



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

2250A Union Place, Simi Valley, CA 93065

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Zeus Motor/ Generator Controller



OVERVIEW:

The Zeus Motor/Generator Controller incorporates our rugged controller and Silicon Carbide (SiC) power stage into a military grade package and can serve as a servo drive or a generator controller converting machine 3-phase AC voltages into regulated DC bus voltage.

The following describes both the electrical and physical interfaces for the Zeus Controller.

Included in this document is information necessary to integrate the Zeus Servo Drive with other system components.

The Zeus Controller can be connected to the following two types of networks:

- RS-422 and
- 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 Zeus Controller 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:

The power signals are isolated from the control circuitry. There are two Amphenol power connections on the controller:

- 1.PL00X-301-10D10 (Orange) (P)
- 2.PL00Y-301-10D10 (Black) (N)

The Amphenol mating power connections for the controller:

- 1.PL18X-301-70 (Orange) (P)
- 2.PL18Y-301-70 (Black) (N)

MOTOR:

The motor signals are isolated from the control circuitry. There are three Amphenol motor connections on the controller:

- 1.PL00U-301-10D10 (Yellow) (A)
- 2.PL00V-301-10D10 (Green) (B)
- 3.PL00W-301-10D10 (Red) (C)

The Amphenol mating motor connections for the controller:

- 1.PL18U-301-70 (Yellow) (A)
- 2.PL18V-301-70 (Green) (B)
- 3.PL18W-301-70 (Red) (C)

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.

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

- Low-Level Power (28 VDC In)
- RS422
- Interlock
- 3 Analog Inputs
- USB (Future upgrade)
- 3 Analog Outputs

This interface also includes service inputs that can be used to connect using the Host Interface for the Zeus motor/Generator Controller (HiDS).

FEEDBACK:

The Zeus Motor/Generator Controller contains a motor feedback interface. The feedback interface is on a single 22-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 D38999/26FC35SN.

There are three feedback configurations:

- Resolver
- Encoder
- Hall sensors

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SIGNAL DESCRIPTION:

The Zeus Motor/Generator Controller 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 Zeus Motor/Generator Controller includes an RS422 physical interface compliant to the TIA/EIA-422-B specification. The maximum data rate is 1 Mbps. The RS422 pins are short circuit protected from -7 V to +12 volts. Receive line terminated with 120 ohms.

The Zeus Motor/Generator Controller includes one RTD and one Thermistor inputs. The RTD input is calibrated for a 100 Ohm device and the NTC Thermistor input is calibrated for a 10K Ohm device. Temperature inputs signals are decoupled from the internal DSP unit.

The Zeus Motor/Generator Controller includes three 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 Zeus Motor/Generator Controller 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 +/- 5 V.

The three analog outputs are routed to the system connector for monitoring. The user may use the HiDS to setup the analog outputs. The maximum voltage on the analog output is 5 V. The analog outputs current capability is 50 mA.

Future enhancement: 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. (Not to be used for motor operation.)

