

Automatic Voltage Regulator

Voltage Regulators

◆ Modular Power Conditioning System

◆ The Toughest Power Conditioner on the Market Today

The Staco Energy Products Co. Automatic Voltage Regulator is based on a series regulation transformer controlled by variable transformers (VTs). It offers tight output regulation, robust design and easy customization.

In today's world, the cost of electrical power and its quality have become major operating concerns. The continuing increase in the cost of electrical power has heightened interest in energy savings, and poor power quality has been identified as a cause of expensive malfunctions and shutdowns in new high technology equipment.

Voltage regulation problems account for more than 90% of the power problems seen at most sites. The Staco Energy Products Co.'s base Automatic Voltage Regulator (AVR) provides protection against all but the most extreme voltage swings. When additional non-voltage issues occur, Staco Energy offers a series of options that address such issues as high voltage transients, high harmonic content and site load balance. This integrated and targeted approach provides site-specific power correction in a one-box solution.

Warranty

The industry leading 3-year warranty is our guarantee that Staco Energy offers the toughest, most robust Voltage Regulation System on the market today.

Advantages:

- **Modular Construction for Easy Customization**
- **Options Offer More Features and Functionality**
- **Extremely High Overload/Inrush Rating**
- **Very Low Cost of Ownership Due to Efficiency and Virtually Maintenance-free Operation**
- **Trouble-free Operation with No Active Devices in Power Path**
- **1% or Better Output Voltage Regulation**
- **Continuous Voltage Regulation – Not Crude Step Regulation**
- **Redundant, Manual Regulation Control (raise/lower switch)**
- **Individual Coil Protection – Avoid Catastrophic Cascade Failures**
- **Gold Plated Contacts on All Coils**
- **Nickel Plated Copper Bus Bar**
- **Easy, Front Panel Access for Service/Installation**
- **No Waveform Distortion – No Harmonics Added**
- **Small Footprint**
- **Able to Withstand the Continuous Vibration of Mobile Applications**



Automatic Voltage Regulator

The Staco Energy Products Co. Automatic Voltage Regulator's unique construction blends precise regulation, high availability, and ruggedness into a highly customizable package.

Base Regulator System

Technology	Motorized Variable Transformer controlled, series regulation transformer (buck-boost transformer with secondary wired in series with the load)			
KVA rating (single-phase)	2.5, 5, 7.5, 10, 15, 25, 37.5 (up to 500 kVA, contact factory)			
Voltage (single-phase)	120, 208, 230, 240, 277, 380, 400, 480			
KVA rating (three-phase)	9, 15, 30, 45, 75, 112.5, 150, 225, 300, 400, 500 (up to 1,000 kVA., contact factory.)			
Voltage (three-phase)	120, 208, 240, 380, 400, 420, 440, 480			
Input Regulation ($\pm 1\%$ output)	+10% / -20%			
Input Regulation ($\pm 5\%$ output)	+15% / -25%			
Response Time	< 2mS			
Correction Time	29 V/sec. at 480 VAC 3 phase, 48 V/sec. 240 VAC single phase. Contact factory for other times.			
Efficiency	99% typical			
Mean Time Between Failure Harmonic	Greater than 200,000 hours			
Distortion	None added			
Harmonic Content	None added			
Overload Rating	33% - 2 hours	50% - 1 hour	100% - 15 minutes	1,000% - 30 cycles
Output impedance	Less than 1% (maintains tight regulation with 100% load step)			
Load Power Factor (pf)	0 lagging to 0 leading			
Altitude (operating)	10,000 feet without derating			
Temperature (operating)	0° to 40° C			
Audible Noise	Less than 45 dBA			
Wiring	Hardwired			
Enclosure	NEMA 1 (others available)			

Power Conditioning Options

Power Problem	Base Unit Voltage Regulator	Optional Isolation Transformer	Optional Surge Protection	Optional Advanced MP Controller	Optional Individual Phase Control
Brownout	X				
Under Voltage / Sag	X				
Over Voltage / Surge	X				
High Voltage Transient			X		
Lightning Protection			X		
Unbalanced Load					X
3rd Harmonic Reduction		X			
Line Noise		X			
Establish a Neutral on Output		X			
Front Panel LCD Display				X	
Remote Communications & Control				X	
Output Regulation	$\pm 1\%$ (5%)	$\pm 1\%$ (5%)	$\pm 1\%$ (5%)	± 0.5 VAC	± 0.5 VAC



Applications for Voltage Regulation

- **BROADCAST:** Regulation for broadcast transmitter sites and studios.
- **COMMERCIAL:** High-rise building whole floor regulation or power conditioning, input voltage regulation for elevator control, large A/C chillers, lighting, and other sensitive non-critical systems.
- **INDUSTRIAL:** Industrial automation, process control, CNC, factory robotics, facility level of point-of-use, heavy load machinery regulation.
- **MARINE:** Dockside or shipboard voltage regulation and power conditioning.
- **MEDICAL:** Medical Imaging: X-ray, CAT Scan, and MRI power conditioning; building or whole floor regulation.
- **MOBILE:** Commercial broadcast and military mobile communication trucks, trailers and shelters.

Points to Consider for Sizing and Configuration

OUTPUT:

Voltage?	_____	VAC
Phase?	Single	Three
Neutral Available?	Yes	No
Frequency?	50 Hz	60 Hz

INPUT:

Voltage?	_____	VAC
Neutral Required?	Yes	No
kVA Required	_____	kVA

OPTIONS:

Surge Suppression?	Yes	No
Individual Phase Control?	Yes	No
Advanced MP Controller?	Yes	No
Isolation Transformer?	Yes	No
External Bypass?	Yes	No
Other?		

