

# **Servo Voltage Stabilizer User Manual**

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TECHNOVISION ENERGY PVT LTD

## Servo Voltage Stabilizer User Manual

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## **INTRODUCTION**

We thank you for purchasing our SERVO VOLTAGE STABILIZER. From “TECHNOVISION ENERGY PVT LTD” We look forward to a long lasting relationship from hereon.

We are pleased to present the Operating Manual for your “TECHNOVISION ENERGY PVT LTD” SERVO VOLTAGE STABILIZER.

This equipment has been manufactured to precise specifications, utilizing the latest state of the art technology with professional grade electrical & electronic components. All the parameters have been checked & counter checked adequately to ensure long and trouble free service. All the points mentioned in the operating manual are strictly adhere to. You are requested therefore to thoroughly understand the contents of this manual and acquaint yourself with the operating data provided. If you still have certain doubts, kindly refer your problems to us.

This equipment's carries seal of prompt & efficient after sales besides the one-year warranty. In case of any problem, it would help if you can inform us with serial number of equipment, whenever you send a service request.

## INFORMATION FOR SAFETY

### 2.1. USING THIS MANUAL

The generic information of the equipment is supplied in soft copy on technovision official website, and it includes among other documents the own user's manual of the system and the document concerning to «Safety instructions». Before doing any action over the equipment regarding Operational, installation or commissioning, change of location, setting or handling, read them carefully. This user's manual is intended to provide information regarding the safety and to give explanations about the procedures for the installation and operating of the equipment. Read them carefully and follow the stated steps in the established order



Compliance as regards to "Safety instructions" is mandatory, being the user the legal responsible regarding to its observance and application.



Prevent exposure to the elements and do not allow water to enter the Stabilizer. Please install it indoors.



Avoid wearing jewelry during installation.



Power connections must remain tight to avoid excessive heating from a loose connection.



Use properly sized conductors and circuit breakers input and output side refer table no.6.



The grounding terminal is located in the wiring compartment and is identified by the symbol below.












This Stabilizer is to be connected to AC circuits only. These AC connections are identified by the Symbol below: Input and Output side also AC Supply.



If you received any damaged material during transportation on your side please contact technovision technical support team before installing stabilizer.



If you find any loose connection because transportation please tighten the connection before Commissioning.

-  Disconnect the power source before servicing or repairing electrical equipment.
-  Inspect portable cord-and-plug connected equipment, extension cords, power bars, and electrical fittings for damage or wear before each use. Repair or replace damaged equipment immediately.
-  Always tape extension cords to walls or floors when necessary. Do not use nails and staples because they can damage extension cords and cause fire and shocks
-  Use extension cords or equipment that is rated for the level of amperage or wattage that you are using.
-  Always use the correct size fuse. Replacing a fuse with one of a larger size can cause excessive currents in the wiring and possibly start a fire.
-  Be aware that unusually warm or hot outlets or cords may be a sign that unsafe wiring conditions exists. Unplug any cords or extension cords from these outlets and do not use until a qualified electrician has checked the wiring.
-  Risk of electric shock is greater in areas that are wet or damp. Install Ground Fault Circuit Breakers (ELCB) as they will interrupt the electrical circuit before a current sufficient to cause death or serious injury occurs.
-  Know where the panel and circuit breakers are located in case of an emergency.
-  Do not touch a person or stabilizer live apparatus in the event of an electrical incident. Always disconnect the power source first.

The equipment's are delivered duly labelled for the correct identification of any their parts, which combined with the

Instructions described in this user's manual, allows the end-user to make any operating of both installation and commissioning, in an easy and ordered way without doubt. When an equipment differs from the one shown in figures, additional annexes will be edited if they were deemed appropriate or necessary. Download on technovision official website.

Finally, once the equipment is installed and operative, for future requests or doubts that could arise, it is recommended to keep the documentation in a safe place with easy access.

## QUALITY AND STANDARD GUARANTEE

### 3.1 DECLARATION OF THE MANAGEMENT


Our target is the client's satisfaction, therefore this Management has decided to establish a Quality and Environmental policy, by means of installation a Quality and Environmental Management System that becomes us capable to comply the requirements demanded by the standard ISO 9001:2001 and ISO 9001:2015 and by our Clients and concerned parts too.

Likewise, the enterprise Management is committed with the development and improvement of the Quality and Environmental Management System, by means of:

The communication to all the company about the importance of satisfaction both in the client's requirements and in the legal and regulations.

- The Quality and Environmental Policy diffusion and the fixation of the Quality and Environment targets.
- To carry out revisions by the Management.
- To provide the needed resources.

### 3.2 STANDARD

The SERVO VOLTAGE STABILIZER product is designed, manufactured and commercial- sized in accordance with the standard EN ISO 9001:2001 & ISO 9001:2015 of Quality Management Systems and certified by SGS body. The  marking shows the conformity to the EEC Directive by means of the application of the following standards:



In case of any modification or intervention over the equipment by the end-user, the manufacturer is not responsible.



This is an equipment of class A. This equipment, in domestic environment can cause radio interferences, in such case the end-user must take the appropriate measures.





Declaration of conformity CE of the product is at the client disposal under previous request to our headquarters offices.

### **3.3. ENVIRONMENT**

This product has been designed to respect the Environment and manufactured in accordance with the ISO 14001 norm.

### **3.4 EQUIPMENT RECYCLING AT THE END OF ITS USEFUL LIFE**

Our company commits to use the services of authorized societies and according to the regulations, in order to treat the whole recovered product at the end of its useful life (contact your distributor).

### **3.5 PACKAGING**

To recycle the packaging, follow the legal regulations in force, in accordance with the particular norm of the country where the equipment is installed.

## PRESENTATION

### 4.1 VIEWS

#### 4.1.1 Equipment views

Tables from 1 to 5 show the standardized models with their physical dimensions

All models have a control panel with LCD as an interface between the equipment and the end-user, which gives information of different nature through its menus structured in categories.

Three phase equipment's consisting of three single phase cabinets, each one of them will have their own control panel.

##### 4.1.1.1 Single phase Air cooled Stabilizer

Model Number	KVA Rating	Voltage Rating		Dimensions (L X W X H) MM
		Input	Output	
TVS-S1	1 KVA	170-270 VAC	230 VAC	230 X 305 X 180
TVS-S5	2.5 - 5 KVA	170-270 VAC	230 VAC	310 X 430 X 230
TVS-S10	7.5 - 10 KVA	170 - 270 VAC	230 VAC	300 X 380 X 620
TVS-S15	15 KVA	170 - 270 VAC	230VAC	500 X 400 X 660
TVS-WS10	7.5 - 10 KVA	150 - 300 VAC	230 VAC	500 X 400 X 660

Table 1 Single phase servo voltage stabilizer

#### 4.1.1.2 Three phase Air Cooled Stabilizer

Model Number	KVA Rating	Voltage Rating		Dimensions (L X W X H) MM
		Input	Output	
TVS-T10	7.5 - 10 KVA	340 - 480 VAC	415 VAC	400 X 450 X 840
TVS-T15	10 - 15 KVA	340 - 480 VAC	415 VAC	400 X 450 X 840
TVS-T30	20 - 30 KVA	340 - 480 VAC	415 VAC	400 X 800 X 850
TVS-T60	40 - 60 KVA	340 - 480 VAC	415 VAC	400 X 800 X 850
TVS-T80	70 - 80 KVA	340 - 480 VAC	415 VAC	500 X 900 X 1000
TVS-WT30	20 - 30 KVA	260 - 520 VAC	415 VAC	400 X 800 X 850
TVS-WT50	40 - 50 KVA	260 - 520 VAC	415 VAC	500 X 900 X 1000

