Dragon Servo Drive

DRAGON SERVO DRIVE

ESI Motion's Dragon Servo Drive is the core of ESI's, fully integrated "plug and play" control solution.

This highly capable servo drive system has the agility and flexibility to offer multiple configurations. The Dragon incorporates our rugged controller and power driver modules, offers several feedback options, and is packaged in a military-grade submersible case. This versatile servo drive is ideal for high performance military, aviation, and specialized industrial applications operating outdoor, at high temperatures, in high vibration, or other extreme environmental conditions.

CONFIGURATIONS

Motor Types:

DC Brushless, Brushed, and Induction

Feedback:

Sensorless, Encoder, Resolver, Hall, and BiSS-C

Cooling Options:

Chassis, Fan, or Liquid cooled

Packaging:

Ruggedized

SPECIFICATION

- **Bus Voltage (DC) 24 V to 610 V**
- **Peak Current 40 A, Output Power 12 kW (per axis)**
- **Operating Temperature –40°C to 71°C**
- **Maximum Electrical Speed 75K RPM**
- **Weight 6.4 lbs. / 2.9 kg**

FEATURES

- **Single, Dual, or Quad* axis configuration**
- **Shock and Vibration tolerant construction**
- **High Voltage Interlock and Brake Drivers**
- **Integrated EMI filter and DC Bus Voltage Regeneration switch and active Inrush limiter.**
- **Configurable, user friendly GUI with enhanced data collection capability**
- **MIL-STD-810, MIL-STD-1275, MIL-STD-704, MIL-STD-461**

***Contact ESI for additional details**

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ESI MOTION

Overview

The Dragon Servo Drive incorporates our rugged controller and servo drive modules into a military grade package. The following describes both the electrical and physical interfaces for the Dragon Servo Drive. Included in this document is information necessary to integrate the Dragon Servo Drive with other system components.

In order to design a multi-use capability, networking has been emphasized in the Dragon Servo Drive. The Dragon Servo Drive can be connected to the following two types of networks:

RS-422, Controller Area Network (CAN)

Both networks are ideal for real-time embedded networking. They have been proven to be stable and robust as well as flexible. Thus, the Dragon Servo Drive can easily be modified through software to accept commands and report feedback without hardware modification.

This document discusses the system interconnect by functional group. The four groups are as follows:

Power, Motor, System, Feedback

Power

The power input is the main power input. The power signals are isolated from the control circuitry.

The power connector is an insert arrangement 16-10, part number MS3452L16-10P. The MS3452 series features box mounting and crimped pins. The box connections are pins and they mate with a socket-type connector, part number MS3456L16-10S.

Motor

The motor connector contains the following signals:

Phase A, Phase B, Phase C, Brake, Regeneration, Interlock, Chassis

The motor connector is an insert arrangement 24-19. The connector part number is MS3470L24-19S. The MS3470 series features box mounting and crimped pins. The connections are sockets and they mate with a pin-type connector, part number MS3476L24-19P.

The Dragon Servo Drive provides two 24 V brake drivers, high voltage interlock, and regeneration switch output. The brake current is nominally 1 amp and is current limited to 1.5 A +- 10%.

System

The system signals are routed to a 37-pin connector. The connector is type D38999/20FD35AN (insert arrangement 13-35). It accepts a size 22D pin (AWG wire size 22-28). The connections are pins and they mate with a socket-type connector, PN D38999/26FD35SN.

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The system signals are the main interface used in an end application. This interface includes low-level power and several networking and discrete I/O signals. Since the end use of the Dragon Servo Drive is unknown, a generic interface has been provided to include the following:

Low-Level Power (28 VDC In), Fan Output, RS422, 3 Digital Inputs, 2 Analog Inputs, USB, 4 Analog Test Points Out, 2 Digital Outputs, CAN, 5 VDC Out.

This interface also includes service inputs that can be used for the following test and update functions:

Connect using the Host Interface for the Dragon Servo (HiDS), Monitor the four Analog Test Points, Inject an Analog Test Signal, Reprogram Internal Flash Memory.

Feedback

The Dragon Servo Drive contains a motor feedback interface. The feedback interface is on a single 37-pin connector. The connector is type D38999/20FD35AA (Insert arrangement 15-35, A clocking). It accepts a size 22D pin (AWG wire size 22-28). The connections are pins and they mate with a socket-type connector, part number JD38999/26FD35SA.

There are three feedback configurations:

Dual Resolver, Dual Encoder, Single Resolver and BiSS-C.

Hall sensor feedback is also available and is interchangeable with the Encoder signals. Contact ESI Motion for details.

Signal Description

The Dragon Servo Drive includes a CAN physical interface compliant to the ISO 11898-2 specification. The maximum data rate is 1 Mbps for a bus length of 40 meters. The CAN interface meets the extended common mode range of –7 to +12 V. No internal bus termination is provided.

The Dragon Servo Drive includes an RS422 physical interface compliant to the TIA/EIA-422-B specification. The Dragon Servo Drive is capable of a 1 Mbps data rate. The RS422 pins are short circuit protected from –7 V to +12 volts.

The Dragon Servo Drive includes five digital inputs and well as two digital outputs. The Digital I/O signals are optically isolated from the internal DSP unit. The digital inputs include varistors rated to 5.6 V. Note that the 1000 pF capacitors are used to protect the circuit from ESD damage – all ESD capacitors are rated at 100 VDC.

The Dragon Servo Drive includes two analog inputs. These inputs may be configured through software as a control or test input. In a control mode, the signal may be used to give the Dragon Servo Drive a torque or velocity command. In test mode, the signal may be used to inject a test signal into the system. The analog inputs have a differential voltage input range of +- 10 V.

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The four analog test points are routed to the system connector for monitoring. The user may use the HiDS to setup the analog test points. The voltage range on the analog test points are +- 2.5 V. The test points are buffered with a 100 Ohm resistor.

The user may connect a standard USB port to the USB D+, USB D-, USB VBUS and USB GND for access to the HiDS functions.

The user may use the USB port to reprogram the internal FLASH memory. A flash update program is provided by ESI Motion.

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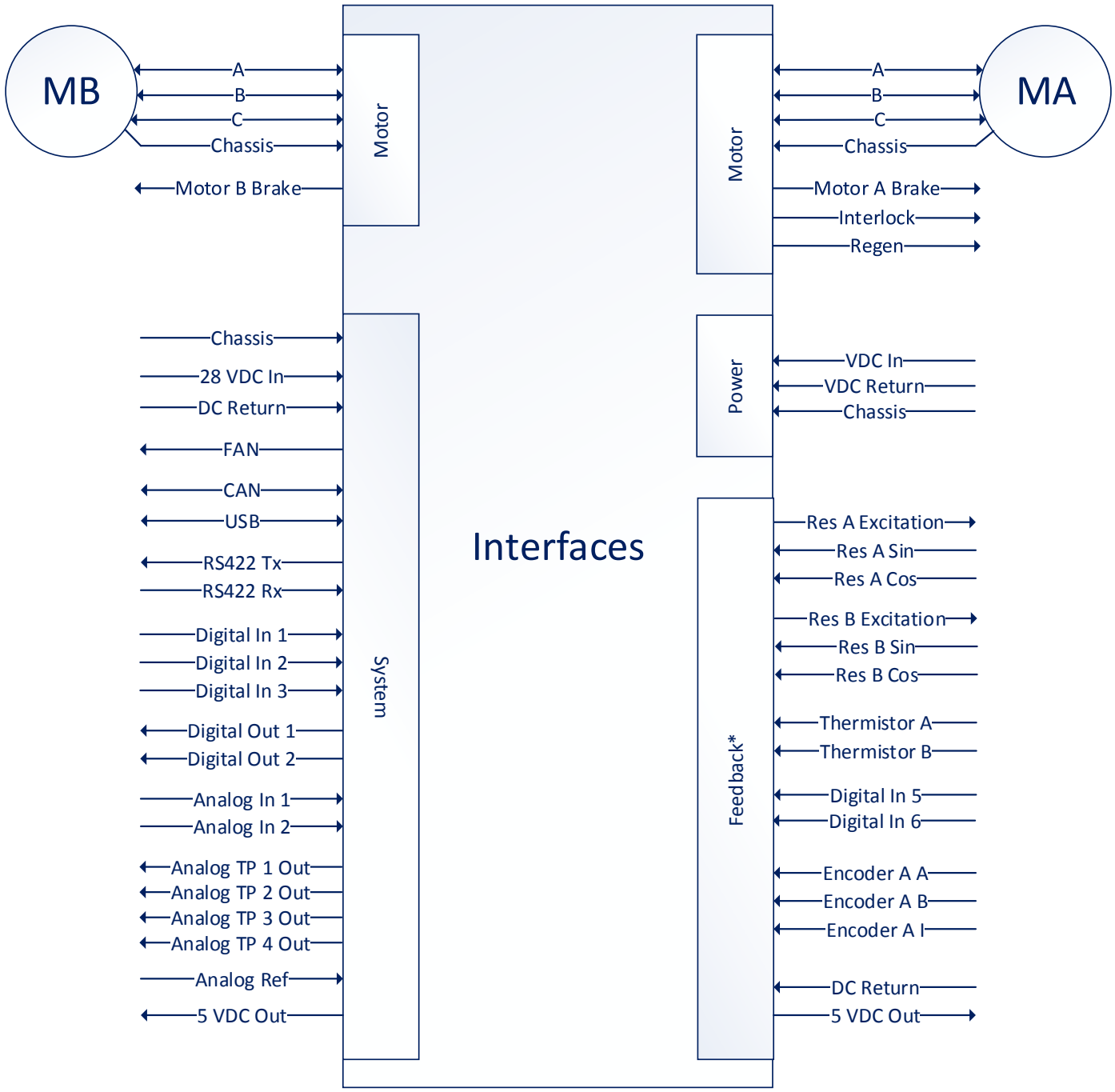
System Diagram



