LEGA ENERJI ELEKTRONIK SAN VE TIC LTD STI
www.legaups.com

SINGLE - PHASE STATIC REGULATOR

INSTRUCTIONS FOR USE

STATIC SINGLE-PHASE VOLTAGE REGULATOR

Turkey

Important Notice!

Thank you for preferring us. Your product has been designed to protect your sensitive devices for years.

This manual contains very important information both as to specifications, installation and operation of regulator and as to safety of regulator and related loads. It is essential to thoroughly read and understand the manual and follow instructions for proper and safe operation and maximum performance of product.

☞ Read completely and thoroughly the manual prior to installation!

☞ Keep the manual for future reference!

Symbols Used

☞ Indicates special attention in manual.

 Indicates life-critical instructions.

 Indicates damage to device and/or injury to user.

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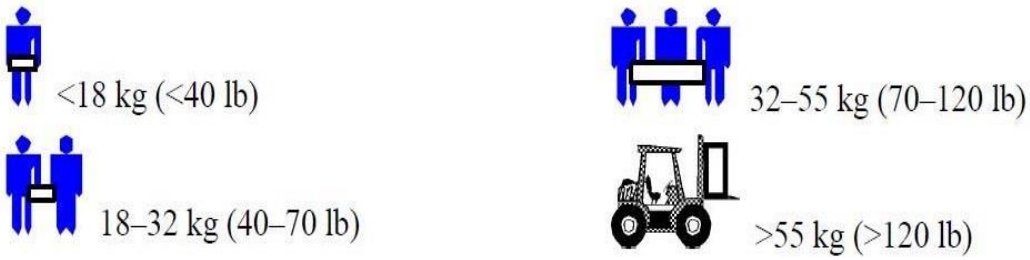
Safety

Information relating to safety of LEGA Static Regulator and devices connected thereto as well as the safety of user has been detailed as follows. However, installation shall not start before reading the entire manual.

- Please read this booklet in order to use the regulator for a longer life.
- The warranty document is given with this booklet. It has three copy. When the device is been commissioning, the warranty document is confirmed by relevant institution and then third copy is sent to manufacturer.
- Please put the manual user in a place where can been reached in the future keep.
- When device is switched from cold to hot, air humidity may concentrate inside. In such a case wait for at least two hours because operation will be highly dangerous.
- Device must be operated in an environment equipped with all specifications mentioned in "installation" section of manual.
- Make sure the spaces left around the device for ventilation are not blocked.
- Be careful not to allow any foreign substances (liquid or solid) penetrate into device.
- Device must be connected by authorized service technician.
- Earthing connections must be made.
- Connections against fire danger must be made with proper section of cables. All cables must be insulated and laid in a manner to prevent stumbling.
- No loads must be connected to output of device that exceed its power.
- Device may only be repaired by authorized service technician.
- In case of emergency, (damage to cabin, front panel or connections, penetration of foreign substances into device etc.) device must be shut down immediately and input voltage must be disconnected and authorized service must be informed.
- Please don't use your device before grounding.
- The cover of the regulator must not be opened. In the device isn't any part that the user can interfere.
- Please shouldn't be used your device above its power.
- The temperature and humidity at the place where the regulator is used must be the proper value.
- Please pay attention to provide ventilation and be distance over 20 cm between the device and the closest object in order to work cooling system of device properly.
- Device must be properly packaged for transport.
- Please, do not lift heavy loads without help.



General Introduction

What is Regulator..?

Voltage Regulators are electronic or electromagnetic voltage regulators that are manufactured to protect the devices in places like homes, workplaces, factories, etc. from getting damaged due to voltage drop or voltage rise and to make the best of these devices.

Why do we need Voltage Regulator..?

Today, because all the electrical/electronic devices have sensitive structures, they are affected badly from the voltage change in the mains. In addition to causing the operations which are done in these devices/machines to be left half finished and damaging the quality of the products obtained from these devices/machines, this situation also causes high cost malfunctions in the mentioned devices/machines. Work and production loss causes high costs as well besides the costs for repairment.

Therefore, it has become compulsory to use at least Voltage Regulator or UPS in order to make all the electrical devices operate safely and uninterrupted. Some device/machine manufacturers even exclude the possible malfunctions from warranty coverage when their products are used without Voltage Regulator or UPS.

LEGA Static Voltage Regulator is a high technology product which you can safely use wherever the usage of Voltage Regulator is compulsory.

