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Taurus AE Physical ICD

601-0057-000 Rev. C

The Taurus AE (Actuator Edition) motor controller is based on our Taurus FOC technology which enables customized control loops and tuning, along with bi-directional communications to give your system more advanced control and monitoring. The Taurus AE provides motor sensors for slow-speed operation, alignment and parking support, perfect for use on an actuator.

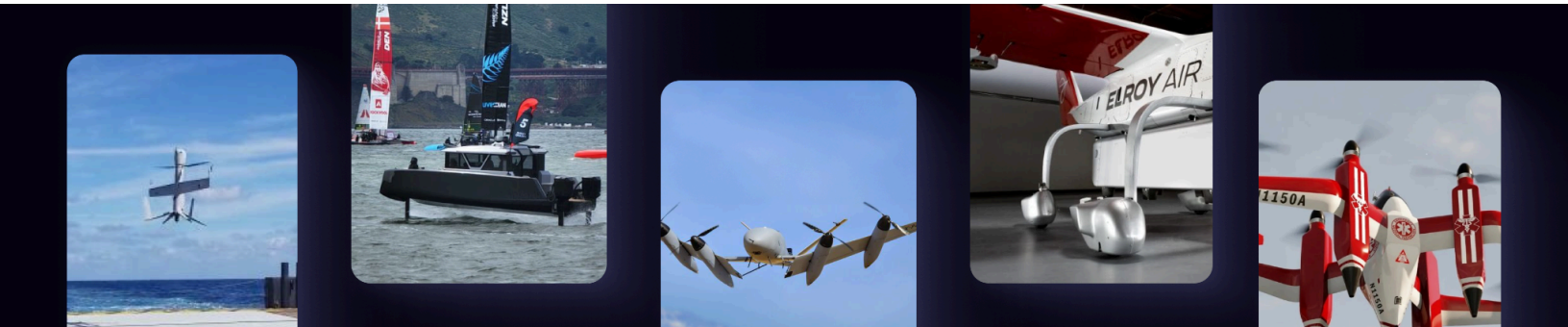


Table of Contents

Introduction

The allocortech inc Taurus AE (Actuator Edition) is a BLDC motor controller that implements full FOC/SVPWM for high efficiency operation up to 2kW peak power. The Taurus AE has isolated communications channels configurable for CAN 2.0, RS-422/485, or RS-232. It also provides general-purpose digital output/input, which can be configured for PWM output/input capture. A set of 4 digital sensor inputs can either be used for Hall sensor input or Quadrature Encoder input signals from the motor. Additionally, there are 2 differential analog sensor inputs that may be used for measuring motor temperature or other analog sensors.

Scope of this Document

This document covers the mechanical and electrical specifications of the allocortech Inc Taurus AE (part number 100-0063 and variants). The software development interfaces will be covered in other documents.

Version History

Revision	Changes
A	Initial Release
B	Updated Maximum Input Voltage
C	Document template changed to new format

List of Abbreviations

4W RS485	Four wire, full duplex, differential serial (aka RS-422) with RS-485 line levels.
BLDC	Brushless DC (motor)
CAN	Controller Area Network, serial protocol ISO 11898
EMI	Electromagnetic Interference
FOC	Field Oriented Control
GND	Power or Digital Ground, isolated from Chassis Ground
GPI	General Purpose Input
GPO	General Purpose Output
PWM	Pulse Width Modulation
SVPWM	State Vector Pulse Width Modulation

References

CAN 2.0 Specification

Electrical Interface

Connector Pinouts

J1 - Primary Connector

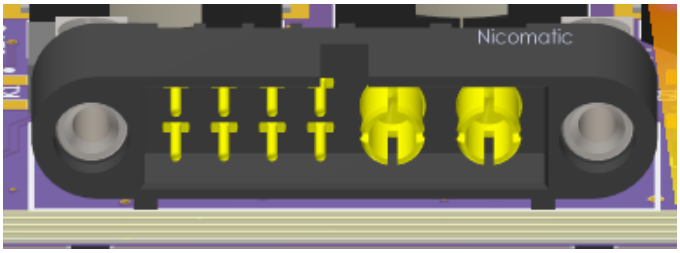
Part Number: `Nicomatic 221V08F26-0200-3400CM`

Recommended Mating Part Numbers

- `Nicomatic 222S08M16C-0200-4310` (16-20AWG HP)
- `Nicomatic 222S08M16C-0200-4315` (14AWG HP)
- `Nicomatic 222S08M16C-0200-4320` (12AWG HP)

