

 **ESI MOTION™**



**Servo Drives & Control Systems**



ESI Motion delivers high-performance **servo drive technology** for harsh environments. We offer both off-the-shelf and modified high performance, rugged servo drive and control system solutions for defense and commercial applications.

### CORE COMPETENCIES

- Servo Drive Assemblies & Modules
- Control Systems
- Energy Recovery Systems
- Stabilization & Actuator Systems
- Power Conversion & EMI Filters
- Engineering Services

#### Industry Standards

- DO-160
- DO-178
- DO-254
- MIL-STD-810
- MIL-STD-1472
- MIL-STD-1275
- MIL-STD-704
- MIL-STD-461
- MIL-STD-464
- MIL-C-5541
- MIL-C-5015
- IP67

### ENGINEERING CAPABILITIES

- Requirements development
- Hardware & software modifications
- Program design reviews
- System-level integration
- On-site support
- DFAR/FAR compliance
- Mean Time Between Failure (MTBF)
- EMI conductive & susceptibility
- Environmental screening & verification
- Radiation testing
- Product qualification

### DIFFERENTIATORS

- **High-power density** - for demanding requirements
- **Reliable** - fielded & proven on numerous programs
- **Compact** - 2-10x smaller & lighter modular designs
- **Configurable** - multiple power & packaging options
- **Seamless Integration** - real-time GUI data capture
- **Rapid prototyping** - compresses concept to production time
- **Rugged** - ability to withstand harsh environments
- **AS9100D certified**

### NAICS CODES

- 335314 - Relay & Industrial Control manufacturing
- 334419 - Other Electronic Component Manufacturing
- 335999 - Other Miscellaneous Electrical Equipment & Manufacturing
- 336992 - Military Armored Vehicle, Tank & Tank Component Manufacturing
- 336411 - Aircraft Manufacturing
- 541330 - Engineering Services
- 336415 - Transportation Equipment Manufacturing
- 336419 - Guided Missile and Space Vehicle Parts & Auxiliary Equipment Manufacturing

### CLIENTS



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## Mission. Done. Together.

ESI Motion, founded in 2004 by an American family, is a global leader in high-performance servo drive technology, specializing in harsh environments and mission critical applications. Our products are used in defense and commercial ground vehicles, aerospace, space, naval defense and maritime applications, unmanned systems, traditional and alternative energy and other specialized industries.

ESI Motion management blends together cutting-edge modular servo drive technology with world-class best practices and execution. From the start, we have been committed to working in collaboration with our partners and stakeholders to deliver the highest quality products and services to our clients.

ESI Motion follows strict AS9100D quality management and documentation processes, six sigma process improvement methodology and industry standard project management practices.

These practices along with ESI Motion's highly specialized technology allow us to consistently deliver on-time, high-quality products that exceed client expectations.



ESI Motion, 2250-A Union Place, Simi Valley, CA 93065

P: 800.823.3235 E: [sales@esimotion.com](mailto:sales@esimotion.com)

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## High Performance Motor Control Systems

ESI Motion designs and manufactures high-performance, versatile servo drives and modules for specialized industrial applications and extreme environments.

ESI Motion understands the need for **dependable**, rugged and high-performance servo drive modules in mission critical motor control systems. Our engineers have invested many hours designing, testing and refining some of the most **compact**, high-performance servo drives and power modules in the industry. All our drives and modules are designed for maximum power, accuracy and reliability while minimizing space and weight. From **extreme temperature and harsh environments** to low-temperature or high-pressure, our drives are designed to perform.

### Precise, Detailed Motor Control

Servo drives direct motors to a set position, continually check the position using sensors and adjusts accordingly. ESI's servo drives are used in defense and commercial ground vehicles, aerospace, space, naval defense and maritime applications, unmanned systems, energy and other specialized industries. They provide a critical role to exert detailed and **precise control** for an attack helicopter turret, robotic arm positioner, airborne antenna stabilizer, radar system or other motor-controlled system.



	Proton	Atom	Mite	Mite	Rogue	Scorpion	Nova
Specifications	Single-Axis	Dual-Axis	Single-Axis	Dual-Axis	Single or Dual Axis	Single-Axis	Single or Dual Axis
<b>Bus Voltage (DC)</b>	75V	8V - 80V	10V - 170V	10V - 170V	28V	24V - 610V	28V
<b>Peak Motor Current</b>	50A	Up to 100A	Up to 40A	Up to 80A	20A	Up to 80A	Up to 6A per axis
<b>Output Power</b>	1000 W	7700 W	2kW	2kW	500W	24kW	100 W (per Axis)
<b>Temperature</b>	-55°C to 100°C Aerospace -40°C to 85°C Industrial -30°C to 60°C Commercial	-55°C to 100°C Aerospace -40°C to 85°C Industrial -30°C to 60°C Commercial	-40°C to 71°C -55° to 100°C (Extended)	-40°C to 71°C -55° to 100°C (Extended)	-40°C to 71°C -55° C to 100 C (Optional Extended)	-40°C to 71°C -55° to 100°C (Extended)	-40°C to 71°C
<b>Electrical Speed</b>	Up to 75,000RPM	Up to 75,000RPM	Up to 75,000RPM	Up to 75,000 RPM	Up to 75,000 RPM	Up to 75,000 RPM	Up to 75,000 RPM
<b>Weight</b>	0.58 oz	1.9 oz (53.9g)	1.9 oz (53.9g)	3.7 oz (105g)	2.9 lbs.	1 lb. (453g)	2 lbs. (907.2g)
<b>Size</b>	1.46" L x 1.46" W x 0.73" H	1.8" L x 1.3" W x 0.3" H	2.0" L x 1.8" W x 0.8" H	2.0" L x 3.0" W x 0.6" H	5.86" L x 4.86" W x 2.725" H	2.6" L x 4.0" W x 1.8" H	4.0" W x 3.5" L x 1.9" H

Our dual-axis Mite servo drive module packs **unrivaled power density** in 3.7oz or 105g, less space than a deck of cards. Our ultra-compact single-axis Mite is smaller than a matchbox. For more robust applications, the Scorpion module offers even more power in compact and durable packaging.

### Fully Integrated Modular Systems

Our integrated modular systems combine all critical functions into a single unit that is both lightweight and rugged. We offer multiple configurations for each line that can be suited to various environmental conditions including high-temperature, high-voltage and high-speed applications. Each line can be further modified based on your specific needs or used as a **turnkey solution**.

### Ruggedized Servo Drives

Designed for defense and specialized applications, our fully integrated servo drive line offers the most **robust configurations**. Available with military grade connectors and submersible cases, the Dragon, Vulcan and Roadwind lines offer lightweight, versatile “plug-and-play” capabilities for rapid deployment and integration. For systems that demand **adaptable drives** that can still function in High-speed and high-temperature environments, our Wolverine Line achieves the perfect balance of efficiency, configurability and reliability. These **“plug-and-play”** servo drives offer a wide range of configurations, shock and vibration resistance and incredible speed and temperature tolerance. When projects have specific needs for both high-speed and high-power, our Hyperion really excels! Used on Formula One and other high-power applications, these drives are a true engineering achievement and deliver incredible power, compact size and weight.

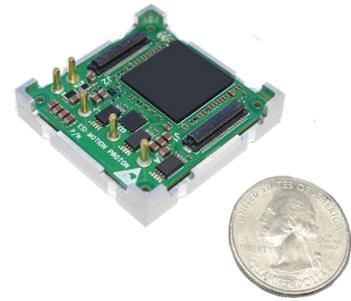


	Wolverine	Dragon	Draco	Vulcan	Roadwind	Hydra	Zeus	Hyperion
Specifications	Configurable	Versatile	Light-Weight	High-Temp	High-Speed	High-Power	High-Power	High-Power
<b>Bus Voltage (DC)</b>	Variable	24V - 610V	300V, 600V	24V - 610V	12V - 150V	48V - 600V	48V - 600V	400V - 800V
<b>Peak Motor Current</b>	Variable	Up to 80A	Up to 120A	Up to 65A	Up to 200A	Up to 50A	Up to 180A	125A - 250A
<b>Output Power</b>	Variable	12kW	36kW	12kW	15kW	20kW	75kW	100kW
<b>Temperature</b>	Variable	-40°C to 71°C	-40°C to 71°C -55° C to 100 C (Optional Extended)	-40°C to 121°C	-40°C to 71°C	-40°C to 85°C (Optional 105°C)	-40°C to 85°C (Optional 105°C)	-40°C to 75°C
<b>Electrical Speed</b>	Variable	Up to 75,000 RPM	Up to 75,000 RPM	Up to 75,000 RPM	Up to 300,000 RPM	Up to 75,000RPM	Up to 75,000RPM	Up to 240,000 RPM
<b>Weight</b>	Variable	From 6.4 lbs. (2.9 kg)	4.5 lbs.	11.5 lbs. (5.2kg)	8.1 lbs. (3.7 kg)	15.5 lbs. (7 kg)	Single Axis <25 lbs. (x kg) Dual Axis xx lbs. (x kg)	9.8 lbs. (3.5kg)
<b>Size</b>	8.8" L x 6.3" W x 2.4" H	11.3" L x 7.0" W x 2.7" H	9.38" L x 6.26" W x 2.6"H	16.3" W x 6.3" L x 3.0" H	13.8" L x 7.0" W x 3.1" H	9.5" L x 5.8" W x 4.4" H	S. 8.0" L x 8.7" W x 5.1" H D. x.x" L x x.x" W x x.x" H	10.3" L x 5.9" W x 4.0" H

