

# User Manual

Automatic Voltage Regulator



*3 phase In / 3 phase Out*

**3-150 kVA**

SERVO MOTOR

## IMPORTANT NOTICES!

Dear user;

This manual contains information about features of Voltage Regulator (AVR), installation, operation and the loads connected to the AVR, safety information, use of the AVR, operation principles, settings and measurements (calibrations), detection and troubleshooting.

Read the instructions carefully before the installation.

Keep manual in case you need as an Application Source!

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Life span of the device is 10 years.

This Voltage Regulator is designed to meet the requirements specified in TS EN 60335-1 and TS EN 60335-1 / A11 Standards. This AVR complies with the norms of the following marking.

## MEANINGS OF SYMBOLS USED IN THE MANUAL

This symbol points out where to pay attention mostly.



This symbol shows instructions that may pose a life threatening hazard, such as an electric shock if not followed.



This symbol indicates instructions that may cause injury to the user and / or damage to the AVR if not followed.



This symbol indicates that the transport materials used for AVR are recyclable.

### **Abbreviations and Descriptions**

AVR: Automatic Voltage Regulator

V: Volt (Voltage)

A: Amper (Current)

P: Watt (Power)

### **For Manual Bypass:**

Mains (1): The bypass load thru Mains voltage.

Regulator (2): The load thru Regulator

## MEANINGS OF SYMBOLS ON AVR



PE: Protective Earth



Electroshock Hazard (Black/Yellow)



Includes warning instructions



Recycle






Heavy load

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## 1.SAFETY INSTRUCTIONS

<p><b>Human Safety</b></p> 	<p><b>Use the AVR where there is restricted access.</b></p> <p><b>When AVR Line (Manual Bypass) is selected, device is deactivated and the load is sourced from the mains and the output is energized.</b></p> <p><b>AVR must be connected to earth appropriately.</b></p> <p><b>The AVR should only be turned on by authorized service personnel.</b></p>
<p><b>Device Safety</b></p> 	<p><b>The AVR must be protected by a circuit breaker that is easily accessible against overload and short-circuit conditions.</b></p> <p><b>Do not operate the AVR if the ambient temperature and the relative humidity are out of specified range in this manual.</b></p> <p><b>Do not operate the AVR in the presence of liquid or in extremely humid environments.</b></p> <p><b>Do not allow liquid or foreign objects to enter the AVR.</b></p> <p><b>Do not block the AVR ventilation holes.</b></p> <p><b>Lifespan of AVR is 10 years.</b></p>
<p><b>Recycling and Change</b></p> 	<p><b>Use insulated handled tools.</b></p> <p><b>To prevent occupational accidents, remove watches, metal accessories such as rings and use rubber shoes and gloves.</b></p> <p><b>Replaced semi-finished materials must be packed to be recycled.</b></p>

## 2.GENERAL INSTRUCTIONS

### 2.1.Safe Handling



Be careful when handling loads. Do not carry heavy loads without help. Move wheeled devices on smooth and unobstructed surfaces.

Do not use ramps that are more inclined at 10 ° angle.

Follow the recommendations below for load weights.

- An adult can carry loads up to 18 kg.
- Two adults can carry loads up to 32 kg.
- Up to 55 kg can carry loads of three adults.
- Use pallet trucks, forklifts, etc. to transport heavy loads from 55 kg.

Save packing materials in case AVR is transported by technical service or to other place.



Since AVR is heavy, must be used a proper vehicle to handle.



The AVR should be packed properly when it needs to be carried again. For this reason, it is recommended to save the original package.



All packaging materials must be dropped at the relevant collection points in accordance with recycling rules.



## 2.2.Location

This product complies with the restricted access and safety requirements specified in TS EN 60335-1 and EN 60335-1 / A11 safety standards. Users must meet the following requirements.

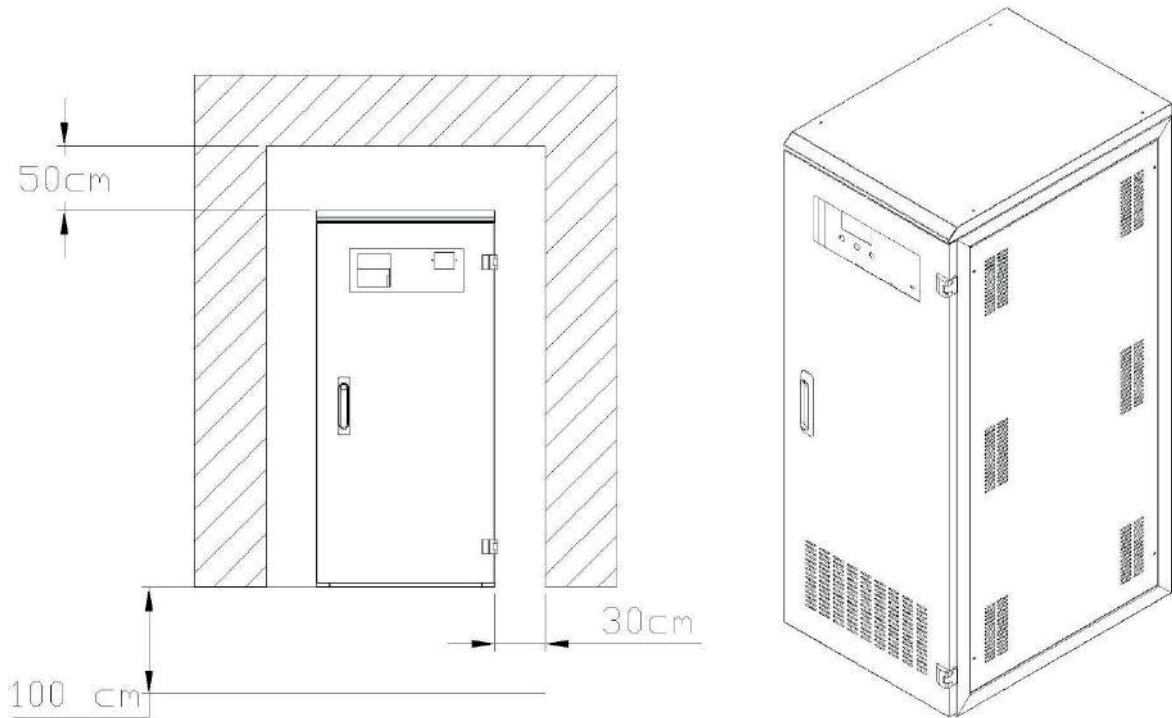


Image-1



### Non-Suitable Operating Enviroments for AVR

**Harmful smoke, dust, abrasive dust.**

**Moisture, steam, rainy/bad weather conditions**

**Explosive powders and mixtures**

**Excessive temperature changes**

**Lack of ventilation**

**Direct/ indirect exposure to radiation heating thru any other sources**

**Severe electromagnetic field**

**Harmful radioactive level**

**Insects, fungus**

**AVR is not designed for outdoor use**

**The AVR can operate at ambient temperatures between -10 °C/ + 50°C. The relative humidity at ambient must be between 20%-95%.**

**Make sure the floor is strong enough to carry the system weight.**

## 2.3.Storage

- AVR can be stored at a temperature of -25 ° C to +60 ° C, far away from heaters and in a dry environment.
- The relative humidity at ambient must be between 20%-95%.
- Check the AVR power compliance of total load to be connected to AVR and line.
- The AVR must be stored in a dry and moisture-proof environment before commissioning.

## 3.UNPACKING AND ASSEMBLY



**The equipment damaged during transportation must be inspected by the Technical Service Personnel before the installation.**



**As AVR is delivered to you, please check the packaging firstly. Even device is packed carefully, it may have been damaged during the transportation. In case of any damage in the packaging, please contact the transportation company.**

**The output voltage and output frequency of the AVR are set to 220V / 50Hz as standard.(230 V/240 V as optional)**

**It is recommended to store AVR original packaging.**

### 3.1.Unpacking

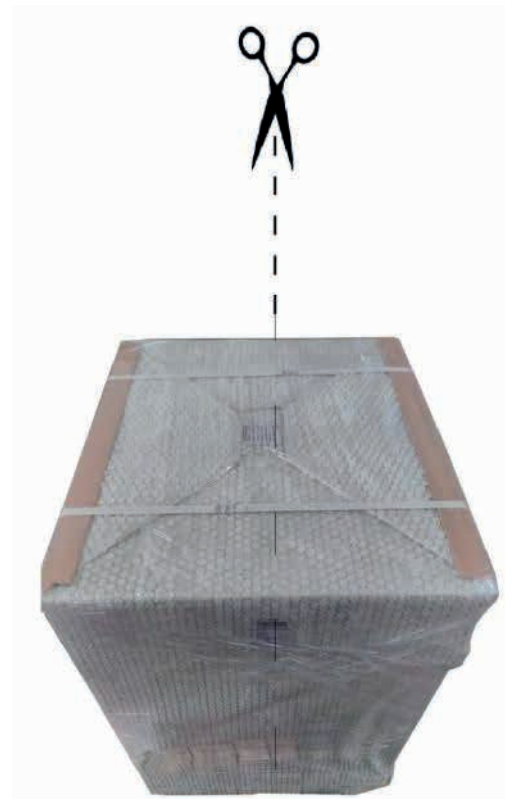


Image-2

The cardboard box is removed from the top as held by the handles.

### 3.2.Assembly Procedures

The installation complies with national installation regulations.

- TS HD 384.4.42 S1: Electrical installation at the premises Part 4: Protection for safety Group 42: Protection against thermal effects
- TS HD 384.4.482.S1: Electrical installations in buildings, Part 4: Safety protection Group 48: Selection of protective measures due to external effects, Part 482: Protection against fire at special hazards or places whereas danger exists

The line and bypass inputs must have protection and circuit breaker systems in the power distribution panel. The breakers on the board will cut all conductors at the same time.



**Connections must only be made by Authorized Technical Personnel. The user's attempt to make connections on his own can be life-threatening.**

3.3. 3 KVA -150 KVA(1 Phase Input/1Phase Output)Front Panel View

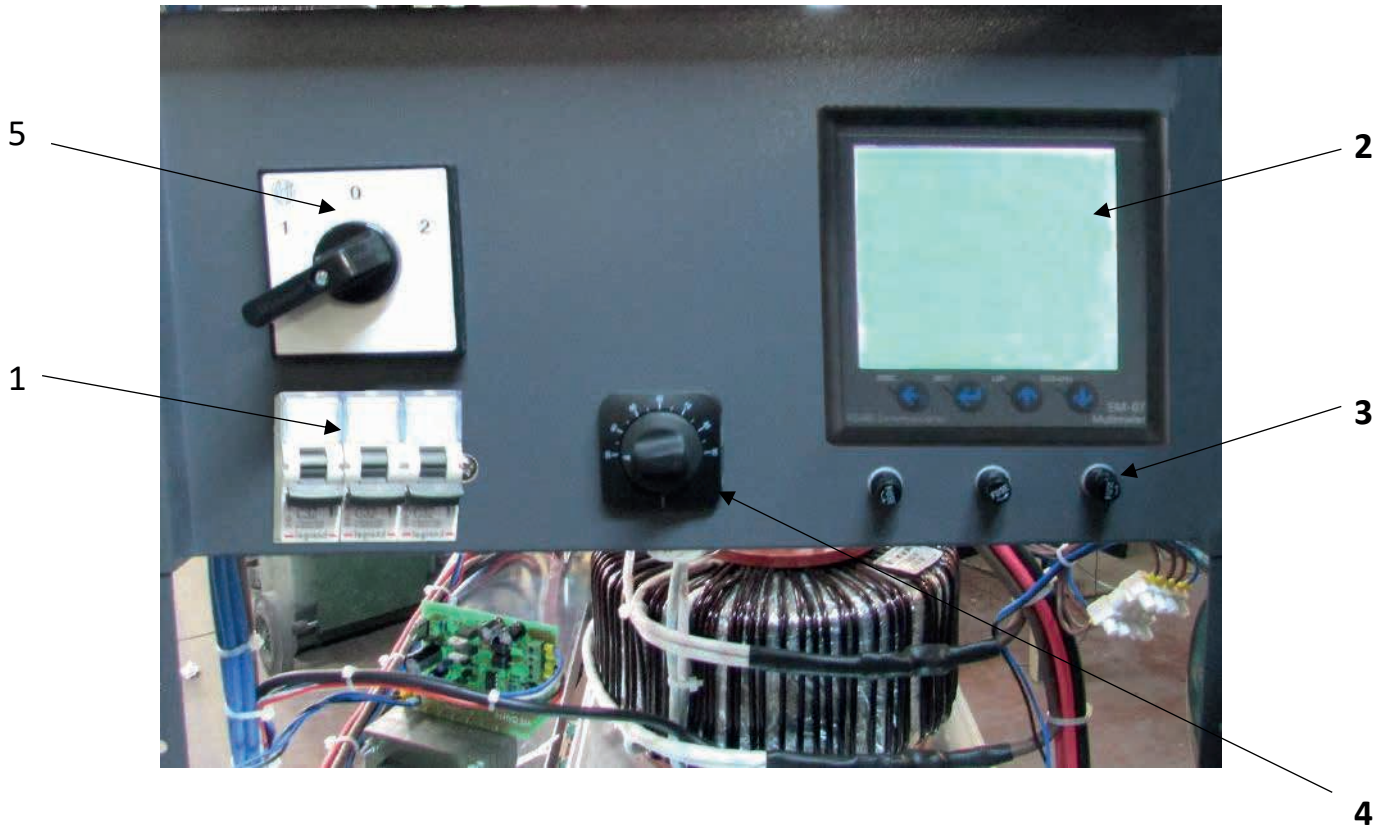


Image-3

Image-1

1	MCB(Miniature Circuit Breaker)
2	Monitoring
3	Fuses
4	Thermostat Adjust
5	Cam Switch(Line-Regulator)

**3.4. 3 KVA - 150 KVA(3Phase Input/ 3 Phase Output) Rear Panel View**



Image-4

Image-4

1	Input / Output / Neutral Connection
2	Smart Fan

### 3.5. 3 KVA -150 KVA (3 Phase Input/3 Phase Output) Connection of Terminals



**Feedback Risk**

Firstly, separate the AVR from the circuit. Measure all terminals including the earth connection (PE) and check if there is dangerous voltage.



