User Manual

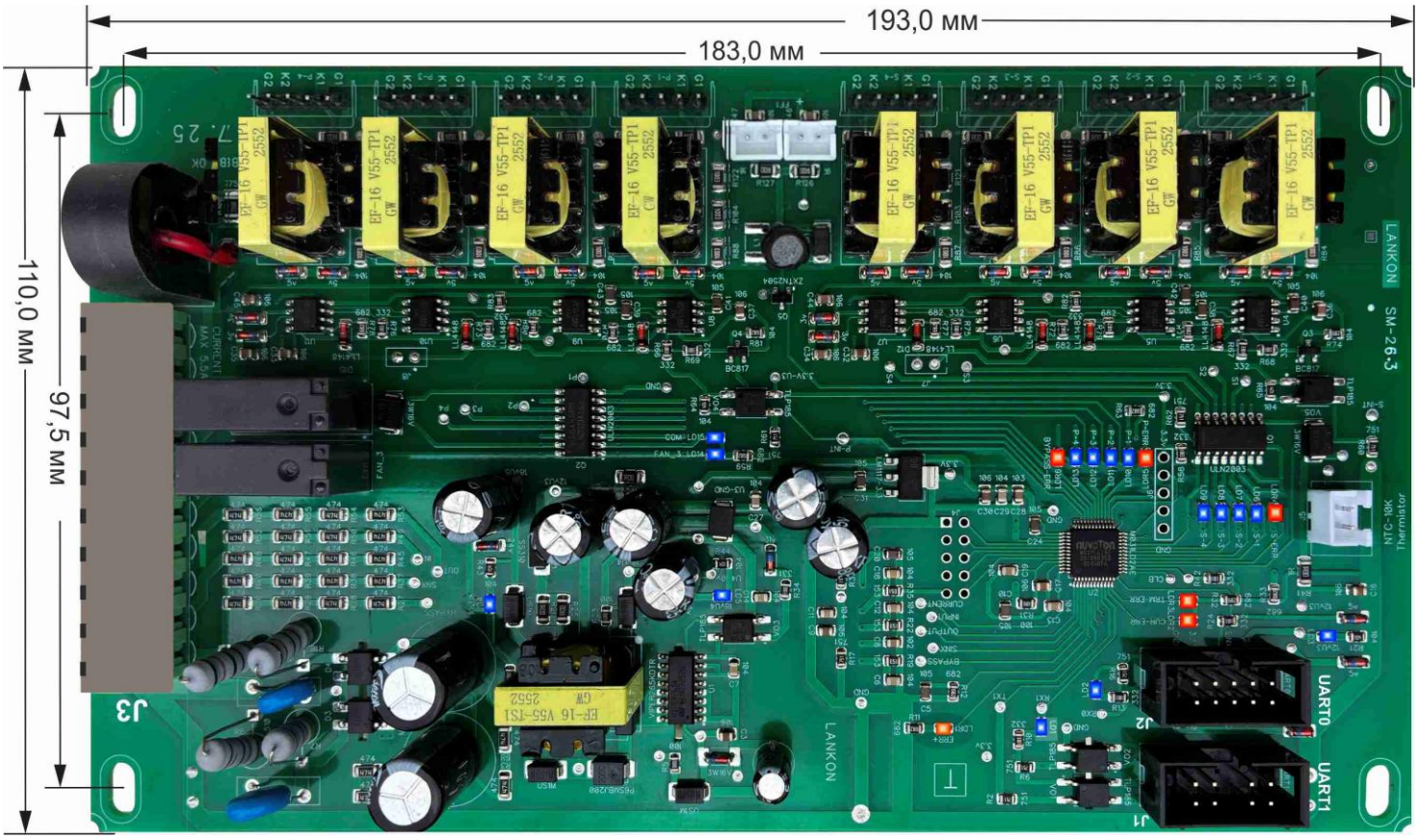

Figure 1 — Lankon SM-2603 Board General View

The "Lankon" Engineering Group does not carry out the final assembly or manufacturing of any device.

The Group only engineers and manufactures the embedded systems and electronic boards used in final devices; it manages the processes of monitoring and controlling devices over the internet, and automatically sending generated fault codes to the relevant e-mail addresses.

It also provides consulting services to manufacturing companies regarding the use of these devices.