# PROTON

## Single Axis Servo Drive Module

### *Industry-Leading* Ultra-Low Weight & Compact Size

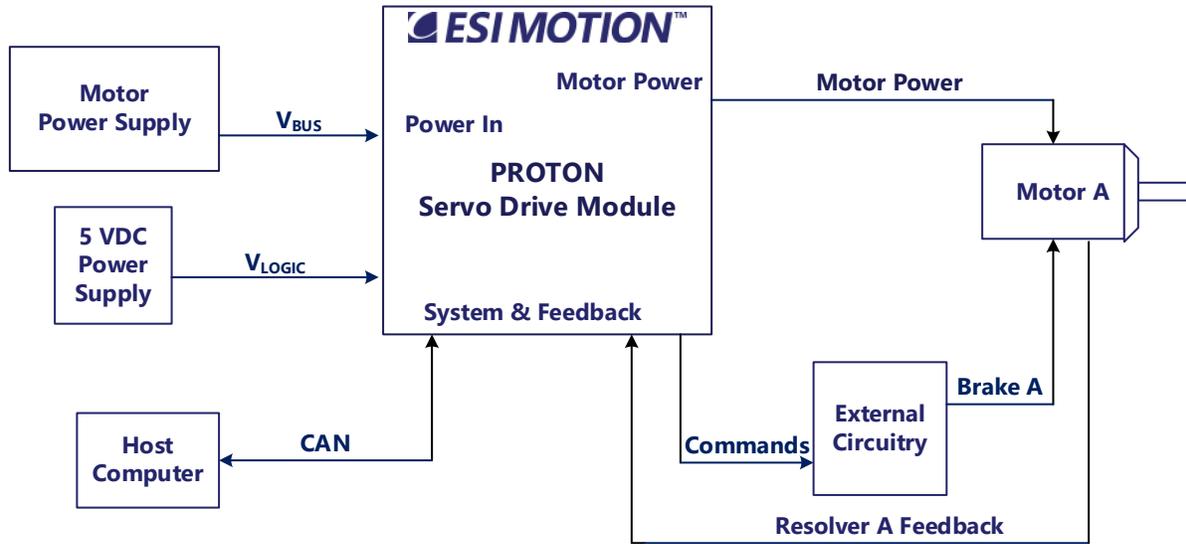


ESI Motion's Proton leads the industry with its *extremely small size and low weight*. The Proton is a high-performance digital servo controller that can source 50 Amps with an 80 VDC bus to drive the most demanding applications.

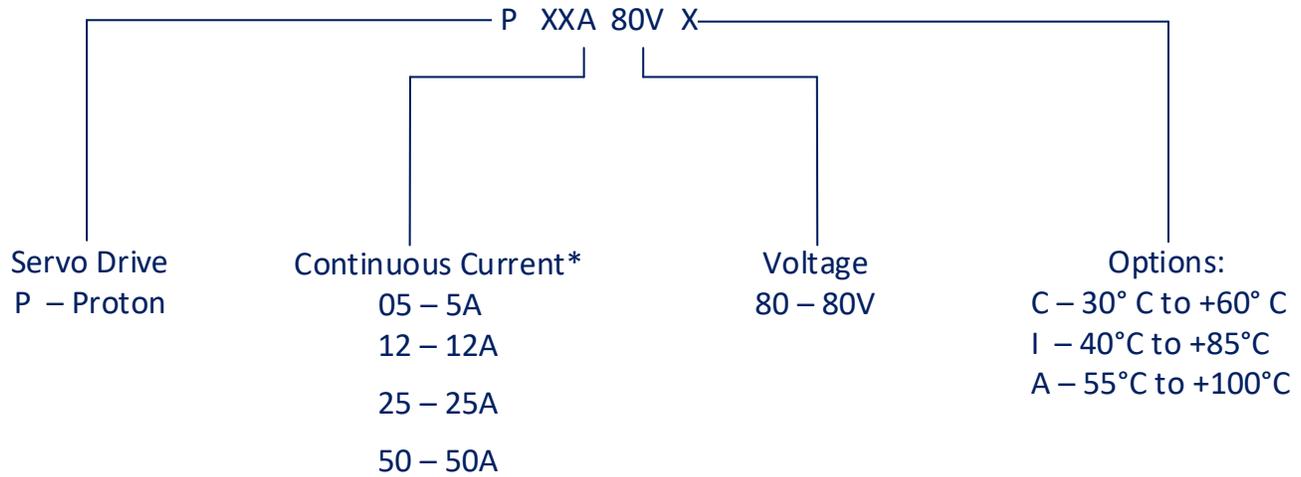
#### Key Features

- Bus Voltage Range: 8VDC – 80VDC
- 50 Amps Continuous Motor Current
- 30 Amps Continuous Output Current Without Heatsink
- Max Output power: 3850W (80 VDC Bus, Motor Current 50 Amps peak-of-sin)
- Wide Operating Temperatures:
  - - 55°C to 100°C - Aerospace
  - - 40°C to 85°C – Industrial
  - - 30°C to 60°C - Commercial
- Fully Digital High-Performance Drive
- 40 kHz PWM Frequency Offered Standard (Consult factory for PWM frequencies up to 100 kHz)
- Multiple Feedbacks Included
  - Dual Resolver
  - Dual Quadrature Encoder
  - Dual BiSS-C
  - Dual HALL
  - Sensorless
- Communication Interfaces
  - CAN
  - RS-422
- CANOpen and EtherCAT (Coming Soon)
- MIL-STD-883 Temperature/Vibration Acceptance Available
- Size: 37.1mm x 37.1mm x 10.4mm (1.47" x 1.47" x 0.41")
- Weight: 16.72g (0.59 oz)
- Torque, Velocity, or Position control
- Embedded Motion Controller, Coordinated Motion single Axis
- Configurable, user-friendly GUI with Integrated Oscilloscope
- 5 Digital IO
- Compliant to IPC-610 Class II (Class III available)
- Chassis-cooled
- I/O Board available
- Customizable Solutions (Including Radiation Tolerant)

**Typical Proton Application:**



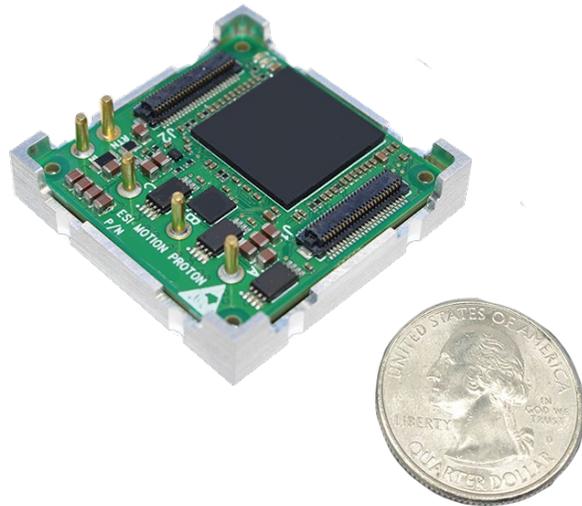
## Ordering Information



\* Peak Sine Wave, per module

### Example

Part Number: P50A80VA  
 Servo Drive: Proton  
 Continuous Current: 50 Amp Total  
 Max Bus Voltage: 80 V  
 Temperature Range: -55 to 100C



## Accessories

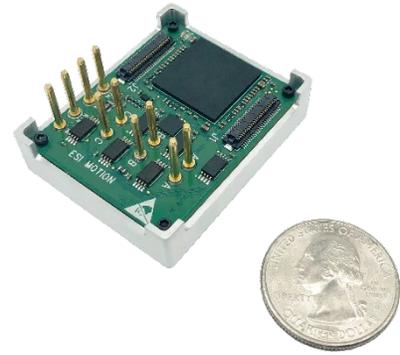
PART NUMBER	MANUFACTURER	DESCRIPTION
600333-00	ESI Motion	Proton IO Board – Converts the Proton into a stand-alone unit.
500208-00	ESI Motion	Connector Kit – Mating Connectors for Single Motor
IPEH-002021	Peak Systems	USB-to-CAN Adapter (Required for PC Interface)
GC-CAN-TERM-GC	GRID CONNECT	DB9 CAN Termination

# ATOM

## Dual Axis Servo Drive Module

### *Industry-Leading*

### Ultra-Low Weight & Compact Size

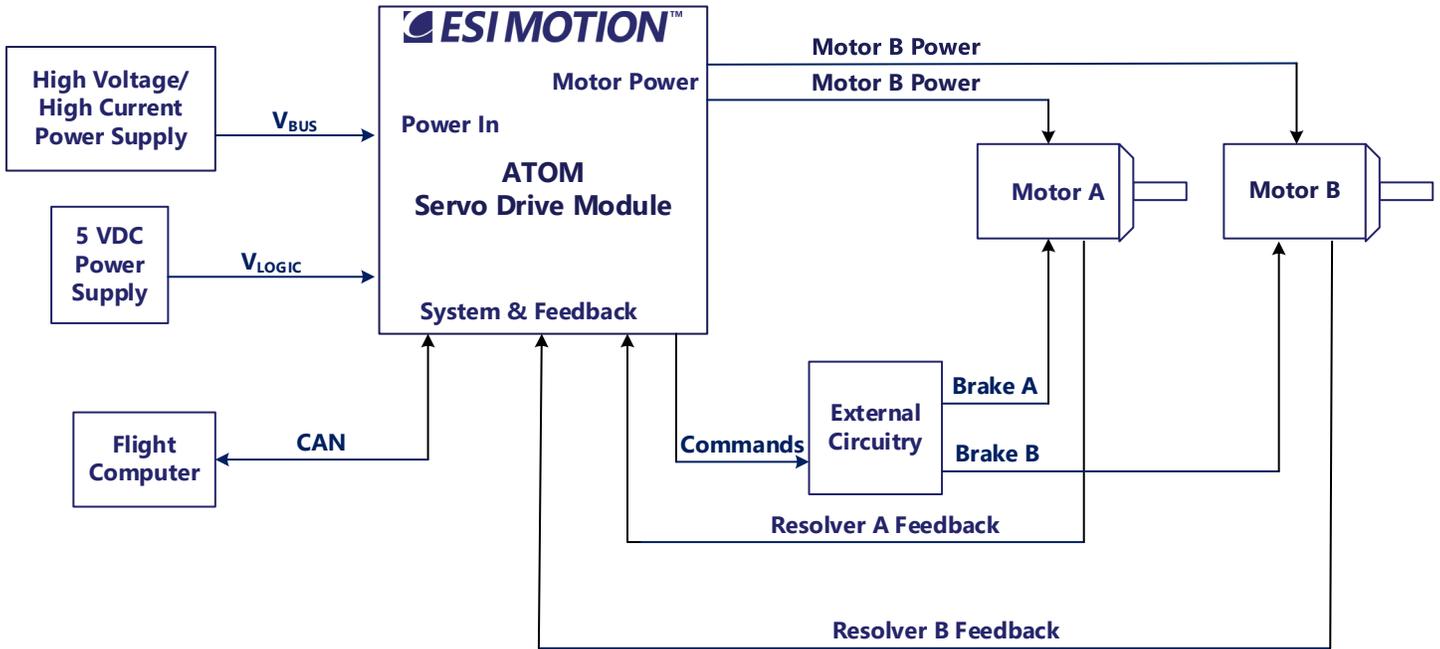


ESI Motion's Atom leads the industry with its *extremely small size and low weight*. The Atom is a high-performance digital servo controller that can source 100 Amps with an 80 VDC bus to drive the most demanding applications.