Why should we use LEGA Static Voltage Regulator..?

LEGA Static Voltage Regulator is completely electronic voltage regulator which does not have any moving part inside of it. It has no eroding, perishing, and maintenance requiring parts. Volt- age regulation is made with microprocessor controlled digital technology in milliseconds. Regula- tion process is made with the help of Thyristor-thyristor module and transformer. It brings the voltage to 220 VAC or three-phase 380 VAC level after one period by measuring the change in the voltage in the first period of the mains. Regulation is made at maximum of 20 milliseconds. This means that regulation speed is 5000 V / sec.

LEGA Static Voltage Regulators are manufactured to operate in the voltage range between 165-250 VAC as standard, and optionally, they are manufactured in wider and narrower ranges.

LEGA Static Voltage Regulators can be manufactured in 1% to 10% output voltage precision. Our standard manufacture is in 3% precision which would be accepted by many electronic de- vices/machines.

LEGA Static Voltage Regulators prevent the load to be damaged by cutting the output voltage with the help of contactor contained in the regulator when the output voltage exceeds 200 – 240 VAC limits. These values can be configured with the help of LCD Panel.

It is possible to follow up the operation data of the device with the help of LCD screen available on the front panel of the regulator.

LEGA Static Voltage Regulators provide extra protection for sensitive loads thanks to its RFI / EMI filters. It does not produce harmonics because of its operating topology.

LEGA Static Voltage Regulators respond very quickly to the loads that require high starting cur- rent thanks to the semiconductors (Thyristor – Thyristor Module) which are resistant to sudden and high currents and which have been carefully selected during their manufacture. Over-current, over-voltage, low voltage, peak voltage, over temperature and short circuit protections are avail- able and special protections can be added on request.

In the event of possible malfunction in Voltage Regulator, Manual By-Pass switch is included in our product as standard to continue operating via mains.

LEGA Static Voltage Regulators are manufactured from DKP sheet and can be manufactured as special products in different colors with different IP protection classes and electrostatic powder paint which can be designated on request. LEGA Static Voltage Regulators are manufactured sensitively to produce vibration and sound as low as possible.

Usage areas of Voltage Regulator

CNC Machine Tools.

Heating, Cooling And Air Conditioning Tools. Radio, Television Transmitter Stations. Electrical And Electronic Medical Devices. Rectifiers.

Electrical Motors.

Wired And Wireless Communication Devices. Automatic Welding Machines.

Magnetic Devices. İllumination Devices.

Printing Machines And Precise Electronic Type Setting Machines. Precise Photography Studio Tools.

Induction Heating Devices. Electro-Covering Systems.

All Kinds Of Electronic Weaving, Embroidery And Knitwear Benches. Laboratories Containing Electrical And Electronic Devices.

Testing And Research Laboratories.

Factory, Hospital, Hotel And Apartment Building Entrances. And Other Places And Tools Requiring Stable Voltage.

Differences Servo and Static Voltage Regulator

Servo Voltage Regulator	Static Voltage Regulator
Because of the transformer and variac system, the efficiency is around 90%.	Because of the use of semiconductor technology and thyristors in the power units, the efficiency is about 95%.
There are indicator lamps on the front panel for output voltmeter and for input - output.	There are input voltage, output voltage, output% load, temperature, fault information etc. İnfo. with LCD front panel.
It takes up a lot of space for being big.	It's small and ergonomic.
It is not used in extremely humid and dusty environments.	Can be used safely in any environment.
Overcurrent protection is only done by fuse.	It has fuse protection and electronic overcurrent protection.
It is regulated by the variac-engine system. Correction speed max. 90 V / sec.	It is regulated by thyristor technology. Correction speed 5000 V / sec.
The mechanically linked variac-motor system consumes away in time, so the failure rate is higher where the electrical power is too variable.	Because of no moving parts inside, it is not possible to break down with time or operation.
Coals which are moved for regulation on the variac need to be checked and cleaned every 1-2 years.	There are no parts which need maintenance and cleaning.
It is large and heavy.	Small in size and light weight.
It's an old technology.	It's an new technology.
The input voltage range that can be corrected is limited because of mechanical and electrical structure.	The input voltage range that can be corrected is too wide.

