SSt-6000-R

DSP-Based Digital Servo Drive

The SSt-6000-R is the latest in Teknic's line of high bandwidth, digital vector servo drives. Built on the integration of position, velocity, and torque loops pioneered in earlier designs, this unit provides improved performance, enhanced diagnostics and even better machine reliability.

For years, Teknic has proven the benefits of tightly integrating servo compensation with torque control under a dedicated DSP per axis. The latest in a line of high performance drives, the SSt-R series continues to improve the state of the art by utilizing this topology in such a way to allow all information to be shared in real time so all system functions cooperate in any situation. For example, if the torque loop senses voltage saturation, this information is instantly passed upstream to the servo compensator and the system delivers a coordinated response, maintaining elegant load control. The result is performance superior to other digital servo drives or analog torque amplifiers. OEMs will realize tighter tracking, faster settling, and smoother motion—all of which yield superior machine throughput and reliability.

The SSt-6000-R improves on previous SSt versions by providing enhanced diagnostics which significantly reduce system engineering, integration and troubleshooting time. Mechanical or electrical troubles, as well as servo system configurations, can be easily diagnosed with the built-in oscilloscope. Other diagnostic modes reduce troubleshooting steps, quickly getting machines up and running with a minimum of effort and complexity.

CUTTING EDGE SERVO CONTROL

The SSt-6000-R's servo performance is the product of decades of algorithm refinement capitalizing on a truly unique design architecture.

Superior Tracking Accuracy

Multi-derivative, state feedforward gains significantly improve tracking performance and do not create the audible noise or torque chatter of traditional implementations.

Zero Settling Time

For demanding point to point applications, the advanced technology of the SSt-R provides zero settling time.[1]

Ultra Smooth Motion

Teknic's proprietary Regressive AutoSpline™ (RAS) technology produces ultra-smooth trajectories. The profiles are jerk and jerk-derivative limited, which reduces shock, vibration, noise, and wear—even in high speed machines.

Adaptive Tuning

The SSt utilizes an adaptive control algorithm (IMT) based on neural fuzzy logic. The IMT virtually eliminates any inertia matching concerns and allows for large and varying loads.

Anti-Hunt™

The SST-6000-R uses small-signal, sliding-mode, automatic gain modulation to eliminate hunting even with extreme gains. Axes will be perfectly still and have no loss of accuracy.

Ease of Performance

Some systems are high performance and others easy to use; few are both. The SSt's cascading PIV control structure provides cutting edge performance *with* ease of use. Even the sophisticated RAS, IMT, and Anti-Hunt features are easy to set up.

FLEXIBLE, LOW EFFORT INTEGRATION

The SSt has OEM friendly features designed to make upgrading performance quick and painless.

Drop-in Controller Compatibility

R-series servo drives accept analog torque, analog velocity and digital trajectory commands that are compatible with most servo controllers or stepper indexers. This provides a simple performance upgrade path for servos and allows for drop-in stepper replacement with little or no software changes.

Universal Motor Interface

SSt servo drives control many types of motors (such as rotary and linear brushless servomotors, brush motors, galvos or voice coils, etc.) from virtually any manufacturer without electrical restriction on the motor.

Development/Assembly Feature Examples

- Robust PIV compensator eliminates production tuning.
- With QuickSet™ software, the SSt-6000-R provides a wealth of diagnostics to pinpoint failures due to assembly errors and allow for quick troubleshooting.
- Simplified blink codes easily identify the origin and type of problems, reducing overall troubleshooting time.
- QuietDesign™ EMI reduction system eliminates shield clamps, ferrite slugs and other components required to meet regulatory requirements such as CE.
- OEM friendly cabling is robust, mass producible and testable. With CAD drawings available at no charge, they are also economical to build.
- Automatic digital filtering on Enable, Mode, limit and commutation sensor inputs improves signal reliability.

[1] **≤1 msec (assuming mechanical system bandwidth ≥ required move bandwidth)**

ADDITIONAL CAPABILITIES...

Software Scope

Now engineers and technicians can view, configure and troubleshoot the entire motion system using nothing but QuickSet software. A built-in oscilloscope enables quick troubleshooting by providing detailed information about servo drive performance. Advanced triggering modes allow you to capture data related to the start or finish of a move or even a safety shutdown event. View any monitor port variable (tracking error, actual torque, etc.) alongside specific move status (in-range, move done, etc.), drive status (shutdowns, limits, saturation, etc.) or Mode line status (torque foldback, gear shift, etc.). This easy-to-use tool provides an effective method for system evaluation, configuration and diagnosis.

