



# TSX

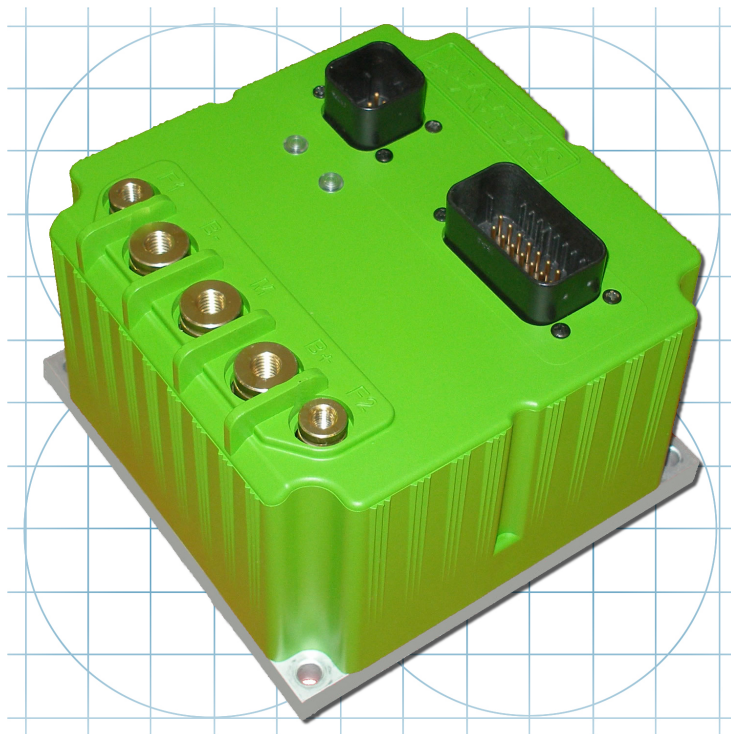
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## DESCRIPTION

The TSX line of fully-programmable controllers for separately excited motors have half-H armature control and independent full-H field control enabling contactorless reversing and motor performance optimization.

With current and thermal limiting of armature and field sections, current limited contactor I/O, automotive quality AMPSEAL™ connectors, and rugged highly ingress resistant ABS case the TSX is fully protected. TSX supports Hall-effect, resistive, and inductive throttle types. The TSX line have a CAN interface and can be slaved with to another TSX for dual-motor control.

TSX controllers are fully programmable with the intuitive PC Probit II user interface allowing control of virtually all settings including current limits, maximum speeds in both forward and reverse, and battery over-discharge protection.



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## KEY FEATURES

- Compact size and low weight
- Regenerative braking
- Up to six fully programmable PWM switched outputs
- Contactorless motor reversing
- Separate armature and field current limits
- Automotive-quality AMPSEAL™ waterproof connectors
- Thermal protection
- Safe-sequencing
- Hall or pot and inductive throttle
- CAN interface
- Speed sensor input

## BATTERY VOLTAGE

- 24 to 48 Volt DC Input

## OUTPUT CAPABILITY

- Up to 500 amps armature current for 1 minute
- Up to 200 amps continuous armature current
- Up to 50 amp peak field current

## APPLICATIONS

- Golf cars
- Burden carriers
- Material Handling Equipment
- Automated Guided Vehicles
- Aerial Lift Platforms
- Airport Ground Service Equipment

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## FEATURES AND BENEFITS

### Flexibility

- Fully programmable with the Navitas PC Probit II programming package
- Up to six programmable switch PWM switched outputs enable control of additional devices such as contactors, horns, lights, hour-meter enable, and back-up beepers
- Programmable to match the unique characteristics of each separately excited motor model
- Programmable low-voltage battery discharge interrupt (BDI) cutbacks will limit motor speed to extend the battery charge
- Up to three speed limit inputs with programmable cut-back speeds and priority level
- Multiple user-selectable vehicle operating profiles

### Control

- Full bridge field control design allows reversing without the use of direction contactors
- Armature current controlled at all times to help reduce brush wear and arcing
- Regenerative braking harnesses excess energy to extend the battery charge
- Motor over-speed protection is ensured using the motor field

### Communications

- Integrated LEDs flash information and error codes for basic controller diagnostics
- Additional fault outputs provide diagnostic information to remote displays
- Protected I/O connections
- Internal clocks for key-on and drive-time tracking
- Battery state of charge calculator for remote CAN based battery discharge indicators

