

# THREE-PHASE ELECTROMECHANICAL VOLTAGE STABILIZER

## SET 04-18 EM



## 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

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

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.

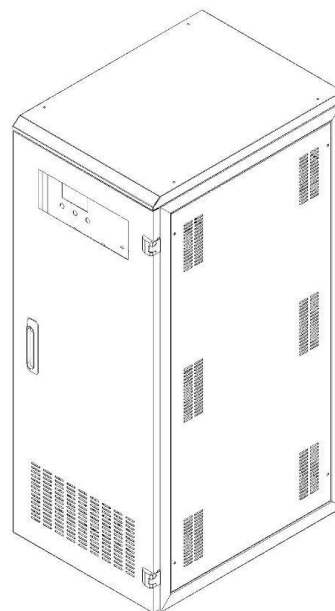
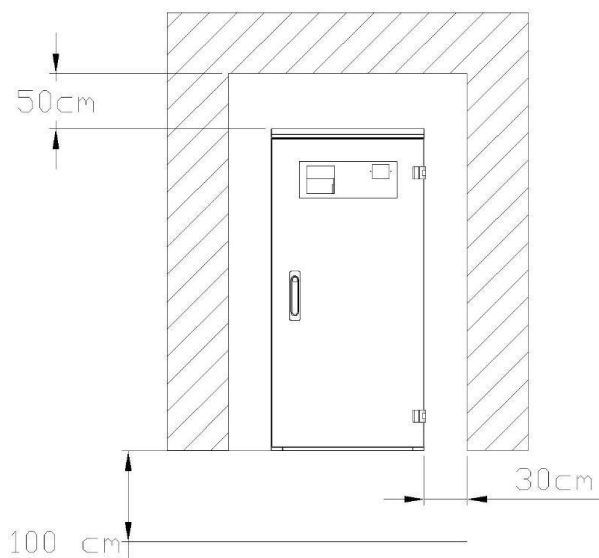


Image-1.1 models up to 150kVA

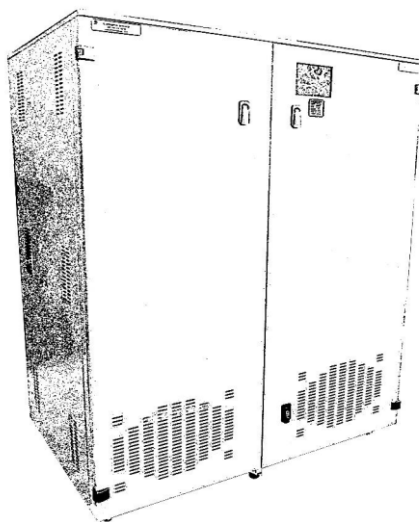


Image-1.2 models from 200 to 400kVA

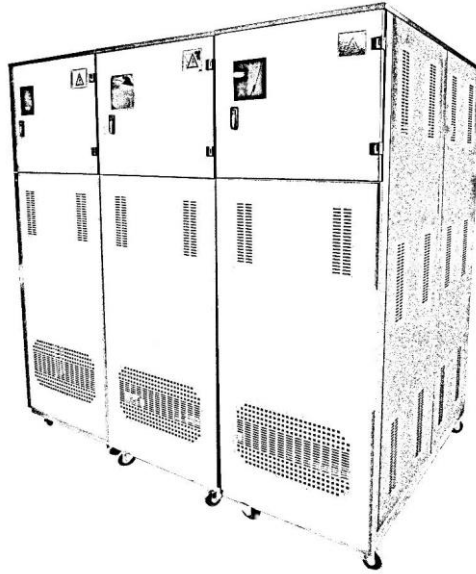


Image-1.3 models from 400 to 800kVA

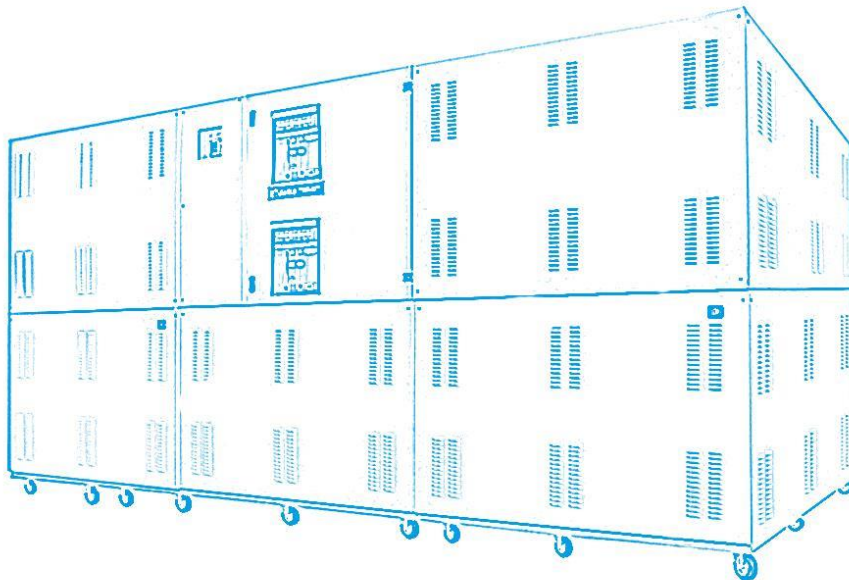


Image-1.4 models from 1000 to 3000kVA

#### 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  $-25^{\circ}\text{C}$  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