Backshells:

- Simple Potting Dam Backshell: `Nicomatic 14487-21`
- Straight, RA, and 45° backshells also available



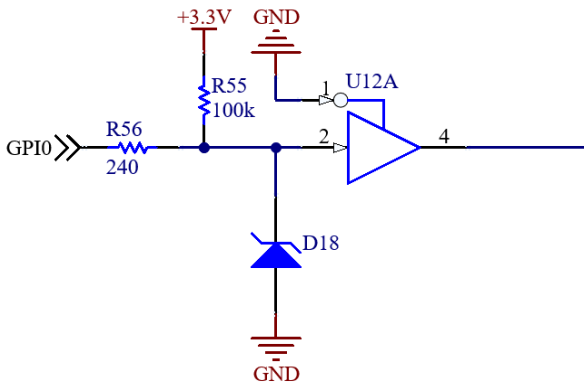
4	3	2	1	HP2	HP1
8	7	6	5		

Pin	Name	Primary Function	Alt. Function A	Alt. Function B
HP1	VIN	Primary Power Input (+)	-	-
HP2	GND	Primary Power Input (-)	-	-
1	RS232 TX	RS-232 Transmit	-	RS-422 RX+
2	RS232 RX	RS-232 Receive	-	RS-422 RX-
3	CAN_H	CAN High	RS-485+	RS-422 TX+
4	CAN_L	CAN Low	RS-485-	RS-422 TX-
5	GPO0	General-Purpose Output (channel 0)	-	-
6	GPI0	General-Purpose Input (channel 0)	-	-
7	GND	Reference ground for GPI0/GPO0	-	-
8	ISO-GND	Isolated reference ground for pins 1-4 (RS-232, RS-485, RS-422 and CAN)	-	-

Isolated signals support up to 400V isolation from the primary power input.

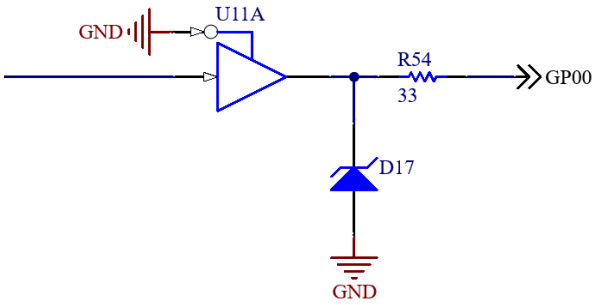
VIN/GND Primary Power Input: 18-52V, see Electrical Ratings for details.

General Purpose Input



Specification	Rating
Input Clamp Current	-20mA (max)
V_{IH} High-Level Input Voltage	1.39V
V_{IL} Low-Level Input Voltage	0.65V
Voltage Max (Continuous)	8.1V
Voltage Min (Continuous)	-4.8V

General Purpose Output



Specification	Rating
I_{out} Continuous	+/-25mA
High-Level Output Current	-7mA @ 3.3V -8mA @ 5V
Low-Level Output Current	7mA @ 3.3V 8mA @ 5.0V
V_{OH}	2.9V@3.3V /-5.5mA 4.6V@5.0V / -8mA
V_{OL}	0.1V @ 20µA

Note: compensation for 33Ω series resistor not included.

J2 - Motor Connector

Part number: `Molex 39-30-3037`

Recommended Mating Part Number: `Molex 39-01-4030`

3	2	1

Pin	Name	Notes
1	Motor Phase W	13A Continuous
2	Motor Phase V	13A Continuous
3	Motor Phase U	13A Continuous

J4 - Sensor Connector

Part Number: `Molex 43045-1000`

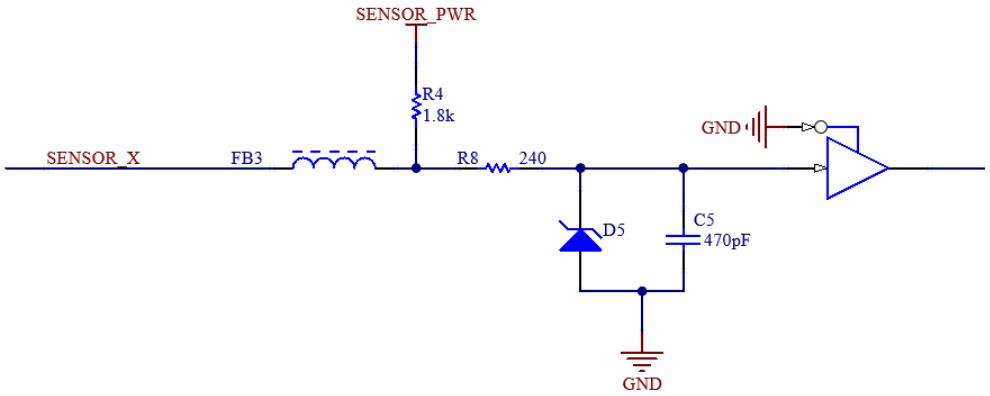
Recommended Mating Part Number: `Molex 43025-1000`

