H Series Brushless Motor Drives

All-Digital, AC-Input, Position, Velocity or Torque Control

Allied Motion's H Drive is an advanced brushless servo motor drive featuring Hiperface DSL, multi-feedback device support, outstanding safety features, and is capable of supplying up to 10 Arms continuous, 21 Arms peak current at up to 240 VAC.

The H Drive features a digital, DSP-based design for precise motor control and easy commissioning, with multiple, configurable digital I/O to meet various application requirements while providing outstanding servo motion performance for robot, medical, industrial and automation applications.

H Drives will accurately control the torque, velocity or position of a wide range of servo motors, including our HeiMotion brushless servo motors and our Megaflux series of brushless torque motors, needing up to 4 kW of continuous power.

Options

- Chassis grounding kit for cable connections
- Connectorized mating cables for feedback and motor power
- Connector mates kit

Features & Benefits

- 10 Arms (14 Adc) continuous current
- 21 Arms (30 Adc) peak current
- Up to 4 kW continuous output power
- Line-operated, 110 - 240 VAC, 50/60 Hz, single- or three-phase
- Command sources:
  - ±10 VDC analog
  - ALLnet programming over Ethernet; internally stored programs
  - CANopen over CAN
  - CANopen over EtherCAT
- Programmable digital I/O:
  - 6 isolated inputs
  - 3 isolated outputs
  - 4 high speed discrete I/O
- Motor feedback options:
  - Encoders (incremental and high speed serial)
  - Resolver
  - Halls
- Dual feedback device control available
- Complete fault protection
- STO (Safe Torque Off)
- Analog output
- Integrated regenerative energy control circuit
- Integrated motor brake control
- Pluggable connectors
- DSP-based controller implements digital control of motor
- PC-based GUI for commissioning, monitoring, and programming

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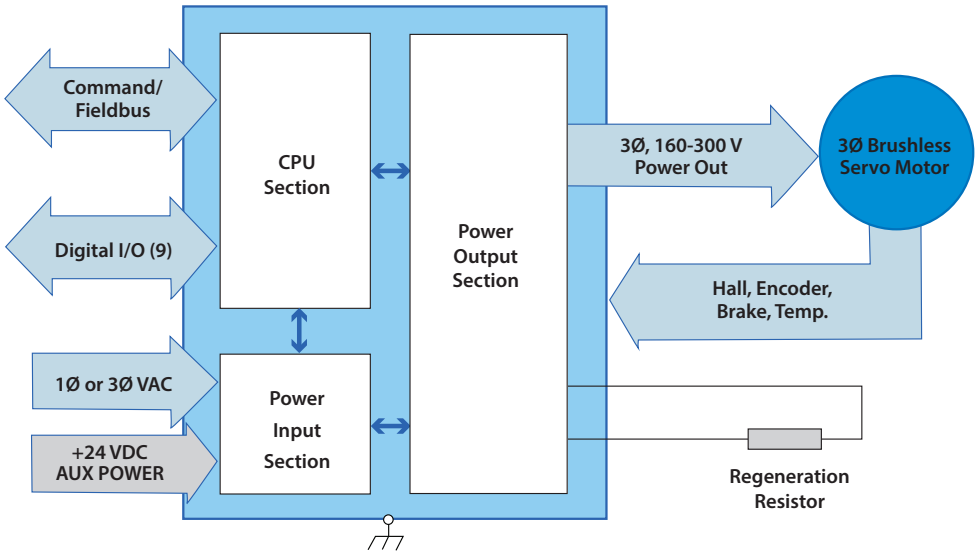
H Drive Specifications

Model	HDA-208-14
Continuous Current	10 Arms (14 Adc)
Peak Output Current (4 sec)	21Arms (30 Adc)
Continuous Output Power	4 kW (220 VAC 3Ø); 2400 W (220 VAC 1Ø); 1200 W (110 VAC 1Ø)
AC Input	110–240 VAC, 50 / 60 Hz, single- or three-phase
AUX Power	• 24 VDC at up to 1 A to maintain processor & motor feedback power during high voltage removal • Internally-controlled holding brake excitation circuitry for 24V brake at up to 2A • External 24V logic power required for brake operation
Regeneration Energy Absorption	• External resistor connection port; up to 1000 W continuous absorption • Turn-on threshold: 380 V
Communication Interface	• Ethernet 100 Mbit • Standard RJ45 isolated Ethernet interface • Use InControl for drive commissioning, monitoring, and motion programming
Command Interfaces	• CANopen over EtherCAT: Dual RJ45 isolated EtherCAT connectors • CANopen over CAN; dual RJ45 CAN connectors for daisy-chained communication • DS301: Accessible Allied Motion drive parameters • DS402: Standard motion commands • ± 10V analog for velocity, torque • Master encoder input for gearing or camming • Allnet programs
Programming Language	• Allnet (Allied Motion protocol) – Run programs over Ethernet from any platform that runs .NET framework – Store programs and run them



H Drive Specifications

Motor Feedback Types	• Hall Sensors: – 300 ohm internal pull-ups to 5 V – Max motor speed 20,000 rpm (6 pole motor) • Encoder and Hall sensors • Encoder only (initial motor alignment required) • Analog Sin/Cos Encoder: – 1.0 Vp-p differential; – Interpolation up to 12 bits – 200 kHz maximum cycle frequency • Resolver: – 2 pole supported – Resolution 14 bits – Reference 10 kHz, 3 Vrms @ up to 100 mA – Maximum speed: 10,000 rpm
Encoders	• Signal compatibility: up to 10 MHz quadrature count • +5 V @ up to 0.4 A provided for encoder power • Primary and secondary encoder feedback supported • Differential encoder inputs (single-ended not recommended) • Encoder types supported: – Incremental ABZ – Analog sin/cos – Hiperface DSL
Amplifier Type	PWM (10 kHz) 4-quadrant control
Motor Impedance	200 µH line-to-line minimum
Current Loop	DQ PI current loop, 50 µsec update time
Velocity Loop	PID / PDF 500 µsec update time
Position Loop	Proportional with feed forward, 500 µsec update time
Digital I/O (programmable)	• 6 optically isolated inputs: – Wirable as sinking or sourcing – 5 - 24 V compatible, 5 kOhm input impedance • 3 optically isolated outputs: – Individually wirable as sinking or sourcing; – Source / sink current up to 24 mA at up to 28 VDC
STO Inputs / Output	• Dual optically-isolated STO safety inputs: • 1 optically-isolated output for STO feedback • Same electrical specification as digital I/O • STO is per EN61800-5-2 SIL3
High Speed I/O	• 4 high speed input / output usable as: – programmable inputs – auxiliary encoder input – buffered encoder output – customizable functions are available
Analog Output	• 0-10 V at up to 10 mA • Scalable to many programmable parameters
Analog Inputs	• 2 differential inputs: – ±10 VDC – 12-bit resolution – 10 kOhm input resistance

