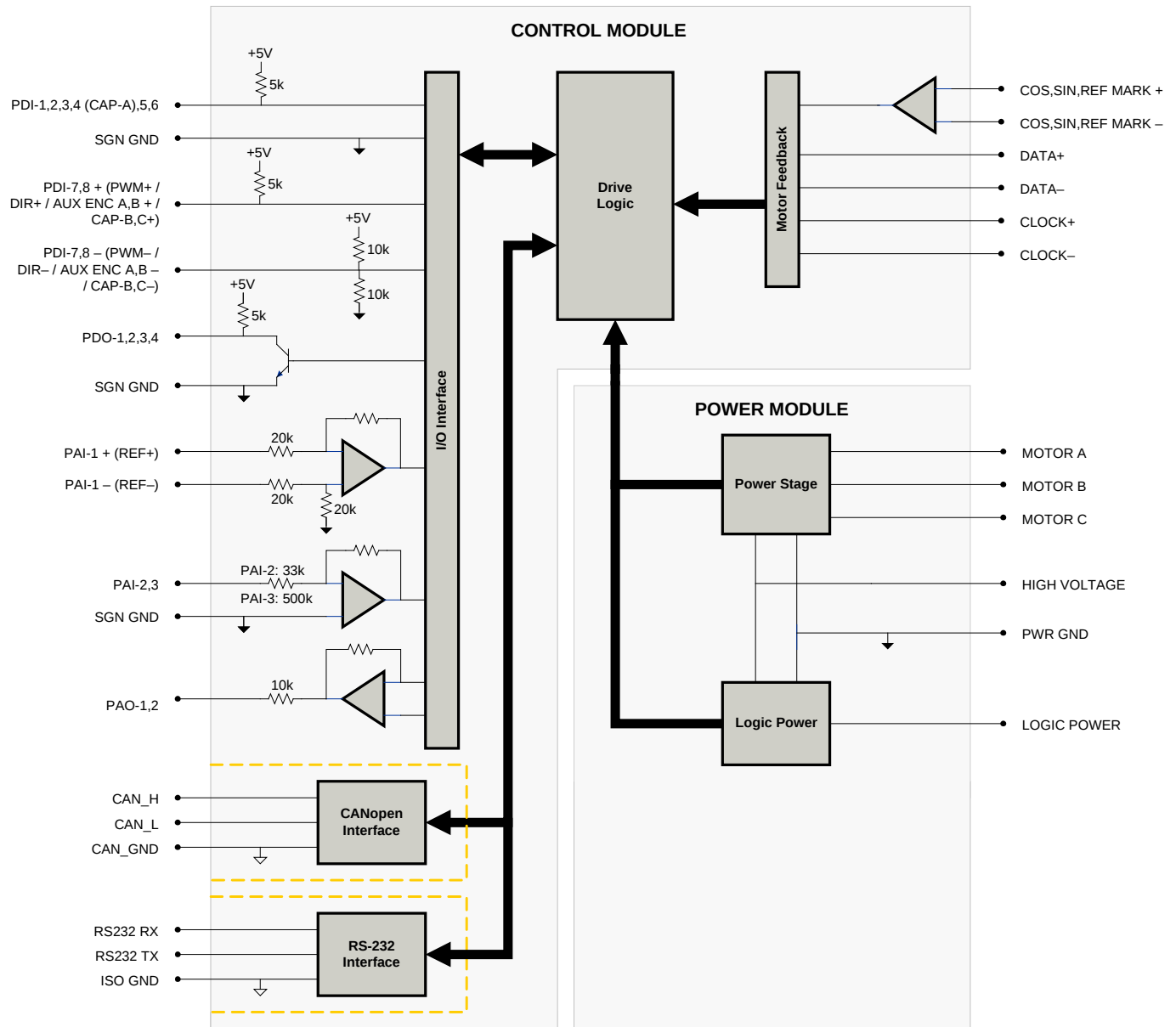
### INPUTS/OUTPUTS

- 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

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

## BLOCK DIAGRAM



### Information on Approvals and Compliances



US and Canadian safety compliance with UL 508c, the industrial standard for power conversion electronics. 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.



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).



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.