Check the AVR's input, output fuses and Mains Automatic Fuses are in the OFF position before connections of output.



Before installation, make sure that all circuit breakers in the panel are in the "OFF" position.

Connection terminals of the AVR located at rear side. Remove the rear cover with an instrument.

After removing the cover, route the earth, input and output cables through holes located below cable connection points.

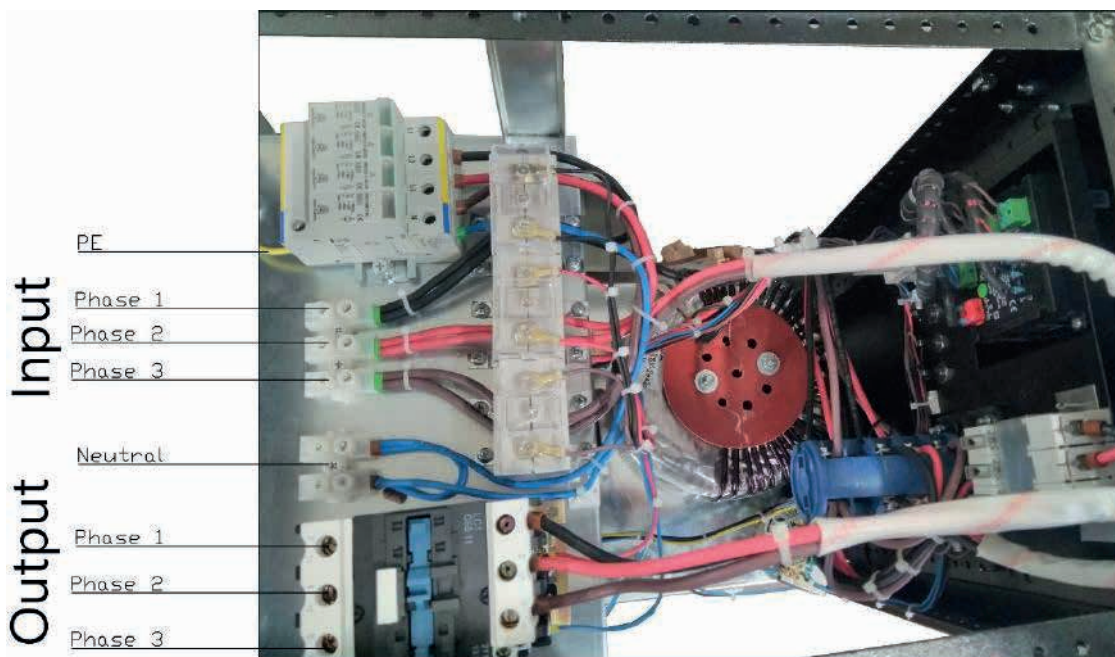


Image-5

### 3.5.1. Earth Connection



**For safety, the ground connection of the device must be done. Perform PE ground connections before connecting any other cable.**

AVR's PE (Earth) must be connected to high quality Earth line (low resistance)The connection of the load must be done through the output Earthing screw.



**If the ground cable accompany with the input neutral cables, it should be cut long enough so that the ground cable does not come out even if the phase cables are come out.**

### 3.5.2. Input-Output and Neutral Connections



**The modifications on the panel must be carried out by the authorized technical personnel.**

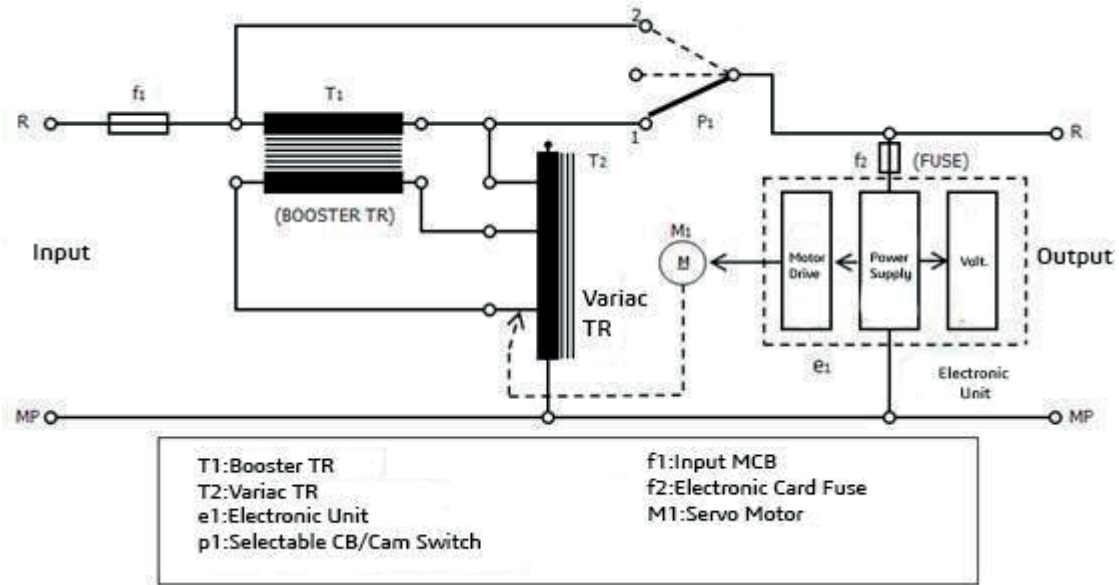


**Before connecting the input cables, make sure the Automatic fuse in the distribution panel at "OFF" position.**

A residual current relay (min 300mA) must be connected to the distribution panel.

## 4.AVR (AUTOMATIC VOLTAGE REGULATOR) OPERATIONS

The AVR (Automatic Voltage Regulator) connected between the mains and the device protects the device / devices from line breakdowns, especially line outages.



AVR Block Diagram

Image-6

In case of drops or rises on main input voltage, the electronic control circuit senses the variation precisely and drives the servo motor quickly. With this signal, the motor moves the Variable Transformer (Variac) to the left or right which effects booster transformer's primary winding as generating voltage plus or minus according to Mains voltage and source the voltage for secondary winding as addition or subtraction to the mains input voltage. Thus, keeps the output voltage precisely with determined tolerance against input voltage fluctuations and makes the system under safe operation. Due to fast response timing control system and high start-up torque DC motor, regulator corrects even small voltage changes very quickly.

If DC motor is out of input operating limits, the output voltage is automatically set to the required value by the limit switches and deactivated by the control circuit.



## 4.1. Device Specifications and Basic Information

### 4.1.1. Power Range

3 – 150 kVA three phase production.

### 4.1.2. Working Voltage Range

Standart:	%-25,%+15	380/400/415 V	Three Phase
Optional:	%±20		
	%±40		
	±30		
	% -35,%+15		
	%-30,%+20		
	%-35,%+15		

### 4.1.3. Correction Speed

90 V/sec.

### 4.1.4. Output Deviation

As long as the regulator is not used over its power, there is no deviation from the output.

### 4.1.5. Efficiency

Regulators' efficiency is over 98% since the use of high quality transformer with silicon sheet and conductors .

### 4.1.6. Operational Temperature

Regulators shall be used up to 50 ° C unless there is acidic and humid environment. Extra cooling system also applied for the hot environments over this temperature.

### 4.1.7. By-Pass System

By-pass operation is realized thru high quality pako switches. In case of any fault, the regulator can be transferred to the Line with the 2x and 6x pole changeover switches without any operation.

## 4.2. Advantages of AVR

- High quality and Long Life Solution
- Safe and tested system
- Silent Operation and High Efficiency
- No Distortion at output
- Stable and uninterruptible supply
- Wide correction bandwidth, high accuracy

## 4.3 Application Fields

- CNC machines
- Heating, cooling and air conditioning devices,
- Radio&TV stations,
- Medical devices,
- Rectifiers
- Electrical motors,
- Telecommunication devices,
- Automatic welding machines,
- Magnetic devices,
- Lighting devices,
- Printing machines and precise typesetting machines,
- Precise photography studio tools,
- Induction heating devices,
- Electroplating systems,
- All kinds of electronic weaving looms,
- Laboratories with electrical and electronic equipment,
- Testing and research laboratories,
- Lifts, Elevators
- Factories, Hotels, Offices, Houses

## 5. .INPUT/OUTPUT DISPLAY

The input / output display on the front panel shows the voltage value at the input and the voltage at the output of the device.(Image-7)



Image-7

Image-7

1	It shows phase number belong to measurement values
2	Showing values are minimum of measurement values
3	Showing values are maximum of measurement values
4	Showing values are average of measurement values
5	Showing values are demand of measurement values
6	It shows Serial Communications
7	It shows that type of measurement values
8	It shows number of error
9	It shows relay state.  means that relay is close,  means that relay is open.
10	It shows phase sequence. "L123" means that phase sequence is correct."L132" means that phase sequence is incorrect.

### 5.1 .Connection Form

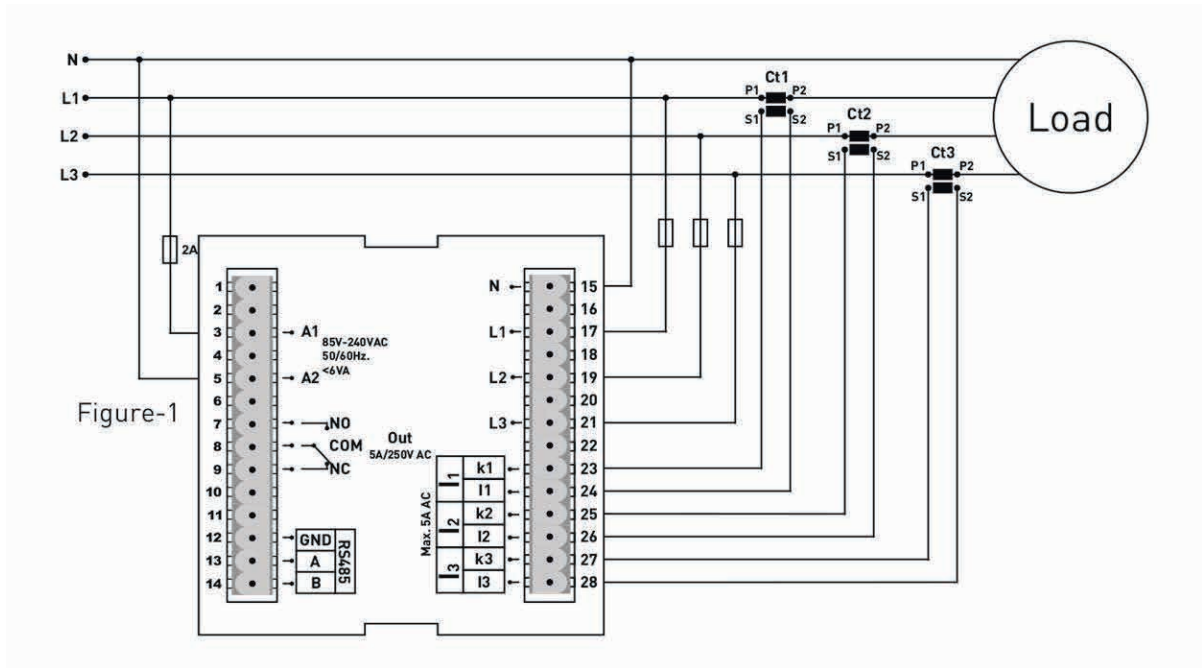


image-8

### 5.2 .Using The Buttons



ESC:

**State of Measurement; Back to home screen. State of Menu; Exit menu. State of changing parameter; Not save chance and back to menu state. State of Error; Manual reset**



SET:

**State of Measurement; Entry Menu. State of Menu; Entry state of changing parameter . State of changing parameter; save chance and back to menu state**



UP:

**State of Measurement; To navigate from a main measurement values to another. State of Menu; To navigate from menu parameters to another. State of changing parameter; Increase value of parameter**



DOWN:

**State of Measurement; To navigate from a deep measurement values to another (min,max,avg, dmd). State of Menu; To navigate from menu parameters to another. State of changing parameter; Decrease value of parameter**

### 5.3 .Error Codes :

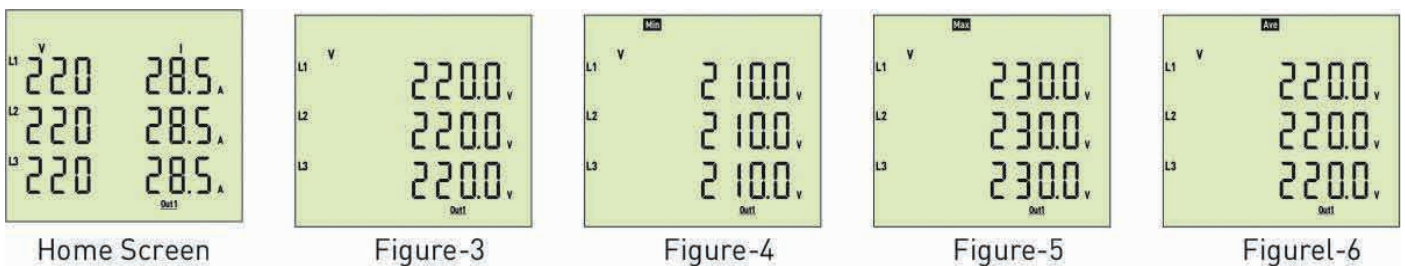
If device in any case of error cut off, relay will be open, backlight of display will be flashing and bottom right-hand corner of display will display ERR Code.