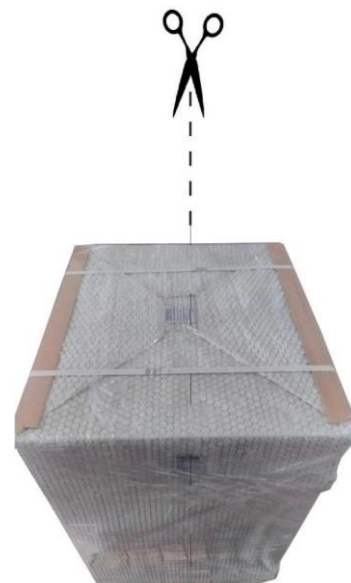


image-2



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

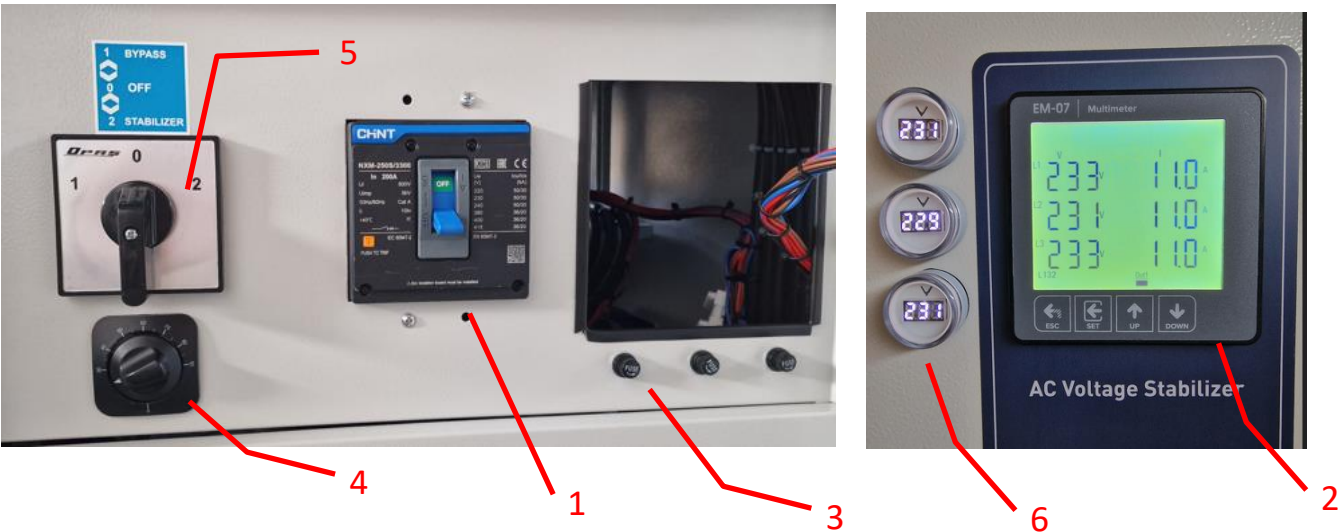


image-3.1

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

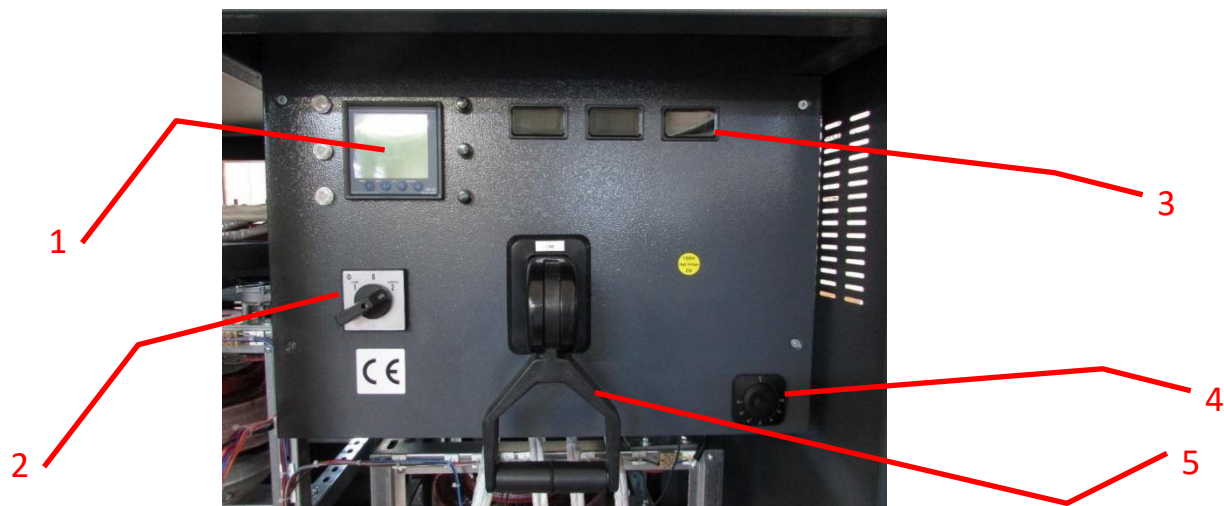


image-3.2

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

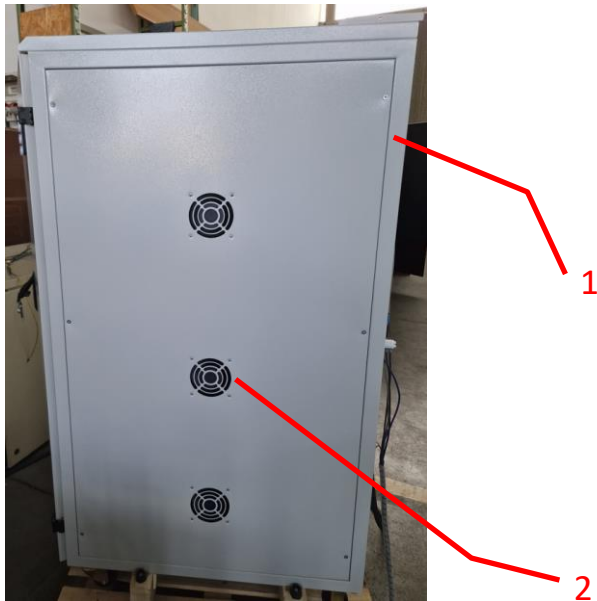


Image-4.1

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

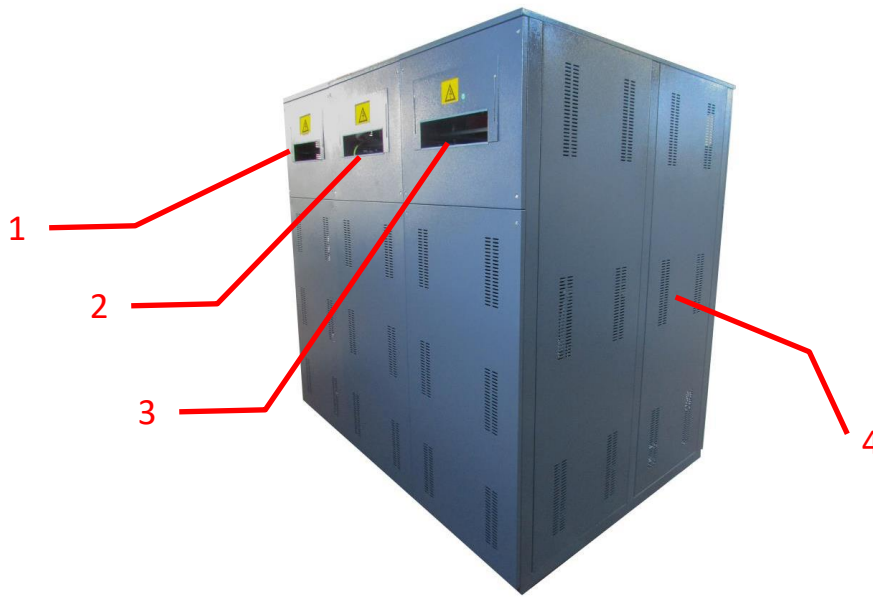


Image-4.3

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)

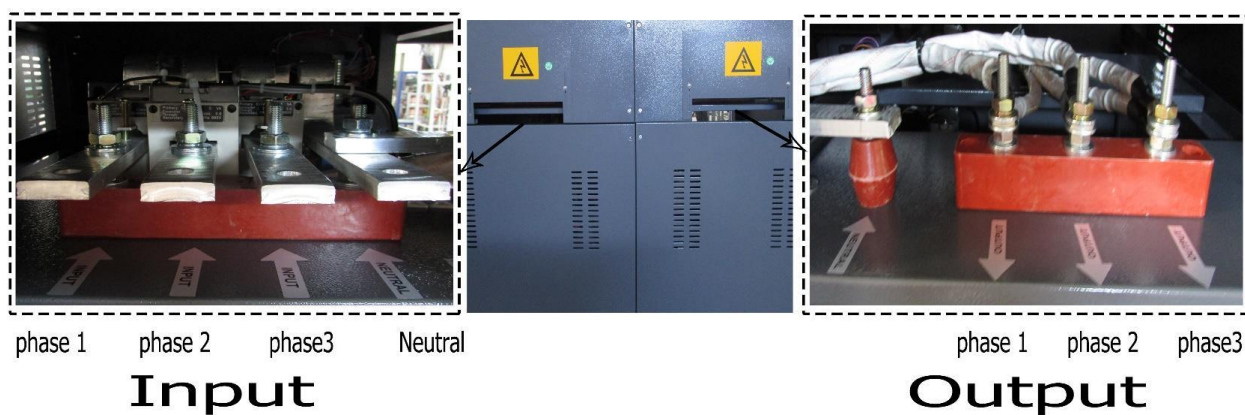


Image-5.2

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

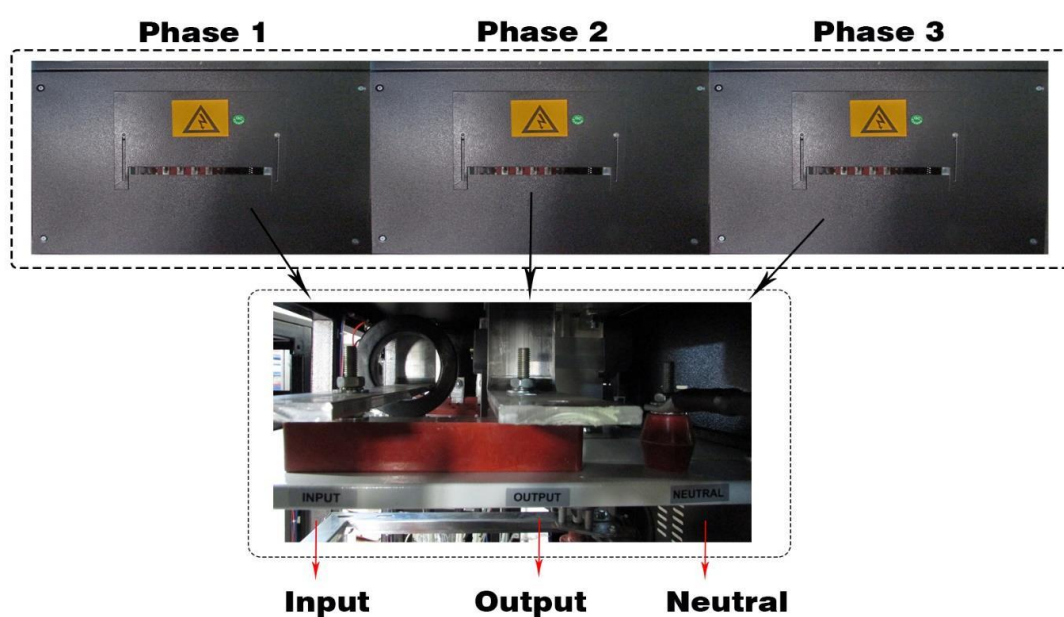
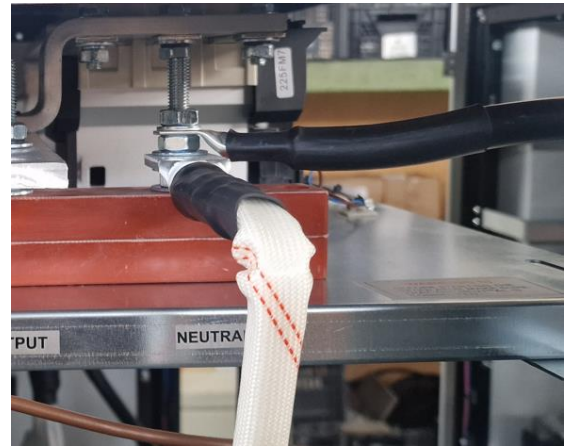


Image-5.3

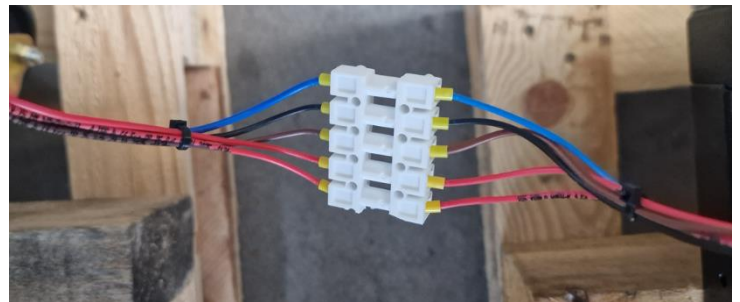


- POSITION UNITS 1-2-3 FROM LEFT TO RIGHT LEAVING A SPACE BETWEEN
- CONNECT THE NEUTRAL TERMINALS OF EACH MODULE WITH THE NEUTRAL CABLES AND BOLTS PROVIDED, NEUTRAL L1 TO NEUTRAL L2, NEUTRAL L2 TO NEUTRAL L3



- CONNECT THE SIGNAL CONNECTORS L1 TO L2 AND L2 TO L3

It is now possible to join the three modules using the bolts supplied.



