



Your investment in
productivity

Why is the TSi Static Power Conditioner
your **best investment** in boosting machine
performance and productivity?

Equipments are under threat

Industrial equipments are susceptible to break downs & malfunctioning due to **poor power quality** accompanied with voltage fluctuations, sags, surges, spikes & electrical noises:

- ➔ CNC machines & Robotics
- ➔ Rectifier chargers and UPS
- ➔ Air-conditioning equipment
- ➔ Equipment with AC input switch-mode power supplies
- ➔ Process control & monitoring equipment
- ➔ Micro-processor based machines

Industries are under threat

Industries lose millions of dollars in burnt cards, downtime & productivity loss, consequent upon electronic equipment break-downs & malfunctioning due to power quality issues. Most affected industries are in following sectors:

- ➔ Automotive
- ➔ Textiles
- ➔ Engineering
- ➔ Medical, Diagnostic & Pharma
- ➔ Telecommunication, Defence & Radar
- ➔ Process industry
- ➔ Office, Commercial, Residential spaces

Why is the threat growing?

- Developing countries have an insufficient infrastructure for the generation and distribution of electricity.
- Too many users are competing for the limited power with primitive distribution capacities, causing significant voltage fluctuations and power interruptions.
- The mains voltage could vary from +/- 10% to +/- 20% in many countries!
- Short duration sags could take the voltage down by -30% or more for up to 200 milliseconds!
- Standard AC drives, rectifiers & electronic controllers are not designed to withstand such a wide input voltage window.
- The likely result is lesser reliability and/or the possibility of equipment failure, leading to unscheduled downtime; and increased costs for maintenance and repair.

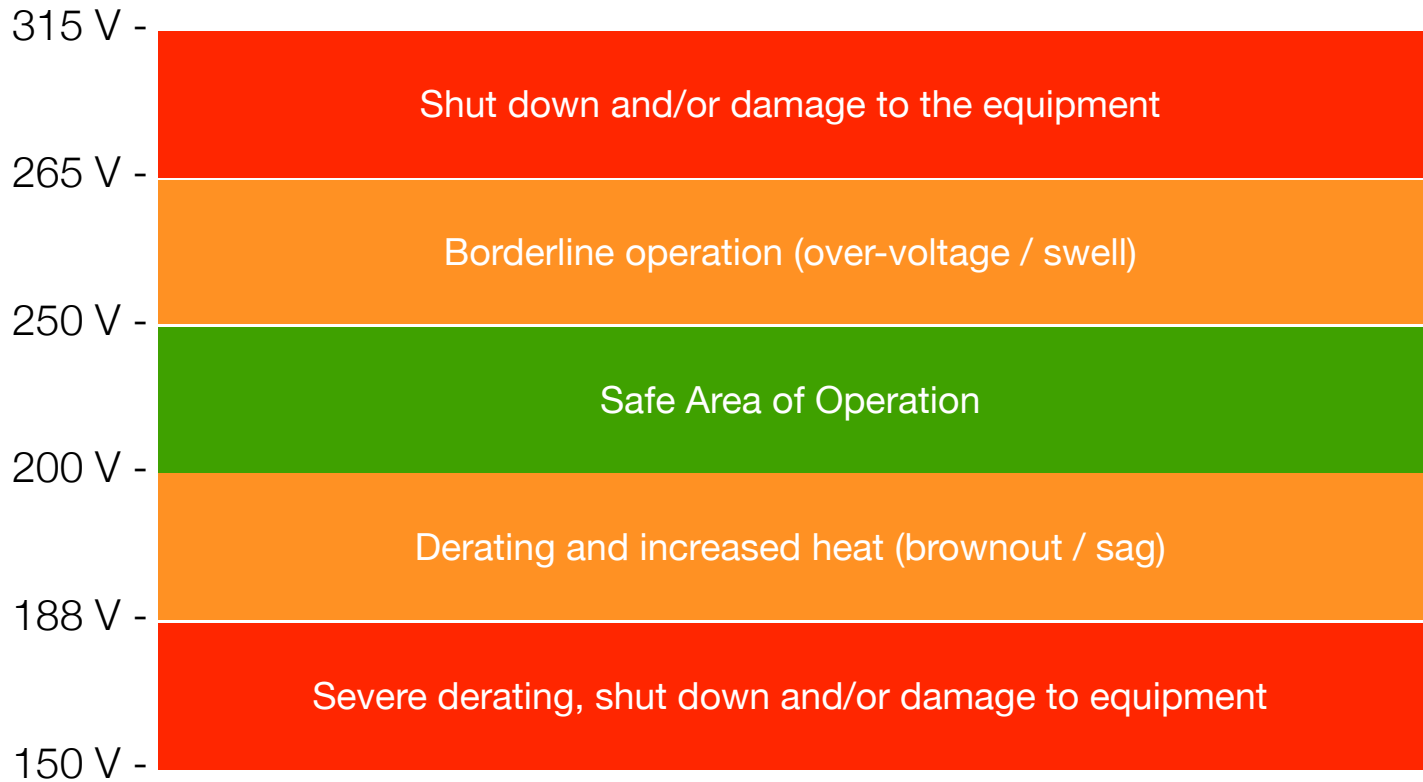
Need for the **next generation** of power conditioning

The right solution is in using a highly reliable, maintenance free, fast correcting Automatic Voltage Regulator, coupled with a suitable spike & noise filter.

