VRx

Extended Input Voltage | Automatic Voltage Regulator | Isolation Transformer

Model
VRx-4400
4.4 kVA
208/220,
230/240V
Single Phase

Outdoor Line Conditioner With Automatic Voltage Regulation And Optional Isolation Transformer

The VRx-4400 power line conditioner is designed to provide your outdoor mission-critical systems with exceptionally high availability of power, comprehensive protection from mains voltage instability and from surge voltages outside of normal system design parameters.

VRx has the ability to handle the harsh and extremely wide input voltage levels often found in some international electrical environments. VRx is specifically designed to handle a wide voltage input window (160-330vac), automatically adjust the voltage to safe levels, and has internally coordinated surge protection devices.

VRx is also designed with a Fail-Safe automatic bypass which enables the VRx to provide power to the load even in the event of internal failure that may otherwise result in a disruption of power to the load.

VRx with isolation transformer provides complete isolation from the AC line, with a neutral-to-ground bond to eliminate all surge voltages between neutral and ground.

Typical Applications

Designed for critical outdoor systems where reliability and predictability matter, such as remote transceiver base stations, fixed wireless applications, as well as for other outdoor equipment requiring additional protection. They are also for mission-critical applications such as telecom applications in remote environments where consistent voltage levels cannot be trusted, and where service calls are expensive.

VRx provides highly available regulated power and protection from mains voltages outside of the design limits for RBS power plants, typically 184-264vac. A low input voltage can result in inadequately charged batteries as the AC-DC power system is unable to draw the power required. An input voltage in excess of 264V, even for a short time, can cause the destruction of AC-DC power systems. In summary, VRx is designed to protect equipment even in the most challenging worldwide electrical, mechanical and environmental conditions.

Key Features Of The VRx Series

- Outdoor lockable enclosure
- Exceptionally high availability power
- Accepts continuous 160-330vac at 50/60Hz input
- 5 stage automatic voltage regulation
- Built-in Over-Voltage (OVP) and Under-Voltage (UVP) Protection
- Automatic fail-safe bypass
- Fail-safe design ensures OVP functions even if voltage regulation circuits fail & unit transfers to bypass
- Coordinated surge protection in accordance with IEC 61312
- EFT & noise protection w/low dv/dt
- True isolation & neutral-ground bond with optional isolation transformer
- Low weight & high efficiency
- Quiet operation
- 2 year warranty

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Outdoor Rated Extended Voltage Range Automatic Voltage Regulator

Key VRx Series Benefits

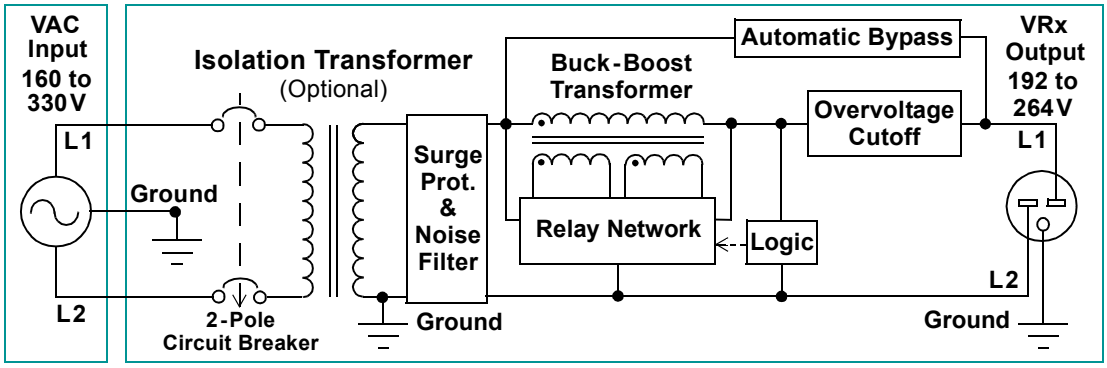
VRx provides enhanced surge immunity and stable power where frequent power interruptions, high/low nominal line voltage, line noise and unstable line voltage exist. VRx regulated output protects AC-DC power systems, UPS and switch-mode power supplies from failure caused by unstable AC mains. VRx noise filtering and surge protection only lets through voltage well below equipment immunity levels while providing coordination of surge protective devices.

VRx provides over-voltage protection which protects the loads from catastrophic failure that could result from harmful sustained over-voltage. Under-voltage protection ensures against low voltage problems. VRx is equipped with a 2 pole circuit breaker rated to handle the full load even @160VAC. VRx used between a UPS and AC mains provides even greater protection for connected equipment, while saving UPS batteries for true black-outs.

VRx provides sufficient hysteresis to prevent back and forth nuisance switching between stages that can be caused by power line transients, even when powered by higher impedance sources such as engine generators.