* Dual Resolver Shown

DRAGON SERVO DRIVE SYSTEM DIAGRAM

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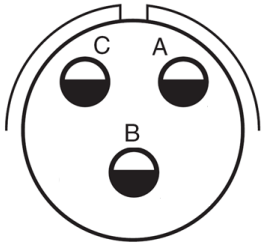
Electrical Interfaces

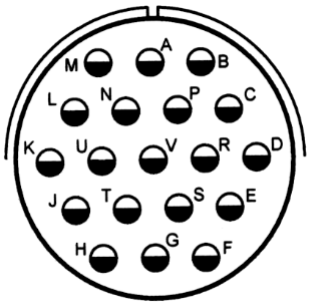
POWER, J1



Power, J1, MS3452L16-10P*		
PIN	**DESCRIPTION**	**CURRENT RATING**
A	Voltage DC In	23
B	Voltage DC Return	23
C	Chassis	23

* Mating connector MS3456L16-10S

MOTOR, J2



Motor, J2, MS3470L24-19S*		
PIN	**DESCRIPTION**	**CURRENT RATING**
A	Motor A Phase A	23
B	Motor A Phase B	23
C	Motor A Phase C	23
D	Chassis	23
E	Regeneration (-)	23
F	Regeneration (+)	23
G	Chassis	23
H	Motor B Phase C**	23
J	Motor B Phase B**	23
K	Motor B Phase A**	23
L	Interlock (+)	23
M	Interlock (-)	23
N	Motor A Brake (-)	23
P	Motor A Brake (+)	23
R	Motor B Brake (-)	23
S	Motor B Brake (+)	23
T	Unused	23
U	Unused	23
V	Unused	23

* Mating connector MS3476L24-19P
** Used in parallel with pins A, B, and C for single Axis drives with continuous current requirements greater than 40 A.

