

# USER MANUAL

## **STATIC VOLTAGE STABILIZER**

True PWM controlled IGBT based Technology

(Three Phase Static Voltage Stabilizer (SVS))

**Revision details:**

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|              |                   |                     |                 |
|              |                   |                     |                 |
|              |                   |                     |                 |

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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 personal 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.

## **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 Stabilizers 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 Stabilizers 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 time of one or one and half cycle with the accuracy of +/- 1% of the output 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

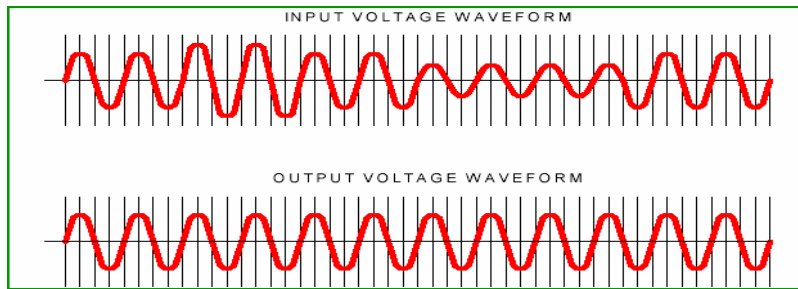


Fig-1

## 2.3 DIFFERENT APPLICATION OF STATIC VOLTAGE STABILIZER

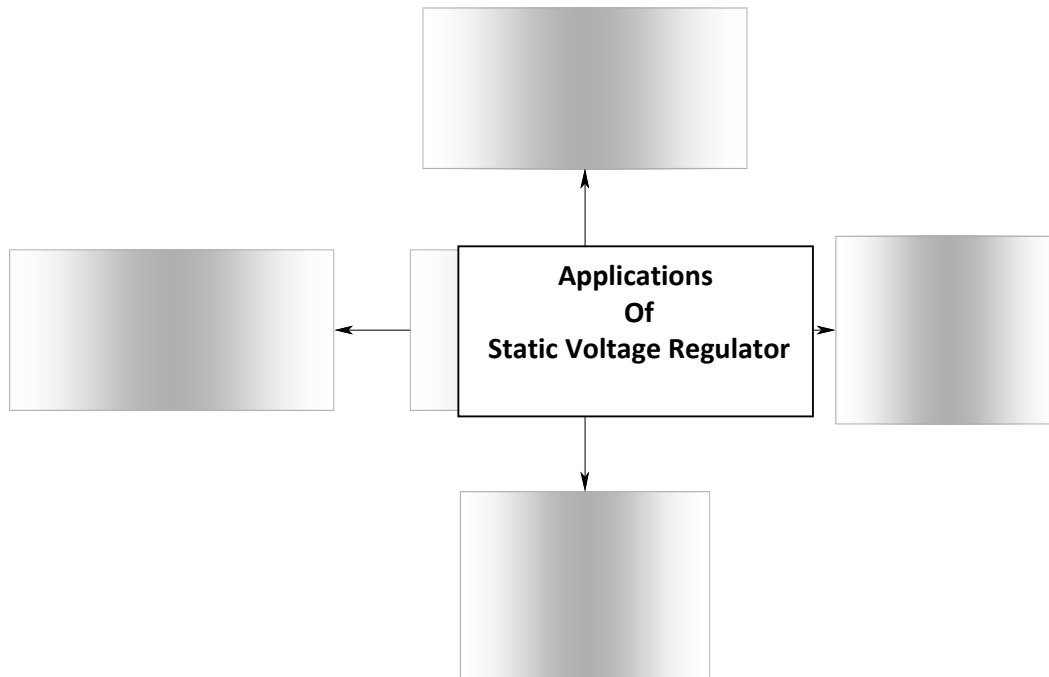


Fig-2

### 3.0 PRINCIPLE OPERATION

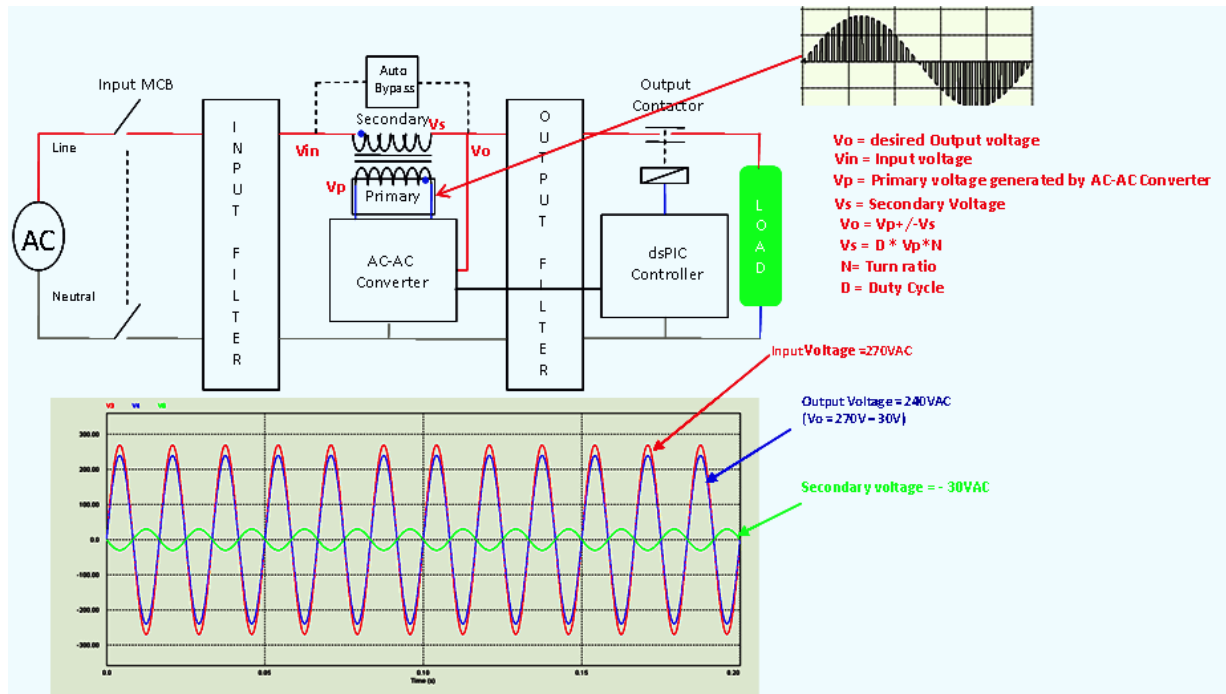


Fig-3

A major wiring block diagram showing the overall function of the Static Voltage Stabilizer. Connections of basic sub units of the Stabilizers are given in above Figure.

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.

**Note:** The functional block diagram shown in fig-3, is to control single phase of the system. In actual Unbalanced Three Phase system, there will be one functional block per phase.

