

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

| | |
|--------------------|-------------------------------|
| Peak Current | 60 A (42.4 A _{RMS}) |
| Continuous Current | 30 A (21.2 A _{RMS}) |
| Supply Voltage | 40 - 270 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

MODES OF OPERATION

- Current
- Position
- Velocity

COMMAND SOURCE

- ±10 V Analog
- 5V Step & Direction
- Communication Interface

FEEDBACK SUPPORTED

- Halls
- Incremental Encoder
- ±10 V Analog
- Auxiliary Incremental Encoder

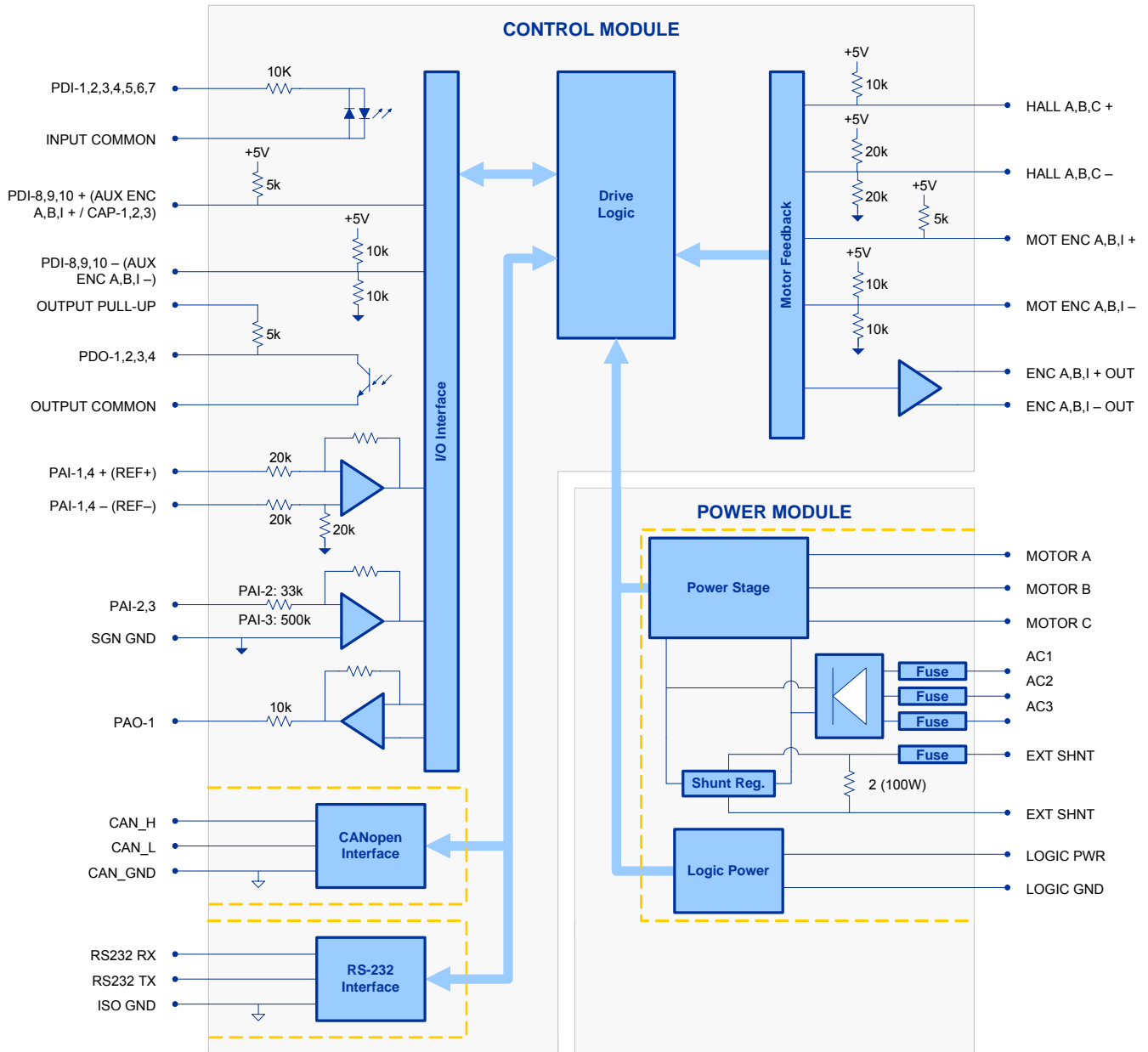
INPUTS/OUTPUTS

- 3 High Speed Captures
- 4 Programmable Analog Inputs
- 1 Programmable Analog Output
- 3 Programmable Digital Inputs (Differential)
- 7 Programmable Digital Inputs (Single-Ended)
- 4 Programmable Digital Outputs




COMPLIANCES & AGENCY APPROVALS

- RoHS
- UL/cUL Pending
- CE Pending

BLOCK DIAGRAM



Approvals and Compliances

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

SPECIFICATIONS

| Power Stage Specifications | | |
|---|---------|---|
| Description | Units | Value |
| AC Supply Voltage | VAC | 40 - 270 |
| DC Supply Voltage | VDC | 0 - 400 |
| Over Voltage Limit | VDC | 439 |
| Under Voltage Limit | VDC | 55 |
| Logic Supply Voltage | VDC | 20 - 30 |
| Peak Output Current | A | 60 |
| Maximum Continuous Output Current | A | 30 |
| Maximum Continuous Output Power | W | 12000 |
| Maximum Power Dissipation at Continuous Current | W | 600 |
| Internal Bus Capacitance | µF | 1650 |
| Internal Braking Resistor | - | Yes |
| Minimum Load Inductance (Line-To-Line) ¹ | µH | 600 |
| Switching Frequency | kHz | 20 |
| Control Specifications | | |
| Description | Units | Value |
| Communication Interfaces | - | CANopen (ISO 11898-2), RS-232 |
| Command Sources | - | ±10 V Analog, 5V Step & Direction, Communication Interface |
