

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.

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 (30 A _{RMS}) |
| AC Supply Voltage | 200 - 240 VAC |
| DC Supply Voltage | 255 - 373 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
- ▲ Built-in brake/shunt regulator
- ▲ On-the-Fly Mode Switching
- ▲ On-the-Fly Gain Set Switching

MODES OF OPERATION

- Profile Current
- Profile Velocity
- Profile Position
- Cyclic Synchronous Current Mode
- Cyclic Synchronous Velocity Mode
- Cyclic Synchronous Position Mode

COMMAND SOURCE

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

FEEDBACK SUPPORTED

- ±10 VDC Position
- Auxiliary Incremental Encoder
- Heidenhain EnDat®
- Stegmann Hiperface®
- Tachometer (±10 VDC)

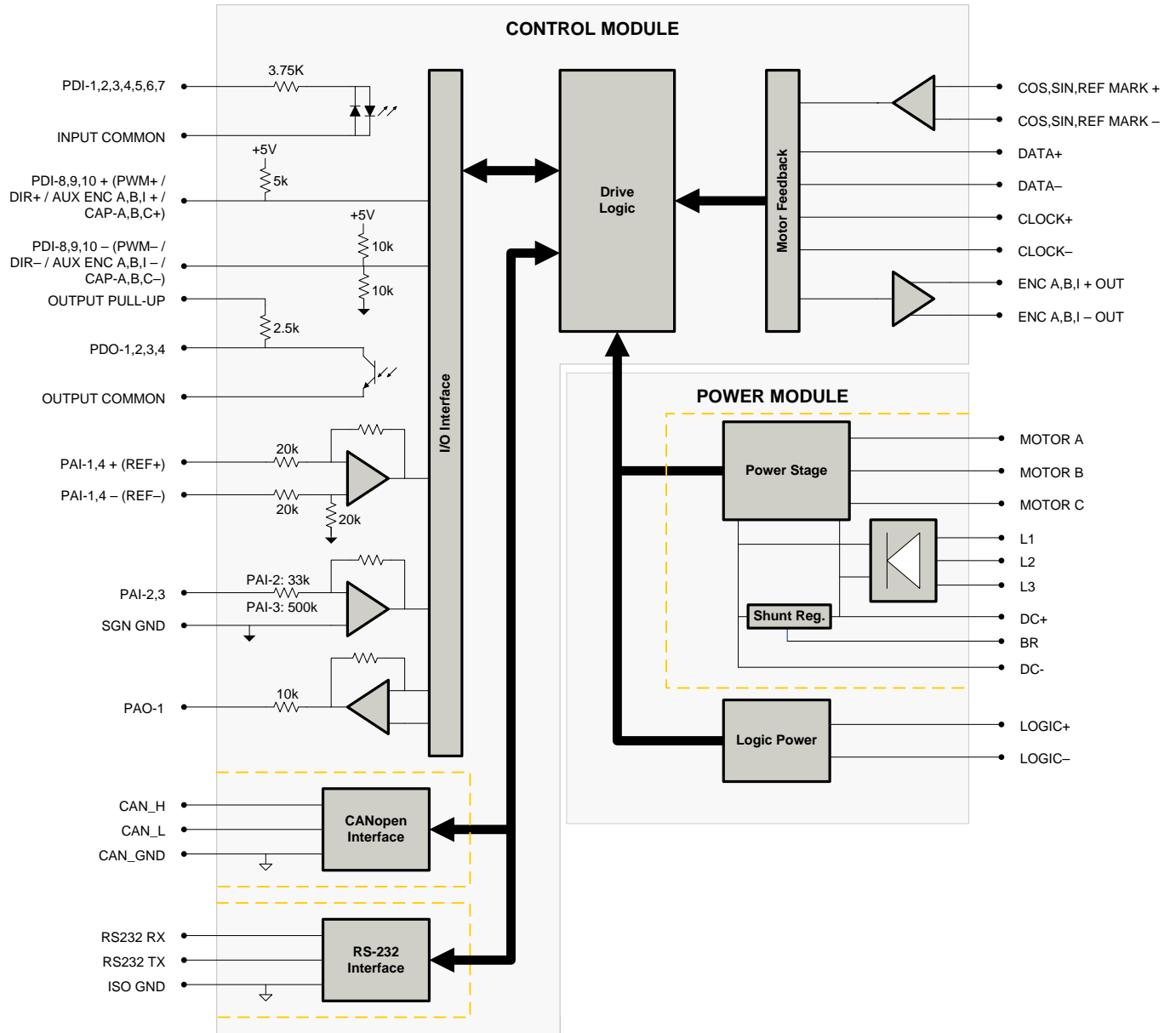
INPUTS/OUTPUTS

- 3 High Speed Captures
- 4 Programmable Analog Inputs (16-bit/12-bit Resolution)
- 1 Programmable Analog Output (10-bit Resolution)
- 3 Programmable Digital Inputs (Differential)
- 7 Programmable Digital Inputs (Single-Ended)
- 4 Programmable Digital Outputs (Single-Ended)