Table 2 Three phase Air Cooled Stabilizer

#### 4.1.1.3 Three phase Air cooled Series with Isolation Transformer

Model Number	KVA Rating	Voltage Rating		Dimensions (L X W X H) MM
		Input	Output	
TVS-TISO30	20 - 30 KVA	340 - 480 VAC	200 VAC	800 X 600 X 1200
TVS-TISO60	40 - 60 KVA	340 - 480 VAC	200 VAC	800 X 600 X 1200

Table 3 Three phase Air cooled Series with Isolation Transformer

#### 4.1.1.4 Three phase Oil cooled Series

Model Number	KVA Rating	Voltage Rating		Dimensions (L X W X H) MM
		Input	Output	
TVS-TOC100	80-100 KVA	360 - 460 VAC	415 VAC	Rack = 1000X380X620 Tank=1020X410X640 JB=400X400
TVS-TOC150	125 -150 KVA	360 - 460 VAC	415 VAC	Rack = 1180X435X720 Tank=1200X460X800 JB=500X500

Table 4 Three phase Oil cooled Series

#### 4.1.1.5 Three phase Air cooled Power Conditioner Series

Model Number	KVA Rating	Voltage Rating		Dimensions (L X W X H) MM
		Input	Output	
TVS-TPC15	10 - 15 KVA	360 - 460 VAC	415 VAC	400 X 450 X 840
TVS-TPC30	20 - 30 KVA	360 - 460 VAC	415 VAC	400 X 800 X 850
TVS-TPC60	40 – 60 KVA	360 - 460 VAC	415 VAC	400 X 800 X 850
TVS-TPC80	70 – 80 KVA	360 - 460 VAC	415 VAC	500 X 900 X 1000

Table 5 Three phase Air cooled Power Conditioner Series

#### 4.2 PRESENTATION

Servo Voltage stabilizer model has been designed to operate in fluctuated mains and to safeguard the critical loads, in particular, those ones with a complicated nature: high inrush start up currents, high reactive character, high powers, etc. These equipment's are very robust against long overloads and they have a high output accuracy (up to  $\pm 1\%$ ), they are manufactured in single and three phase structures with independent phase regulation or average regulation in the three phases depending on the model.



Figure 1 Front View



Figure 2 Back View



Figure 3 LHS & RHS View

Any three phase servomotor stabilizer has only one electronic control card for all the phases and one Display card for its monitoring and complete control, less those ones that consist of three independent single phase equipment's duly connected to make a three phase equipment. In these ones, each cabinet will have its own electronic control card and its display card.

Depending on the total power of the three phase equipment's, no matter if they include some options or not, they are supplied assembled in one metallic cabinet, and divided in two cabinets joined together mechanically at factory or by three separate cabinets, which will be joined after their final location. The input and output are marked in the terminal strips of the equipment. When installing the device, use the suitable cross cable section in order to guarantee its correct operating.

Three phase servo motor stabilizer has only one electronic control card for all the phases and one display card for its monitoring and complete control, less those ones that consist of three independent single phase equipment's duly connected to make a three phase equipment. In these ones, each cabinet will have its own electronic control card with Display card. Depending on the total power of the three phase equipment's, no matter if they include some options or not, they are supplied assembled in one metallic cabinet, and divided in two cabinets joined together mechanically at factory or by three separate cabinets, which will be joined after their final location. The input and output are marked in the terminal strips of the equipment. When installing the device, use the suitable cross cable section in order to guarantee its correct operating.

The LCD display of the control panel of the stabilizer allows checking the input/output voltages and frequency, whenever you need. Also, the LCD has measurements of Load current per phase. There are LED indicators to indicate Phase indication. Block diagram of a Servo Voltage Stabilizer is shown in Fig. 4 (the three phase structure is similar to it but repeating the same block per each phase).

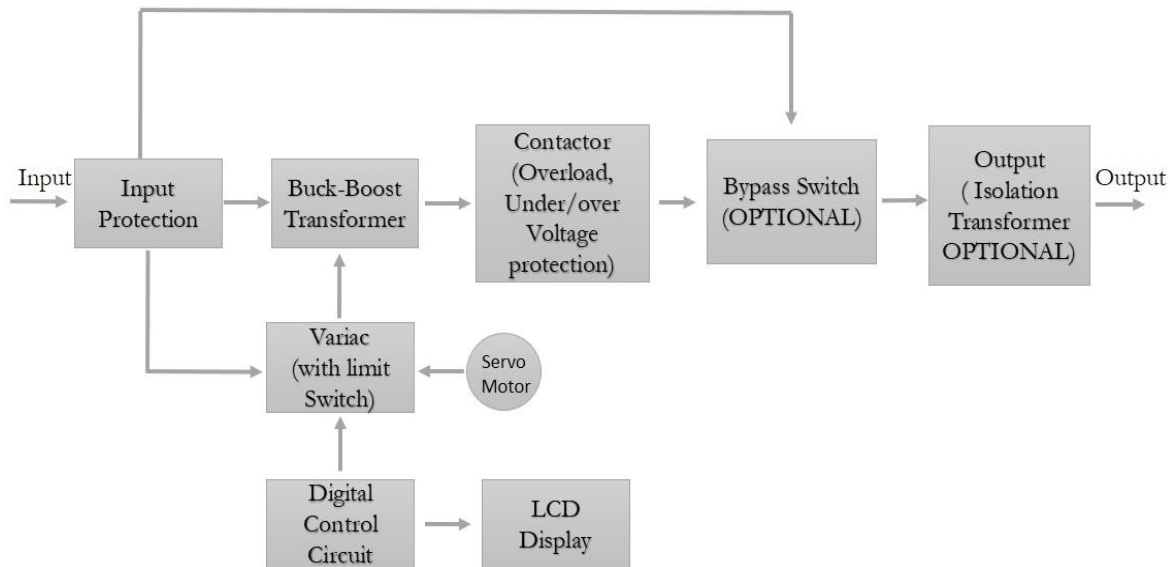


Figure 4 Block Diagram of Servo Voltage Stabilizer

The LCD Display shows the values of the input/output voltages (Phase to Phase & Phase to Neutral) and frequency. And also measure output current with the output current transformers. Also, the LED indicators inform about Phase indication. To know in detail the LCD panel information and the meaning of the LEDs go to the corresponding section of this manual. The input circuit breaker protections, provides protection against long over currents to both the loads and the stabilizer. Depending on the model and the protection degree IP, the cooling is natural or forced, in order to keep the internal temperature stable.

Although the input voltage range is  $\pm 15\%$  for the standard models, under request, it is possible to manufacture equipment's with wide input voltage range up to  $\pm 30\%$  (input voltage window).

The voltage stabilizer protects against sudden changes, irregularities, increasing or decreasing of the voltage mains by means of an accurate voltage stabilization.

Also, as standard the control electronic unit includes the Maximum and minimum voltage protection signal (adjustable to input or output, but by default on the last), which is needed to disconnect the output by means of a contactor. In case of the voltage exceeds the allowed limits or mains fault. In order to keep the protection against sudden voltage changes, the signal is delayed a few seconds.

It is also possible to include an option that allows disconnecting the output of the stabilizer due to overload. In this case, the equipment will include the output current sensors to make the overload measurement.

As an option, the stabilizer can be equipped with a manual Bypass, which is not ready to be maneuvered with load connected. It allows keeping the loads supplied during the maintenances or fixing periods.