Error Code	Information
Err0	Phase Sequence ERR
Err1	High Voltage ERR
Err2	Low Voltage ERR
Err3	High Current ERR
Err4	Low Current ERR
Err5	High Frequency ERR
Err6	Low Frequency ERR
Err7	Demurrage ERR
Err8	Voltage Fuses ERR
Err9	Current Fuses ERR
ErrA	Asymmetry Voltage ERR
Errb	Asymmetry Current ERR

### 5.4 .Start-up of Device :

Read the warnings before the device is energized. Make sure that the device is connected according to the connection diagram. When the device energized for the first time, the Home Screen is displayed. Enter the current transformer ratio and the voltage transformer ratios, if installed, on the settings menu at first.

### 5.5 .Display Information :



**Home Screen:** It shows voltage and current values together. If protection type is L-N, it shows phase-neutral voltage else, if protection type is L-L it shows phase-phase voltage. If you use voltage transformer, it is not showed. The figure-3 is displayed when you press the Down button.

**Figure-3:** It shows the phase-neutral voltage values. The figure-4 is displayed when you press the Down button.

**Figure-4:** It shows the phase-neutral minimum voltage values. The figure-5 is displayed when you press the Down button.

**Figure-5:** It shows the phase-neutral maximum voltage values. The figure-6 is displayed when you press the Down button.

**Figure-6:** It shows the phase-neutral mean voltage values. The figure-7 is displayed when you press the Down button.



Figure-7



Figure-8



Figure-9



Figure-10

**Figure-7:** It shows the phase- phase voltage values. The figure-8 is displayed when you press the Down button.

**Figure-8:** It shows the phase- phase minimum voltage values. The figure-9 is displayed when you press the Down button.

**Figure-9:** It shows the phase- phase maximum voltage values. The figure-10 is displayed when you press the Down button.

**Figure-10:** It shows the phase- phase mean voltage values. The figure-11 is displayed when you press the Down button



Figure-11



Figure-12

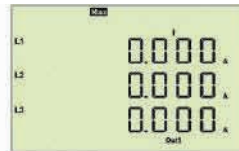


Figure-13



Figure-14

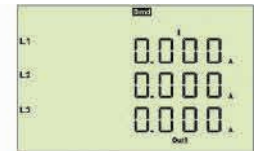


Figure-15

**Figure-11:** It shows the current values of each phase. The figure-12 is displayed when you press the Down button.

**Figure-12:** It shows the minimum current values of each phase. The figure-13 is displayed when you press the Down button.

**Figure-13:** It shows the maximum current values of each phase. The figure-14 is displayed when you press the Down button.

**Figure-14:** It shows the mean current values of each phase. The figure-15 is displayed when you press the Down button.

**Figure-15:** It shows the current demand current values of each phase. The figure-16 is displayed when you press the Down button.

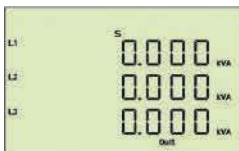


Figure-16



Figure-17



Figure-18

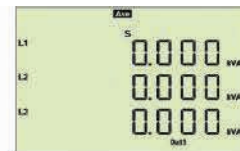
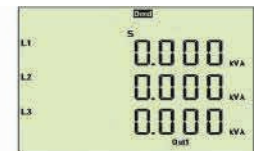


Figure-19



Şekil-20

**Figure-16:** It shows the apparent power values of each phase. The figure-17 is displayed when you press the Down button.

**Figure-17:** It shows the minimum apparent power values of each phase. The figure-18 is displayed when you press the Down button.

**Figure-18:** It shows the maximum apparent power values of each phase. The figure-19 is displayed when you press the Down button.

**Figure-19:** It shows the mean apparent power values of each phase. The figure-20 is displayed when you press the Down button.

**Figure-20:** It shows the apparent power demand values of each phase. The figure-21 is displayed when you press the Down button.



Figure-21



Figure-22



Figure-23



Figure-24

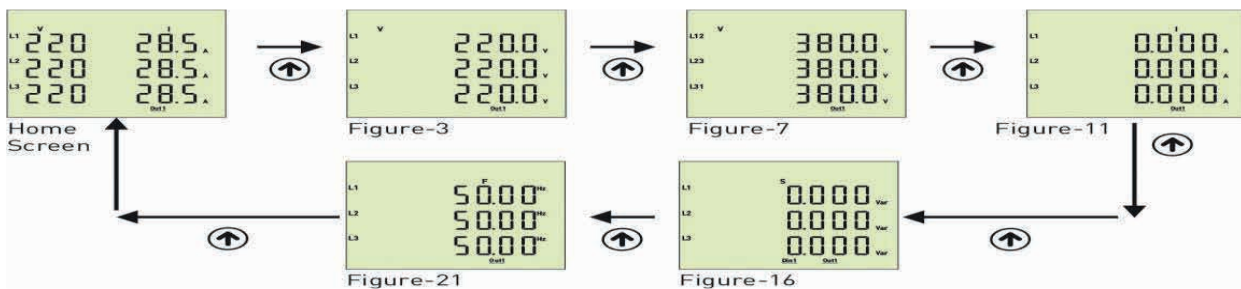
**Figure-21:** It shows the frequency values of each phase. The figure-22 is displayed when you press the Down button.

**Figure-22:** It shows the minimum frequency values of each phase. The figure-23 is displayed when you press the Down button.

**Figure-23:** It shows the maximum frequency values of each phase. The figure-24 is displayed when you press the Down button.

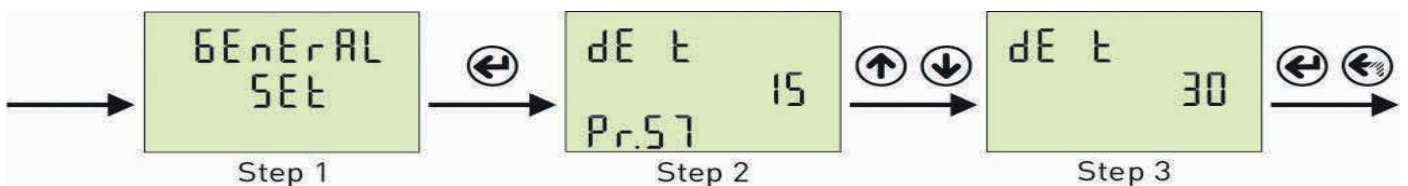
**Figure-24:** It shows the mean frequency values of each phase. The Home Screen is displayed when you press the Down button.

### 5.6 .To Advance in Display Inventory :



The Home screen is displayed, when the device is energized. When you press the up button to see the other data on the display, the next data is displayed (Figure-3). The figure-7 is displayed when you press the Up button. The figure-11 is displayed when you press the Up button. The figure-16 is displayed when you press the Up button. The figure-21 is displayed when you press the Up button. The screen back to Home Screen when you press the Up button . If you want to see values of min,max,mean and demand you can use down button. If you back to home screen in anywhere, you can use ESC button

### 5.7 .Demand Time Set :



**Step 1:** Press Menu button and enter password to enter program list. The Voltage SET is displayed when you enter password and press the Menu Button.Press “Up”button until you see the General SET

**Step 2:** Pr.54 is displayed when you press the “SET” button and press “Up” button. You will see Pr.57. It is using for setting demand Time.It is deleted from screen when you press the “SET” button.

**Step 3:** You can increase/decrease value to use Up/Down Button. You can use “SET” button to save. If you press “ESC” button, you cannot record your settings.

### 5.8 .Phase Sequence Protection Enable / Disable :

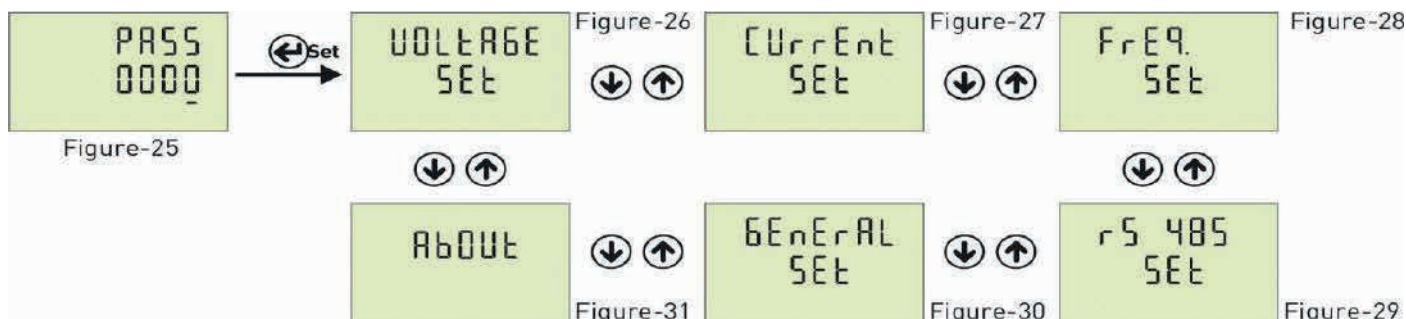


**Step 1:** Press Menu button and enter password to enter program list. The Voltage SET is displayed when you Home Screen enter password and press the Menu Button.Press “Up”button until you see the General SET

**Step 2:** Pr.54 is displayed when you press the “SET” button and press “Up” button. You will see Pr.56. It is using for enable/disable phase sequence protection. It is deleted from screen when you press the “SET” button.

**Step 3:** You can select Disable/Enable to use Up/Down Button. You can use “SET” button to save. If you press “ESC” button, you cannot record your settings.

### 5.9 .Setting



**Figure-25:** Press Menu button to enter password section. The figure-26 is displayed when you enter password and press the Menu button.

**Figure-26:** It uses for voltage settings. The figure-27 is displayed when you press the UP button.

**Figure-27:** It uses for current settings. The figure-28 is displayed when you press the UP button.

**Figure-28:** It uses for frequency settings. The figure-29 is displayed when you press the UP button.

**Figure-29:** It uses for RS-485 settings. The figure-30 is displayed when you press the UP button.

**Figure-30:** It uses for general settings. The figure-31 is displayed when you press the UP button.

**Figure-31:** It uses for about the device. This section give a information about device serial number and version number. You can use ESC button for exit menu.



5.10 .Voltage Settings :



Figure-26

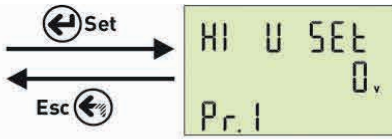


Figure-32

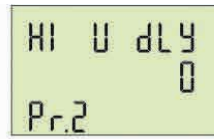


Figure-33

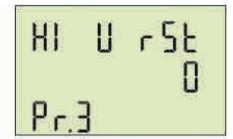


Figure-34



Figure-50

Press Menu button and enter password (Default Password =0000) to enter program list. The figure-26 is displayed when you enter password and press the Menu button. You enter Voltage set when you press Menu button. If you enter voltage set menu, the figure-32 displayed. This menu have 19 different voltage set value. When you press the up button to see the other voltage set values on the display, the next data is displayed. The figure-32 is displayed when you press the up button after the Pr.19 is displayed. By using up-down buttons select the program. Press Menu to enter required program. By up-down buttons, you can set the program. Press Menu to record your settings, if you press ESC button, you cannot record your settings.



Figure-35



Figure-49

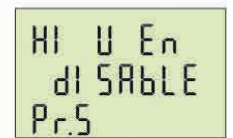


Figure-36

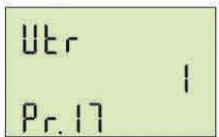


Figure-48

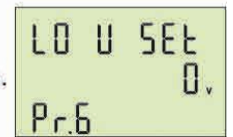


Figure-37



Figure-47

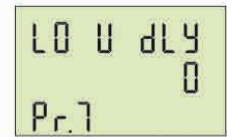


Figure-38

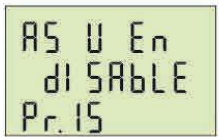


Figure-46

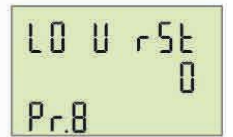


Figure-39

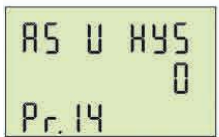


Figure-45



Figure-40

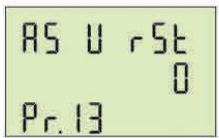


Figure-44

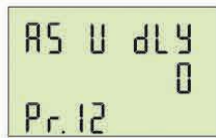


Figure-43

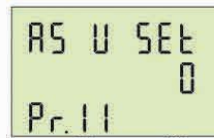


Figure-42



Figure-41

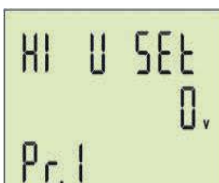


Figure-32

**Pr.1 : High Voltage Protection Value:** Determines the maximum operating voltage value of load.  
**Default:** 250V, **Min:** 1V, **Max:** 300V



Figure-33

**Pr.2: High Voltage Protection Delay Time:** Determines delay open time. Delay time for activating the output. If any voltage exceeds high voltage protect value, Relay output switches open at the end of delay time.

**Default:** 3sec, **Min:** 1sec, **Max:** 10000sec.

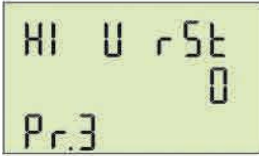


Figure-34

**Pr.3: High Voltage Protection Reset Time:** Determines delay close time. If all voltage below the high voltage protect value as a hysteresis voltage , relay output switches close at the end of the reset time.