COMPLIANCES & AGENCY APPROVALS

- RoHS
- UL/cUL Pending
- CE Pending

BLOCK DIAGRAM



Information on Approvals and Compliances



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 |
| Rated Voltage | VAC (VDC) | 240 (339) | |
| AC Supply Voltage Range | VAC | 200 - 240 | |
| AC Supply Minimum | VAC | 180 | |
| AC Supply Maximum | VAC | 264 | |
| AC Input Phases ¹ | - | 3 | |
| AC Supply Frequency | Hz | 50 - 60 | |
| DC Supply Voltage Range ² | VDC | 255 – 373 | |
| DC Bus Over Voltage Limit | VDC | 420 | |
| DC Bus Under Voltage Limit | VDC | 205 | |
| Logic Supply Voltage | VDC | 20 - 30 (@ 850 mA) | |
| Maximum Peak Output Current ³ | A (Arms) | 60 (42.4) | |
| Maximum Continuous Output Current ⁴ | A (Arms) | 30 (30) | |
| Max. Continuous Output Power @ Rated Voltage ⁵ | W | 9662 | |
| Max. Continuous Power Dissipation @ Rated Voltage | W | 509 | |
| Internal Bus Capacitance | µF | 1120 | |
| External Shunt Resistor Minimum Resistance ⁶ | Ω | 20 | |
| Minimum Load Inductance (Line-To-Line) ⁷ | µH | 600 | |
| Switching Frequency | kHz | 14 | |
| 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, Heidenhain EnDat®, Stegmann Hiperface®, Tachometer (±10 VDC) | |
| Commutation Methods | - | Sinusoidal | |
| Modes of Operation | - | Profile Current, Profile Velocity, Profile Position, Cyclic Synchronous Current Mode, Cyclic Synchronous Velocity Mode, Cyclic Synchronous Position Mode | |
| 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) | - | 4/1 | |
| Primary I/O Logic Level | - | 24 VDC | |
| Current Loop Sample Time | µs | 71.4 | |
| Velocity Loop Sample Time | µs | 142.9 | |
| Position Loop Sample Time | µs | 142.9 | |
| Maximum Sin/Cos Encoder Frequency | kHz | 200 | |
| Maximum Sin/Cos Interpolation | - | 2048 counts per sin/cos cycle | |
| Internal Shunt Regulator | - | Yes | |
| Internal Shunt Resistor | - | No | |
| | | Mechanical Specifications | |
| Description | Units | | Value |
| Agency Approvals | - | RoHS, UL/cUL Pending, CE Pending | |
| Size (H x W x D) | mm (in) | 256.5 x 182.6 x 83.7 (10.1 x 7.2 x 3.3) | |
| Weight | g (oz) | 2812.3 (99.2) | |
| Heatsink (Base) Temperature Range ⁸ | °C (°F) | 0 - 75 (32 - 167) | |
| Storage Temperature Range | °C (°F) | -40 - 85 (-40 - 185) | |
| Form Factor | - | Panel Mount | |
| Cooling System | - | Natural Convection | |
| +24V LOGIC Connector | - | 2-port, 5.08 mm spaced, enclosed, friction lock header | |
| FAN Connector | - | 2-port, 5.08 mm spaced, enclosed, friction lock header | |
| AUX COMM Connector | - | 3-pin, 2.5 mm spaced, enclosed, friction lock header | |
| AUX ENCODER Connector | - | 15-pin, high-density, male D-sub | |
| COMM Connector | - | Shielded, dual RJ-45 socket with LEDs | |
| DC POWER Connector | - | 4-port, 10.16 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, 10.16 mm spaced, enclosed, friction lock header | |
| AC POWER Connector | - | 4-port, 10.16 mm spaced, enclosed, friction lock header | |

Notes

- Can operate on single-phase AC (208 VAC minimum) as long as output power does not exceed 3kW maximum.
- Large inrush current may occur upon initial DC supply connection to DC Bus.
- 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 I_{rms} value attainable when RMS Charge-Based Limiting is used.
- $I_{rms} = (DC \text{ Rated Voltage}) * (\text{Cont. RMS Current}) * 0.95$.
- ADVANCED Motion Controls recommends using an external fuse in series with the shunt resistor. A 5 amp motor delay fuse is typical.
- 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 |

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 + (AUX ENC I+ / CAP-A+) | Programmable Digital Input or Auxiliary Encoder or High Speed Capture (For Single-Ended Signals Leave Negative Terminal Open) | I |
| 9 | PDI-10 - (AUX ENC I- / CAP-A-) | Programmable Digital Input or Auxiliary Encoder or High Speed Capture (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 - | | I |