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H Drive Specifications

Motor Temperature Monitor	• Detection for NTC thermistor, 1 to 100 kOhm
Status Indicators (LED)	• Green, slow-blink: disabled, no faults • Green, fast-blink: enabled • Red, solid: booting • Red, blinking: fault
Protection Features	• Over voltage detection (390 Vdc threshold) • Under voltage detection (40 Vdc threshold) • Over current detection (110% of Adc rated current) • Over temperature detection (100 °C threshold) • Short-circuit protection of output section: line-line, line-dc bus, line-dc return • I^2T current foldback • Brake short circuit detection and protection • Digital output short-circuit protection
Size	207 mm height x 47 mm width x 120 mm depth (vertical mount)
Weight	0.9 kg
Environmental	• Ambient temperature: 0 - 40 °C operating -40 - 85 °C storage • Humidity: 0 - 95% non-condensing • Contaminants: pollution degree 2 • Vibration: 10 Hz < f< 57 Hz (0.75mm amplitude), 57 Hz < f < 150 Hz (10m/5^2 (1g)); EN62477-1 • Shock: 10 g, 10 ms, half sine pulse, IEC60068-2-27 • Environment: IEC68-2

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H Drive Electrical Connections

I/O

26-pin High Density Female Dsub

Pin	Function
1	Discrete IN 1
2	Discrete IN 2
3	Discrete IN 3
4	Discrete IN 4
5	Discrete IN 5
6	Discrete IN 6
7	STO1 Input
8	STO2 Input
9	+24V (up to 100ma) [1]
10	Analog 1 IN +
11	Analog 2 IN +
12	24V RTN
13	Discrete OUT 1 C
14	Discrete OUT 2 C
15	Discrete OUT 3 C
16	STO Output C
17	STO1 In Common
18	+24V RTN
19	Analog 1 IN -
20	Analog 2 IN -
21	Discrete IN Common
22	Discrete OUT 1 E
23	Discrete OUT 2 E
24	Discrete OUT 3 E
25	STO Output E
26	STO2 In Common

Mate: Amphenol 10090769-P264ALF or equivalent

EtherCAT and EtherNET

8-pin RJ45 (3): standard Ethernet pinout

Pin	Function
1	TX+
2	TX-
3	RX+
4	—
5	—
6	RX-
7	—
8	—

Mate: RJ45 cable

Main Power

8-pin 10 mm pluggable

Pin	Function
1	PE (Protective Earth)
2	L3 (AC line voltage 3)
3	L2 (AC line voltage 2)
4	L1 (AC line voltage 1)
5	Ext Regen Resistor –
6	Ext Regen Resistor +
7	DC- Bus Return
8	DC+ Bus Positive

Mate: OSTTJ157150MP, On-Shore Technology

Motor Power

4-pin 10 mm pluggable

Pin	Function
1	Motor Phase A
2	Motor Phase B
3	Motor Phase C
4	PE (Motor Ground)

Mate: OSTTJ077150MP, On-Shore Technology

Aux Power

2-pin 3.5mm pluggable

Pin	Function
1	V+ (Auxiliary 24V Power)
2	V- (Auxiliary 24V Return)

Mate: OSTTJ0211530, On-Shore Technologies

CAN

8-pin RJ45 (2): standard CANopen over CAN RJ45 non-isolated pinout

Pin	Function
1	CANH
2	CANL
3	COM
4	—
5	—
6	—
7	—
8	—

Mate: RJ45 cable

Feedback

15-pin High Density Male Dsub

Pin	Function
1	Encoder A+ / Sin+
2	Encoder B+ / Cos+
3	Encoder Z+ / Resolver Exc +
4	+5V [2]
5	+5V [2]
6	Encoder A- / Sin-
7	Encoder B- / Cos-
8	Encoder Z- / Resolver Exc -
9	COM (5V, Thermistor RTN)
10	COM (5V, Thermistor RTN)
11	Hall A
12	Hall B
13	Hall C
14	COM (5V, Thermistor RTN)
15	Motor Thermistor

Mate: Amphenol 10090770-S154ALF or equivalent

Aux Encoder

15-pin High Density Female Dsub

Pin	Function
1	High Speed I/O 1+
2	High Speed I/O 2+
3	High Speed I/O 3+
4	High Speed I/O 4+
5	+5V [2]
6	High Speed I/O 1-
7	High Speed I/O 2-
8	High Speed I/O 3-
9	High Speed I/O 4-
10	Analog Output (0-10V)
11	—
12	—
13	+5V [2]
14	COM (5V RTN, AN OUT)
15	COM (5V RTN, AN OUT)

Mate: Amphenol 10090769-P154ALF or equivalent

Brake

4-pin Molex MiniFit Jr

Pin	Function
1	Brake –
2	Brake +
3	Hiperface DSL - / Motor Thermistor –
4	Hiperface DSL + / Motor Thermistor +

Mate: Molex 0039012040

[1] Drive supplied +24 V for I/O

[2] Up to 400 mA total may be shared among the four +5 V pins

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Safe Torque Output (STO)

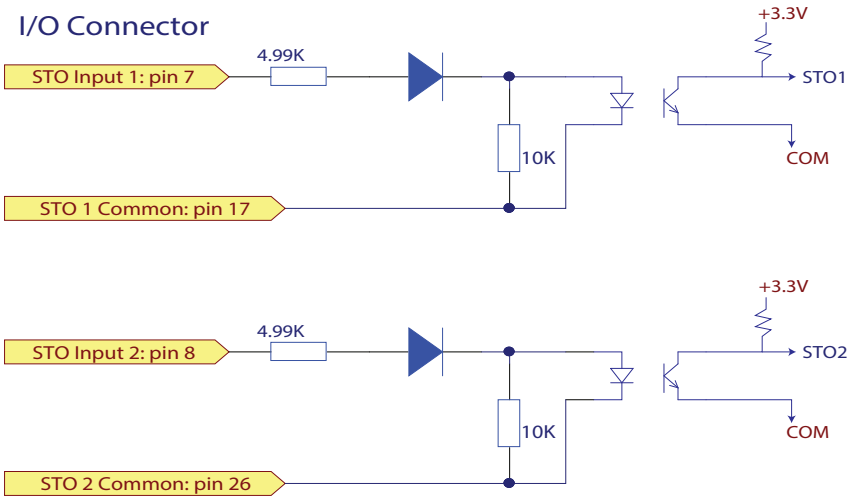
Note: STO MUST be activated to enable the drive.

STO is provided as a safety feature as defined in IEC61800-5-2. Two STO optically-isolated inputs must both be activated to enable drive to the output stage.

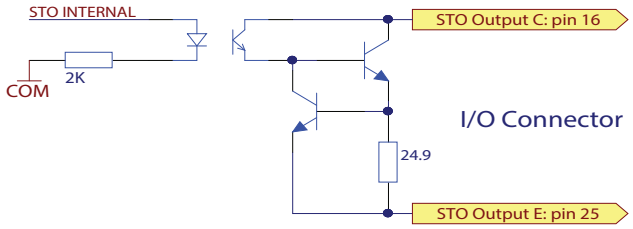
STO inputs can each be enabled by applying +5 V to +27 V from STOINx to STOxCOM

STO Bypass: STO can be bypassed by connecting the following signals:

- I/O pin 9 (24 V) to I/O pin 7 (STOIN1)
- I/O pin 17 (STO1COM) to I/O pin 8 (STOIN2)
- I/O pin 26 (STO2COM) to I/O pin 18 (24 V RTN)



STO Out is an isolated output which is driven by the internal hardware state of the STO input.

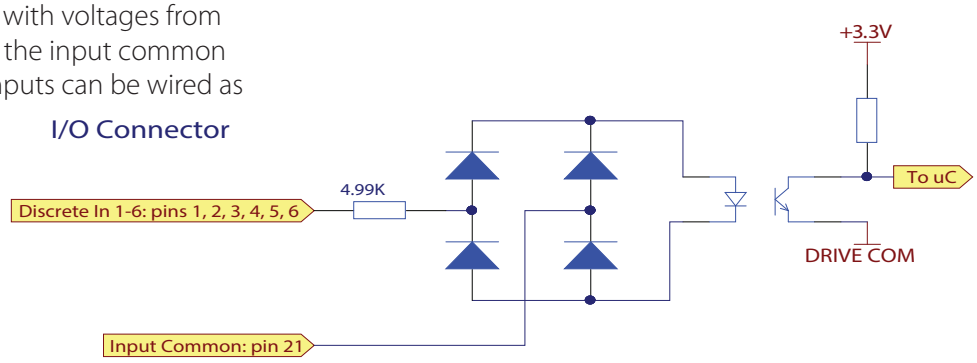


Discrete Inputs

There are 6 optically-isolated discrete inputs: DiscreteIn1 to DiscreteIn6.

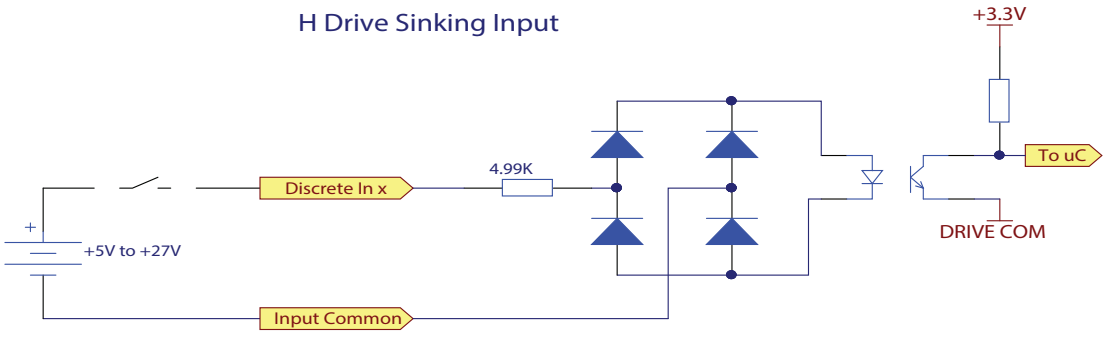
Discrete inputs can be enabled with voltages from +5 V to +27 V from the input to the input common (common to all 6 inputs). The inputs can be wired as sourcing or sinking.

I/O Connector



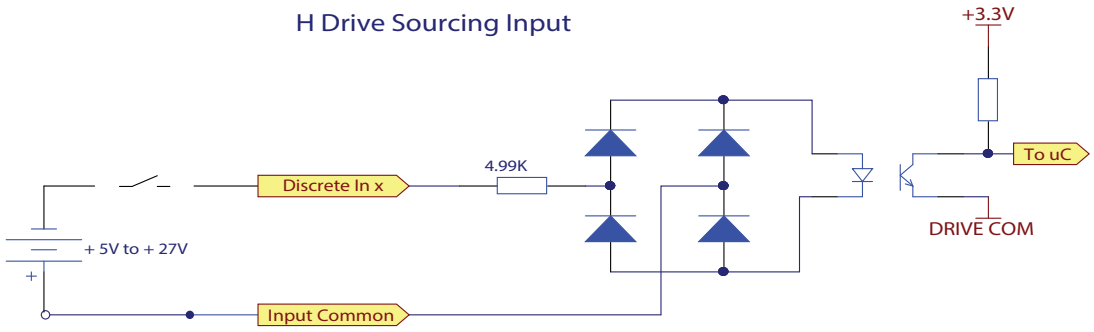
Sinking inputs example: Input Common is wired to the excitation voltage return. Inputs are activated by connecting each input to the excitation voltage: +5 V to +27 V.

H Drive Sinking Input



Sourcing inputs example: Input Common is wired to the excitation voltage: +5 V to +27 V. Inputs are activated by connecting each input to the excitation voltage return.

H Drive Sourcing Input



Input Programming: Refer to InControl manual for input definition and programming

Americas +1 (716) 242-7535
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Asia +852 2607 4038

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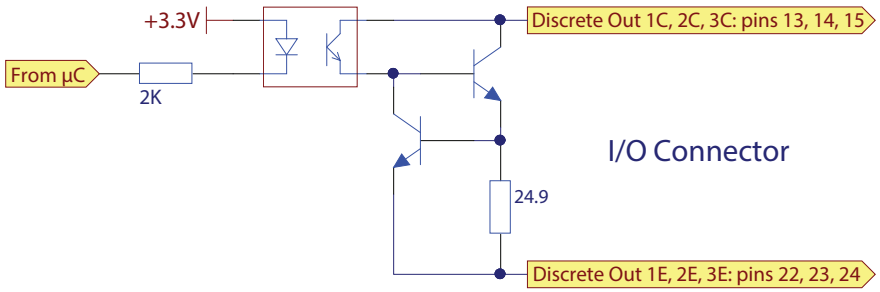
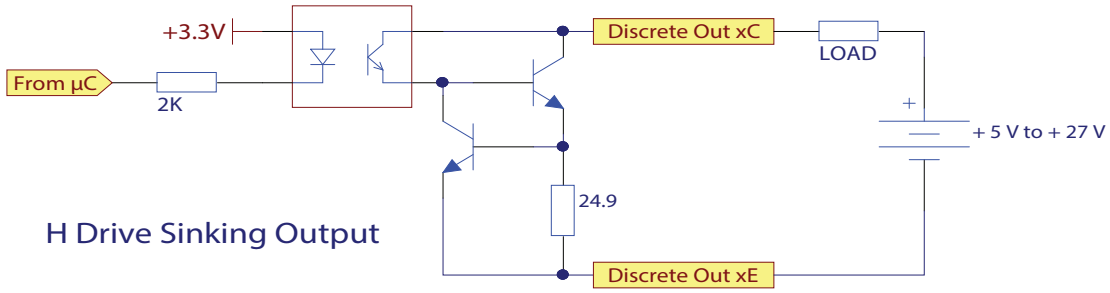
Discrete Outputs

There are 3 optically-isolated discrete Outputs: Discrete Out 1 to Discrete Out 3

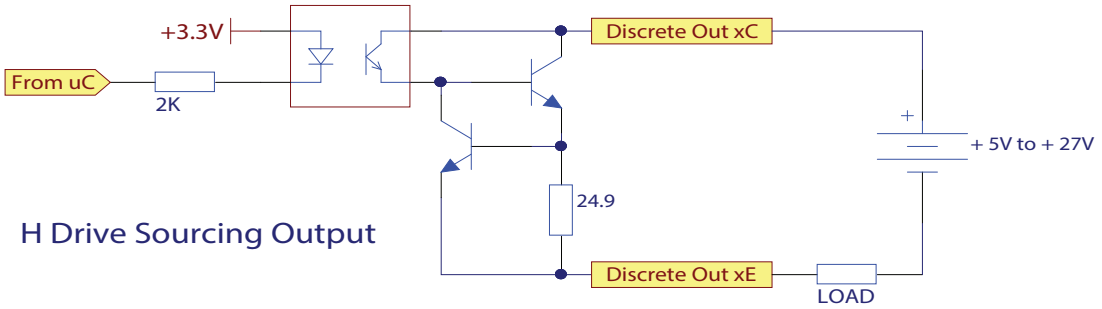
The outputs can supply up to 24 mA at voltages up to 27 V. They are short circuit protected.



Sinking Outputs Example: Discrete Out xC is wired to the load. The other side of the load is connected to excitation +supply. Discrete Out xE is connected to the excitation supply return.

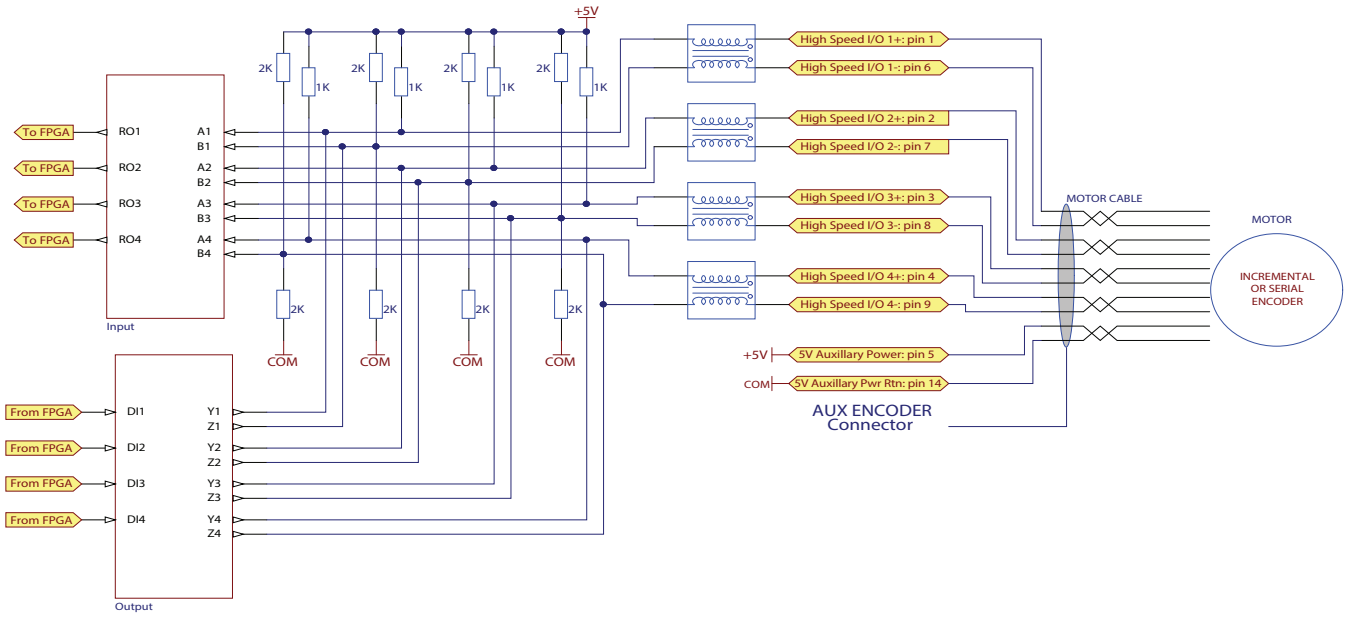


Sourcing Outputs Example: Discrete Out xC is wired to the excitation voltage. Load is connected from Discrete Out xE to the excitation supply return.



Output Programming: Refer to InControl manual for output definition and programming.

High Speed I/O



How to set up I/O as input Encoder

Encoder Wiring

Encoder termination at high speed I/O: encoder termination of 1 kOhm is provided between the + and - input pins of each encoder input pair. Some encoders may require 120 ohm termination. This will require connecting a resistor of approximately 133 ohms across each pair of encoder inputs: A, B, and Z.

How to Set up the I/O as Encoder Feedback

Encoder Feedback Wiring

- Encoder A corresponds to High Speed pair 1
- Encoder B corresponds to High Speed pair 2
- Encoder Z corresponds to High Speed pair 3

Encoder termination: encoder termination of 120 ohms is recommended at the receiving end of each differential output pair.

How to Set up the I/O as Discrete I/O

Input Voltage Range: The input voltage on the high speed I/O pins is restricted to the voltage range from 0 V to +5 V. Voltages outside of this range can damage the input.

Input Wiring: If single-ended inputs are needed, inputs should be wired to pins High Speed I/O x + (positive inputs). Negative inputs are biased at 2.5 V by internal resistors. If necessary the bias input voltage can be changed by adding a resistor from each pin to +5 V or COM, depending on the desired bias voltage. The bias voltage on the negative pins should be half of the expected input range of the input signal.