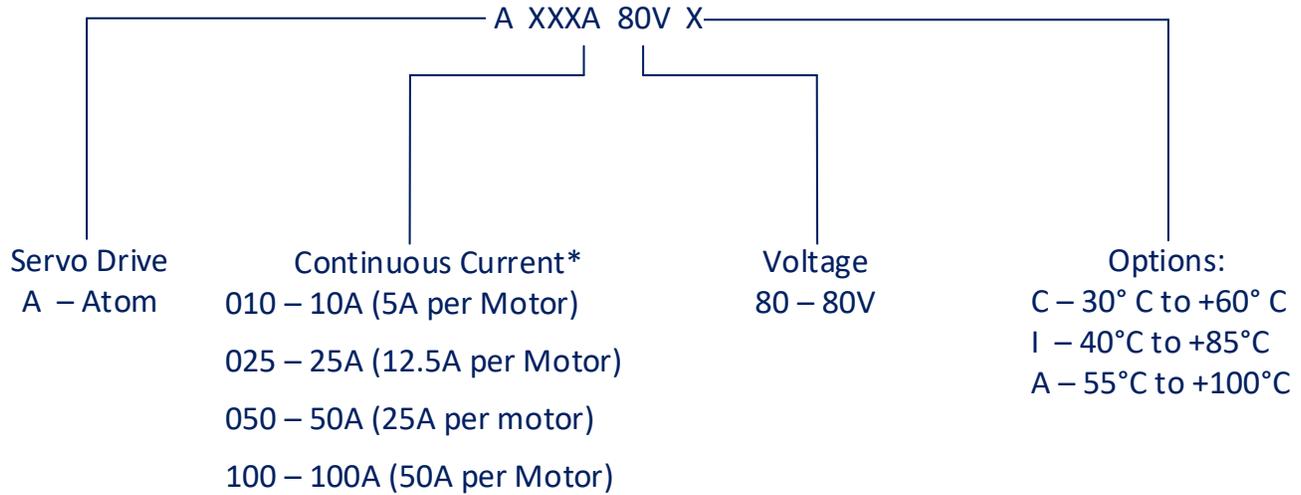
#### Key Features

- Bus Voltage Range: 8VDC – 80VDC
- 100 Amps Continuous Motor Current
- 30 Amps Continuous Output Current Without Heatsink
- Max Output power: 7700W (80 VDC Bus, Motor Current 100 Amps peak-of-sin)
- Wide Operating Temperatures:
  - - 55°C to 100°C - Aerospace
  - - 40°C to 85°C – Industrial
  - - 30°C to 60°C - Commercial
- Fully Digital High-Performance Drive
- 40 kHz PWM Frequency Offered Standard (Consult factory for PWM frequencies up to 100 kHz)
- Software Configurable to drive a Single Motor or two Independent Motors
- Multiple Feedbacks Included
  - Dual Resolver
  - Dual Quadrature Encoder
  - Dual BiSS-C
  - Dual HALL
  - Dual Sensorless
- Communication Interfaces
  - CAN
  - RS-422
- CANOpen and EtherCAT (Coming Soon)
- MIL-STD-883 Temperature/Vibration Acceptance Available
- Size: 45.5mm x 37mm x 10.7mm (1.79" x 1.46" x 0.42")
- Weight: 53.9g (1.9 oz)
- Torque, Velocity, or Position control
- Embedded Motion Controller, Coordinated Motion 2+ Axis
- Configurable, user-friendly GUI with Integrated Oscilloscope
- 5 Digital IO
- Compliant to IPC-610 Class II (Class III available)
- Chassis-cooled
- I/O Board available
- Customizable Solutions (Including Radiation Tolerant)

## Typical Atom Application:



## Ordering Information



\* Peak Sine Wave, per module

### Example

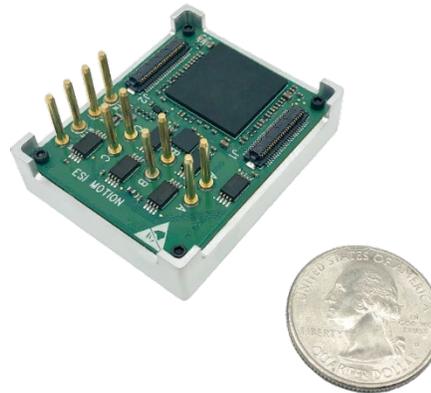
Part Number: A100A80VA

Servo Drive: Atom

Continuous Current: 100 Amp Total

Max Bus Voltage: 80 V

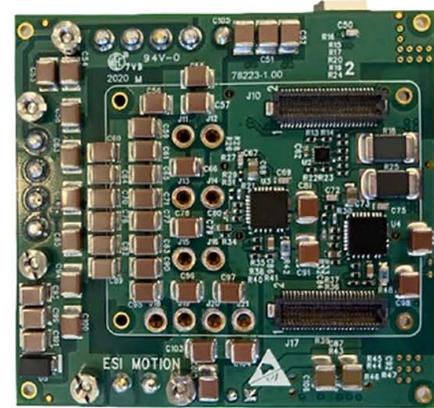
Temperature Range: -55 to 100C



## Accessories

PART NUMBER	MANUFACTURER	DESCRIPTION
600333-00	ESI Motion	Atom IO Board – Converts the Atom into a stand-alone unit.
500208-00	ESI Motion	Connector Kit – Mating Connectors for Single Motor
500203-00	ESI Motion	Connector Kit – Mating Connectors for Dual Motor
IPEH-002021	Peak Systems	USB-to-CAN Adapter (Required for PC Interface)
GC-CAN-TERM-GC	GRID CONNECT	DB9 CAN Termination

# I/O Board for the Atom Servo Drive Module

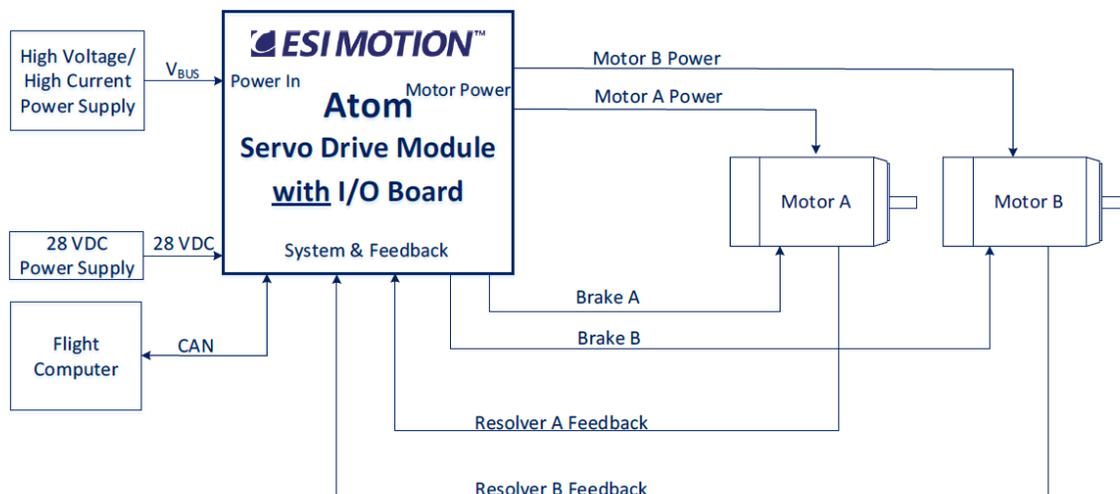


The Atom I/O Board is an optional circuit board that can be purchased along with the Atom Servo Module. The I/O Board provides the user with a platform that can be used for system development, prior to the design of a user-defined board that will mate with the Atom Servo Drive Module. The I/O Board provides all the connections necessary for motor control. Signals are arranged by connector into three groups: J3 Motor A Feedback, J4 System, and J6 Motor B Feedback. Voltages are:  $V_{BUS}$  Input Power on J8, 28VDC IN on J4, and Motor A & B Power Outputs on J2 and J5, respectively.

Refer to ESI Document 100282-00, *Atom Datasheet* for the electrical characteristics of signals and voltages. A 5V regulator on the I/O Board is used to power both the Atom Servo Module controller ( $V_{LOGIC}$ ) and external motor feedback devices (up to 0.5A). The I/O Board is designed to work with Main Power (VDC\_IN) from 10V to 90V.

