

### 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 an EtherCAT® interface for network communication using CANopen over EtherCAT (CoE), and a USB port 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 DPE Series Hardware Installation Manual is available for download at [www.a-m-c.com](http://www.a-m-c.com).

### Power Range

|                    |                               |
|--------------------|-------------------------------|
| Peak Current       | 60 A (42.4 A <sub>RMS</sub> ) |
| Continuous Current | 30 A (30 A <sub>RMS</sub> )   |
| AC Supply Voltage  | 200 - 240 VAC                 |
| DC Supply Voltage  | 255 - 373 VDC                 |



EtherCAT®

### Features

- ▲ CoE – Based on DSP-402 Device Profile for Drives and Motion Control
- ▲ Synchronization using Distributed Clocks
- ▲ Position Cycle Times down to 100µs
- ▲ 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
- ▲ Dedicated Safe Torque Off (STO) Inputs

### 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
- Encoder Following
- Over the Network
- Sequencing
- Indexing
- Jogging

### FEEDBACK SUPPORTED (FIRMWARE DEPENDENT)

- Halls
- Incremental Encoder
- Absolute Encoder (EnDat® 2.1/2.2, Hiperface®, or BiSS C-Mode)
- 1Vp-p Sine/Cosine Encoder
- Auxiliary Incremental Encoder
- Tachometer (±10 VDC)

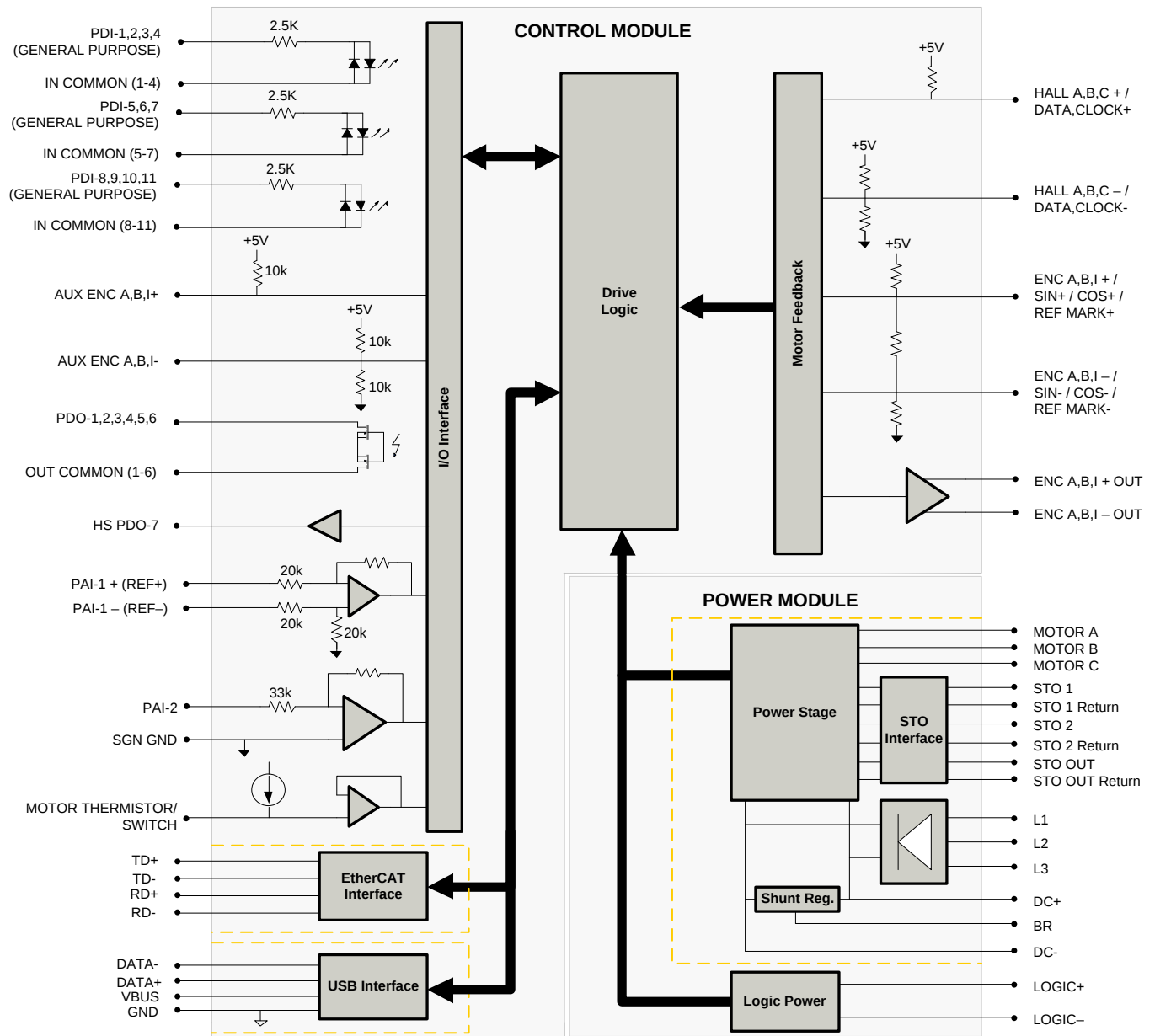
### INPUTS/OUTPUTS

- 1 Motor Thermistor/Switch Input
- 11 General Purpose Programmable Digital Inputs
- 1 High Speed Programmable Digital Output
- 6 General Purpose Programmable Digital Outputs
- 2 Programmable Analog Inputs