The names of the user manuals required to use these boards in a static voltage regulator are as follows:

1. SM-2603, main board.
2. SM-2603P, power unit.
3. EPM-310, display.
4. EPM-310-RS-485, communication.
5. EPM-310-Wi-Fi, communication.

You can download the current user manuals from the internet resources below.

https://gearsteady.com/documents

https://github.com/Sabir392/devices

Date: 2026/07/05

SM-2603 User Manual

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2. Safety Warnings

The following warnings must be strictly followed for the safe and correct use of the device:

🔴 When powering the board, remember that it carries voltage that is dangerous to life.

🔴 If, during connection, one board's UART-0 input is connected to another board's UART-0 input, or if the phase and neutral lines between boards are reversed, the boards and thyristor modules may suffer irreversible damage when voltage is applied.

⚠️ It is mandatory to use a 0.1 µF…1 µF AC capacitor between terminals A1 and A2 of the contactor coil.

⚠️ Grounding the enclosure is mandatory for the safe operation of the device; never operate the device without grounding. Lack of grounding creates a risk of electric shock.

⚠️ Be sure to complete the thermal and electrical calculations before operating the system at maximum capacity.

3. Definition of the Device Name

"Lankon SM-2603" is the device name and consists of the components specified below, used to identify the device:

Lankon: A proper name referring to the origin of the engineering team that developed the device.
SM-2603: An alphanumeric code indicating the type and version of the device:
SM (Static Motherboard): Refers to the technical class of the device.
2603 (2026.03): Indicates the project's latest design/revision date (in year/month format).

The functional control of the device is carried out via the "EPM-310-96" display board. For this reason, in documents and applications the device name may be referenced together with, or as, "EPM-310".

4. Purpose of the Device

The device has been specially designed for use in the manufacturing of static voltage regulators. The primary aim of the design is to increase the safety of electronic systems during manufacturing processes and to simplify the production stages. In line with current manufacturing approaches, rather than producing all components under a single structure, the principle adopted is the use of high-quality components supplied by manufacturers specialized in their field. This approach is important for increasing product quality and providing a competitive advantage.

"SM-2603" series boards are designed using advanced electronic components and optimized control algorithms. The system aims to largely prevent errors that may occur during manufacturing and operating processes.

5. Advantages of the Device

The features listed below describe the design and performance advantages of the device:

1.1. Provides a high-safety, long-life operating structure for CNC machines.
1.2. Operates stably over a wide supply voltage and frequency range (36 V…480 V, 25 Hz…800 Hz).
1.3. In the absence of a neutral line, the system operates — thanks to its protection algorithms — in a way that prevents damage to the device and connected loads.
1.4. Reliably drives different types of thyristors and thyristor modules.
1.5. The output voltage can be adjusted between minimum and maximum values within approximately 0.02 seconds.
1.6. In the event of a short circuit at the output, it puts the system into protection mode without blowing the fuse, preserving system integrity. It allows for inrush (starting) current.

1.7. Warns the user via the display in the event of faulty or missing cable connections.
1.8. Does not require additional sensitive wiring for the display connection; the system has a simple and reliable structure.
1.9. In bypass mode, the load voltage and current can be monitored via the display. In this state, the device is powered from the bypass line.
1.10. Compatible with systems with or without booster, single-phase, three-phase, and with 6 or 8 thyristor modules. Provides the ability to use a single type of board and software across different models.
1.11. Input, output, and BYPASS current are measured with a single current transformer.
1.12. A single type of flat communication cable is used both between boards and between the display and the board.
1.13. The RS-485 Modbus communication interface is brought out to the front panel and provides connection via two lines.
1.14. The Wi-Fi communication feature works through standard web browsers (Chrome, Safari, Edge, Vivaldi, Firefox) without requiring an additional application.
1.15. When the network connection is lost and then restored, the device automatically reconnects to the modem.
1.16. There is a separate EEPROM storage area for each phase (72 × 3 data capacity).
1.17. Wherever there is internet, it is possible to monitor and intervene with the device from anywhere in the world
1.18. At the moment a fault occurs, it sends an e-mail to all registered e-mail addresses.