### 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.

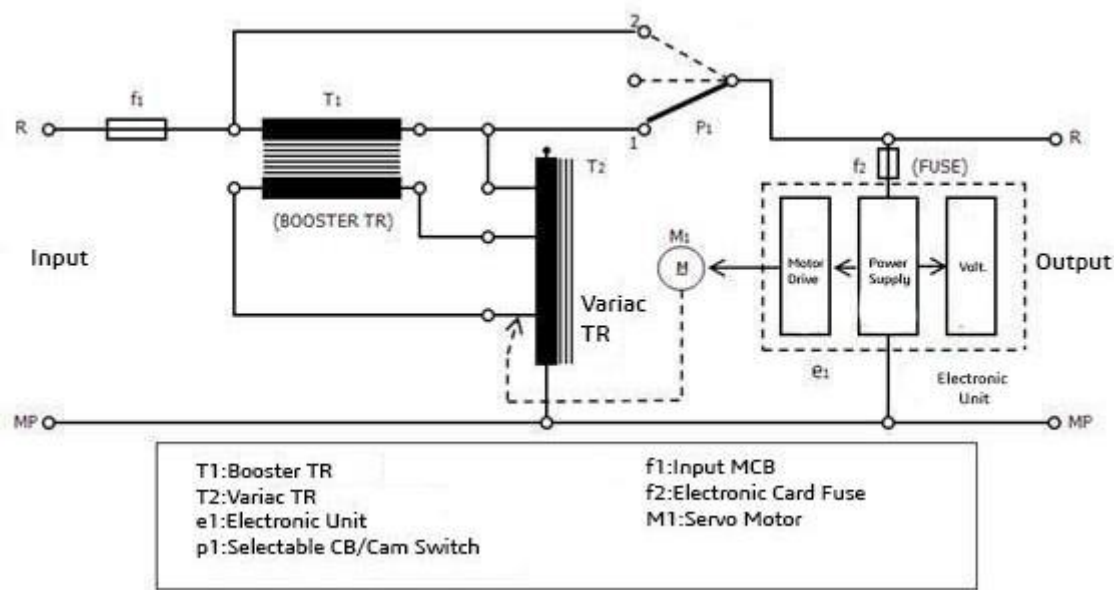


Before connecting the input cables, make sure the Automatic fuse in the distribution panel is in "OFF" position.

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.



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



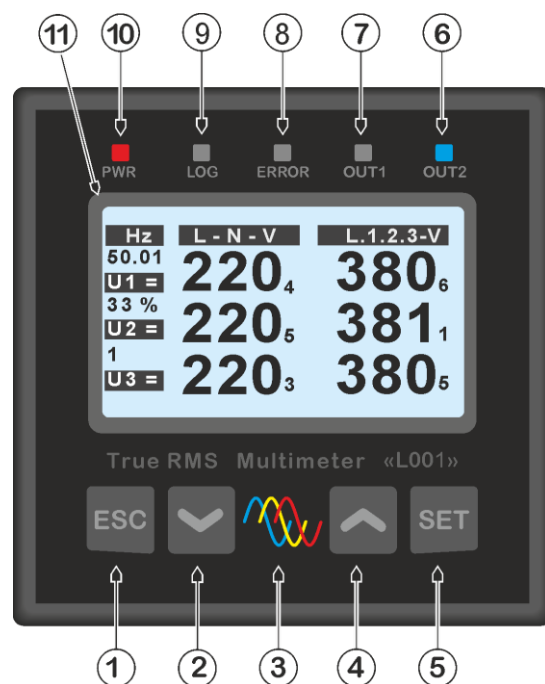
**Multimeter « L-001 »**  
**Technical Instructions and User Manual**

### Purpose of the measuring device

This digital multimeter is designed to measure, analyse, and protect the loads connected to three-phase AC electrical networks. Equipped with the latest technology, this device comes with user-friendly menus and all the necessary features. All the information and warnings you need to know about the device are detailed in the user manual. Please, for the safety of your system and yourself, read this manual carefully before operating the device. If there are any unclear issues, do not proceed without contacting our company.

### General Structure

The device is manufactured in a durable plastic case with dimensions of 96x96 mm. The front panel features five warning LEDs, four buttons, and a graphic display with a resolution of 128x64 pixels. The main monitoring page of the device is shown in Picture 2. The rear panel includes four 5.08 mm socket female terminals for easy connection, on which empty male terminals are mounted. The device is equipped with two sliding plastic lugs for easy mounting on the panel.



### Front Panel Description

1. ESC Button: Used to exit the settings menu.
2. ALT Button: Used to navigate between sub-menus.
3. LOGO: The logo of the device brand.
4. UP Button: Provides upward navigation through the menus.
5. SET Button: Used to save settings and confirm menu options.
6. Relay 2 LED (OUT2): Displays the status of the second relay output.
7. Relay 1 LED (OUT1): Displays the status of the first relay output.
8. Error LED (ERROR): Activates when there is an error in the system.
9. Data Recording (LOG): Indicates that measurement data is being recorded.
10. System Power Supply (PWR): Activates when the system has sufficient power supply.
11. Graphic Display (128x64): Shows measurement values and system information.

Rear Panel View and Description

- 1. Neutral Power Input: Used for the neutral connection to the device.
- 2. Power Input: Phase (25...350V) AC.
- 3. Common Relay Output: Common output point for relays.
- 4. Relay 2 Output: Used to activate various devices controlled by the system.
- 5. Relay 1 Output: Used to activate various devices controlled by the system.

Current Transformer Inputs (Phase 1, Phase 2, Phase 3):  
Separate current transformer inputs for each phase.

- 6. Phase 1 Current Transformer Input 1.
- 7. Phase 1 Current Transformer Input 2.
- 8. Phase 2 Current Transformer Input 1.
- 9. Phase 2 Current Transformer Input 2.
- 10. Phase 3 Current Transformer Input 1.
- 11. Phase 3 Current Transformer Input 2.

Voltage Measurement Inputs (for Phases and Neutral):  
Inputs for measuring voltages between phases and with neutral.

- 12. Neutral voltage measurement input for phases.
- 13. Phase 1 voltage measurement input.
- 14. Phase 2 voltage measurement input.
- 15. Phase 3 voltage measurement input.



Model and Features

There are four different models of the device, and each model has some specific features:

- L-001: Equipped with features for frequency, three-phase voltage, and three-phase current. Additional features such as Wi-Fi, temperature sensor, RS-485, and MODBUS-RTU are not available.
- L-002: Includes 3 x Heating sensors while retaining the other basic features.
- L-003 and L-004: Equipped with more advanced features and specifically designed for industrial use.

Model	Features							Note
	FREQUENCY	THREE PHASE VOLTAGE	THREE PHASE CURRENT	Wi - Fi	HEAT SENSOR FOR ALL THREE PHASES	RS-485	MODBUS-RTU	
L-001	✓	✓	✓					
L-002	✓	✓	✓		✓			
L-003	✓	✓	✓	✓	✓			
L-004	✓	✓	✓	✓	✓	✓		

## On the Main Screen, Monitoring Measurements

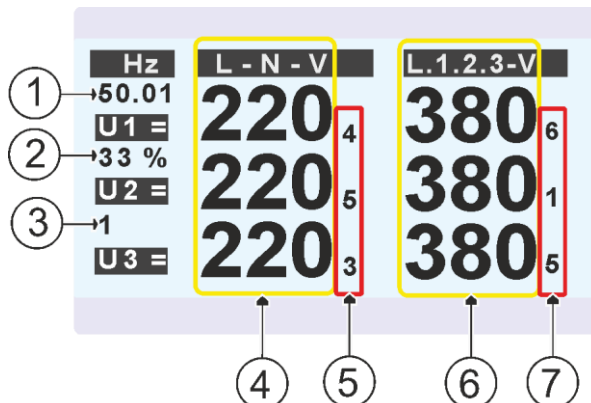
To monitor the parameters, the device has 11 different main monitoring pages available.

Transitions between pages are made by briefly pressing the 'UP' and 'DOWN' buttons.

The explanation of the values shown on the screen pages is as follows, showing the parameters and system information.

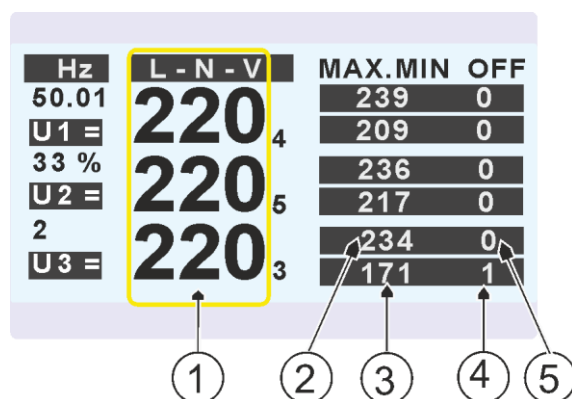
### Main Screen Page « 1 »

1. Network Frequency.
2. Three-Phase Current Percentage.
3. Screen Page Number.
4. Voltage Value Between Three Phases and Neutral.
5. Decimal Part of the Voltage Value Between Three Phases and Neutral.
6. Voltage Value Between Phases.
7. Decimal Part of the Voltage Value Between Phases.



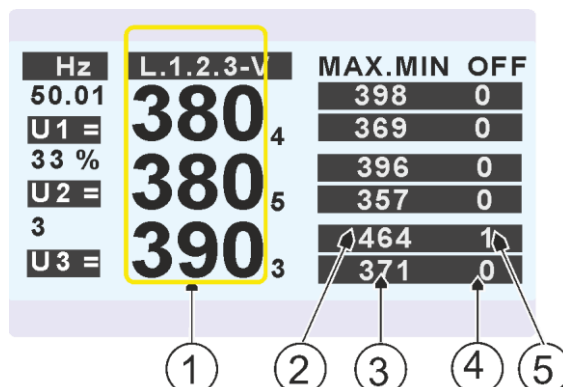
### Main Screen Page « 2 »

1. Voltage Value Between Three Phases and Neutral.
2. Highest Recorded Voltage Value Between Three Phases and Neutral.
3. Lowest Recorded Voltage Value Between Three Phases and Neutral.
4. Number of Voltage Interruptions Due to Low Voltage Between Three Phases and Neutral.
5. Number of Voltage Interruptions Due to High Voltage Between Three Phases and Neutral.