1 Description of System

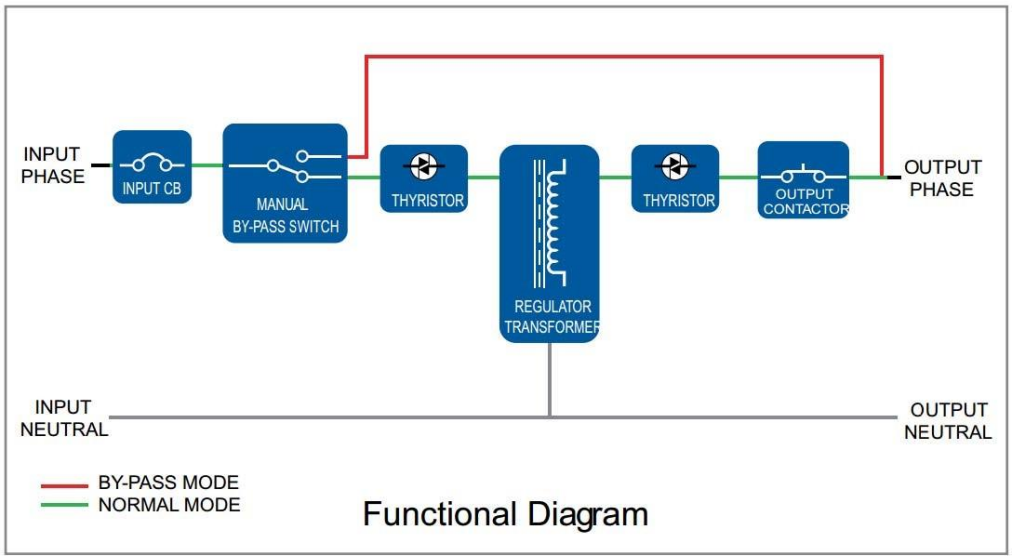
Preventing any surges and drops and all irregularities in mains voltage and regulating the voltage LEGA Static Automatic Voltage Regulator electro-mechanically cuts off output voltage in any surges and drops outside setting zone thanks to electronically provided protection and prevents any related possible damages (cut-off option).

Regulator is used safely for computer system, fax, photocopy and laboratory devices, domestic and business illumination, complete flat and office feeds, manufacturing houses and workshops.

LEGA Static Regulators precisely, rapidly and safely regulate Output Voltage through serial transformer connected to the mains and precise Microprocessor Controlled Digital Controlling Unit. It uses Card system to hold Output Voltage at desired level with the least error. It also precisely and accurately offers Input / Output Voltage, Frequency and Current values (Option) with Digital Display features to users.

Phase protection is produced upon demand (cut-off option) and output voltage is cut-off with contactor whenever no low input voltage, high input voltage and any phase is available. In order to prevent from any influence by spikes 2 seconds of delay is available between pulling and releasing times of contactor. Moreover, regulator is equipped with manual by-pass switch and on/off features.

Input Voltage, Output Voltage, Output Frequency and as an option Output Current values are displayed digitally on display. Front panel allows remote display on if any voltage occurs at output with available signal lamps and if output voltage is either high or low within limits and at the same time dry contact information. Proper fuses have been used to protect both load and Digital EPM against Short Circuit and Over Currents. Device is internally cooled by fan. Single-phase models are naturally cooled thanks to special internal structure.



2 Installation

Examine the device once you receive. Although device is properly packed, it may get damaged during transportation. If there is any damage on packaging, contact transporter.

Check if customizations you demanded upon ordering have been made before starting up the device.

2nd1 Handling

Device must be properly packaged for handling. Therefore, it is highly recommended to keep the original packaging.

2nd2 Storing

Device must be stored in a dry environment away from any heaters and direct sunlight at temperature between–25 °C and +55 °C.

Relative humidity in the environment must be between 20% and 95% (non-condensable).

2nd3 Placement

Device must be placed in;

- With no direct sunlight;
- Dry; and
- Away from heating elements and well-ventilated place.
- Please select dusty and non-corrosive locations for the device.
- Please do not use the device where flammable or explosive materials are present.

Moreover:

- Environment must not contain extreme dust and
- Surfaces of device containing vents must be at a distance of at least 20 cm.