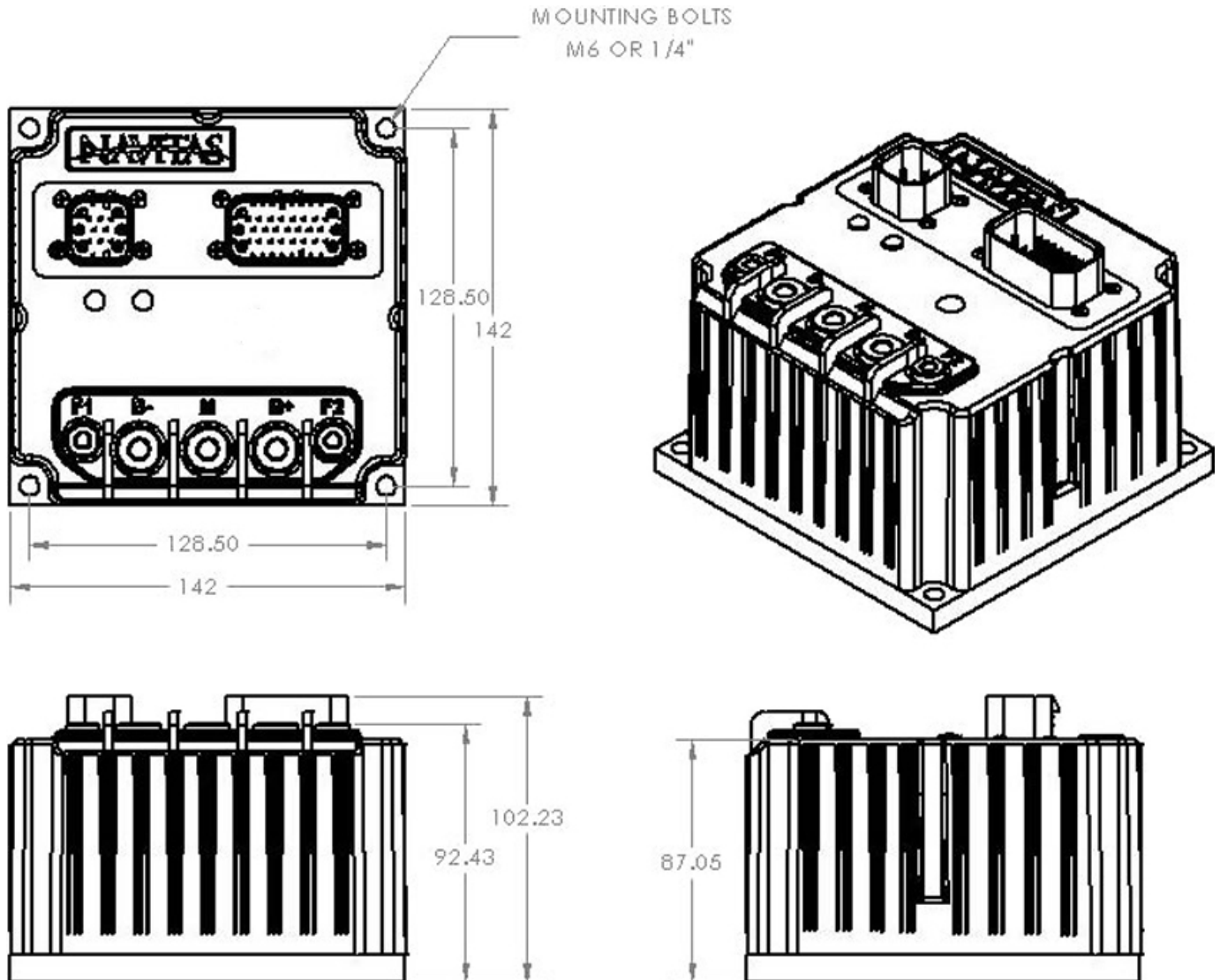
### Safety

- Regenerative braking provides vehicle speed control at any throttle position when going down ramps and channels the extra energy back into the batteries for longer battery life
- Adjustable regen settings allow for braking strength to be tailored to the specific vehicle for safety during stopping and forward/reverse transitions
- Safe-Sequencing including high pedal disable (HPD) and static-return-to-off (SRO) interlock ensure safe startup and vehicle operation
- Emergency reverse/belly button switch input causes immediate motor reversal
- Controlled temperature cutback on armature and field drive current limits ensures there is no sudden loss of power under any thermal condition



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## DIMENSIONS



- Base footprint 142x142mm
- Enclosure height 87mm (connector housing [without plug] projects a further 15mm)
- 6.75mm/0.25 inch mounting holes on 128.5mm centres
- Field connection is 2xM6 bolt
- Motor and battery connection are 3xM8 bolt
- Connectors are AMPSEAL™ 23 pin and 8 pin (black)

- Ingress: Robust ABS/aluminum enclosure designed to meet IP67.
- Operating Temperature: -40°C to +50°C
- Storage Temperature: -40°C to +70°C
- Switching frequency: 16 kHz

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## MODEL CHART

Model	System Voltage	Armature Rating (1 min)	Field Rating (1 min)	Throttle Types	Contactor Outputs
TSX500-426PI	24-48	500	50	2 X 0-5k/5-0k/0-5v	6
TSX500-416PI	24-48	500	50	1 X Inductive + 1 X 0-5k/5-0k/0-5v	6

*Note: Specifications are subject to change without notice.*

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