#### **4.3 MAIN QUALITY PERFORMANCES**

- Wide range of powers for single and three phase installations.
- Toroidal shape autotransformers (Variacs) for all the power range, fast and efficient with Servo motors.
- Output accuracy, better than  $1\%$  (adjustable).
- Depending on the three phase equipment's model common and independent regulation per phase, they are immune to unbalanced loads.
- As standard, input voltage range of  $\pm 15\%$ , being able to manufacture ranges up to  $\pm 30\%$ .
- High efficiency, up to  $97,5\%$ .
- High response time, up to  $70\text{ V/sec}$
- Complete control Circuit with LCD to supervise the stabilizer.
- Output accuracy guaranteed by a control with TRIAC through servo Motor.
- Stable operating against load and/or voltage fluctuations.
- Wide operating temperature ranges ( $-10\text{ }^{\circ}\text{C}.. +55\text{ }^{\circ}\text{C}$ ).
- Optimized mechanical design, easy maintenance.
- Overload up to  $200\%$  over the nominal for  $20\text{ sec.}$
- High robustness and reliability.

#### 4.4 PANEL INDICATION & CONTROLS

- Input on : This indicator shows the input availability
- Output on : This indicator shows the output availability
- High/low voltage indicator : This indicator shows the input high or input low i.e. beyond or below the range of voltage stabilizer.
- Auto/manual switch : This switch facilitates automatic and manual mode of operation to the stabilizer. In auto mode the output voltage of the servo is always in conjunction with increase/decrease switch is used to set output voltage to the desired level.
- Increase/Decrease switch : This switch work only in manual mode to Increase / decrease the output voltage.
- Output/cutoff : If output of servo goes above 260 in each phase  $\pm 2V$  Ac or falls below 190/200V cut-off. The indicator shows cut-off condition of the corresponding phase.
- Voltage Adjust : This is potentiometer with which output of the Servo can be set to the required level between 220V and 240V in each phase in Auto mode.
- Reset-auto/ Manual : When the reset switch is in Auto position, the Output will available automatically. When the Reset switch is in manual position, the output Will available by using of 3ph output
- ON/OFF : Push button switches

#### 4.5 OPERATING PRINCIPLE

The electronic control manages the output voltage of the stabilizer permanently, providing a correction signal the Servo motor, in order to achieve the wanted output voltage with an accuracy of  $\pm 1\%$  (adjustable from  $\pm 0,5\%$  up to  $\pm 5\%$ ). The motor acts over the toroidal autotransformer (Variac), by increasing or decreasing the voltage, by moving the brush in the variable tap in one way or to the other.

Servo Voltage Stabilizer utilizes an autotransformer (variatic) coupled with motor and BUCK BOOST transformer. The BUCK BOOST transformer has two winding i.e. primary and secondary. Primary connected to AUTOTRANSFORMER (Variatic) and secondary to series with supply line. The primary voltage of BUCK BOOST transformer controlled by auto transformer moving arm position with the help of motor. Thus adding

or subtracting the line voltage is being controlled. A solid state sensor unit continuously monitors the output voltage and the error voltage is compared with fixed reference voltage. The error is amplified through high gain Pic micro controller 18F450 which in turn controls the direction of the motor movement. This drives an Auto Transformer moving arm position till the correct output voltage is restored. The action of this SERVO system is exceptionally FAST with minimal over shoot. Sensing at the output point automatically compensates for any load current change. This method of stabilization is free from generation and wave form distortion.

#### 4.5.1 Control System

The advanced feature of control system lies in its exceptionally fast response with minimal overshoot. This is mainly due to the use of low internal mechanical system. PIC 18F4520 continuously monitors the output voltage with reference voltage and generate error signal. Any error voltage is amplified, this amplified error voltage is fed to optocoupler fires the correspondent TRIACS to control the AC motor direction clock wise or Anti clock wise. The control PCB has three identical circuits for R, Y, B phase controlling along with protection circuit for low and high voltage cut-off. The PCB has following presets for setting the voltage, regulation and below cut-off voltages for regular stabilizer range. high & low cut of range change as per wide range of stabilizer.

DESCRIPTION		Range
• High Output Voltage Cutoff	:	470V
• Low Output Voltage Cutoff	:	350V

#### 4.5.2 Protection

- High Voltage Protection
- Low Voltage Protection
- Over load protection with output Trip
- Short circuit protection with MCB
- SERVO –bypass provided at input
- Surge protection as per customer demand
- Phase Reversing
- Single phasing
- Neutral fail
- Phase 2 phase



## 4.6 OPTIONS

### 4.6.1 Manual Bypass

Manual bypass option consists in a two positions cam switch, which allows selecting between positions MAINS «1», where the output is connected to the input of the stabilizer directly (Bypass) and position SERVO «2» where the output of equipment is connected to the output of the stabilizer directly.

OFF «0» Output OFF



### 4.6.2 Isolation Transformer

The isolation transformer is built with separate windings and it has an electrostatic shield between the primary and secondary windings, which provides a high level of electrical noise attenuation (> 40 dB). This option can be built in either inside the “TVS-TISO” series attending to different operating conditioning or in a separate case. Among other functions a part from the isolation, it can act as:

- Input or output voltage adaptor.
- Configuration adaptor: delta-star or vice versa...).
- And even combining the two above options depending on the case.

As a result of the possible combinations, this document does not consider the power standardization of tables 1 to 8 in the assembling with isolation transformer, because the physical dimensions and weight will vary, but in any case its main feature of galvanic isolation will be not be affected.

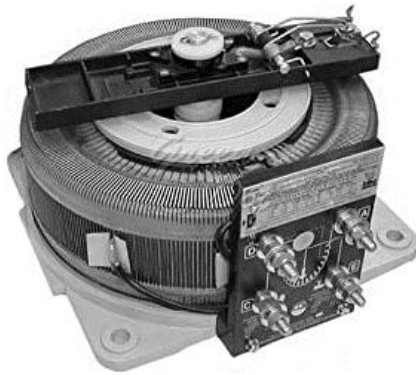


## 4.7 MAJOR COMPONENT

### 4.7.1 VARIAC

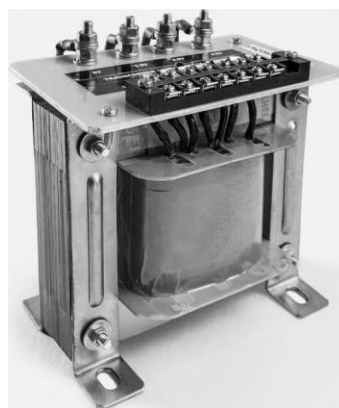
Variac is also known as Dimmer, Autotransformer or Variable transformer

It is normally round in the shape. Silicon CRGO toroidal core is used for the base & copper wire with specific turn ratio according to the capacity is used. The basic purpose of dimmer is to increase or decrease the voltage which is fed to the buck boost transformer. 50% of the output voltage is increased or decreased by dimmer only. Let us take an example: If the input voltage is 160V, the dimmer will increase it to 190V & rest of the 30V (since 220V is required to run any single phase load) will be done by Buck Boost Transformer.



### 4.7.2 BUCK BOOST TRANSFORMER

Contrary to dimmer it is in rectangular shape. Bobbin is fitted with EI CRGO or HRGO core. When the transformer structure is built, it is dipped in varnish tank for extra protection. This type of Insulating varnish also called transformer varnish is put on all the windings used in buck boost transformers to encapsulate them before the servo stabilizer is ready for regress testing. Transformer varnish enhances coil life and protects windings in the transformer from environmental exposure that would otherwise get damaged due to vibrations. This varnish can be used as a great insulator for any coil of wire. Though transformer is there in Isolation Transformer also, But it different from buck boost transformer



#### 4.7.3 SERVOMOTOR (SYNCHRONIZING MOTORS)

Servomotor as the name suggests is the main part of servo stabilizer. The motor rotates the arm connected on the dimmer in clockwise or anti clockwise direction according to input voltage.