| Feedback Supported | - | ±10 V Analog, Auxiliary Incremental Encoder, Halls, Incremental Encoder |
| Commutation Methods | - | Sinusoidal, Trapezoidal |
| Modes of Operation | - | Current, Position, Velocity |
| Motors Supported | - | Brushed, Brushless, Induction, Voice Coil |
| 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 |
| Current Loop Sample Time | µs | 50 |
| Velocity Loop Sample Time | µs | 100 |
| Position Loop Sample Time | µs | 100 |
| Max Encoder Line Frequency ² | MHz | 4 |
| Mechanical Specifications | | |
| Description | Units | Value |
| Size (H x W x L) | mm (in) | 234.7 x 161.8 x 151.3 (9.2 x 6.4 x 6) |
| Heatsink (Base) Temperature Range ³ | °C (°F) | 0 - 65 (32 - 149) |
| Storage Temperature Range | °C (°F) | -40 - 85 (-40 - 185) |
| Cooling System | - | Natural Convection |
| Form Factor | - | Stand Alone |
| IP Rating | - | IP10 |
| +24V LOGIC Connector | - | 2-port, 5.08 mm spaced, enclosed, friction lock header with threaded flange |
| 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 BUS / BRAKE RESISTOR Connector | - | 5-contact, 13 mm spaced, dual-barrier terminal block |
| FEEDBACK Connector | - | 15-pin, high-density, female D-sub |
| I/O Connector | - | 26-pin, high-density, female D-sub |
| MOTOR POWER / DC BUS Connector | - | 5-contact, 13 mm spaced, dual-barrier terminal block |
| POWER Connector | - | 5-contact, 13 mm spaced, dual-barrier terminal block |

Notes

1. Low inductance motors, such as 'pancake' and 'basket-wound', require external inductors. The Minimum Load Inductance provided assumes the highest allowed bus voltage. Lower inductances are acceptable for lower bus voltages.
2. Pre-quadrature frequency.
3. Additional cooling and/or heatsink may be required to achieve rated performance.