### COMPLIANCES & AGENCY APPROVALS

- UL
- cUL
- RoHS II
- TÜV Rheinland® (STO)
- CE Pending

# 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.



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.



Functional Safety STO is TÜV Rheinland® certified and meets requirements of the following standards:

- EN ISO 13849-1 Category 4 / PL e
- EN IEC 61800-5-2 STO (SIL 3)
- EN62061 SIL CL3
- IEC 61508 SIL 3

## 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 <sup>1</sup>                            | -                     | 3                                                                                                                                                                         |
| AC Supply Frequency                                     | Hz                    | 50 – 60                                                                                                                                                                   |
| DC Supply Voltage Range <sup>2</sup>                    | 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)                                                                                                                                                        |
| Safe Torque Off Voltage                                 | VDC                   | 24 (±6)                                                                                                                                                                   |
| Maximum Peak Output Current <sup>3</sup>                | A (A <sub>RMS</sub> ) | 60 (42.4)                                                                                                                                                                 |
| Maximum Continuous Output Current <sup>4</sup>          | A (A <sub>RMS</sub> ) | 30 (30)                                                                                                                                                                   |
| Maximum Continuous Power @ Rated Voltage <sup>5</sup>   | W                     | 9662                                                                                                                                                                      |
| Maximum Continuous Power Dissipation @ Rated Voltage    | W                     | 509                                                                                                                                                                       |
| Internal Bus Capacitance                                | µF                    | 1120                                                                                                                                                                      |
| External Shunt Resistor Minimum Resistance <sup>6</sup> | Ω                     | 20                                                                                                                                                                        |
| Minimum Load Inductance (Line-To-Line) <sup>7</sup>     | 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 <sup>8</sup>                   | -                     | EtherCAT® (USB for Configuration)                                                                                                                                         |
| Command Sources                                         | -                     | ±10 V Analog, Encoder Following, Over the Network, Sequencing, Indexing, Jogging                                                                                          |
| Feedback Supported                                      | -                     | Halls, Incremental Encoder, Absolute Encoder (EnDat® 2.1/2.2, Hiperface®, or BiSS C-Mode), 1Vp-p Sine/Cosine Encoder, Auxiliary Incremental Encoder, Tachometer (±10 VDC) |
| Commutation Methods                                     | -                     | Sinusoidal, Trapezoidal                                                                                                                                                   |
| Modes of Operation                                      | -                     | Profile Current, Profile Velocity, Profile Position, Cyclic Synchronous Current, Cyclic Synchronous Velocity, Cyclic Synchronous Position                                 |
| 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)         | -                     | 11/7                                                                                                                                                                      |
| Programmable Analog Inputs/Outputs (PAIs/PAOs)          | -                     | 2/0                                                                                                                                                                       |
| 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 II, UL/cUL, TÜV Rheinland® (STO), 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 <sup>9</sup>          | °C (°F)               | 0 - 75 (32 - 167)                                                                                                                                                         |
| Storage Temperature Range                               | °C (°F)               | -40 - 85 (-40 - 185)                                                                                                                                                      |
| Cooling System                                          | -                     | Natural Convection                                                                                                                                                        |
| Form Factor                                             | -                     | Panel Mount                                                                                                                                                               |
| AUX. COMM Connector                                     | -                     | 5-pin, Mini USB B Type port                                                                                                                                               |
| COMM Connector                                          | -                     | Shielded, dual RJ-45 socket with LEDs                                                                                                                                     |
| FEEDBACK Connector                                      | -                     | 15-pin, high-density, female D-sub                                                                                                                                        |
| AUX. ENCODER Connector                                  | -                     | 15-pin, high-density, male D-sub                                                                                                                                          |
| I/O Connector                                           | -                     | 26-pin, high-density, female D-sub                                                                                                                                        |
| +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                                                                                                                    |
| 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                                                                                                                   |
| DC POWER Connector                                      | -                     | 4-port, 10.16 mm spaced, enclosed, friction lock header                                                                                                                   |
| STO Connector                                           | -                     | 8-port, 2.0 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 A<sub>rms</sub> value attainable when RMS Charge-Based Limiting is used.
- P = (DC Rated Voltage) \* (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.
- Lower inductance is acceptable for bus voltages well below maximum. Use external inductance to meet requirements.
- EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
- Additional cooling and/or heatsink may be required to achieve rated performance.