#### 4.7.4 CARBON BRUSH

This is a moving part in servo stabilizer, it is fitted in the shaft to make the contact with Variac. If the input voltage variation is very frequent, this carbon brush will erode early and customer has to replace it very frequently. That is why servo stabilizer manufacturers should use best quality carbon brush.



#### 4.7.5 CONTACTOR

The function of contactor is to cut the output of any servo stabilizer if it exceeds a prescribed limit.



#### 4.7.6 SPD( Surge protection device)

The Surge Protection Device (SPD) is a component of the electrical installation protection system. This device is connected in parallel on the stabilizer input power supply circuit this is the most commonly used and most efficient type of Electrical Spikes, Sudden Voltage fluctuation protection.






#### 4.7.7 MCB/MCCB

The MCB is used to switch on /off the servo stabilizer and gives short circuit protection whereas MCCB is normally for overload protection.





## INSTALLATION

-  Read and respect the Safety Information, described in section 2 of this document. To obviate some of the indications described in it, can cause serious or very serious injuries to the persons in direct contact or in the vicinity, as well as faults in the equipment and/or loads connected to itself.
- Check that data in the nameplate are the required ones by the installation.
- A wrong connection or maneuvering, can cause faults in the stabilizer and/or loads connected to it. Read the instructions of this manual carefully and follow the stated steps in the established order.
-  The equipment must be installed by qualified personnel and it can be used by personnel with not specific training, just with only help of this «User's manual».
-  Any connection of the equipment, including the control (interface, remote control ...), will be done with all the switches in rest and no mains present (power supply switch of the equipment turned «Off»).

### 5.1 TO CONSIDER IN THE INSTALLATION

- The equipment's have terminals for its input and output connections. Nevertheless some models due to their high power rate, the power supply cable connection is directly done in the own terminals of the input switch or breaker, when they have rods.
- As regards to the protective earth connection and earth bonding connection, the equipment's have an earth terminal or stud, less those double cabinets, which will have two earth connection points by means of studs, one for the main protective earth cable and the other one for the earth bonding for the load or loads.
- The nameplate of the equipment contents the maximum input current (corresponding to the nominal power with low voltage regulation) and the nominal output. The efficiency of the equipment has been considered to calculate the input current
- Overload condition is considered as a nonpermanent and exceptional way.
- In case peripheral elements are added at the input or output like transformers or autotransformers, The current of the nameplates of these elements has to be considered in order

to select the suitable cross cable section, by respecting the Local and/or National Low Voltage Electro technical Regulations.

- Regarding the size of the terminals of the built switches in the protection panel, the cross cable section has to be considered, in order to leave them completely embraced in all its section, in order to have an optimal contact between both elements
- It is compulsory that the line that supplies the stabilizer includes the input protection, which allows to break it to make the connection tasks with no voltage, otherwise it could mean a danger of the fitters. It is recommended to equip the installation with a switchgear protection panel, which besides of the input protection, it has an output protection and manual Bypass switch. The startup and shutdown operating instructions are described in the user's manual, considering that the installation is provided with a complete panel like the recommended one. If it is not available omit the protection or switch maneuvering.
- The documentation supplied together with this user's manual, and the information regarding the «Recommended installation» can be checked. This information shows the wiring diagram, protection sizes and minimum connecting cross cable sections, attending to the nominal operating voltage of the equipment. All the values are calculated for a maximum cable length of 30 m between the protection panels, equipment and loads.
  1. For higher lengths correct the cross sections in order to avoid dropping voltages, in accordance with the particular Regulations or norms of the country.
-  The size and type of the protection to install will be the stated in the information related to «Recommended installation», supplied together with this user's manual in the documentation.
- The neutral regimes of the input and output are identical for the servo voltage stabilizers «with no galvanic isolation».
-  When, as an option, an equipment incorporates a galvanic isolation transformer, which can be built in from factory or by your own, either at the input or output of the equipment, protections for indirect contact must be fitted in (RCD) at the output of each transformer, because in case of electrical shock in the secondary winding, due to its isolation feature, it will impede the tripping of the protections located in the primary of the transformer (isolation transformer output).
- We remind you that any isolation transformer fitted in or supplied from factory, has the output neutral earthed through a cable that joints the neutral and power terminals. If an isolated output neutral were needed, this cable bridge 27 must be removed, by taking the needed cautions as regards to the local and/or national regulations.
- Switches, breakers and protections must break the NEUTRAL apart from the lines, in case of installation in IT neutral regime.

## 5.2 EQUIPMENT RECEPTION

### 5.2.1 Unpacking, inspection and contents checking

- When receiving the equipment, check that no incident has happened during transport (impact, fall ...) and the specifications of the equipment correspond with the ones stated in the order, therefore it is recommended to unpack the stabilizer in order to make a first visual inspection.
- In case of incidents, make the needed claims to your supplier or in lack of him to our firm



Never start up an equipment when external damages are detected.

- Also check data in the nameplate stucked in the packaging and equipment, correspond to the ones stated in the purchase order, so it will be needed to unpack it (see section 5.2.3). Otherwise, make the nonconformity as soon as possible, by quoting the serial number of the equipment and the references of the delivery note.
- Check the packaging contents: The own equipment.
- Once the reception is finished, it is advisable to pack the equipment again till its commissioning in order to protect it against mechanical impacts, dust, dirt, etc.

### 5.2.2 Storage

- The storage of the equipment, will be done in a dry and cool place, and protected from rain, dust, water jets or chemical agents. It is advisable to keep the equipment inside its original packaging because it has been designed to assure the maximum protection during transport and storage.

### 5.2.3 Unpacking

- The packaging of the equipment has wooden pallet, cardboard or wooden enclosure depending on the case, polystyrene corners (EPS) or polyethylene foam (EPE), plastic wrap and polyethylene strip, all of them are recyclable materials; so if you are going to dispose them, do it in accordance with the regulations in force. It is recommended to keep the packaging, in case it would have to be used in future. Nevertheless, models in cabinet are supplied with no pallet, unless the transport is by sea or it was requested in the order. To move it, use a pallet jack or forklift through the own base of the cabinet

(Note: - Wooden Packing is Optional as per customer requirement)

- Proceed to unpack the equipment. To do that, cut the strips of the cardboard and take it out from top like a cover or dismantle it with the needed tools if it is a wooden enclosure; remove the corners and plastic wrap. Bared over a honeycomb cardboard base, which is used as shock absorber and at the same time it is over the wooden pallet. These units have two lifting lugs to make easier the lifting tasks of the equipment and the pallet removing
- External inspection - When the shipment arrives, inspect the shipping material for any signs of transportation damage or mishandling. Do not attempt to install the Stabilizer if damage is apparent. If any damage is noted, file a damage claim with the shipping agency within 24 hours

and contact Technovision Service Team Contact details mansion in Annexure of the manual. Compare the components of the shipment with the bill of lading. Report any missing items to the carrier and to Technovision immediately.



#### TIPPING/HEAVY EQUIPMENT HAZARD

- The unit is easily tipped. Use extreme caution when unpacking and moving the equipment.
- A minimum of two or more people (as per weight & size of the stabilizer) are required to unpack and move the equipment.
- Ensure that the floor and sub-floor can support the total weight of the system, especially when the weight is concentrated on the stabilizing feet. Failure to follow these instructions can result in death or serious injury.



Move to the Installation Site Use a pallet jack or a forklift to move the Modular PDU. Make sure to lift only from the bottom. Do not use a forklift if the Modular PDU has been removed from its pallet.

#### Notice:-


- Leaving the equipment uncovered and exposed to the elements will cause damage and void the factory warranty.
- When possible, leave the equipment on the pallet until you are ready to move it to its final location.
- If the height of the enclosure exceeds the height of the doorway, remove the enclosure from the pallet.
- After the unit has been removed from the pallet, move it only by rolling it on the casters.
- Ensure that the floor is level. The unit must be installed on a level floor.