**Default:** 3sec, **Min:** 1sec, **Max:** 10000sec.

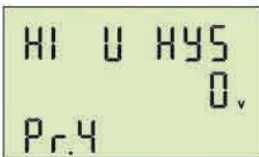


Figure-35

**Pr.4: High Voltage Protection Hysteresis:** Required hysteresis voltage for high voltage warning is programmed.

**Default:** 5V, **Min:** 1V, **Max:** 200V

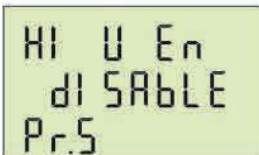


Figure-36

**Pr.5: High Voltage Protection Enable/Disable:** Determines Enable or Disable the high voltage protection.

**Default:** Enable, **Min:** Disable, **Max:** Enable

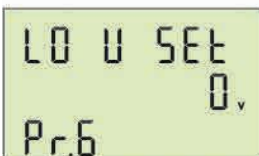


Figure-37

**Pr.6: Low Voltage Protection Value:** Determines the minimum operating voltage value of load.

**Default:** 170V, **Min:** 1V, **Max:** 300V



Figure-38

**Pr.7: Low Voltage Protection Delay Time :** Determines delay open time. Delay time for activating the output. If any voltage over the low voltage protect value, Relay output switches open at the end of delay time.

**Default:** 3sec, **Min:** 1sec, **Max:** 10000sec.



Figure-39

**Pr.8: Low Voltage Protection Reset Time:** Determines delay close time.If all voltage below the low voltage protect value as a hysteresis voltage , relay output switches close at the end of the reset time.

**Default:** 3sec, **Min:** 1sec, **Max:** 10000sec.



Figure-40

**Pr.9: Low Voltage Protection Hysteresis:** Required hysteresis voltage for low voltage warning is programmed.

**Default:** 5V, **Min:** 1V, **Max:** 200V

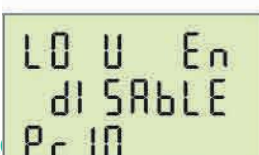


Figure-41

**Pr.10: Low Voltage Protection Enable/Disable:** Determines Enable or Disable the low voltage protection.

**Default:** Enable, **Min:** Disable, **Max:** Enable

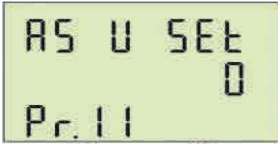


Figure-42

**Pr.11: Voltage Asymmetry Protection Value** : Determines the controlled voltage asymmetry. **Asymmetry Ratio Adjustment:** Device calculates a value by dividing difference between highest and lowest phase value to highest phase value.  
**Asymmetry Ratio** =  $[(\text{Highest Voltage} - \text{Lowest Voltage}) / \text{Highest Voltage}] \times 100$   
**Default:** %20, **Min:** %5, **Max:** %30

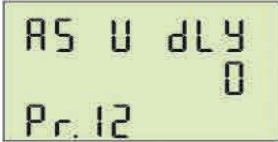


Figure-43

**Pr.12: Voltage Asymmetry Protection Delay time:** Determines delay open time. Delay time for activating the output. If calculated asymmetry value below the voltage asymmetry protect value, Relay output switches open at the end of delay time.  
**Default:** 3sec, **Min:** 1sec, **Max:** 10000sec.

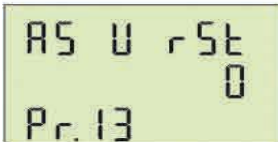


Figure-44

**Pr.13: Voltage Asymmetry Protection Reset Time:** Determines delay close time. If calculated asymmetry value over the voltage asymmetry protect value as a hysteresis voltage , relay output switches close at the end of the reset time.  
**Default:** 3sec, **Min:** 1sec, **Max:** 10000sec.

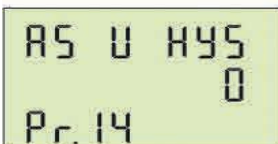


Figure-45

**Pr.14: Voltage Asymmetry Protection Hysteresis:** Required hysteresis voltage for voltage asymmetry warning is programmed.  
**Default:** %2, **Min:** %1, **Max:** %10



Figure-46

**Pr.15: Voltage Asymmetry Protection Enable/Disable:** Determines Enable or Disable the voltage asymmetry protection.  
**Default:** Enable, **Min:** Disable, **Max:** Enable

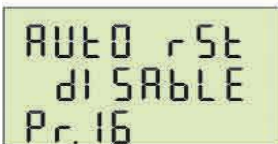


Figure-47

**Pr.16: Voltage Auto Reset Enable/Disable:** If auto reset enable and system into error, if all voltage are over/below the protect value as hysteresis value ,relay output switches on at the end of the Reset time. If Auto reset is disable, after all voltage are over/below hysteresis value, relay output switches manually. (Using ESC button).  
**Default:** Enable, **Min:** Disable, **Max:** Enable

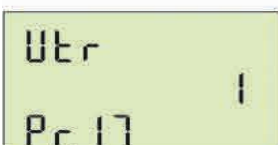


Figure-48

**Pr.17: Voltage Transformer Ratio:** If you use medium voltage , you can use VTR  
**Default:** 1, **Min:** 1, **Max:** 999

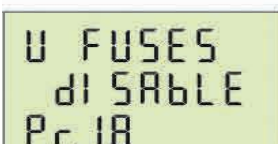


Figure-49

**Pr.18: Voltage Fuses Enable/Disable:** If any phase voltage exceeds 1.5 times of high voltage protect values, or ,if any phase voltage decrease 0.5 times of low voltage protect value, the relay switches off instantly. At position disable, voltage fuses function is cancelled.  
**Default:** Disable, **Min:** Disable, **Max:** Enable

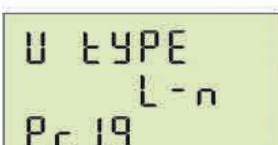


Figure-50

**Pr.19: Voltage Protection Type:** Voltage Protection can be selected as L-N or L-L in this menu. Phase-Neutral voltage protection can be implemented if the “L-N” protection is selected. Phase-Phase voltage protection can be implemented if the “L-L” protection is selected.  
**Default:** L-n, **Min:** L-n, **Max:** L-L

5.11 .Current Settings :



Figure-27



Figure-51

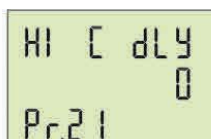


Figure-52



Figure-53

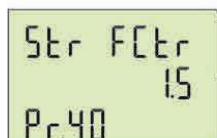


Figure-71

Press Menu button and enter password (Default Password =0000) to enter program list. The figure-26(Voltage SET) is displayed when you enter password and press the Menu button. The figure-27 (Current SET) is displayed when you press the up button. You enter Current set when you press Menu button. If you enter Current set menu, the figure-51(Pr.20) displayed. This menu have 21 different current set value. When you press the up button to see the other current set values on the display, the next data is displayed. The figure-51 is displayed when you press the up button after the Pr.40 is displayed. By using up-down buttons select the program. Press Menu to enter required program. By up-down buttons, you can set the program. Press Menu to record your settings, if you press ESC button, you cannot record your settings.

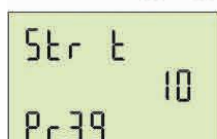


Figure-70



Figure-54

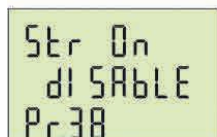


Figure-69



Figure-55



Figure-68



Figure-56

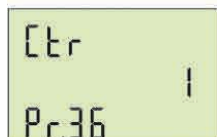


Figure-67



Figure-57

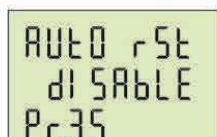


Figure-66



Figure-58

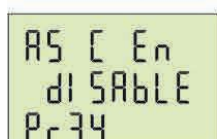


Figure-65



Figure-59

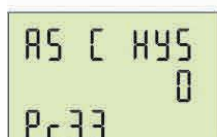


Figure-64

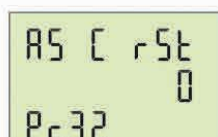


Figure-63

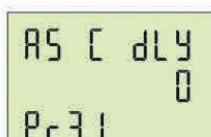


Figure-62



Figure-60

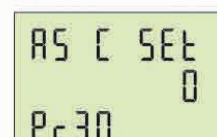


Figure-61

- Pr.20:** High Current Protection Value
- Pr.21:** High Current Protection Delay Time
- Pr.22:** High Current Protection Reset Time
- Pr.23:** High Current Protection Hysteresis
- Pr.24:** High Current Protection Enable/Disable
- Pr.25:** Low Current Protection Value
- Pr.26:** Low Current Protection Delay Time
- Pr.27:** Low Current Protection Reset Time
- Pr.28:** Low Current Protection Hysteresis
- Pr.29:** Low Current Protection Enable/Disable
- Pr.30:** Current Asymmetry Protection Value
- Pr.31:** Current Asymmetry Protection Delay Time
- Pr.32:** Current Asymmetry Protection Reset Time
- Pr.33:** Current Asymmetry Protection Hysteresis
- Pr.34:** Current Asymmetry Protection Enable/Disable
- Pr.35:** Current Auto Reset Enable/Disable
- Pr.36:** Current Transformer Ratio
- Pr.37:** Current Fuses Enable/Disable
- Pr.38:** Demurrage Protection Enable/Disable
- Pr.39:** Demurrage Protection Time
- Pr.40:** Demurrage Protection Factor



Figure-51

**Pr.20: High Current Protection Value:** Determines the maximum operating current value of load.

**Default:** 3.0A, **Min:** 0.1A, **Max:** 5.0A

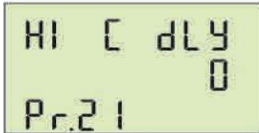


Figure-52

**Pr.21: High Current Protection Delay Time:** Determines delay open time. Delay time for activating the output. If any current exceeds high current protect value, Relay output switches open at the end of delay time.

**Default:** 3sec, **Min:** 1sec, **Max:** 10000sec.

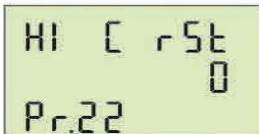


Figure-53

**Pr.22: High Current Protection Reset Time:** Determines delay close time. If all current below the high current protect value as a hysteresis current, relay output switches close at the end of the reset time.

**Default:** 10sec, **Min:** 1sec, **Max:** 10000sec.

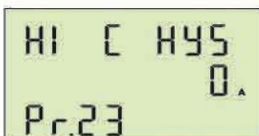


Figure-54

**Pr.23: High Current Protection Hysteresis:** Required hysteresis current for high current warning is programmed.

**Default:** 0.5A, **Min:** 0.1A, **Max:** 3.0A

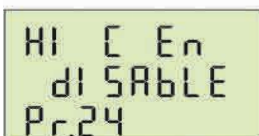


Figure-55

**Pr.24: High Current Protection Enable/Disable:** Determines Enable or Disable the high current protection. IIR.

**Default:** Enable, **Min:** Disable, **Max:** Enable



Figure-56

**Pr.25: Low Current Protection Value:** Determines the minimum operating current value of load.

**Default:** 0.1A, **Min:** 0.1A, **Max:** 5.0A



Figure-57

**Pr.26: Low Current Protection Delay Time:** Determines delay open time. Delay time for activating the output. If any current over the low current protect value, Relay output switches open at the end of delay time.

**Default:** 3sec, **Min:** 1sec, **Max:** 10000sec.



Figure-58

**Pr.27: Low Current Protection Reset Time:** Determines delay close time. If all current below the low current protect value as a hysteresis current, relay output switches close at the end of the reset time.

**Default:** 10sec, **Min:** 1sec, **Max:** 10000sec.



Figure-59

**Pr.28: Low Current Protection Hysteresis:** Required hysteresis current for low voltage warning is programmed.

**Default:** 0.5A, **Min:** 0.1A, **Max:** 3.0A



Figure-60

**Pr.29: Low Current Protection Enable/Disable:** Determines Enable or Disable the low current protection.

**Default:** Enable, **Min:** Disable, **Max:** Enable

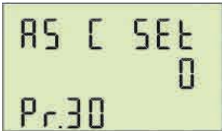


Figure-61

**Pr.30: Current Asymmetry Protection Value:** Determines the controlled current asymmetry. **Asymmetry Ratio Adjustment:** Device calculates a value by dividing difference between highest and lowest phase value to highest phase value.

**Default:** %30, **Min:** %5, **Max:** %50

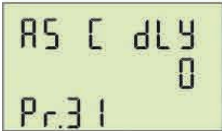


Figure-62

**Pr.31: Current Asymmetry Protection Delay Time :** Determines delay open time. Delay time for activating the output. If calculated asymmetry value below the current asymmetry protect value, Relay output switches open at the end of delay time.

**Default:** 3sec, **Min:** 1sec, **Max:** 10000sec.

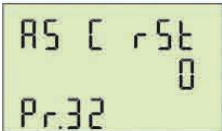


Figure-63

**Pr.32: Current Asymmetry Protection Reset Time:** Determines delay close time. If calculated asymmetry value over the current asymmetry protect value as a hysteresis current, relay output switches close at the end of the reset time.

**Default:** 10sec, **Min:** 1sec, **Max:** 10000sec.



Figure-64

**Pr.33: Current Asymmetry Protection Hysteresis:** Required hysteresis current for current asymmetry warning is programmed.

**Default:** %3, **Min:** %1, **Max:** %20

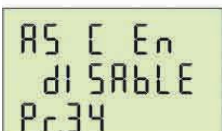


Figure-65

**Pr.34: Current Asymmetry Protection Enable/Disable:** Determines Enable or Disable the current asymmetry protection.

**Default:** Disable, **Min:** Disable, **Max:** Enable



Figure-66

**Pr.35: Current Auto Reset Enable/Disable :** If auto reset enable and system into error, if all current are over/below the protect value as hysteresis value ,relay output switches on at the end of the Reset time. If Auto reset is disable, after all current are over/below hysteresis value, relay output switches manually. (Using ESC button).

