

USER MANUAL

STATIC VOLTAGE STABILIZER

True PWM controlled IGBT based Technology

(Single Phase Static Voltage Stabilizer (SVS))

Revision details:

Sr No	Revision NO	Revision date	Remarks
1	1.0	29/07/2011	Initial Draft
2	1.1	21/01/2012	Final Release

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While every precaution has been taken to ensure accuracy and completeness in this manual, SUVIK assumes no responsibility and disclaims all liability for damages resulting from use of this information or for any errors or omissions.

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1.0 IMPORTANT SAFETY WARNING

As dangerous voltages are present within the Static voltage Stabilizer, only SUVIK technician is permitted to open it. Failure to observe this could result in electric shock risk and invalidation of any implied warranty.

1.1 TRANSPORT

Please transport the Static Voltage Stabilizer only in the original packaging (to protect against shock and Impact).

1.2 SETUP

- Do not install the SVS system near water or in damp environments.
- Do not install the SVS system where it would be exposed to direct sunlight or near heat source.
- Do not block off ventilation openings in the SVS system's housing.

1.3 INSTALLATION

This manual contains information concerning the installation and operation of the Digital SVS. All relevant parts of the manual should be read prior to commencing the installation.

Before installation, please inspect the unit. Be sure that nothing inside the package is damaged. Please keep the original package in a safe place for future use

- Ensure not to connect equipment which leads system to overload.
- Place cables in such a way that no one can step on or trip over them.
- For sock proof operation always connect proper earthing to system before making it on.
- Ensure that input to the SVS & load cable are shock proof.
- The SVS must be serviced by an authorized representative of SUVIK. Failure to do so could result in personnel safety risk, equipment malfunction and invalidation of warranty.
- Digital SVS has been designed for Commercial/Industrial use only, and is not recommended for use in life Support applications.
- Before energizing the system ensure input, output and earth connections are proper.

1.4 OPERATION

- Do not disconnect the mains cable on the SVS system during operation.
- Before disconnection the SVS ensure load is safely shutdown.
- Ensure that no fluids or other foreign objects can enter the SVS system.

1.5 MAINTENANCE, SERVICING AND FAULTS

- The SVS system operates with hazardous voltages. Repairs may be carried out only by qualified maintenance personnel.
- Before carrying out any kind of servicing and/or maintenance, disconnect the input and verify that no current is present and no hazardous voltage exists in the system.
- Do not dismantle the SVS system.

Note: System warranty will get wave-off if the system is opened other than SUVIK technician or authorized dealer.

2.0 INTRODUCTION

Static Voltage Stabilizer is able to respond to changes in the voltage level on the input line. These changes are called sags (voltage drops) and surges (voltage peaks). Sags might be due to undersized distribution lines, connection of large loads to the network, ground faults, etc.

Surges might be generated by disconnection of large loads, increased voltage at the generating plant, atmospheric events, etc.

The duration of such phenomena depends on their cause and is not easily predictable. Sags are generally more common especially where the distribution is not wide and efficient.

Other disturbances like spikes, transients, high frequency noise and harmonic distortion have to be treated with the addition of specific filtering systems.

The good functioning of the majority of electrical and electronic equipment depends on the supply voltage correctness and steadiness. Nowadays, many industrial and private users are subject to long-lasting fluctuations that can be inconvenient or even dangerous.

AC Voltage Regulators are used for obtaining a steady AC supply with very close tolerances from fluctuating mains. They find application in a very wide variety of fields.

There are various types of Automatic AC Voltage Regulators to suit the different requirements of various special fields, of these, the dsPIC based Static Voltage Stabilizer offers the maximum advantages. These include high correction rate of 20 KHz and correction time of one or one and half cycle with the accuracy of +/- 1%. The output regulation remains same for all variations of line voltage & load current within the specified limits, virtually no waveform distortion, efficiencies of over more than 95%.