#### 5.2.4 Transport till its location

- Equipment's in case have four casters, in order to make easier their transport until their location. Nevertheless, if the reception area is far from the installation place, it is recommended to move the equipment by means of pallet jack or the suitable means evaluating the remoteness between both points. If the distance is long, it is recommended to move the equipment packed till the installation area and later on unpack it.
- For models in cabinet, it is essential to move it with mechanical means till the final location.

#### 5.2.5 Connections

-  This equipment is ready to be installed in mains with power distribution system R, Y, B & N keeping in mind during the installation the features of the used system and the national electrical system of the final country
- The cross cable sections used to supply the equipment and loads, will be in accordance with the power stated in the nameplate stucked in the equipment, respecting the Low Voltage Electro technical Regulation or norms of the corresponding country.
- The installation will be provided with input protections, RCB and circuit breakers sized to the current stated in the nameplate of the equipment at least, and characteristic equal to the stated figure in the «Recommended installation» document. For equipment's connected to IT distribution power system, the protection will be four poles in order to break the lines and neutral in the same maneuvering. Overload condition is considered as a nonpermanent and exceptional operating mode, so these currents will not be kept in mind when sizing the protection.
- The output protection will be a circuit breaker with the characteristic equal to the stated figure in the «Recommended installation» document.
- Depending on the model of the stabilizer, some control connections can be accessible from the rear of the equipment. Nevertheless any power connection is protected by a cover and those models in cabinet, it is needed to open the door too. When the corresponding tasks are finished, the terminal cover will be put back together with their fixing screws and those models in cabinet and front door, the door will be closed by means of the foreseen mechanisms.
- It is recommended to use spade terminals in all the cables connected to terminals.
- Check the correct torque of terminal screws.

## 5.2.6 Input and output wire selections

- Select circuit breaker and cable size as per table

Servo Stabilizer Input & Output Cable requirement chart						
Input Operating Range		(360-460) VAC		Output	415 VAC +/-1%	
KVA	Input Details		Input Breaker	Output Details		Output Breaker
3P+N	Current(A)	Cable (Sqmm)	MCB/MCCB (3P)	Current(A)	Cable (Sqmm)	MCB/MCCB (3P)
7.5	12.50	1.5	16A	10.87	1.5	16
10	16.67	2.5	20A	14.49	2.5	16
15	25.00	6	32A	21.74	6	32
20	33.33	10	40A	28.99	10	32
25	41.67	10	50A	36.23	10	40
30	50.00	16	63A	43.48	16	50
40	66.67	25	80A	57.97	25	63
50	83.33	35	100A	72.46	35	80
60	100.00	35	125A	86.96	35	100
70	116.67	50	125A	101.45	50	125
80	133.33	50	150A	115.94	50	125
100	166.67	70	175A	144.93	70	150
125	208.33	95	225A	181.16	95	200
150	250.00	100	300A	217.39	100	300

Table 6 Input and output wire selection table for 360-460VAC Range



Servo Stabilizer Input & Output Cable requirement chart						
Input Operating Range		(340-480) VAC		Output	415 VAC +/-1%	
KVA	Input Details		Input Breaker	Output Details		Output Breaker
3P+N	Current(A)	Cable (Sqmm)	MCB/MCCB (3P)	Current(A)	Cable (Sqmm)	MCB/MCCB (3P)
7.5	13.89	1.5	16A	10.87	1.5	16
10	18.52	2.5	20A	14.49	2.5	16
15	27.78	6	32A	21.74	6	32
20	37.04	10	40A	28.99	10	32
25	46.30	10	50A	36.23	10	40
30	55.56	16	63A	43.48	16	50
40	74.07	25	80A	57.97	25	63
50	92.59	35	100A	72.46	35	80
60	111.11	50	125A	86.96	35	100
70	129.63	50	125A	101.45	50	125
80	148.15	50	150A	115.94	50	125
100	185.19	70	175A	144.93	70	150
125	231.48	95	225A	181.16	95	200
150	277.78	120	300A	217.39	100	300

Table 7 Input and output wire selection table for 340-480VAC Range

Servo Stabilizer Input & Output Cable requirement chart						
Input Operating Range		(280-520) VAC		Output	415 VAC +/-1%	
KVA	Input Details		Input Breaker	Output Details		Output Breaker
3P+N	Current(A)	Cable (Sqmm)	MCB/MCCB (3P)	Current(A)	Cable (Sqmm)	MCB/MCCB (3P)
7.5	16.67	2.5	20A	10.87	1.5	16
10	22.22	4	32A	14.49	2.5	16
15	33.33	10	40A	21.74	6	32
20	44.44	10	50A	28.99	10	32
25	55.56	16	63A	36.23	10	40
30	66.67	16	80A	43.48	16	50
40	88.89	35	100A	57.97	25	63
50	111.11	50	125A	72.46	35	80
60	133.33	50	150A	86.96	35	100
70	155.56	70	175A	101.45	50	125
80	177.78	70	200A	115.94	50	125
100	222.22	95	225A	144.93	70	150
125	277.78	95	300A	181.16	95	200
150	333.33	120	350A	217.39	100	300



Table 8 Input and output wire selection table for 280-520VAC Range

### 5.2.7 Connection of input terminals

-  As this is an equipment with class I protection against electrical shocks, it is essential to install the protection earth conductor (connect earth ). Connect this conductor, before supplying voltage to the input terminals.
- In three phase stabilizers consisting of single phase equipment's, it is needed and essential to make one of these two options as regards to the earth
  - Joint the earth terminals (screws) of the three equipment's by means of the cable and connect the protective earth cable coming from the installation to any of the terminal.
  - Or come with one separate earth cable to each terminal (screw) of each equipment, but they have to come from the same point
- Depending on the model of stabilizer, the power supply connections are directly done to the terminals or to the own rods of the input switch or breaker.



- The illustrations corresponding to models in cabinet are shown with direct connection over the maneuvering mechanism as a mere example. Models with no terminals, the connection order will not differ from the one stated unless the labelling of the equipment states it
- Connect the power supply cables to input terminals (P) and (N) in single phase equipment's or (R), (Y), (B) and (N) in three phase equipment's
- In three phase stabilizers consisting of three single phase cabinets, in case it was requested to have one single point to connect the neutral, joint the neutral rod of the three equipment's by means of the two extensions copper rods. Otherwise connect the suitable cross cable section to the three terminals corresponding to the neutral of each equipment. When it is not a conditioning (only one conductor), it is able to connect a suitable cross cable section to the input neutral terminal of each equipment.
- In case of discrepancies between the labelling and the instructions of this manual, the labelling will always prevail.