## SPECIFICATIONS

| Power Specifications                                |          |                                                                                                                                                     |
|-----------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Description                                         | Units    | Value                                                                                                                                               |
| DC Supply Voltage Range                             | VDC      | 20 - 80                                                                                                                                             |
| DC Bus Over Voltage Limit                           | VDC      | 88.7                                                                                                                                                |
| DC Bus Under Voltage Limit                          | VDC      | 17.5                                                                                                                                                |
| Logic Supply Voltage                                | VDC      | 20 - 80                                                                                                                                             |
| Maximum Peak Output Current <sup>1</sup>            | A (Arms) | 40 (28.3)                                                                                                                                           |
| Maximum Continuous Output Current <sup>2</sup>      | A (Arms) | 20 (20)                                                                                                                                             |
| Maximum Continuous Output Power                     | W        | 1520                                                                                                                                                |
| Maximum Power Dissipation at Continuous Current     | W        | 80                                                                                                                                                  |
| Internal Bus Capacitance                            | µF       | 500                                                                                                                                                 |
| Minimum Load Inductance (Line-To-Line) <sup>3</sup> | µH       | 250 (at 80 V supply); 150 (at 48 V supply); 75 (at 24 V supply)                                                                                     |
| Switching Frequency                                 | kHz      | 20                                                                                                                                                  |
| Maximum Output PWM Duty Cycle                       | %        | 100                                                                                                                                                 |
| 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, Sequencing, Indexing, Jogging                                                 |
| Feedback Supported                                  | -        | ±10 VDC Position, Auxiliary Incremental Encoder, EnDat® 2.1, Hiperface®, 1Vp-p Sine/Cosine Encoder, Tachometer (±10 VDC)                            |
| Commutation Methods                                 | -        | Sinusoidal                                                                                                                                          |
| Modes of Operation                                  | -        | Profile Current, Profile Velocity, Profile Position, Interpolated Position Mode (PVT)                                                               |
| 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 Sin/Cos Encoder Frequency                   | kHz      | 200                                                                                                                                                 |
| Maximum Sin/Cos Interpolation                       | -        | 2048 counts per sin/cos cycle                                                                                                                       |
| Mechanical Specifications                           |          |                                                                                                                                                     |
| Description                                         | Units    | Value                                                                                                                                               |
| Agency Approvals                                    | -        | CE Class A (EMC), CE Class A (LVD), cUL, RoHS II, UL                                                                                                |
| Size (H x W x D)                                    | mm (in)  | 190.5 x 111.8 x 35.9 (7.5 x 4.4 x 1.4)                                                                                                              |
| Weight                                              | g (oz)   | 872 (30.8)                                                                                                                                          |
| Heatsink (Base) Temperature Range <sup>4</sup>      | °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                                                                                                                                                |
| 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                                                                                                                  |
| MOTOR POWER Connector                               | -        | 3-port, 7.62 mm spaced, enclosed, friction lock header                                                                                              |
| POWER Connector                                     | -        | 4-port, 7.62 mm spaced, enclosed, friction lock header                                                                                              |

### Notes

- 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.
- Continuous  $A_{rms}$  value attainable when RMS Charge-Based Limiting is used.
- Lower inductance is acceptable for bus voltages well below maximum. Use external inductance to meet requirements.
- 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                             | COS +      | Cosine Input                                                                                                                                                             | I    |
| 2                             | COS -      |                                                                                                                                                                          | I    |
| 3                             | SIN +      | Sine Input                                                                                                                                                               | I    |
| 4                             | SIN -      |                                                                                                                                                                          | I    |
| 5                             | SGN GND    | Signal Ground                                                                                                                                                            | SGND |
| 6                             | DATA-      | Differential Data Line (Differential Hall A if using 1Vp-p Sine/Cosine encoder. Pin 6 = Hall A+, Pin 7 = Hall A-. For single-ended Halls leave negative terminal open.)  | I/O  |
| 7                             | DATA+      |                                                                                                                                                                          | I/O  |
| 8                             | CLOCK+     | Differential Clock Line (Differential Hall B if using 1Vp-p Sine/Cosine encoder. Pin 8 = Hall B+, Pin 9 = Hall B-. For single-ended Halls leave negative terminal open.) | O    |
| 9                             | CLOCK-     |                                                                                                                                                                          | O    |
| 10                            | REF MARK + | Reference mark from sine/cosine encoder                                                                                                                                  | I    |
| 11                            | RESERVED   | Reserved (Differential Hall C if using 1Vp-p Sine/Cosine encoder. Pin 11 = Hall C+, Pin 12 = Hall C-. For single-ended Halls leave negative terminal open.)              | -    |
| 12                            | RESERVED   |                                                                                                                                                                          | -    |
| 13                            | +5V OUT    | +5V Encoder Supply Output (Short Circuit Protected)                                                                                                                      | O    |
| 14                            | PAI-3      | Programmable Analog Input (12-bit Resolution)                                                                                                                            | I    |
| 15                            | REF MARK - | Reference mark from sine/cosine encoder                                                                                                                                  | 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    |