2.1 THE OUTSTANDING FEATURES OF STATIC VOLTAGE STABILIZER

- Very fast correction speed of 20Khz
- Very fast correction time of 20-30ms
- Excellent voltage regulation of +/- 1%
- Soft start to reduce inrush current
- Auto bypass
- No moving parts so no wear and tear and high reliability No maintenance
- Silent operation
- Excellent load protection capabilities to ensure load life,
- Compatible with almost all load application
- Converter power handles only delta power so system becomes compact in size
- Static Voltage Stabilizer is working on IGBT (static device) based PWM Control technology, No moving or mechanical contact for voltage regulation
- At the primary of buck-boost transformer delta Voltage is added and subtracted by IGBT based AC – AC converter to regulate output voltage
- Rating of the AC-AC convert is $\frac{1}{4}$ (as per input voltage range) of the rated power
- Cycle by cycle voltage regulation without interrupting load current

2.2 WAVEFORM OF INPUT VOLTAGE AND OUTPUT VOLTAGE

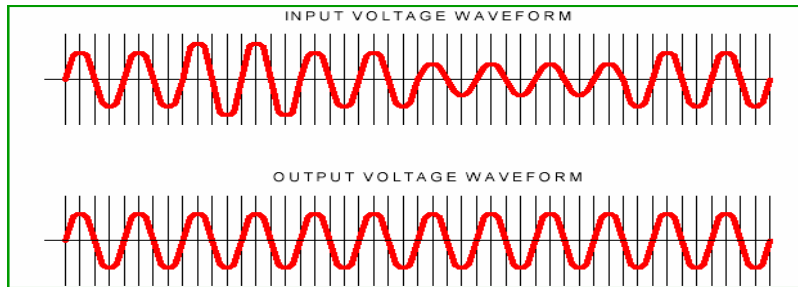


Fig-1

2.3 DIFFERENT APPLICATION OF STATIC VOLTAGE STABILIZER

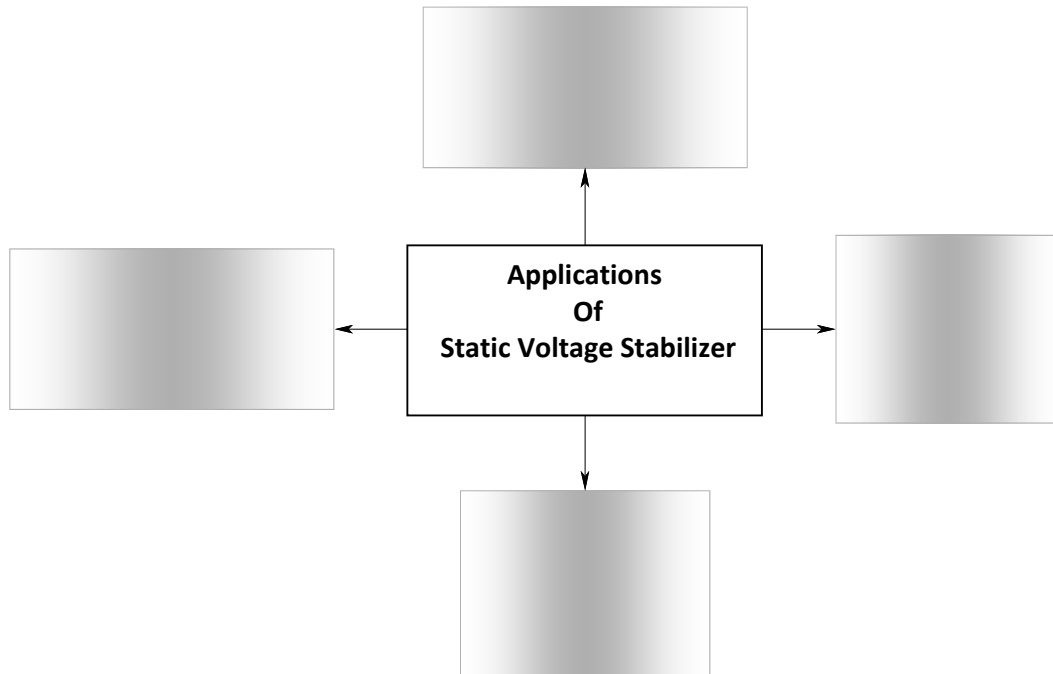


Fig-2

3.0 PRINCIPLE OPERATION

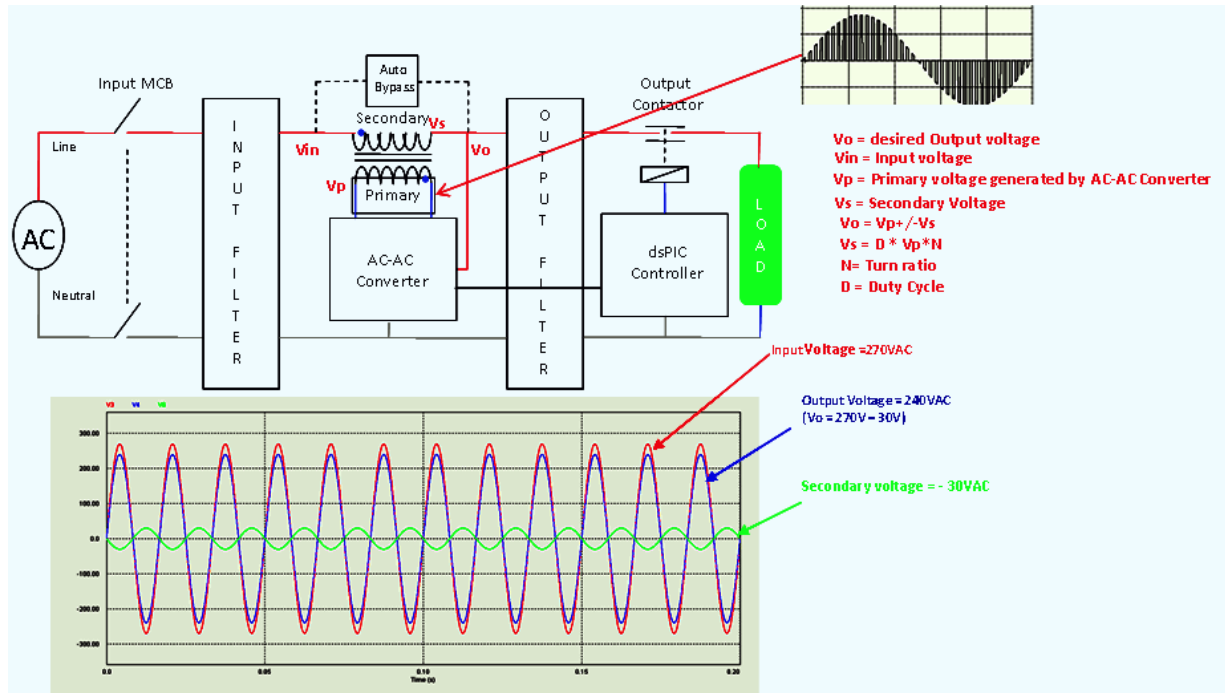


Fig-3

A major block diagram shows the overall function of the Static Voltage Stabilizer. Connections of basic sub units of the Stabilizers are given in above Figure (Fig - 3).

The secondary winding of a double wound buck/boost control transformer is connected in series to the supply line going to the load. Its primary winding is fed with a voltage from a IGBT based AC-AC converter, AC-AC converter input is connected across the Output supply. The voltage is induced in the secondary winding gets added to or is subtracted from the mains voltage depending upon its phase with respect to the line voltage. The induced voltage will either be in phase or out of phase by 180° with the supply voltage.

Buck or Boost voltage is obtained based on the output and is obtained by changing AC-AC converter output polarity. Output Voltage amplitude is changed by changing the PWM duty cycle. PWM duty cycle of 20 KHz frequency varies from 0 to 95% to regulate the output voltage in case of sag or swell. The correction time of the SVS is as low as 30ms. High-end dsPIC based digital control ensures the cycle by cycle correction to meet the voltage sensitive machine and load voltage requirement. Static Voltage Stabilizer has inherent input and output voltage (high / low) cut off detection and will trip in specified time to protect the load.

