

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 | 100 A (70.7 A _{RMS}) |
| Continuous Current | 50 A (35.4 A _{RMS}) |
| Supply Voltage | 200 - 240 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

- 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
- Indexing
- Jogging

FEEDBACK SUPPORTED

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

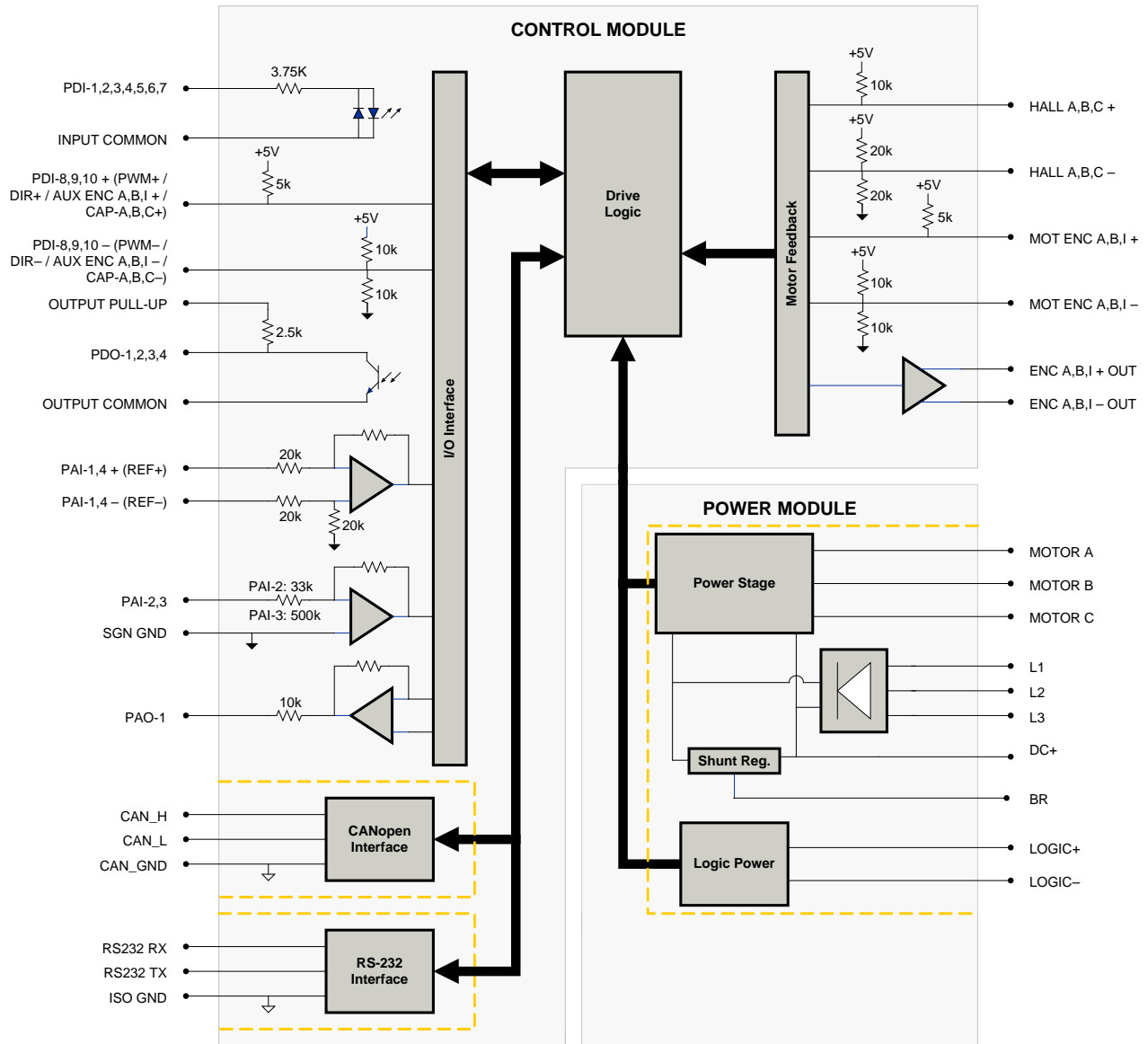
INPUTS/OUTPUTS

- 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

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

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 CE for both 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