### 5.2.8 Connection of output terminals

-  As this is an equipment with class I protection against electrical shocks, it is essential to install the protection earth conductor (connect earth  ). Connect this conductor, before supplying voltage to the input terminals.
- Depending on the model of stabilizer, the load or loads connections are directly done to the terminals or to the own rods of the manual switch option, if it is included.
- The illustrations corresponding to models in cabinet, are shown with direct connection over the manual bypass maneuvering mechanism as a mere example. For those models without this option, there will always be a terminal strip. Models with no terminals, the connection order will not differ from the one stated unless the labelling of the equipment states it.
- Connect the cables to supply the loads or loads to the output terminals and in single phase equipment's or (R), (Y), (B) and (N) in three phase equipment's, Pay attention to the neutral connection in a three phase unit with star configuration, because if the line is connected instead of the neutral, the load will suffer a high over voltage that can destroy it. In three phase equipment's with delta output, the neutral terminal (N) is not available.
- In three phase stabilizers consisting of three single phase cabinets, in case it was requested to have one single point to connect the neutral, joint the neutral rod of the three equipment's by means of the two extensions copper rods, otherwise connect the suitable cross cable section to the three terminals corresponding to the neutral of each equipment. When it is not a conditioning (only one conductor), it is able to connect a suitable cross cable section to the output neutral terminal (N) of each equipment.
- In case of discrepancies between the labelling and the instructions of this manual, the labelling will always prevail.
- With respect to the protection that must be placed at the output of the stabilizer, we recommend that the output power should be distributed in four lines, at least. Each one of them should have a circuit breaker protection switch of a quarter of the nominal power. This type of output power distribution will allow, in the event of a breakdown in any of the machines connected to the equipment that causes a short-circuit, will only affect to the line that is faulty. The rest of the connected loads will have their continuity assured due to the tripping of the protection of the line

affected by the short-circuit only

### 5.2.9 Connection of the protective earth

-  As this is an equipment with class I protection against electrical shocks, it is essential to install the protection earth conductor (connect  earth). Connect this conductor, before supplying voltage to the input terminals.
- Make sure that all the loads connected to the stabilizer, the protective earth is only connected to this point. The fact of not respecting the protective earth connection of the load or loads to this single point, will create back feed loops to earth that will affect to the quality of the power supplied.
- Regardless of the equipment has one or two protection earth terminals, are always joined to the ground of the stabilizer.
- In three phase stabilizers consisting of single phase equipment's, it is needed and essential to make one of these two options as regards to the earth :
  - Joint the earth terminals (screws) of the three equipment's by means of the cable and connect the protective earth cable coming from the installation to any of the terminals
  - Or come with one separate earth cable to each terminal (screw) of each equipment, but they have to come from the same point.

## OPERATING

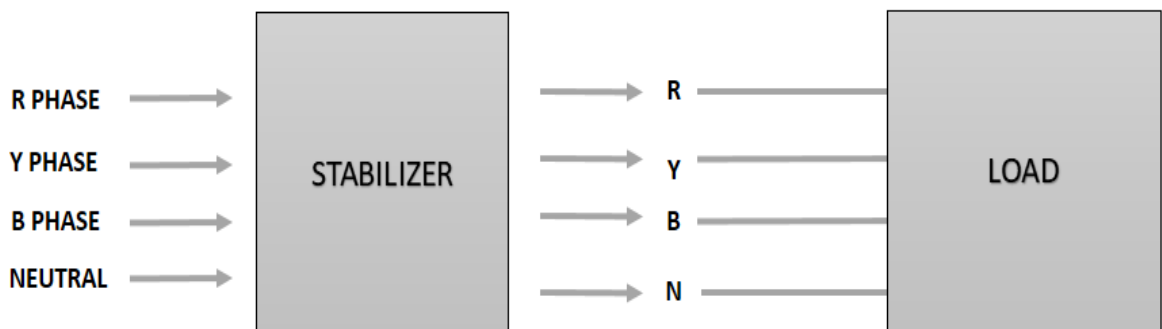
### 6.1 CONTROLS BEFORE COMMISSIONING

- Make sure that all the connections have been made properly and sufficiently tight, respecting the labelling of the equipment.
- Check that start up switch of the stabilizer is in «0» or «Off» position.
- In equipment's with the manual Bypass switch option, the preset position from factory of this switch is «0» (OFF). Turn the Rotary switch to position «2» (Servo). In case the switch were at position «1» (Mains), turn it to position «2» (Servo).
- Check that the loads are shutdown

### 6.2 START UP AND SHUTDOWN OF THE STABILIZER

#### 6.2.1. First commissioning procedure

- It is understood as «Start», that the stabilizer is connected to the electrical mains, with the correct voltage at the input terminals and the switch turned «On»
- In case of three phase load connected to stabilizer check phase sequence correctly. Check Phase sequence as per below figure.



## 6.2.2 Shutdown of the stabilizer

- Shutdown the load or loads.
- Turn to position «0» or «Off» the input circuit breaker of the stabilizer.



DO NOT use them for this function when they are isolators, because they are not built in to break current.

- Turn to position «0» or «Off» the input and/or output switch located in the protection panel.

## 6.3 BYPASS MANUAL, OPTION

### 6.3.1. Load power supply from mains through the manual Bypass

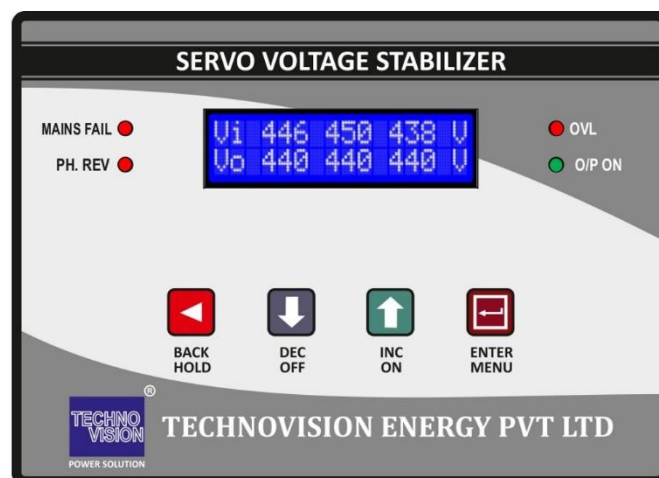
- Shutdown the load and stabilizer as section 6.2.2 states.
- Turn the manual Bypass switch option, to position «1» (Mains) Or (Bypass). The stabilizer will be out of service and ready for its maintenance or fixing in case of fault.
- Start up the loads, they will be directly supplied from commercial mains supply



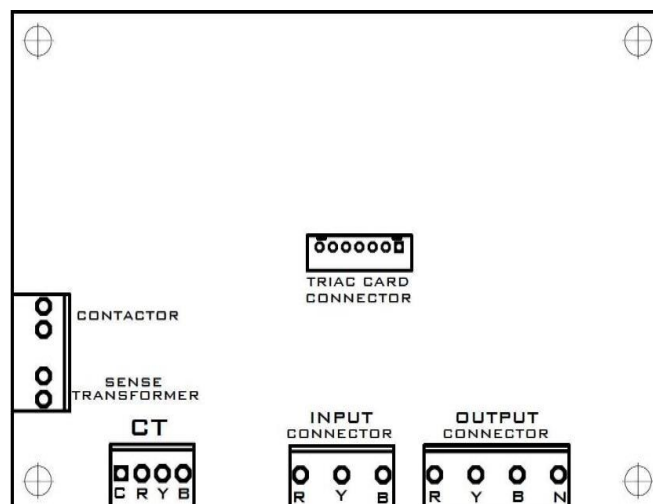
The manual bypass switch cannot break current/ load, so it is reminded that any action over it will make a break in the loads as it is break before make type and also because it shifts through the position «0» and input MCB is « OFF » or «0» position.