10	9	8	7	6
5	4	3	2	1

Pin	Name	Function	Alt Function	Notes
1	SENSOR_GND	Hall GND	QEP GND	Connected to power ground.
2	M_TEMP_A+	-	-	Analog Input A
3	M_TEMP_A-	-	-	Reference for Analog Input A
4	M_TEMP_B+	-	-	Analog Input B
5	M_TEMP_B-	-	-	Reference for Analog Input B
6	SENSOR_VDD	Hall Power	QEP Power	3.3V (default), Software configurable to 5V. 250mA Current Limit
7	SENSOR_A	Hall A	QEP Index	Input, 1.8kΩ pull-up to SENSOR_VDD
8	SENSOR_B	Hall B	QEP Phase A	Input, 1.8kΩ pull-up to SENSOR_VDD
9	SENSOR_C	Hall C	QEP Phase B	Input, 1.8kΩ pull-up to SENSOR_VDD

10	SENSOR_D	-	-	Input, 1.8kΩ pull-up to SENSOR_VDD

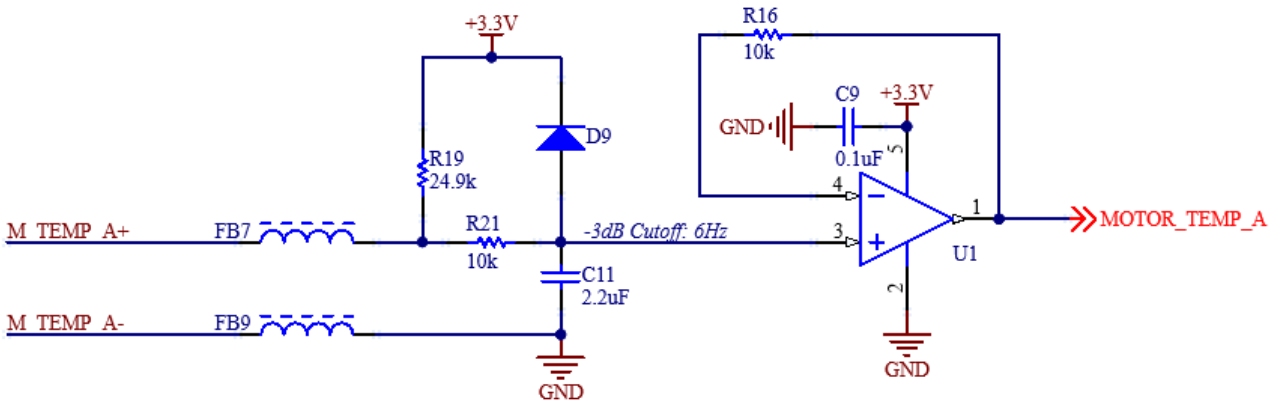
Hall/QEP Sensor Inputs



Each sensor input has a 1.8kΩ pull-up for the case of open-collector output Hall sensors. The signal is also filtered through a 240Ω/470pF (F_C = 1.4Mhz) RC low-pass filter. Then all 4 input sensor signals enter a logic buffer with <4.8ns delay.

Specification	Rating
V_{IH} High-Level Input Voltage	2.0V
V_{IL} Low-Level Input Voltage	0.8V
Voltage Max (Continuous)	6.3V
Voltage Min (Continuous)	-3.0V