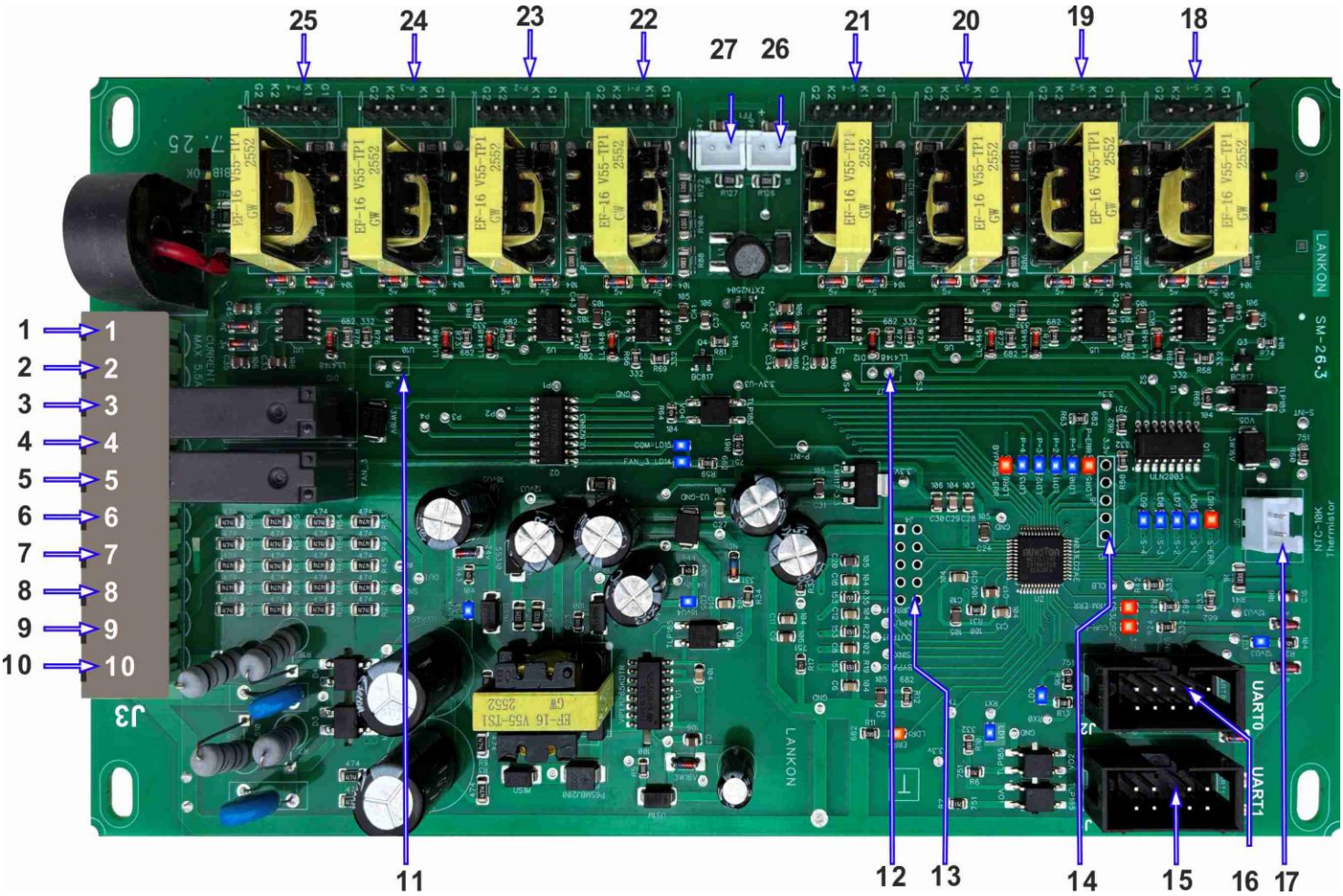


Figure 2 — SM-2603 Terminal Connections

6. Connections and Terminals

“Lankon SM-2603” board front view and brief descriptions of the numbered connection terminals are given in Figure 2.

In the connection diagram, terminal markings should be arranged by phase as (R), (S), and (T) so that the different phase boards can be distinguished from one another.

The flat cables used for communication between boards are keyed to prevent incorrect connection. The middle pins at one end of the cable have been deliberately disabled. This way, a board's UART-1 output can

only be connected to another board's UART-0 input. Avoid forcing the cable during connection, otherwise the terminal may be damaged.