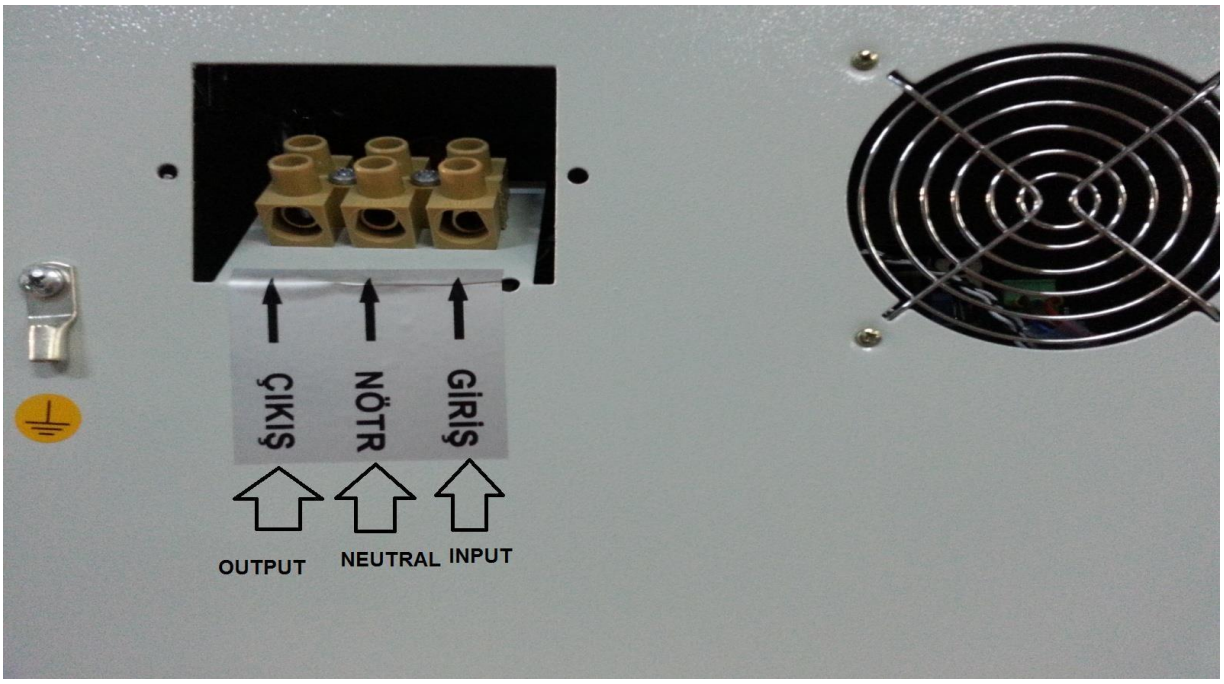
Regulator may operate in environment temperatures between 0 °C and +40 °C.

Connections may only be made by authorized service technicians. Any attempts by user to make connections may threaten life.

When device is switched from cold to hot, air humidity may concentrate inside. In such a case wait for at least two hours before making connections because it will be highly dangerous.

Connection terminals of device are either on front or back face. Cover on terminals must be disassembled to make connections.

THREE-PHASE STATIC WIRING DIAGRAM UP TO 10 KVA – 50 KVA



1- **Unscrew 4 screws on upper cover and remove cover.**
2- **Then select the cable suitable to section on union indicating input on terminal and attach the cable and then attach and squeeze output cable on terminal. Attach and squeeze common neutral cables on terminal.**

LEGA static voltage regulators consist of a regulating thyristor and staged transformer and electronic card controlling this and also is a safe and tried system. In addition to current protection, phase protection, extreme temperature and smart fan properties, it is equipped with silent operation, high efficiency, undistorted output, stable and uninterrupted feeding, wide regulation range, high precision properties.

Connections are described below. Please follow the order below while making the connections.

2.5 Earth Connection

Static Regulator must be earth connected.

Static regulator's input earth terminal must be connected to a high-quality (low resistance) earth line.

Loads must be earth connected via output earthing terminal.

2.6 Input Connection

A bipolar automatic fuse connected on phase and neutral lines must be added to main switchboard to connect Static Regulator and a residual current relay must be installed.

To install an automatic fuse at equivalent values with input fuse of device on switchboard will be appropriate.

Protection threshold value of residual current relay in the input of Static Regulator must be the total of 30 mA and residual currents of loads connected to Static Regulator output.

Current values recommended as above are given only considering Static Regulator on the automatic fuse in question. Otherwise, both values must be recalculated considering all devices on the same fuse.

Any modifications on switchboard must be performed by an authorized service technician on electrical installations.

After necessary modifications, switch automatic fuse on switchboard to "0" position and connect phase to INPUT terminal through fuse on switchboard and neutral to NEUTRAL terminal.