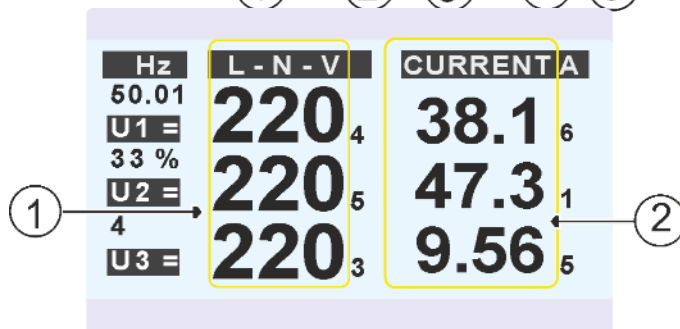
### Main Screen Page « 3 »

1. Voltage values between phases.
2. Highest recorded voltage value between three phases.
3. Lowest recorded voltage value between three phases.
4. Number of voltage interruptions due to low voltage between three phases.
5. Number of voltage interruptions due to high voltage between three phases.



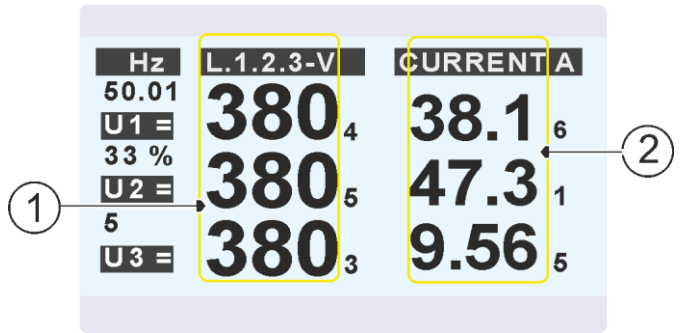
### Main Screen Page « 4 »

1. Voltage value between three phases and neutral.
2. Three-phase current value.



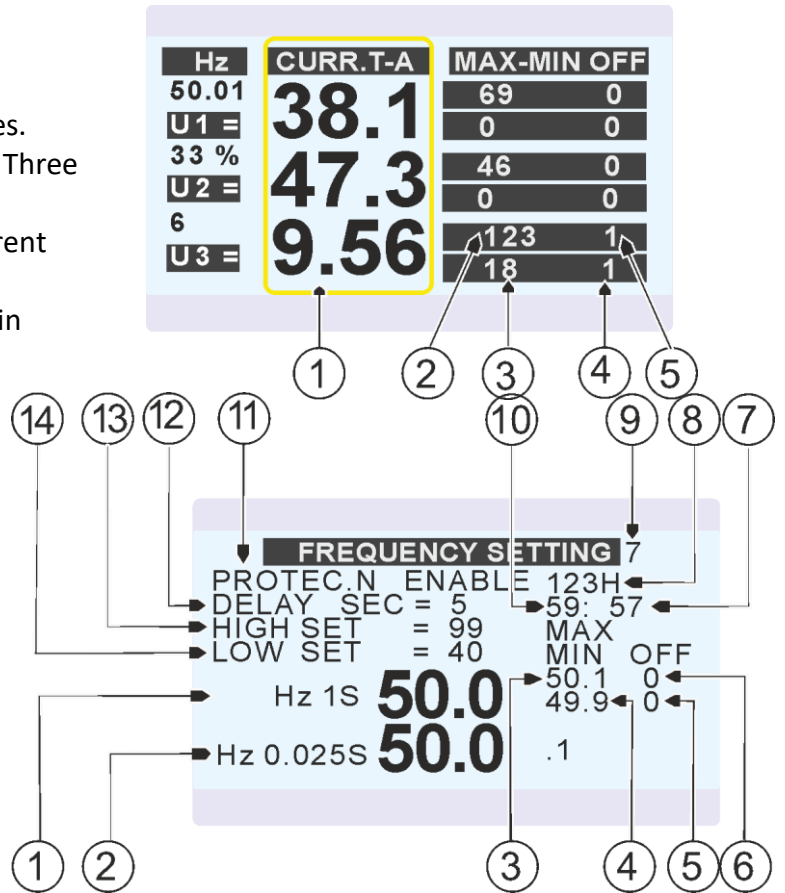
### Main Screen Page « 5 »

1. Voltage value between phases.
2. Current value.



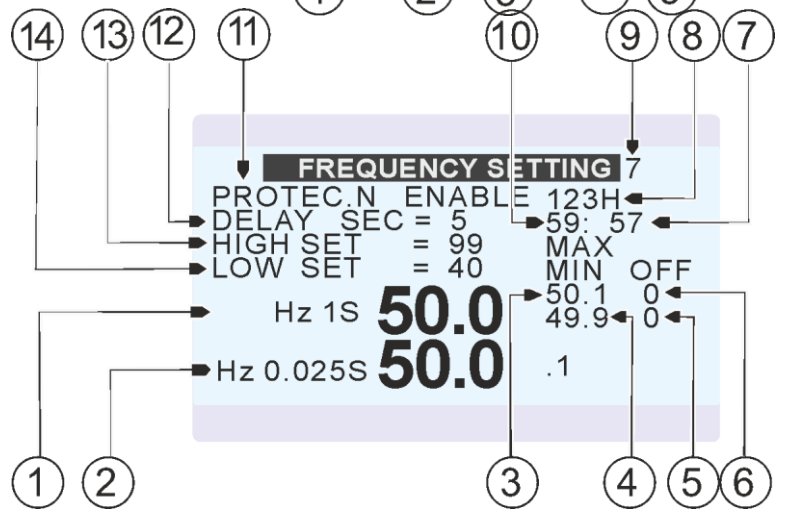
### Main Screen Page « 6 »

1. Three-Phase Current Value.
2. Highest Current Value Recorded in Three Phases.
3. Lowest Asymmetric Current Value Recorded in Three Phases
4. Number of Shutdowns Due to Asymmetric Current (Protection)
5. Number of Protections (Shutdowns) Recorded in Three Phases Due to High Current.



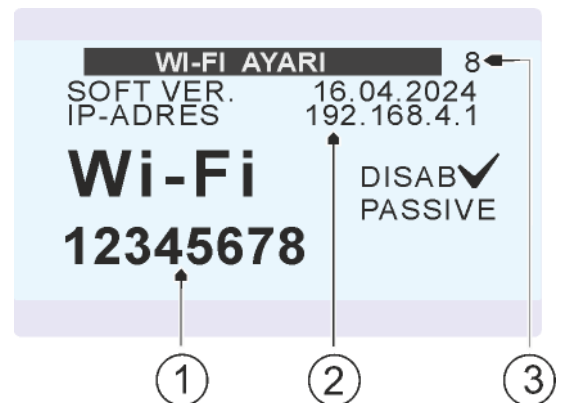
### Main Screen Page « 7 »

1. Frequency: per second.
2. Frequency: per 0.025 second.
3. Highest Recorded Frequency Value.
4. Lowest Recorded Frequency Value.
5. Number of Shutdowns Due to Low Frequency
6. Number of Shutdowns Due to High Frequency.
7. Active Usage Time, Seconds.
8. Active Usage Time, Hours.
9. Screen Page Number.
10. Active Usage Time, Minutes.
11. Frequency Protection Status: Active/Passive.
12. Frequency Protection Delay Time, Seconds.
13. Upper Frequency Protection Value.
14. Lower Frequency Protection Value.



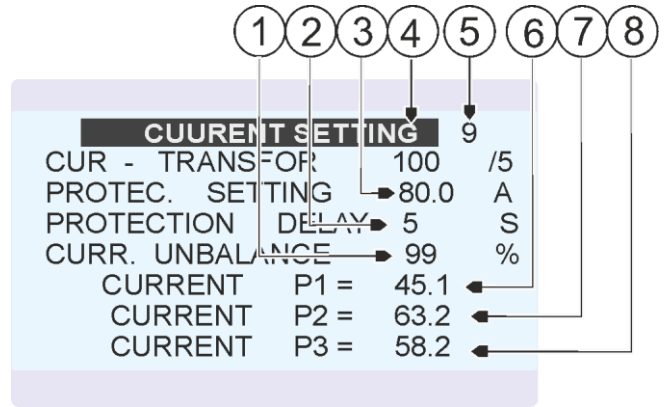
### Main Screen Page « 8 »

1. Wi-Fi Password.
2. Wi-Fi IP Address.
3. Screen Page Number.



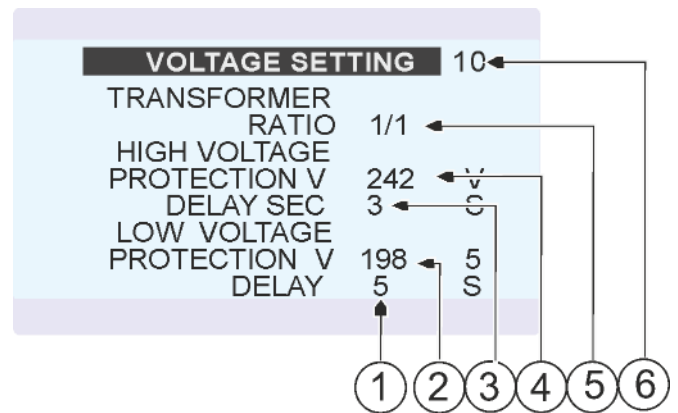
### Main Screen Page « 9 »

1. Asymmetric Current Protection Ratio.
2. Current Protection Delay, Seconds.
3. Current Protection Value.
4. Current Measurement Transformer Ratio.
5. Screen Page Number.
6. Phase 1 (P1) Actual Current Value.
7. Phase 2 (P2) Actual Current Value.
8. Phase 3 (P3) Actual Current Value.



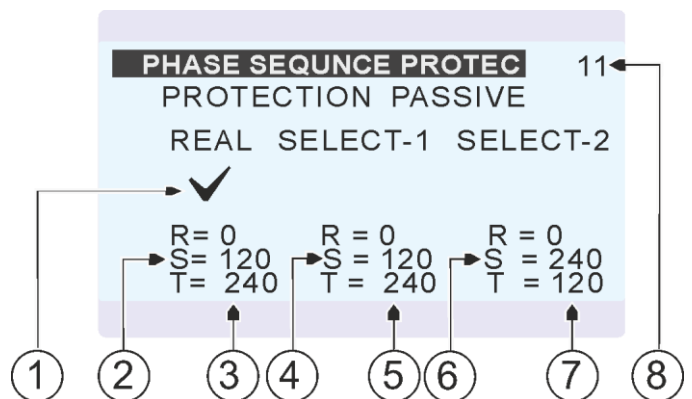
### Main Screen Page « 10 »

1. Low Voltage Protection Delay, Seconds.
2. Low Voltage Protection Value.
3. High Voltage Protection Delay, Seconds.
4. High Voltage Protection Value.
5. Voltage Measurement Transformer Ratio.
6. Screen Page Number.