## Key Features

- Facilitates fast initial integration and lab test
- Dual-axis (Motor A & Motor B)
- Standard connectors for:
  - VDC\_IN
  - Motor A & B Power Outputs
  - Motor A & B Feedback
  - System (incl. Communications and 28VDC In)
  - Brakes
- 5V and 3.3V Power LED Indicators
- Size: 2.2" L x 2.3" W x 0.5" D
- Brake drivers (it accepts TTL brake commands from the Atom and provides outputs to drive brakes)

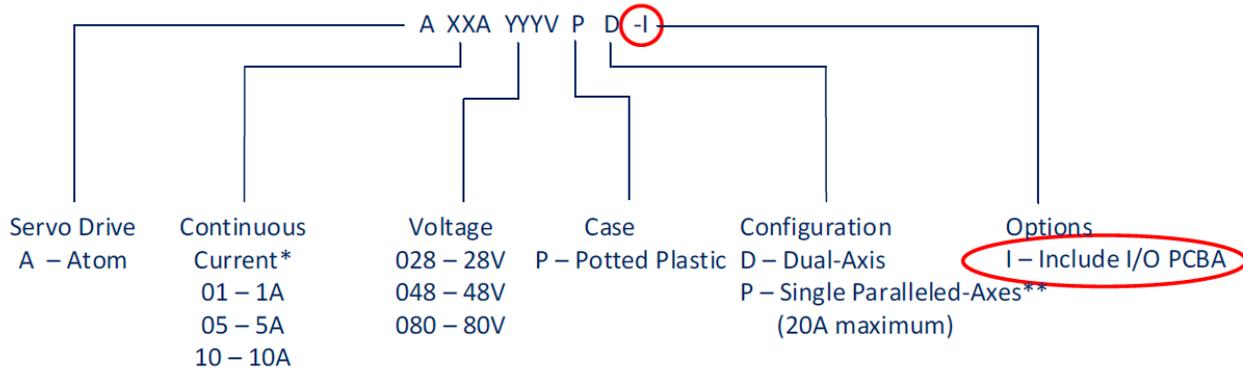


## Ordering Information

The ESI Motion Atom Servo Module ordering information chart is shown below.

For an Atom including the I/O Board, please add the -I option shown below.

For a stand-alone purchase of the Atom I/O Board, please contact ESI Motion at [Sales@ESIMotion.com](mailto:Sales@ESIMotion.com).

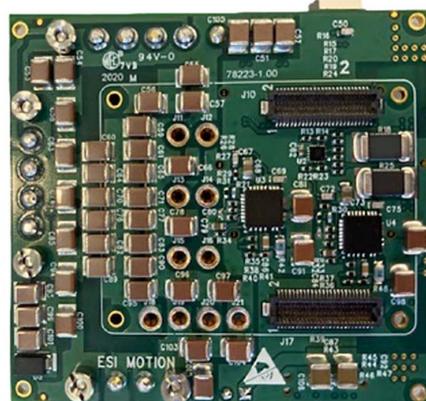


\* Peak Sine Wave, per axis

\*\* Paralleled Axes rated to 2 x Continuous Current

Current and Voltage values are nominal, refer to the Installation Manual for the full operational range.

Example: Part Number: A10A028VPD-I  
 Servo Drive: Atom  
 Continuous Current: 10A  
 Nominal Voltage: 28V  
 Case: Potted Plastic  
 Configuration: Dual-Axis  
 Options: Include I/O PCBA



## MITE SERVO DRIVE MODULE DATASHEET



### ESI Motion's Mite Series is the latest innovative solution in our servo drive module portfolio.

The Mite Series is available in single axis, dual axis or paralleled axis.

This extremely lightweight controller has a configuration option which makes this the only dual axis drive of this complexity on the market today.

The Mite incorporates our rugged controller and power driver modules, offers many feedback options and is packaged in a potted plastic case.

This versatile servo drive line is ideal for precision military, aviation, automotive, robotic and specialized industrial applications where size and weight are critical.



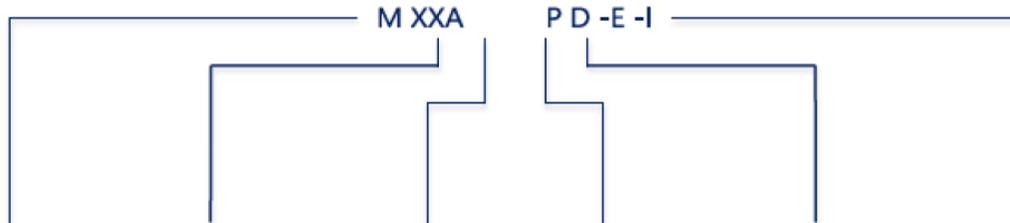
### Specifications & Features:

- Bus Voltage (DC) 10V to 170V
- Peak Current up to 80A
- Output Power 2kW
- Operating Temperature - 40°C to 71°C
  - Extended -55°C to 71°C (optional)
- Maximum Electrical Speed 75,000 RPM
- Weight 1.9oz./53.9g (Single) 3.7oz./105g (Dual)
- Size:
  - Single: 2.0" L x 1.8" W x 0.8" H
  - Dual: 2.0" L x 3.0" W x 0.6" H
- Independent dual axis configuration option
- Light weight and efficient
- Torque, velocity or position control
- Configurable, user friendly GUI with integrated oscilloscope feature

### Configurations:

- Motor Types: DC brushless, brushed and induction
- Feedback: sensorless, encoder, resolver, hall and BiSS-C
- Cooling Options: Chassis
- Packaging: Potted plastic case

# Ordering Information



Servo Drive	Continuous Motor Current*	Voltage	Case	Configuration	Options
M – Mite	01 – 1A 02 – 2A 05 – 5A 10 – 10A 20 – 20A 40 – 40A	012 – 12V 028 – 28V 048 – 48V 075 – 75V 170 – 170V	P-Potted Plastic	S – Single Axis D – Dual Axis P – Single Paralleled Axes** (80A maximum)	- E Extended Operating Temperature - I Include I/O PCBA

\* Peak Sine Wave

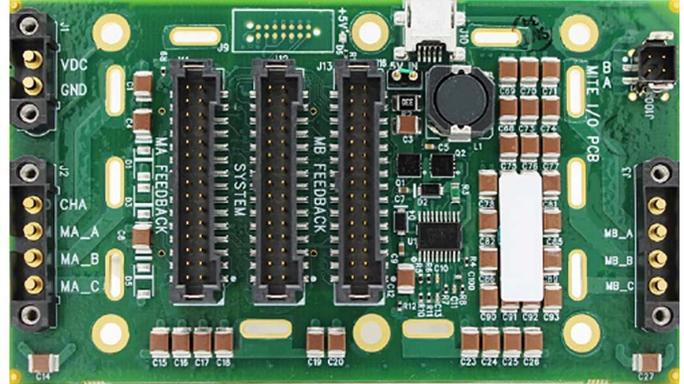
\*\* 2 X Continuous Current

Current and Voltage values are nominal, refer to the Installation Manual for the full operational range.

Example: Part Number: M10A048VPD-E-I  
 Servo Drive: Mite  
 Continuous Current: 10A  
 Nominal Voltage: 48V  
 Case: Potted Plastic Configuration: Dual Axis  
 Options:  
 -Extended Operating Temperature  
 -Include I/O PCBA



# I/O Board for the Dual-Axis Mite Servo Drive Module (Brake Driver Version)



The Mite I/O Board is an optional circuit board that may be purchased in addition to the Mite Servo Drive Module. The I/O Board provides users with a platform to use for system development that will mate with the Mite Servo Drive Module prior to the design of a user-defined board. The Mite I/O Board provides all connections necessary for motor control, with convenient lab environment connectors for each signal and voltage group (see page 2).

Refer to the Mite Datasheet (ESI Document 100236) for the electrical characteristics of each signal and voltage.

A 5V regulator is used on the I/O Board to power both the Mite Servo Drive Module controller ( $V_{LOGIC}$ ) and external motor feedback devices (up to 2.5A).

Note: An I/O board that will be used with VDC\_IN ( $V_{BUS}$ ) greater than 75V requires the 5V regulator to be disabled. An I/O Board purchased with a Mite Servo Drive Module that is rated for 170V will already have the 5V regulator disabled. In this case, a separate 5V input voltage must be supplied.

## Key Features:

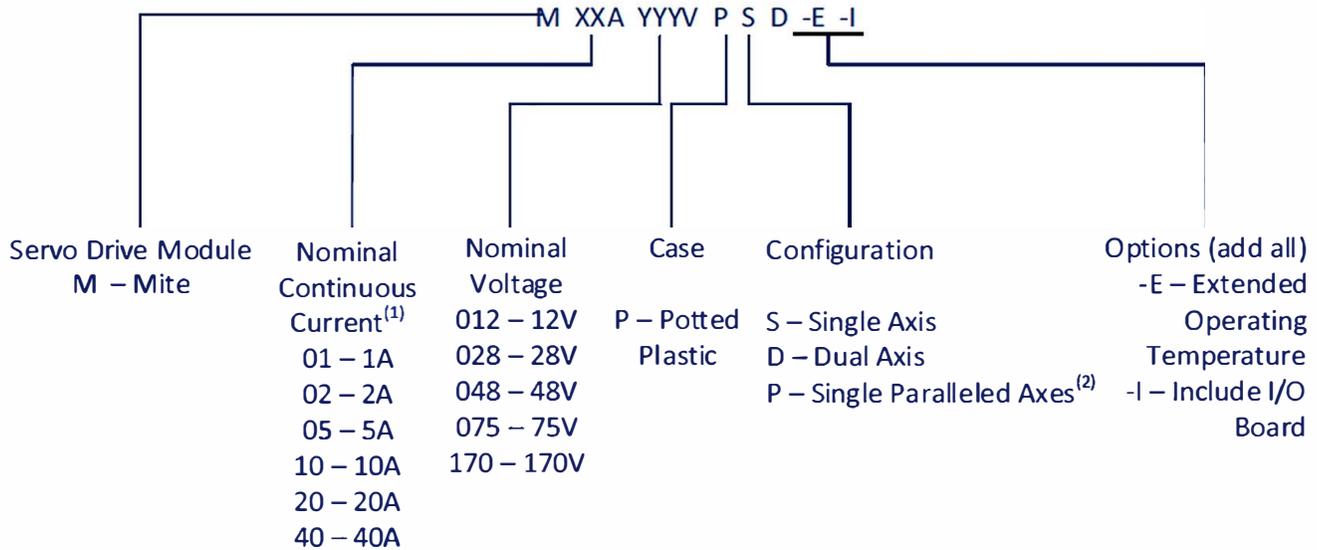
- Facilitates fast initial integration and lab testing
- Dual-axis (Motor A & Motor B)
- Standard connectors for:
  - VDC\_IN
  - Motor A & B Power Outputs
  - Motor A & B Feedback
  - System / Communications
  - Brakes
  - USB
- Single power supply connection (For  $\leq 75V$  use, VDC\_IN provides power to both  $V_{BUS}$  and  $V_{LOGIC}$ ; for  $>75V$ , a separate 5V supply is required)
- 5V Power LED Indicator
- Size: 4" L x 2.3" W x 0.35" D
- Brake drivers (accept TTL brake commands from the Mite and provides outputs to drive brakes)

## Ordering Information

The ESI Motion Mite Servo Module ordering information chart is shown below.

