

## 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

# Wolverine Servo Drive

## Overview

The Wolverine Servo Drive is a semi-custom, low cost alternative that incorporates our rugged controller and servo drive modules into a small package. The following describes both the electrical and physical interfaces for the Wolverine Servo Drive. Included in this document is information necessary to integrate the Wolverine Servo Drive with other system components.

Networking has been emphasized in the Wolverine Servo Drive. The Wolverine 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. The Wolverine 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:

- Motor (Input) Power
- Motor Output
- System
- Feedback

## Motor Power

The input power for the motor is supplied through motor power connector into the device. 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 or similar.

## Motor Output

The motor output connector contains the interface for the load motor and provides the switched power to the motor.

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 or similar.

The Wolverine Servo Drive provides two 24 V brake drivers, high voltage interlock, and optional regeneration switch output. The brake current is nominally 1 amp and is current limited to 1.5 A  $\pm$  10%.

## Wolverine Servo Drive

### System Interface

The system signals are routed to a 37-pin connector. The connector is type D38999/20FD35AN with 13-35 insert arrangement. 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 or similar.

The System Interface (SI) is the 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 Wolverine is unknown, a generic interface has been provided to include the following:

- Low-Level Power (28 VDC In)
- Fan Output
- RS422
- 2 Analog Inputs
- USB
- 2 Analog Test Points
- Out
- CAN
- 5 VDC Out

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

- Connect using the Host Interface for the Wolverine Servo (HiDS)
- Monitor the two Analog Test Points
- Inject an Analog Test Signal
- Reprogram Internal Flash Memory

### Feedback

The Wolverine Servo Drive's feedback interface contains input for four different types of motor feedback. The feedback consists of encoder feedback, resolver feedback, hall sensor feedback, and BISS-C feedback. 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, or similar.

## Wolverine Servo Drive

### Signal Description and Electrical Characteristics

SIGNAL	MINIMUM	MAXIMUM	UNITS
Motor VDC In	10	610	V
Peak Phase Current	-	40	A
	-	80 <sup>(7)(9)</sup>	A
Regeneration	-	15	A
Brakes	-	24	V
Brake Current	-	1.5	A
Interlock <sup>(1)</sup>	1	18	V
28 VDC In	20	33	V
28 VDC In Current <sup>(5)</sup>	-	0.3	A
Fan Out	-	24	V
Fan Out Current	-	1.5	A
Command, Analog In <sup>(1)</sup>	-10	10	V
Command, Analog In Impedance <sup>(1)</sup>	-	20	K Ohm
Analog Test Point Out	-5	5	V
Analog Test Point Out Impedance	-	50	Ohm
5 VDC Out Current	-	500	mA
Resolver Excitation <sup>(1)</sup>	4.0 (8)	-	V rms
Resolver Sin, Cos <sup>(1)</sup>	2 (8)	3.5	V rms
Resolver Sin, Cos Impedance <sup>(1)</sup>	-	20	K Ohm
Thermistor <sup>(1) (6)</sup>	-	2000	Ohm
CAN <sup>(1) (3) (4)</sup>	-	1000	K bps
RS422 <sup>(1) (2) (3)</sup>	-	1000	K bps
USB 2.0 <sup>(1)</sup>	-	12	M bps
Encoder, BiSS-C Data <sup>(1)</sup>	0	5	V
Encoder, BiSS-C Data Impedance <sup>(1)</sup>	-	120	Ohm
BiSS-C Clock <sup>(1)</sup>	3.5	5	V
BiSS-C Clock Current <sup>(1)</sup>	-20	20	mA
Hall	0	5	V
High Speed Serial Bus	0	3.3	V
SCI	0	3.3	V

<sup>(1)</sup> ESD protection.

<sup>(2)</sup> Physical Interface compliant to the TIA/EIA-422-B.

<sup>(3)</sup> Short circuit protection from -7 V to 12 V protection.

<sup>(4)</sup> Compliant to ISO 11898-2 specification.

<sup>(5)</sup> No Fan or Brakes.

<sup>(6)</sup> Recommended NTC 5k, Epcos part # B57540G502F.

<sup>(7)</sup> Parallel Phase Configuration

<sup>(8)</sup> Nominal value

<sup>(9)</sup> Peak Sine Wave

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

The Wolverine 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 Wolverine 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  $\pm 10$  V.