The integrated controller for voltage stabilizer CONTROLS the output voltages, TRIPS under fault conditions and also DISPLAYS Input, Output voltages and load currents, On LCD display panel simultaneously.

4.0 FRONT PANEL & OPERATIONS

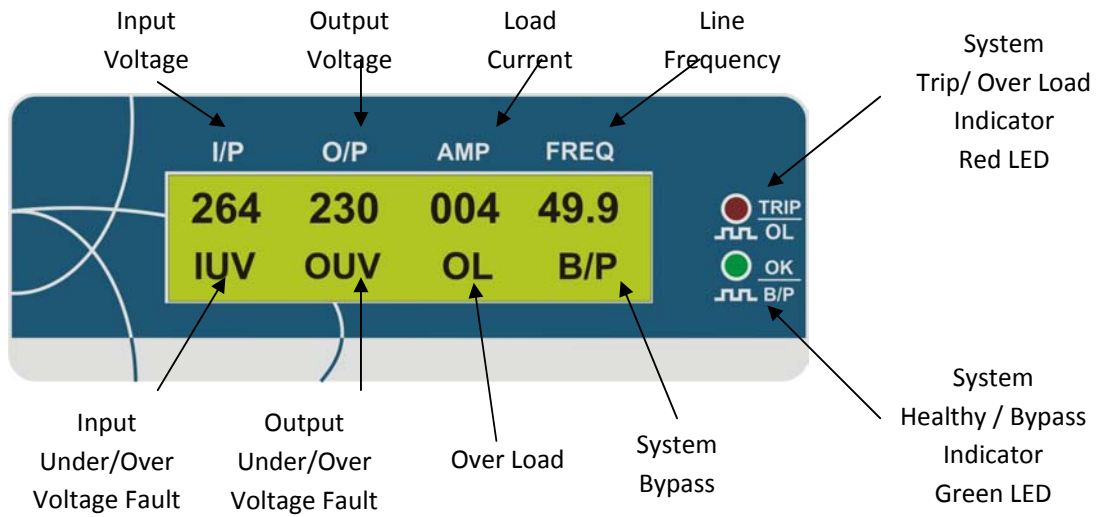


Fig-4

4.1 FRONT PANEL LED OPERATION

LED	Function
Green LED	This LED has mainly two function
	<ol style="list-style-type: none"> 1. Continuous Green LED indicates system output is regulated and healthy (OK) 2. Blinking Green LED indicates system is in bypass mode and output is within safe range (+/-5%)
Red LED	This LED has mainly two function
	<ol style="list-style-type: none"> 1. Continuous RED LED indicates system is tripped and load is isolated. Tripping condition can be due to over load condition, input under voltage/over voltage, output under / over voltage, supply frequency out of range, synchronization problem 2. Blinking RED LED indicates system is in over load condition and within specified time limits for the load current. Once the load will increase beyond 100% this LED will start blinking.

4.2 PARAMETER DISPLAY

Display	Function
Initializin9 System..	When user power on the system that time system will check Input voltage and regulate the output voltage if all voltages are ok than contactor will start load.
264 230 004 49.9	Parameter screen displays the Input voltage, Output voltage, load current and Frequency for the System.

5.0 TROUBLE SHOOTING

Following types of fault & alarm conditions being monitored and acted upon.

- Voltage faults –
 - Input - Under voltage (IUV) and Over voltage (IOV)
 - Output - Under voltage (OUV) and Over voltage (OOV)
- System on bypass
- Frequency Error
- Synchronization
- Load Current fault - Overload