VRx with isolation transformer and its neutral-ground bond enhances system logic accuracy by providing a zero volt logic reference. It also reduces the need for a high quality ground or dedicated line, while eliminating interference from adjacent sources of disturbances. Major benefits provided by VRx are: enhanced reliability with fewer system lock-ups/reboots, a reduction in equipment down time and service and maintenance cost can be expected.

VRx System Architecture



How The VRx Series Works

The VRx Series incorporates a buck/boost transformer, which provides five levels of line regulation: normal, two boost-stages & two buck-stages. Incoming power from the AC mains is automatically adjusted to a nominal 192-264vac over the full input range of 160-330vac.

VRx includes over-voltage & under-voltage protection circuits (OVP & UVP) which disconnect the power if it becomes totally out of spec, and then restores it automatically once it returns to a safe level. If the output voltage approaches 264VAC for any reason, the OVP ensures that the output is safely disabled. When the unit is in the protective OVP state, it is indicated by a continuously illuminated yellow LED.

A 'FailSafe' automatic bypass enables power in case of control system malfunction, and still enables the OVP and UVP circuits. If output voltage of the VRx were to be below acceptable limits for approximately 100ms, the VRx will automatically activate the Fail-Safe Automatic Bypass, (and red "BYPASS" LED is illuminated), enabling the load to be powered from the power line, while still offering protection from harmful power surges.

VRx with isolation transformer provides electrical isolation and a neutral-ground bond for enhanced protection against major surge events such as nearby lightning strikes. The low-impedance isolation transformer ensures continual power conditioning to the load, even when in FailSafe Automatic Bypass.

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Outdoor Rated Extended Voltage Range Automatic Voltage Regulator

VRx-4400 With Isolation Transformer Option

VRx-4400 Liquid-Tight Fittings

Specification	VRx-4400-22/1	VRx-4400-22/2
Electrical		
Capacity in VA (Watts)	4400VA (4400W)	
Transformer Type	Buck-Boost Transformer	Buck-Boost Isolation Transformer
Input		
Nominal Voltage	220/230/240V, 50Hz single phase. 208/240V, 60Hz single phase.	
Operating Voltage	160 ~ 330 Volts AC	
Nominal Frequency	47-63Hz	
Circuit Breaker Rating	Upstream two-pole, 50A is recommended (to be supplied by customer).	
VRx Circuit Breaker Rtg.	Internal two-pole, 32A.	
Input Wire Size (Two wires plus ground)	AWG 8 for both power & earth conductors. TSi recommends stranded copper wire w/ min. 105°C insulation system.	
Output		
Nominal Voltage	230Volts AC, single phase.	
Load Regulation	Better than +2% (with respect to input voltage) from no load to full load.	
Line Regulation	+7/-10% over the input voltage range of 180 to 300V. Output voltage range is 192-264vac over the full Input range of 160 to 330vac.	
Automatic Bypass	Provides automatic bypass in case of control system malfunction. Over-voltage protection is still enabled. Normal operation is restored upon return of power within specified range.	
Over-Voltage Protection	OVP removes power to protected load if output voltage exceeds 264V. Automatic reset returns power when voltage levels are back in tolerance.	
Power Efficiency	96% (typical)	92% (typical)
Total Harmonic Distortion	<1%	
Surge Protection	A coordinated surge protection system consisting of buck-boost transformer, filter & M.O.V. (Plus isolation transformer on -22/2).	
Surge Test Conditions	Per ANSI/IEEE C62.41-1991 test waveforms	
Surge Let-Through Voltage	200A L-N L-G A3 Ring Wave: 20V 20V 3000A Comb. Wave: 250V 250V	L-N L-G N-G Single Pulse: 50V 50V 0.5V Ring Wave: 20V 20V 0.5V Comb. Wave: 250V 250V 0.5V
Note:	Unit should be installed within 30' (10m) of the neutral-ground bond at the service entrance, or ext. iso. transformer. Or use -22/2.	The measured rate of voltage rise/fall (dV/dt) of the remnant waveform is less than 10V/µS with input test waveform dV/dt of 6kV/µS
Status Indicators	Green LED for normal regulating mode operation, red LED for bypass operation, and yellow LED for overvoltage shutdown activation.	
AC Connection	Terminal block connectors via 3/4" liquid-tight fittings.	
Physical		
Dimensions	D: 16"(406mm)Wide x 28"(711mm)H x 12"(305mm)Deep.	
Weight	100 lbs (43.5kg)	200 lbs (87kg)
Pedestal Mounting Kit	Optional Pedestal Mounting Kit is available (Please call).	
Safety		
Agency Approvals	System is built in a weather tight metal enclosure. Designed to meet UL, cUL and IEC standards.	
Environmental		
Ambient Temperature	-40° to +52°C, 10 to 90% Relative Humidity (non-condensing).	
Altitude	From sea level to 10,000 feet (3000m) above sea level.	
Warranty		
Warranty	2 Year Limited Warranty, Parts and Labor	

TSi's ongoing product improvement process makes specifications subject to change. Other companies product names herein are for identification purposes only, and may be trademarks of their respective companies.

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