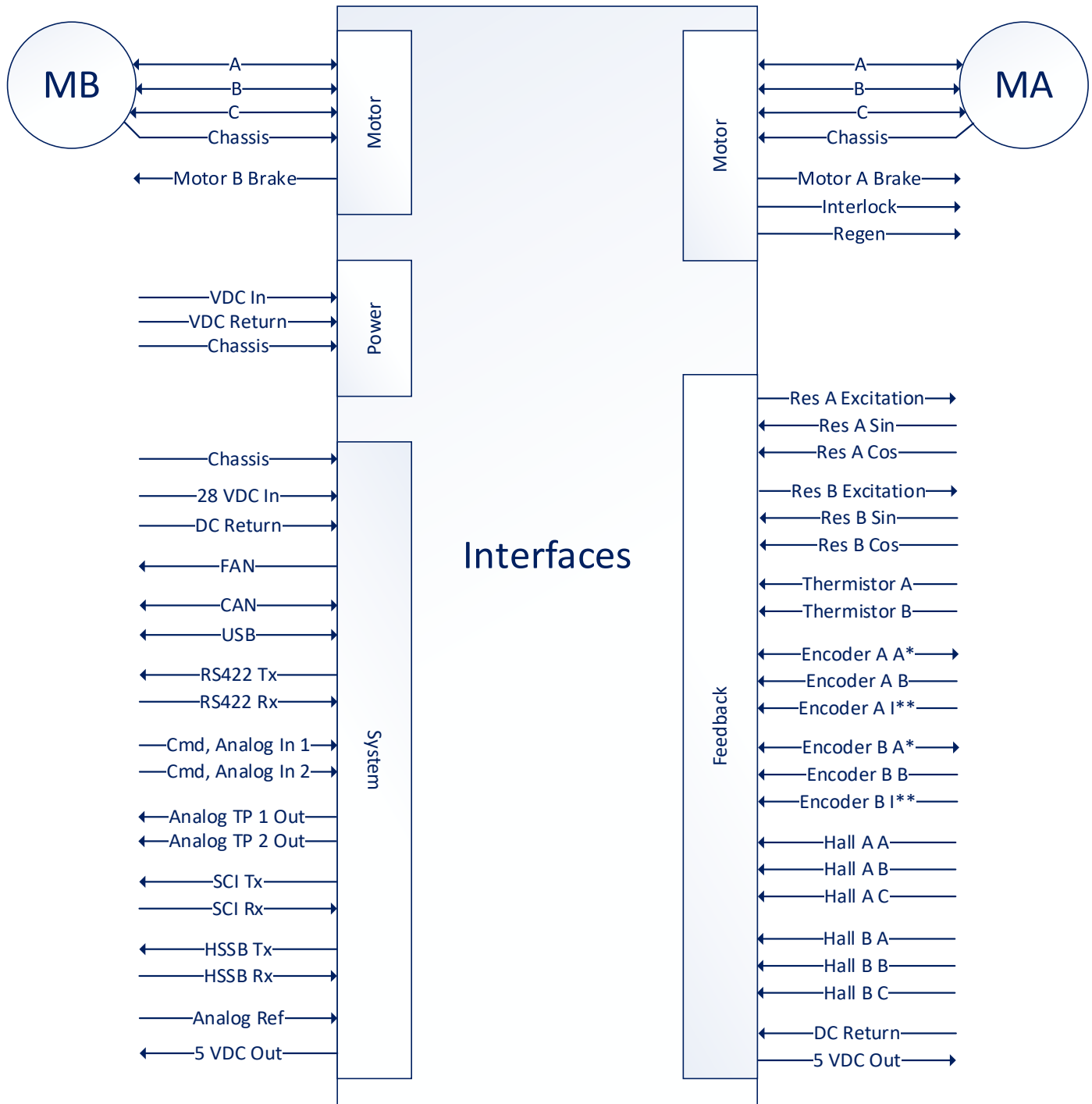
The two analog test points are routed to the system connector for monitoring. The user may use the HiDS to setup the analog test points. The voltage range on the analog test points are  $\pm 5$  V. The test points are buffered with a 50 Ohm resistor.

The user may connect a standard USB port to the USB DP and USB DN 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.



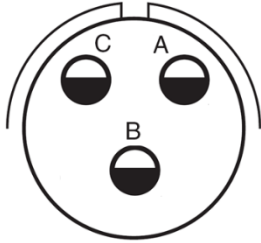
# System Diagram



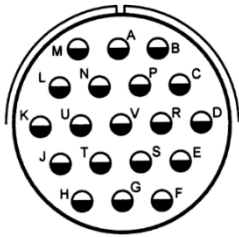
\*BiSS-C Clock output  
 \*\*BiSS-C Data input



# Motor Interface



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



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

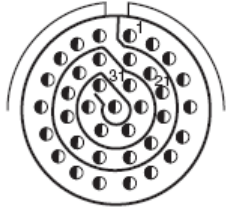


\* Mating connector MS3476L24-19P

\*\* Used in parallel with pins A, B, and C for single Axis drives with continuous current requirements greater than 40 A.