PIN FUNCTIONS

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

| 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 + (AUX ENC A+ / CAP-2) | Programmable Digital Input or Auxiliary Encoder or High Speed Capture | I |
| 5 | PDI-8 - (AUX ENC A-) | Programmable Digital Input or Auxiliary Encoder (For Differential Signals Only) | I |
| 6 | PDI-9 + (AUX ENC B+ / CAP-2) | Programmable Digital Input or Auxiliary Encoder or High Speed Capture | I |
| 7 | PDI-9 - (AUX ENC B-) | Programmable Digital Input or Auxiliary Encoder (For Differential Signals Only) | I |
| 8 | PDI-10 + (AUX ENC I+ / CAP-1) | Programmable Digital Input or Auxiliary Encoder or High Speed Capture | I |
| 9 | PDI-10 - (AUX ENC I-) | Programmable Digital Input or Auxiliary Encoder (For Differential Signals Only) | 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 | 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 | - |

| DC BUS / BRAKE RESISTOR - Power Connector | | | |
|--|--------------|------------------------------------|------|
| Pin | Name | Description / Notes | I/O |
| 1 | HIGH VOLTAGE | DC Bus Output | O |
| 2 | PWR GND | DC Bus Ground | PGND |
| 3 | EXT SHNT | External Shunt Resistor | O |
| 4 | EXT SHNT | External Shunt Resistor | O |
| 5 | INT SHNT JMP | Jumper For Internal Shunt Resistor | - |

| 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 | Differential Encoder A Channel Input (For Single Ended Signals Use Only The Positive Input) | 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 | 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 | I |
| 5 | PAI-1 - (REF-) | | I |
| 6 | PAI-2 | Programmable Analog Input | I |
| 7 | PAO-1 | Programmable Analog Output | O |
| 8 | OUTPUT PULL-UP | Digital Output Pull-Up | 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 / DC BUS - 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 | PWR GND | DC Bus Ground | PGND |
| 5 | HIGH VOLTAGE | DC Bus Output | O |

| POWER - Power Connector | | | |
|-------------------------|------|---|-----|
| Pin | Name | Description / Notes | I/O |
| 1 | AC1 | AC Supply Input (Single Or Three Phase) | I |
| 2 | AC2 | | I |
| 3 | AC3 | | I |

| | | | |
|---|----------|-------------|----|
| 4 | CASE GND | Case Ground | PE |
| 5 | RESERVED | Reserved | - |

HARDWARE SETTINGS

Switch Functions

| Switch | Description | Setting | |
|--------|--|---------|-----|
| | | On | Off |
| 1 | Bit 0 of binary value of drive address/ID. | 1 | 0 |
| 2 | Bit 1 of binary value of drive address/ID. | 1 | 0 |
| 3 | Bit 2 of binary value of drive address/ID. | 1 | 0 |
| 4 | Bit 3 of binary value of drive address/ID. | 1 | 0 |
| 5 | Bit 4 of binary value of drive address/ID. | 1 | 0 |
| 6 | Bit 5 of binary value of drive address/ID. | 1 | 0 |
| 7 | Bit 0 of binary value of drive bit rate setting. | 1 | 0 |
| 8 | Bit 1 of binary value of drive bit rate setting. | 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 |
|-------------------------------|-------------------------------|----------------------------|
| CANopen | RS-485 | |
| Load from non-volatile memory | Load from non-volatile memory | 0 |
| 500 | 9.6 | 1 |
| 250 | 38.4 | 2 |
| 125 | 115.2 | 3 |

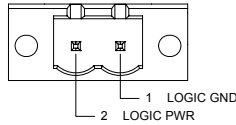
Jumper Settings

| Jumper | Description | Configuration | | |
|--------|--|----------------------|------------------|----------|
| | | Not Installed | Pins 1-2 | Pins 2-3 |
| J1 | Reserved. | - | - | N/A |
| J2 | CAN bus termination. Install this jumper on the last drive in a CAN network. | Non-terminating Node | Terminating Node | N/A |