## PIN FUNCTIONS

| COMM – EtherCAT Communication Connector |          |                            |     |
|-----------------------------------------|----------|----------------------------|-----|
| Pin                                     | Name     | Description / Notes        | I/O |
| 1                                       | RD+      | Receiver + (100Base-TX)    | I   |
| 2                                       | RD-      | Receiver - (100Base-TX)    | I   |
| 3                                       | TD+      | Transmitter + (100Base-TX) | O   |
| 4                                       | RESERVED | -                          | -   |
| 5                                       | RESERVED | -                          | -   |
| 6                                       | TD-      | Transmitter - (100Base-TX) | O   |
| 7                                       | RESERVED | -                          | -   |
| 8                                       | RESERVED | -                          | -   |
| 9                                       | RESERVED | -                          | -   |

| I/O – Signal Connector |            |                                                                                                      |      |
|------------------------|------------|------------------------------------------------------------------------------------------------------|------|
| Pin                    | Name       | Description / Notes                                                                                  | I/O  |
| 1                      | PDO-1      | General Purpose Programmable Digital Output (120 mA maximum)                                         | O    |
| 2                      | PDO-2      | General Purpose Programmable Digital Output (120 mA maximum)                                         | O    |
| 3                      | PDO-3      | General Purpose Programmable Digital Output (120 mA maximum)                                         | O    |
| 4                      | OUT COMMON | Digital Output Common (1-6)                                                                          | OCOM |
| 5                      | GROUND     | Ground                                                                                               | GND  |
| 6                      | PDO-4      | General Purpose Programmable Digital Output (120 mA maximum)                                         | O    |
| 7                      | PDO-5      | General Purpose Programmable Digital Output (120 mA maximum)                                         | O    |
| 8                      | HS PDO-7   | High Speed Programmable Digital Output                                                               | O    |
| 9                      | PDO-6      | General Purpose Programmable Digital Output (120 mA maximum)                                         | O    |
| 10                     | PDI-1      | General Purpose Programmable Digital Input                                                           | I    |
| 11                     | PDI-2      | General Purpose Programmable Digital Input                                                           | I    |
| 12                     | PDI-3      | General Purpose Programmable Digital Input                                                           | I    |
| 13                     | PDI-4      | General Purpose Programmable Digital Input                                                           | I    |
| 14                     | IN COMMON  | Digital Input Common (1-4)                                                                           | ICOM |
| 15                     | IN COMMON  | Digital Input Common (5-7)                                                                           | ICOM |
| 16                     | PDI-5      | General Purpose Programmable Digital Input                                                           | I    |
| 17                     | PDI-6      | General Purpose Programmable Digital Input                                                           | I    |
| 18                     | PDI-7      | General Purpose Programmable Digital Input                                                           | I    |
| 19                     | PDI-8      | General Purpose Programmable Digital Input                                                           | I    |
| 20                     | PDI-9      | General Purpose Programmable Digital Input                                                           | I    |
| 21                     | PDI-10     | General Purpose Programmable Digital Input                                                           | I    |
| 22                     | PDI-11     | General Purpose Programmable Digital Input                                                           | I    |
| 23                     | IN COMMON  | Digital Input Common (8-11)                                                                          | ICOM |
| 24                     | PAI-1+     | General Purpose Differential Programmable Analog Input or Reference Signal Input (16-bit Resolution) | I    |
| 25                     | PAI-1-     |                                                                                                      | I    |
| 26                     | GROUND     | Ground                                                                                               | GND  |

| FEEDBACK – Feedback Connector * |                     |                  |                       |                                                                                              |      |
|---------------------------------|---------------------|------------------|-----------------------|----------------------------------------------------------------------------------------------|------|
| Pin                             | Incremental Encoder | Absolute Encoder | 1Vp-p Sin/Cos Encoder | Description / Notes                                                                          | I/O  |
| 1                               | HALL A+             | DATA-            | HALL A+               | Differential Hall A+ / Differential Data Line (BiSS: SLO-)                                   | I    |
| 2                               | HALL B+             | CLOCK+           | HALL B+               | Differential Hall B+ / Differential Clock Line (BiSS: MA+)                                   | I    |
| 3                               | HALL C+             | N/C              | HALL C+               | Differential Hall C+                                                                         | I    |
| 4                               | ENC A+              | SIN +            | SIN +                 | Differential Encoder A / Differential Sine Input (Leave open for BiSS and EnDat 2.2)         | I    |
| 5                               | ENC A-              | SIN -            | SIN -                 |                                                                                              | I    |
| 6                               | ENC B+              | COS +            | COS +                 | Differential Encoder B / Differential Cosine Input (Leave open for BiSS and EnDat 2.2)       | I    |
| 7                               | ENC B-              | COS -            | COS -                 |                                                                                              | I    |
| 8                               | ENC I+              | REF MARK+        | REF MARK +            | Differential Encoder Index / Differential Reference Mark (Leave open for BiSS and EnDat 2.2) | I    |
| 9                               | ENC I-              | REF MARK-        | REF MARK -            |                                                                                              | I    |
| 10                              | HALL A-             | DATA+            | HALL A-               | Differential Hall A- / Differential Data Line (BiSS: SLO+)                                   | I    |
| 11                              | HALL B-             | CLOCK-           | HALL B-               | Differential Hall B- / Differential Clock Line (BiSS: MA-)                                   | I    |
| 12                              | SGND                | SGND             | SGND                  | 5V Return (Signal Ground)                                                                    | SGND |
| 13                              | +5V OUT             | +5V OUT          | +5V OUT               | +5V Encoder Supply Output. Short-circuit protected. (250mA)                                  | O    |
| 14                              | THERMISTOR          | THERMISTOR       | THERMISTOR            | Motor Thermal Protection                                                                     | I    |
| 15                              | HALL C-             | N/C              | HALL C-               | Differential Hall C-                                                                         | I    |