Fault	Fault Description	Troubleshooting
Voltage faults – Under Voltage (UV) 162 197 000 49.9 IUV OUV Over voltage (OV) 295 255 004 49.9 IOV OOV	<p>Under voltage (UV) and Over voltage (OV) faults occur when the controlled output or input voltage goes beyond the range specified. When the input voltage varies beyond the range, Static Voltage Stabilizer is not able to control the output within the specified regulation limits. The output or input voltage when crosses the UV or OV Trip voltage level, it is displayed on the LCD Panel. The occurrence of fault does not trip the output immediately. If the fault persists for no. of seconds specified then the output will trip. The red Trip LED will lit when the output trips.</p> <p>Similarly when the fault condition is removed (UV or OV) the tripped output does not come ON immediately. If the stable faultless condition prevails for no. of seconds specified, then only the output will come and the red Trip LED on the front of the controller box will go off and Green LED will lit.</p>	<p>If fault not remove than check the Input connection of system and load connection.</p> <p>If all connection OK than call CSD/Dealer for troubleshooting.</p>
Overload fault: 264 230 024 49.9 OL Over Load Restart System	<p>When the load is more than 100% system internal over load timer will start and RED LED will blink till the over load reduce <100% or RED LED lit permanently by tripping the system. In this case load will be isolated from the output. In over load condition “OL” message will display on LCD. Over load is latch able fault and needs power recycle to restart the function.</p>	<p>Check the load connection, if load connection Ok than check load is short circuit or not if short than remove short circuit and restart the SVS.</p> <p>If it doesn't solve the problem, please call CSD/Dealer for troubleshooting.</p>

System on bypass 268 254 000 49.9 B/P	If input or output voltage is out of range then output will stay in bypass mode till its max threshold level, same time green led will blink till it will not regain the normal input and or output range. In bypass mode also output voltage will be within +/-5% only.	Check the input and output voltage at terminal. Still you find same problem, please call CSD/Dealer for troubleshooting.
Frequency Error: Frequency Out of Sync	This problem will persist if supply frequency is out of specified range / input waveform is too distorted.	Check supply frequency and Input output connection. If user still find this error message than call CSD/Dealer for troubleshooting.

