

THREE-PHASE ELECTROMECHANICAL VOLTAGE STABILIZER

SET-EM 04-14



IMPORTANT NOTICE!

Dear user,

This manual contains information about the features of SET-EM range Automatic Voltage Regulator (AVR), installation, operation, 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 EN 60335-1 and EN 60335-1 / A11 Standards. This AVR complies with the standards required for CE mark.



MEANINGS OF SYMBOLS USED IN THE MANUAL



This symbol points out where to pay highest attention



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: Ampere (Current)

P: Watt (Power)

For Manual Bypass:

BYPASS (1): The load is connected to mains voltage

STABILIZER (2): The load is connected to the 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>Human Safety</p> 	<p>Use the AVR is restricted access areas only</p> <p>When AVR Bypass mode is selected, device is deactivated, the load is fed from the mains and the output is energized.</p> <p>AVR must be properly connected to earth</p> <p>The AVR should only be turned on by authorized service personnel</p>
<p>Device Safety</p> 	<p>The AVR must be protected by a circuit breaker that is easily accessible against overload and short-circuit conditions.</p> <p>Do not operate the AVR if the ambient temperature and the relative humidity are out of specified range in this manual.</p> <p>Do not operate the AVR in the presence of liquid or in extremely humid environments.</p> <p>Do not allow liquid or foreign objects to enter the AVR.</p> <p>Do not obstruct or cover the AVR ventilation holes</p> <p>Lifespan of AVR is 10 years.</p>
<p>Recycling and Change</p> 	<p>Use isolated hand tools.</p> <p>To prevent accidents, remove watches, metal accessories such as rings, and use rubber shoes and gloves.</p> <p>Replaced semi-finished materials must be packed to be recycled</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 inclined more than 10°.

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.
- Three adults can carry loads up to 55 kg.

Use pallet trucks, forklifts, etc. to transport heavy loads from 55 kg.

Store up the packing materials in case AVR is transported by technical service or moved to a different place.



Since AVR is heavy, a proper vehicle must be used for its handling.



The AVR should be packed properly when it needs to be carried again. For this reason, it is recommended to store up 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 EN 60335-1 and EN 60335-1 / A11 safety standards. Users must meet the following requirements.

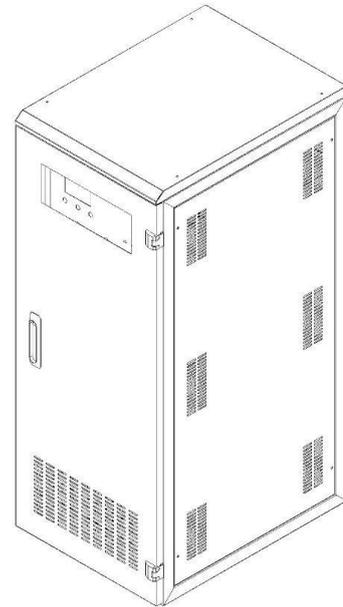
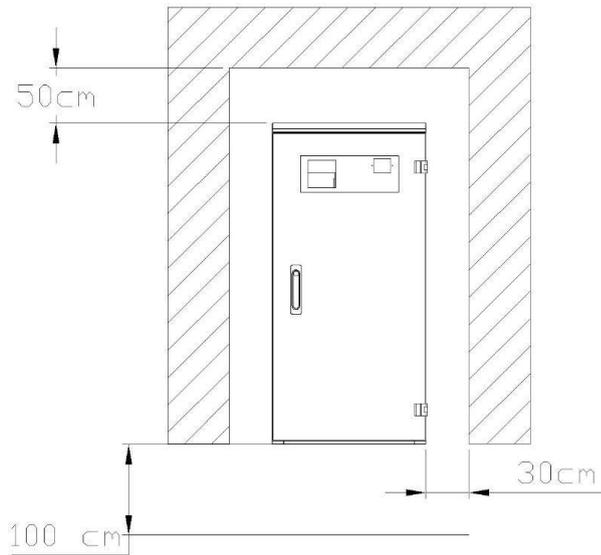


Image-1.1 models up to 150kVA

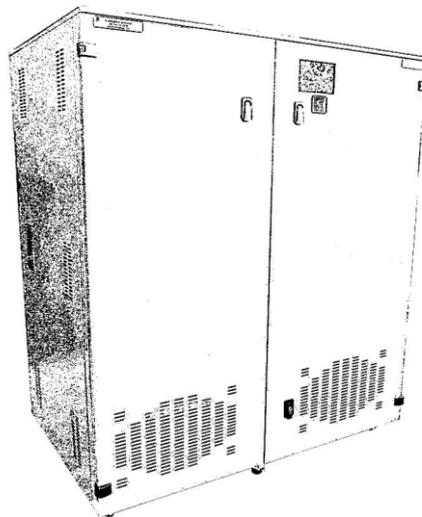


Image-1.2 models from 200 to 400kVA

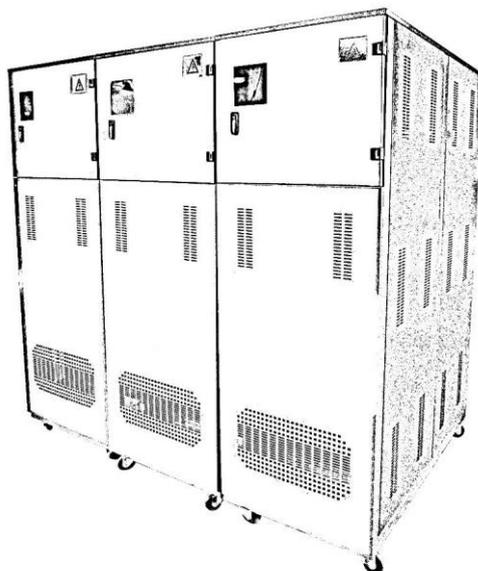


Image-1.3 models from 400 to 800kVA

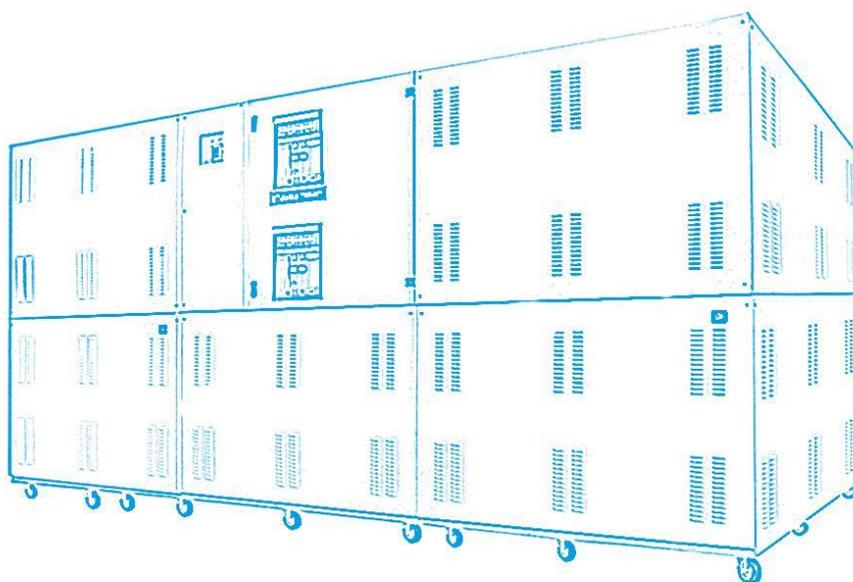


Image-1.4 models from 1000 to 3000kVA

Non-Suitable Operating Environments 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/ + 40°C.
- The relative humidity must be between 20% and 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 $+60^{\circ}\text{C}$, far away from heaters and in a dry environment.
- The relative humidity must be between 20%-95%.
- Check the AVR power compliance to the 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 first. 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 230V / 50Hz as standard. (220 V/240 V optional)



It is recommended to store up AVR original packaging.

3.1. Unpacking

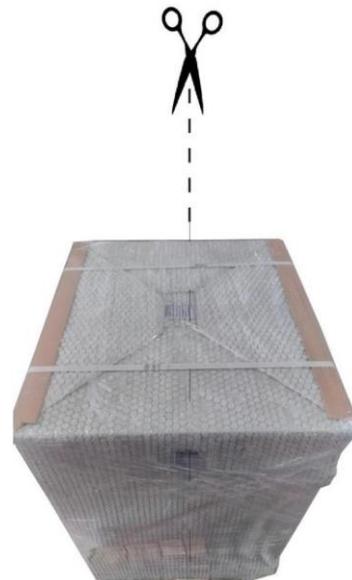


Image-2

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

3.2. Wiring Procedures

The installation complies with international installation regulations.

- HD 384.4.42 S1: Electrical installation at the premises Part 4: Protection for safety Group 42: Protection against thermal effects
- 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 where particular danger risks of danger exist

The line and bypass inputs must have protection through circuit breakers in the power distribution panel. The breakers on the board must open 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. 10 KVA - 150 KVA (3 Phase Input/3 Phase Output) Front Panel View

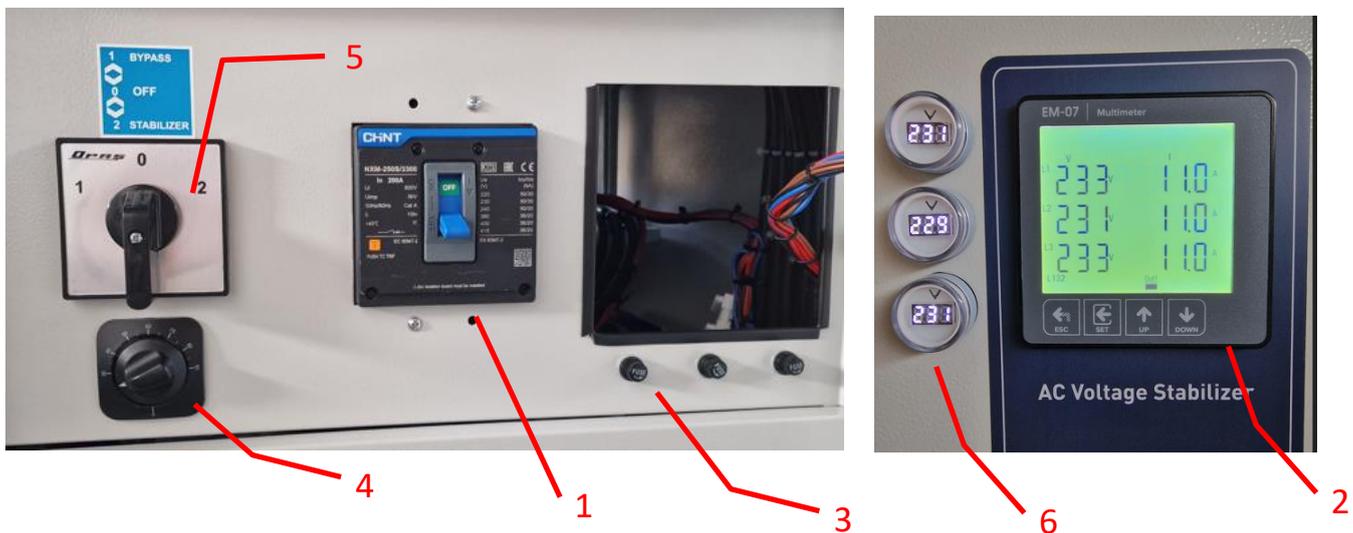


image-3.1

Image-3.1

1	MCB (Miniature Circuit Breaker)
2	Voltage analyser and setting monitor
3	Fuses
4	Adjustable Thermostat
5	Bypass Switch (bypass-stabilizer)
6	Input voltage meters