Make sure to switch automatic fuse on switchboard to "0" before starting to connect input cables.

Minimum section of cables between switchboard and Static Regulator must be selected according to the power of device. In case of selecting small sections, there may be a risk of fire.

2.7 Output Connection

In case Static Regulators are to supply more than a few independent loads, it is recommended to use different fuses and residual current relays for each load. When each load is connected to Static Regulator through each and every fuse according to its respective current, in case of a short circuit on any of the loads, short circuited fuse blows and other loads do not get affected by this case thanks to short circuit protection property of device.

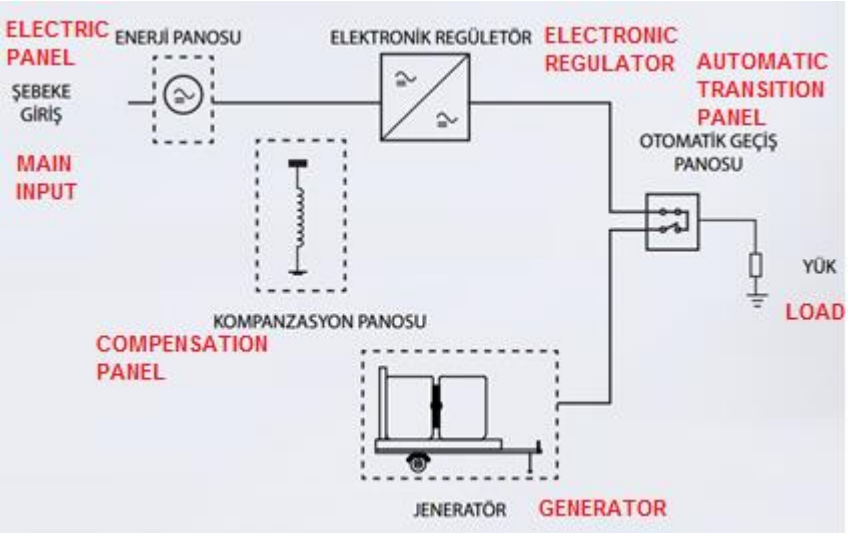
Make sure input, output automations and automatic fuses on switchboards are in "0" position before starting to make output connections.

Loads are connected to OUTPUT, NEUTRAL and output earthing terminals on switchboard of Static Regulator.

Sections of cables between Static Regulator and loads must be selected according to its respective current.

Maximum power contracted by loads connected to Static Regulator must not exceed nominal power of Static Regulator.

RECOMMENDED CONNECTION TYPE



3 Starting Up and Switching Off

3.1 Starting Up

After making the connections as described above, all you have to do to start up the device is to switch all fuses and automations on switchboard to “ON” position and then device will automatically start if mains voltage is above a certain value.

3.2 Switching Off

Turn the Switch and Fuses to “0” position to switch off the device.

If maintenance and etc. operations will be performed on Static regulator without cutting the power of loads connected to the device, turn switch to Mains position.

4 Operation

4.1 Operating the Device

4.1.1 Operating from Regulator

Operating from regulator is possible only if mains voltage is between certain limits. While Static Regulator is operating in this mode, it processes mains voltage and supplies the loads with a voltage equal to mains nominal value. Detailed information about mains voltage range the device may operate within is given in section “Input Voltage Tolerance”.

4.1.2 Operating from Mains (BYPASS)

Transferring voltage on input to output through a mechanical switch on Static Regulators is called “by-pass”.

Bypass feature is generally used to separate Static Regulator from input and output without deactivating the loads during maintenance.

4.2 Operation under Abnormal Situations

4.2.1 Overloading

Connecting loads exceeding nominal power of device output is called “overloading”. Device keeps powering the loads exceeding nominal power in regulator mode until fuses blow.

☞ Be careful not to overload the device for safe operation.

4.2.2 Short Circuit on Output

Device forces the fuse on device to blow acting as a source of current upon any short circuits on output. Short circuit disappears upon blowing of fuse and other loads are protected against getting affected by this situation.

☞ Each and every load must be connected to circuit through different fuses selected according to nominal current to enable device properly perform short circuit protection function.

4.3 Indicators

4.3.1 Display

Output Voltage, Input Voltage values are displayed on display.