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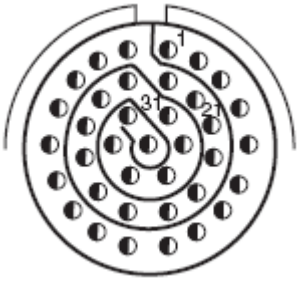
Electrical Interfaces

SYSTEM, J3



System, J3, D38999/20FD35AN*

PIN	DESCRIPTION	WIRE GUAGE
1	Chassis	22-28
2	28 VDC In	22
3	28 VDC In	22
4	Fan Power Out	22-28
5	Digital In 3 (+)	22-28
6	RS422 Tx (+)	22-28
7	RS422 Tx (-)	22-28
8	RS422 Rx (+)	22-28
9	RS422 Rx (-)	22-28
10	Digital In 1 (+)	22-28
11	Digital In 1 (-)	22-28
12	Digital In 2 (+)	22-28
13	Digital In 2 (-)	22-28
14	Analog Reference	22-28
15	Analog In 1 (+)	22-28
16	Analog In 1 (-)	22-28
17	Analog In 2 (+)	22-28
18	Analog In 2 (-)	22-28
19	DC Return	22
20	USB DP	22-28
21	USB DN	22-28
22	USB Vbus	22-28
23	USB Gnd	22-28
24	Digital In 3 (-)	22-28
25	Spare	22-28
26	Spare	22-28
27	Analog Test Point 1 Out	22-28
28	Analog Test Point 2 Out	22-28
29	Analog Test Point 3 Out	22-28
30	Analog Test Point 4 Out	22-28
31	Digital Out 1 (+)	22-28
32	Digital Out 1 (-)	22-28
33	Digital Out 2 (+)	22-28
34	Digital Out 2 (-)	22-28
35	CAN H	22-28
36	CAN L	22-28
37	5 VDC Out**	22-28

* Mating connector D38999/26FD35SN ** 500 mA max. total sum for all pins

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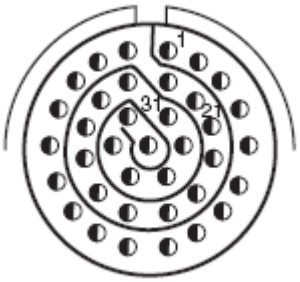
Electrical Interfaces

FEEDBACK, J4



Feedback, J4, D38999/20FD35AA*

PIN	DUAL RESOLVER	DUAL ENCODER	SINGLE RESOLVER AND BiSS-C	WIRE GUAGE
1	Chassis	Chassis	Chassis	22-28
2	Resolver A Excitation (+)	Unused	Resolver A Excitation (+)	22-28
3	Resolver A Excitation (-)	Unused	Resolver A Excitation (-)	22-28
4	Resolver A Sin (+)	Analog In 3 (+)	Resolver A Sin (+)	22-28
5	Resolver A Sin (-)	Analog In 3 (-)	Resolver A Sin (-)	22-28
6	Resolver A Cos (+)	Analog In 4 (+)	Resolver A Cos (+)	22-28
7	Resolver A Cos (-)	Analog In 4 (-)	Resolver A Cos (-)	22-28
8	Resolver B Excitation (+)	Unused	BiSS-C Clock (+)	22-28
9	Resolver B Excitation (-)	Unused	BiSS-C Clock (-)	22-28
10	Resolver B Sin (+)	Analog In 5 (+)	Unused	22-28
11	Resolver B Sin (-)	Analog In 5 (-)	Unused	22-28
12	Resolver B Cos (+)	Analog In 6 (+)	Unused	22-28
13	Resolver B Cos (-)	Analog In 6 (-)	Unused	22-28
14	Thermistor A (+)	Thermistor A (+)	Thermistor A (+)	22-28
15	Thermistor A (-)	Thermistor A (-)	Thermistor A (-)	22-28
16	Thermistor B (+)	Thermistor B (+)	Thermistor B (+)	22-28
17	Thermistor B (-)	Thermistor B (-)	Thermistor B (-)	22-28
18	5 VDC Out**	5 VDC Out**	5 VDC Out**	22-28
19	DC Return	DC Return	DC Return	22
20	Unused	Encoder B A (+)	Unused	22-28
21	Unused	Encoder B A (-)	Unused	22-28
22	Unused	Encoder B B (+)	Unused	22-28
23	Unused	Encoder B B (-)	Unused	22-28
24	Unused	Encoder B I (+)	Unused	22-28
25	Unused	Encoder B I (-)	Unused	22-28
26	Digital In 5 (+)	Digital In 5 (+)	Digital In 5 (+)	22-28
27	Digital In 5 (-)	Digital In 5 (-)	Digital In 5 (-)	22-28
28	Digital In 6 (+)	Digital In 6 (+)	Digital In 6 (+)	22-28
29	Digital In 6 (-)	Digital In 6 (-)	Digital In 6 (-)	22-28
30	5 VDC Out**	5 VDC Out**	5 VDC Out**	22-28
31	DC Return	DC Return	DC Return	22
32	Encoder A A (+)	Encoder A A (+)	BiSS-C Data (+)	22-28
33	Encoder A A (-)	Encoder A A (-)	BiSS-C Data (-)	22-28
34	Encoder A B (+)	Encoder A B (+)	Unused	22-28
35	Encoder A B (-)	Encoder A B (-)	Unused	22-28
36	Encoder A I (+)	Encoder A I (+)	Unused	22-28
37	Encoder A I (-)	Encoder A I (-)	Unused	22-28