3.3. 200KVA - 800KVA (3 Phase Input/3 Phase Output) Front Panel View

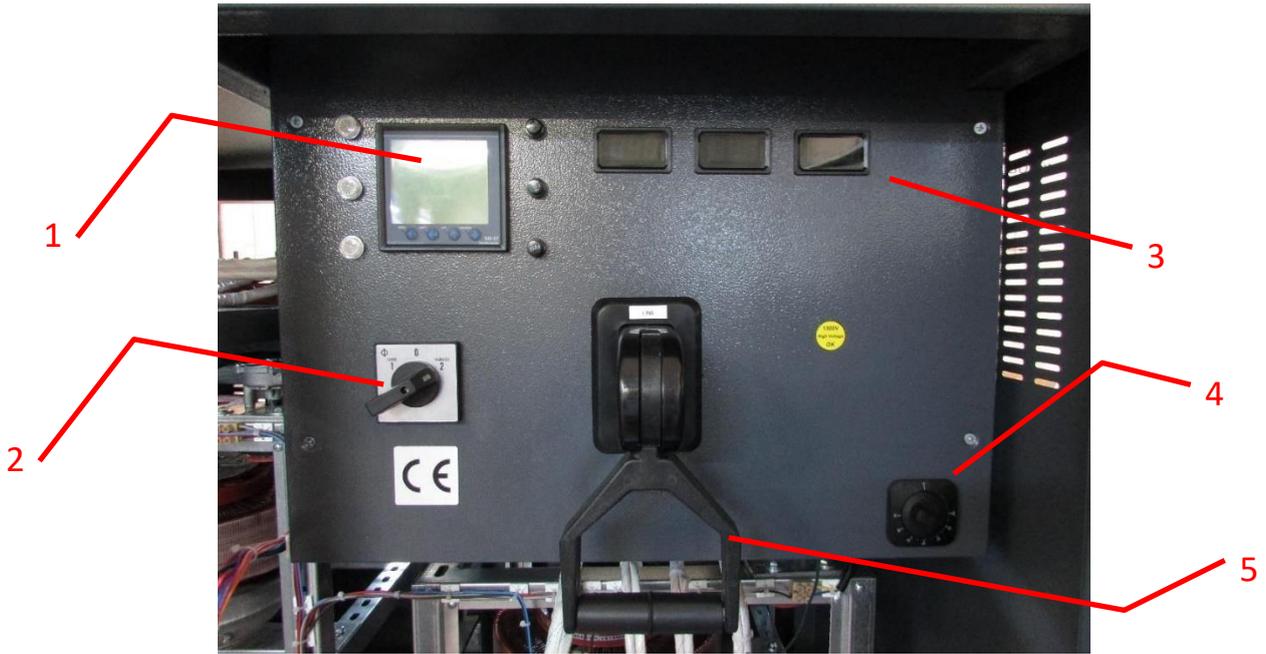


Image-3.2

Image-3.2

1	Monitoring
2	Optional (selectable switch)
3	Input voltage meters
4	Adjustable Thermostat
5	Bypass Switch (bypass-stabilizer)

3.3. 1000KVA - 3000KVA (3 Phase Input/3 Phase Output) Front Panel View

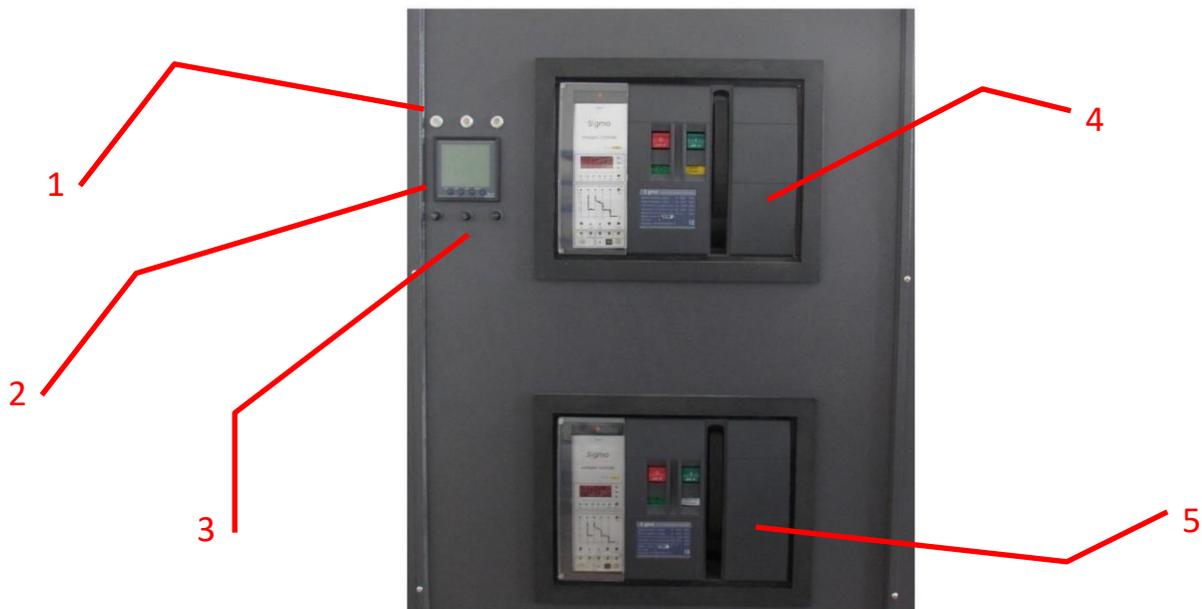


image-3.3

Image-3.3

1	Mains Phase Indicator Lamps
2	Control and monitoring multimeter
3	Protection fuses
4	Bypass / Line (air Circuit breaker)
5	Stabilizer (air Circuit breaker)

3.4. 10 KVA - 150 KVA (3 Phase Input/ 3 Phase Output) Rear Panel View

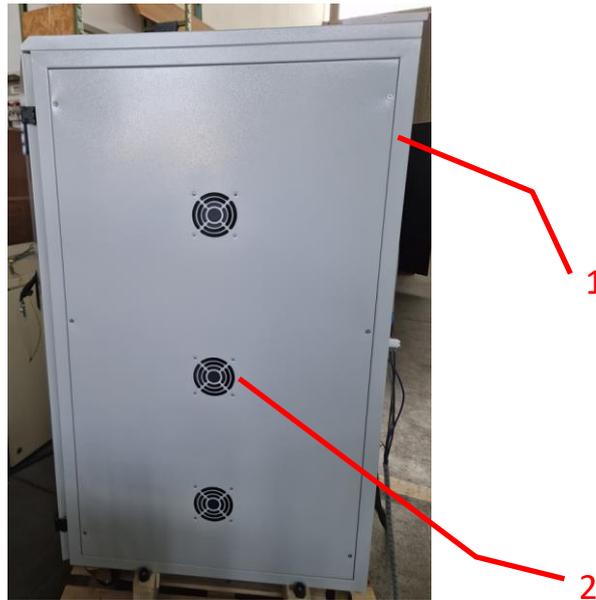


Image-4.1

Image-4.1

1	Input / Output / Neutral Connection
2	Smart Fan

3.4. 200 KVA - 400KVA (3 Phase Input/ 3 Phase Output) Rear Panel View



Image-4.2

Image-4.2

1	Input / Output / Neutral Connection
2	Air vent

3.4. 500KVA - 800KVA (3 Phase Input/ 3 Phase Output) Rear Panel View

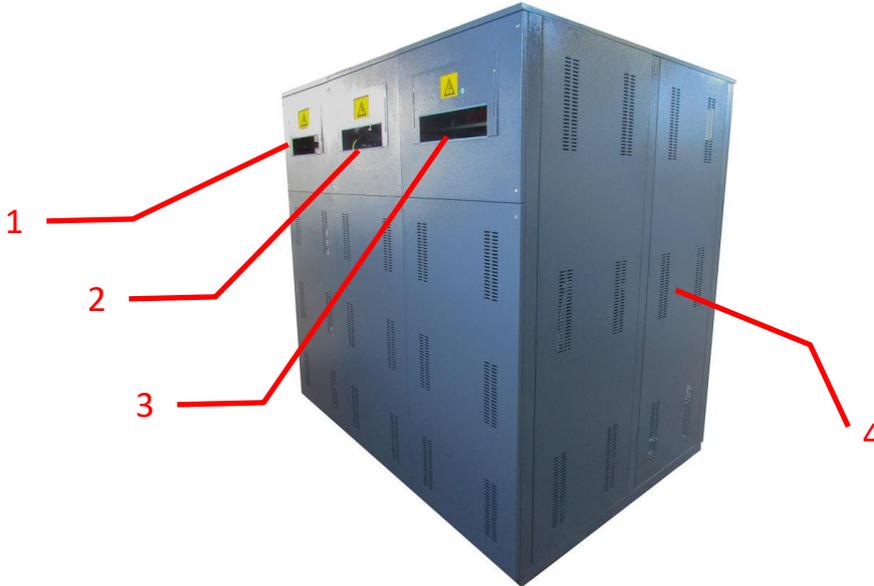


Image-4.3

Image-4.3

1	Input / Output / Neutral Connection (Phase 1)
2	Input / Output / Neutral Connection (Phase 2)
3	Input / Output / Neutral Connection (Phase 3)
4	Air vent

3.5. 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 a screwdriver.