**4.0 FRONT PANEL & OPERATIONS**

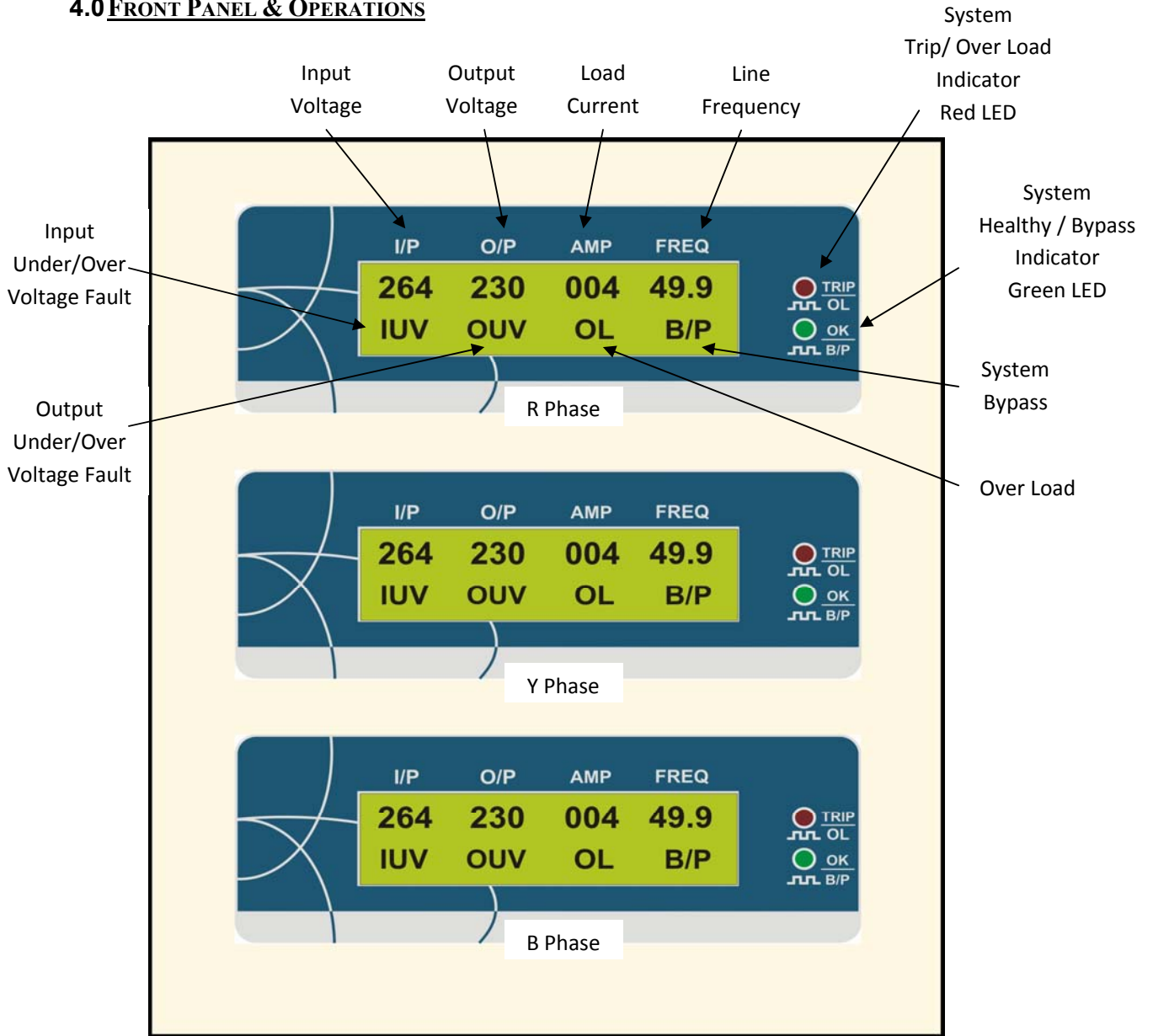


Fig-4

#### 4.1 FRONT PANEL LED OPERATION

| LED       | Function  |
|-----------|---|
| Green LED | This LED has mainly two function <ol style="list-style-type: none"> <li>1. Continuous Green LED indicates system output is regulated and healthy (OK)</li> <li>2. Blinking Green LED indicates system is in bypass mode and output is within safe range (+/-5%)</li> </ol>  |
| Red LED   | This LED has mainly two function <ol style="list-style-type: none"> <li>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</li> <li>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.</li> </ol> |

#### 4.2 PARAMETER – LCD DISPLAY

| Display | Function   |
|---------|--|
|         | 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. |
|         | 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  |
|--|---|--|
| <b>Voltage faults –</b><br><br><b>Under Voltage (UV)</b><br>162 197 000 49.9<br>IUV OUV<br><br><b>Over voltage (OV)</b><br>295 255 004 49.9<br>IOV OOV | 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 and the 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.<br><br>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. | If fault not remove than check the Input connection of system and load connection.<br><br>If all connection OK than call CSD/Dealer for troubleshooting.   |
| <b>Overload fault:</b><br>264 230 024 49.9<br>OL<br><br>Over Load<br>Restart System  | 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.  | 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.<br><br>If it doesn't solve the problem, please call CSD/Dealer for troubleshooting. |
| <b>System on bypass</b><br>268 254 000 49.9<br>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.<br><br>Still you find same problem, please call CSD/Dealer for troubleshooting.  |
| <b>Frequency Error:</b><br>Frequency<br>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.<br><br>If user still find this error message than call CSD/Dealer for troubleshooting.   |