What would the next generation be like?

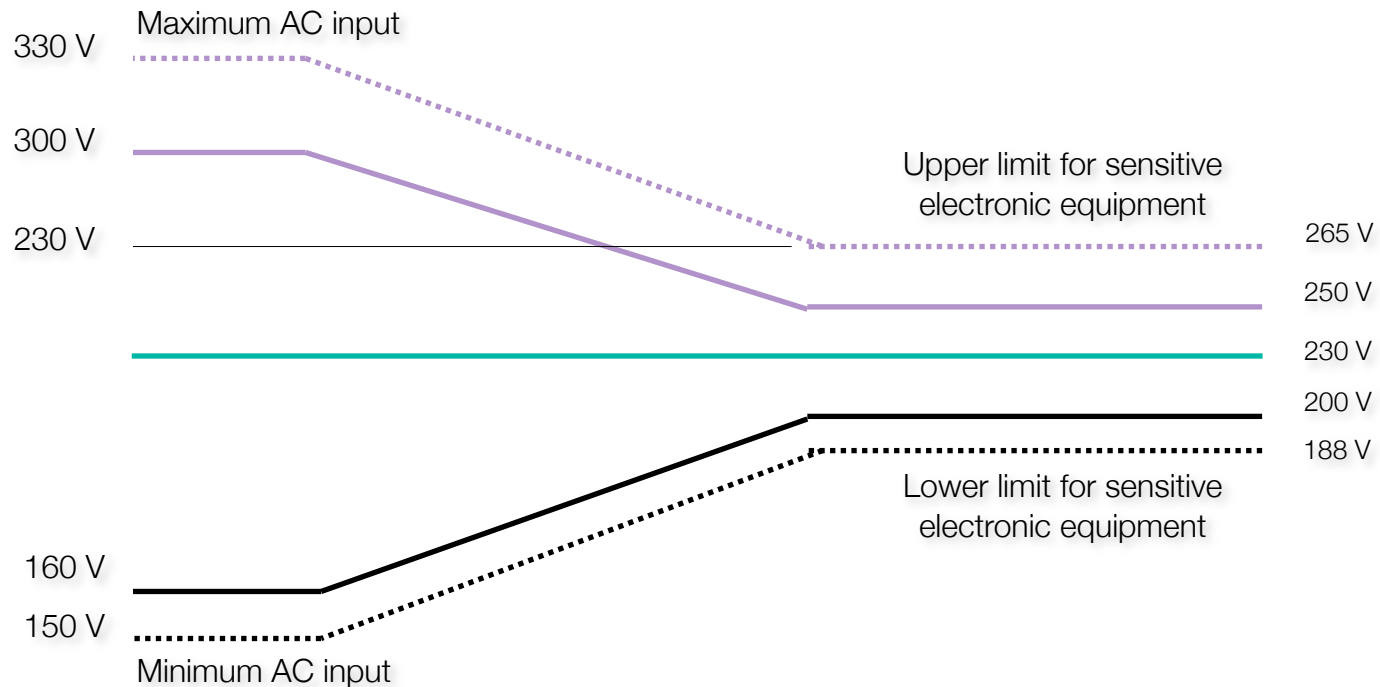
- The old generation, aka Servo-motor based or tap-switching type AVR's have a very slow response time and inherent performance limitations. They have become obsolete for sensitive load equipment such as CNC Controllers & rectifier based drives, using solid-state devices, because of their inability to control sags, sudden fluctuations, transients & noises.
- The use of expensive UPS for power conditioning leads to major investment and even more power losses.
- **The next generation would be smarter and cheaper.** Everything that no Servo or UPS can ever provide!

AC Mains Input Voltage Windows Recommended for Sensitive Electronics



Important data points

Operating AC Input Voltage Range and Output Regulation of VRp
(for 230V ac output models with +/- 20% designed range)



TSi VRp the ideal Line Conditioner

- VRp provides **real-time, precision control** of:
 - Voltage Fluctuations
 - Sags
 - Surges
 - Spikes
 - Electrical Noises
- Voltage is corrected instantaneously, with a 20 millisecond response-cum-regulation time thus keeping the voltage cycle uninterrupted! There is no switching of taps or any other breakage in the power path.
- Its high frequency insulated gate bi-polar transistor (IGBT) driven converter takes the incoming AC power, measures against the nominal voltage and adds/subtracts voltage, to achieve precisely regulated 230 VAC output.