### Main Screen Page « 11 »

1. Permitted Phase Sequence.
2. Phase S, Degree.
3. Phase T, Degree.
4. Phase S, Degree.
5. Phase T, Degree.
6. Phase S, Degree.
7. Phase T, Degree.
8. Screen Page Number.



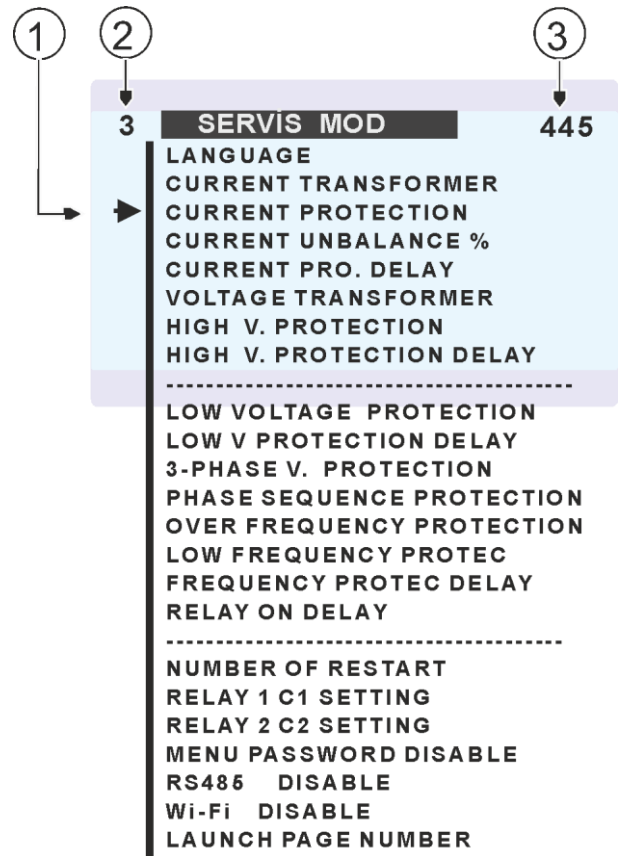
**SERVICE MODE: Menu Access and Settings.**



To enter the menu, briefly press the "SET" button. The display will show the first 8 lines of the menu. As the arrow is moved and the 8th line is passed, the next 8 lines (lines 9 to 17) will be displayed.

1. The arrow that is moved between lines 1 to 24 using the "UP" and "DOWN" buttons.
2. Menu Line Number.
3. Countdown timer that automatically returns to the home page.

1. To change the value on a desired line, move the arrow to the front of the parameter to be changed using the "UP" and "DOWN" buttons. When the arrow is in front of the line to be changed, pressing the "SET" button will open a new page on the screen.
2. On the opened page, if the arrow is blinking, you can change the value with the "UP" and "DOWN" buttons. If the arrow is not blinking, you can move it to the desired menu by shifting it with the "UP" and "DOWN" buttons. Once the desired menu is reached, pressing the "SET" button again starts the arrow blinking and the value can be changed with the "UP" and "DOWN" buttons.
3. To exit the desired menu, you must use the "ESC" button. All your changes are automatically saved to memory after one minute.



"For example, in Picture 15, entry is made from line number 3.  
The current protection value is changed."

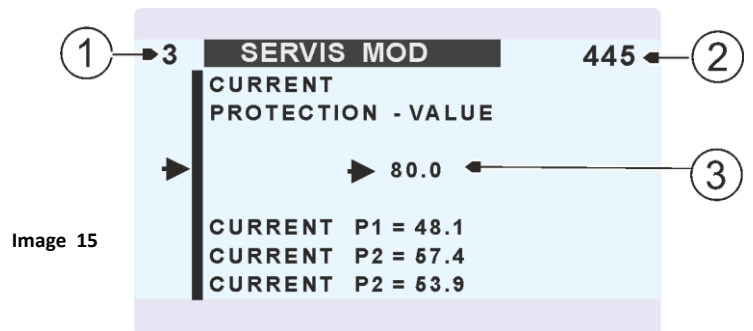


Image 15

## Deleting Records

The device records all observed parameters and does not automatically delete them from memory even after power outages.

To reset the records, the 'ESC' button must be held down for 10 seconds. During this process, a countdown will appear on the screen. When the countdown reaches zero, all records will be reset."

### Detailed Explanation of Set Parameters:

1. **LANGUAGE - LANGUAGE:** Two languages are available on the LCD screen. It is adjusted according to need.
2. **CURRENT TRANSFORMER RATIO:** If the measured value is below 5 A, there is no need to use a current transformer.
3. **CURRENT PROTECTION VALUE:** Adjusted as needed.
4. **CURRENT IMBALANCE %:** If the current value between phases exceeds the current protection value by % (\*\*), the system activates. Especially beneficial if there are three-phase motors or voltage regulators in the system.
5. **CURRENT PROTECTION DELAY:** Adjusted as needed.
6. **VOLTAGE TRANSFORMER RATIO:** Adjusted as needed.
7. **UPPER VOLTAGE PROTECTION VALUE:** If the voltage exceeds 242v + 5v hysteresis (247v), the protection activates. The three-phase protection value changes automatically at a ratio of 1 = 1\*1.7272.
8. **UPPER VOLTAGE PROTECTION DELAY:** Adjusted as needed.
9. **LOWER VOLTAGE PROTECTION VALUE:** If the voltage drops below 198v - 10v hysteresis (188v), the protection activates. The three-phase protection value changes automatically at a ratio of 1 = 1\*1.7272.
10. **LOWER VOLTAGE PROTECTION DELAY:** Adjusted as needed.
11. **THREE-PHASE VOLTAGE PROTECTION:** Should be active in places with three-phase motors.
12. **PHASE SEQUENCE PROTECTION:** Should be active in places with three-phase motors.
13. **UPPER FREQUENCY PROTECTION:** Adjusted as needed.
14. **LOWER FREQUENCY PROTECTION:** Adjusted as needed.
15. **FREQUENCY PROTECTION DELAY:** Adjusted as needed.
16. **RELAY ON DELAY:** Adjusted as needed.
17. **RESTART COUNT:** If the parameter is set to 0, the relay will not shut off unless the "ESC" button is pressed after the voltage normalizes. For example, if set to 3, after the voltage has been cut three times by the system (releasing the relay and shutting down three times), either the device's voltage must be cut and restored, or the "ESC" button pressed to allow voltage back to the system.
18. **RELAY-1, C1 SETTING:** There are two relays inside the device. Each relay can be assigned a different role from the menu. Role ON-OFF/BYPASS/ALARM/FAN. Adjusted as needed.
19. **RELAY-2, C2 SETTING:** Same as parameter 18.
20. **Spare (Passive).**
21. **MENU PASSWORD-7773:** If the number is changed, when the device power is cut and restored, the menu access password activates. The system will require the correct password when you wish to re-enter the menu. The correct password is always 7773.
22. **RS-485:** Model "L-004" Active.
23. **Wi-Fi:** Can be set to Active or Passive, and the password can be changed.
24. **START PAGE NUMBER:** 1..10.

## Technical parameters and operating characteristics

Technical Specification	Parameter values	Note
Operating Voltage	25 V ..... 350 V AC	
Operating Frequency	43 Hz ..... 430 Hz	
Power consumption	< 3 VA	
Voltage Input	3 V ..... 330 V	
Voltage Measurement Range	3 V ..... 330 kV	
Voltage Transformer Ratio	1 / ..... 999	
Current Input	10 mA ..... 6 A	
Current Measurement Range	10 mA ..... 10.000 A	
Current Transformer Ratio	5A / 5A ..... 2000 A	
Accuracy measurement.	± 1 %	
Supported Connection	3P 4W	
Communication	RS485, MODBUS RTU, Wi-Fi.	Varies depending on model
Information display	Graphic 128 x 64	Easy to read in daylight
Weight	< 250 Gr	
Protection Class	IP41 (Panel), IP20 (Body)	
Panel Hole Size	91mm x 91mm	
Connection Type	Plug-in terminal blocks	5.08 mm
Cable diameter	1.5 mm <sup>2</sup>	
Operating Altitude	< 2000 meters	