* Mating connector D38999/26FD35SA ** 500 mA max. total sum for all pins

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Electrical Characteristics

SIGNAL	MINIMUM	MAXIMUM	UNITS
VDC In	24	610	V
Peak Phase Current	-	2 x Rated Current [7][9]	A
Regeneration	-	15	A
Brakes	-	24	V
Brakes	-	1.5	A
Interlock [1]	1	18	V
28 VDC In	20	33	V
28 VDC In [5]	-	0.3	A
Fan Out	-	24	V
Fan Out	-	1.5	A
Digital In [1]	1	18	V
Digital Out [1]	9	54	mA
Analog In [1]	-10	10	V
Analog In [1]	-	224	K Ohm
Analog Out [1]	-2.5	2.5	V
Analog Out [1]	-	100	Ohm
5 VDC Out	-	500	mA
Resolver Excitation [1]	4.0 [8]	-	V rms
Resolver Sin, Cos, Analog In [1]	2 [8]	3.5	V rms
Resolver Sin, Cos, Analog In [1]	10	5K [8]	Hz
Resolver Sin, Cos, Analog In [1]	-	20	K Ohm
Thermistor [1] [6]	-	1100	Ohm
CAN [1] [3] [4]	-	1000	K bps
RS422 [1] [2] [3]	-	1000	K bps
USB 2.0 [1]	-	12	M bps
Encoder, BiSS-C Data [1]	0	5	V
Encoder, BiSS-C Data [1]	-	120	Ohm
BiSS-C Clock [1]	3	5	V
BiSS-C Clock [1]	-250	250	mA

[1] ESD protection.

[2] Physical Interface compliant to the TIA/EIA-422-B.

[3] Short circuit protection from –7 V to 12 V protection.

[4] Compliant to ISO 11898-2 specification.

[5] No Fan or Brakes.

[6] Recommended NTC 5k, Epcos part # B57540G502F.

[7] Peak Sine Wave

[8] Nominal value

[9] Up to a Maximum of 40 A or 80 A for a parallel configuration

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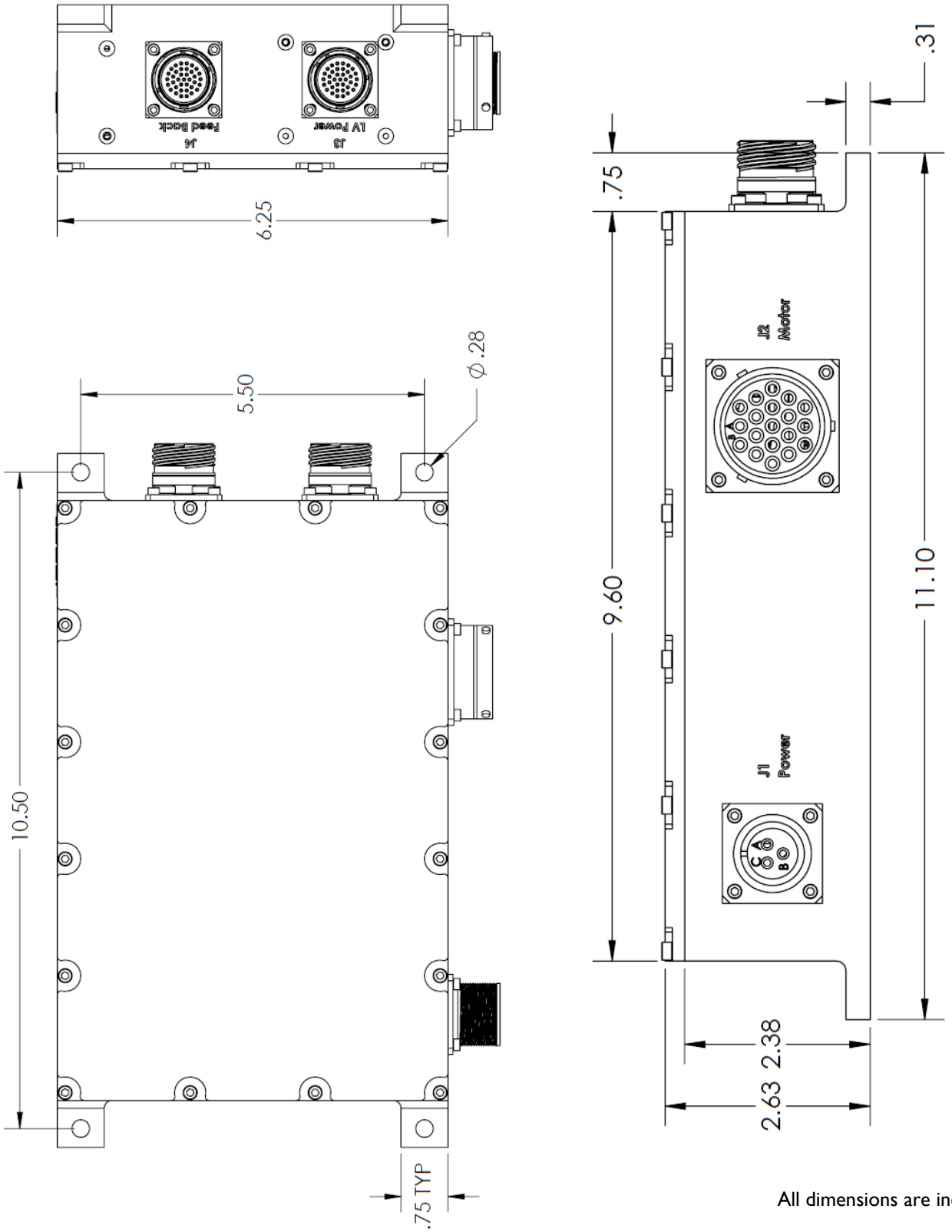
Mechanical



All dimensions are inches.

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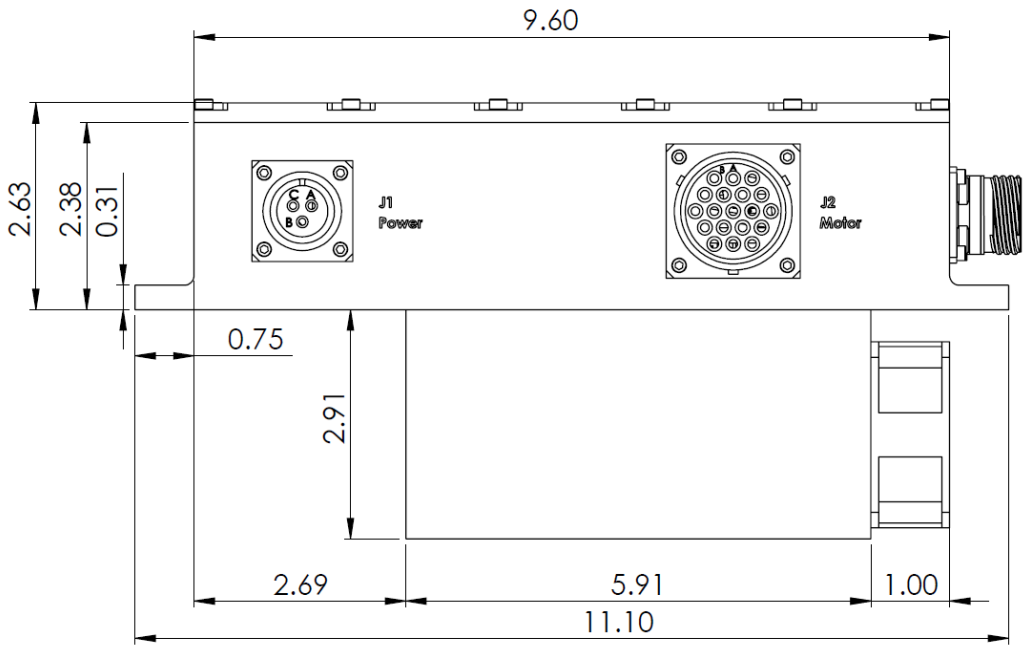