## Systems Interface

System, J3, D38999/20FD35AN\*



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

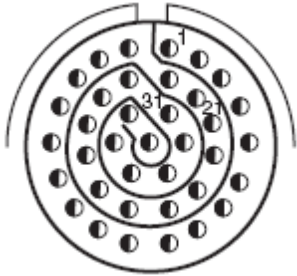


\* Mating connector  
 D38999/26FD35SN

\*\* 500 mA max. total  
 sum for all pins



## Feedback Interface

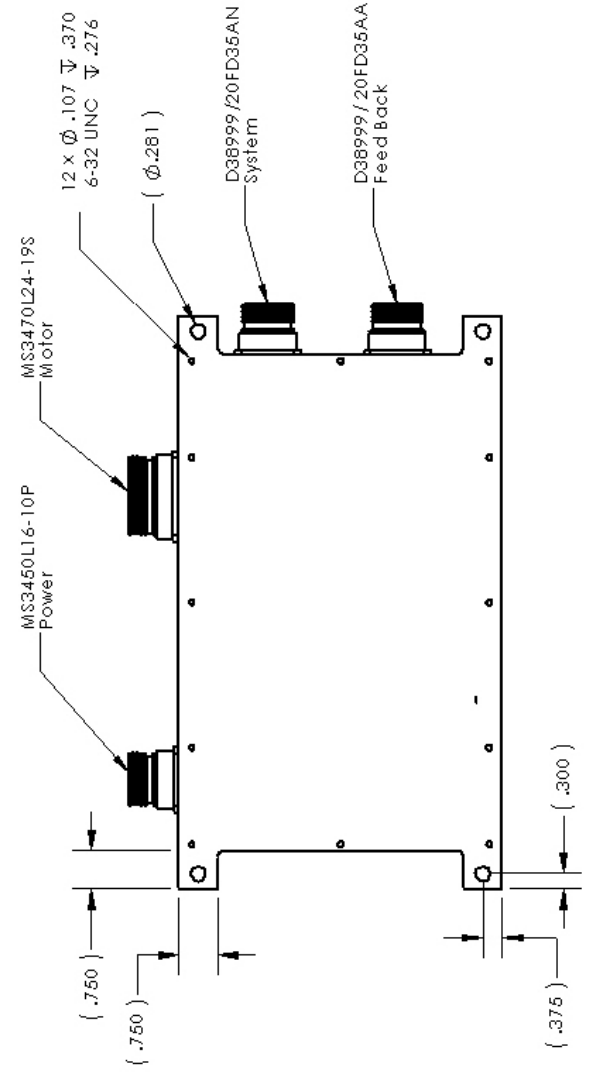
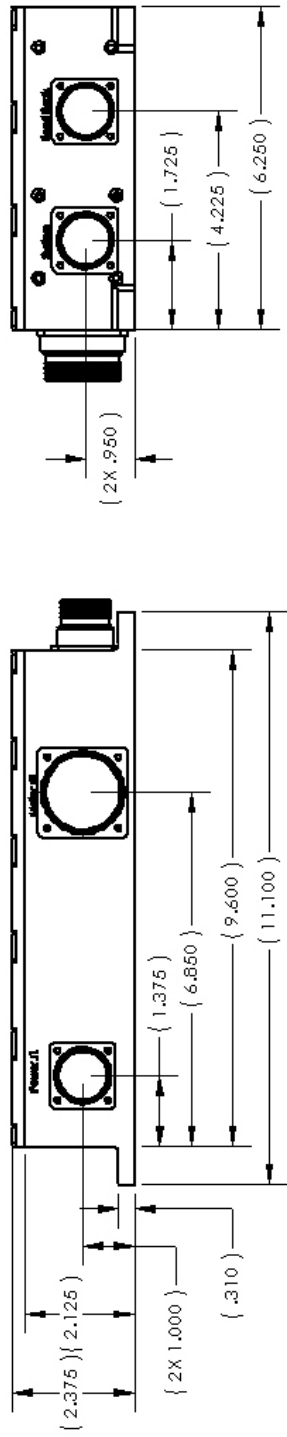