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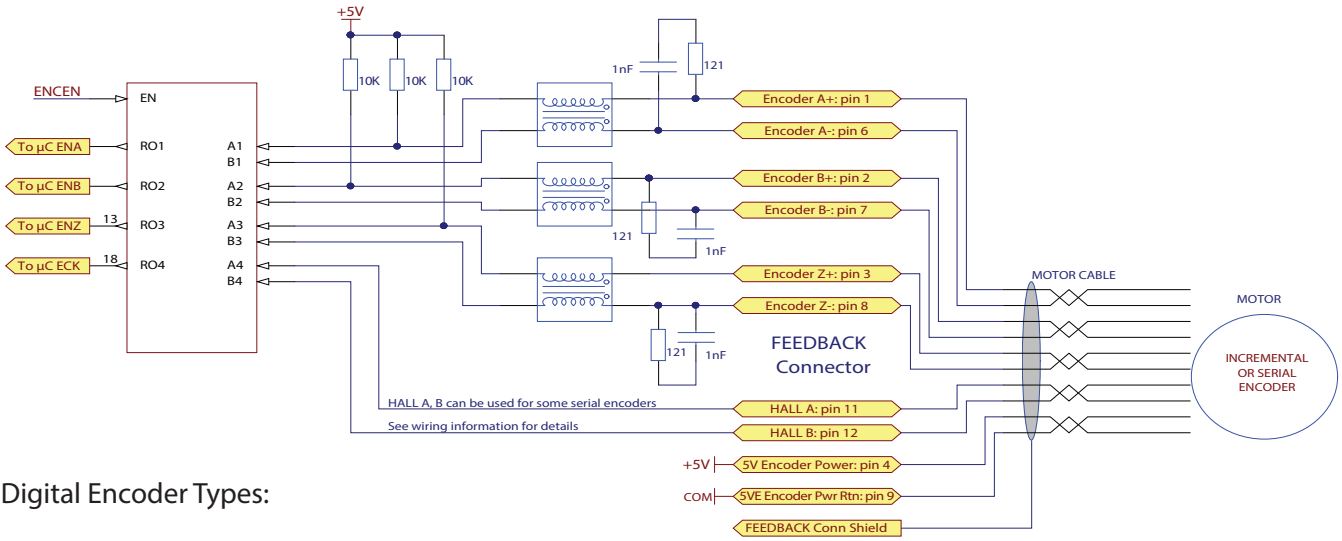
Digital Encoder Input

Encoder termination: encoder termination of 121 ohms (ac) is provided between the + and - input pins of the Encoder A, B, and Z channels.



Digital Encoder Types:

- Incremental
- High Speed Serial Input (EnDat, BISS, other)
- Hiperface DSL

Incremental Encoder

Encoder termination: AC encoder termination of 121 ohms is provided between the + and - input pins of the Encoder A, B, and Z channels. This does not have to be supplied by the customer.

If an incremental encoder is used, it should be a differential encoder. Single ended encoders are not recommended for motor control in higher voltage drives. Wire the encoder A, B, and (if necessary) Z channels.

For Hall wiring with incremental encoder see "Hall Commutation Inputs" on page 11.

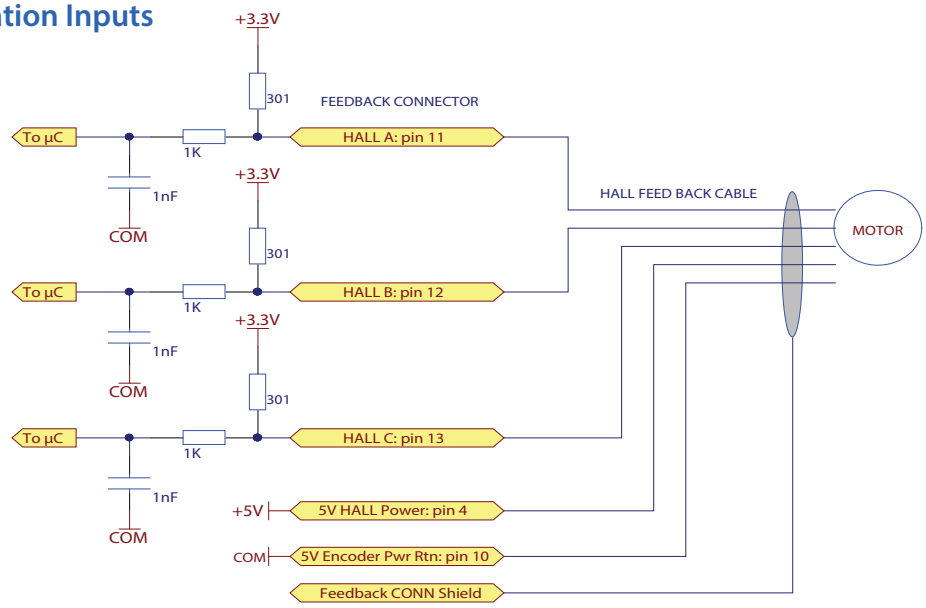
High Speed Encoder:

Encoder wiring (BISS and EnDat)

Hiperface DSL:

See "Hiperface DSL" on page 14.

Hall Commutation Inputs



Motor commutation with Hall devices: Hall sensor inputs from a motor are usually found on motors with incremental encoders or as the primary feedback of a motor.

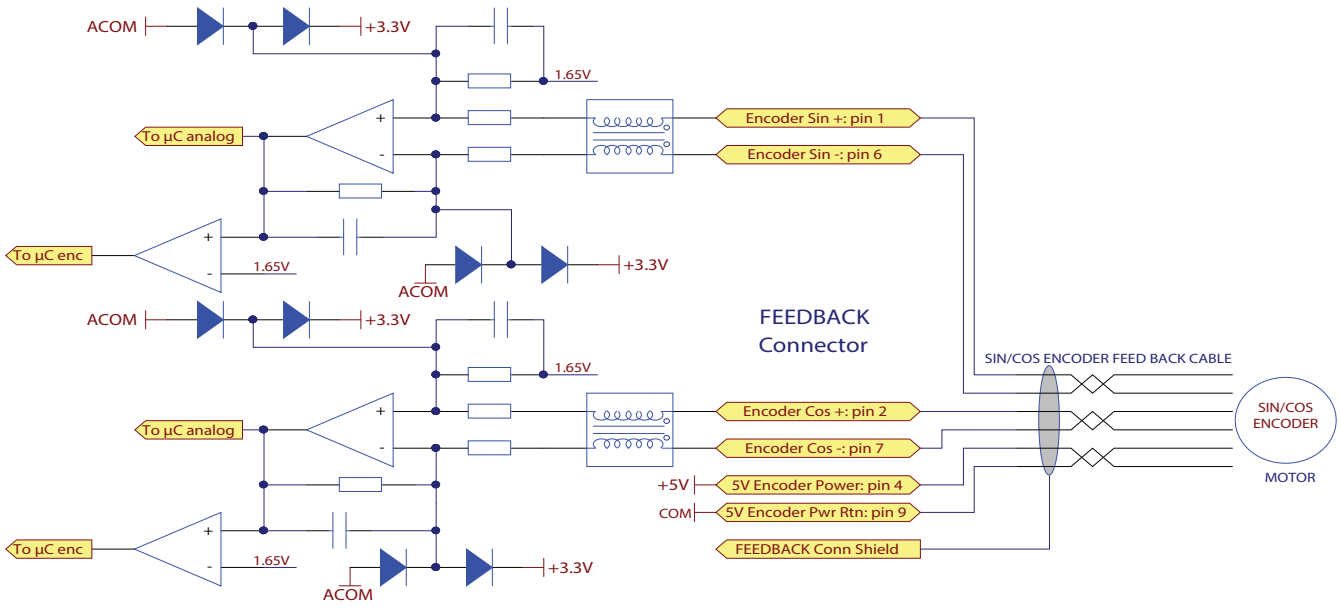
When Halls are used in conjunction with an encoder, after power up the H Drive will commutate the motor based on the Hall input state. Once a Hall state transition occurs, the motor will be commutated thereafter sinusoidally based on encoder feedback.