| MOTOR 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   |

| POWER - Power Connector |              |                                                 |      |
|-------------------------|--------------|-------------------------------------------------|------|
| Pin                     | Name         | Description / Notes                             | I/O  |
| 1                       | PWR GND      | Power Ground (Common With Signal Ground)        | PGND |
| 2                       | HIGH VOLTAGE | DC Power Input                                  | I    |
| 3                       | LOGIC GND    | Logic Supply Ground (Common With Signal Ground) | GND  |
| 4                       | 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. Note that higher bit rates are possible when using the value stored in NVM.

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

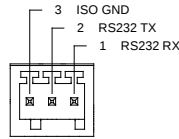
### Jumper Settings

| Jumper | Description                                                                                                                                                                                                               | Configuration |                      |                         |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------|-------------------------|
|        |                                                                                                                                                                                                                           | Header Jumper | Not Installed        | Pins 1-2<br>Pins 2-3    |
| J1     | CAN bus termination. Install this jumper (2.54mm) 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<br>N/A |
| J2     | Reserved.                                                                                                                                                                                                                 |               | -                    | -<br>N/A                |

## MECHANICAL INFORMATION

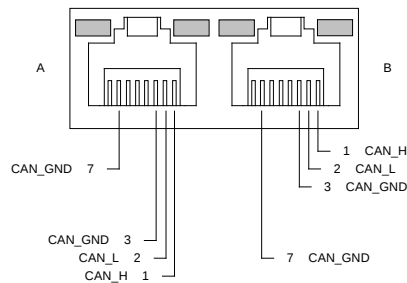
### AUX COMM - RS232 Communication Connector

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



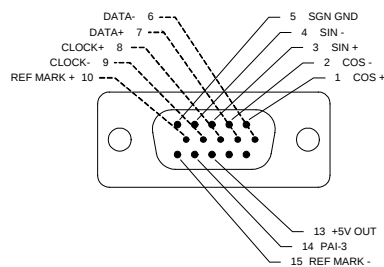
### COMM - CAN Communication Connector

|                       |                     |                                       |
|-----------------------|---------------------|---------------------------------------|
| Connector Information |                     | Shielded, dual RJ-45 socket with LEDs |
| Mating Connector      | Details             | AMP: Plug P/N 5-569552-3              |
|                       | Included with Drive | No                                    |



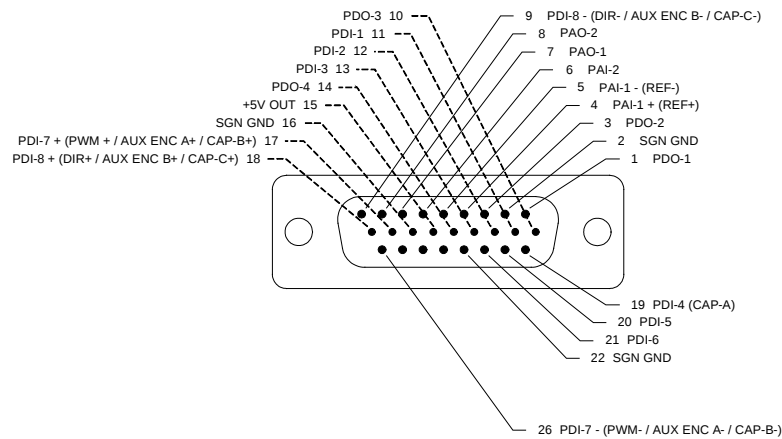
### FEEDBACK - Feedback Connector

|                       |                     |                                                                                                      |
|-----------------------|---------------------|------------------------------------------------------------------------------------------------------|
| 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                                                                                                   |



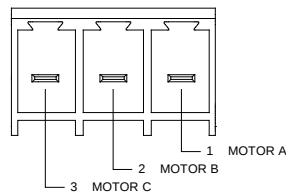
### I/O - Signal Connector

|                       |                     |                                                                                                       |
|-----------------------|---------------------|-------------------------------------------------------------------------------------------------------|
| 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                                                                                                    |