| 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 | 429 |
| DC Bus Under Voltage Limit | VDC | 205 |
| Logic Supply Voltage | VDC | 20 - 30 (@ 850 mA) |
| Maximum Peak Output Current ³ | A (Arms) | 100 (70.7) |
| Maximum Continuous Output Current | A (Arms) | 50 (35.4) |
| Max. Continuous Output Power @ Rated Voltage ⁴ | W | 11400 |
| Max. Continuous Power Dissipation @ Rated Voltage | W | 600 |
| Internal Bus Capacitance | µF | 1500 |
| External Shunt Resistor Minimum Resistance ⁵ | Ω | 10 |
| Minimum Load Inductance (Line-To-Line) ⁶ | µH | 600 |
| Switching Frequency | kHz | 16 |
| 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, Indexing, Jogging |
| Feedback Supported | - | ±10 VDC Position, Auxiliary Incremental Encoder, Halls, Incremental Encoder, Tachometer (±10 VDC) |
| Commutation Methods | - | Sinusoidal, Trapezoidal |
| 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 | 62.5 |
| Velocity Loop Sample Time | µs | 125 |
| Position Loop Sample Time | µs | 125 |
| Maximum Encoder Frequency | MHz | 20 (5 pre-quadrature) |
| Internal Shunt Regulator | - | Yes |
| Internal Shunt Resistor | - | No |
| Mechanical Specifications | | |
| Description | Units | Value |
| Agency Approvals | - | CE Class A (EMC), CE Class A (LVD), cUL, RoHS, UL |
| Size (H x W x D) | mm (in) | 272.8 x 230.4 x 149.4 (10.7 x 9.1 x 5.9) |
| Weight | g (oz) | 5500 (194) |
| 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 | - | Forced Convection |
| IP Rating | - | IP10 |
| AUX COMM Connector | - | 3-pin, 2.5 mm spaced, enclosed, friction lock header |
| AUX ENCODER Connector | - | 15-pin, high-density, male D-sub |
| BRAKE/LOGIC Connector | - | 4-contact, 13 mm spaced, dual-barrier terminal block |
| 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 | - | 4-contact, 13 mm spaced, dual-barrier terminal block |
| POWER Connector | - | 4-contact, 13 mm spaced, dual-barrier terminal block |

Notes

- Can operate on single-phase VAC if peak/cont. current ratings are reduced by at least 30%.
- DC Supply operation will reduce peak/cont. current ratings by at least 30%.
- 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.
- 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 |

| BRAKE/LOGIC - Logic Power Connector | | | |
|--|-----------|---|-----|
| Pin | Name | Description / Notes | I/O |
| 1 | LOGIC GND | Logic Supply Ground | GND |
| 2 | LOGIC PWR | Logic Supply Input | I |
| 3 | BR | External Brake Resistor Connection | - |
| 4 | DC+ | Brake Resistor DC+ Connection for brake resistor. | O |

| 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 | 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 | Buffered Encoder Channel A Output | O |
| 21 | ENC A- OUT | | O |
| 22 | ENC B+ OUT | Buffered Encoder Channel B Output | O |
| 23 | ENC B- OUT | | O |
| 24 | ENC I+ OUT | Buffered Encoder Index Output | O |
| 25 | ENC I- OUT | | O |
| 26 | SGN GND | Signal Ground | SGND |

| MOTOR POWER - Motor Power Connector | | | |
|-------------------------------------|---------------|--|-----|
| Pin | Name | Description / Notes | I/O |
| 1 | SHIELD | Motor cable shield. Internally connected to protective earth ground. | - |
| 2 | MOTOR POWER U | Motor Phase U | O |
| 3 | MOTOR POWER V | Motor Phase V | O |
| 4 | MOTOR POWER W | Motor Phase W | O |

| POWER - AC Power Connector | | | |
|----------------------------|------|-------------------------------|-----|
| Pin | Name | Description / Notes | I/O |
| 1 | L1 | AC Supply Input (Three Phase) | I |
| 2 | L2 | | I |
| 3 | L3 | | I |
| 4 | PE | Protective Earth Ground | - |