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

10KVA - 150KVA (3 Phase Input/Output)

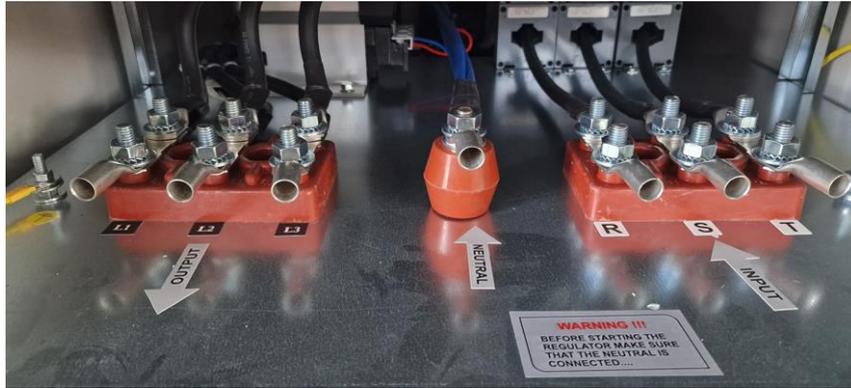


Image-5.1

200KVA - 400KVA (3 Phase Input/Output)



Image-5.2

500KVA - 3000KVA (3 Phase Input/Output)

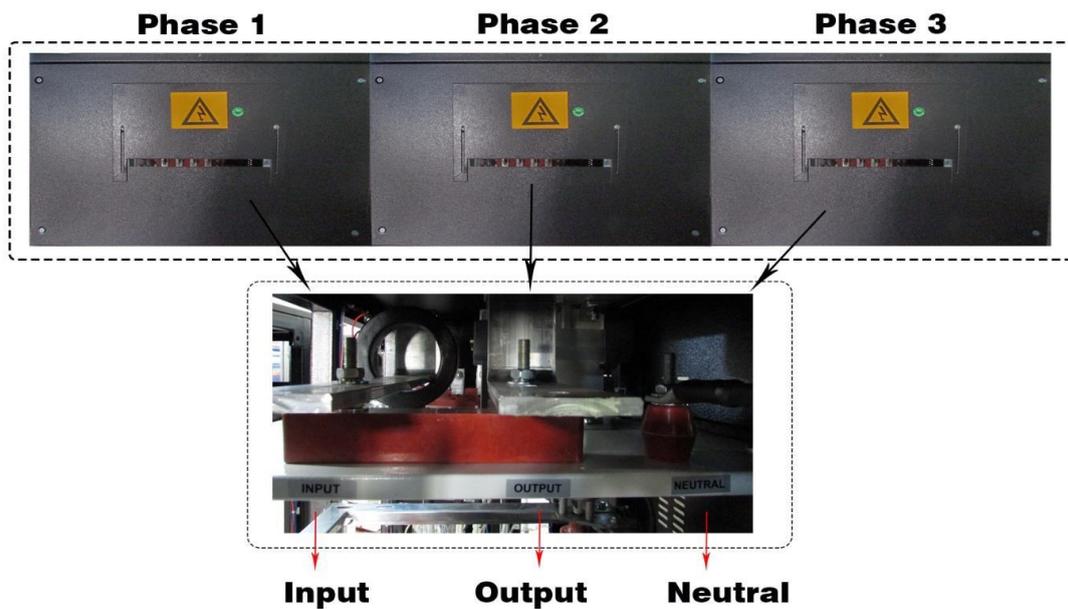


Image-5.3

3.5.1. Earth Connection



For safety, the ground connection of the device must be done. Perform PEground 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 accompanies the input and neutral cables, it should be cut long enough so that the ground cable does not come out even if the phase cables are disconnected.

3.5.2. Input-Output and Neutral Connections



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

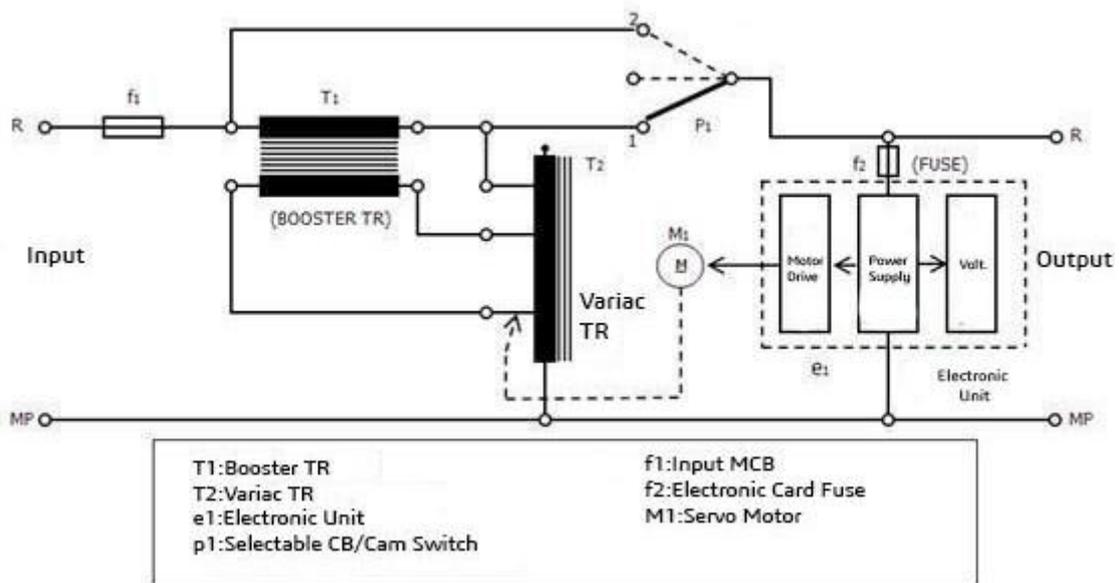


Before connecting the input cables, make sure the Automatic fuse in the distribution panel is in "OFF" position.

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/s 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 feeds primary winding of buck-boost transformer, thus generating increasing or decreasing voltage according to mains voltage on the secondary winding connected in series with the line. 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

10 – 3000 kVA three phase

4.1.2. Working Voltage Range

Standard:	-25% ÷ +15%	380/400/415 V	Three Phase
Optional:	±20%		
	±30%		
	±40%		
	-35% ÷ +15%		
	-30% ÷ +20%		
	others on request		

4.1.3. Correction Speed

90 V/sec.

4.1.4. Output Deviation

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

4.1.5. Efficiency

Efficiency of the regulator is over 98% due to 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 through high quality changeover 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	phase number of measured 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	Serial Communication is active
7	Type of measurement values
8	It shows error code
9	It shows relay status.  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 Diagram

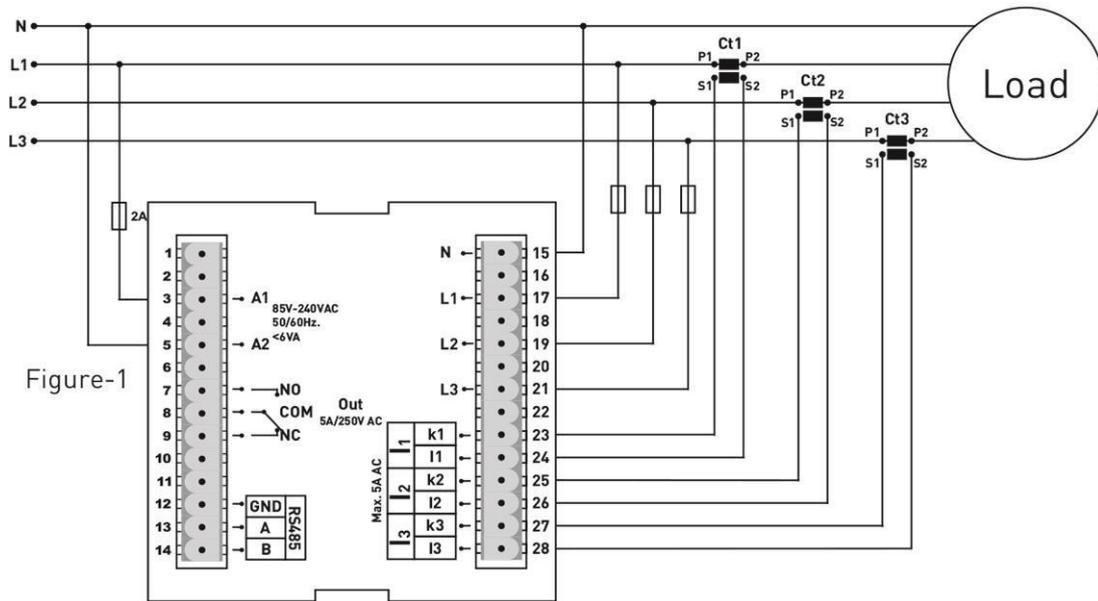


Figure-1

image-8

5.2. Using The Buttons



ESC:

**In measure state: Back to home screen. In Menu state: Exit menu.
In state of changing parameters: Don't save choice and back to menu state.
Error state: 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 group of 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 is 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

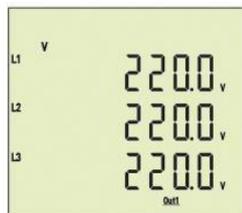


Figure-3

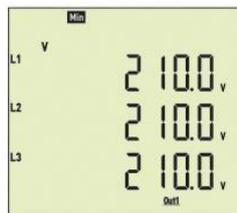


Figure-4

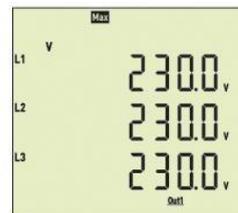


Figure-5

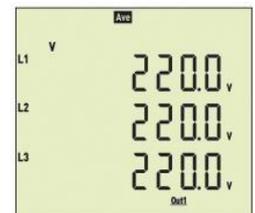


Figure-6

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 DOWN button.

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

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

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

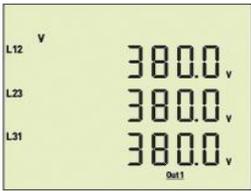


Figure-7



Figure-8

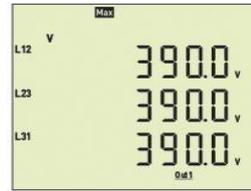


Figure-9

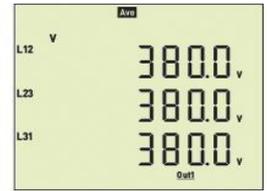


Figure-10

Figure-7: It shows the phase-phase voltage values. The figure-8 is displayed when you press DOWN button.
Figure-8: It shows the phase-phase minimum voltage values. The figure-9 is displayed when you press DOWN button.
Figure-9: It shows the phase- phase maximum voltage values. The figure-10 is displayed when you press DOWN button.
Figure-10: It shows the phase- phase mean voltage values. The figure-11 is displayed when you press DOWN button

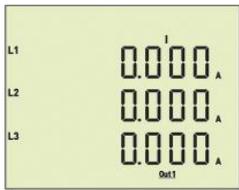


Figure-11

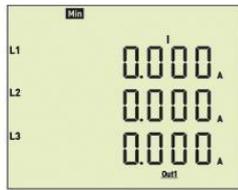


Figure-12

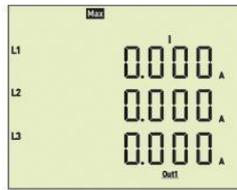


Figure-13

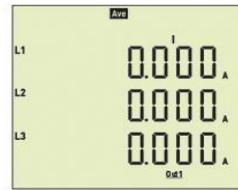


Figure-14

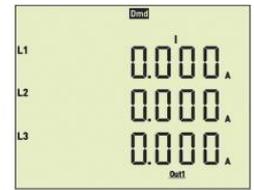


Figure-15

Figure-11: It shows the current values of each phase. The figure-12 is displayed when you press DOWN button.
Figure-12: It shows the minimum current values of each phase. The figure-13 is displayed when you press DOWN button.
Figure-13: It shows the maximum current values of each phase. The figure-14 is displayed when you press DOWN button.
Figure-14: It shows the mean current values of each phase. The figure-15 is displayed when you press DOWN button.
Figure-15: It shows the current demand current values of each phase. The figure-16 is displayed when you press DOWN button.