## 6.0 CONNECTION

### 6.1 Panel I/O connection

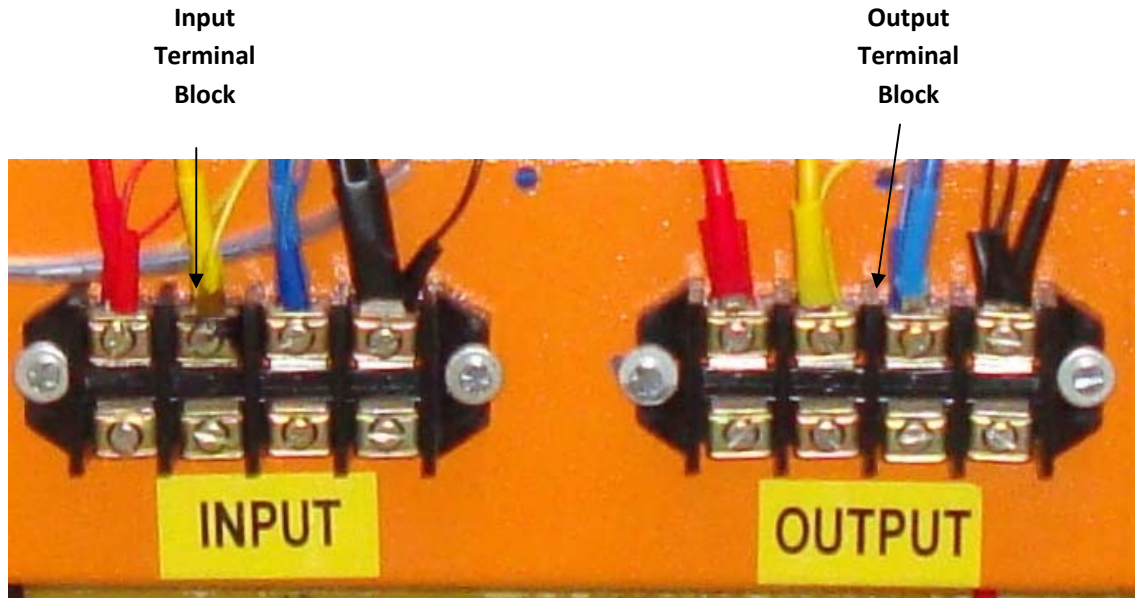
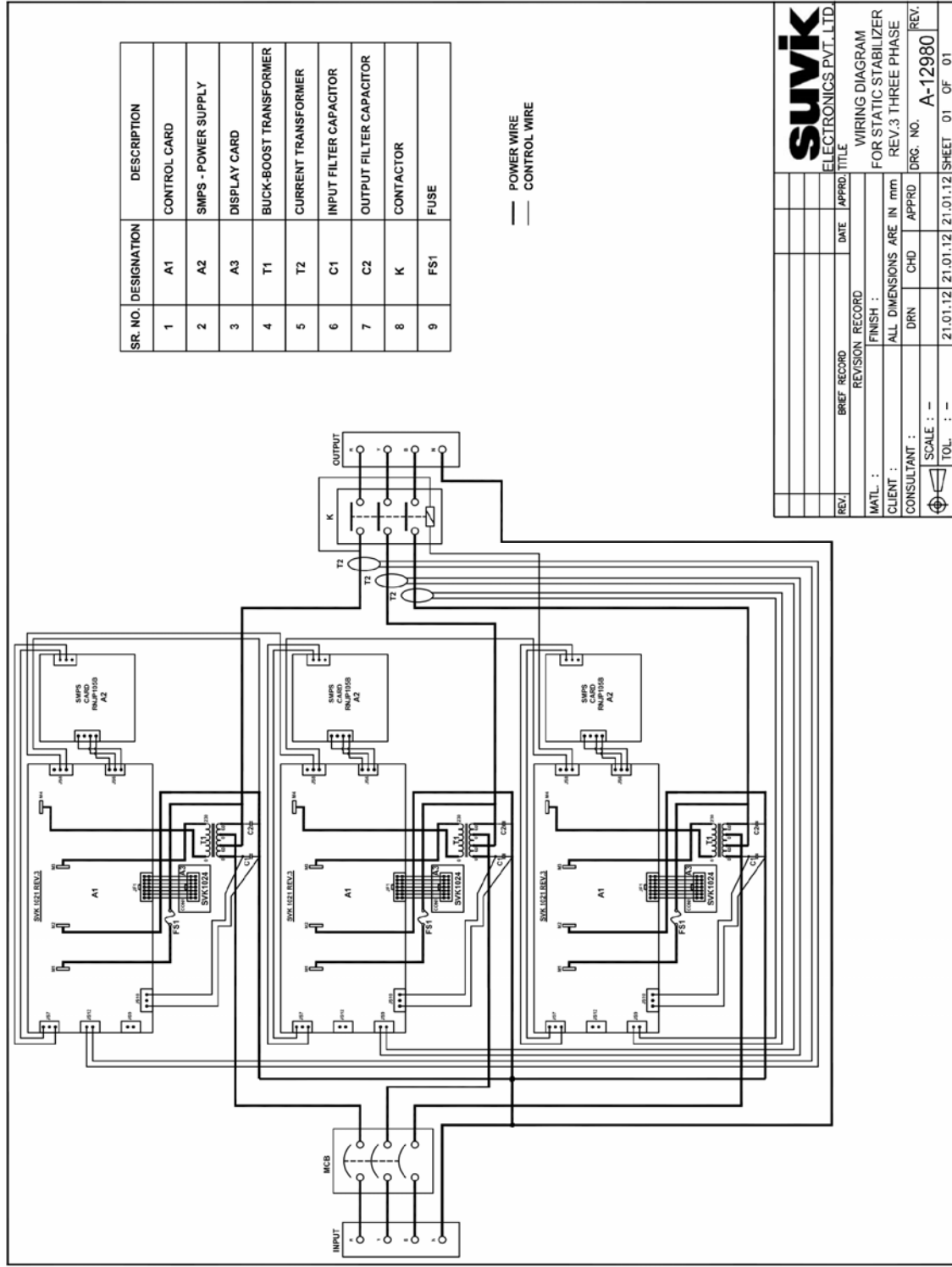