Electronic Gear Shift

A feature developed for OEMs that require high speed motion in addition to extremely high accuracy positioning. This feature provides a single input to switch between high speed/low resolution and low speed/high resolution motion. Now OEMs can provide the best of both worlds even with controller step output rate limitations.

Shutdown History

Quickly discover the root cause of machine problems: A historical view of recent fault activity is captured which allows engineers and technicians to retrace a series of safety shutdowns in a machine.

Low Total Servo Phase Delay

The total time from the moment the position feedback is read to the time torque is updated at the motor is fully deterministic and the fastest in the industry (35µs).

Extremely Fast Torque Response Time

Sinewave commutation with vector feed-forward and DQ decoupling provides near-zero torque response time *at any speed.*

Elimination of Motor Burn-out

Motor burn-out is eliminated using true RMS limiting and no added wiring or sensors. It is much faster and more effective than I^2t or thermostats.

Hardstop and Limit Homing

Upgrading from stepper motors may require you to initialize axes without using home sensors. The servo drive can accurately detect a hardstop and then automatically capture its position and ramp down torque; homing without sensors.

SPECIFICATIONS

GENERAL	Dimensions, in (mm):	8.93 (227) x 5.56 (141) x 3.15 (80).
	Weight, oz (g):	71.8 (2035).
ENVIRONMENTAL	Temperature:	0-40 Degrees C.
	Humidity:	0-95%, non-condensing.
COMPLIANCE	Electrical safety:	EN 61010, UL508C.
	EMI:	EN 50081-2, EN 50082-2.
	Machine safety:	EN 954-1, with proper power control.
OUTPUT POWER	Current:	23 Amps Peak (3 seconds). 9 Amps RMS vertical on metal surface. 12 Amps RMS with mounted fan cooling.
	PWM ripple frequency:	28kHz, center balance vector type.
COMPENSATOR	TSPD (Total Servo Phase Delay):	35 µS.
	Position/Velocity control:	Enhanced PIV with proprietary velocity, acceleration and jerk estimators, Inertia Matching Technology (IMT), Regressive AutoSpline (RAS) and Anti-Hunt. Provides velocity, acceleration, jerk, and friction feed-forward gains.
	Torque control:	Synchronous vector with DQ decoupling, SmartSaturation, and auto calibration.
ENCODER	Interface:	Single-ended or differential, user selectable.
	Max count rate:	15MHz.
	Features:	Bad sequence detection, digital filtering.
MOTOR COMPATIBILITY	Requirements:	Any permanent magnet motor of any type.
LIMIT INPUTS	Interface:	TTL with 1kΩ pull-up; digitally filtered.
HALL SENSOR INPUTS	Specifications:	Optically isolated; 1kΩ pull-up to +5V.
	Features:	Digitally filtered; used for setting torque vector upon initialization only; drive can run in hall-less mode.
DEDICATED INTERFACE INPUTS/OUTPUTS	Outputs:	Drive ready; move done, in-range, all-systems-go; encoder and limit pass-through, +5V.
	Inputs:	Enable motor; Mode (engage/disengage drive features, such as torque foldback, hardstop homing, electronic gear shift etc.); Digital pulse and direction; ±10V torque, ±10V velocity, encoder, limits, etc.
REAL-TIME MONITOR PORT	Features:	Configurable filtering, sync pulse at move start, wide scaling/high zoom, non-volatile.
	Output variables:	Position error, actual velocity, commanded velocity, velocity error, commanded torque, actual torque, SGN velocity, SGN position, measured position, jerk commanded, acceleration commanded, max phase voltage.
PROTECTION & SAFETY FUNCTIONS	Drive protection:	Short circuit (phase-to-phase, phase-to-ground), over temp, over voltage, over current, protected for open windings, fused.
	Motor protection:	True RMS torque limiting, automatic speed limit, motor jam detection, over temp.
	Mechanical safeguards:	Hardstop detection, limit switch servoing, adjustable tracking error limits and shutdown thresholds, adjustable torque and speed limit.
± 10V ANALOG MODE	Format:	Differential input, ±10V range, >10kΩ impedance, 10% of peak per volt scale.
INPUT SUPPLY	Input voltage:	90-240 VAC (50-60Hz) or 128-340 VDC.
COUNTRY OF ORIGIN	Manufactured in:	USA.