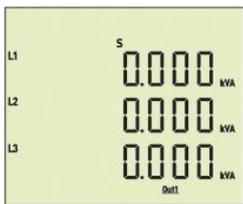


Figure-16

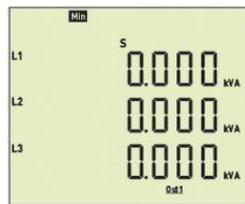


Figure-17

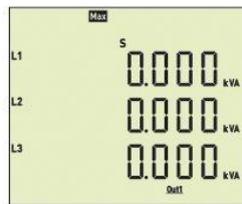


Figure-18

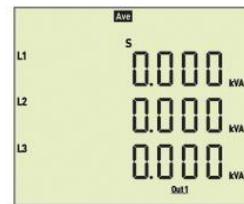
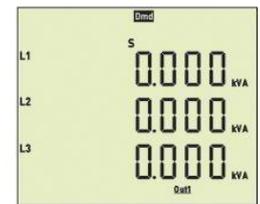


Figure-19



Şekil-20

Figure-16: It shows the apparent power values of each phase. The figure-17 is displayed when you press DOWN button.
Figure-17: It shows the minimum apparent power values of each phase. The figure-18 is displayed when you press DOWN button.
Figure-18: It shows the maximum apparent power values of each phase. The figure-19 is displayed when you press DOWN button.
Figure-19: It shows the mean apparent power values of each phase. The figure-20 is displayed when you press DOWN button.
Figure-20: It shows the apparent power demand values of each phase. The figure-21 is displayed when you press DOWN button.

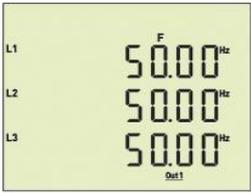


Figure-21



Figure-22



Figure-23

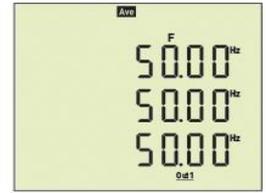


Figure-24

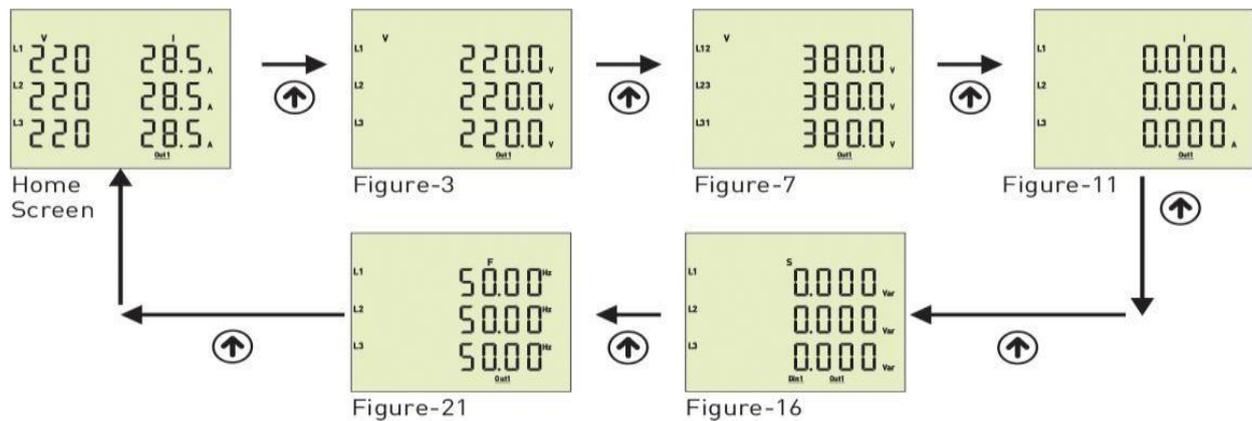
Figure-21: It shows the frequency values of each phase. The figure-22 is displayed when you press DOWN button.

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

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

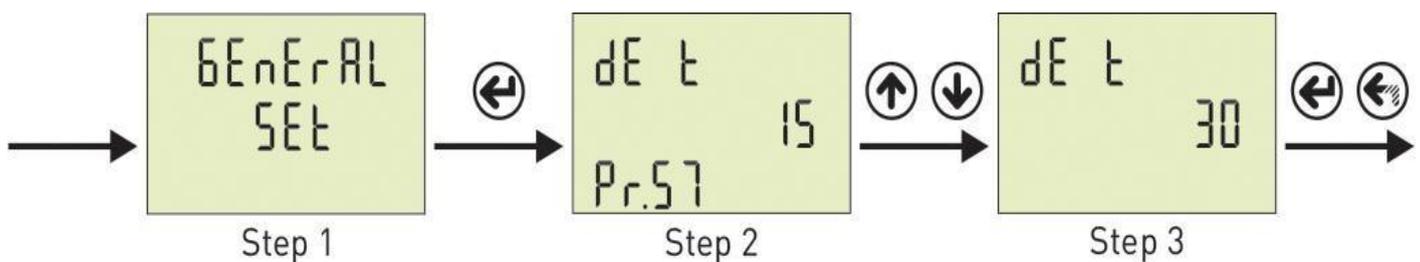
Figure-24: It shows the mean frequency values of each phase. The Home Screen is displayed when you press DOWN button.

5.6. To Advance in Display Inventory:



The Home screen is displayed when the device is energized. When you press 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 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 UP button. If you want to see values of min, max, mean and demand you can use down button. If you want to go back to home screen from 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.57 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.56 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

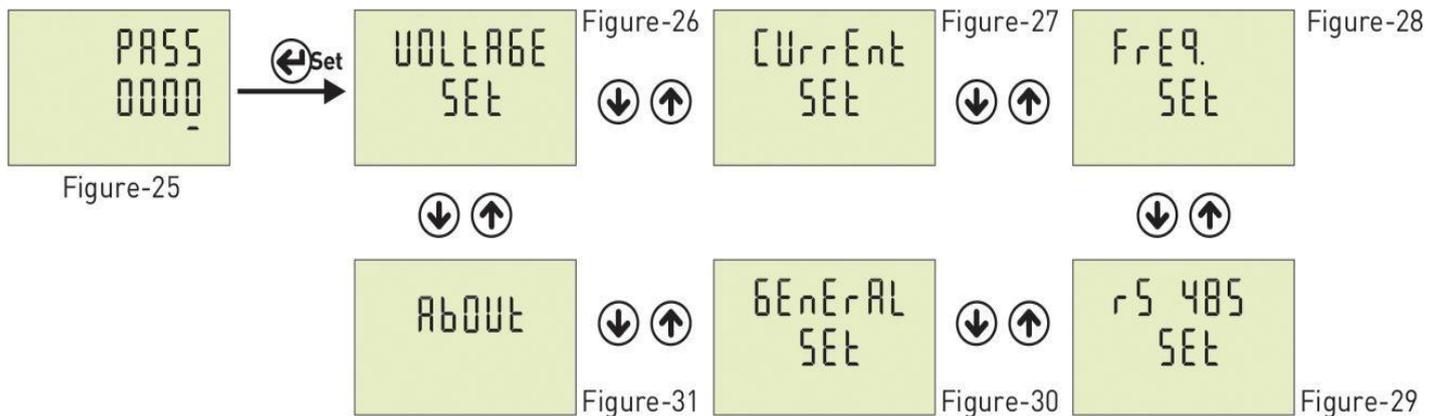


Figure-25: Press Menu button to enter password section. The figure-26 is displayed when you enter password and press the Menu button.

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 gives an information about device serial number and version number. You can use ESC button for exit menu.

5.10. Voltage Settings:



Figure-26

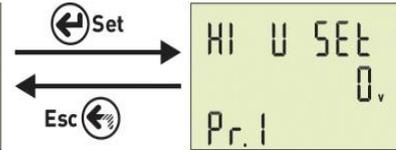


Figure-32

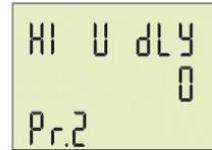


Figure-33

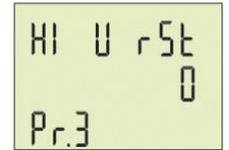


Figure-34

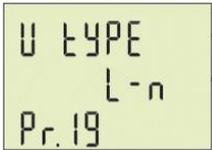


Figure-50

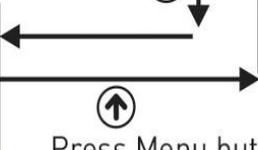


Figure-32

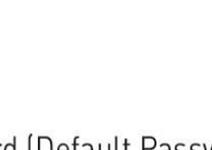


Figure-33

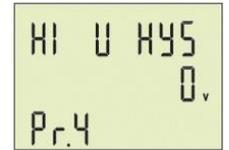


Figure-35



Figure-49

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-36

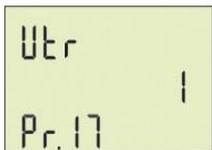


Figure-48

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-37



Figure-47

- Pr.1:** High Voltage Protection Value
- Pr.2:** High Voltage Protection Delay time
- Pr.3:** High Voltage Protection Reset time
- Pr.4:** High Voltage Protection Hysteresis
- Pr.5:** High Voltage Protection Enable/Disable
- Pr.6:** Low Voltage Protection Value
- Pr.7:** Low Voltage Protection Delay time
- Pr.8:** Low Voltage Protection Reset time
- Pr.9:** Low Voltage Protection Hysteresis
- Pr.10:** Low Voltage Protection Enable/Disable
- Pr.11:** Voltage Asymmetry Protection Value
- Pr.12:** Voltage Asymmetry Protection Delay Time
- Pr.13:** Voltage Asymmetry Protection Reset Time
- Pr.14:** Voltage Asymmetry Protection Hysteresis
- Pr.15:** Voltage Asymmetry Protection Enable/Disable
- Pr.16:** Voltage Auto Reset Enable/Disable
- Pr.17:** Voltage Transformer Ratio
- Pr.18:** Voltage Fuses Enable/Disable
- Pr.19:** Voltage Protection Type

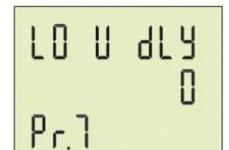


Figure-38



Figure-46



Figure-39

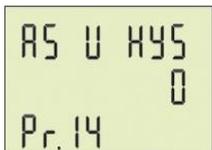


Figure-45

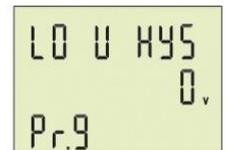


Figure-40



Figure-44

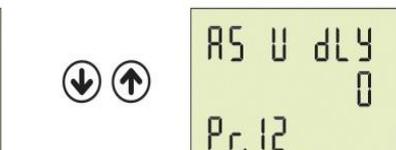


Figure-43

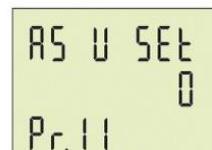


Figure-42



Figure-41



Figure-32

Pr.1 : High Voltage Protection Value: Determines the maximum operating voltage value of load.

Default: 250V, **Min:** 1V, **Max:** 300V

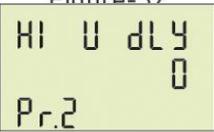


Figure-33

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.

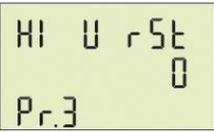


Figure-34

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.