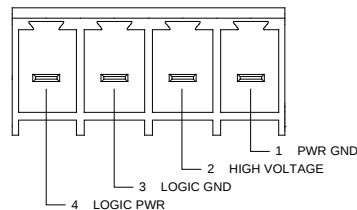
### MOTOR POWER - Power Connector

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

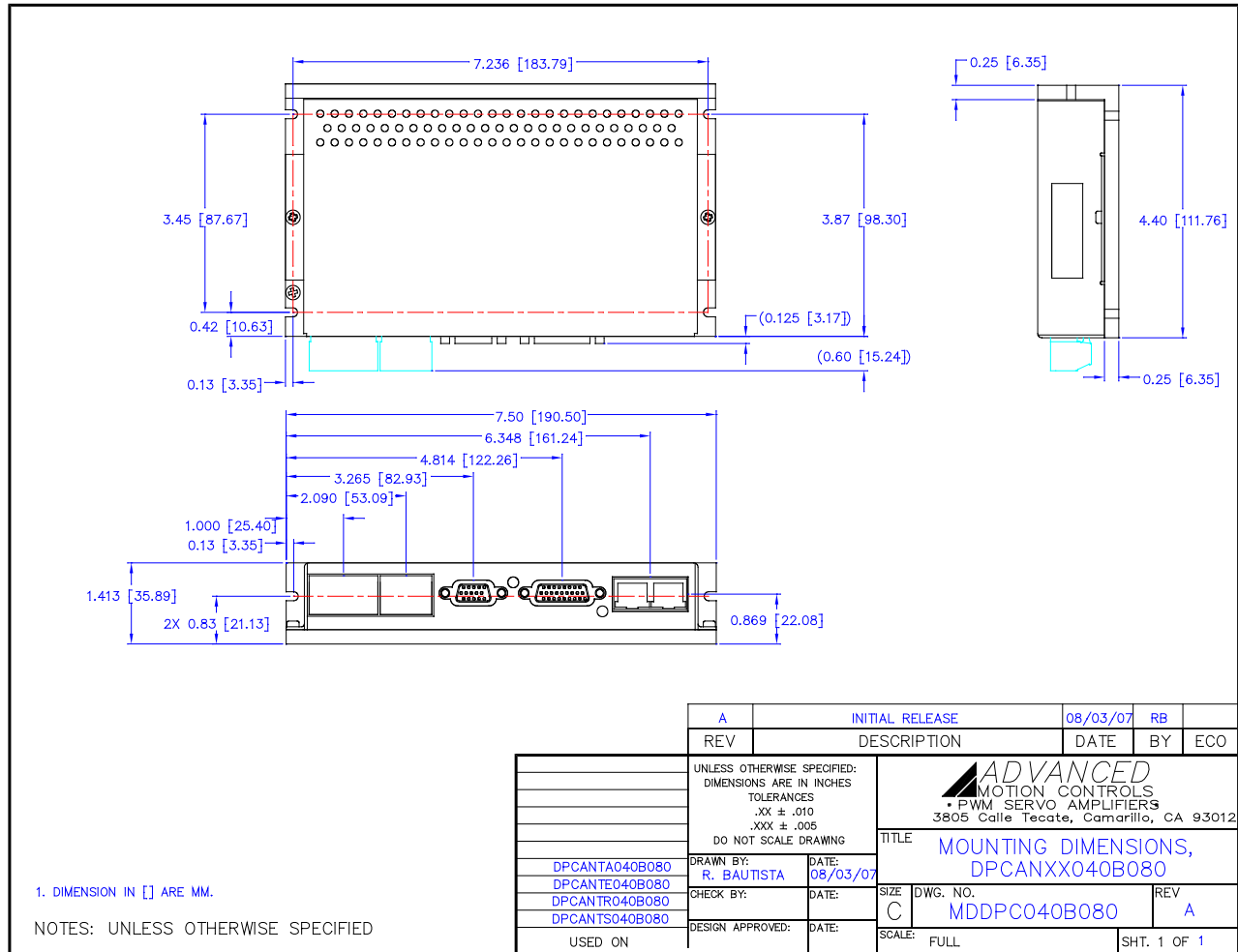


### POWER - Power Connector

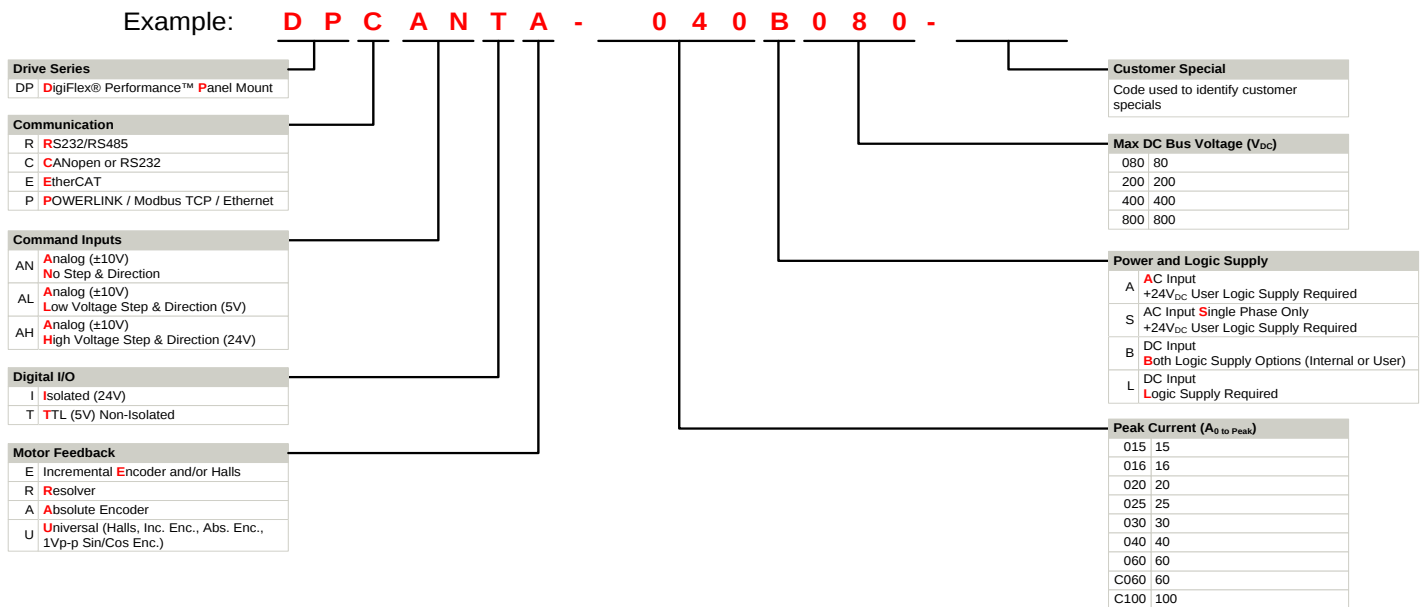
|                       |                     |                                                        |
|-----------------------|---------------------|--------------------------------------------------------|
| Connector Information |                     | 4-port, 7.62 mm spaced, enclosed, friction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