When Halls alone are the feedback device the motor will be commutated in a 6 step manner: 2 motor phases are powered in any given Hall state and the third motor phase is unpowered.

Analog Sin/Cos Encoder

Analog sin/cos encoders output sin and cos analog signals rather than digital signals as does an incremental A B Z type encoder. The drive digitizes the analog encoder signals to create quadrature encoder signals.

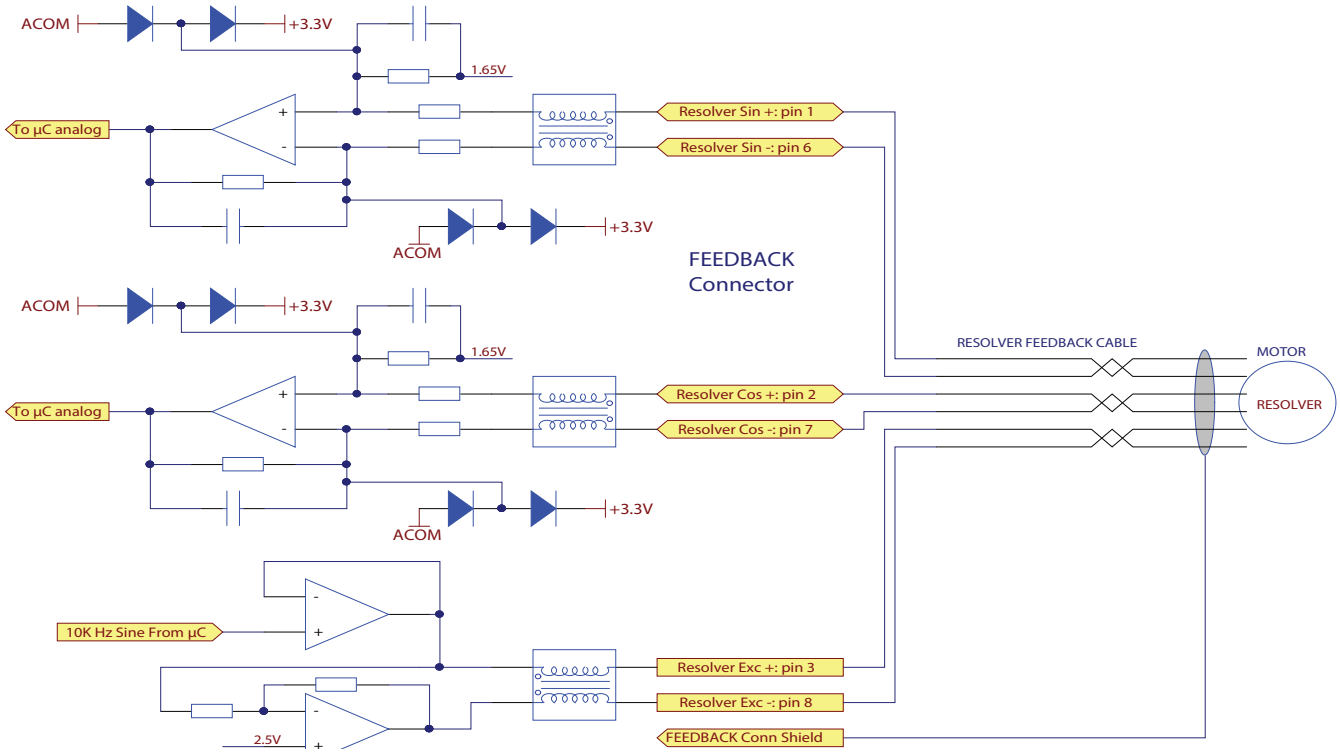
The drive does an interpolation between the digitized encoder edges at up to 12 bits to create higher resolution feedback. 1 Vp-p analog sin/cos encoder output signals are supported. Up to 250 mA is available at 5 V for encoder power.



Resolver Interface

The resolver interface accepts a 2-pole resolver with 2:1 excitation to sin/cos feedback ratio. Resolver resolution is 65,536 counts per motor revolution.

Resolver excitation is differential, 3 Vrms (4.5 V p-p) and 10 kHz sinusoidal. The drive's resolver receiver is differential.



Brake

A motor brake can be connected at shown. A motor brake can be controlled by the H Drive. The brake is supplied by power from the AUX POWER connector (see next page). It must be a 24 V brake. The drive can control up to 2 A of brake current.

Brake Configuration Parameters:

- BDTM (brake delay engage time in seconds)
- BFTM (brake engage time after fault)
- BKOV (brake override: can be used to test brake operation)

BRAKE Connector

1	Brake -
2	Brake +
3	Motor Thermistor - / Hiperface DSL–
4	Motor Thermistor + / Hiperface DSL+

Dual Row MiniFit Jr

Hiperface DSL Encoder

A Hiperface DSL encoder employs serial digital encoder signals to transmit feedback information. One advantage of this is that a single cable can be used to connect a servo motor to the H Drive because both the motor power lines and the encoder lines can be contained within the same cable. Allied Motion offers such a single cable (PN HDA-CB-DSL-3, see page 19). A Hiperface DSL encoder is connected to the H Drive using the BRAKE input port pins 3 and 4.

Thermistor

A motor thermistor can be connected for a non-Hiperface DSL motor. A Hiperface DSL encoder and motor thermistor cannot be connected simultaneously. It is possible to monitor motor temperature through the Hiperface DSL interface.