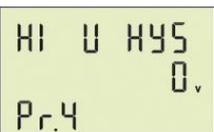


Figure-35

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

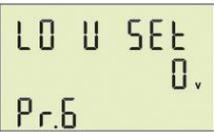


Figure-37

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

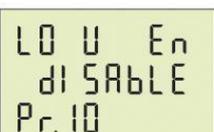


Figure-41

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

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

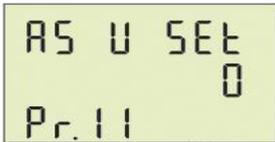


Figure-42

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 = [(Highest Voltage – Lowest Voltage) / Highest Voltage] x 100
Default: %20, **Min:** %5, **Max:** %30

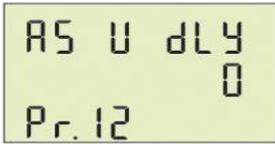


Figure-43

Pr.12: Voltage Asymmetry Protection Delay time: Determines delay open time. Delaytime 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.

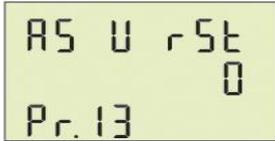


Figure-44

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.

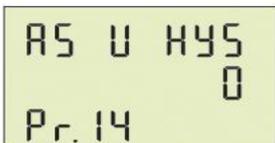


Figure-45

Pr.14: Voltage Asymmetry Protection Hysteresis: Required hysteresis voltage for voltage asymmetry warning is programmed.

Default: %2, **Min:** %1, **Max:** %10

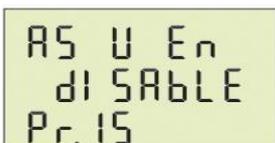


Figure-46

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

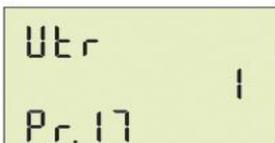


Figure-48

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

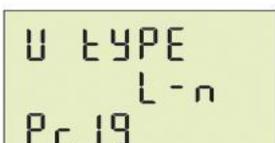


Figure-50

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

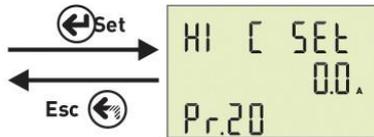


Figure-51

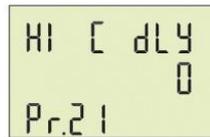


Figure-52

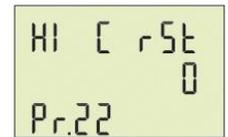


Figure-53

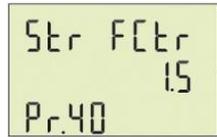


Figure-71

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.

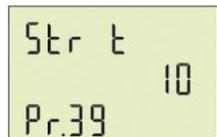


Figure-70



Figure-54



Figure-69



Figure-55



Figure-68



Figure-56

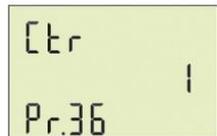


Figure-67



Figure-57



Figure-66

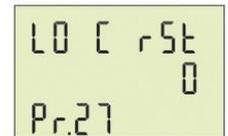


Figure-58



Figure-65



Figure-59

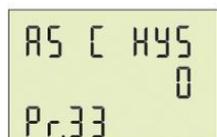


Figure-64

- 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

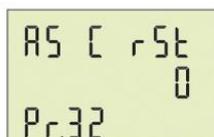


Figure-63



Figure-62



Figure-60

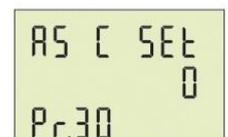


Figure-61

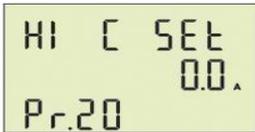


Figure-51

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

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

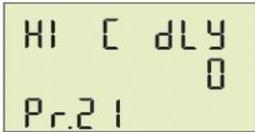


Figure-52

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.

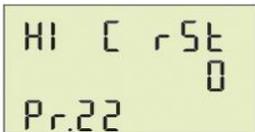


Figure-53

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.

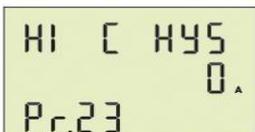


Figure-54

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

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

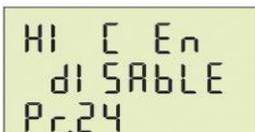


Figure-55

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

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

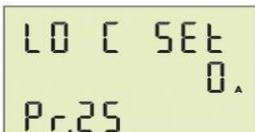


Figure-56

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

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

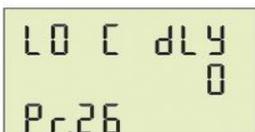


Figure-57

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.

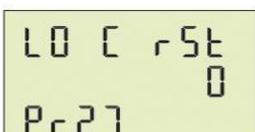


Figure-58

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.

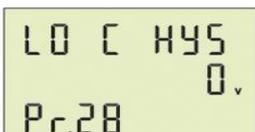


Figure-59

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

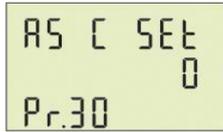


Figure-61

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

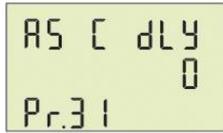


Figure-62

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.

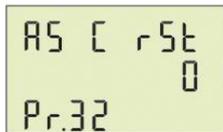


Figure-63

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.

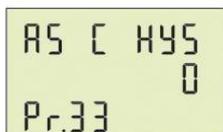


Figure-64

Pr.33: Current Asymmetry Protection Hysteresis: Required hysteresis current for current asymmetry warning is programmed.
Default: %3, Min: %1, Max: %20

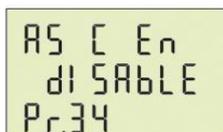


Figure-65

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

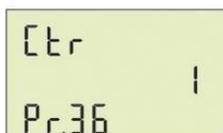


Figure-67

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



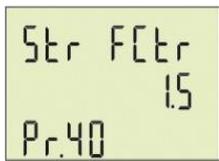
Figure-69

Pr.38: Demurrage Protection Enable/Disable: Determines Enable or Disable the demurrage protection.
Default: Enable, Min: Disable, Max: Enable



Figure-72

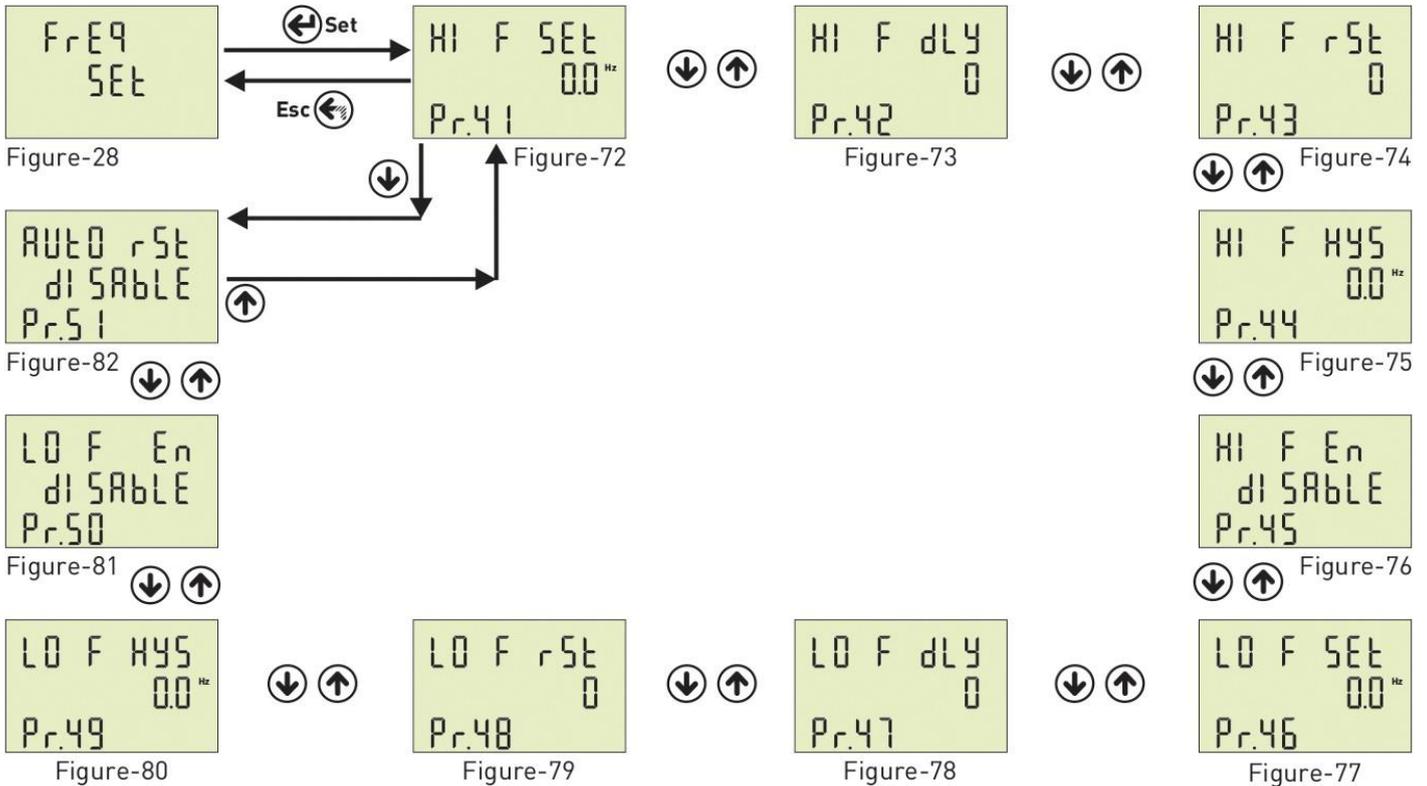
Pr.39: Demurrage Protection Time: Demurrage time is used to prevent from faulty switching caused by motor Demurrage current. In this period, demurrage is controlled by device.
Default: 10, Min: 1, Max:100



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 has 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

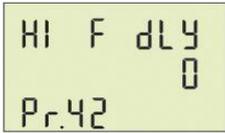


Figure-73

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.

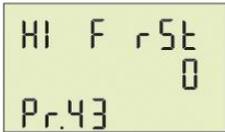


Figure-74

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.

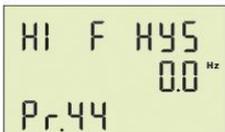


Figure-75

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

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

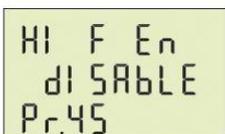


Figure-76

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

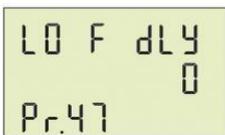


Figure-78

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.

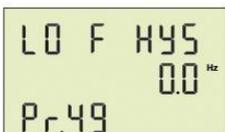


Figure-80

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 outputswitches on at the end of the Reset time. If Auto reset is disable, after all frequency areover/below hysteresis value, relay output switches manually. (Using ESC button).

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

5.13. RS485 Settings:



Figure-29

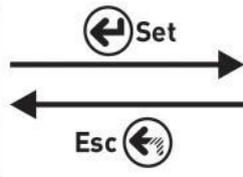


Figure-83



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) is displayed. This menu has 2 different current set values. 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.