MECHANICAL INFORMATION

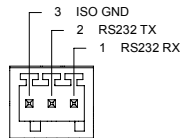
+24V LOGIC - Logic Power Connector

| | |
|-----------------------|---|
| Connector Information | 2-port, 5.08 mm spaced, enclosed, friction lock header with threaded flange |
| Mating Connector | Phoenix Contact: P/N 1777808 |



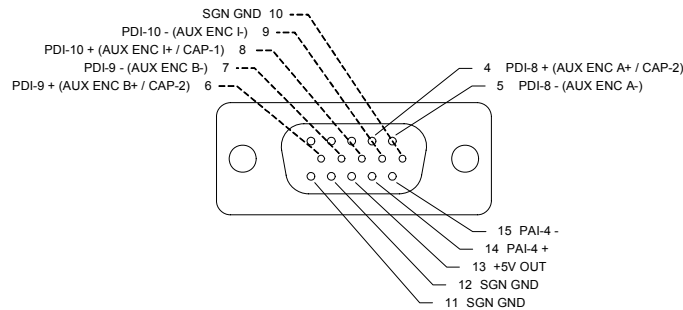
AUX COMM - RS232 Communication Connector

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



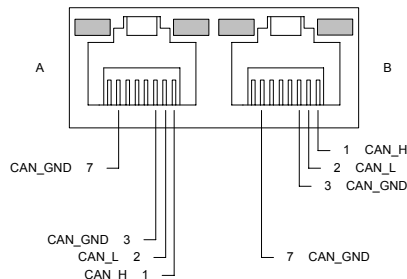
AUX ENCODER - Auxiliary Feedback Connector

| | |
|-----------------------|--|
| Connector Information | 15-pin, high-density, male D-sub |
| Mating Connector | AMP: Plug P/N 748365-1; Housing P/N 748677-1; Terminals P/N 748610-4 (loose) or 748610-2 (strip) |



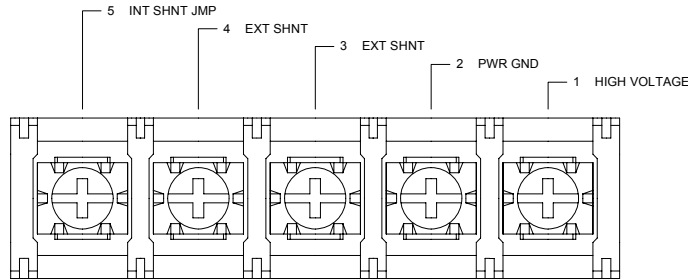
COMM - CAN Communication Connector

| | |
|-----------------------|---------------------------------------|
| Connector Information | Shielded, dual RJ-45 socket with LEDs |
| Mating Connector | AMP: Plug P/N 5-569552-3 |



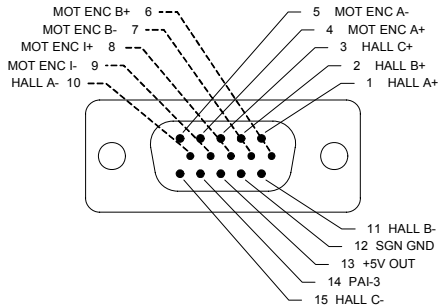
DC BUS / BRAKE RESISTOR - Power Connector

| | |
|-----------------------|--|
| Connector Information | 5-contact, 13 mm spaced, dual-barrier terminal block |
| Mating Connector | Not applicable. |