\*Note: Feedback supported (Incremental Encoder, Absolute Sin/Cos Encoder, or 1Vp-p Sin/Cos Encoder) will be dependent on firmware.

| AUX. ENCODER – Auxiliary Encoder Connector |                       |                                                                                      |      |
|--------------------------------------------|-----------------------|--------------------------------------------------------------------------------------|------|
| Pin                                        | Name                  | Description / Notes                                                                  | I/O  |
| 1                                          | ENC A+ OUT / RESERVED | Buffered Encoder Channel A Output* or Reserved.                                      | O    |
| 2                                          | ENC A- OUT / RESERVED |                                                                                      | O    |
| 3                                          | ENC B+ OUT / RESERVED | Buffered Encoder Channel B Output* or Reserved.                                      | O    |
| 4                                          | AUX ENC A+            |                                                                                      | I    |
| 5                                          | AUX ENC A-            | Auxiliary Encoder Input (For single ended signal leave negative terminal open)       | I    |
| 6                                          | AUX ENC B+            |                                                                                      | I    |
| 7                                          | AUX ENC B-            | Auxiliary Encoder Input (For single ended signal leave negative terminal open)       | I    |
| 8                                          | AUX ENC I+            |                                                                                      | I    |
| 9                                          | AUX ENC I-            | Auxiliary Encoder Index Input (For single ended signal leave negative terminal open) | I    |
| 10                                         | ENC B- OUT / RESERVED |                                                                                      | O    |
| 11                                         | ENC I+ OUT / RESERVED | Buffered Encoder Index Output* or Reserved.                                          | O    |
| 12                                         | SGND                  |                                                                                      | SGND |
| 13                                         | +5V OUT               | +5 VDC User Supply                                                                   | O    |
| 14                                         | PAI-2                 | Programmable Analog Input (12-bit Resolution)                                        | I    |
| 15                                         | ENC I- OUT / RESERVED | Buffered Encoder Index Output* or Reserved.                                          | O    |

\*Buffered encoder output only available with incremental encoder or 1Vp-p sin/cos encoder feedbacks. 1:1 input-to-output ratio, 5V square wave output. Reserved pins for all other feedbacks.

| AUX. COMM - USB Communication Connector |          |                     |      |
|-----------------------------------------|----------|---------------------|------|
| Pin                                     | Name     | Description / Notes | I/O  |
| 1                                       | VBUS     | Supply Voltage      | O    |
| 2                                       | DATA -   | Data -              | I/O  |
| 3                                       | DATA +   | Data +              | I/O  |
| 4                                       | RESERVED | -                   | -    |
| 5                                       | USB GND  | USB Ground          | UGND |

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

| 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    |

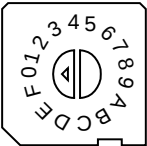
| AC Power Connector |         |                                                                                                                  |      |
|--------------------|---------|------------------------------------------------------------------------------------------------------------------|------|
| Pin                | Name    | Description / Notes                                                                                              | I/O  |
| 1                  | L1      | AC Supply Input (Three Phase). External 20 A time delay fuses are recommended in series with the AC input lines. | 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   |                                                                          | -    |

| STO – Safe Torque Off Connector |                |                               |         |
|---------------------------------|----------------|-------------------------------|---------|
| Pin                             | Name           | Description / Notes           | I/O     |
| 1                               | STO OUTPUT     | Safe Torque Off Output        | O       |
| 2                               | RESERVED       | Reserved                      | -       |
| 3                               | STO-1 RETURN   | Safe Torque Off 1 Return      | STORET1 |
| 4                               | STO-1          | Safe Torque Off – Input 1     | I       |
| 5                               | STO-2 RETURN   | Safe Torque Off 2 Return      | STORET2 |
| 6                               | STO-2          | Safe Torque Off – Input 2     | I       |
| 7                               | RESERVED       | Reserved                      | -       |
| 8                               | STO OUT RETURN | Safe Torque Off Output Return | STORETO |