**Default:** Enable, **Min:** Disable, **Max:** Enable

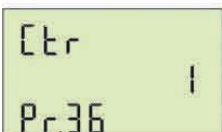


Figure-67

**Pr.36: Current Transformer Ratio:** If a current transformer which has a ratio of 100/5A is used between the system and device; Current transformer ratio is entered as = 100/5 = 20. If the current transformer is not used between the system and device, current transformer ratio is entered as "1"

**Default:** 1, **Min:** 1, **Max:** 2000



Figure-68

**Pr.37: Current Fuses Enable/Disable:** If any phase current exceeds 1.5 times of high current protect value, or ,if any phase current decrease 0.5 times of low voltage protect value, the relay switches off instantly. At position disable, current fuses function is cancelled.

**Default:** Disable, **Min:** Disable, **Max:** Enable



Figure-69

**Pr.38: Demurrage Protection Enable/Disable:** Determines Enable or Disable the demurrage protection.

**Default:** Enable, **Min:** Disable, **Max:** Enable

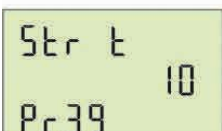


Figure-72

**Pr.39: Demurrage Protection Time:** Demurrage time is used to prevent from faulty switching caused by motor Demurrage current. In this period, demurrage is controlled by device.

**Default:** 10, **Min:** 1, **Max:**100

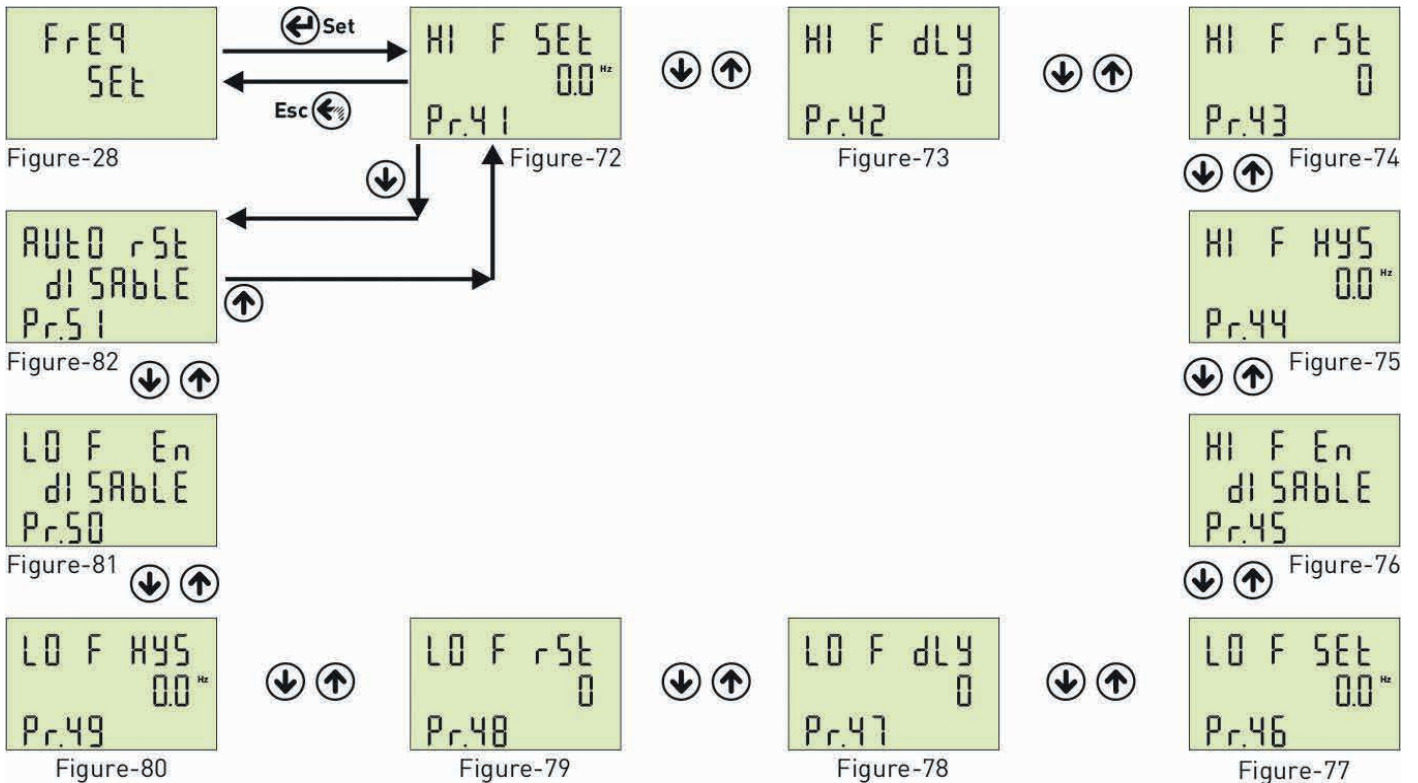


**Pr.40: Demurrage Protection Factor:** Demurrage current is 3-5 times more than normal operation current consumption.

**Ex:** High current set value is :5A, demurrage protection factor is :1.5. Max Demurrage current is  $5 \times 1.5 = 7.5$  A so device will let motor use 35A for start up.

**Default: 3.0, Min: 1.0, Max: 10.0.**

**5.12 .Frequency Settings :**



Press Menu button and enter password to enter program list. The figure-26(Voltage SET) is displayed when you enter password and press the Menu button. The figure-27(Current SET) is displayed when you press the up button. The figure-28(Frequency SET) is displayed when you press the up button. You enter Frequency set when you press Menu button. If you enter Frequency set menu, the figure-72(Pr.41) displayed. This menu have 11 different current set value. When you press the up button to see the other Frequency set values on the display, the next data is displayed. The figure-Figure 78 is displayed when you press the up button after the Pr.51 is displayed. By using up-down buttons select the program. Press Menu to enter required program. By up-down buttons, you can set the program. Press Menu to record your settings, if you press ESC button, you cannot record your settings.

- Pr.41:** High Frequency Protection Value
- Pr.42:** High Frequency Protection Delay Time
- Pr.43:** High Frequency Protection Reset Time
- Pr.44:** High Frequency Protection Hysteresis
- Pr.45:** High Frequency Protection Enable/Disable
- Pr.46:** Low Frequency Protection Value
- Pr.47:** Low Frequency Protection Delay Time
- Pr.48:** Low Frequency Protection Reset Time
- Pr.49:** Low Frequency Protection Hysteresis
- Pr.50:** Low Frequency Protection Enable/Disable
- Pr.51:** Frequency Auto Reset Enable/Disable

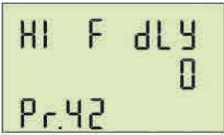


Figure-73

**Pr.42: High Frequency Protection Delay Time:** Determines delay open time. Delay time for activating the output. If any frequency exceeds high frequency protect value, Relay output switches open at the end of delay time.

**Default:** 3sec, **Min:** 1sec, **Max:** 10000sec.

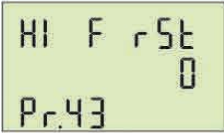


Figure-74

**Pr.43: High Frequency Protection Reset Time:** Determines delay close time. If all frequency below the high frequency protect value as a hysteresis frequency, relay output switches close at the end of the reset time.

**Default:** 3sec, **Min:** 1sec, **Max:** 10000sec.

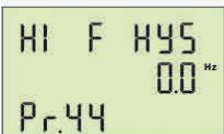


Figure-75

**Pr.44: High Frequency Protection Hysteresis:** Required hysteresis frequency for high frequency warning is programmed.

**Default:** 0.5Hz, **Min:** 0.1Hz, **Max:** 20.0Hz



Figure-76

**Pr.45: High Frequency Protection Enable/Disable:** Determines Enable or Disable the high frequency protection.

**Default:** Disable, **Min:** Disable, **Max:** Enable

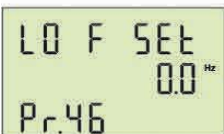


Figure-77

**Pr.46: Low Frequency Protection Value:** Determines the minimum operating frequency value of load.

**Default:** 49Hz, **Min:** 45.0Hz, **Max:** 70.0Hz



Figure-78

**Pr.47: Low Frequency Protection Delay Time:** Determines delay open time. Delay time for activating the output. If any frequency over the low frequency protect value, Relay output switches open at the end of delay time.

**Default:** 3sec, **Min:** 1sec, **Max:** 10000sec.



Figure-79

**Pr.48: Low Frequency Protection Reset Time:** Determines delay close time. If all frequency below the low frequency protect value as a hysteresis frequency, relay output switches close at the end of the reset time.

**Default:** 3sec, **Min:** 1sec, **Max:** 10000sec.



Figure-80

**Pr.49: Low Frequency Protection Hysteresis:** Required hysteresis frequency for low voltage warning is programmed.

**Default:** 0.5Hz, **Min:** 0.1Hz, **Max:** 20.0Hz

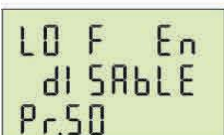


Figure-81

**Pr.50: Low Frequency Protection Enable/Disable :** Determines Enable or Disable the low frequency protection.

**Default:** Disable, **Min:** Disable, **Max:** Enable

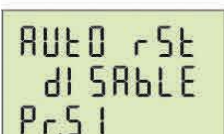


Figure-82

**Pr.51: Frequency Auto Reset Enable/Disable:** If auto reset enable and system into error, if all frequency are over/below the protect value as hysteresis value ,relay output switches on at the end of the Reset time. If Auto reset is disable, after all frequency are over/below hysteresis value, relay output switches manually. (Using ESC button).

**Default:** Disable, **Min:** Disable, **Max:** Enable



**5.13 .RS485 Settings :**



Figure-29

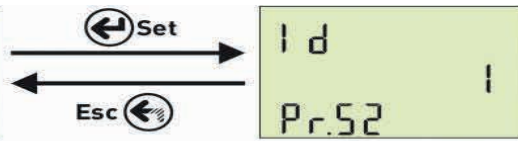


Figure-83

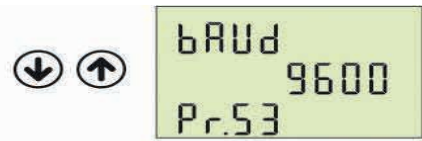


Figure-84

Press Menu button and enter password to enter program list. The figure-26(Voltage SET) is displayed when you enter password and press the Menu button. The figure-27(Current SET) is displayed when you press the up button. The figure-28(Frequency SET) is displayed when you press the up button . (RS485 SET) is displayed when you press the up button. You enter Rs-485 set when you press Menu button. If you enter Rs-485 set menu, the figure-83(Pr.52) displayed. This menu have 2 different current set value. When you press the up button to see the other Frequency set values on the display, the next data is displayed. By using up-down buttons select the program. Press Menu to enter required program. By up-down buttons, you can set the program. Press Menu to record your settings, if you press ESC button, you cannot record your settings.



Figure-83

**Pr.52: Modbus ID:** Determines Modbus device ID.  
**Default:** 1, **Min:** 1, **Max:** 247

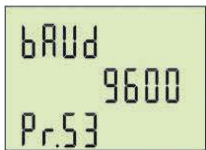


Figure-84

**Pr.53: Baudrate Selection:** Determines Modbus communication speed.  
**Default:** 9600bps, **Min:** 1200bps, **Max:** 38400bps

Note: **Stopbits: 1, Parity: none and Databits:8**

**5.14 .General Settings :**

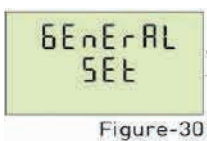


Figure-30

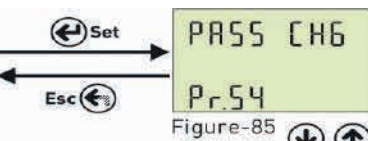


Figure-85



Figure-86



Figure-87

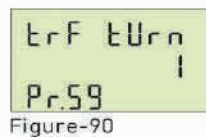


Figure-90



Figure-89



Figure-88

Press Menu button and enter password to enter program list. The figure-26(Voltage SET) is displayed when you enter password and press the Menu button. The figure-27(Current SET) is displayed when you press the up button. The figure-28(Frequency SET) is displayed when you press the up button . (RS485 SET) is displayed when you press the up button. The figure-30(General SET) is displayed when you press the up button. You enter General set when you press Menu button. If you enter General set menu, the figure-85(Pr.54) displayed. This menu have 6 different current set value. When you press the up button to see the other General set values on the display, the next data is displayed. By using up-down buttons select the program. Press Menu to enter required program. By up-down buttons, you can set the program. Press Menu to record your settings, if you press ESC button, you cannot record your settings



Figure-85

**Pr.54: Password Change:** This menu is used for changing the user password.  
**Default:** 0000, **Min:** 0000, **Max:** 9999



Figure-86

**Pr.55: Password Protection Enable/Disable:** This menu is used for activating the user password. After the user password is activated for entering to the menus; if the Menu button is pressed, while the instant values are observed, user password is required.  
**Default:** Disable, **Min:** Disable, **Max:** Enable



Figure-87

**Pr.56: Phase Sequence Protection Enable/Disable:** You can use device with phase sequence or without phase sequence function. If you set device for phase sequence, when running, it will be check phase sequence and it will display sequence error on screen. If you set "Disable" You can see phase sequence error but device not give error.  
**Default:** Disable, **Min:** Disable, **Max:** Enable

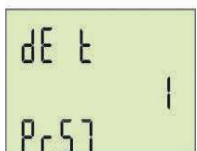


Figure-88

**Pr.57: Demand Time:** Determines demand calculate time. Demand is calculated using average value. Device take sample for demand time and calculate average value. Demand is maximum average value.  
**Default:** 15min, **Min:** 1min, **Max:** 120min.