## Explanation of Error Codes in the Device.

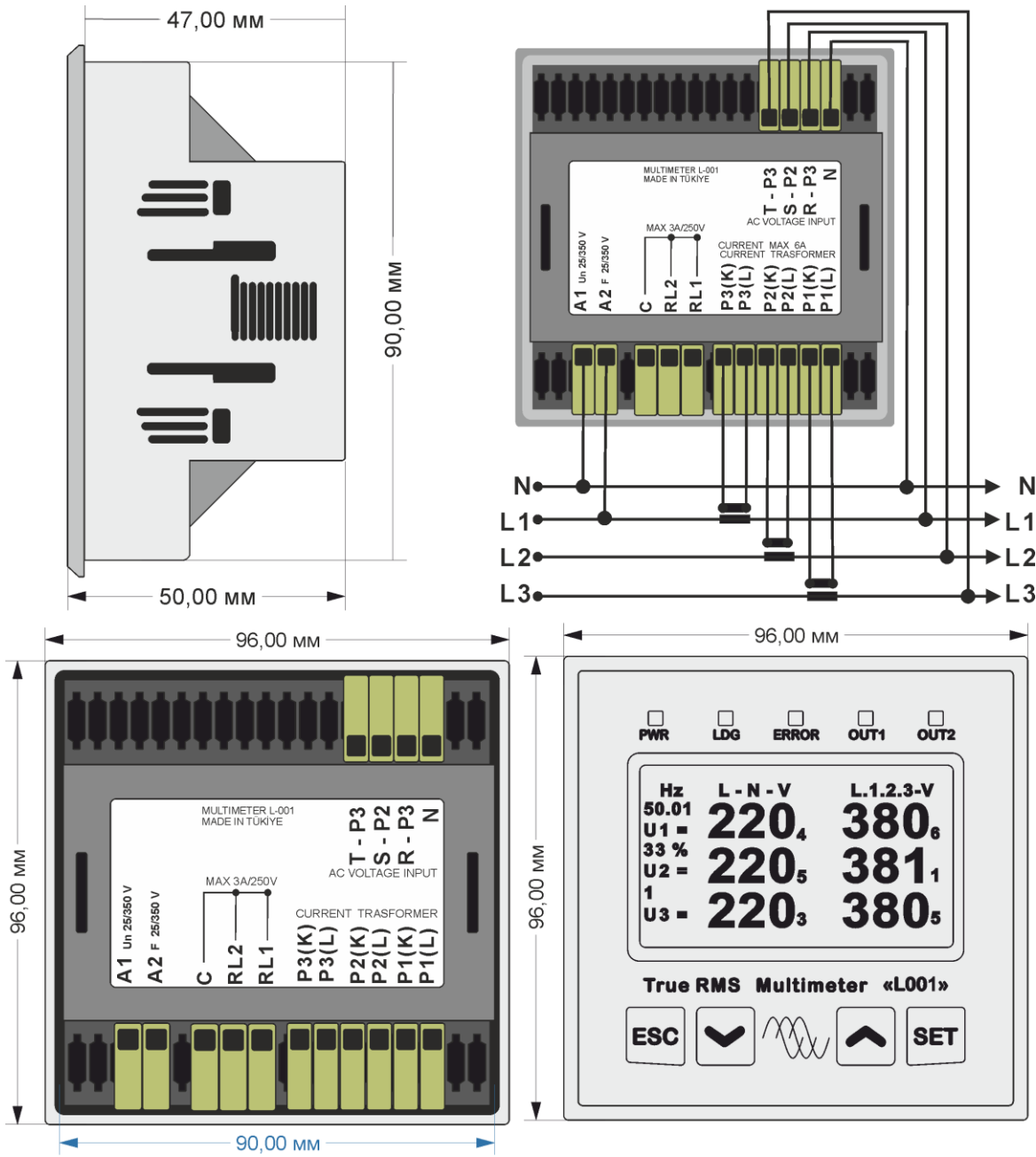
- Error = 1: High voltage between the first phase and neutral.
- Error = 2: Low voltage between the first phase and neutral.
- Error = 3: High voltage between the second phase and neutral.
- Error = 4: Low voltage between the second phase and neutral.
- Error = 5: High voltage between the third phase and neutral.
- Error = 6: Low voltage between the third phase and neutral.
- Error = 7: High voltage between the first and second phases.
- Error = 8: Low voltage between the first and second phases.
- Error = 9: High voltage between the second and third phases.
- Error = 10: Low voltage between the second and third phases.
- Error = 11: High voltage between the third and first phases.
- Error = 12: Low voltage between the third and first phases.
- Error = 13: High current in the first phase.
- Error = 14: High current in the second phase.
- Error = 15: High current in the third phase.
- Error = 16: High asymmetrical current between phases.
- Error = 17: High asymmetrical current between phases.
- Error = 18: High asymmetrical current between phases.
- Error = 19: High frequency.
- Error = 20: Low frequency.
- Error = 21: Exceeded the number of resets after power cut and protective re-engagement.
- Error = 22: Incorrect phase sequence.



5.1. Connection Diagram

Device dimensions and technical drawing.  
Panel Cutout Dimensions: 91 mm x 91 mm

Connection Diagram



## 6.1. AVR Internal Structure

10-150kVA

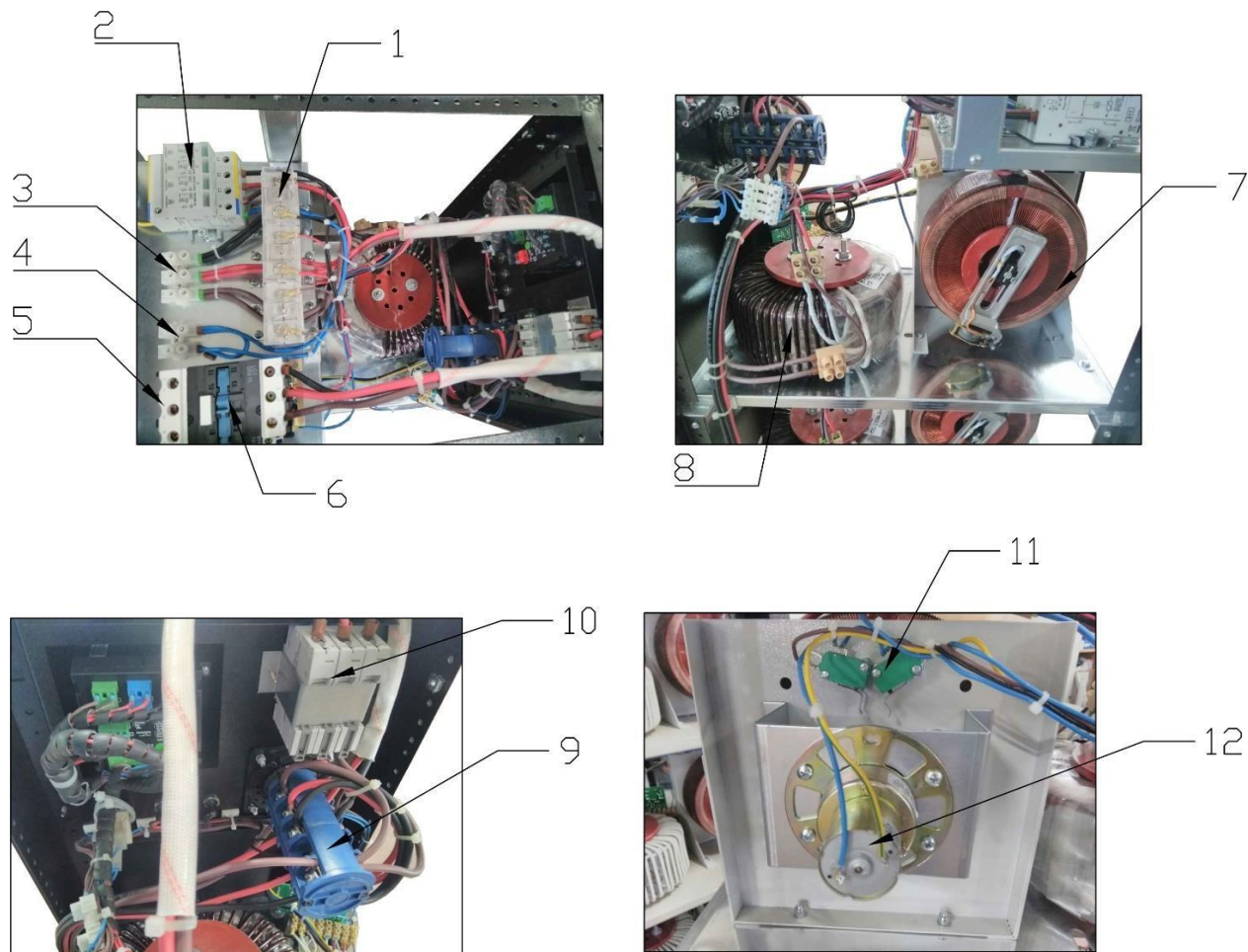


Image -10.1

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

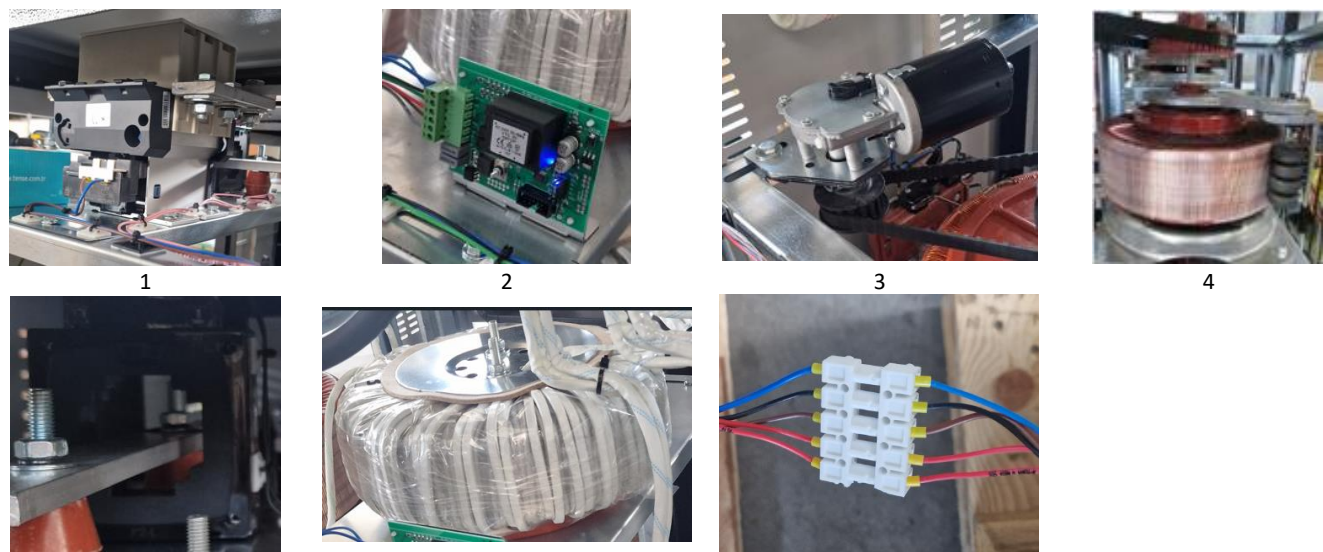


Image -10.2

Image-10.2

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

500-800kVA



Image -10.3

Image-10.3

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

1000-3000kVA

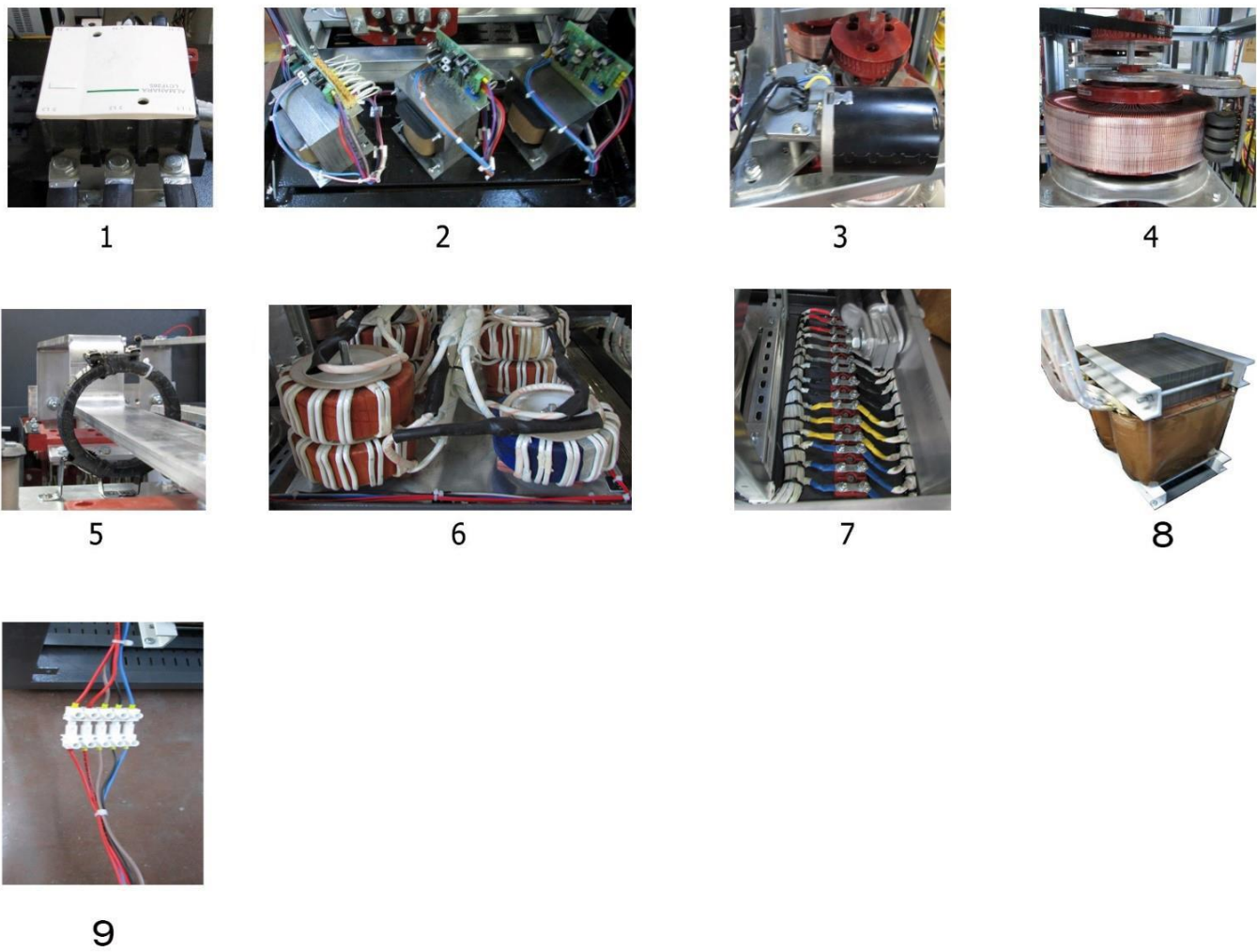


Image -10.4

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

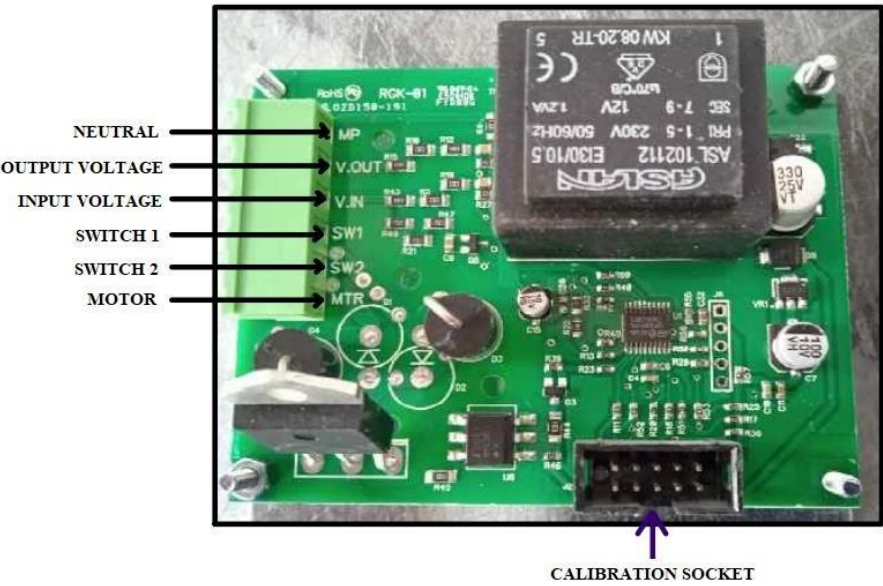


Image-11-1

200-3000kVA

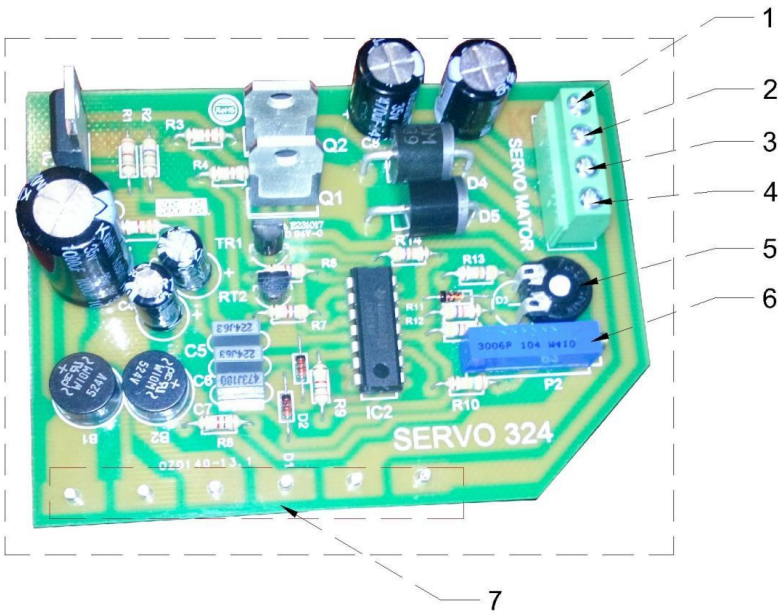
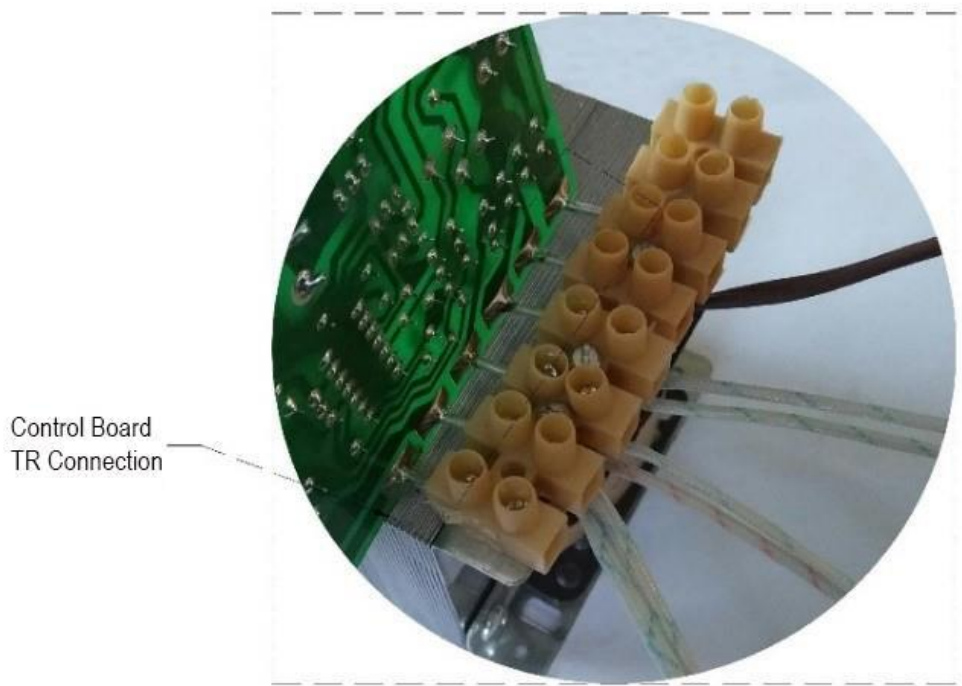
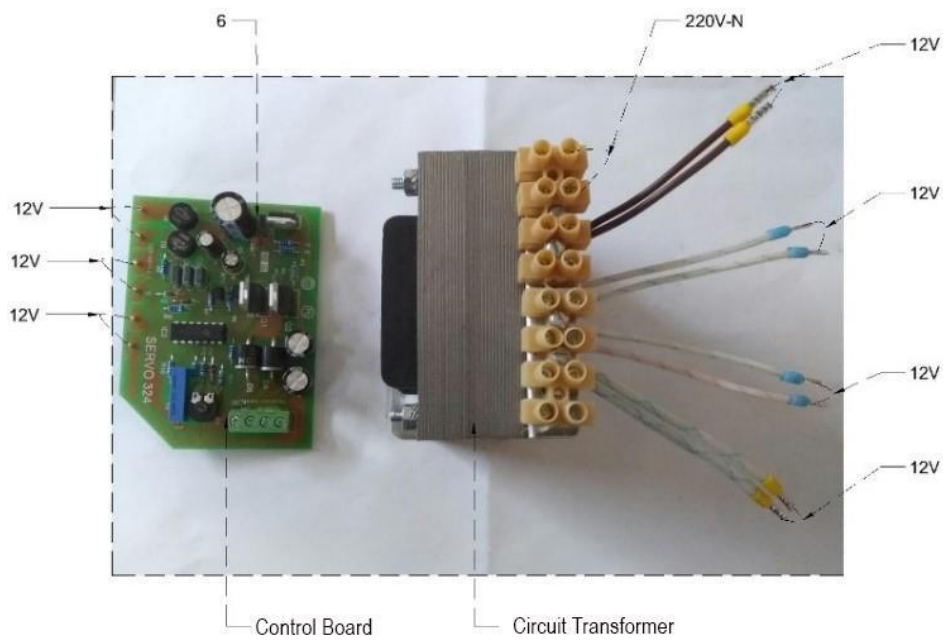