## CONTROL PANEL

### 7. OVERVIEW:

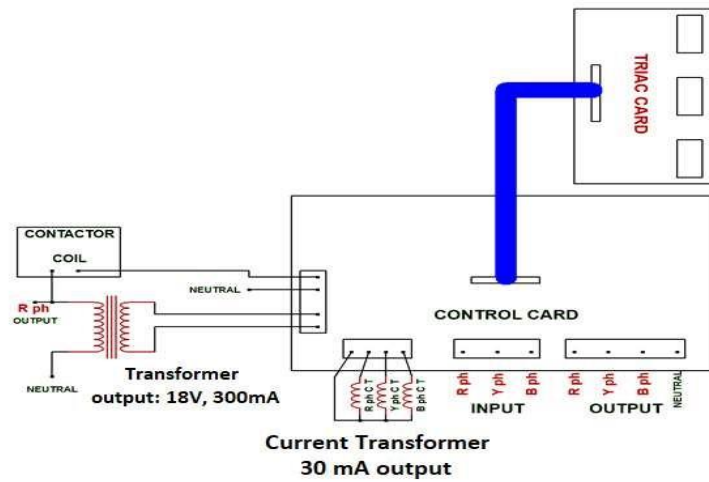


### 7.1 board connections:

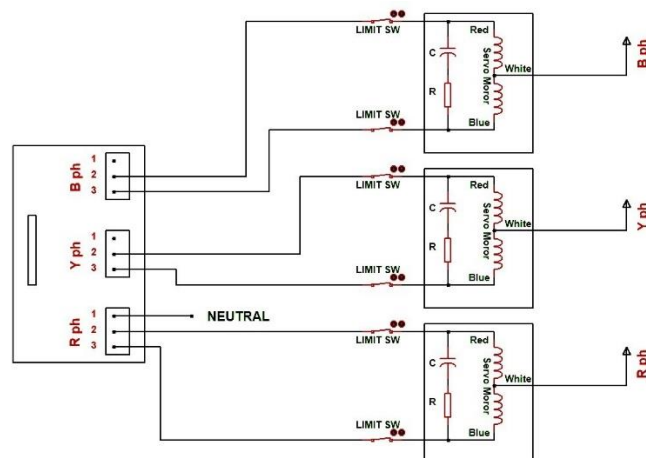
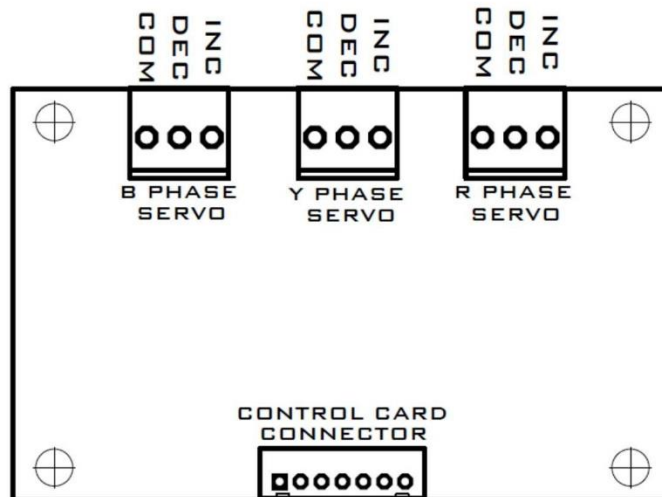




## 7.2 wiring diagram:



## 7.3 TRIAC connections:








NOTE: - If the motor is running in wrong direction, interchange pin no. 2 & pin no. 3 of the respective phase.

#### 7.4 LED indication:

Condition	LED
Input Fail Indication	Red LED (IP Fail)
Phase Reverse Indication	Red LED (Ph. Rev)
Overload Indication	Red LED (Ovl)
Output ON	Green LED (o/p ON)

#### 7.5 Running Mode Display:

Display's showing in LCD display	Description
	Phase Voltages of Input & Output for R, Y & B Phase
	Line Voltages of Input & Output for R, Y & B Phase
	Line Current for R, Y & B Phase
	Frequency
	System Status

#### 7.6 KEY function:

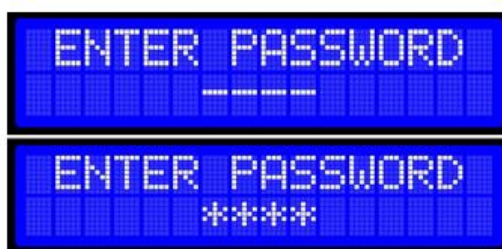
Key	Set Mode	Run Mode
HOLD/BACK	Short - Back to previous display	Short - Change display Hold - Freeze display
OFF/<<	Decrement value/Previous record in LOG	Hold - Output Off
ON/>>	Increment value/Next record in LOG	Hold - Output On
OPT./ENTR	Short - Change display & save values	Short - Mute/Unmute beep Hold - Entry in Advance options

## 7.7 Advance options:

The card has two modes of setting i.e. GENERAL SETTINGS:

### 7.7.1 General settings:-

To enter GENERAL SETTINGS long press the ENTER key, user interface will ask for a 4-digit password. Each digit must be set using START/STOP keys and confirmed using ENTER key. Only upon entering a right password can the settings be accessed. This is to prevent the parameters from unintentional or unauthorized alteration. A wrong password will result in access restriction.



AFTER ENTERING the right password, the display will now show the GENERAL SETTINGS screen which has three options; respectively Error LOG (LOG), Parameter settings (SET), Calibration (CAL). Press the START/STOP key to navigate between the options & press the ENTER key to select the desired option.



### 7.7.2 Error log:

If LOG option is selected, error records are shown as latest error first, Use START/STOP key to scroll through the error log entry. The last entry shown will be blank to indicate end of errors.



### 7.7.3 Parameter settings:

If SET option is selected, display will show the parameters given in TABLE 5, to increment/decrement values use START/STOP key, long press the START/STOP to increment/decrement values rapidly. Press the

ENTER key to save current value & go to next parameter. To return on GENERAL SETTINGS screen at any moment press the BACK key. For returning to the RUN mode from the GENERAL SETTINGS screen press the BACK key again.



Parameter	Description	Ranges
Set Volt	Set voltage	100-999V
Vout High	Output high voltage limit	100-999V
Vout Low	Output low voltage limit	100-999V
Vin High	Input high voltage limit	100-999V
Vin Low	Input low voltage limit	100-999V
Tcut HV	High voltage cut off time limit for Output & Input	0-999S
Tcut LV	Low voltage cut off time limit for Output & Input	0-999S
Tcut Ph	Cut off time limit for PH. REV & PH. FAIL	0-999S
ON Delay	Auto start delay	0-999S
Sensitivity	Sensitivity	1-25V
Hysteresis	Hysteresis	1-25V
Auto/Man	Auto ON after error condition is cleared	Auto/Manual
Phase Rev	Phase reverse protection	Yes/No
Ph. Fail	Phase fail protection	Yes/No
Scrolling	Scrolls display	Yes/No
Beep Alert	Buzzer alert on error	Yes/No

#### 7.7.4 Change User Password:

Upon pressing the STOP key on Change User Pwd, user interface will ask for a 4-digit password. Each digit must be set using START/STOP keys and confirmed using ENTER key. After entering the new 4-digit password, the password will be updated. To return on GENERAL SETTINGS screen press the BACK key & for changing the next parameter press the ENTER key.



#### 7.7.5 Disable User Password:

To disable User Password long press the STOP key on Change User Pwd screen, the password will be disabled.





### 7.7.6 Motor test:

To check motor functioning it can be controlled manually using this setting. The servo motors can be rotated Clockwise & Anticlockwise by pressing the START/STOP keys. Please note that output is turned OFF once user enters into this mode and is turned back ON again when the user comes out of this mode and the output is adjusted by the algorithm.



### 7.7.7 Calibration:

For calibrations select CAL option, take pre-calibrated measuring instruments, for Voltage calibration ensure that the supply is stable, connect a Multimeter between phase & neutral, adjust the values on display according to Multimeter reading, do the same for input & output phases













Upon selecting the calibration option, display will show the parameters given in TABLE , to increment/decrement values use START/STOP key, long press to the START/STOP increment/decrement values rapidly. Press the ENTER

key to save current value & go to next parameter. To return on GENERAL SETTINGS screen at any moment press the BACK key. For returning to the RUN mode from the GENERAL SETTINGS screen press the BACK key.