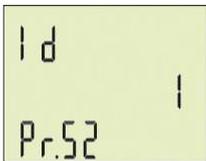


Figure-83

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

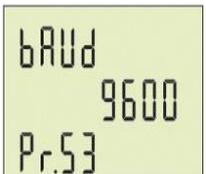


Figure-84

Pr.53: Baud rate Selection: determines Modbus communication speed.
Default: 9600bps, Min: 1200bps, Max: 38400bps

Note: **Stop bits: 1, Parity: none and Databits:8**

5.14. General Settings:

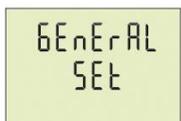


Figure-30

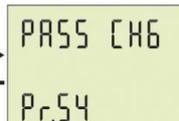
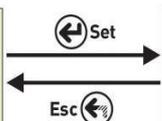


Figure-85

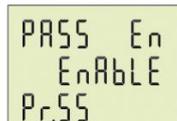


Figure-86

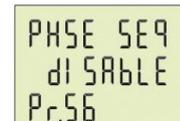


Figure-87

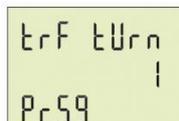


Figure-90

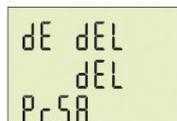


Figure-89

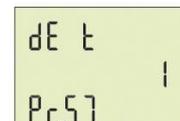


Figure-88

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 has 6 different current set values. 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.

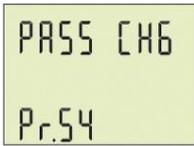


Figure-85

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

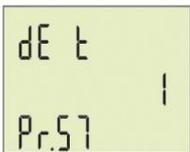


Figure-88

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.

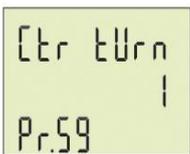


Figure-90

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

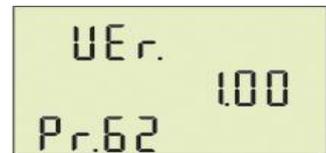


Figure-92

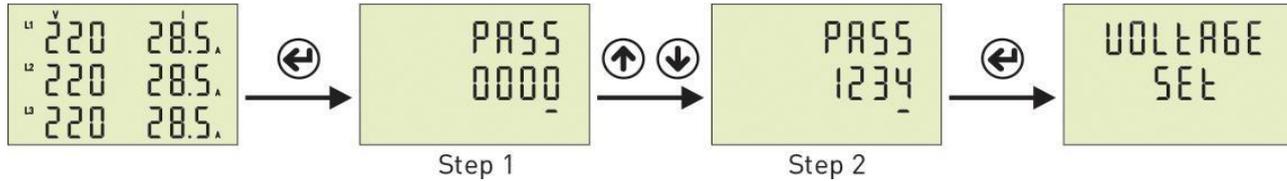
Press Menu button and enter password to enter program list. The figure-26 (Voltage SET) is displayed when you enter password and press the Menu button. The figure-27 (Current SET) is displayed when you press the up button. The figure-28 (Frequency SET) is displayed when you press the up button. The figure-29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

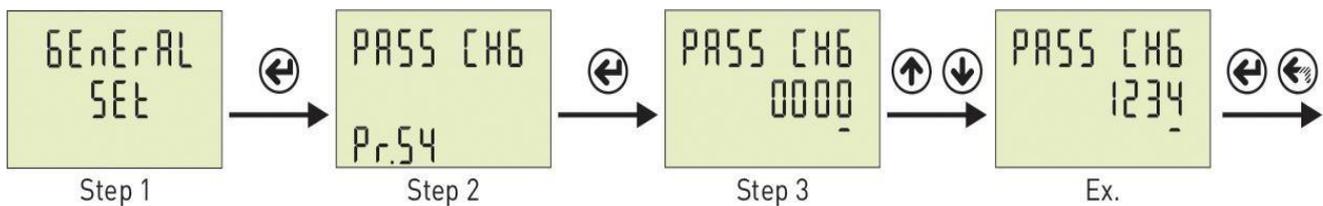


Step 1: Press "SET" button for entering menu.

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 changed. You can increase digit value using "Up" button. Press "Set" button after enter the user password. To get back to home screen press "ESC" button.

Default password is "0000".

5.17. Changing Password:

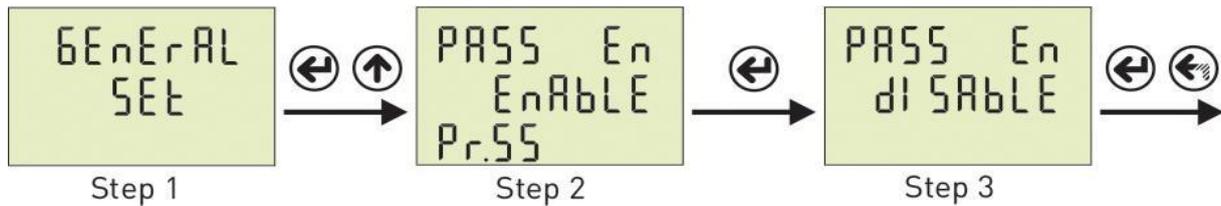


Step 1: Press Menu button and enter password to enter program list. The Voltage SET is displayed when you enter password and press the Menu button. Press "Up" button until you see the General SET

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 change 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:

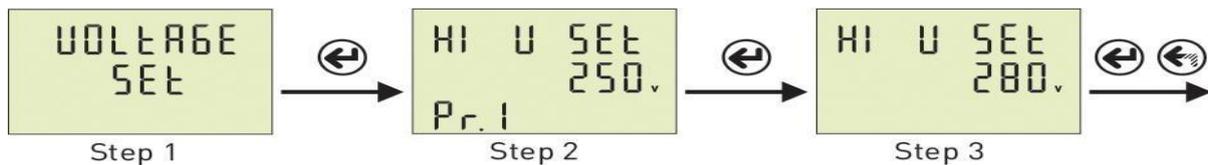


Step 1: Press Menu button and enter password to enter program list. The Voltage SET is displayed when you enter password and press the Menu button. Press “Up” button until you see the General SET

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 :



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.

Figure-26



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.

Figure-32



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)

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 touse 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 thePr.6 (figure-37)

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 thePr.9 (figure-40)

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 touse 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)

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 touse 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.

Figure-26



"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 includes set of high/low current protection, current transformer ratio and demurrage settings.

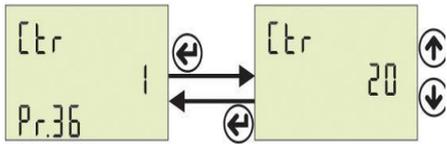


Figure-67

Pr.36 is used to set current transformer ratio. You can increase/decrease value using 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).

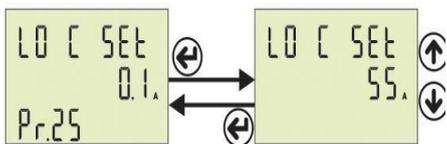


Figure-56

Pr.25 is used to set 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)

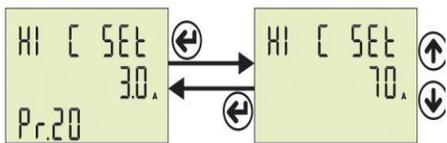


Figure-51

Pr.20 is displayed when you press the "SET" button and press "Up" button. You will see Pr.20 (Figure-51). It is used to set high current protection. You can increase/decrease value using Up/Down button. You can use "SET" button to save. Press "Up" button until you see the Pr.39 (figure-70).

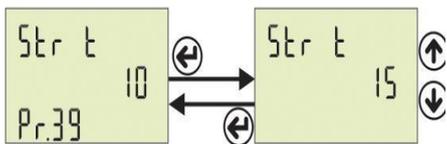


Figure-70

Pr.39 is used to set demurrage time. It is deleted from screen when you press the "SET" button. You can increase/decrease value using 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).

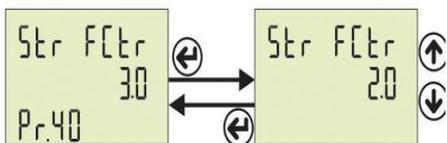


Figure-71

Pr.40 is used to set 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 to go back to home screen.