6.0 CONNECTION

6.1 Panel I/O connection

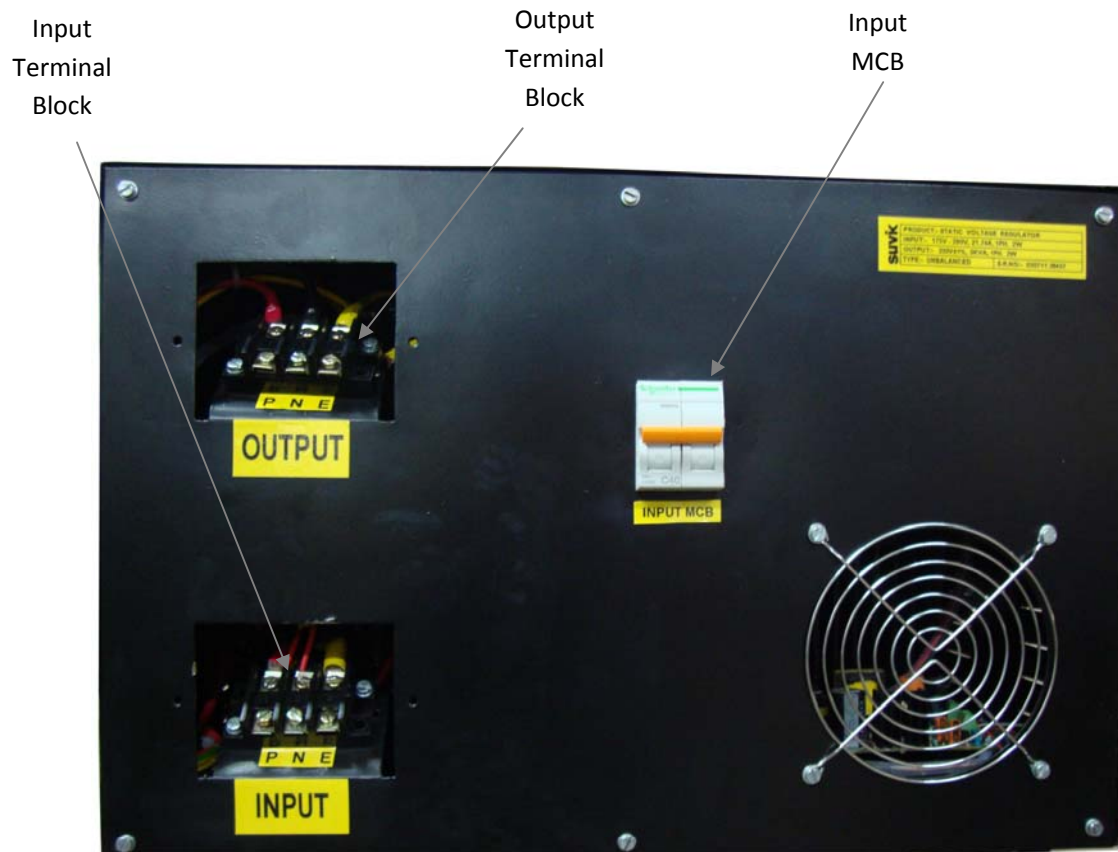


Fig.5

Note: Above picture is indicative and can vary based on the model or design

6.2 Wiring diagram

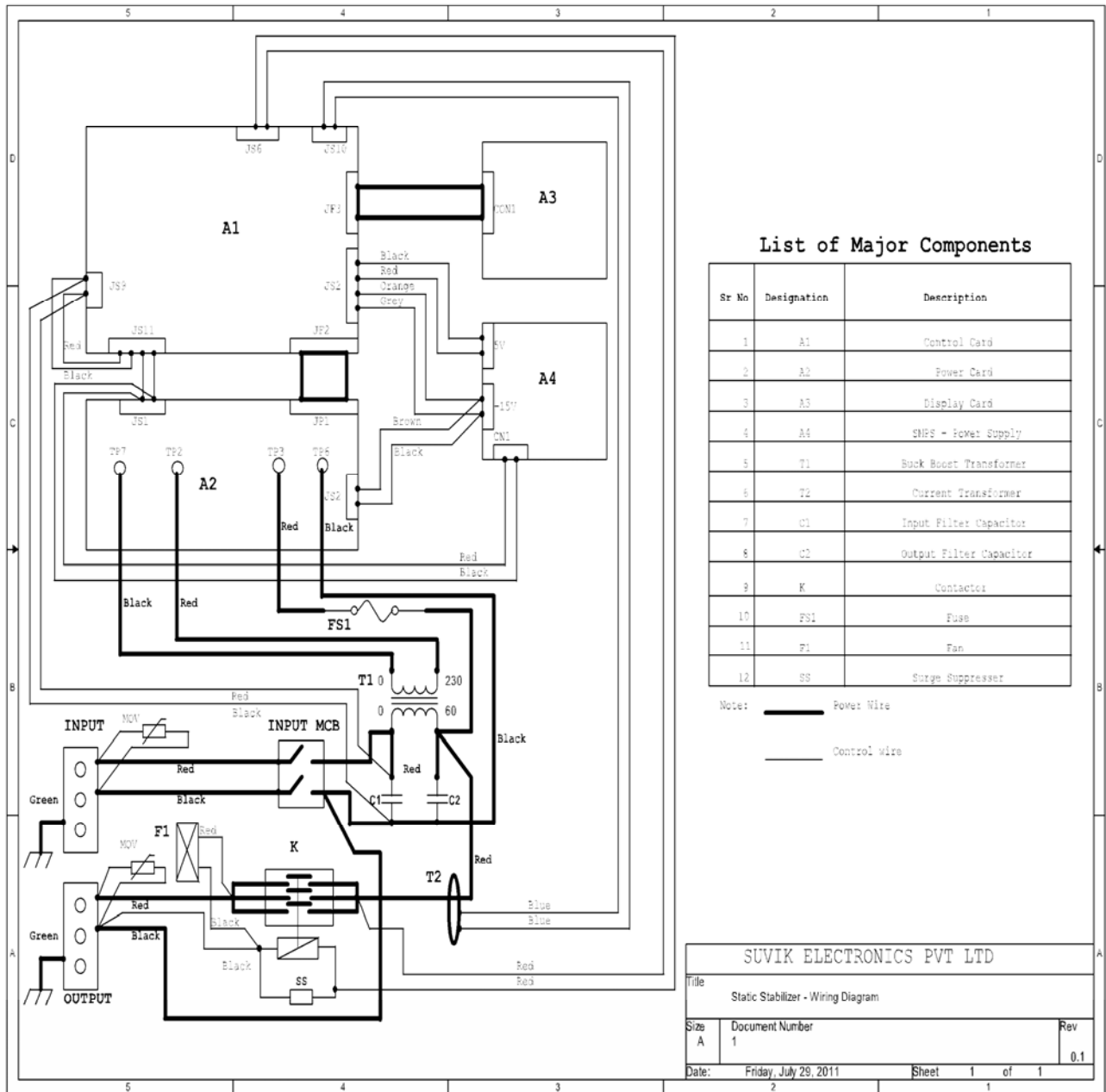


Fig-6

7.0 TECHNICAL SPECIFICATIONS

Parameters	Rating		3KVA	5KVA	7.5KVA	10KVA	15KVA
Input Voltage	Nominal voltage Rating	V	230 VAC, 1 Phase, 2 Wire, + Earth				
	Voltage Range	V	170V – 290V (Other range available on request)				
	Relaxed Input voltage range*		165V – 290V				
	Frequency	Hz	Nominal 50/60 Hz, Range 45-60 Hz				
	Input MCB	A	~20A	~30A	~40A	~50	~75A
	Terminal block		Yes				
Output voltage	Voltage	V	230VAC, +/- 1%				
	Correction time		1 - 1.5 cycles				
	Voltage Regulation	%	+/- 1				
	Dynamic Regulation	%	+/- 5				
	Output voltage Regulation in Relaxed Input Voltage range	%	210V - 250V +/- 1%				
	Output Wave form distortion		Nil				
	Effect of Power factor		Nil				
	Output Overload	%	100> & <110 - 60Mins, 110> & <125 - 10Mins				
		%	125> & <150 – 1 Mins, 150> & <300 – 10 Secs				
		%	300> - Immediate Trip				
Protection	Terminal block		Yes				
	Output Contactor	A	~15A	~20A	~30A	~45A	~65A
	Automatic bypass		Yes				
	Manual bypass*		Optional				
	Input Under voltage	V	165 +/- 1%				
	Input Over voltage	V	280 +/- 1%				
	Output Under Voltage	V	200 +/- 1%				
	Output Over Voltage	V	250 +/- 1%				
	Frequency Out of Range	Hz	45< & >65				
Display / Indication	LED / LCD*		LCD(Optional)				
	Output Healthy	LED	Green LED				
	Input and Output Under voltage	LED	Green LED - Blink				
	Input Over voltage						
	Overload / Short circuit	LED	Red LED - Blink				
	Trip Indication		Red LED				