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 |

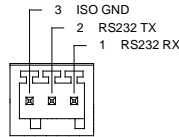
Jumper Settings

| 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

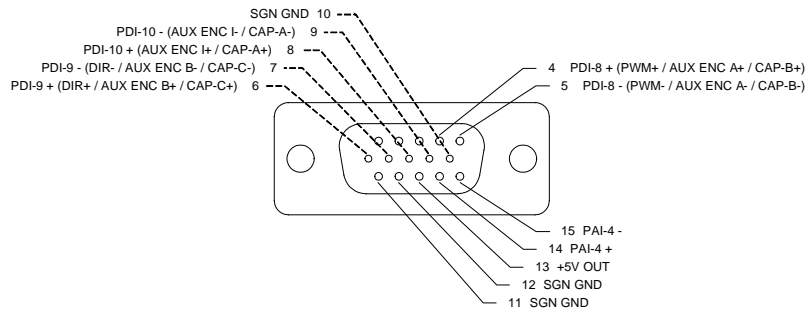
AUX COMM - RS232 Communication Connector

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



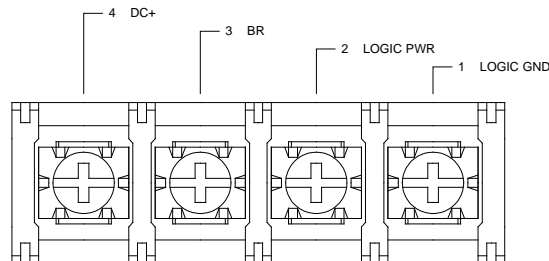
AUX ENCODER - Auxiliary Feedback Connector

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



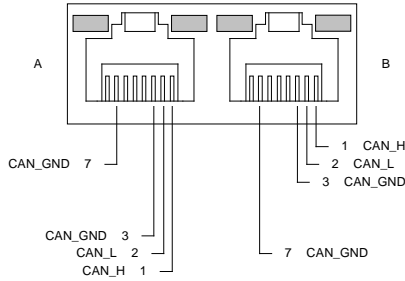
BRAKE/LOGIC - Logic Power Connector

| | | |
|-----------------------|---------------------|--|
| Connector Information | | 4-contact, 13 mm spaced, dual-barrier terminal block |
| Mating Connector | Details | Not applicable |
| | Included with Drive | Not applicable |