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

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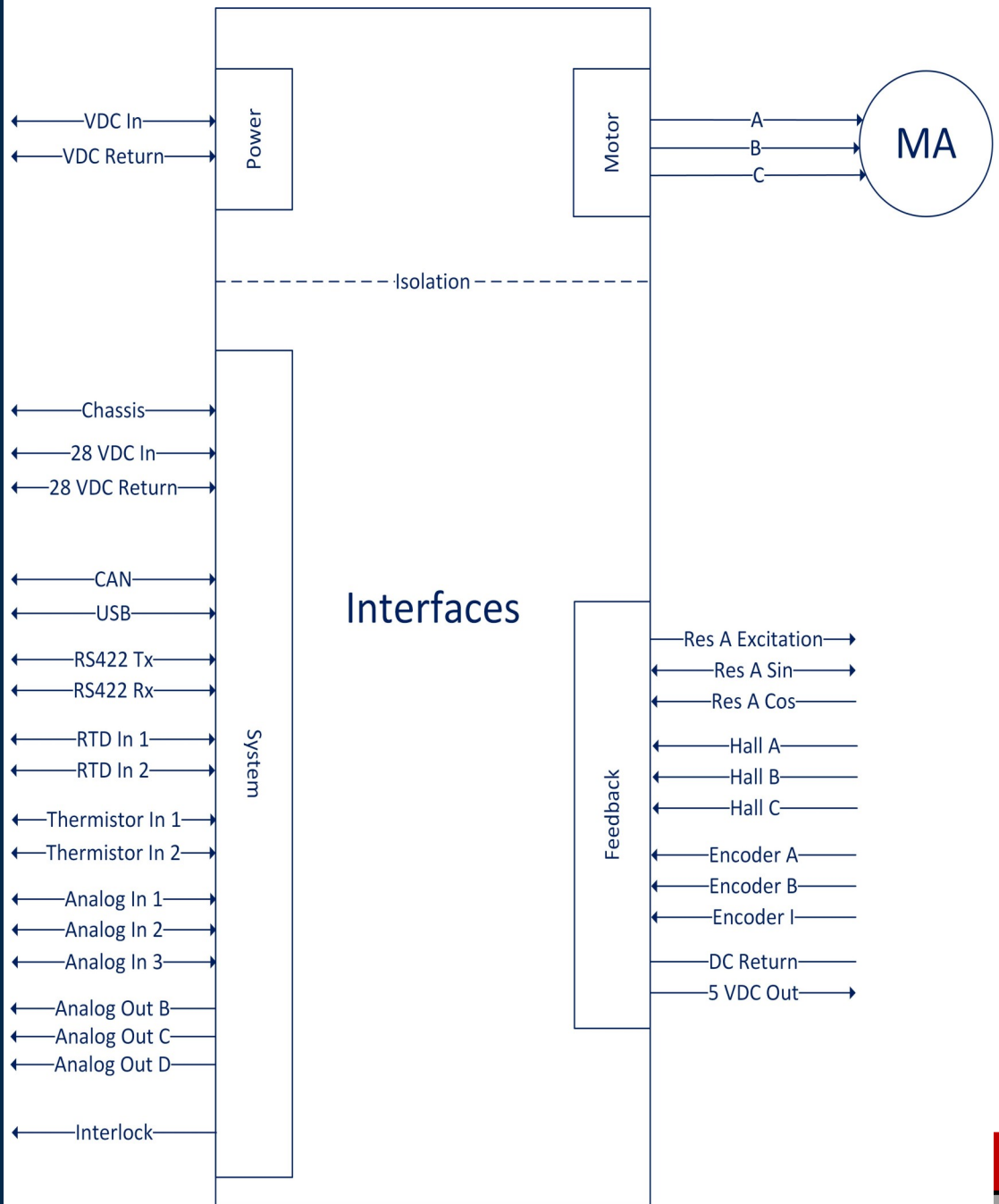
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SYSTEM DIAGRAM



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ELECTRICAL INTERFACES

POWER:

Power, PL00X (Y) - 301-10D10*		
PIN	DESCRIPTION	CURRENT RATING ⁽¹⁾
A	High Voltage DC In	300
B	High Voltage DC Return	300

*Mating connector PL18X(Y)-301-70

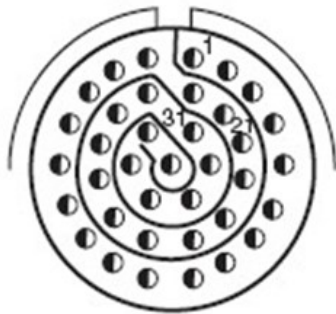
MOTOR:

Power, PL00X (Y) - 301-10D10*		
PIN	DESCRIPTION	CURRENT RATING ⁽¹⁾
A	Phase A	300
B	Phase B	300
C	Phase C	300



Notes:

⁽¹⁾ = connector rating, see electrical characteristics for drive rating.



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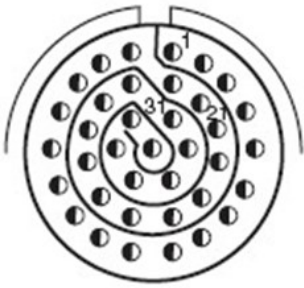
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ELECTRICAL INTERFACES