Optional Components

Surge Protection

Provides transient voltage surge suppression (TVSS) against high voltage transients generated both internally (such as motors, environmental control equipment, manufacturing, and office equipment) and externally (substation switching transient, system faults, and severe weather such as lightning strikes).

- 10 year free replacement warranty on surge protector
- Parallel configuration provides 40kA (40,000 amps) per phase peak surge current protection
- EMI/RFI attenuation up to 41dB normal mode, 40dB common mode
- Response time \leq 1 nanosecond
- Protection: all modes: L-N, L-L, N-G, L-G
- ANSI/IEEE C62.41 Category B. Designed to protect against externally generated impulse transients and internally generated switching/ring wave transients.
- UL 1449 listed on surge protection

Advanced Communications & Control (MP Controller)

- Increases output regulation to ± 0.5 VAC from standard $\pm 1\%$
- LCD display with numeric/special function keypad
- Monitor and manage output voltage and set points
- Three form "C" contact closures and eight logic level output signals
- Multiple set points may be programmed for variable speed, ramping, and dwell for dynamic voltage control
- User programmed to accept peak-to-peak, average or RMS measurements
- Optional RS232 and RS422 communications for remote monitoring and control
- MP controller standard on three-phase systems with Individual Phase Controlled (IPC)

Individual Phase Control

Provides ± 0.5 VAC regulation (w/MP Controller) on each phase, independently. Provides load balancing for applications with unbalanced, single-phase loads or unbalanced and fluctuating utility power.

Double Shielded Isolation Transformer (Wye-Wye)

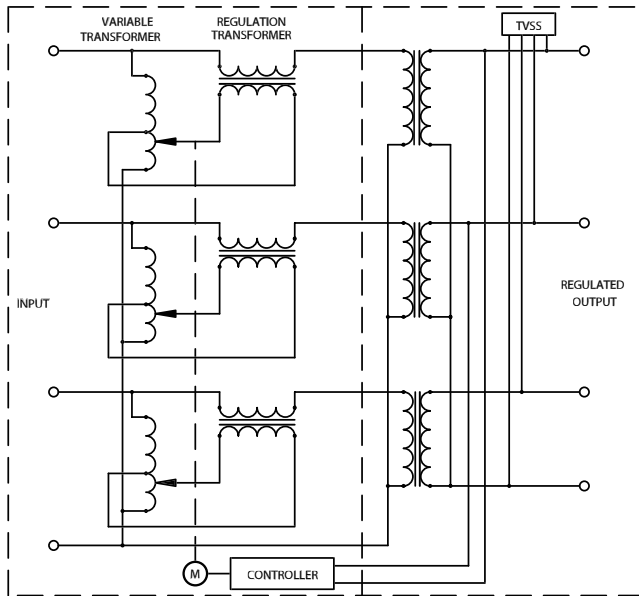
- Provides extra protection & isolation between the utility and the load
- Noise attenuation
- 120 dB common mode
- 60 dB transverse mode
- All copper construction
- Traps 3rd harmonic and triple harmonics
- Removes electrical ground noise/interference
- Creates a bonded neutral (newly derived source)
- 97% or greater efficiency
- Required where input & output voltages differ

Additional Options

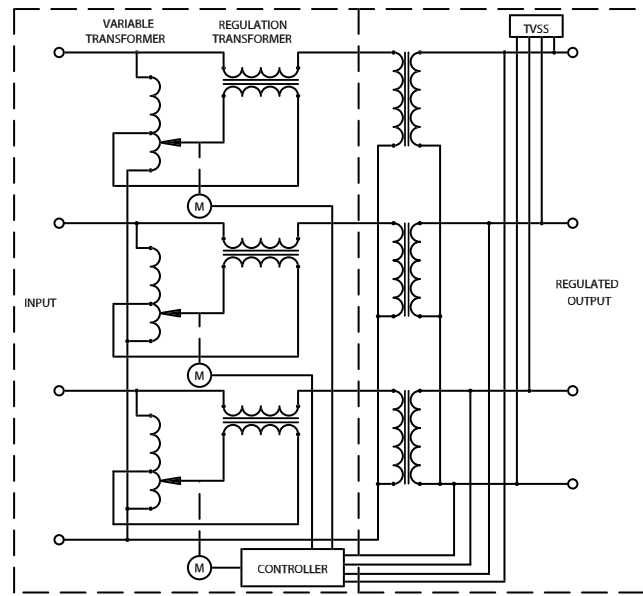
- External maintenance bypass in a free-standing or wall-mount cabinet
- Input and output circuit breakers
- Remote emergency power off (REPO)
- Additional / custom power meters
- Custom enclosures for harsh /outdoor environments

Circuit Diagrams

Three Phase, Single Line Control



Three Phase, Individual Line Control



Your Energy Experts

Staco Energy Products Co. offers a broad range of electrical products, from variable transformers and voltage regulators to sophisticated power conditioners and UPS equipment, along with the expert knowledge to know which technology is right for you. Our experienced staff of engineers is available to assist you in configuring exactly the right product to meet your specifications. They stand ready to work with you on complex special applications or simple modifications to our standard product line.

Our conservative design philosophy, tightly controlled product configuration and consistent manufacturing processes ensure that every Staco Energy Products Co. customer gets the highest quality product possible. Because we are strongly committed to quality, we test 100% of our product before it ships, and then stand behind our workmanship with industry leading warranties.

As your energy experts, we offer a full service customer support program. Beginning with your initial contact, our thorough application assistance ensures that you select the right product and options for your needs. Technical documentation is available to support your planning requirements.

Represented locally by:

