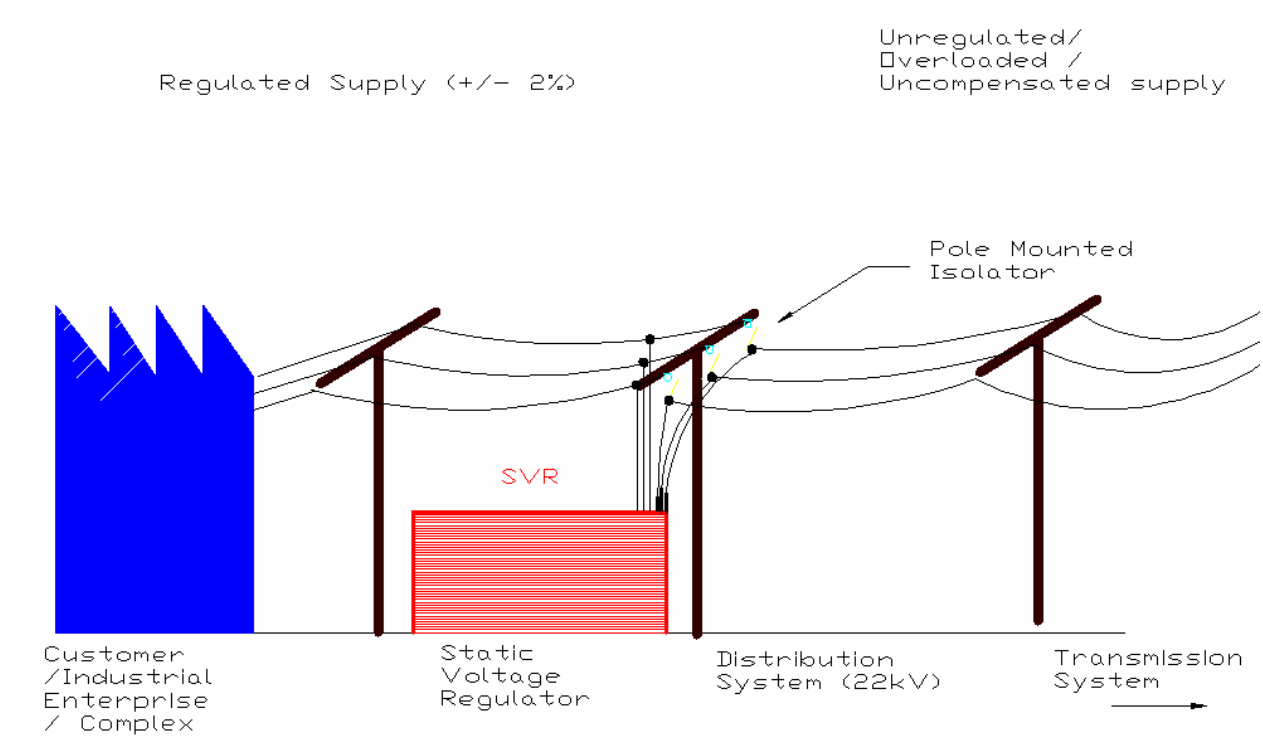
STATIC POWER

Static Voltage Regulator for 22 kV Industrial / Commercial applications

The SVR provides a low cost, more reliable and more robust alternative to expensive voltage regulators requiring energy storage. The SVR fully compensates for these sags ands surges preventing the majority of typical facility downtimes to provide for a quick payback and for a high return on investment solution.

Example:

Three phase, 200 Amperes @ 22 kV (22 MVA) for a voltage line regulation of ± 20% and a resolution of better than 2% per step (total of ± 8 steps), correction ≤ ½ cycle including sensing time, (other variants admissible).



Features:

HV Isolation Transformers manufactured externally by HV Transformer Manufacturer (such as Wilson / TMC …)
Control Cubicle and power circuit operates at LV (< 1000 Volts AC).
HV fault capacity of greater then 20 X Overcurrent / fault capacity easily attainable, (12kA @ 22 kV).
Extended load fault capacities of (20kA, 30 X and 30kA, 50 X achievable) by overrating of devices.
Larger regulation or offset regulation range also possible (e.g. +10 -30%)
High efficiency > 99.7 % (less than 0.3% loss)
Transportable Totally enclosed Skid mounted.
MTBF > 500,000 Hrs, Maintainable with MTTR < 30 min (spares available)
Thyristors (SCRs) with high fault tolerance only utilized
Maintenance Bypass & LV repair isolation provided.
Insensitive to load changes or incoming power quality
Remote Monitoring, metering & control
Rugged – high overload & load surge capability
Senses downstream fault and prevents boosting into downstream faults
SVR does not include environmentally hazardous transformer oil or energy storage battery.
Air conditioning equipment is not required for energy removal because of its high efficiency.
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STATIC POWER PTY LTD ABN 42 101 765 913 also trading as UPS AUDIT SERVICES & I-STS MANUFACTURING
MANUF: 5/39-45 SUSAN STREET ELTHAM 3095 MAIL: BOX 2003 RESEARCH DELIVERY CENTRE RESEARCH 3095 VICTORIA AUSTRALIA
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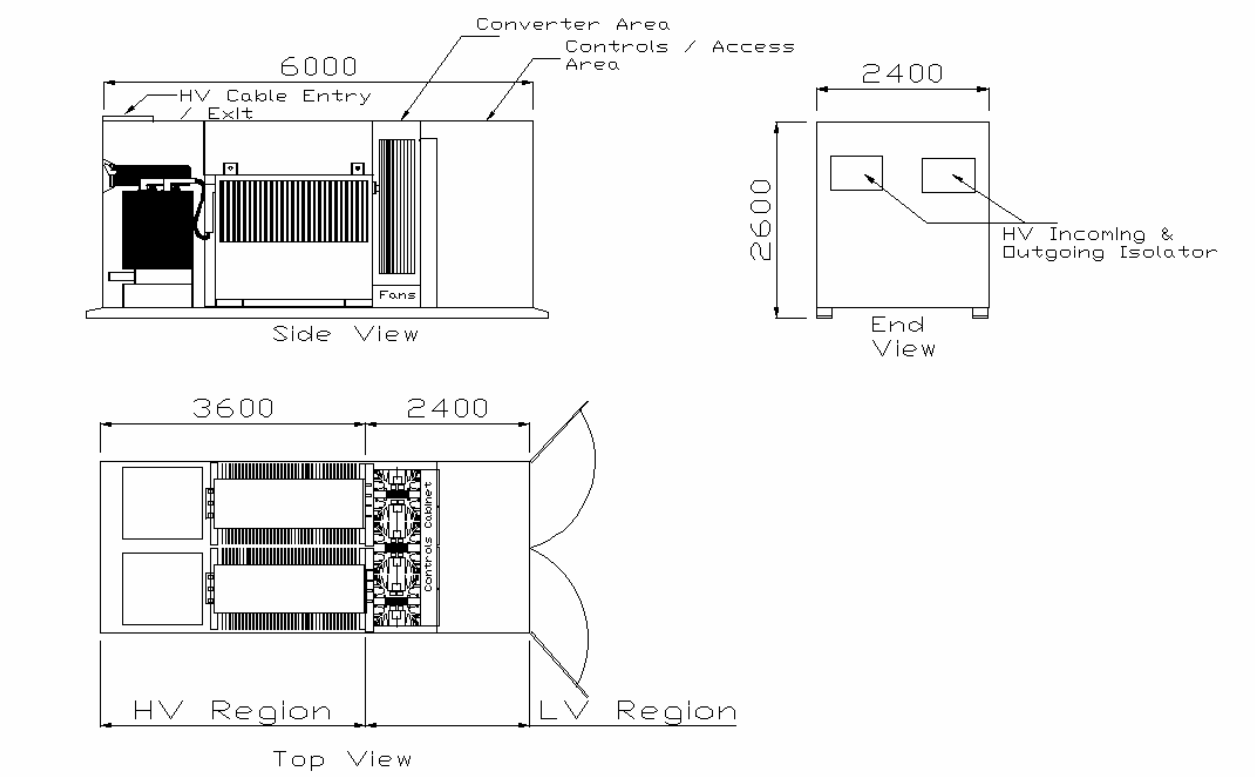
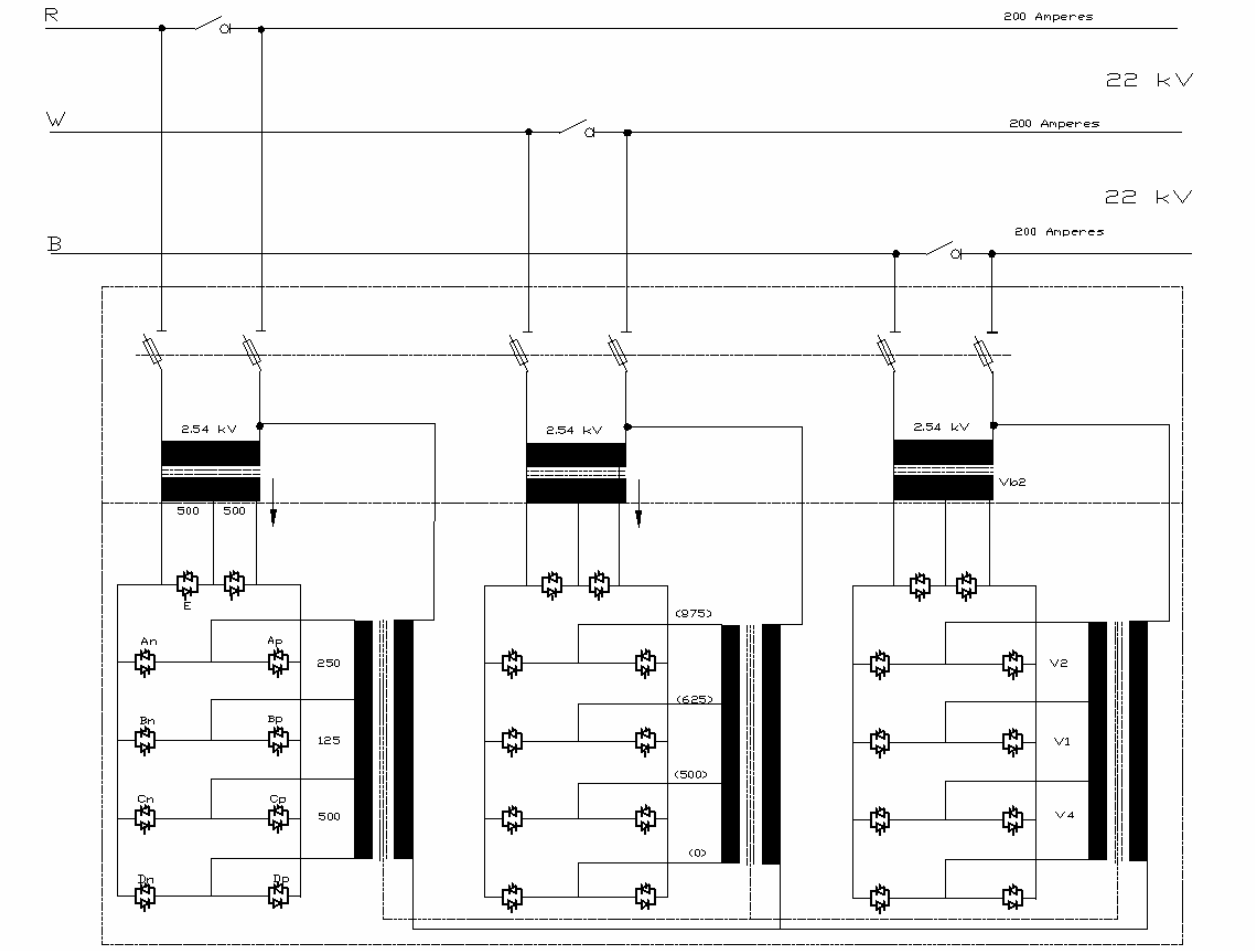
Physical Implementation