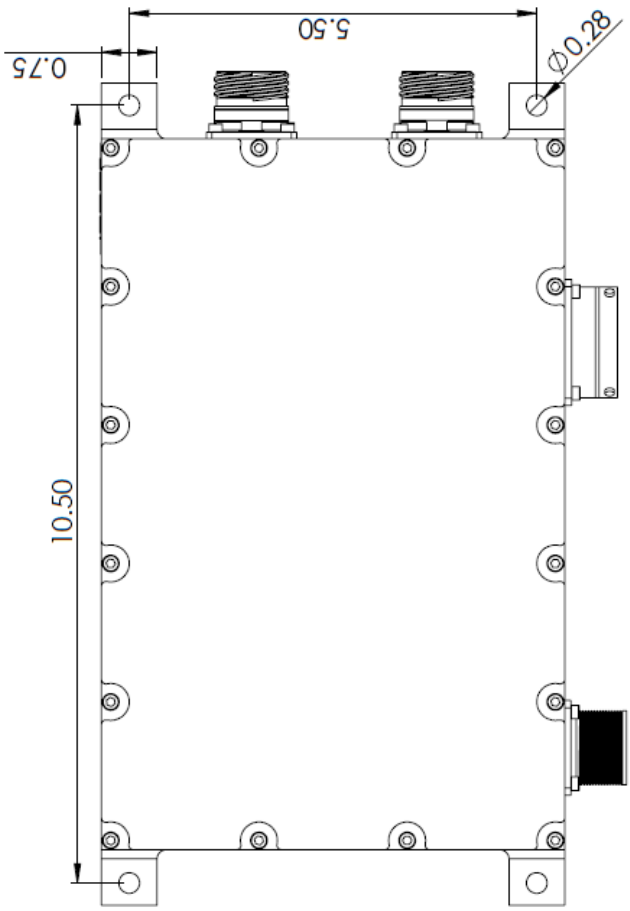

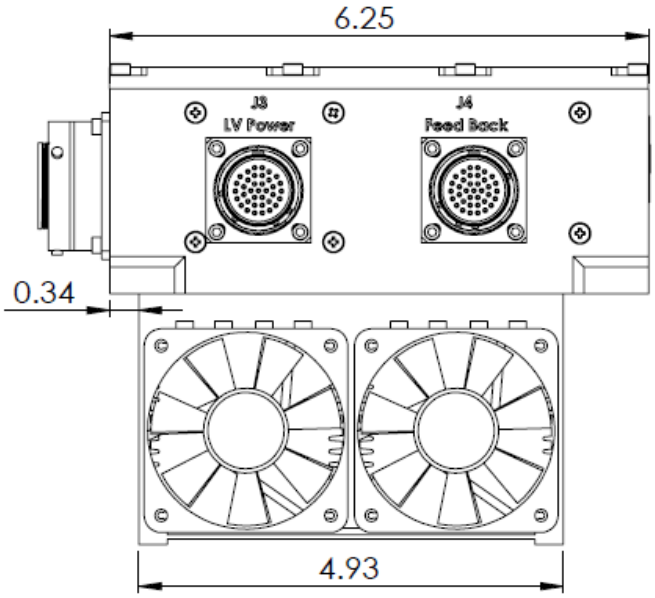

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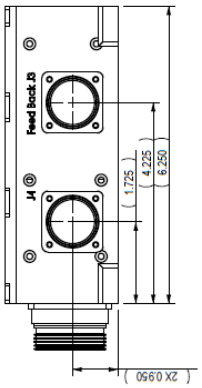