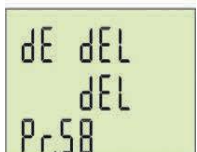


Figure-89

**Pr.58: Demand Record Delete:** You can delete demand and average records.  
**If cut off device energy min,max, average and demand values are deleted.**

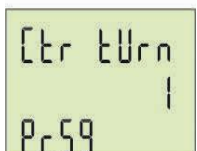


Figure-90

**Pr.59: Current Transformer Cable Turn Number:** User defines the turn number, which is the number of how much tour the current cable has rounded into the current transformer. Numbers can be selected between 1-20. Greater the number of turn means greater the sensitivity  
**Default:** 1, **Min:** 1, **Max:** 20.

**5.15 .About :**



Figure-31



Figure-91

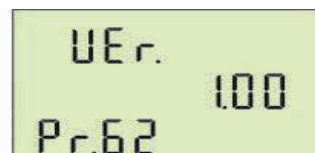
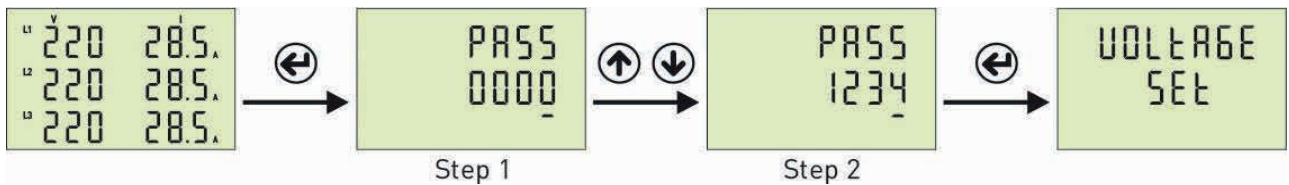


Figure-92

Press Menu button and enter password to enter program list.  
 The figure-26(Voltage SET) is displayed .  
 when you enter password and press the Menu button.  
 The figure-27(Current SET) is displayed when you press the up button.  
 The figure-28(Frequency SET) is displayed when you press the up button.  
 The figure-29(RS485 SET) is displayed when you press the up button.

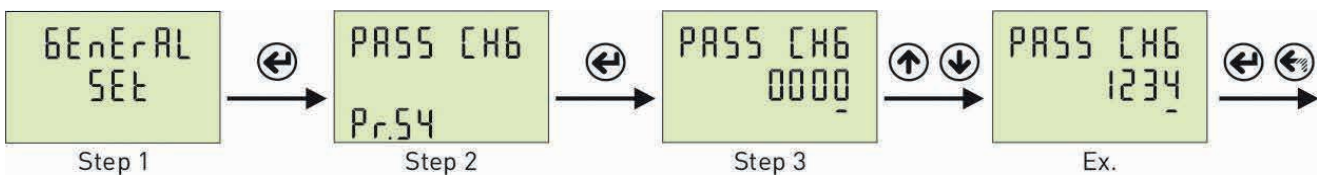
The figure-30(General SET) is displayed when you press the up button.  
 The figure-31(About) is displayed when you press the up button.  
 You enter “About” when you press Menu button. If you enter “About” menu,  
 the figure - 91(Pr.61) displayed.  
 When you press the up button to see the other parameter on the display, the next data is displayed.

**5.16 .Enter Menu with Password :**



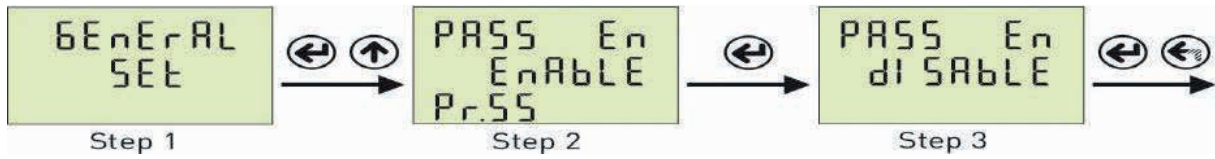
**Step 1:** Press “SET” button for entering menu.  
**Step 2:** If Password is activated ,you can see “PASS” screen, you have to enter user password. There are four digit and press “Down” button ,selected digit is change. You can increase digit value using “Up” button. Press “Set” button after enter the user password. If you back to home screen you press “ESC”button. Default password is “0000”.

**5.17 .Schanging Password :**



**Step 1:** Press Menu button and enter password to enter program list. The Voltage SET is displayed when you enter password and press the Menu button.Press “Up”button until you see the General SET  
**Step 2:** Pr.54 is displayed when you press the “SET” button. Pr.54 is using for changing password. Pr.54 is deleted from screen when you press the “SET” button.  
**Step 3:** You can chance selected digit(underline) using “Down” button.”Up ”button is used to increase its value.You can use “SET” button to save new password. if you press “ESC” button, you cannot record your settings

**5.17 .Password Enable / Disable :**

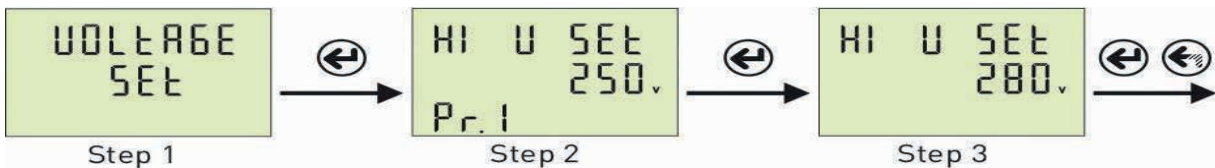


**Step 1:** Press Menu button and enter password to enter program list. The Voltage SET is displayed when you enter password and press the Menu button. Press “Up” button until you see the General SET

**Step 2:** Pr.54 is displayed when you press the “SET” button and press “Up” button. You will see Pr.55. It is using for enable/disable password protection. It is deleted from screen when you press the “SET” button.

**Step 3:** You can select Disable/Enable to use Up/Down Button. You can use “SET” button to save. if you press “ESC” button, you cannot record your settings.

**5.18 .High Voltage Protection Value Change :**



**Step 1:** Press Menu button and enter password to enter program list. The Voltage SET is displayed when you enter password and press the Menu button.

**Step 2:** Pr.1 is displayed when you press the “SET” button. It is using for setting high voltage protection value. It is deleted from screen when you press the “SET” button.

**Step 3:** You can increase/decrease value to use Up/Down Button. You can use “SET” button to save. If you press “ESC” button, you cannot record your settings.

**5.19 .Low Voltage Protection Value Change :**



**Step 1:** Press Menu button and enter password to enter program list. The Voltage SET is displayed when you enter password and press the Menu button.

**Step 2:** Pr.1 is displayed when you press the “SET” button. and press “Up” button. You will see Pr.6. It is using for setting low voltage protection value. It is deleted from screen when you press the “SET” button.

**Step 3:** You can increase/decrease value to use Up/Down Button. You can use “SET” button to save. if you press “ESC” button, you cannot record your settings.

**5.20 .High Current Protection Value Change :**



**Step 1:** Press Menu button and enter password to enter program list. The Voltage SET is displayed when you enter password and press the Menu button. Press “Up” button until you see the Current SET

**Step 2:** Pr.20 is displayed when you press the “SET” button. It is using for setting high current protection value. It is deleted from screen when you press the “SET” button.

**Step 3:** You can increase/decrease value to use Up/Down Button. You can use “SET” button to save. If you press “ESC” button, you cannot record your settings

**5.21 .Low Current Protection Value Change :**



**Step 1:** Press Menu button and enter password to enter program list. The Voltage SET is displayed when you enter password and press the Menu button. Press “Up” button until you see the Current SET

**Step 2:** Pr.20 is displayed when you press the “SET” button. and press “Up” button. You will see Pr.25. It is using for setting low current protection value. It is deleted from screen when you press the “SET” button.

**Step 3:** You can increase/decrease value to use Up/Down Button. You can use “SET” button to save. if you press “ESC” button, you cannot record your settings.

**5.22 .Voltage Asymmetry Protection Value Change :**



**Step 1:** Press Menu button and enter password to enter program list. The Voltage SET is displayed when you enter password and press the Menu button.

**Step 2:** Pr.1 (HI V SET ) is displayed when you press the “SET” button and press “Up” button. You will see Pr.11. It is using for setting voltage asymmetry protection value. It is deleted from screen when you press the “SET” button.

**Step 3:** You can increase/decrease value to use Up/Down Button. You can use “SET” button to save. if you press “ESC” button, you cannot record your settings.

**5.23 .Quick Setup :**

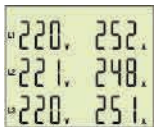


Figure-26

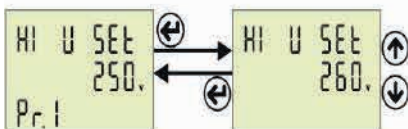


Figure-32

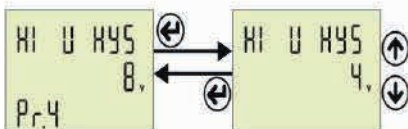


Figure-35

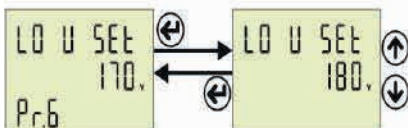


Figure-37

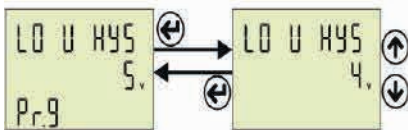


Figure-40

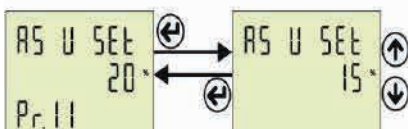


Figure-42



Figure-26



This section describes some of the most commonly used parameters. You can adjust your system by apply them. These parameters are High/Low Voltage Protection value and hysteresis, Voltage Asymmetry protection value, High/Low Current Protection value and hysteresis, Current transformer ratio, demurrage factor and time.

Press Menu button and enter password to enter program list. The Voltage SET is displayed when you enter password and press the Menu button. Voltage SET menu is include set of high/low voltage protection and asymmetry settings. Pr.1 is displayed when you press the “SET” button.

Pr.1 is using for setting high voltage protection. It is deleted from screen when you press the “SET” button. You can increase/decrease value to use Up/Down Button. You can use “SET” button to save. The figure-32 is displayed when you press the SET button. .Press “Up”button until you see the Pr.4 (figure-35)

Pr.4 is using for setting high voltage protection hysteresis. It is deleted from screen when you press the “SET” button. You can increase/decrease value to use Up/Down Button. You can use “SET” button to save. The figure-35 is displayed when you press the SET button. Press “Up”button until you see the Pr.6 (figure-37)

Pr.6 is using for setting low voltage protection. It is deleted from screen when you press the “SET” button. You can increase/decrease value to use Up/Down Button. You can use “SET” button to save. The figure-37 is displayed when you press the SET button. Press “Up”button until you see the Pr.9 (figure-40)

Pr.9 is using for setting low voltage protection hysteresis. It is deleted from screen when you press the “SET” button. You can increase/decrease value to use Up/Down Button. You can use “SET” button to save. The figure-40 is displayed when you press the SET button. Press “Up”button until you see the Pr.11 (figure-42)

Pr.11 is using for setting voltage asymmetry protection. It is deleted from screen when you press the “SET” button. You can increase/decrease value to use Up/Down Button. You can use “SET” button to save. The figure-42 is displayed when you press the SET button. Press “ESC” button for back to main menu.

“Voltage SET”is displayed when you pressed the “ESC” button. (Figure-26)  
 “Current SET”is displayed when you press the “Up” button (Figure-27).



Figure-27

Current SET menu is include set of high/low current protection,current transforme ratio and demurrage settings.

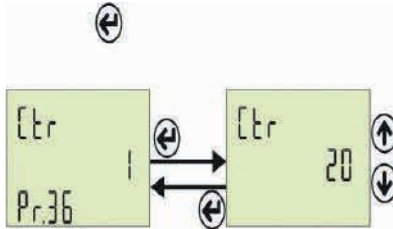


Figure-67

Pr36 It is using for setting current transformer ratio. You can increase/decrease value to use Up/Down Button. You can use "SET" button to save. The figure-67 is displayed when you press the SET button. Press "Up" button until you see the Pr.25 (figure-56).

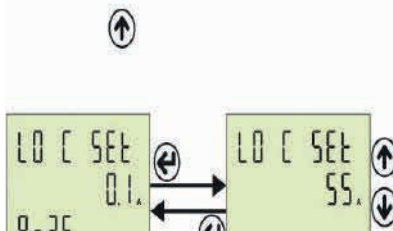


Figure-56

Pr.25 is using for setting low current protection. It is deleted from screen when you press the "SET" button. You can increase/decrease value to use Up/Down Button. You can use "SET" button to save. The figure-56 is displayed when you press the SET button. Press "Up"button until you see the Pr.20 (figure-51)

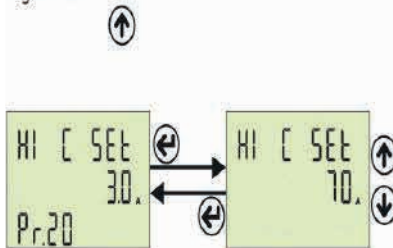


Figure-51

Pr.20 is displayed when you press the "SET" button and press "Up" button. You will see Pr.36 (Figure-67).It is using for setting current transformer ratio. You can increase/decrease value to use Up/Down Button. You can use "SET" button to save. The figure-67 is displayed when you press the SET button. Press "Up" button until you see the Pr.25 (figure-56).

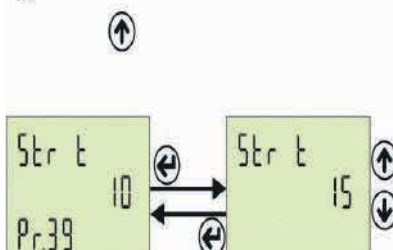


Figure-70

Pr.39 is using for setting demurrage time. It is deleted from screen when you press the "SET" button. You can increase/decrease value to use Up/Down Button. You can use "SET" button to save. The figure-70 is displayed when you press the SET button. Press "Up"button until you see the Pr.40 (figure-71).