The motor thermistor can be from 1 to 100 kOhm NTC thermistor.

Motor Thermistor Configuration Parameters:

- MTB (motor thermistor beta)
- MTR0 (motor thermistor resistance at 25 °C)
- MTOT (motor overtemperature limit)

If a thermistor is not used, setting MTOT to greater than 900 °C will disable motor overtemperature monitoring.

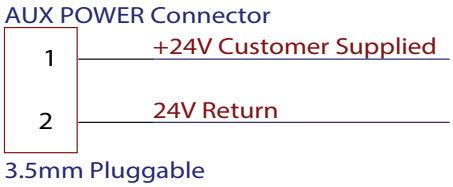
AUX Power Connector

AUX POWER Functionality:

Brake Power: supply power to the motor brake through the motor brake control circuit (see page 14)

Keep-Alive Power:

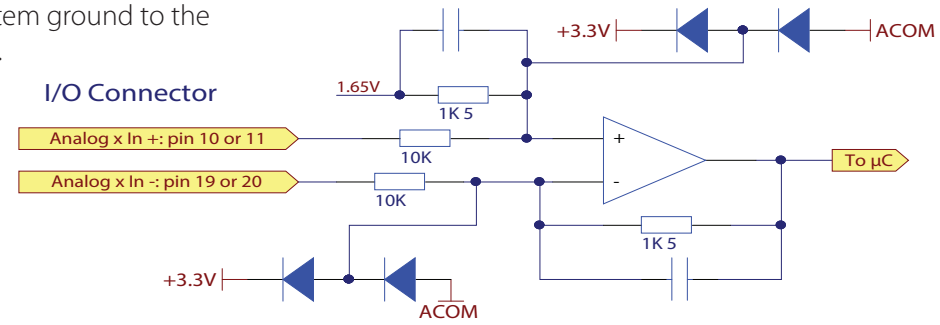
- Requires up to 1 A for keep-alive
- Maintains CPU and feedback active when AC power is removed
- Not necessary for the drive to function; will work from AC power only



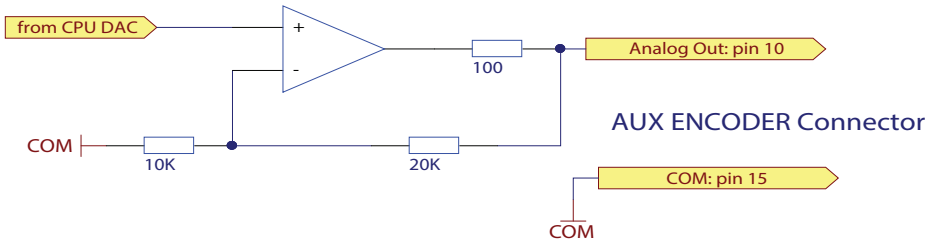
Analog I/O

Analog Inputs: 2 differential inputs with ±10 V range are available and are programmable to multiple functions.

It is recommended that the user wire their analog input signal to the + input and their system ground to the -input of the desired analog input.

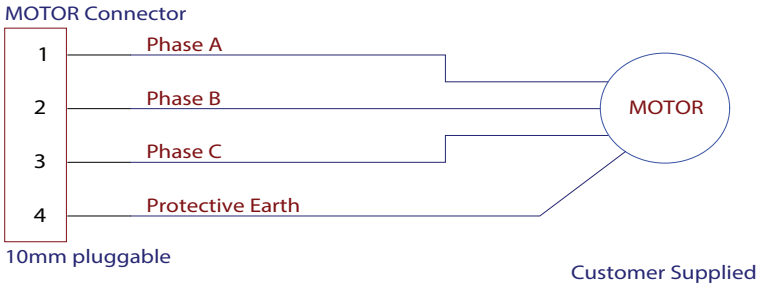


Analog Output: there is 1 analog output with a voltage range of 0 - 10 V. It is programmable and scalable to many drive variables. It is driven from a 12 bit D/A converter.



Motor Connections

Motor connections are made to the drive as shown:



Power Connections

Power connections are:

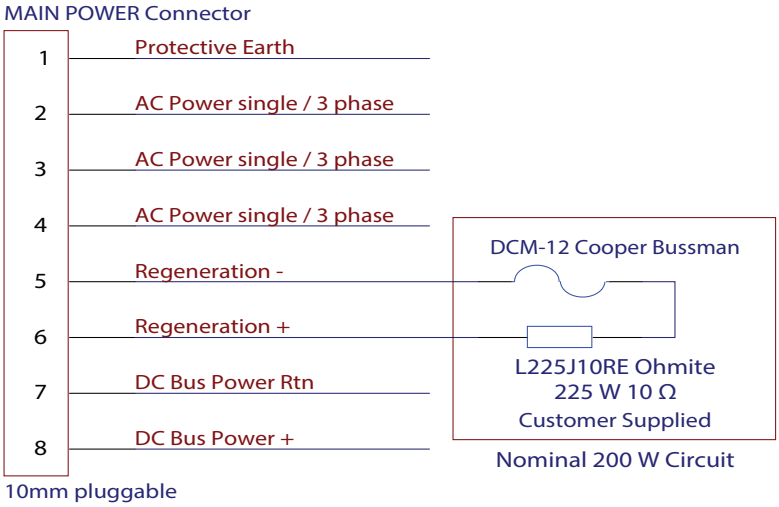
- Single-phase / 3-phase input AC power
- Regeneration
- DC Bus

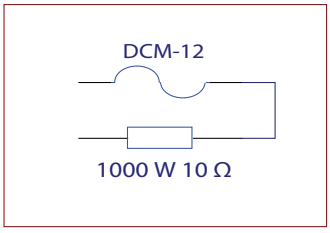
Input power: 3-phase or single-phase 208 to 240 Vac nominal power is connected to pins 2, 3, and 4 of the POWER connector.

Regeneration: up to 1000 W of regenerated energy can be dissipated. The regeneration resistor is limited to 1000 W continuous dissipation via firmware. InControl parameter, REG PLIM is used to set the maximum regen power dissipation.

DC Bus paralleling: The DC buses of 2 drives can be connected in parallel by connecting pin 7 to pin 7 and pin 8 to pin 8 on the POWER connectors of each drive. When doing this, the AC power to pins 2, 3, and 4 of each connector should be wired on both connectors. This will help distribute the rectifier power dissipation to both drives.

Chassis Ground: chassis ground to the drive should be connected to pin 1 and to the chassis ground lug as shown on page 18.