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 | I/O |
| 7 | DATA+ | | I/O |
| 8 | CLOCK+ | Differential Clock Line | O |
| 9 | CLOCK- | | O |
| 10 | REF MARK + | Reference mark from sine/cosine encoder | I |
| 11 | RESERVED | Reserved | - |
| 12 | RESERVED | 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 | 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 | PAO-1 | Programmable Analog Output (10-bit Resolution) | O |
| 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 | Isolated Programmable Digital Input | I |
| 18 | PDI-6 | Isolated Programmable Digital Input | I |
| 19 | PDI-7 | Isolated Programmable Digital Input | 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 |

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

| Fan Power Connector | | | |
|---------------------|---------|---------------------|-----|
| Pin | Name | Description / Notes | I/O |
| 1 | FAN GND | Fan Ground | GND |
| 2 | FAN PWR | Fan Power Input | I |

| AC Power Connector | | | |
|--------------------|---------|-------------------------------|------|
| Pin | Name | Description / Notes | I/O |
| 1 | L1 | AC Supply Input (Three Phase) | I |
| 2 | L2 | | I |
| 3 | L3 | | I |
| 4 | CHASSIS | Chassis Ground | CGND |

| DC Power Connector | | | |
|--------------------|------|--|------|
| Pin | Name | Description / Notes | I/O |
| 1 | DC- | Power Ground | PGND |
| 2 | DC+ | DC Power Input | I |
| 3 | DC+ | External Shunt Resistor Connection. Connect resistor between DC+ and BR. | - |
| 4 | BR | | - |

| Motor Power Connector | | | |
|-----------------------|---------|---------------------|------|
| Pin | Name | Description / Notes | I/O |
| 1 | CHASSIS | Chassis Ground | CGND |
| 2 | MOTOR A | Motor Phase A | O |
| 3 | MOTOR B | Motor Phase A | O |
| 4 | MOTOR C | Motor Phase B | O |

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 | | |
|--------|---|----------------------|------------------|----------|
| | | Not Installed | Pins 1-2 | 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 | 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 |

AUX ENCODER - Auxiliary Feedback Connector

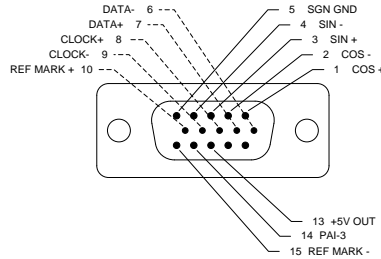
| | | |
|-----------------------|---------------------|---|
| Connector Information | | 15-pin, high-density, male D-sub |
| Mating Connector | Details | TYCO: Plug P/N 1658681-1; Housing P/N 5748677-1; Terminals P/N 1658686-2 (loose) or 1658686-1 (strip) |
| | Included with Drive | No |

COMM - 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 |

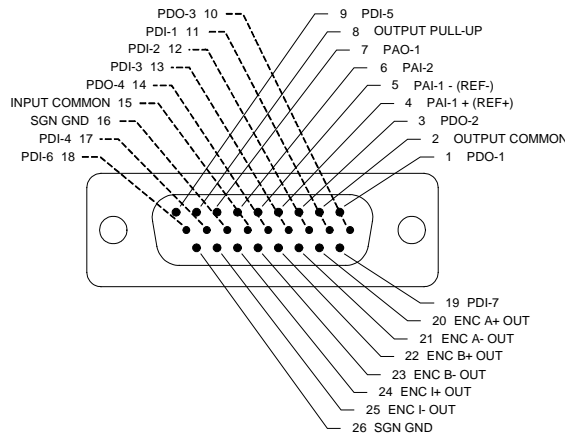
FEEDBACK - Feedback Connector

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



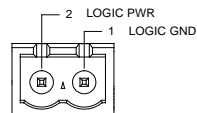
I/O - Signal Connector

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



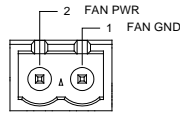
Logic Power Connector

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



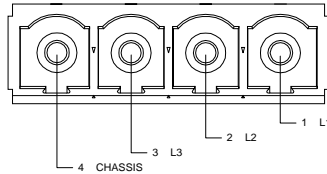
Fan Power Connector

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



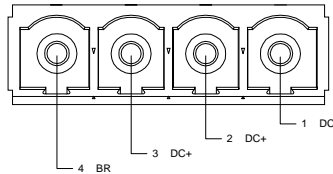
AC Power Connector

| | | |
|-----------------------|---------------------|--|
| Connector Information | | 4-pin, 10.16 mm spaced, enclosed, friction lock header |
| Mating Connector | Details | Phoenix Contact: P/N 1913523 |
| | Included with Drive | Yes |