Analog Inputs



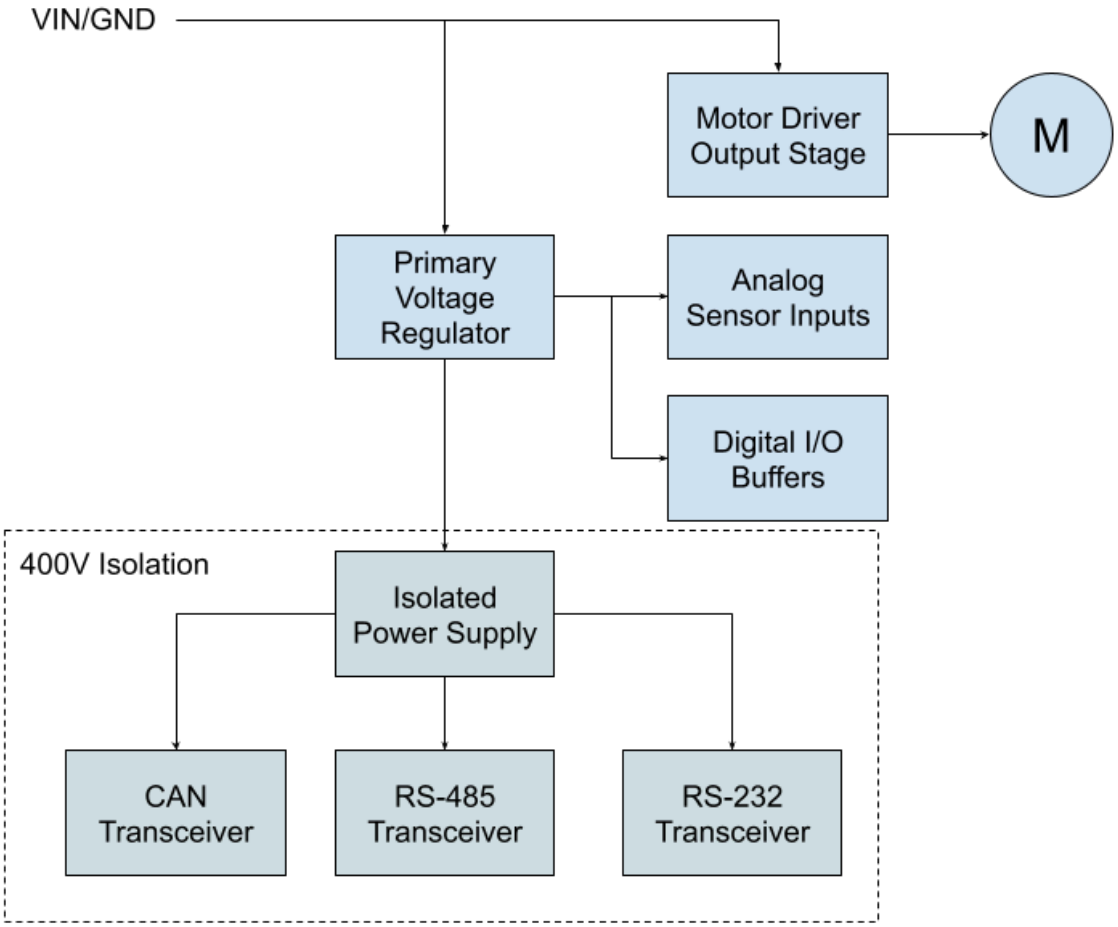
Both analog inputs are electrically equivalent to the above circuit. Alternate resistor configurations are available on request to achieve different gains.

Standard software will measure temperature from a 10kΩ NTC thermistor with ß = 3490K (e.g. `Murata NXRT15XV103FA1B040`).

Functional Interface

Power Topology

The communications signals (CAN, RS-485/RS-422, RS-232) are isolated from the main power input. However, some signals, specifically motor sensor inputs and digital input/output signals are not isolated, and are referenced to the main power ground.



Absolute Maximums

Parameter	Min	Max	Units
Input Voltage on VIN	-0.5 *	52	V
VIN Current	±20 (continuous) ±30 (peak)		A
System/Idle Power	1.0	1.5	W
Motor Power	0	1200 (continuous) 1800 (peak)	W
GPI0 Voltage to GND	-4.8	8.1	V
GPO0 Voltage to GND	-1.3	SENSOR_VDD + 1.3	V
SENSOR_A/B/C/D to GND	-3.8	SENSOR_VDD + 3.8	V
CAN Common Mode to ISO-GND	-2	+7	V
RS-485 Common Mode to ISO-GND	-25	+25	V
RS-485 Transient Fault Protection to ISO-GND	-65	+65	V
RS-232 RX to ISO-GND	-25	+25	V
RS-232 TX to ISO-GND	-13.2	+13.2	V
GND to ISO-GND	-400	+400	V

* The Taurus-AE can withstand up to 8A in the case of reverse power polarity.