Figure-27

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

6.1. AVR Internal Structure

10-150kVA

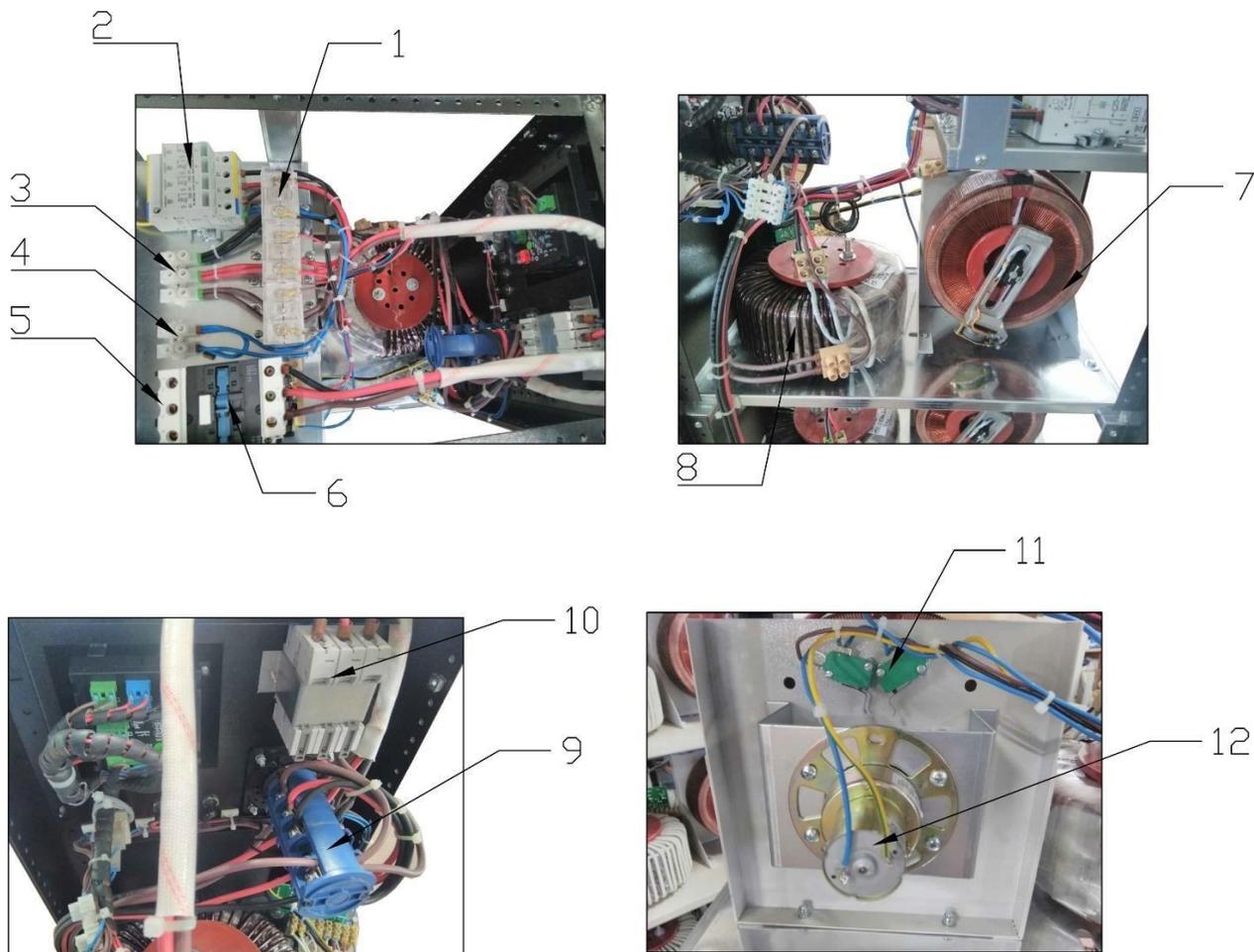


Image -10.1

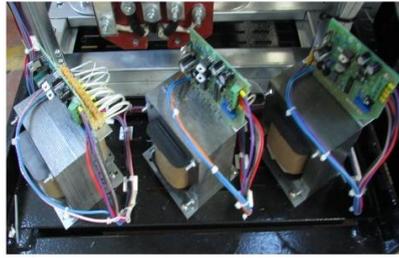
Image-10.1

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

200-400kVA



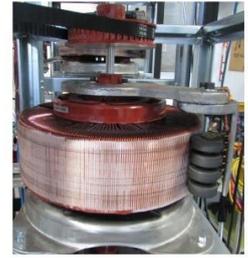
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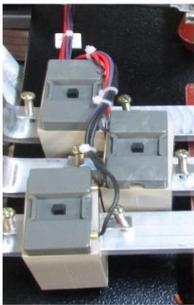
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3



4



5



6



7

Image -10.2

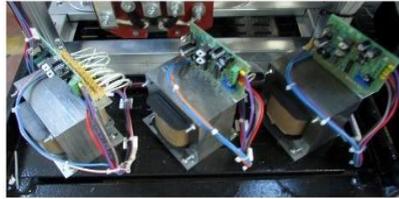
Image-10.2

1	Contactors
2	Control Boards
3	DC Motor
4	Variac transformer
5	Current transformer
6	Balance transformers
7	Booster transformer

500-800kVA



1



2



3



4



5



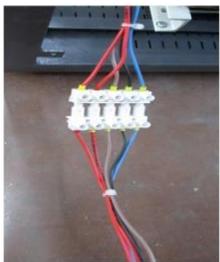
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7



8



9

Image -10.3

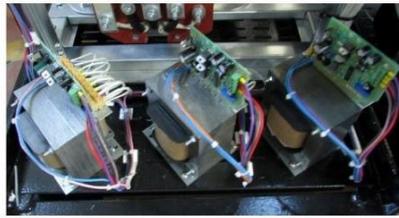
Image-10.3

1	Contactors
2	Control Boards
3	DC Motor
4	Variac transformer
5	Current transformer
6	Balance transformers
7-8	Booster transformer
8	Connection terminal

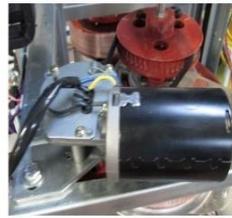
1000-3000kVA



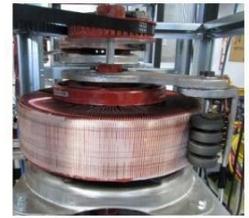
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2



3



4



5



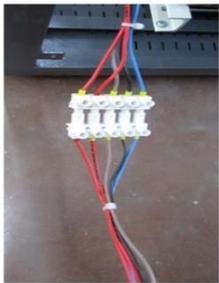
6



7



8



9

Image -10.4

Image-10.4

1	Contactor
2	Control Boards & circuit transformer
3	DC Motor
4	Variac transformer
5	Current transformer
6	Balance transformers
7	Power connection
8	Booster Transformer
9	Connection terminal

6.2. Control Board and Assembly

10-150kVA

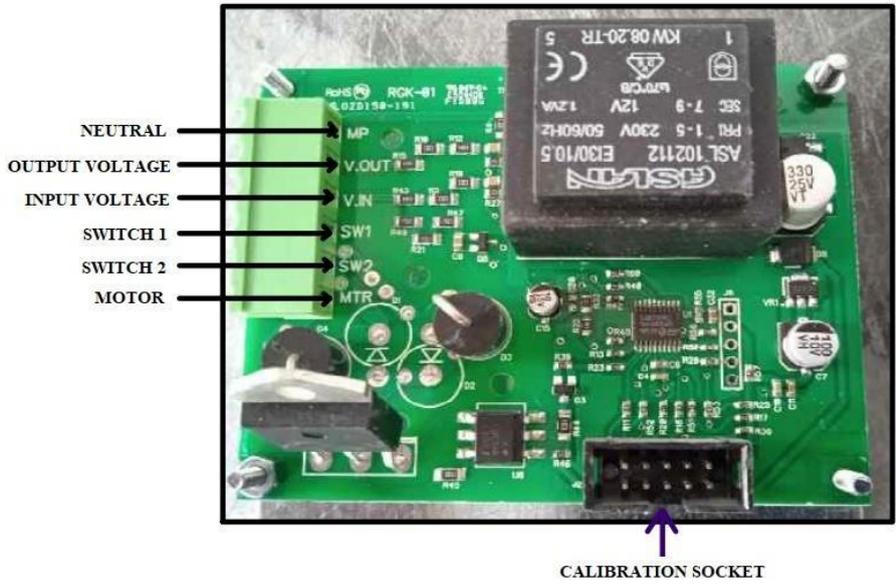


Image-11-1

200-3000kVA

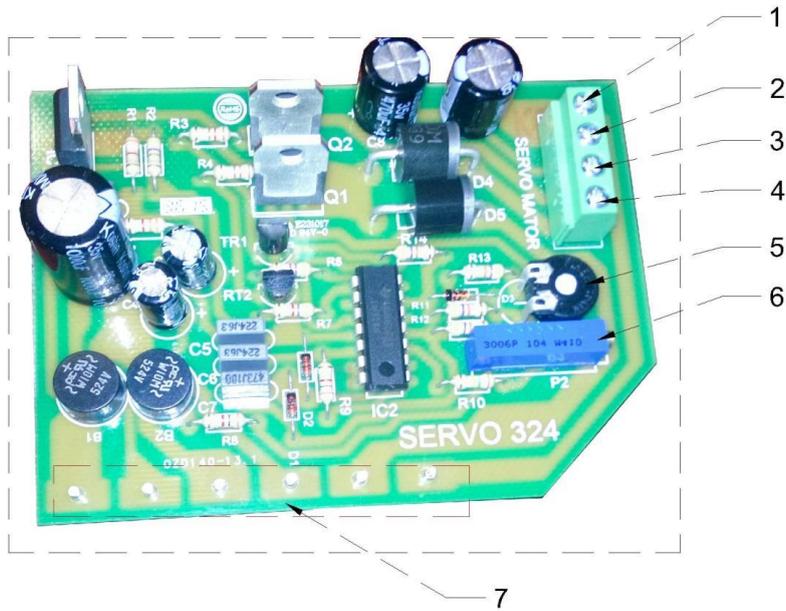
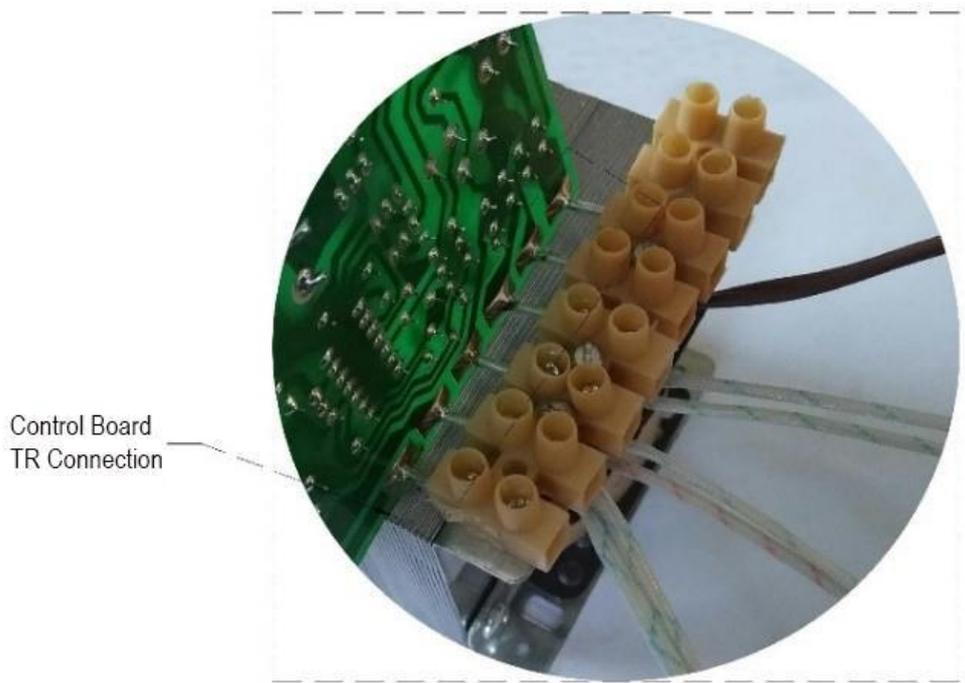
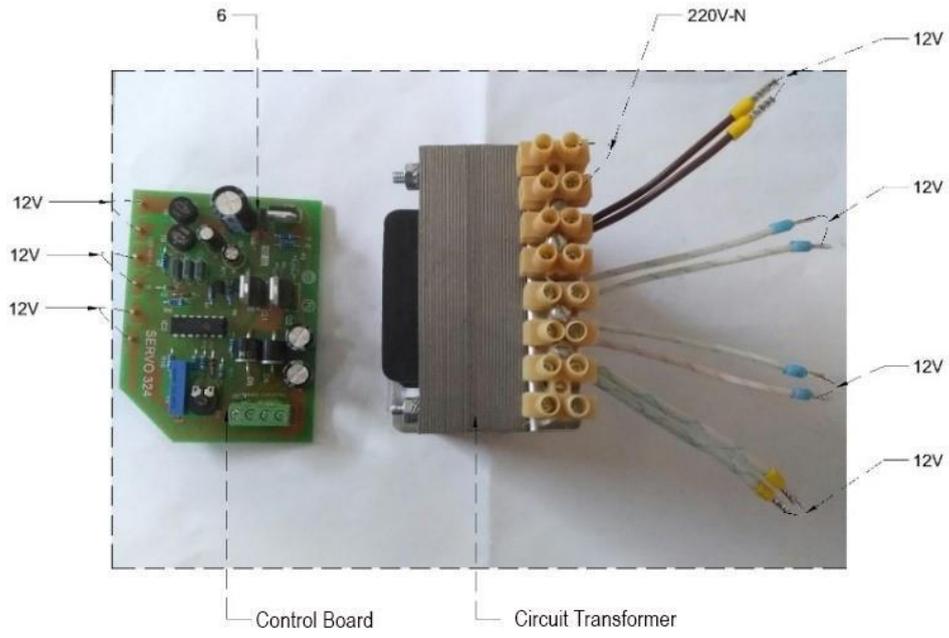


Image-11-2

1	Motor
2	Limit switch – common pin
3	Limit switch 1
4	Limit switch 2
5	Output voltage accuracy setting
6	Output voltage setting
7	Circuit transformer connection pins

THREE-PHASE ELECTROMECHANICAL VOLTAGE STABILIZER
SET-EM 04-14



6.3. Possible Malfunctions and Troubleshooting

Malfunction	Possible Causes	Troubleshooting
If voltmeter retrieves incorrectly	Voltmeter Malfunction	If voltmeter is digital, please check the socket. If it is analogue, please replace with new one
	Control Board Malfunction	Check the neutral connections. If problem continues, please contact technical service
If smell from device	Overloaded	Check the loads on phases. Switch the device to Line position and contact technical service
If device retrieves Voltage incorrectly	If the device at protection position	Check the cartridge fuse. Phase may 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 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	Overload, Motor connections could be loosened	Switch the changeover switch to by-pass position and contact to your supplier or Technical service giving the required information below: - Serial No and Power - Malfunction Date

ATTENTION!