	I/O port *		2 Output One input IO (Optional)				
	Communication		RS232/485 (Optional)				
	IT/UIT*		Optional				
Overall	Efficiency	%	Better Than 96%				
	Cooling method		Forced cooling				
	Ingress Protection		IP20, for other contact to sales				
	Temperature	%	0 - 45 Deg C, (Other ranges available on request)				
	Humidity	%	0 - 95 (RH - Non Condensing)				
	Noise	dB	<60				
	Dimension	mm	L325 xW455xH325				
	Weight	Kg	32Kg	38Kg	40Kg	42Kg	50Kg

* Indicates Optional feature or component

Our policy is one of continuous improvement and company reserves the right to amend design and specifications without notice. .

8.0 WARRANTY CERTIFICATE

WARRANTY CERTIFICATE

SUVIK products are manufactured to meet high standard of quality. This product is warranted against any manufacturing defect for a period of one year from the date of invoice/ purchase from Suvik or its authorized distributors, subject to the following conditions.

1. The defective unit will be replaced provided the unit is delivered to the Service Center at Customer's risk and cost. Any indirect or consequential loss to the purchaser / user is excluded from the warrantee obligation of Suvik Electronics Pvt. Ltd. And its dealers / distributors.
2. The warrantee is not valid in cases of damages resulting from
 - Accident, mishandling or negligence
 - Unauthorized modification and / or repair by the user
 - Operation outside the specification of the products.

This product has been tested and inspected as per specifications. In case of difficulty, contact your dealer/ distributors or

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