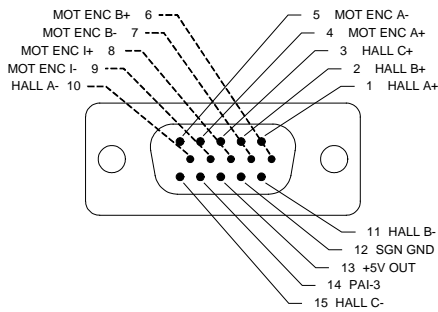
COMM - CAN Communication Connector

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



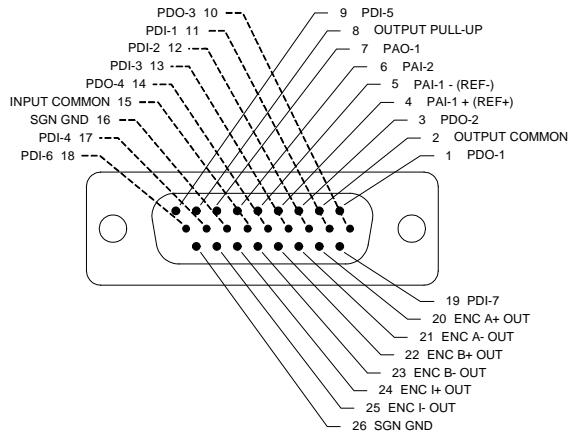
FEEDBACK - Feedback Connector

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



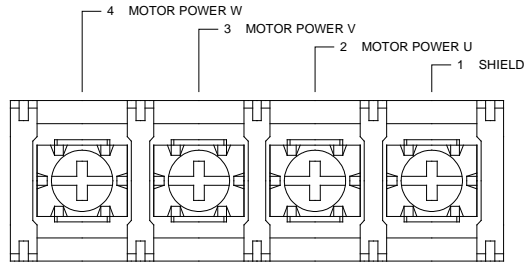
I/O - Signal Connector

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



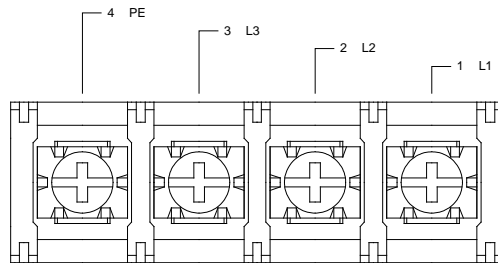
MOTOR POWER - Motor Power Connector

| | | |
|-----------------------|---------------------|--|
| Connector Information | | 4-contact, 13 mm spaced, dual-barrier terminal block |
| Mating Connector | Details | Not applicable |
| | Included with Drive | Not applicable |