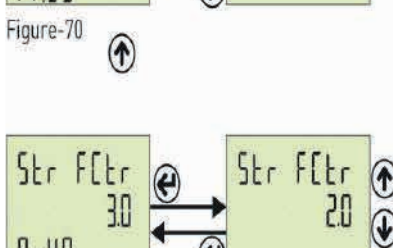


Figure-71

Pr.40 is using for setting demurrage time. It is deleted from screen when you press the "SET" button. You can increase/decrease value to use Up/Down Button. You can use "SET" button to save. The figure-71 is displayed when you press the SET button. Press twice "ESC" button for back to Figure-71 home screen.



Figure-27

All settings are made. Press ESC to exit. The figure-27 is displayed on screen. Press the ESC key again.

6.1. AVR Internal Structure

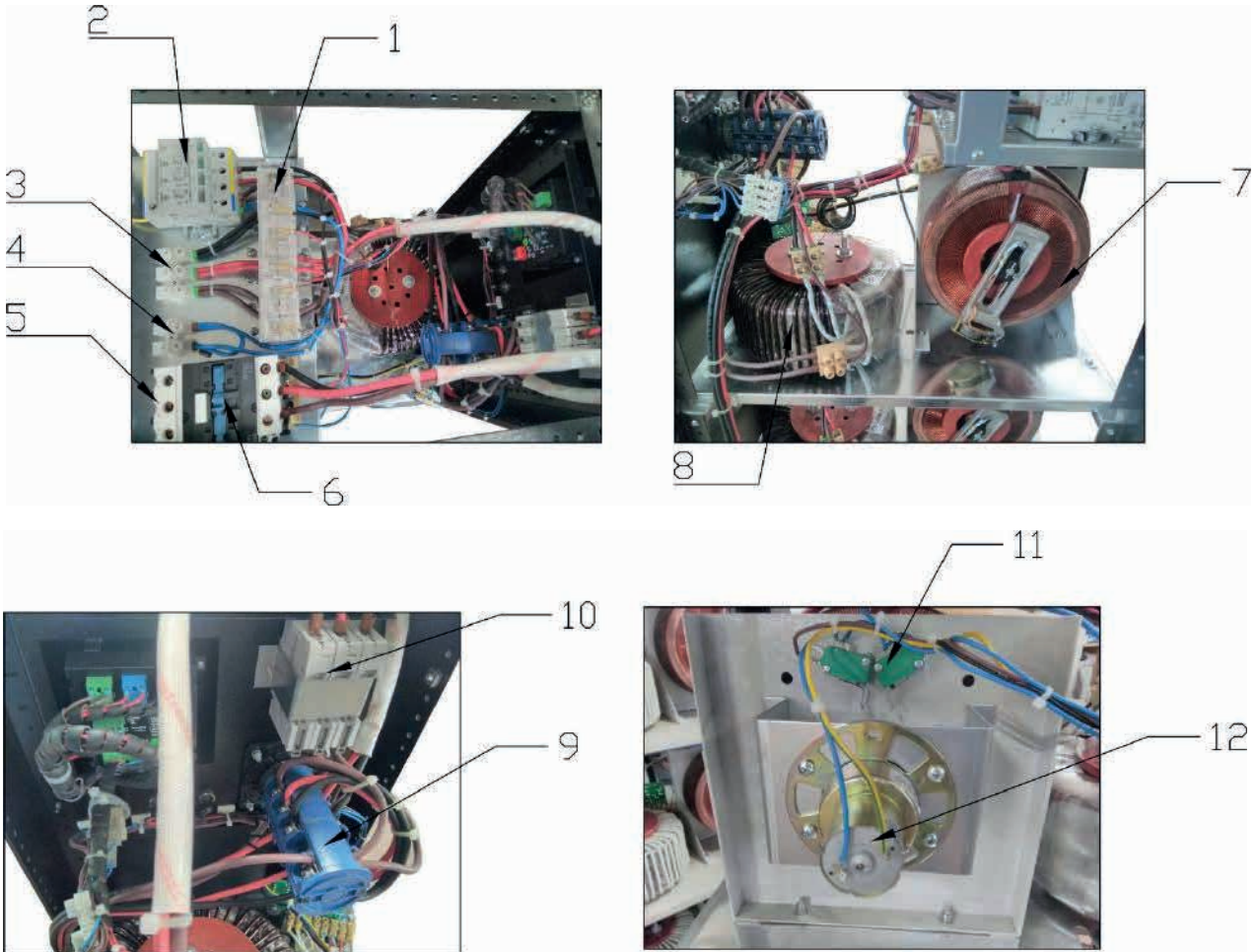


Image -10

**Resim-10**

1	Current Transformer
2	Surge Arrester(Optional)
3	Input Terminal
4	Neutral
5	Output Connection
6	Contactor
7	Variac Transformer
8	Booster Transformer
9	Selectable Switch(By Pass)
10	Miniature Circuit Breaker(MCB)
11	Limit Switch
12	DC Motor



## 6.2. Control Board and Assembly

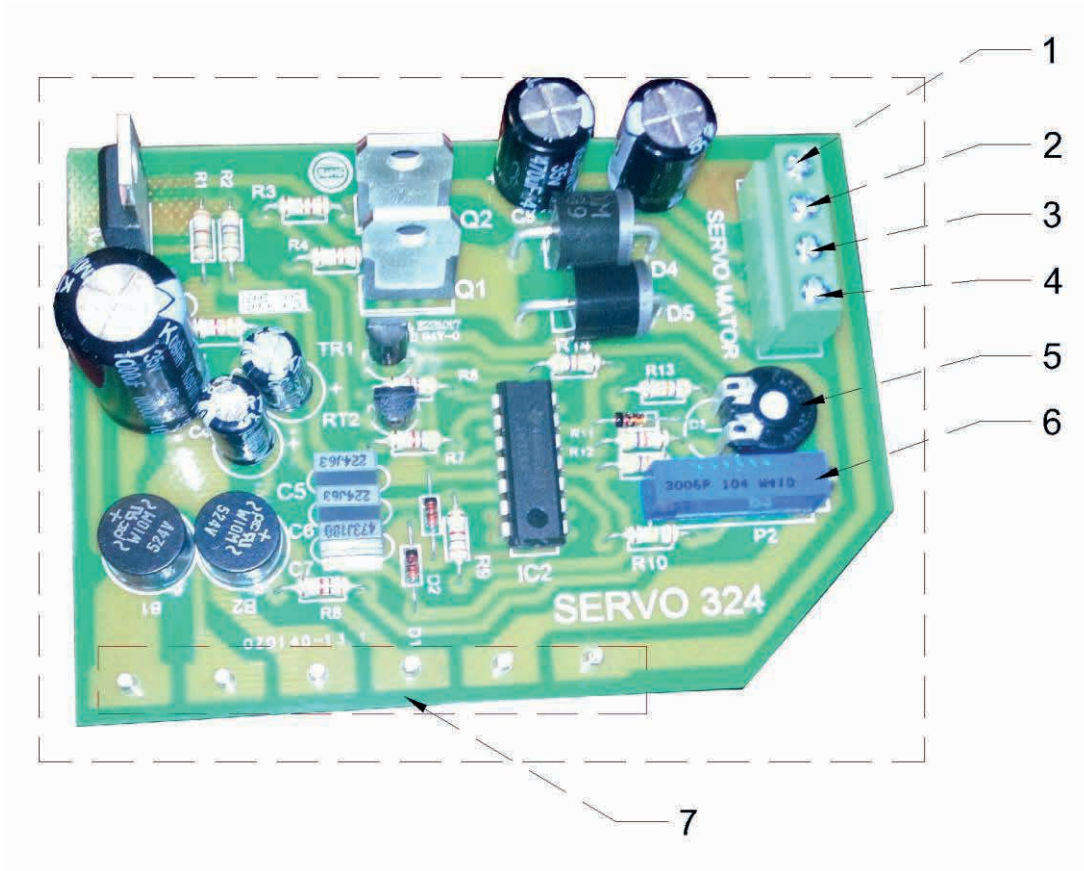


Image-11

**Image-11**

<b>1</b>	Motor
<b>2</b>	Limit Switch(Common Pin)
<b>3</b>	Limit Switch-1
<b>4</b>	Limit Switch-2
<b>5</b>	Output Voltage Accuracy Setting
<b>6</b>	Output Voltage Setting
<b>7</b>	Circuit Transformer Connection Pins

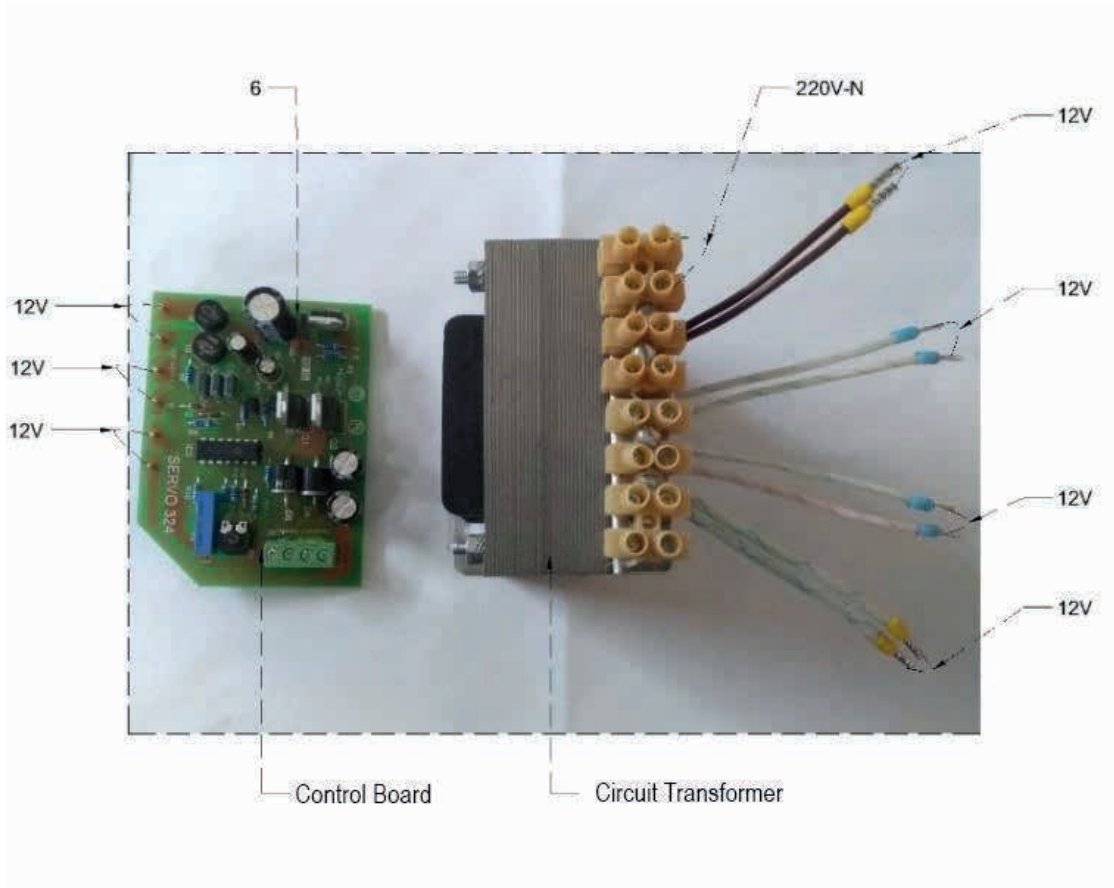


Image-12

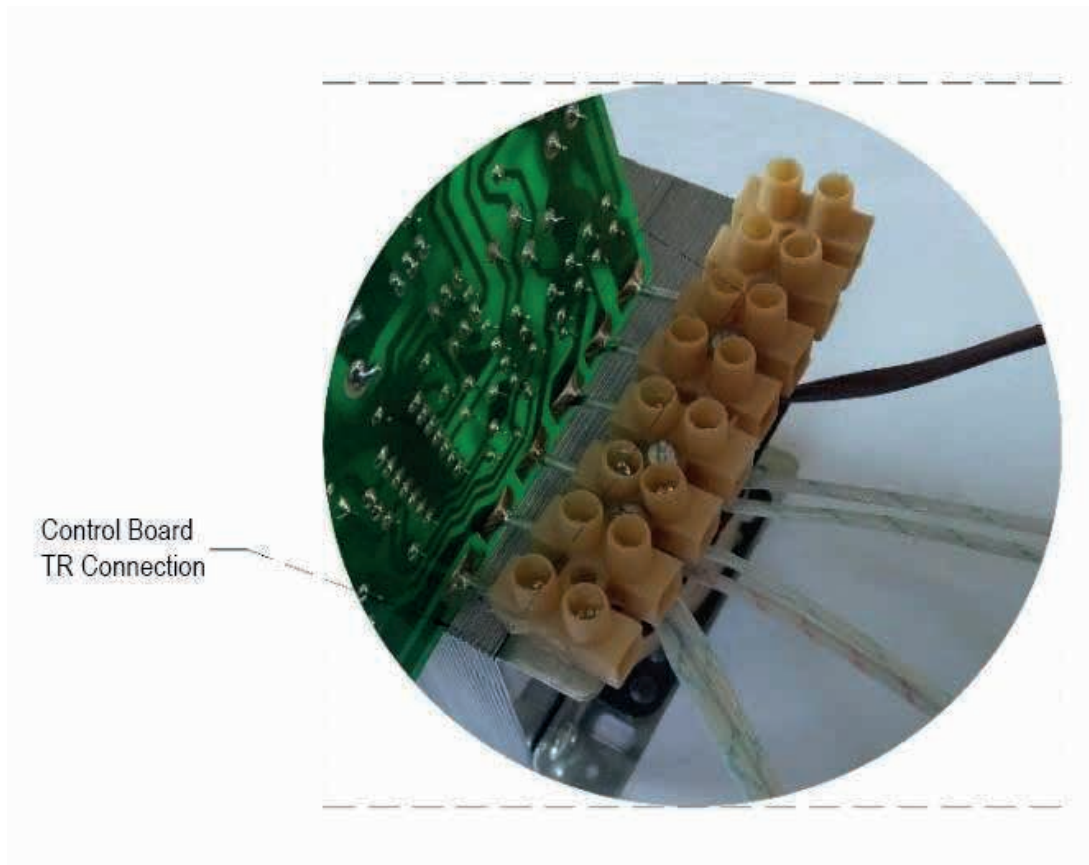


Image-13

### 6.3. Possible Malfunctions and Troubleshootings

Malfunction	Possible Causes	Troubleshooting
If voltmeter retrieves incorrectly	Voltmeter Malfunctioned	If voltmeter is digital, please check the socket. If it is analogue, please replace with new one
	Control Board Malfunctioned	Check the neutral connections. If problem continues, please contact with technical service
If smell from device	Overloaded	Check the loads on phases. Switch the device to Line position and contact with technical service
If device retrieves Voltage incorrectly	If the device at protection position	Check the cartridge fuse. Phase would be lost or there is no Neutral connection or input voltage could be out of operation range
	If the device not at protection position	Cartridge fuse burnt or damaged. Voltmeter damaged. Please contact with technical service
If device automatically on and off	If the device at protection position	Please make sure the neutral and phase connections are correct
	If the device not at protection position	Overloaded or operational input voltage range is out of interval
If any noise from device	Oveloaded, Motor connections could be loosened	Switch the Pakoswitch to Line position and contact to your supplier or Technical service wit giving the required information below: -Serial No and Power -Malfunction Date

**ATTENTION!**

Only authorized technical personnel should make an intervention to the equipment.