## HARDWARE SETTINGS

### EtherCAT Station Alias Selector Switches

| Switch Diagram                                                                                                                                                                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                       |     |         |   |   |                       |   |   |     |   |   |     |     |     |     |   |   |     |   |   |     |   |   |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----|---------|---|---|-----------------------|---|---|-----|---|---|-----|-----|-----|-----|---|---|-----|---|---|-----|---|---|-----|
| <div><p>SW0</p></div> <div><p>SW1</p></div> | <p>Hexadecimal switch settings correspond to the drive Station Alias. Note that drives on an EtherCAT network will be given an address automatically based on proximity to the host. Setting the switches manually is optional, and only necessary if a fixed address is required.</p> <table><tr><th>SW1</th><th>SW0</th><th>Node ID</th></tr><tr><td>0</td><td>0</td><td>Address stored in NVM</td></tr><tr><td>0</td><td>1</td><td>001</td></tr><tr><td>0</td><td>2</td><td>002</td></tr><tr><td>...</td><td>...</td><td>...</td></tr><tr><td>F</td><td>D</td><td>253</td></tr><tr><td>F</td><td>E</td><td>254</td></tr><tr><td>F</td><td>F</td><td>255</td></tr></table> | SW1                   | SW0 | Node ID | 0 | 0 | Address stored in NVM | 0 | 1 | 001 | 0 | 2 | 002 | ... | ... | ... | F | D | 253 | F | E | 254 | F | F | 255 |
| SW1                                                                                                                                                                                                           | SW0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Node ID               |     |         |   |   |                       |   |   |     |   |   |     |     |     |     |   |   |     |   |   |     |   |   |     |
| 0                                                                                                                                                                                                             | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Address stored in NVM |     |         |   |   |                       |   |   |     |   |   |     |     |     |     |   |   |     |   |   |     |   |   |     |
| 0                                                                                                                                                                                                             | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 001                   |     |         |   |   |                       |   |   |     |   |   |     |     |     |     |   |   |     |   |   |     |   |   |     |
| 0                                                                                                                                                                                                             | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 002                   |     |         |   |   |                       |   |   |     |   |   |     |     |     |     |   |   |     |   |   |     |   |   |     |
| ...                                                                                                                                                                                                           | ...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ...                   |     |         |   |   |                       |   |   |     |   |   |     |     |     |     |   |   |     |   |   |     |   |   |     |
| F                                                                                                                                                                                                             | D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 253                   |     |         |   |   |                       |   |   |     |   |   |     |     |     |     |   |   |     |   |   |     |   |   |     |
| F                                                                                                                                                                                                             | E                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 254                   |     |         |   |   |                       |   |   |     |   |   |     |     |     |     |   |   |     |   |   |     |   |   |     |
| F                                                                                                                                                                                                             | F                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 255                   |     |         |   |   |                       |   |   |     |   |   |     |     |     |     |   |   |     |   |   |     |   |   |     |

### LED Functions (on RJ-45 Communication Connectors)

| LINK LED                                                                              |                                                                                                                                                     |                                                                                    |
|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| LED State                                                                             | Description                                                                                                                                         |                                                                                    |
| Green – On                                                                            | Valid Link - No Activity                                                                                                                            |                                                                                    |
| Green – Flickering                                                                    | Valid Link - Network Activity                                                                                                                       |                                                                                    |
| Off                                                                                   | Invalid Link                                                                                                                                        |                                                                                    |
|                                                                                       |                                                                                                                                                     |                                                                                    |
| STATUS LED                                                                            |                                                                                                                                                     |                                                                                    |
| LED State                                                                             | Description                                                                                                                                         |                                                                                    |
| Green – On                                                                            | The device is in the state OPERATIONAL                                                                                                              |                                                                                    |
| Green – Blinking (2.5Hz – 200ms on and 200ms off)                                     | The device is in the state PRE-OPERATIONAL                                                                                                          |                                                                                    |
| Green – Single Flash (200ms flash followed by 1000ms off)                             | The device is in state SAFE-OPERATIONAL                                                                                                             |                                                                                    |
| Green – Flickering (10Hz – 50ms on and 50ms off)                                      | The device is booting and has not yet entered the INIT state                                                                                        |                                                                                    |
|                                                                                       | or                                                                                                                                                  |                                                                                    |
|                                                                                       | The device is in state BOOTSTRAP                                                                                                                    |                                                                                    |
|                                                                                       | or                                                                                                                                                  |                                                                                    |
|                                                                                       | Firmware download operation in progress                                                                                                             |                                                                                    |
| Off                                                                                   | The device is in state INIT                                                                                                                         |                                                                                    |
|                                                                                       |                                                                                                                                                     |                                                                                    |
| ERROR LED                                                                             |                                                                                                                                                     |                                                                                    |
| LED State                                                                             | Description                                                                                                                                         | Example                                                                            |
| Red – On                                                                              | A PDI Watchdog timeout has occurred.                                                                                                                | Application controller is not responding anymore.                                  |
| Red – Blinking (2.5Hz – 200ms on and 200ms off)                                       | General Configuration Error.                                                                                                                        | State change commanded by master is impossible due to register or object settings. |
| Red – Flickering (10Hz – 50ms on and 50ms off)                                        | Bootling Error was detected. INIT state reached, but parameter “Change” in the AL status register is set to 0x01:change/error                       | Checksum Error in Flash Memory.                                                    |
| Red – Single Flash (200ms flash followed by 1000ms off)                               | The slave device application has changed the EtherCAT state autonomously: Parameter “Change” in the AL status register is set to 0x01:change/error. | Synchronization error; device enters SAFE-OPERATIONAL automatically                |
| Red – Double Flash (Two 200ms flashes separated by 200ms off, followed by 1000ms off) | An application Watchdog timeout has occurred.                                                                                                       | Sync Manager Watchdog timeout.                                                     |