Power Circuit



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HV Buck/Boost line Isolation Transformer (for each phase)

Ratio 2540 V (HV Side) @ 200 Amperes to 500/0/500 V AC @ 500 Amperes

Regulator Isolation Transformer (Three phase – floating Star Connected) off 22 kV

Primary voltage 12.7 kV to Secondary (3-taps) @ 875 Volts AC / 625 Volts / 500 Volts / 125 Rated at 500 Amperes,

Overload Capability

With short circuit on 22kV line @ 12 kA (devices safe for 35,000 Amperes for 10 msec)
No tap change on load fault (settable 2X – 10 X)

Environmental

Losses @ full load	0.3%
Efficiency (Overall)	99.7%
Load Power Factor Range:	0.75 inductive to 0.75 capacitive
Ambient Temperature Range:	-10°C to 50°C standard
Ambient Humidity Range:	0-95% RH non-condensing
Maximum Inserted Voltage:	35% - 40% of nominal voltage
Source Voltage Compensated:	Beyond 90%
Maximum Sag Rebuild Time:	½ cycle (10 ms for 50 Hz)
Natural Air Cooling (High Rel)	

Senses downstream fault and prevents boosting into downstream faults

SVR does not include environmentally hazardous transformer oil or energy storage battery.
Air conditioning equipment is not required for energy removal because of its high efficiency.

Calculation Example:

16 taps to provide +/- 2% regulation for +/- 20% supply line deviation

Vphase => 22kV
Vline =>12.7kV

Taps			
	1p	Bp + Cn	
	2p	Ap + Bn	
	3p	Dp + Cn	
	4p	Cp + Dn	
	5p	Bp +Dn	
	6p	E+ Ap+ Cn	
	7p	Ap +Dn	
	8p	E + Cp + Dn	
	0	An + Ap	As per accompanying Drawing

Regulator Transformer Total Voltage $V_{reg} = V_1 + V_2 + V_4$

where:

$V_1 = V_{reg}/7$ ($V_2 = V_{reg} * 2 /7$ $V_4 = V_{reg} * 4 /7$

Maximum voltage applied to ½ of the secondary winding

$V_{b2}/2 = V_4 = V_{reg} * 4 /7$

Where $V_{b2} = V_{reg} * 8 /7$

Voltage Step = x%/8

Voltage regulation achievable ± X/8 * 2/3 = ± x/12 % = 1.7%

Where x = ± % desired compensation (say 20%)

For Main Transformer (HV Series transformer)

V_{b1} = Vrated * X / (100*√3) = 2.54 kV (for 22kV line)
$V_{b2} = V_{reg} * 8 /7$