## 7. TECHNICAL SPECIFICATIONS

MODEL	33003	33006	33010	33015	33022	33030	33045	33060	33075	33100	33120	33150
<b>Power(KVA)</b>	3	6	10,5	15	22,5	30	45	60	75	100	120	150
Input of Regulator												
<b>Input Voltage Correction Range</b>	-25/+15% Standart(Other input bandwidth are optional)											
<b>Working Frequency</b>	47...65 Hz											
<b>Line Input Protection</b>	Low Voltage and Over Voltage Protection											
Output of Regulator												
<b>Output Voltage</b>	220/230/240 VAC RMS ±2											
<b>Overload</b>	10 sec %200 load											
<b>Correction Speed</b>	~90 Volt/Sec											
<b>Output Protection</b>	At short circuit,overload or overvoltage situations contactor opens the circuit and protects the load											
Operational Principal												
	Servo Motor, Micro Controller Unit, Full Automatic											
General												
<b>Cooling System</b>	Smart Fan System											
<b>Monitoring of Measured Value</b>	Monitoring the Output and Voltage with Company True RMS Panel Voltmeter											
<b>Total Harmonic Distortion</b>	-											
<b>Efficiency</b>	>%95											
<b>Mechanical By Pass</b>	Manually Controlled Line/Regulator Selectable Cam Switch											
<b>Protection Level</b>	IP 20 (Others Optional)											
Environment												
<b>Operational Temperature</b>	-10°C/+50°C											
<b>Storage Temperature</b>	-25°C/+60°C											
<b>Relative Humidity</b>	<%90 DIN(40040)											
<b>Altitude</b>	<3000m											
<b>Acoustic Level</b>	<50 db(1m <sup>2</sup> )											
<b>Certificates</b>	CE//Tüv Austria Hellas (ISO 9001)											
Physical Features												
<b>HxWxD(cm)</b>	405 x 640 x 1170						605 x 890 x 1400			660x940x1650		
<b>Weight(kg)</b>	65	90	125	135	154	181	227	330	356	456	520	600

## 8. WARRANTY

### 8.1. Warranty Conditions

1. AVR's warranty period is 2 years from the date of delivery of product against defects in components, workmanship and production, if the product is used in the compliance with shown in the user manual.
2. Within the warranty period of the goods, spare parts will be supplied as free of charge if the device is malfunctioned due to components, workmanship and manufacturing defects.
3. Courier/transportation costs occurred during the supply of spare parts will be covered by buyer.
4. Defects resulting from unusual use of the products are out of warranty.

### 8.2. AVR's Out of Warranty Situations

This warranty does not cover the defects caused by improper use of the AVR which can be shown as following situations:

- Malfunction and failures due to user's improper use,
- Transportation damages after delivery/shipment,
- Damages due to the faulty electrical installation and/or use of other than the voltage indicated on the product label,
- Defects and damages caused by natural disasters such as fire and lightning and floods.

Warranty is void if the warranty document has been altered or original serial number on the product or on electronic cards has been removed or altered.

### 8.3. Device and Manufacturer's Information

#### Manufacturer

<b>Name:</b>	
<b>Address:</b>	
<b>Tel / Fax</b>	
<b>e-mail</b>	
<b>Sign&amp;Stamp</b>	

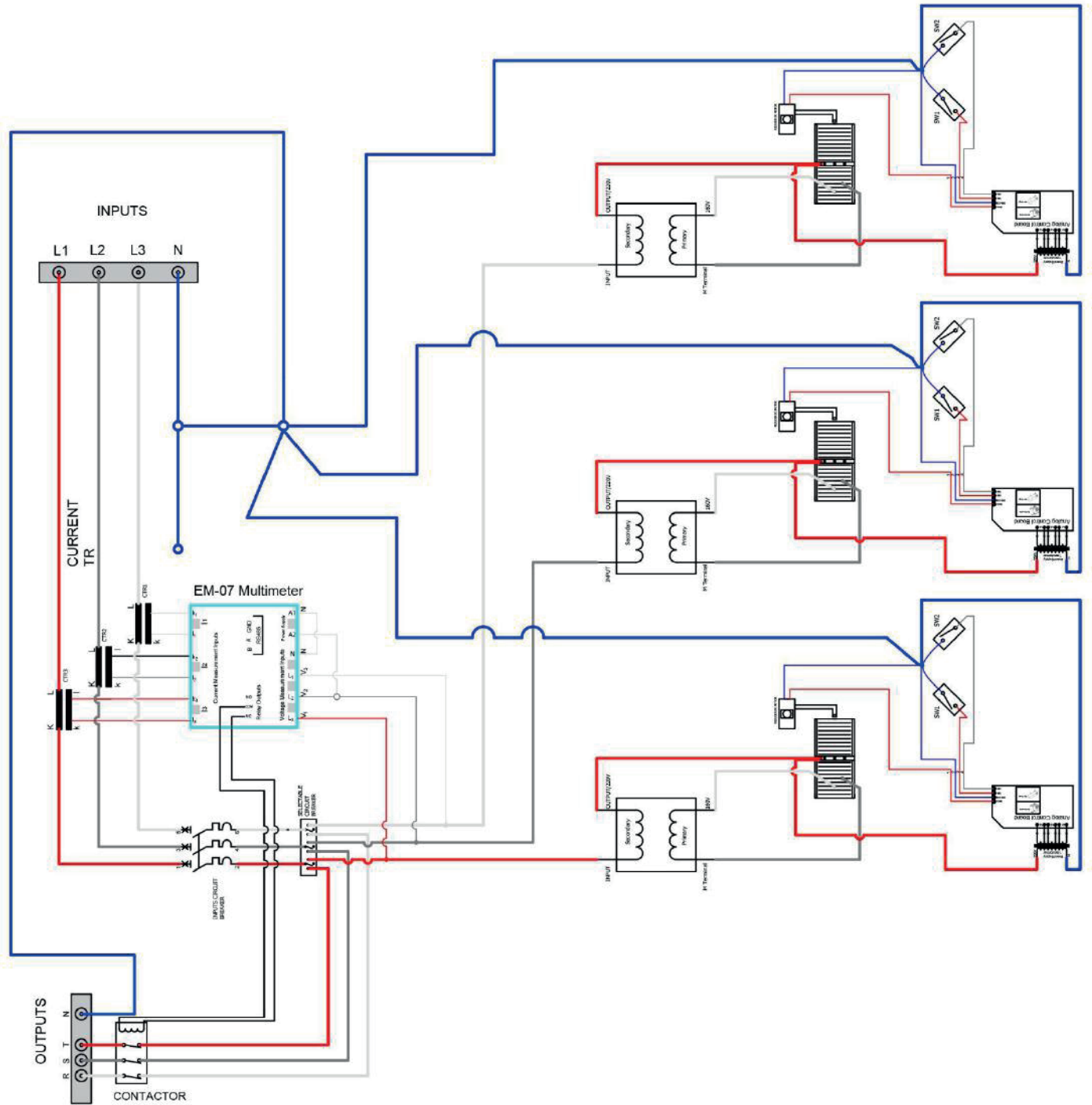
#### Device

<b>Type</b>	Regulator
<b>Brand</b>	
<b>Model</b>	SRV
<b>Label and Serial No</b>	
<b>Delivery Time/Place</b>	
<b>Warranty</b>	
<b>Min. Repair Period</b>	

#### Seller

<b>Company Name</b>	
<b>Address</b>	
<b>Tel/Fax</b>	
<b>Invoice Date&amp;No</b>	
<b>Sign&amp;Stamp</b>	

Three Phase Electrical Connection Diagram







Product Label

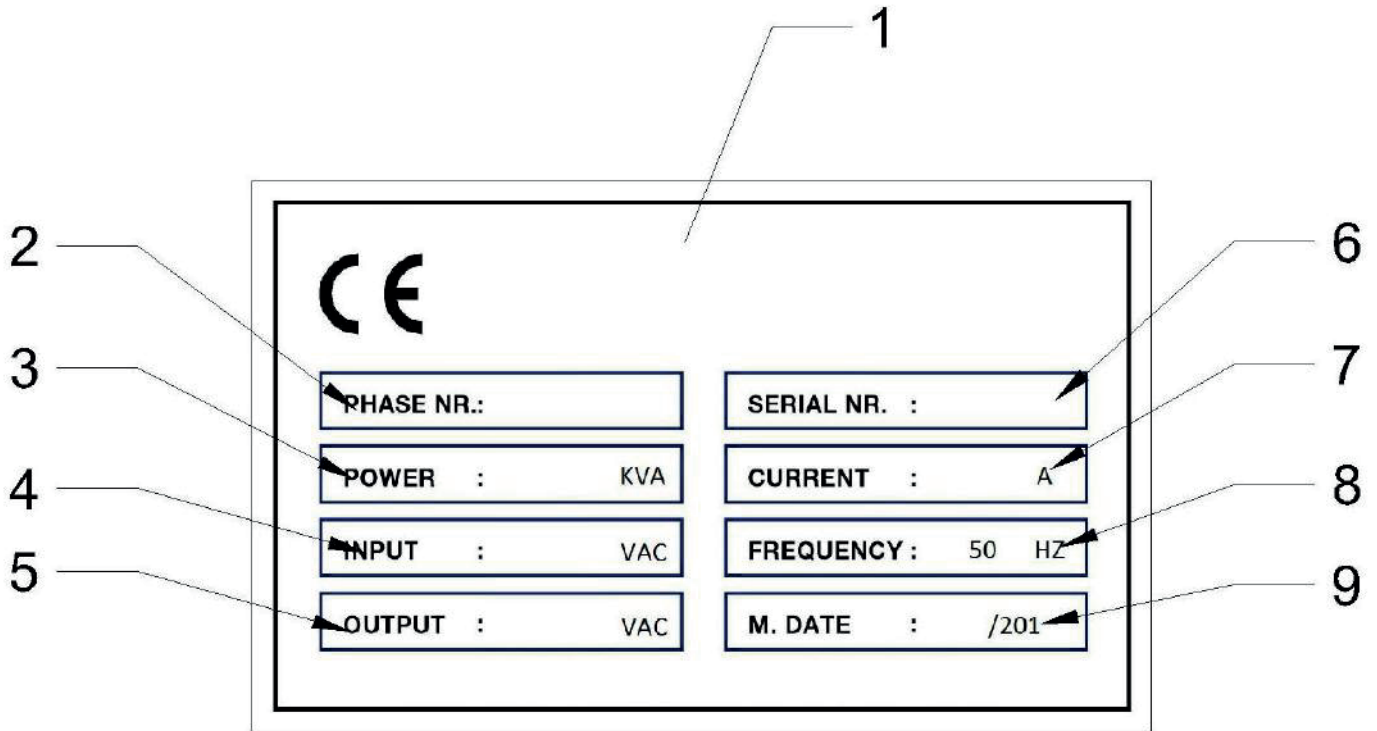


Image-9

Image-9

1	Company Logo
2	No of Phases(1Ph/3Ph)
3	Power(KVA)
4	Input Working Range(V)
5	Output (V)
6	Serial No
7	Current(A)
8	Frequency(Hz)
9	Date of Production

## Product Dimensions



All measures are in mm

Güç(KVA)	A	B	C
3	405	640	1170
6	405	640	1170
10,5	405	640	1170
15	405	640	1170
22,5	405	640	1170
30	405	640	1170
45	405	640	1170
60	605	890	1400
75	605	890	1400
100	605	890	1400
120	660	940	1650
150	660	940	1650

### IMPORTANT NOTICES!

Dear user;

This manual contains information about features of Voltage Regulator (AVR), installation, operation and the loads connected to the AVR, safety information, use of the AVR, operation principles, settings and measurements (calibrations), detection and troubleshooting.



Read the instructions carefully before the installation.



Keep manual in case you need as an Application Source!



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Life span of the device is 10 years.

This Voltage Regulator is designed to meet the requirements specified in TS EN 60335-1 and TS EN 60335-1 / A11 Standards. This AVR complies with the norms of the following marking.