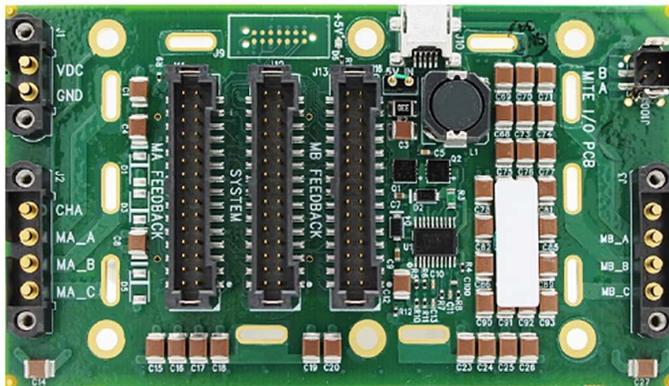
For a Mite including the I/O Board, please add the -I option shown below.

For a stand-alone purchase of the Mite I/O Board, please contact ESI Motion at [sales@esimotion.com](mailto:sales@esimotion.com).



- 1) Peak Sine Wave, per axis
- 2) 2 x Continuous Current (80A Maximum)

Example: Part Number M40A028VPS-E-I  
 Servo Drive Module: Mite  
 Continuous Current: 40A  
 Nominal Voltage: 28VDC  
 Case: Potted Plastic  
 Configuration: Single Axis  
 Extended Operating Temperature  
 Include I/O Board



## SCORPION SERVO DRIVE MODULE DATASHEET



### ESI Motion's Scorpion is an extreme high-power density servo drive module.

This exceptionally lightweight efficient controller is one of the smallest high-power drives on the market today. At 24kW the Scorpion is capable of performing in demanding applications and incorporates our rugged controller and power drive modules, offers multiple feedback options and is packaged in a potted plastic case.



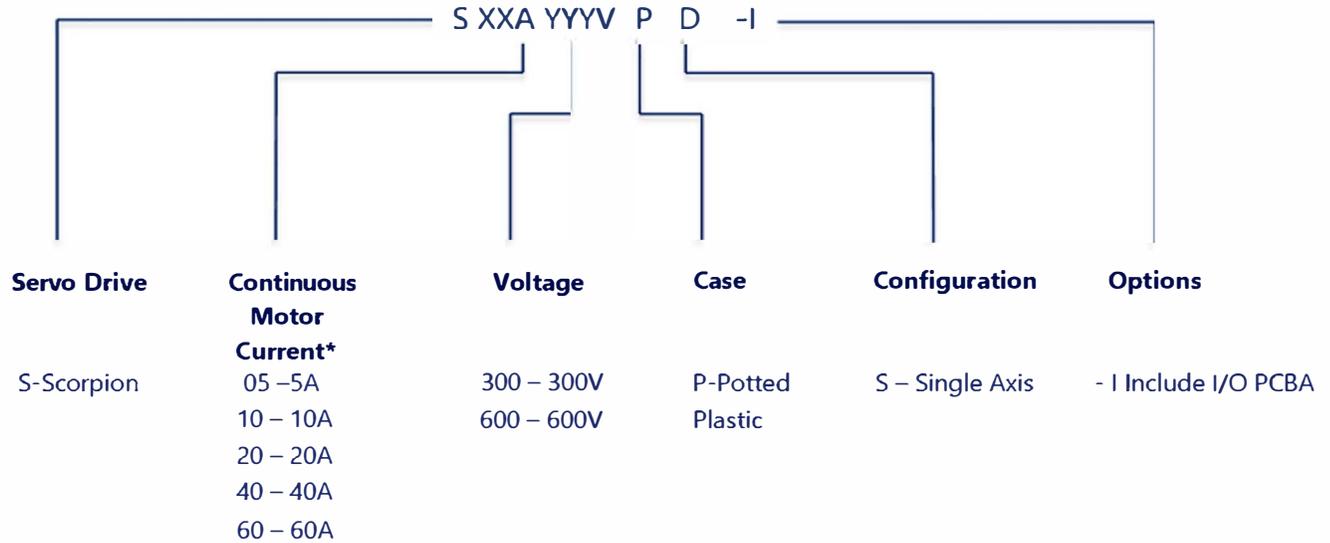
### Specifications & Features:

- Bus Voltage (DC) 24V to 610V
- Peak Current 80A
- Output Power 24kW
- Operating Temperature - 40°C to 71°C
  - Extended -55°C to 100°C (optional)
- Maximum Electrical Speed 75,000 RPM
- Weight 1 lb./453g
- Size: 2.6"L x 4.0"W x 1.8"H
- Single axis configuration
- Operational vibration +/- 20g
- Light weight and efficient
- Torque, velocity or position control
- Configurable, user friendly GUI with integrated oscilloscope feature

### Configurations:

- Motor Types: DC brushless, brushed and induction
- Feedback: sensorless, encoder, resolver, hall, BiSS-C and EnDAT
- Cooling Options: Chassis
- Packaging: Potted plastic case

# Ordering Information



\* Peak of sine wave

**Example:**

**Part Number: S40A600VPS-I**

Servo Drive: Scorpion  
 Continuous Current: 40A  
 Nominal Voltage: 600V  
 Case: Potted Plastic

Configuration: Single Axis

Options:

-Include I/O PCBA



# NOVA

## Dual-Axis Servo Drive

### COTS Motion Control for Low Earth Orbit (LEO) Applications



**The Nova servo drive is a COTS designed product specifically for Low Earth Orbit (LEO) motion control applications.**

This extremely small, lightweight, dual-axis controller is one of the few COTS servo drives for high performance space applications (operating in vacuum and high vibration environments) on the market today!

A radiation tolerant version is available. The safety-critical Nova is based on DO-178C baselined software, which can be tailored to your requirements. Nova is equipped with EMI & inrush protection, brake drivers, and is packaged in a ruggedized case.

#### Features:

- Radiation tolerant (Optional)
- Lightweight and efficient
- Dual-axis configuration
- The Nova uses sinusoidal (sine) drive technology for the best efficiency while minimizing torque ripple.
- Sealed; shock- and vibration-tolerant construction
- Torque, velocity, or position control
- Includes configurable, user-friendly GUI with enhanced data collection capability and integrated oscilloscope feature.
- Motor types: DC Brushless
- Brake drivers
- EMI, ESD and inrush protection
- Feedback: resolver
- Rugged circular connectors (outgassed option for space applications)

#### Specifications:

- Single Power Input / Bus Voltage: 28VDC
- Nominal input current up to 5A/axis (transient: 10A)
- Output Power: 100W (per axis)
- Efficiency >95% (full load)
- Operating Temperature: - 40°C to 71°C
- Flight Unit Weight: 1.01 lbs.
- Flight Unit Size: 4.0" L x 3.5" W x 1.9" H

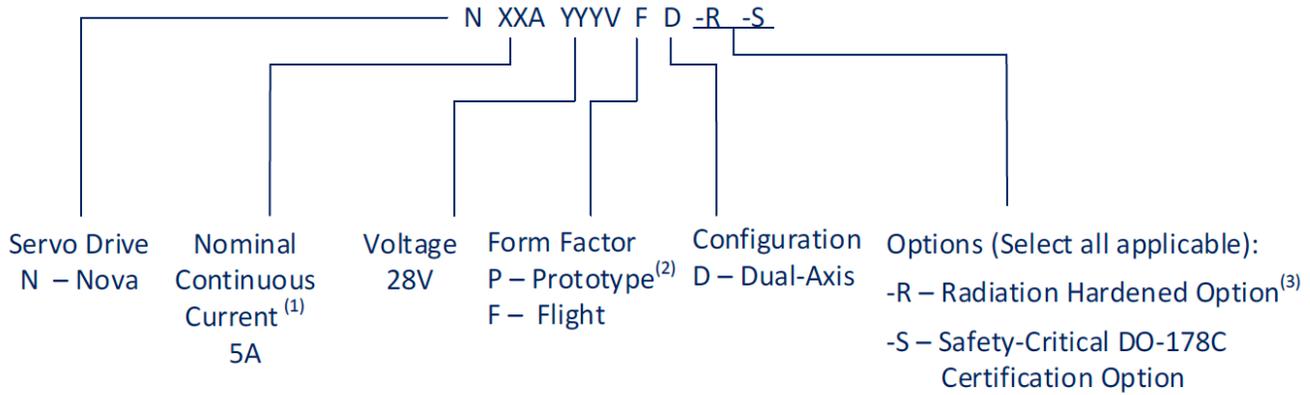
#### Compliance (Flight Units):

- Software Design Assurance: DO-178C Option
- IPC-610 Class III High-Performance Assembly
- Electromagnetic Interference per MIL-STD-461:
  - CE102
  - CS101
  - CS114
  - CS115
  - CS116
  - RE101
  - RE102
  - RS103
- Environmental qualification per MIL-STD-810:
  - Random Vibration (X, Y & Z axes): 22.4 Grms, 20 – 2,000 Hz (0.40 g<sup>2</sup>/Hz)
  - SRS Shock (X, Y & Z axes): 60 to 600 G's, 100 – 750 Hz. 600 G's, 750 – 10,000 Hz.
- Electrical power characteristics: MIL-STD-704F

#### Customization Available

ESI Motion has the expertise to customize a solution for your project's needs – contact us to see how we can tailor a solution for you.

## Ordering Information



1. Peak Sine Wave, per axis. Consult factory for higher current options.
2. Prototype: Engineering Development Unit (larger form factor, for lab use / initial development)
3. Radiation Hardened Option includes Space-rated, outgassed connectors

Example: Part Number: N05A028VFD-R-S  
 Servo Drive: Nova  
 Continuous Current: 5A  
 Nominal Voltage: 28V  
 Form Factor: Flight Unit  
 Configuration: Dual-Axis  
 Radiation Option: Rad Hard  
 Safety-Critical Option: DO-178C Certification



## Model Availability List

The following table lists available models:

Dual Axis:		Notes:
5A	<b>N05A028VFD-R</b>	1. Standard Products are shown in bold, and have expedited lead times. 2. Radiation Hardened Option available. 3. Please contact ESI for Customization, other feedback options or motor types.
	N05A028VFD-R-S	
	<b>N05A028VFD</b> <b>N05A028VPD</b>	
A/V	28V	

# DRACO

## Dual-Axis Servo Drive

**Rugged**  
**Flexible**  
**High-Power Density**



ESI Motion's Draco Servo Drive builds upon the success of our flagship Dragon servo motor line with size and weight reductions, and performance increases, utilizing state-of-the-art wide bandgap technology. It is available in multiple configurations to fit a myriad of applications. Draco incorporates our rugged, high-density DSP 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 applications operating outdoors, at high temperatures, in high vibration, or other extreme environmental conditions. It comes with an industry benchmark Graphical User Interface, allowing the most flexible and precise system integration and control.

ESI Motion's servo drive systems are designed for precision military, aviation, automotive, robotics, and specialized industrial applications where size and weight are critical. ESI Motion products are designed and built at our USA facility.

### Features:

- Nominal Vbus options: 300VDC or 600VDC
- Maximum continuous output current 40A per axis (80A for Paralleled axes model)
- Maximum DC power to 29 kW
- Multiple feedbacks supported including BiSS-C, Quadrature Encoder, Resolver, Hall and Sensorless
- Maximum motor speed 75,000 RPM
- Torque, velocity, or position control
- Shock and vibration tolerant construction
- Brake drivers
- Reverse polarity protection
- MIL-STD-461 EMI filter
- Regeneration switch
- Active inrush limiter
- Includes configurable, user-friendly GUI with enhanced data collection capability and integrated oscilloscope feature

### Specifications:

- Weight:
  - Single channel - 5.36lbs.
  - Dual channel – 5.57lbs.
- Size: 9.38 in x 6.63 in x 2.60 in
- Nominal motor phase current: up to 60A\*
- Efficiency: >97% (full load)
- Operating temperature: -40 to 71°C

### Compliance (Flight Units):

- Software design assurance: DO-178C Option
- Electromagnetic interference per MIL-STD-461:
  - CE102
  - CS101
  - CS114
  - CS115
  - CS116
  - RE101
  - RE102
  - RS103
- Environmental qualification per MIL-STD-810G:
  - Random Vibration 514.7 Category 12 (X, Y & Z axes):  
16.3 Grms, 15 – 2,000 Hz (0.20 g<sup>2</sup>/Hz)
  - Shock Time History 516.7 Procedure 1 (X, Y & Z axes): 40G Terminal Peak Sawtooth, 11ms
- 28V Electrical power characteristics: MIL-STD-704F

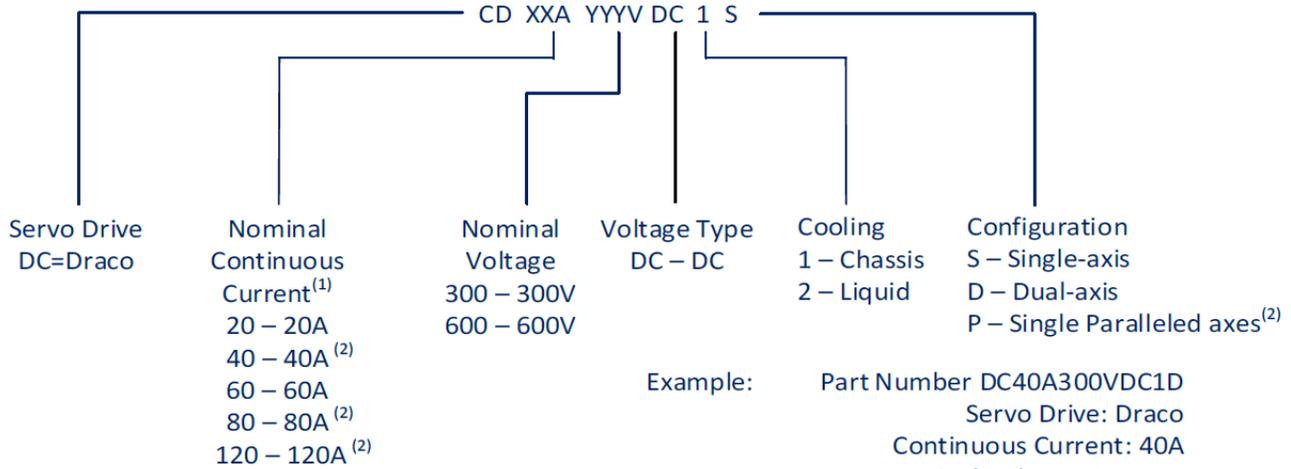
### Customization Available

ESI Motion has the expertise to customize a solution for your project's needs. Contact us today at [sales@esimotion.com](mailto:sales@esimotion.com) to see how we can tailor a solution for you.

**\*(coming soon)**

## Ordering Information

### Draco Servo Drive Configuration Options



- 1) Peak Sine Wave, per axis
- 2 Paralleled axes



## Model Availability List

Single-axis (including Paralleled Axes )

120A/80A	<i>CD120A300VDC1P</i> <i>CD120A300VDC2P</i>	<b>CD80A600VDC1P</b> <i>CD80A600VDC2P</i>
60A/40A	CD 60A300VDC1S CD 60A300VDC2S	<b>CD40A600VDC1S</b> <i>CD40A600VDC2S</i>
40A	<b>CD40A300VDC1P</b> <i>CD40A300VDC2P</i>	<b>CD40A600VDC1P</b> <i>CD40A600VDC2P</i>
20A	<b>CD20A300VDC1S</b> CD 20A300VDC2S	<b>CD20A600VDC1S</b> CD 20A600VDC2S
A/V	300V	600V

Notes:

1. Standard Products are shown in **bold**, and have expedited lead times.
2. 40A and 120A/80A variants (in *italics*) utilize Paralleled connections to both Motor A & B Power to drive the single axis 40A and 120A/80A
3. 60A/120A coming soon

Dual-axis:

60A/40A	CD 60A300VDC1D CD 60A300VDC2D	<b>CD40A600VDC1D</b> <i>CD40A600VDC2D</i>
20A	<b>CD20A300VDC1D</b> CD 20A300VDC2D	<b>CD20A600VDC1D</b> <i>CD 20A600VDC2D</i>
A/V	300V	600V

**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

# Dragon Servo Drive



**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.**

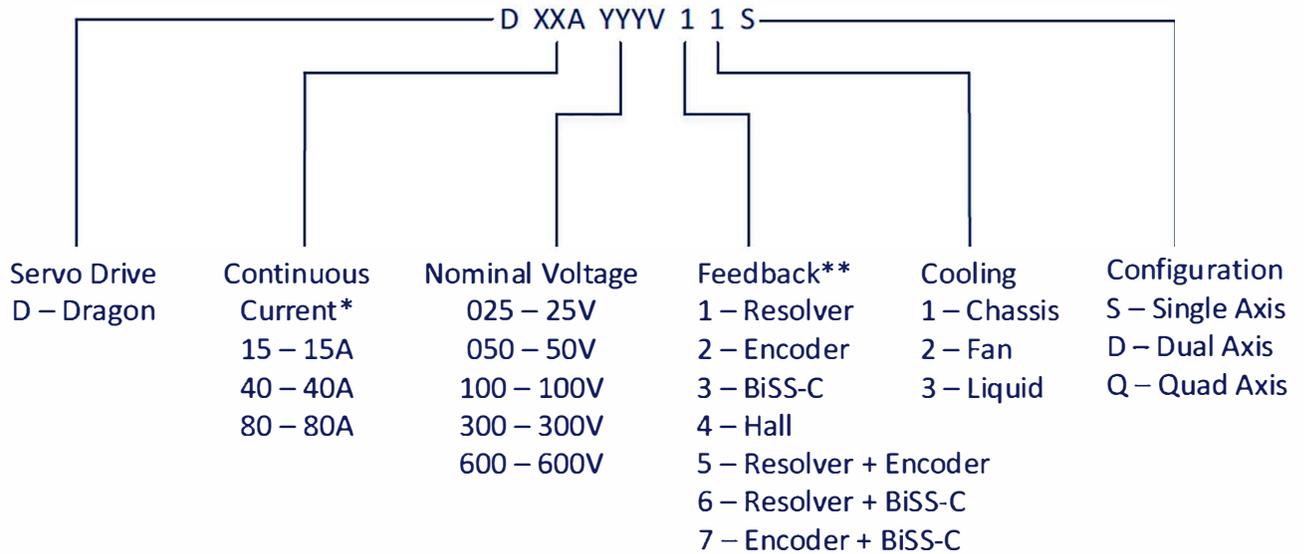
**Configurable, user friendly GUI with enhanced data collection capability**

**MIL-STD-810, MIL-STD-1275, MIL-STD-704, MIL-STD-461**

**\*Contact ESI for additional details**

# ▶ Ordering Information

SERVO DRIVE ORDERING INFORMATION



\* 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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2250A Union Place  
 Simi Valley, CA 93065

## HYPERION SERVO DRIVE DATASHEET



### Insane Power Density & Durability

ESI Motion's Hyperion servo drive line offers an incredibly high-powered, fully integrated "plug and play" control solution. Developed specifically for high-power density markets, the Hyperion drive is ideal for energy recovery, hybrid vehicles and other applications.



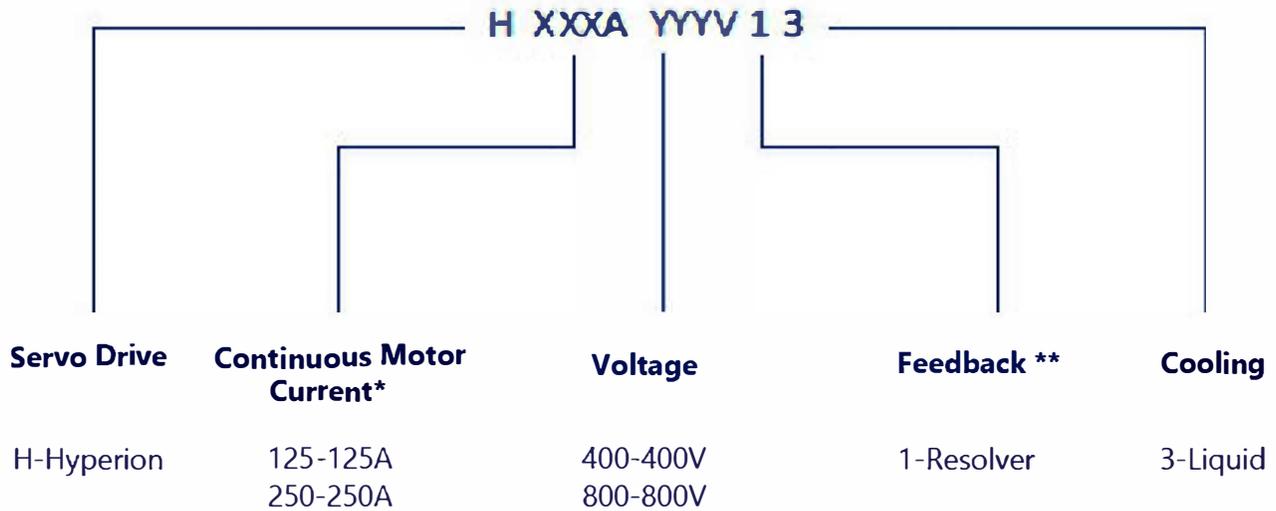
### Specifications & Features:

- Bus Voltage (DC) 400V to 800V
- Peak Current up to 220A
- Output Power 100kW
- Operating Temperature - 40°C to 75°C
- Maximum Electrical Speed 240,000 RPM
- Weight 9.8 lbs./4.4 kg
- Size: 10.3" L x 5.9" W x 4.0" H
- Shock and vibration tolerant construction
- Configurable, user friendly GUI with integrated oscilloscope feature

### Configurations:

- Single axis configuration
- Motor Types: DC brushless, brushed and induction
- Feedback: sensorless & resolver
- Cooling Options: Liquid
- Packaging: Ruggedized

# Ordering Information



\*Peak of sine wave

\*\*All options allow for sensorless feedback

**Example:**

**Part Number: H125A800V13**

- Servo Drive: Hyperion
- Continuous Current: 125A
- Nominal Voltage: 800V
- Feedback: Resolver
- Cooling: Liquid



## WOLVERINE SERVO DRIVE DATASHEET



### Build your own servo drive.

The Wolverine is a highly capable drive system that can control multiple axis within a small package. The Wolverine is built from proven ESI Motion servo drive modules offering multiple options designed to client specifications. The Wolverine is perfect for defense, automotive, energy and specialized industrial applications where a smaller, lighter weight servo drive is needed.

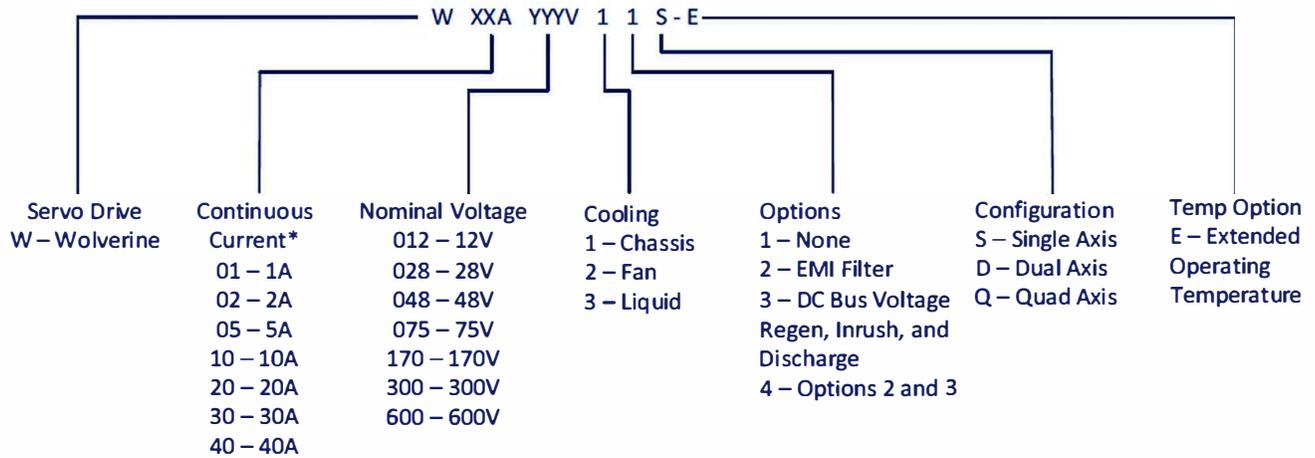


### Specifications & Features:

- Bus Voltage (DC) 10V to 610V
- Peak Current up to 65A
- Output Power 12kW
- Operating Temperature - 40°C to 71°C
  - Extended -55°C to 100°C (optional)
- Maximum Electrical Speed 75,000 RPM
- Weight 2.7 lbs./1.2 kg (Variable)
- Single, Dual or Quad axis configuration
- Shock and vibration tolerant construction
- High voltage interlock and brake drivers
- Configurable, user friendly GUI with integrated oscilloscope feature
- Options: Integrated EMI filter and DC Bus Voltage Regen switch, active inrush limiter and discharge
- Cooling Options: Chassis, Fan or Liquid
- Packaging: Ruggedized
- Communication Interface: RS-422, CAN
- Motor Types: DC brushless, brushed and induction
- Motor Feedback Types: sensorless, encoder, resolver, hall and BiSS-C

# Ordering Information

## Ordering Information



\* Peak Sine Wave

**Example:**

**Part Number: W40A048V12D-E**

Servo Drive: Wolverine

Continuous Current: 40A

Nominal Voltage: 48V

Cooling: Chassis

Options: EMI Filter

Configuration: Dual-Axis

Temp Option: Extended Operating Temperature



## VULCAN SERVO DRIVE DATASHEET



### Rugged Servo Drive That Can Take The Heat

The Vulcan drive incorporates our rugged control and power driver modules, an integrated MIL-STD-461 EMI filter, inrush, military grade connectors and submersible case. The Vulcan operates at high voltages, and temperatures up to 121°C, making it ideal for defense, energy, oil and gas, aviation, automotive, or heavy industrial applications in outdoor, high temperature, high vibration, or other extreme environmental conditions.



### Specifications & Features:

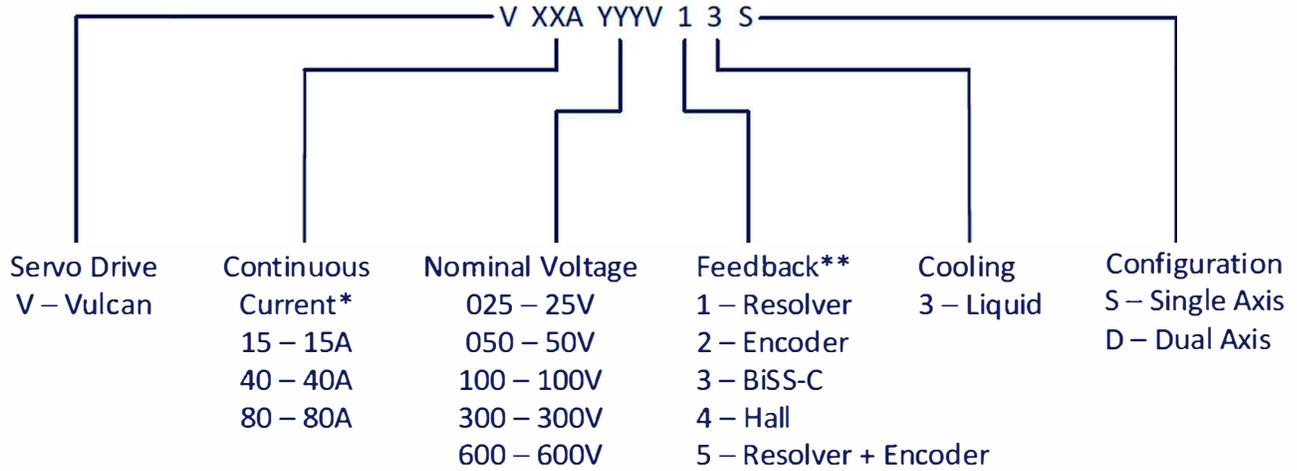
- Bus Voltage (DC) 24V to 610V
- Peak Current up to 65A
- Output Power 12kW
- Operating Temperature - 40°C to 121°C
- Maximum Electrical Speed 75,000 RPM
- Weight 11.5 lbs./5.2 kg
- Size: 16.3" L x 6.3" W x 3.0" H
- Shock and vibration tolerant construction
- Configurable, user friendly GUI with integrated oscilloscope feature

### Configurations:

- Single or Dual axis configuration
- Motor Types: DC brushless, brushed and induction
- Feedback: sensorless. Encoder, hall & resolver
- Cooling Options: Liquid
- Packaging: Ruggedized

# Ordering Information

## Ordering Information



\* Peak Sine Wave

\*\* All Feedback options include Sensorless

**Example:**

**Part Number: V40A300V13D**

Servo Drive: Vulcan

Continuous Current: 40A

Nominal Voltage: 300V

Feedback: Resolver

Cooling: Liquid

Configuration: Dual-axis





## Zeus Motor/Generator Controller Datasheet

**The Zeus Motor/  
Generator Controller is  
a high power and high  
temperature “plug and  
play” control solution.**

This high power motor/  
generator controller offers  
high temperature operation  
and power density in excess  
of 7 kW/liter. The Zeus  
incorporates our rugged  
controller and Silicon  
Carbide (SiC) power stage,  
offers several feedback  
options, and is packaged  
in a military-grade  
submersible case. This  
versatile controller is ideal  
for electric propulsion and  
power generation systems,  
and specialized military and  
industrial applications,  
operating at high  
temperatures, in high  
vibration, or other extreme  
environmental conditions.