Comparison of Servo v/s VRp

Limitations of existing technologies	Advantages with VRp
<p>SCR/ Relay Stabiliser switches the power path & has frequent failures. due to inductive loads, causing site reliability issues.</p>	<p>VRp does not switch power path & handles any nature of loads/ regulations.</p>
<p>Servo stabilizer is an electro-mechanical device, with a limited correction speed. It is unable to offer real-time control of sudden voltage fluctuations & brown-outs</p>	<p>VRp technology corrects the harshest fluctuations instantaneously (within 20 milliseconds), so no brown-outs, no sags, no surges. Ideal condition for modern electronic machines.</p>
<p>Servo stabilizer brushes produce micro sparks, causing electrical noises, often necessitating an Isolation Transformer on its output</p>	<p>VRp is all solid state, there is no switching or sparking inside it, therefore its output is always free of electrical noise, so no need of an additional IT.</p>

Comparison of Servo v/s VRp

Limitations of existing technologies	Advantages with VRp
Servo stabilizer does not have inbuilt surge & spike control ability.	VRp has inbuilt class II surge filter which ensures that any surge, spike or noise from the supply side is eliminated at the VRp input itself.
Due to dust accumulation, wear & tear of its moving parts, servo stabilizer is maintenance-prone.	VRp has very simple design, all solid state construction & no such maintenance issues.
Servo stabilizer gives high voltage overshoots in boost mode during mains outage/ SAG cycles, thus damaging precious equipment & causing nuisance trips.	Due to instantaneous voltage correction, VRp never lets a SAG event persist & never generates an output surge during power cycling.

Comparison of UPS v/s VRp

Stung by the failure of old technologies, & unaware of VRp technology, many users of electronic machines have started using expensive online UPS as a power conditioner, even though power back-up is not mandatory. This has several disadvantages :

Disadvantages of using UPS as a power conditioner	Advantages with VRp
Though online UPS is all solid state technology, but entire throughput power goes through double conversion, hence low efficiency (typically 90%) & high OPEX.	Though VRp is also all solid state technology, but only compensating power goes through double conversion, hence high efficiency (typically 97%) & low OPEX.
Due to double conversion of entire throughput power, online UPS is very big in size & very expensive, hence high CAPEX.	Due to double conversion of only compensating power, VRp is very compact & much smaller in size, hence low CAPEX.
Unable to handle regenerative loads.	Any type of loading is possible.
Does not have auto-bypass	In-built auto-bypass. Continues to correct spikes & noise even in auto-bypass mode.

The 20 milliseconds voltage correction magic time!

This ensures any fluctuation, how-so-ever sudden, any sag or any surge in voltage is corrected wave-to-wave, on real-time basis, so as to maintain voltage profile as per ITIC curve, which forms the basis of electronic components design worldwide. Ensures pure power desired by electronic components to keep performing.



Other AVR technologies take anywhere from 200~3000 mS (0.2~3 seconds) before voltage gets corrected, hence they can NEITHER control sag cycles NOR surge cycles.

Up to +/-1% Realtime Output Voltage Stability

- Superior protection for all your expensive CNC Machines
- Ideal for all sensitive electronic devices
- Minimised step voltage changes

Tap-changer AVR's typically provide only +/- 5% to +/-10% output voltage stability. Servo AVR's can provide +/-1% regulation only under steady state conditions of voltage. These become unstable under sudden voltage fluctuations & can not regulate within +/-1% till the voltage correction cycle is complete.

Overload Capacity

- Upto 200% (for 10 cycles or 200 ms)
- Ideal for starting air-conditioners, motors, rectifiers, switch-mode supplies, X-ray machines and other loads with high inrush currents
- VRp does not have to be oversized
- VRp can comfortably handle regenerative loads as well.

Some AVR's have difficulty with motors, air-conditioners and other loads with high start-up current requirements. Servo AVR's become very unsteady under regenerative loads.

Reliability

- VRp has no moving parts
- VRp has few PCBs
- VRp has few interconnections
- In the unlikely event of a card failure, VRp has a fast automatic bypass which will keep the mains supply on, within a pre-set voltage cut-off range, free of surges & spikes, as long as needed.

Servo AVR's require frequent brush replacement. Big problem if brush gets jammed. Tap-switching AVR's are quite complicated with too many parts and interconnections. Tap-switching AVR's are quite unpredictable during zero crossovers under inductive loads, which are present at cell sites. Both types need separate manual bypass systems in case of failure, resulting in unscheduled shut-downs.

Our success story...

Since 2002, over **30,000 TSi products** are installed in Africa, India, Asia, North America.

Since 2011, TSi-VRp units for Asian & African markets are manufactured and supplied from **Indian operations**.

Over last 3 years in India, topmost Indian & International companies in Automobiles, Robotics, CNC, Automation, Textiles, Wood-working, Plastic Processing, Printing, Engineering, Pharma, Oil & Gas verticals have discovered the many benefits of powering modern machines with Tsi- VRp and are hooked to this technology for reduced downtime, reduced card failures & increased productivity.



Sensitive Robotics running seamlessly at **Hyundai** with the TSi VRp.

Appreciation do give us a sense of purpose...



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Read the Appreciation Letter by [Yash Polymers, Vadodara](#) ➔



Read the Performance Report by
[Escorts Limited \(Agri Machinery Group\)](#) ➔



Read the Appreciation Letter by [Macpower CNC](#) ➔



Read the Appreciation Letter by [Jay Polypack](#) ➔