Feedback, J4, D38999/20FD35AA*		
PIN	DESCRIPTION	WIRE GAUGE
1	Chassis	22-28
2	Resolver A Excitation (+)	22-28
3	Resolver A Excitation (-)	22-28
4	Resolver A Sin (+)	22-28
5	Resolver A Sin (-)	22-28
6	Resolver A Cos (+)	22-28
7	Resolver A Cos (-)	22-28
8	Resolver B Excitation (+)	22-28
9	Resolver B Excitation (-)	22-28
10	Resolver B Sin (+)	22-28
11	Resolver B Sin (-)	22-28
12	Resolver B Cos (+)	22-28
13	Resolver B Cos (-)	22-28
14	Thermistor A (+)	22-28
15	Thermistor A (-)	22-28
16	Thermistor B (+)	22-28
17	Thermistor B (-)	22-28
18	5 VDC Out**	22-28
19	DC Return	22
20	Encoder B A (+) / BiSS-C B Clock (+)	22-28
21	Encoder B A (-) / BiSS-C B Clock (-)	22-28
22	Encoder B B (+)	22-28
23	Encoder B B (-)	22-28
24	Encoder B I (+) / BiSS-C B Data (+)	22-28
25	Encoder B I (-) / BiSS-C B Data (-)	22-28
26	Hall A A	22-28
27	Hall A B	22-28
28	Hall A C	22-28
29	Hall B A	22-28
30	Hall B B	22-28
31	Hall B C	22
32	Encoder A A (+) / BiSS-C A Clock (+)	22-28
33	Encoder A A (-) / BiSS-C A Clock (-)	22-28
34	Encoder A B (+)	22-28
35	Encoder A B (-)	22-28
36	Encoder A I (+) / BiSS-C A Data (+)	22-28
37	Encoder A I (-) / BiSS-C A Data (-)	22-28



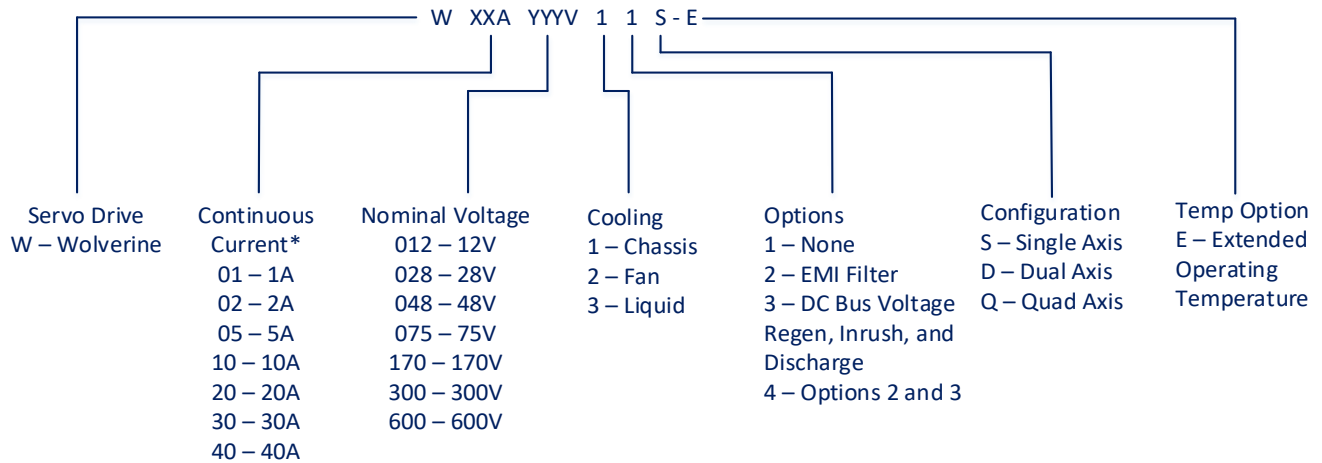
\* Mating connector  
 Samtec P/N CLP-120-  
 02-F-D-TR

**Mechanical Interface**



# Ordering Information

## Ordering Information

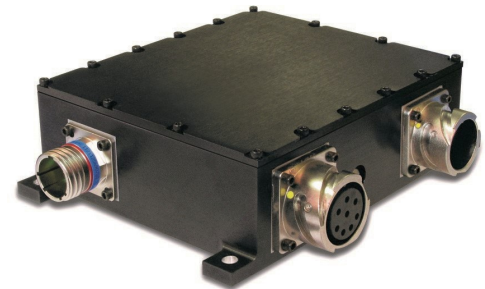


\* Peak Sine Wave

**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



### **Important Information:**

ESI MOTION makes no warranty, either express or implied, including but not limited to any implied warranties of merchantability and fitness for a particular purpose, regarding any marketing materials and makes such materials available solely on an "as-is" basis. In no event shall ESI MOTION be liable to anyone for special, collateral, incidental, or consequential damages in connection with or arising out of the purchase or use of these materials, and the sole and exclusive liability of ESI MOTION, regardless of the form of action, shall not exceed the purchase price of this product. Moreover, ESI MOTION shall not be liable for any claim of any kind whatsoever against the use of these materials by any other party.