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

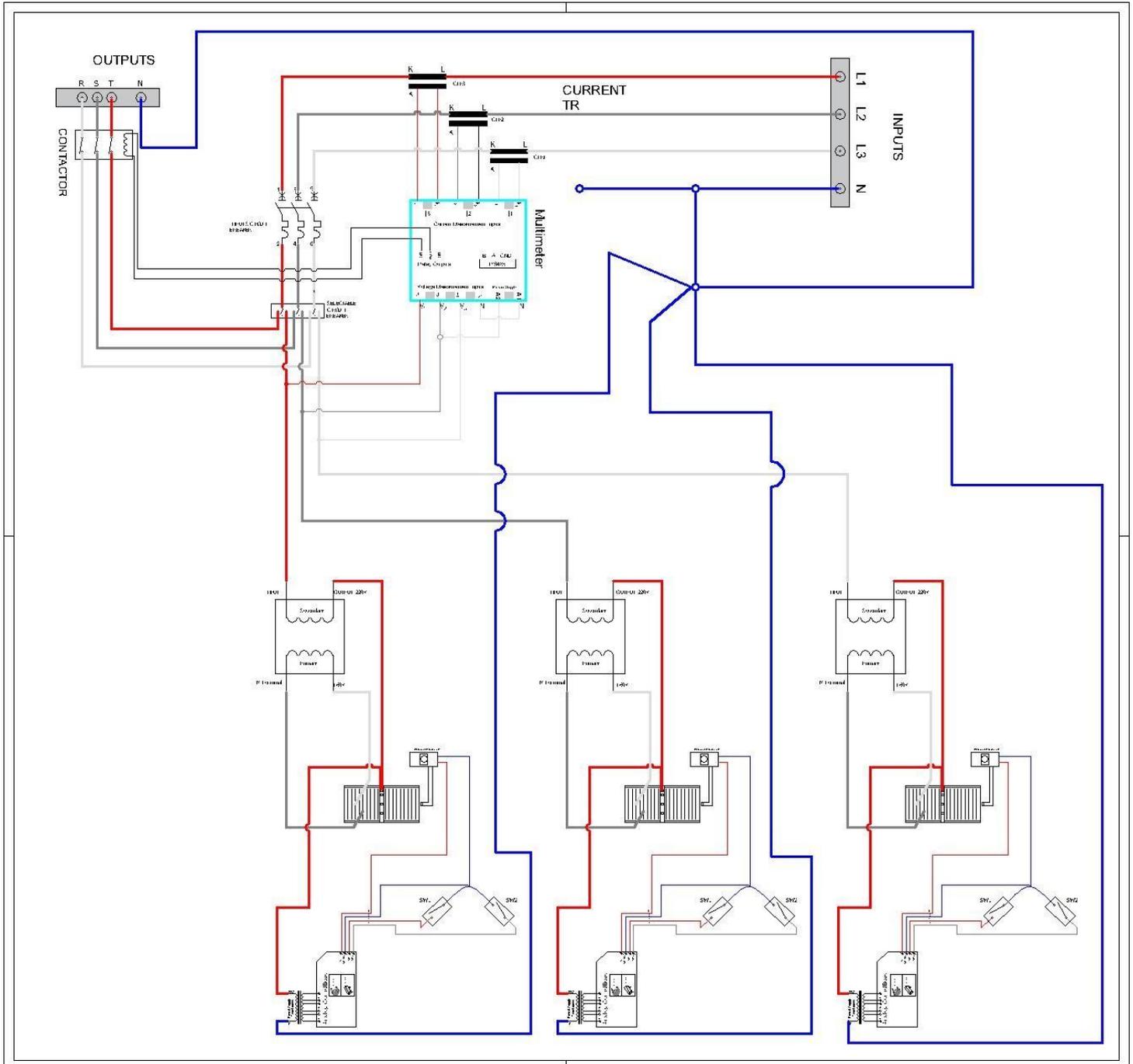
7. TECHNICAL SPECIFICATIONS

CODE SET-EM	04	05	06	08	09	11	12	13	14
Power (KVA/KW)	10/10	15/15	22/22	30/30	45/45	60/60	75/75	100/100	150/150
INPUT									
Input voltage	400Vac 3ph + N								
Voltage range	300Vac ~ 460Vac [other ranges available on request, like 190-415 and 310-485]								
Input frequency	47 : 64 Hz								
OUTPUT									
Output voltage	400Vac (adjustable 380:415V)								
Output accuracy	± 1%								
Output current A	15	21	32	43	65	86	108	144	217
Overload capacity	200% load for 10" / 150% load for 2'								
Output frequency	47 : 64 Hz (same as input frequency)								
Power factor	1								
Regulation Speed	90V / sec								
Efficiency	min. 97%								
Load max unbalance	100%								
Display	Digital instrument with output voltage/current/power reading on each phase and chained Digital voltmeters reading input phase voltage								
PROTECTIONS									
Input protections	Automatic circuit breaker								
Output protections	Short circuit, low-high current, low-high voltage, low-high frequency, phase sequence, inrush current via output contactor								
By-Pass	Manual By-pass included								
MCB output	Optional								
MCB input	Included								
OTHER DATA									
Cooling	Forced ventilation regulated by internal thermostat								
Protection class	IP20 (higher protections available on request)								
Max ambient temp.	-10° C ~ +40° C								
Altitude	1000 mt above sea level								
Relative humidity	95% (without condensation)								
Acoustic pressure	< 50dB								
Colour	RAL7035								
Dimensions WxDxH cm	40x63x116		40x63x127		60x88x139			66x94x165	120x84x185
Weight kg.	115	125	140	165	200	290	320	360	575

Technical data and images are indicative only and may be changed at any time without notice

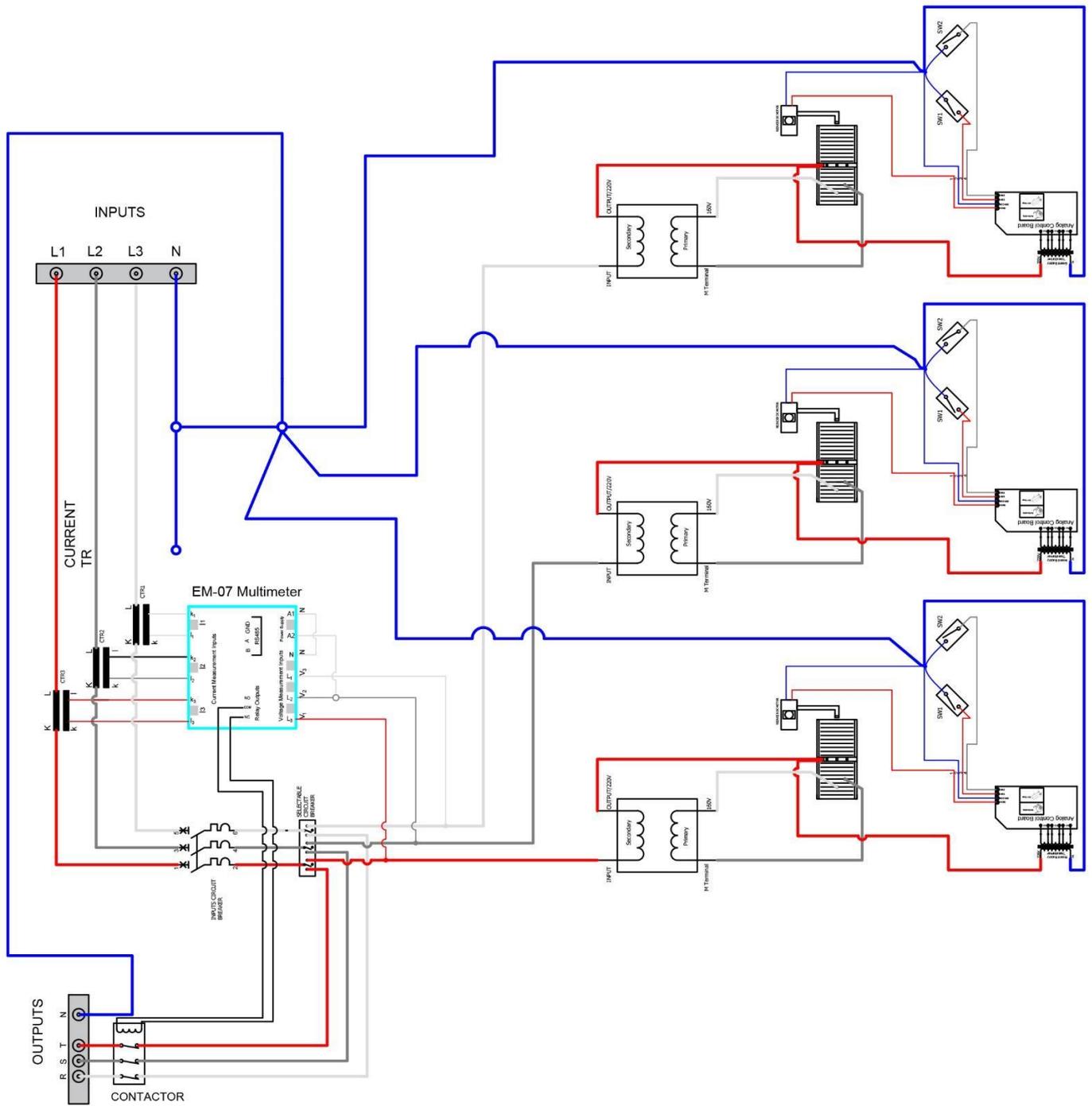
Three Phase Electrical Connection Diagram

10-150KVA



Three Phase Electrical Connection Diagram

200-3000KVA



Product images



10-150kVA models



200-400kVA models



500-800kVA models



1000-3000kVA models



Naicon

UNIT



Diloc



Elsist