5 Important Points in Regulator Use

Automatic Static Voltage Regulators are used to prevent precise devices from failing under bad electrical network conditions. Users with such bad network conditions use Regulator to transfer to devices a regular electrical network.

An electrical network professionally installed within a building is installed by selecting proper quality and thickness of conductive and in accordance with necessary earthing and distribution principles. Any users willing to create regular electrical network with the use of a regulator must pay attention to certain points in making the connections between devices to be supplied by the Regulator. Otherwise, user's health and device's integrity may not be guaranteed.

- Regulator must be connected to electrical network by an authorized service technician using proper sections of cables and as described in installation section.
- Regulator must be connected to an "earthed" switchboard providing the current capacity written on the label on back panel.
- Any device supplied by a socket/switchboard, which is not or poorly earthed, pose a danger of electrical shock to user and the risk of failure of electronic circuits is high.
- Some building electrical installations may show earthed sockets but may contain two-lined (phase and neutral) sockets. Either earth terminals of such sockets may not have been connected to protection earth or connected to neutral terminal instead. In case where no current flows through neutral line, protection may be on earth level. Since neutral voltage will be more different than protection earth level as such sockets or any parallel sockets are loaded, human health and safety of supplied equipment are in danger.

6 Maintenance

If you would like to clean the device, please follow the instructions below:

- Switch off the loads
- Turn all fuses and switch on device to “0” position.
- Wipe the device with a damp-dry cloth.
- Do not keep any inflammable and heat affected materials around the device (under, above, in front, back or on sides of device).
- Device’s environment must be at normal room temperature values and if possible device should not be exposed to direct sunlight and left or used in humid or damp environments.
- Operating environment must be free of any rodents and insects.
- Doors of device must not be opened other than in Authorized Service station.
- Device must not be exposed to any impacts or high temperature causing deformation on external box.
- Any later modifications on electrical installation of device must be suitable to device power.
- External appearance of device must be checked once a month.
- Painting of device must be checked once a year.
- Switches and cables of device must be checked once a month.

Make sure no liquid or solid foreign substances penetrate into device.

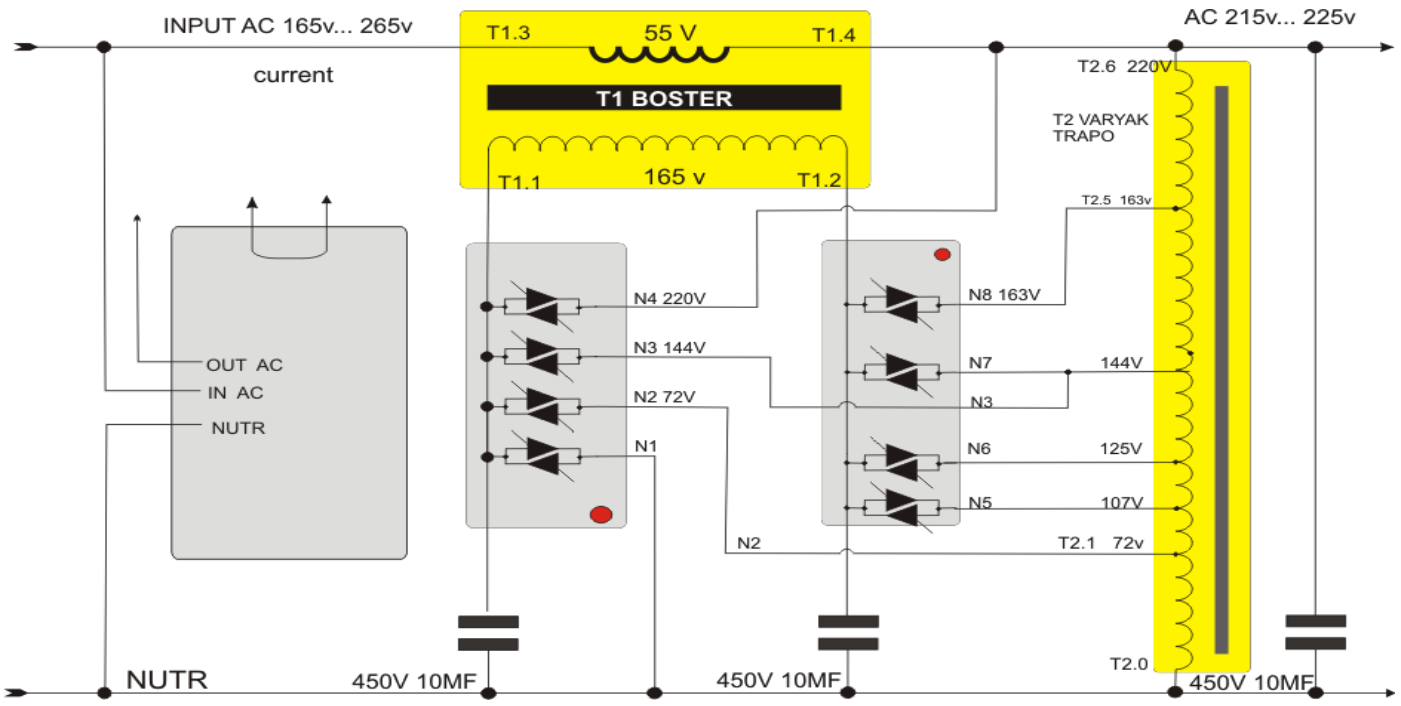
Do not use cleaning powder or any other substances that may damage plastic parts.