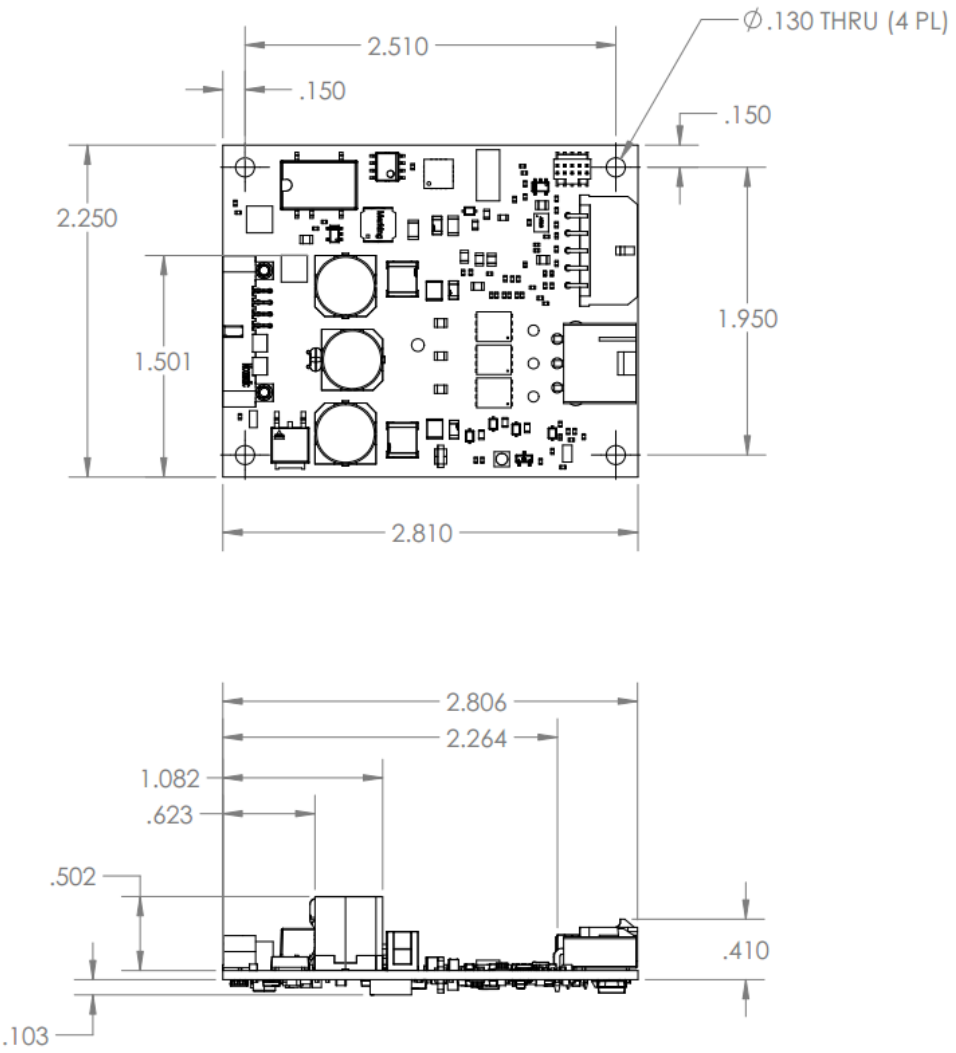
Communications Parameters

Parameter	Min	Nom	Max	Units
CAN Differential Output Voltage (dominant)	1.5		3.0	V
CAN Differential Output Voltage (recessive)	-0.12		0.012	V
RS-422/485 Differential Output	1.5 @ 54Ω			V
RS-422/485 Common Mode Output Voltage		2.5	3	V
RS-422/485 Input Rising Threshold	40		200	mV
RS-422/485 Input Falling Threshold	-200		-40	mV
RS-232 TX High Level Low Level	 5.0	 5.4 -5.4	 -5.0	 V V
RS-232 RX High threshold Low threshold Operating limit	 0.8 -25	 1.8 1.5	 2.4 +25	 V V V

For more detailed information, see the datasheets for the following transceivers:

RS-232	MAX3227
CAN 2.0	SN65HVD255D
RS-422/485	MAX14775

Mechanical Interface



Measurements given in inches.

Mounting Holes

- 4x 0.130”
- 2.510” x 1.950” square pattern
- Plated, electrically isolated

Weight: 37 g

Environmental

Temperature

Operating: -40°C to 105°C

Storage: -40° to 105°C

On-board temperature sensors are included at the following locations. The specific limits are as follows, which software should adhere to. These thresholds assume adequate air flow and/or heat sinking of the Taurus-AE.

Device	Recommended Limit
Inverter MOSFETs	125°C
Internal Processor	125°C
Bulk Capacitor	105°C

Note: RS-232 not available across the full temperature range.