### SPECIFICATIONS:

- Bus Voltage (DC) 48V to 600V
- Continuous Motor Current 180A
- Output Power 75kW
- Operating Temperature -40° C to 85°C (Optional 105°C)
- Maximum Electrical Speed 75K RPM
- Weight 44 lbs./ 20kg
- Size 9.7" L x 7.3"W x 11.8" H

### FEATURES:

- Single-Axis configuration
- Shock & Vibration tolerant construction
- High Voltage Interlock
- Integrated EMI filter 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

### MOTOR TYPES:

- DC Brushless
- Brushed
- Induction

### FEEDBACK:

- Sensorless
- Encoder
- Resolver
- Hall

### COOLING OPTIONS:

- Liquid

### PACKAGING:

- Ruggedized

Product of USA

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[www.esimotion.com](http://www.esimotion.com)



## ROADWIND SERVO DRIVE SERIES



Image Credit: NASA

### 150+ Configurations

#### Specifications

Bus Voltage (DC)	12V – 150V
Peak Motor Current	Up to 200A
Output Power Max	15kW
Temperature	-40°C to 71°C
Electrical Speed Max	Up to 300,000 RPM
Weight	8.1 lbs (3.7kg)
Motor Types	DC Brushless, Brushed and Induction
Feedback Options	Sensorless, Encoder, Resolver, Hall & BiSS-C
Cooling Options	Chassis, Fan or Liquid
Packaging	Ruggedized
Size	13.8" L x 7.0" W x 3.1" H

### High-Speed & High Current Servo Solution

On the cutting edge of servo technology, the Roadwind series satisfies the most speed-hungry applications.

Roadwind operates at 12V to 150V, -40°C to 71°C and is ideal for ground defense, aerospace autonomous vehicles, racing and specialized industrial applications.

The fully-integrated Roadwind system combines all crucial functions into one compact ruggedized case.

#### Highlights

- Incredible high-speed performance up to 300,000 RPM
- High-density DSP controller
- Active inrush limiter
- Resolver, encoder, sensorless, hall & BiSS-C feedback
- Configurable, user-friendly GUI with enhanced data collection capability

#### Applications

- Actuator control
- Traction motor
- Camera stabilization
- Laser beam director
- Hybrid vehicles

# Ordering Information

SERVO DRIVE ORDERING INFORMATION

Servo Drive	Continuous Motor Current*	Voltage	Feedback **	Cooling	Configuration
R-Roadwind	050-50A 100-100A 200-200A	025-25V 050-50V 100-100V 150-150V	1-Resolver 2-Encoder 3-BiSS-C 4-Hall 5-Resolver+ Encoder 6-Resolver + BiSS-C 7-Encoder + BiSS-C	1-Chassis 3-Liquid	S-Single-axis

\* Peak of sine wave

\*\* All options allow for sensorless feedback

**Example:**

**Part Number: R200A050V11S**

Servo Drive: Roadwind

Continuous Current: 200A

Nominal Voltage: 50V

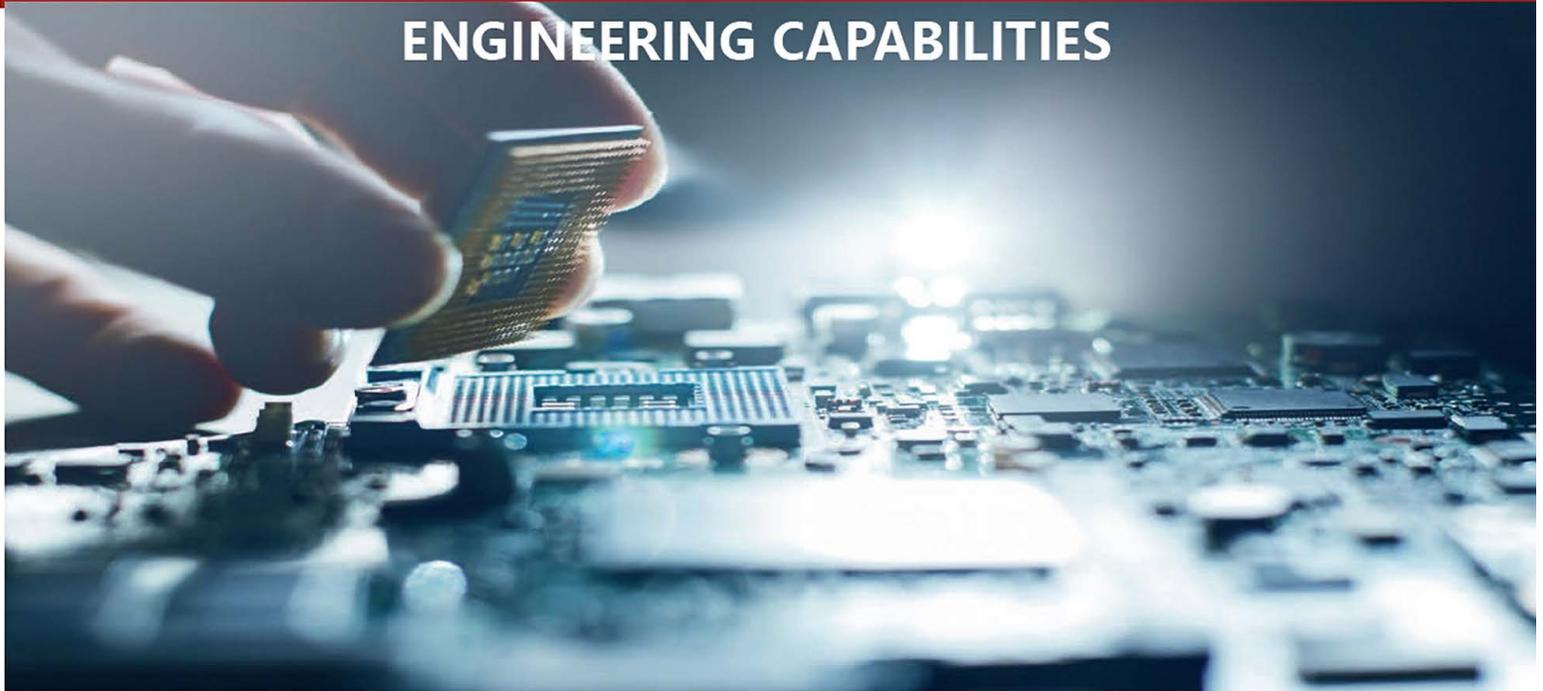
Feedback: Resolver

Cooling: Chassis

Configuration: Single Axis



## ENGINEERING CAPABILITIES



### **Engineering Capabilities**

Our servo control systems are designed to be used in high-demand applications and require a long lifespan with years of dependable use.

### **Initial Design & Engineering Consultation**

Our team is committed to working closely with you to find the solution for your servo drive needs and to ensure you have the support you need.

### **Our Engineering Services Include:**

- Modified off-the-shelf (MOTS) solutions
- Modified packaging
- Modified connector selection
- Modified I/O interface
- Software configuration

### **Comprehensive Engineering Analysis:**

- Thermal analysis
- Vibration & shock
- EMI conductive
- EMI susceptibility
- Mean Time Between Failure (MTBF)
- Derating
- Outgassing
- Humidity
- Altitude
- Salt water, fog and fungus
- And more!

### **Complete Product Documentation**

One of the most important aspects of high quality is the program documentation. **We** take this very seriously. As we design and integrate your servo drive we keep detailed records, diagrams and pertinent documents related to the system. Our documentation policy ensures that you have access to quality information for your servo drive.

### **Design Reviews & Analysis Before Delivery**

- System Requirements Review (SRR)
- Preliminary Design Review (PDR)
- Critical Design Review (CDR)
- Manufacturing Readiness Review (MRR)
- Test Readiness Review (TRR)
- Flight Readiness Review (FRR)

### **Obsolescence Management**

As technology and manufacturing progress, hardware of any kind may eventually become obsolete. Our engineers consider component availability during all program phases and develop obsolescence contingencies accordingly.

## ENGINEERING CAPABILITIES



### Dependable Software

The software used to test, monitor and run this hardware must be equally resilient and easy to use. ESI works carefully to create straight-forward interfaces without sacrificing control flexibility. Our user-friendly GUI can have your motor turning in minutes while giving you access to configure and gather data on dozens of variables real-time.

### Software Program Deliverables

- Development & quality plan
- Software & interface requirement specification
- I/O communication configuration
- Test plan, description & report
- Version description
- GUI (Graphical User Interface) Manual

### Requirement Validation

- Requirements validation matrix
- Acceptance Test Procedure (ATP)
- Qualification Test Procedures (QTP)
- Verification Test Data Package (TDP)

### Quality Control Services

- Component traceability
- Counterfeit parts avoidance
- First article inspection report
- Acceptance test reports
- Certification of conformance

### System Integration & Onsite Support

ESI provides integration assistance and follow-up support for our products. Any integration issues are immediately addressed for problem-free operation following production.

- Sensorless control configuration
- System integration with client test asset at an ESI facility
- System integration at client site
- System-level debugging and defect management
- System-level architecture support

### ESI Motion's Team Can Help You Find Your Ideal Servo Drive Solution

ESI's team is committed to client service and is ready to help you build your ideal servo drive. We have made it our mission not only to build great hardware, but also to build lasting relationships with you and ensure that you have the tools and the resources to support your programs' success.



## NOTES:



## NOTES:



## **NEW PRODUCTS COMING SOON!**

Keep checking our website for the latest information on our newest products for space and other specialized applications.