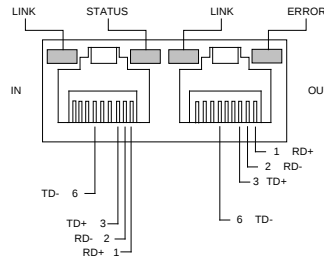
### Safe Torque Off (STO) Inputs

The Safe Torque Off (STO) Inputs are dedicated +24VDC max sinking single-ended inputs. A dedicated STO Disable Key connector is included and should be installed for applications where STO is not required.

## MECHANICAL INFORMATION

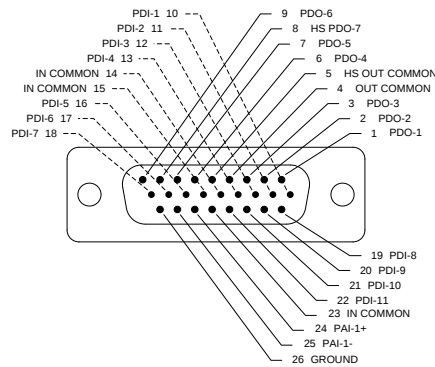
### COMM - EtherCAT Communication Connector

|                       |                     |                                         |
|-----------------------|---------------------|-----------------------------------------|
| Connector Information |                     | Shielded, dual RJ-45 socket with LEDs   |
| Mating Connector      | Details             | Standard CAT 5e or CAT 6 ethernet cable |
|                       | Included with Drive | No                                      |



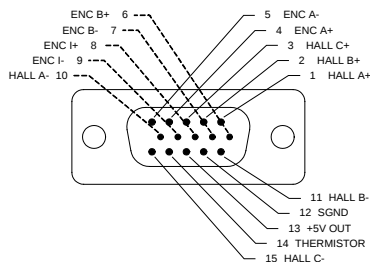
### I/O - Signal Connector

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

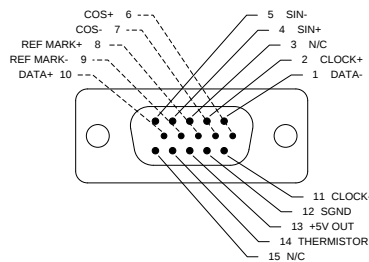


### FEEDBACK - Feedback Connector

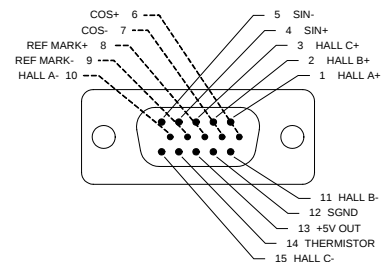
|                       |                     |                                                                                                      |
|-----------------------|---------------------|------------------------------------------------------------------------------------------------------|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



Incremental Encoder



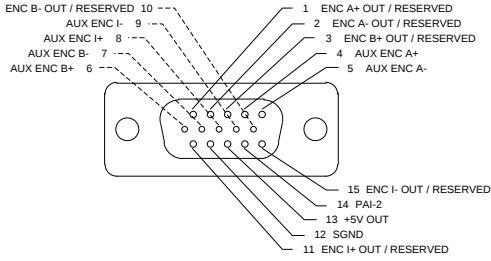
Absolute Encoder



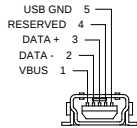
1Vp-p Sin/Cos Encoder

**AUX. ENCODER - Auxiliary Feedback Connector**

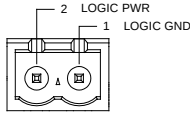
|                       |                     |                                                                                                       |
|-----------------------|---------------------|-------------------------------------------------------------------------------------------------------|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

  

**AUX. COMM - USB Communication Connector**

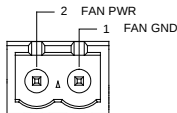
|                        |                     |                                                |
|------------------------|---------------------|------------------------------------------------|
| Connector Information  |                     | 5-pin, Mini USB B Type port                    |
| Suggested Mating Cable | Details             | TYCO: 1496476-3 (2-meter STD-A to MINI-B ASSY) |
|                        | 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                                                    |