Fig.5

6.2 Wiring diagram



|                       |  |  |      |                |          |
|-----------------------|--|--|------|----------------|----------|
| ELECTRONICS PVT. LTD. |  | REV.   | DATE | APPRD.         | TITLE    |
|                       |  | WIRING DIAGRAM<br>FOR STATIC STABILIZER<br>REV.3 THREE PHASE |      |                |          |
| MATERIAL :            |  | FINISH :   |      |                |          |
| CLIENT :              |  | ALL DIMENSIONS ARE IN mm                                     |      |                |          |
| CONSULTANT :          |  | DRN  | CHD  | APPRD          | DRG. NO. |
| SCALE : --            |  | 21.01.12 / 21.01.12  |      | A-12980        |          |
| TOL. : --             |  | 21.01.12   |      | SHEET 01 OF 01 |          |

Fig-6

**7.0 TECHNICAL SPECIFICATIONS**

| Parameter            | Power Rating   | Unit  | 10KVA   | 15KVA | 20KVA | 25KVA | 30KVA | 40KVA | 45KVA |
|----------------------|--|---|---|-------|-------|-------|-------|-------|-------|
| Input Voltage        | Nominal voltage Rating                                   | V   | 230V/400 3 Phase, 4 wire + Earth, 100% Unbalance  |       |       |       |       |       |       |
|                      | Voltage Range  | V   | 190 - 270 Ph-N, 340 - 480 Line to Line, For other |       |       |       |       |       |       |
|                      | Relaxed voltage Input range*                             |   | 170 - 290Ph-N (Optional)                          |       |       |       |       |       |       |
|                      | Frequency  | Hz  | Nominal -50Hz, Range 45- 65Hz                     |       |       |       |       |       |       |
|                      | Input MCB  | A   | ~20A  | ~25   | ~40A  | ~50A  | ~63A  | ~70A  | ~80A  |
|                      | Terminal block   |   | Yes   |       |       |       |       |       |       |
| Output voltage       | Voltage  | V   | 230V +/- 1%                                       |       |       |       |       |       |       |
|                      | Correction time  |   | 1 - 1.5 cycles                                    |       |       |       |       |       |       |
|                      | Voltage Regulation                                       | %   | +/- 1   |       |       |       |       |       |       |
|                      | Dynamic Regulation                                       | %   | +/- 5   |       |       |       |       |       |       |
|                      | Output voltage Regulation in Relaxed Input voltage range | %   | 210 - 250V +/-1% (Optional)                       |       |       |       |       |       |       |
|                      | 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                       |   |       |       |       |       |       |       |
| Terminal block       |  | Yes   |   |       |       |       |       |       |       |
| Protection           | Output Contactor   | A   | ~18A  | ~22A  | ~32A  | ~38A  | ~50A  | ~65A  | ~80A  |
|                      | 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                                 |       |       |       |       |       |       |
|                      | 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 - 40 Deg C, for other contact to sales          |       |       |       |       |       |       |
|                      | Humidity   | %   | 0 - 95 (RH - Non Condensing)                      |       |       |       |       |       |       |
|                      | Noise  | dB  | <60   |       |       |       |       |       |       |
|                      | Caster wheel*  |   | Optional  |       |       |       |       |       |       |
|                      | Dimension  | mm (HxWxD)                                  | 585 x 385 x 775                                   |       |       |       |       |       |       |
| Weight               | Kg   | 85  | 95  | 100   | 120   | 130   | 160   | 175   |       |

\* 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 warranty obligation of Suvik Electronics Pvt. Ltd. And its dealers / distributors.
2. The warranty 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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