Zeus Motor/ Generator Controller



System, J3, D38999/20FD35AN*

PIN	DESCRIPTION	WIRE GAUGE
1	28 VDC In	22
2	28 VDC In	22
3	RTD 1 (+)	22-28
4	RTD 1 (-)	22-28
5	RTD 2 (+)	22-28
6	RTD 2 (-)	22-28
7	Thermistor 1 (+)	22-28
8	Thermistor 1 (-)	22-28
9	Thermistor 2 (+)	22-28
10	Thermistor 2 (-)	22-28
11	RS422 Tx (+)	22-28
12	RS422 Tx (-)	22-28
13	RS422 Rx (+)	22-28
14	RS422 Rx (-)	22-28
15	Chassis	22-28
16	DC Return	22-28
17	CAN H	22-28
18	CAN L	22-28
19	DC Return	22
20	USB D+ (Future Enhancement)	22-28
21	USB P- (Future Enhancement)	22-28
22	USB Vbus (Future Enhancement)	22-28
23	Interlock In	22-28
24	Analog Gnd	22-28
25	Analog In 1	22-28
26	Analog Gnd	22-28
27	Analog In 2	22-28
28	Analog Gnd	22-28
29	Analog In 3	22-28
30	Analog Gnd	22-28
31	Interlock Out	22-28
32	Analog Gnd	22-28
33	Analog Out B	22-28
34	Analog Gnd	22-28
35	Analog Out C	22-28
36	Analog Gnd	22-28
37	Analog Out D	22-28

* Mating connector D38999/26FD35SN

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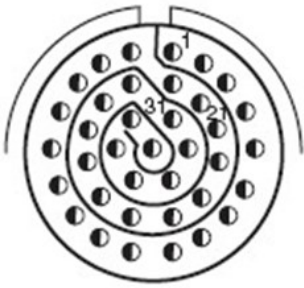
Zeus Motor/ Generator Controller

ELECTRICAL INTERFACES

System, J2, D38999/20FD35AA*

PIN	DESCRIPTION	WIRE GAUGE
1	Encoder A (+)	22
2	Encoder A (-)	22
3	Encoder B (+)	22-28
4	Encoder B (-)	22-28
5	Encoder I (+)	22-28
6	Encoder I (-)	22-28
7	5 VDC Out	22-28
8	Hall A (+)	22-28
9	Hall B (+)	22-28
10	Hall C (+)	22-28
11	Chassis	22-28
12	Hall A (-)	22-28
13	Hall B (-)	22-28
14	Hall C (-)	22-28
15	5 VDC Out	22-28
16	DC Return	22-28
17	Resolver A Excitation (+)	22-28
18	Resolver A Excitation (-)	22-28
19	Resolver A Sin (+)	22
20	Resolver A Sin (-)	22-28
21	Resolver A Cos (+)	22-28
22	Resolver A Cos (-)	22-28

* Mating connector D38999/26FC35SN



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ELECTRICAL CHARACTERISTICS

SIGNAL	MINIMUM	NOMINAL	MAXIMUM	UNITS
HV In	24	600	750	V
Peak Phase Current	-		1.25 X Continuous current ^{(7) (8)}	A
28 VDC In	12		33	V
28 VDC In	-		2	A
RTD Input Impedance ⁽⁶⁾	-		1.1	K Ohm
Thermistor ⁽⁵⁾ Input Impedance	-		2	K Ohm
RS422 ^{(1) (2)}	-		1000	K bps
CAN ^{(2) (3)}	-		1000	K bps
USB 2.0	-		12	M bps
Analog In	-5		5	V
Analog Out	0		5	V
Analog Out	-		50	mA
Encoder A, B, I ^(DIFFERENTIAL)	0		5	V
Encoder A, B, I	0		120	Ohm
5 VDC Out	-		250 ⁽⁴⁾	mA
Hall A, B, C	0		5	V
Resolver Excitation	1.9	2	2.1	V rms
Resolver Excitation Frequency	4.9	5	5.1	K Hz
Resolver Sin, Cos	0.5	1	1.5	V rms
Resolver Sin, Cos ^(INPUT IMPEDANCE)	-	20	-	K Ohm
Coolant Temp			75	°C

⁽¹⁾ Physical Interface compliant to the TIA/EIA-422-B.

⁽²⁾ Short circuit protection from -7 V to 12 V protection.

⁽³⁾ Compliant to ISO 11898-2 specification.

⁽⁴⁾ Total current for all pins.

⁽⁵⁾ 10K Ohm NTC

⁽⁶⁾ 100 Ohm RTD .