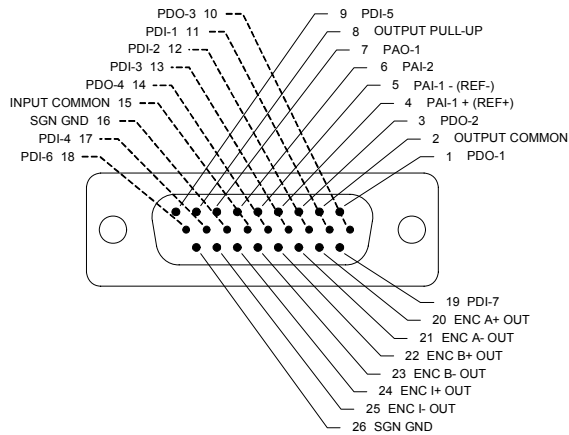
FEEDBACK - Feedback Connector

| | |
|-----------------------|--|
| Connector Information | 15-pin, high-density, female D-sub |
| Mating Connector | AMP: Plug P/N 748365-1; Housing P/N 748677-1; Terminals P/N 748333-4 (loose) or 748333-2 (strip) |



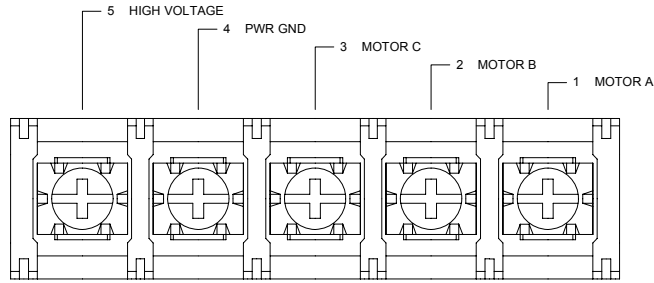
I/O - Signal Connector

| | |
|-----------------------|--|
| Connector Information | 26-pin, high-density, female D-sub |
| Mating Connector | AMP: Plug P/N 748365-1; Housing P/N 748677-2; Terminals P/N 748333-4 (loose) or 748333-2 (strip) |



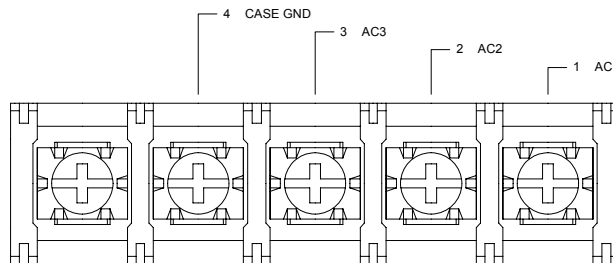
MOTOR POWER / DC BUS - Power Connector

| | |
|-----------------------|--|
| Connector Information | 5-contact, 13 mm spaced, dual-barrier terminal block |
| Mating Connector | Not applicable. |



POWER - Power Connector

| | |
|-----------------------|--|
| Connector Information | 5-contact, 13 mm spaced, dual-barrier terminal block |
| Mating Connector | Not applicable. |



PART NUMBERING INFORMATION

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

| Drive Series | |
|--------------|----------------------|
| DP | DigiFlex Performance |

| Communication | |
|---------------|------------------|
| R | RS232/RS485 |
| C | CANopen or RS232 |
| Q | SynqNet |

| Command Inputs | |
|----------------|--|
| AN | Analog ($\pm 10V$) No Step & Direction |
| AL | Analog ($\pm 10V$) Low Voltage Step & Direction (5V) |
| AH | Analog ($\pm 10V$) High Voltage Step & Direction (24V) |
| NL | No Analog Low Voltage Step & Direction (5V) |
| NN | No Analog, No Step & Direction (Communication Interface Only) |

| Digital I/O | |
|-------------|-----------------------|
| I | Isolated (24V) |
| T | TTL (5V) Non-Isolated |

| Motor Feedback | |
|----------------|--------------------------------------|
| E | Incremental Encoder and/or Halls |
| R | Resolver |
| A | Absolute Sin/Cos (Hiperface & Endat) |
| S | Sin/Cos with Halls |

| 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 |
| N | AC Input Only No Logic Supply Required (Internal Supply) |
| B | DC Input Both Logic Supply Options (Internal or User) |
| L | DC Input Logic Supply Required |
| D | DC Input Only Internal Logic Supply |

| Peak Current (A _{0 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 on the website are readily available, standard product offerings. Other combinations or possibilities can be made available for OEMs with volume requests of 100 or more. Contact Applications Engineering for further information and details.

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