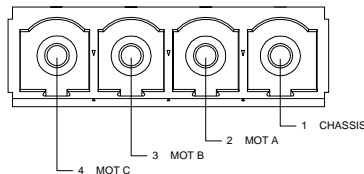
DC Power Connector

| | | |
|-----------------------|---------------------|--|
| Connector Information | | 4-pin, 10.16 mm spaced, enclosed, friction lock header |
| Mating Connector | Details | Phoenix Contact: P/N 1913523 |
| | Included with Drive | Yes |

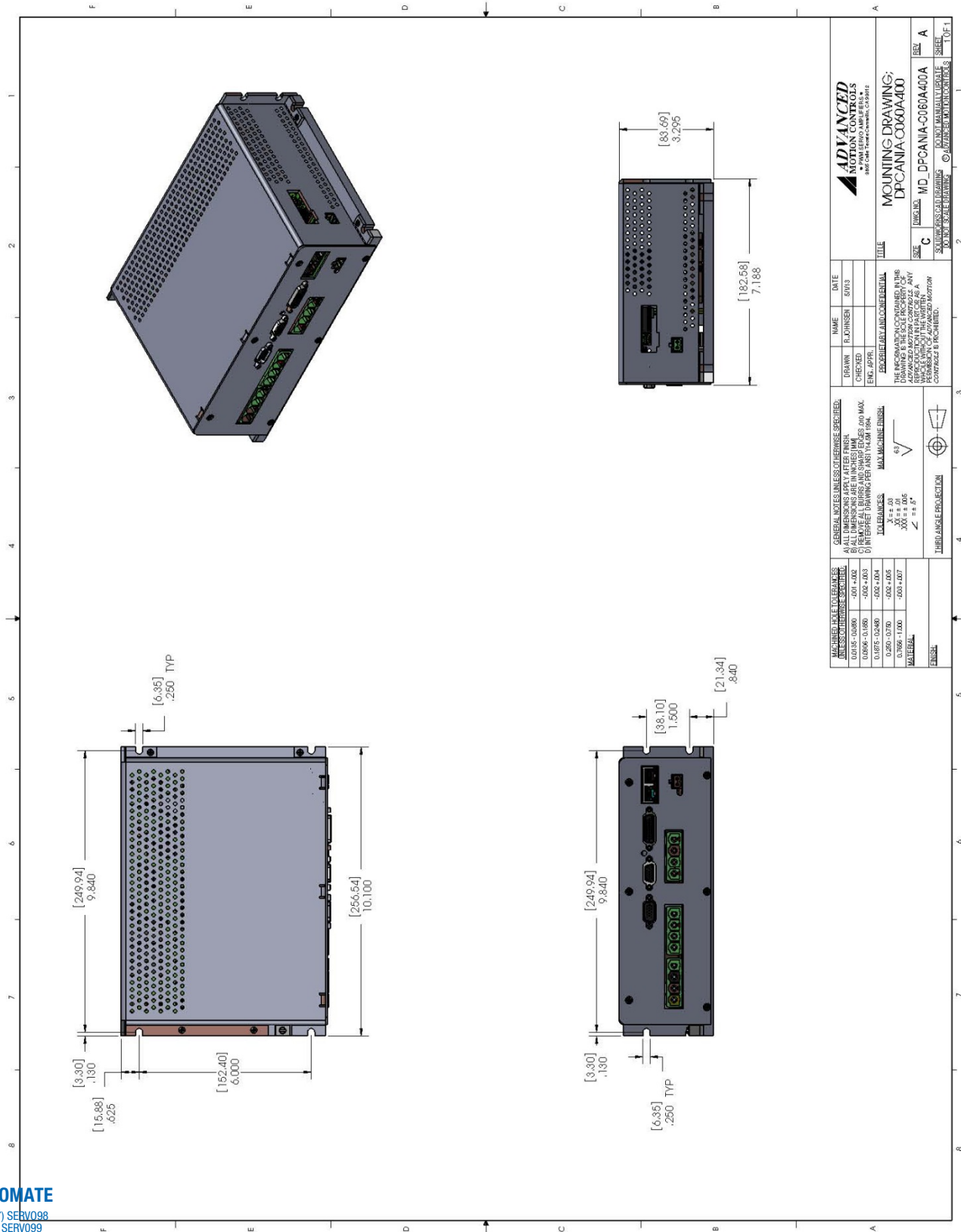


Motor Power Connector

| | | |
|-----------------------|---------------------|--|
| Connector Information | | 4-pin, 10.16 mm spaced, enclosed, friction lock header |
| Mating Connector | Details | Phoenix Contact: P/N 1913523 |
| | Included with Drive | Yes |



MOUNTING DIMENSIONS



PART NUMBERING INFORMATION

Example: **D P C A N I A - C 0 6 0 A 4 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 (HiPercase & 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