⁽⁷⁾ Continuous Current is 180 A (Peak of Sin)

⁽⁸⁾ Maximum Current for 5 seconds



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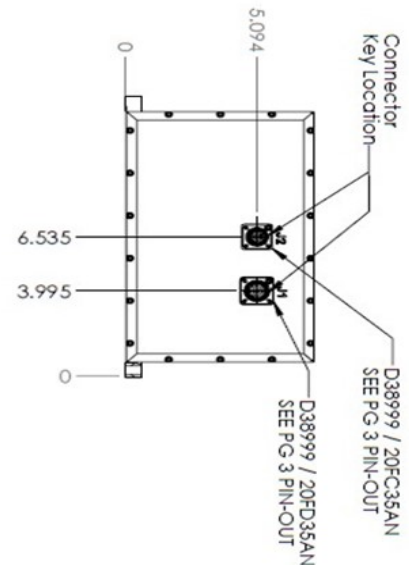
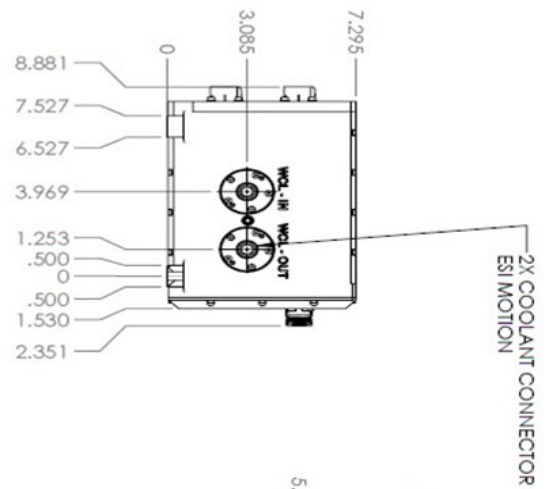
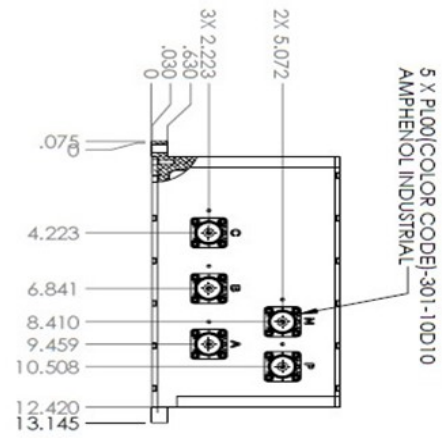
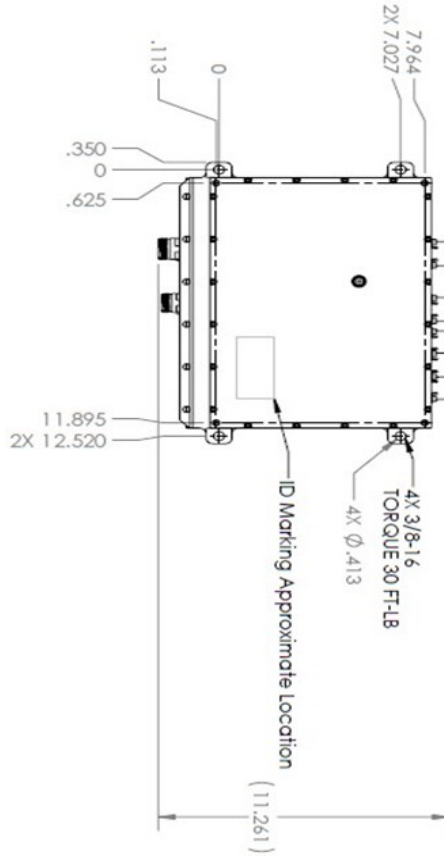
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MECHANICAL



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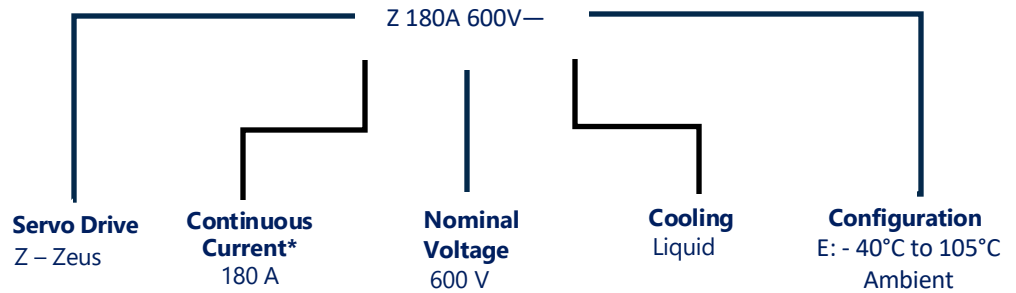
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ORDERING INFORMATION



Example:

Part number: Z180A600V-E

Servo Drive: Zeus

Continuous Current: 180A

Nominal Voltage: 600V

Cooling: Liquid Cooled

Configuration: E (Extended Ambient Temp)



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