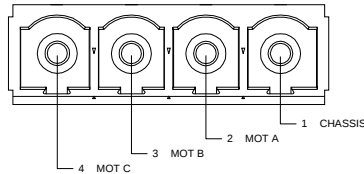
  

**Fan Power Connector**

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

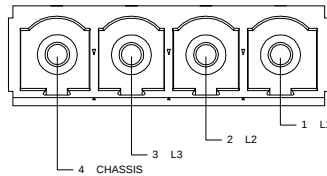
### Motor Power Connector

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



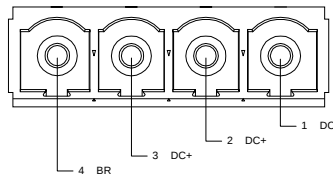
### AC Power Connector

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



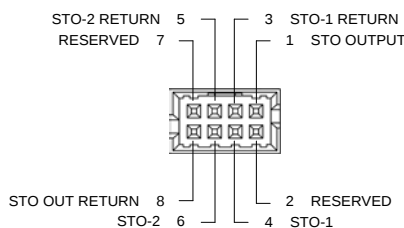
### DC Power Connector

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

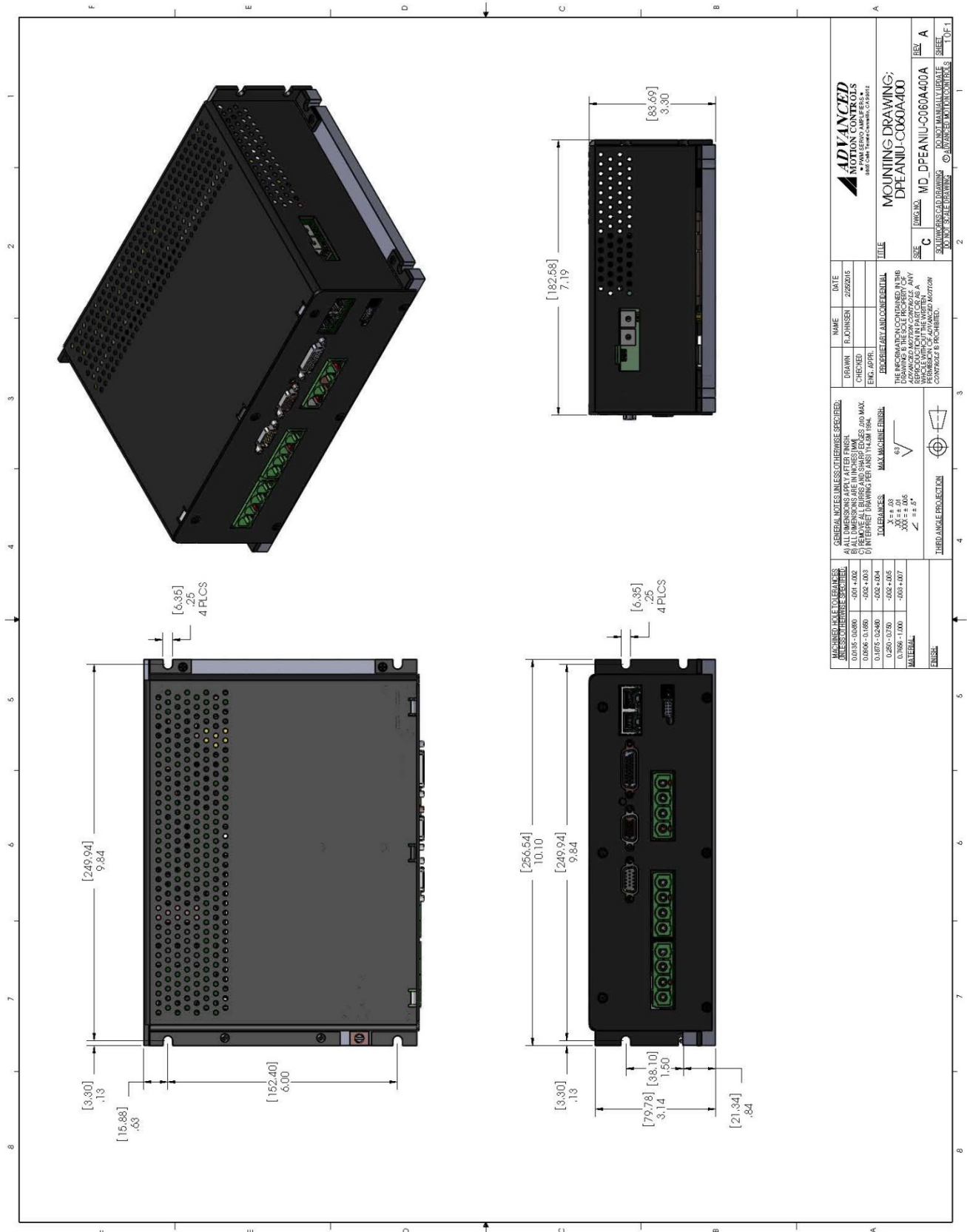


### STO – Safe Torque Off Connector

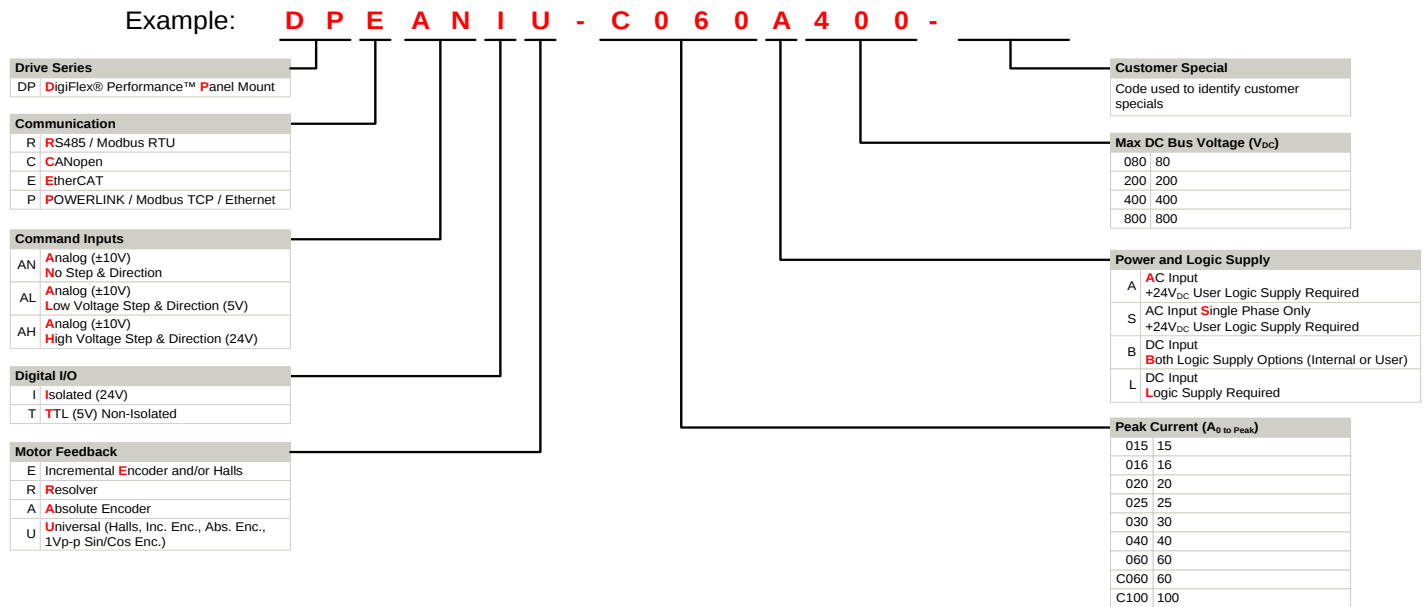
|                       |                     |                                                        |
|-----------------------|---------------------|--------------------------------------------------------|