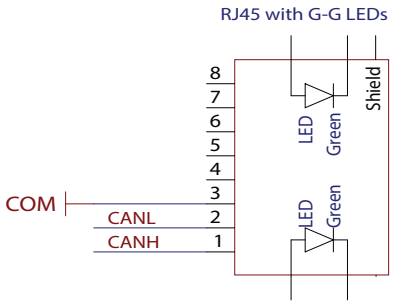




CAN Bus Connections

There are two CAN connectors on the top edge of the drive.

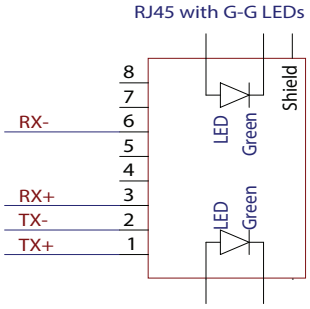
- Used to connect to a CANopen network over CAN
- Two connectors are supplied for daisy-chaining of the CANopen network
- Last device on CANopen network should be terminated with 120 ohms
- Standard RJ45 CANopen pinout on both connectors



EtherCAT and Ethernet Connections

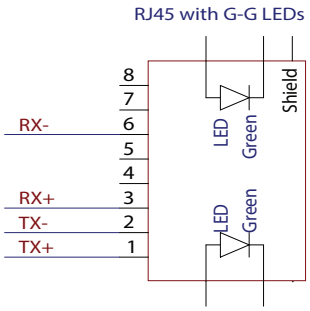
There are two EtherCAT connectors on the top edge of the drive.

- Used to connect to a CANopen network over EtherCAT
- EtherCAT IN and OUT connectors supplied
- Standard RJ45 Ethernet connector allows standard CAT 5 or 6 Ethernet cables



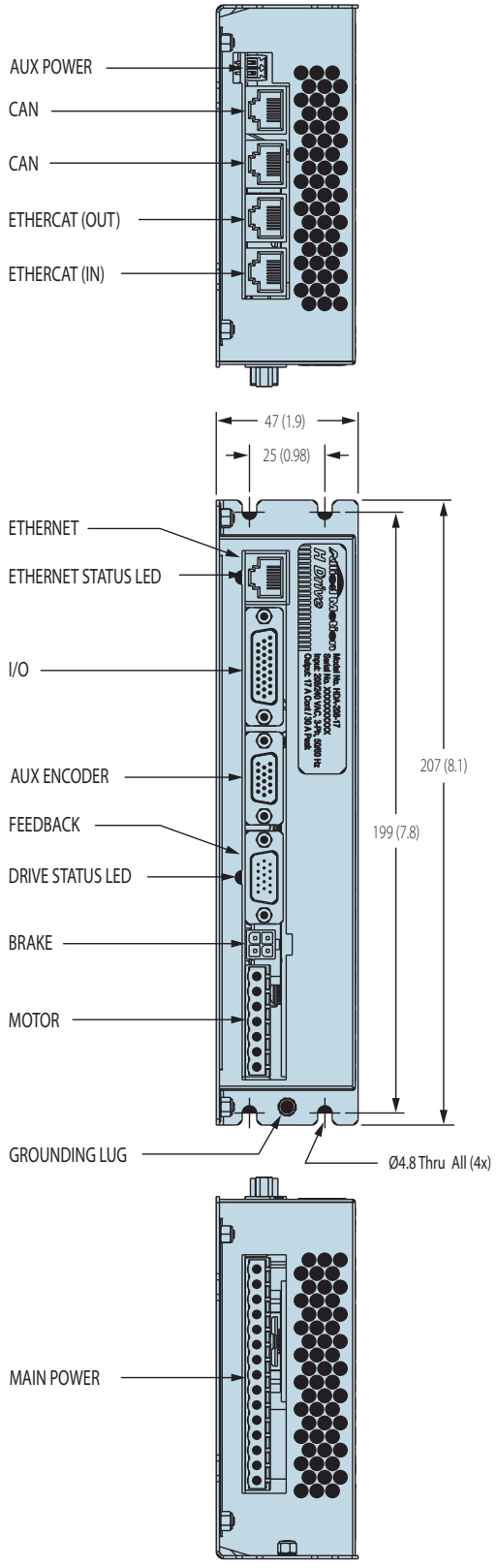
There is one Ethernet connector on the front of the drive.

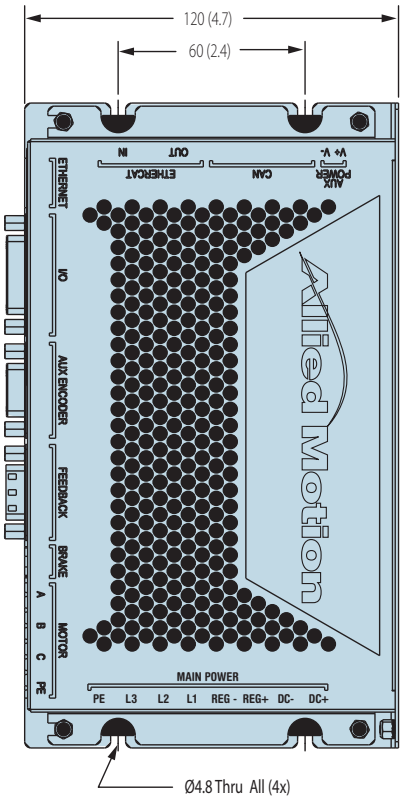
- Used for programming and commissioning of the drive
- Used with Allied Motion InControl PC software.
- Standard RJ45 Ethernet connector allows standard CAT 5 or 6 Ethernet cables



Issue Date: 10.4.21

H Drive Dimensions — mm (in)





H Drive Cable & Connector Kit Accessories

Connector mates not supplied with drive. Order connector mates kit if not ordering cables

HDA-CB-DSL-3	Hiperface DSL motor feedback cable
HDA-208-KIT1	Mating connectors kit
HDA-208-KIT2	Grounding Kit

H Drive Documents & Software

Documentation and most software are available for download from the Allied Motion website (www.alliedmotion.com)

34-2100	Hardware Manual: Wiring and Installation
34-2200	Software Manual: IN Control User Guide
34-2202	Software Manual: Parameters and Control Structure
—	ALLNET .NET Framework software

H Drive Mounting Instructions

Mounting: Vertical position, kept in a closed control cabinet free of conductive or corrosive materials following environmental guidelines, especially maximum temperature operation.

Issue Date: 10.4.21

Allied Motion
Motion Solutions That Change the Game

Allied Motion Solution Centers

Allied Motion Solution Centers provide support to customers around the world from five geographically-strategic locations. Each facility is staffed by experienced application engineers and customer service teams to assist you with all aspects of your motion control needs. We also have a global network of factory-trained Allied Motion Sales Partners to serve you. For contact information on the location nearest you, please see below or visit our website.

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