Parameter	Description	Set Values
R-Ph Vin	R phase input voltage calibration	Enter Multimeter display values
Y-Ph Vin	Y phase input voltage calibration	
B-Ph Vin	B phase input voltage calibration	
R-Ph Vout	R phase output voltage calibration	
Y-Ph Vout	Y phase output voltage calibration	
B-Ph Vout	B phase output voltage calibration	

Table no.6 Available Parameters in User Level

### 7.7.8 Error indications:

Condition	LCD Indication	LED Indication	Buzzer Indication
Input High		I/P Fail (ON), OP (OFF)	ON as soon as voltage becomes high & OFF when the voltage becomes normal
Input Low		I/P Fail (ON), OP (OFF)	ON as soon as voltage becomes low & OFF when the voltage becomes normal
Output High		I/P Fail (OFF), OP (OFF)	ON as soon as voltage becomes high & OFF when the voltage becomes normal
Output Low		I/P Fail (OFF), OP (OFF)	ON as soon as voltage becomes low & OFF when the voltage becomes normal
Overload		OVL(ON), OP (OFF)	ON when cross the overload limit
Ph. Fail	 	I/P Fail (ON), OP (OFF)	ON when Ph. Fails & OFF when the condition is OK
Ph. Reverse		Ph. Rev. (ON), OP (OFF)	ON when Ph. Rev. & OFF when the condition is OK
Ph 2 Ph		I/P Fail (ON), OP (OFF)	ON when Ph 2 Ph & OFF when the condition is OK
Neutral Fail		I/P Fail (ON), OP (OFF)	ON when Neutral Fails & OFF when the condition is OK

## MAINTENANCE

### 8.1 ANNUAL MAINTENANCE

#### 8.1.1 General.

- Blow out the dust accumulated on SERVO with heavy duty blower once in month regularly.
- Check the transmission system of the Variac is still aligned. Correct if it is needed.
- Check that the movement of the Variac is uniform (no vibrations and no steps). Probably, it is required the replacement of the motor or gear system.
- Check that the limit switches work properly. Probably, it is required the replacement of the limit switch.
- Prevent any “conductive” or “Inflammable” cotton particles from depositing on Variac surface
- Check all power wiring nut & bolts for tightness. To prevent spark use lugs. Tighten and checking to be done once in year.
- Tighten coupling gear screw once in three months.
- In case system is provided with line filters and surge protection system, please ensure fuse are intact, if blown off replace with new. This checking to be carried out once in a month.



In case it is needed to take actions in an equipment, call to our Service and Technical Support.



### 8.1.2 Brushes

- Check the free move of the brushes. Probably, it is required the replacement of the brush.
- Check the contact surface is smooth. Probably, it is required the replacement of the Variac.
- Check the pressure over the winding through the spring is correct. Probably, it is required the replacement of the brush spring.



In case it is needed to take actions in an equipment, call to our Service and Technical Support.

### 8.1.3 Maintenance for Oil Cooled stabilizer

<b>SR. NO.</b>	<b>Inspection Frequency</b>	<b>Items to be inspected</b>	<b>Inspection Notes</b>	<b>Action reqd. if inspection shows unsatisfactory conditions</b>
1	Monthly	i. Oil level in SVS ii. Connections	Check Oil level Check tightness	If low, top up with dry oil. Examine SVS for leaks If loose, tighten
2	Quarterly	i. Terminals ii. Oil level in SVS	Examine for cracks and dirt deposits.	Clean or replace
3	Half-yearly	Casketed Joints, Gauges and general paint work	Check of moisture under cover inspects.	Improve ventilation, check oil.
4	Yearly	i. Oil in SVS ii. Megger Value	Check for dielectric Strength More than 10Mohm	Take suitable action to restore quality of oil. If value is less than 10Mohm,

## TROUBLESHOOTING

S.NO.	NOTICED PROBLEM	PROBABLE CAUSE	REMEDY
1	No Power at Output	a) MCB faulty	Replace the MCB
		b) One of the phase output one of the phase output or lower than set value and fault in Electronic card.	Replace the control card
		c) Faulty cut-off relay	Replace the Faulty relay
		d) Fused control blown	Replace the blow off fuse.
		e) Burnt Transformers	Replace the burnt transformer with new one.
		f) Contactor Faulty	Check and replace the contractor
		g) Power not collecting through Carbon brush	Check and replace
		h) One of the phase voltage not getting at input terminal	Check each phase voltage
2	Frequent On/Off of the output contactor	a) Auto transformer in any one phase got struck.	a) The mechanical assembly of Auto transformer is misaligned which may due to faulty motor Faulty R-C network and broken Pinion gear or coupling gear. Take Out the Auto transformer assembly and realign it.
		b) Erratic up and down of input voltage beyond the speed of correction of SCVS (Servo controlled voltage stabilizer)	b) All power connection to be checked right from meter to the stabilizer if still the problem exists Call electricityboard technician Checkup the connection at Distribution transformer.

		c) Faulty Electronic card	c) Replace the faulty card.
S.NO.	NOTICED PROBLEM	PROBABLE CAUSE	REMEDY
3	Heavy sound observed All the time or Continuously for more. (More than 30 sec)	a) Due to faulty servomotor	a) Replace the servomotor.
		b) Due to mechanical misalignment stucked Auto transformer (variac)	b) Check the pinion gear and coupling gear, if faulty replace and realign.
		c) Faulty R-C network	c) Replace the R-C network
		d) Faulty control card	d) Replace the control card
		e) Faulty micro switches	e) Replace them with new one
4	Erratic behavior of SCVS 1) Heavy fluctuation at output voltage even though input is stable  2) Continuous sound different to no. 3	a) Loose carbon brush	a) Tighten the carbon brush
		b) Heavy carbon deposition on Auto transformer (variac)	b) Clean the commutator surface Of auto transformer (variac) with clean cotton dipped in petrol and allow it to dry for few seconds.
		c) Loose connection at Auto transformer at any point	c) Check each and every wire connection tighten it if found loose
5	Frequent Tripping of Input MCB/MCCB or Output MCB/MCCB	a) Over loaded output one phase got struck.	CAUTION: a) The system is overloaded beyond its capacity, reduce the load.
		b) Loose connection at Auto transformer	b) Check all the connections thoroughly and tighten it if found loose.
		c) Loose connection at contactor	c) Tighten the connections at the contactor
		d) Due to very low input voltage	CAUTION: d) Derate the load if the system is operating very much below the rated input voltage
		e) Very high input Voltage	CAUTION: e) Stop the system if input is more than 10% of the rated input voltage. The continuous operation of SCVS beyond the rated input voltage ceases the warranty.

S.NO.	NOTICED PROBLEM	PROBABLE CAUSE	REMEDY
6	Output High /Output Low	a) Faulty R-C network b) Faulty Control Card c) Fault in motor	a) Replace the R-C network b) Replace the control card c) Replace the motor
7	Garbage Value shown in display	Contactor Coil Voltage Reflect on display	Restart the stabilizer through mains MCB
8	Voltage correction not properly	Losses coupling of Motor & Variac	Variac gear tightness
9	1)Input phase cut off shown in display 2)buzzer continuously ON 3)no movement of Variac	Loose connection input / output voltage sensing Connector.	Connect properly
10	1)Display off 2)No movement of Variac	1)Sensing transformer Faulty 2)loose connection	1)Replace transformer 2) Connect properly
11	1)Buzzer continuously ON 2)Display Shown Unregulated o/p Voltage 3)NO Movement of Variac	1) Limit Switch Connector Faulty present on Display card 2)Limit Switch Connected wire Problem or loose connection	1)Check and replace the connector 2) Loose connection Tighten 3)Check Faulty wire And replace



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**We Also Manufacture** – Online UPS, Static Voltage Stabilizers, Isolation Transformer, Battery charger, frequency converters, static switch & Customized power supplies.



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