| Connector Information |                     | 8-port, 2.00 mm spaced, enclosed, friction lock header |
| Mating Connector      | Details             | Molex: P/N 51110-0860 (housing); 50394-8051 (pins)     |
|                       | Included with Drive | No                                                     |



**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.

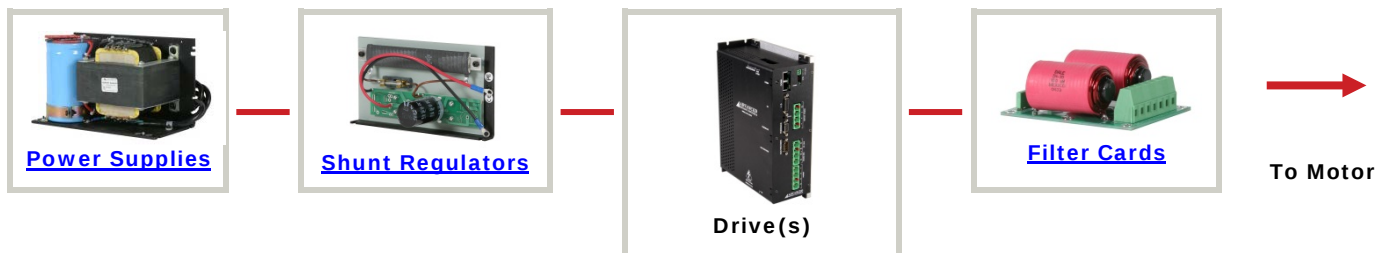
ADVANCED Motion Controls also has the capability to promptly develop and deliver specified products for OEMs with volume requests. Our Applications and Engineering Departments will work closely with your design team through all stages of development in order to provide the best servo drive solution for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