## MOUNTING DIMENSIONS



## PART NUMBERING INFORMATION



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.

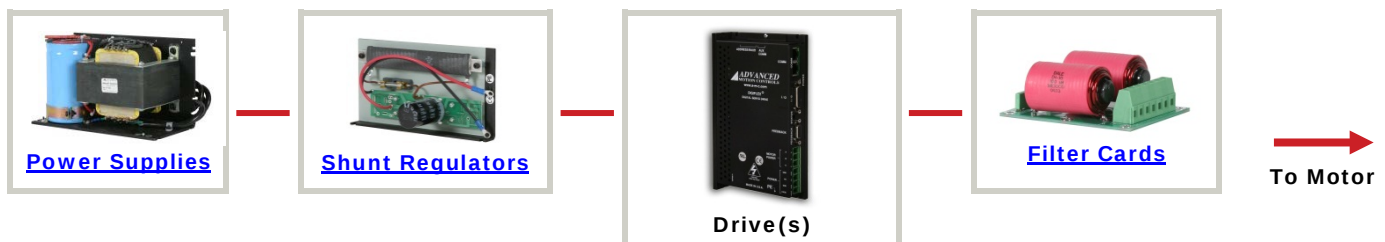
ADVANCED Motion Controls also has the capability to promptly develop and deliver specified products for OEMs with volume requests. Our Applications and Engineering Departments will work closely with your design team through all stages of development in order to provide the best servo drive solution for 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](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.