7 Technical Specifications and Data

Technical Specifications

MODEL	1110	1115	1120	1125	1130	1140	1150
Power kVA	10	15	20	25	30	40	50
REGULATOR INPUT							
In.Vol.Correct.Interval	160 - 250 VAC						
In.Vol.Working Interval	90 - 285 VAC						
Operation Frequency	47...65 Hz						
Line Input Protection	Overcurrent thermic fuse and sudden overburden protection						
REGULATOR OUTPUT							
Output Voltage	220 VAC RMS ± % 3						
Overloading	10 Saniye % 200 Load % 500 Load 20 ms						
Correction Speed	~ 5000 Volt / Sec.						
Upturn Period	20 ms						
Output Protection	Short circuit, overburden, overcurrent electronic protection, protects load via opening control						
WORKING PRINCIPLE							
	Microprocessor controlled, full automatic, static, semi conductor electronic structure maintenance free						
CONTROL PANEL							
Display and Buttons	Display Screen						
Alert Message	Input Low / Hi, Output Low / Hi, Over temperature (Smart Fan System)						
Meas.Value Monitorization	Output Voltage, Network Voltage						
Out. Up. Protect.limit	Standart						
Out. Sub Protect.limit	Standart						
Regulation Voltage	Standart						
GENERAL							
Total Efficiency	> % 97 (Full Load)						
Mechanical ByBass	"Manually Controlled Line - PAKO SWITCH Selects Voltage Regulator" Switch Turn On / Off						
Protection Level	IP 20 // IP 25						
ENVIRONMENTAL							
Working Temperature	-10 °C / 50 °C						
Storage Temperature	- 25 °C / +60 °C						
Relative Humidity	< % 90, DIN (40040)						
Working Altitude	< 2000 m.						
Acoustic Level	< 50 dB (1 metersquare)						
Documents	ISO 9001 // Ce // TÜV Austria Hellas						
Dimensions (YxDxG)	60x40x32 cm		50x50x85 cm			50x70x85 cm	
Weight	35	50	65	70	85	95	100

STATIC REGULATOR PRINCIPLE DIAGRAM



POSSIBLE PROBLEMS AND SOLUTIONS;

Problem	**Possible Cause**	**Solution**
Voltmeter does not show right	Voltmeter is defective	If voltmeter is digital, check socket; if it is analog, replace.
	Electronic card is defective	Check neutral connection, if problem persists please inform Technical Service
Smell emanates from device	Overloading is available	Check loads on phase, switch device to Mains position and inform Technical Service.
Device does not indicate voltage	If device is protected	Check fuse switch. Phase may be cut off, may not be neutral or voltage is not within operating range.
	If device is not protected	Fuse switch may be burned off or defective, voltmeter may be defective. Report technical service
Device turns on and off sometimes	If device is protected	Make sure neutral and phases are correct.
	If device is not protected	It must be drawing excessive ampere. Voltage may be outside current limits.
Sounds coming from device	Overloading is available, motor connection may be loose	Turn device to mains positions, please contact your dealer or Service Center. Provide Service Center with following information: -Device Serial Nr. and KVA, -Date of occurrence of problem.
IMPORTANT NOTICE: Any interventions to device must only be made by qualified individuals.		

8 Superior Performances

High quality and long lasting materials.

Safe and tried system

Silent operation. High efficiency.

Undistorted output.

Stable and uninterrupted supply.

Wide regulation range. High precision.