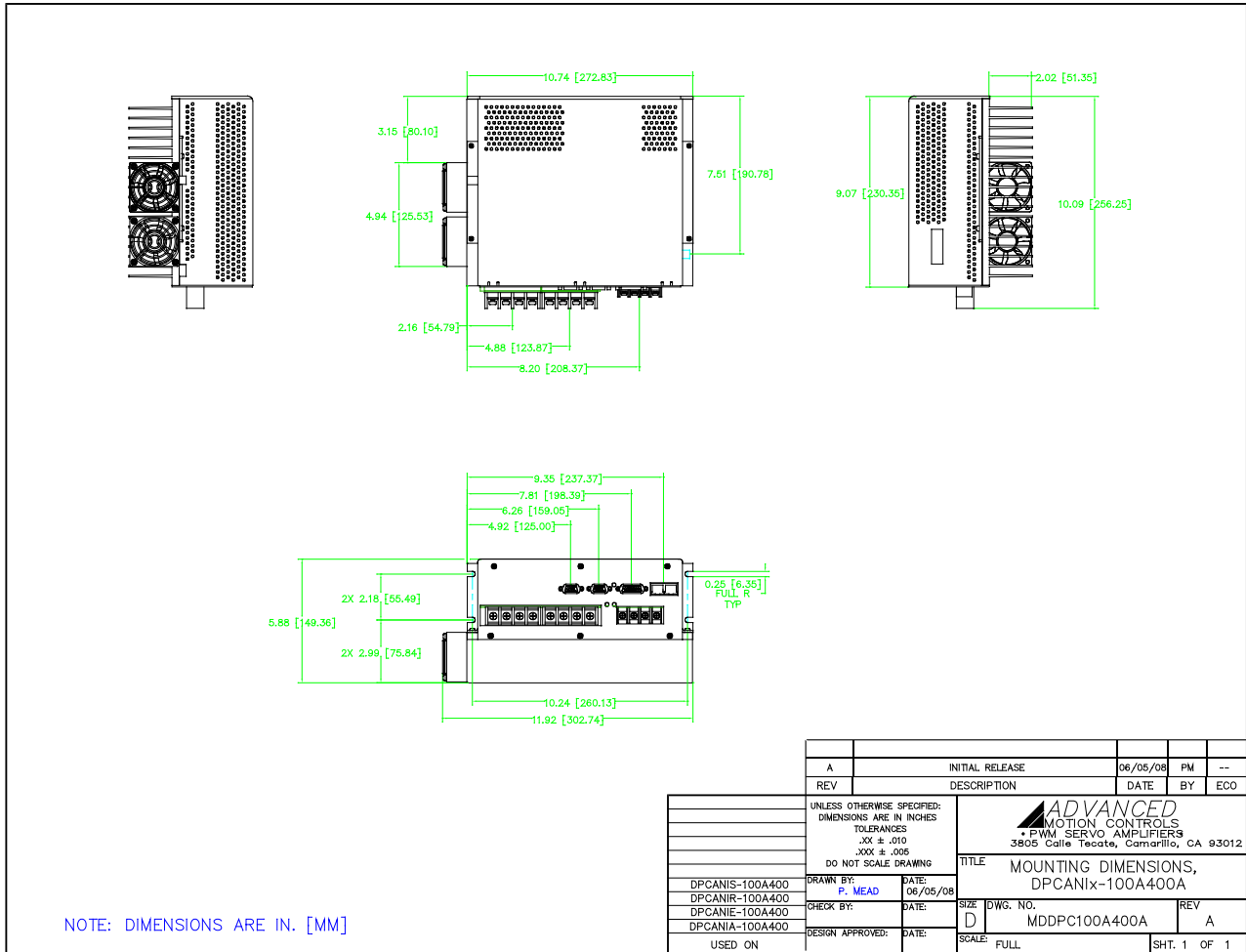


POWER - AC Power Connector

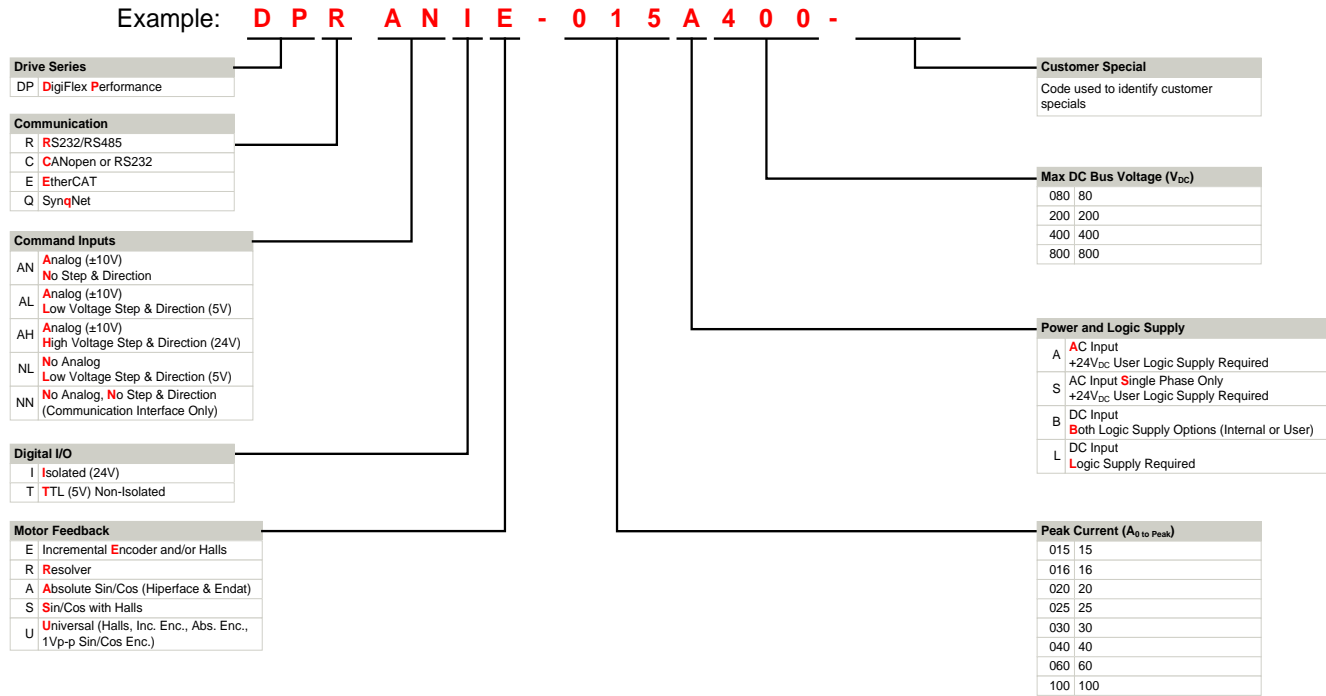
| | | |
|-----------------------|---------------------|--|
| Connector Information | | 4-contact, 13 mm spaced, dual-barrier terminal block |
| Mating Connector | Details | Not applicable |
| | Included with Drive | Not applicable |



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