Image-11-2

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



### 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
<p style="text-align: center;"><b>ATTENTION!</b></p> <p style="text-align: center;">Only authorized technical personnel should make an intervention to the equipment.</p>		



## 7. TECHNICAL SPECIFICATIONS

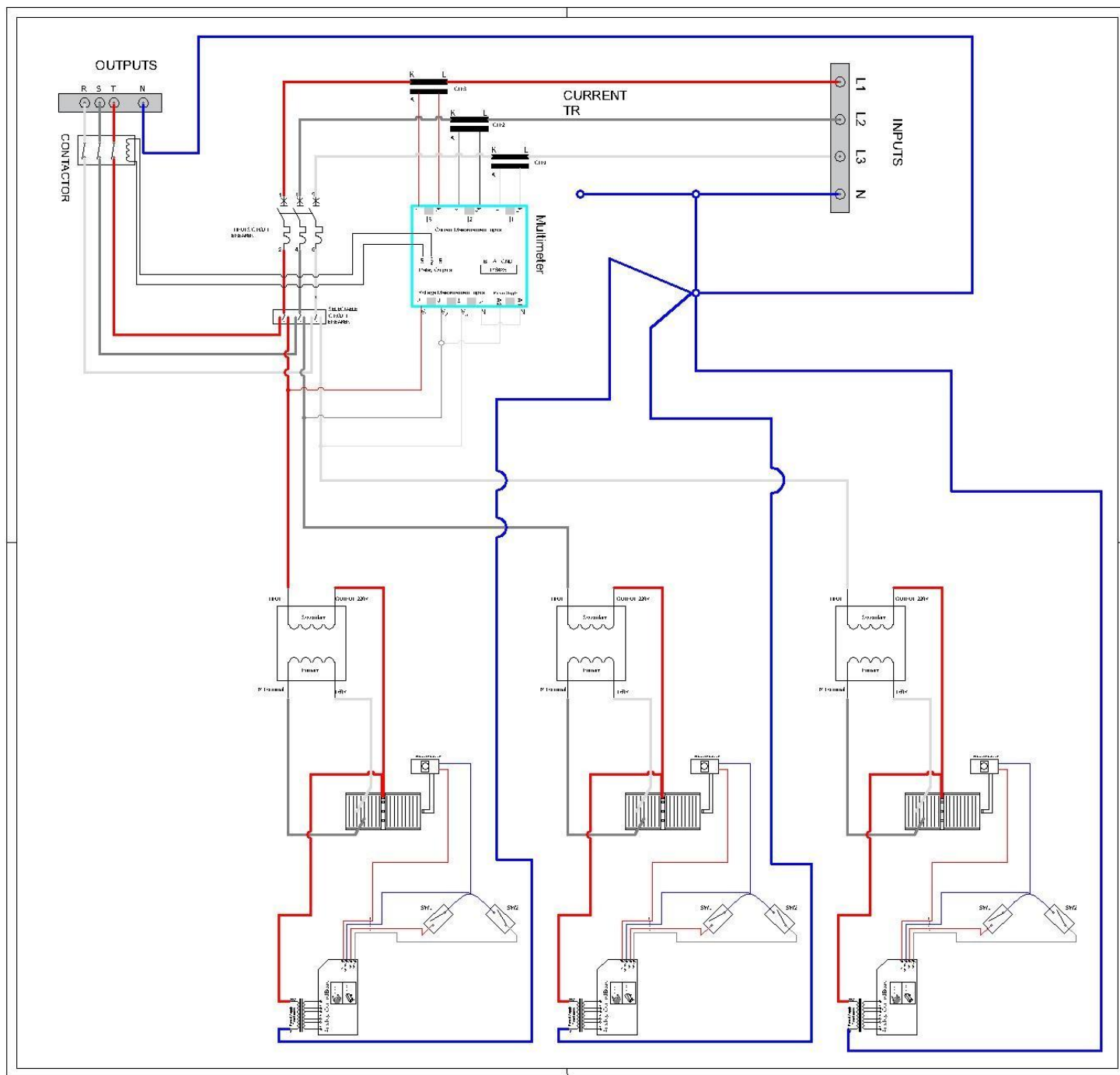
CODE SET-EM	04	05	06	08	09	11	12	13	14
Power (kVA/kW)	10/10	15/15	22/22	30/30	45/45	60/60	75/75	100/100	150/150
INPUT									
Input voltage	400Vac 3ph + N								
Voltage range	300Vac ~ 460Vac [other ranges available on request, like 190-415 and 310-485]								
Input frequency	47 : 64 Hz								
OUTPUT									
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	Optional								
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								
PHYSICAL CHARACTERISTICS									
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

CODE SET-EM				18					
Power (kVA/kW)	200/200	250/250	300/300	400/400	500/500	600/600	800/800	1000/1000	1250/1250
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)	289	362	434	578	724	869	1159	1449	1816
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	Optional								
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								
PHYSICAL CHARACTERISTICS									
Colour	RAL7035								
Dimensions WxDxH cm	120X84X185			175X84X185	180X124X175		180X124X210	210X214X185	T.B.A.
Weight kg.	585	610	635	970	1200	1350	1795	2700	3550

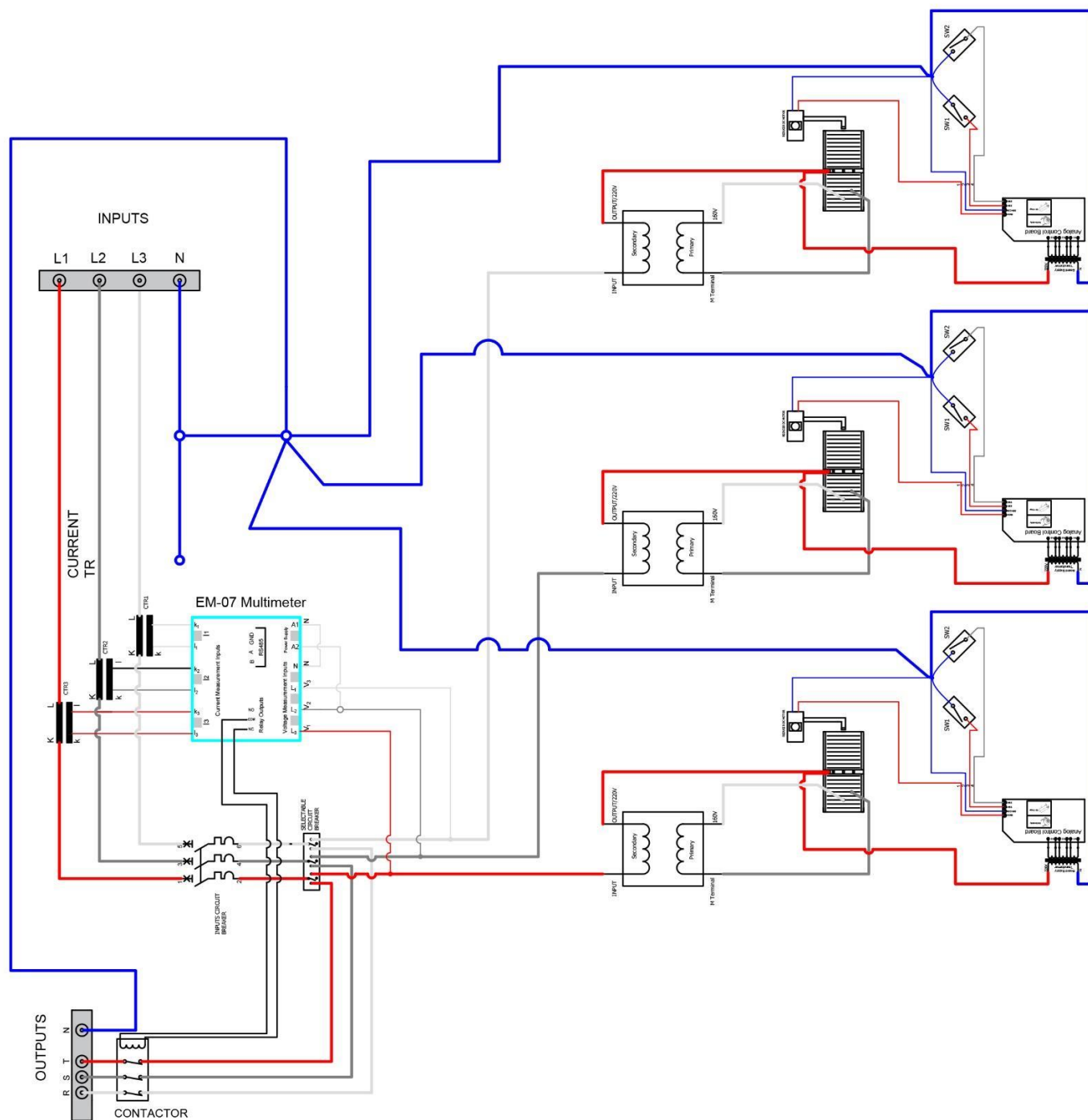
## Three Phase Electrical Connection Diagram

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



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