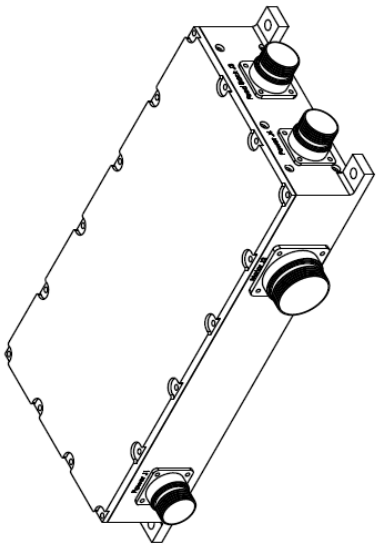

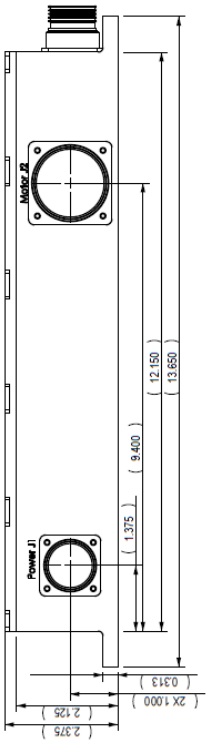

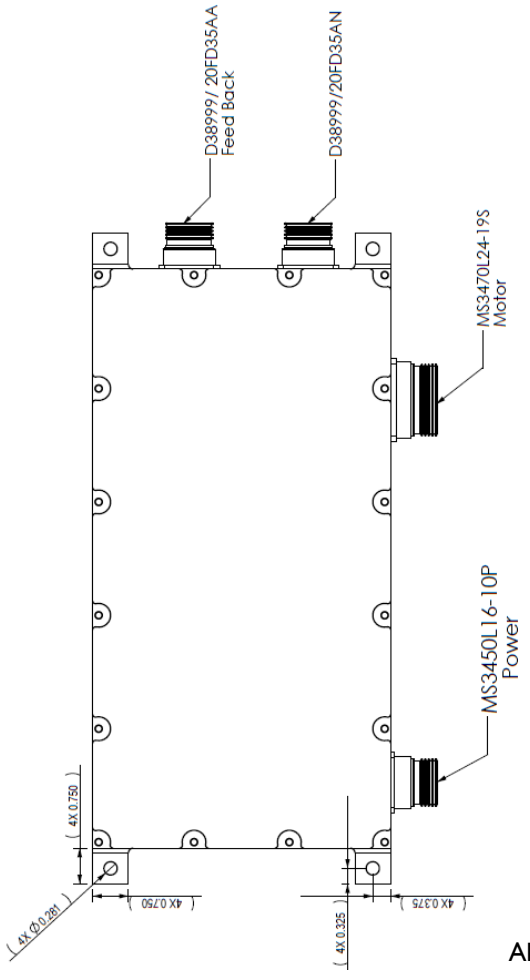

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Ordering Information

D XXA YYYV 1 1 S

Servo Drive	Continuous Current*	Nominal Voltage	Feedback**	Cooling	Configuration
D – Dragon	15 – 15A	025 – 25V	1 – Resolver	1 – Chassis	S – Single Axis
	40 – 40A	050 – 50V	2 – Encoder	2 – Fan	D – Dual Axis
	80 – 80A	100 – 100V	3 – BiSS-C	3 – Liquid	Q – Quad Axis
		300 – 300V	4 – Hall		
		600 – 600V	5 – Resolver + Encoder		
			6 – Resolver + BiSS-C		
			7 – Encoder + BiSS-C		

* Peak Sine Wave
** All Feedback options include Sensorless

Example: Part Number: D40A300V12D

Servo Drive: Dragon

Continuous Current: 40A

Nominal Voltage: 300V

Feedback: Resolver

Cooling: Fan

Configuration: Dual Axis

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