Terminal No	Description	Marking on Board
1	Current transformer terminal (Maximum 5.5A)	CUR 1
2	Current transformer terminal (Maximum 5.5A)	CUR 2
3	Relay terminal controlling the output contactor	COM
4	Relay terminal controlling the output contactor	COM
5	Relay terminal controlling the heatsink fan	FAN_3
6	Relay terminal controlling the heatsink fan	FAN_3
7	Neutral AC voltage — neutral line	NEUTRAL
8	Regulator AC output voltage 90…250V	OUTPUT 0-310v
9	Regulator AC input voltage 35…475V	INPUT 36-310v
10	Bypass — sample terminal taken after the output contactor	Bypass 0-310v
11	When the number of primary thyristor modules on the input is 3, this trace under the fiberglass board is cut (due to reversed board fitting)	J8
12	When the number of secondary thyristor modules on the output is 3, this trace under the fiberglass board is cut (due to reversed board fitting)	J7
13	Terminal that synchronizes the boards in parallel regulators	J4
14	Terminal for loading the program into the microprocessor	J6
15	UART1 connects to the UART0 terminal of the other phase board. Has 8 pins	J1 UART1
16	If the EPM-310 is connected, it identifies itself as Phase(R)1 and instructs the other board that it is Phase(S)2. Has 10 pins	J2 UART0
17	A 10k NTC temperature sensor is fitted on the heatsink.	NTC-10K Thermistor
18	4-wire cable from the secondary S-1 thyristor module	G1- K1 K2- G2 S-1
19	4-wire cable from the secondary S-2 thyristor module	G1- K1 K2- G2 S-2
20	4-wire cable from the secondary S-3 thyristor module	G1- K1 K2- G2 S-3
21	4-wire cable from the secondary S-4 thyristor module	G1- K1 K2- G2 S-4
22	4-wire cable from the primary P-1 thyristor module	G1- K1 K2- G2 P-1
23	4-wire cable from the secondary P-2 thyristor module	G1- K1 K2- G2 P-2
24	4-wire cable from the secondary P-3 thyristor module	G1- K1 K2- G2 P-3
25	4-wire cable from the secondary P-4 thyristor module	G1- K1 K2- G2 P-4
26	12V 150mA DC fan with adjustable speed for special cases, +12 terminal is the right pin, FAN_1	FF1
27	12V 150mA DC fan with adjustable speed for special cases, +12 terminal is the right pin, FAN_2	FF1

7. LED Indicators on the Board

The LANKON SM-2603 board has 21 LED indicators. These LEDs are designed to visually show which stage the board is in.

General Classification of the LEDs

🔴 Red LEDs (6 pcs) — Fault Indicators

Red LEDs indicate fault conditions. Depending on the type of fault, they either stay continuously lit or blink continuously.

No.	Name	Description
2	S-ERR	Secondary thyristor fault — output thyristor failure
7	CUR ERR	High current fault — excessive load current
8	TRM ERR	Overheating fault — thermal protection activated
9	P-ERR	Primary thyristor fault
16	BYPASS ERR	Bypass and output voltage mismatch fault
17	ERR+	Additional critical faults that cannot be indicated by the board's own LED system

⚠️ Note: After a fault occurs, one of the red LEDs corresponding to the fault lights up or blinks continuously. The system may automatically switch to protection mode. The LED fault warning continues until the fault is resolved.

🔵 Blue LEDs (15 pcs) — Status Indicators

Blue LEDs indicate the operating status of the system. Depending on the state, they either stay continuously lit or blink.

No.	Name	Description
1	Supply U3 12V	U3 supply block 12V is active
3	Secondary S-1	Secondary thyristor S-1 active
4	Secondary S-2	Secondary thyristor S-2 active
5	Secondary S-3	Secondary thyristor S-3 active
6	Secondary S-4	Secondary thyristor S-4 active
10	Primary P-1	Primary thyristor P-1 active
11	Primary P-2	Primary thyristor P-2 active
12	UART-0 RS232	RS232 communication port-0 active — data being transmitted
13	Primary P-3	Primary thyristor P-3 active
14	Primary P-4	Primary thyristor P-4 active
15	UART-1 RS232	RS232 communication port-1 active — data being transmitted
18	FAN_3	Cooling fan No. 3 is running
19	Supply U4 18V	U4 supply block 18V is active
20	Output Contactor	Output contactor closed, load connected
21	Supply U5 18V	U5 supply block 18V is active

Importance for the End User and for Manufacturing

For the end user, these LEDs may not have a direct meaning, since the user does not need to look at them while the device is operating normally.

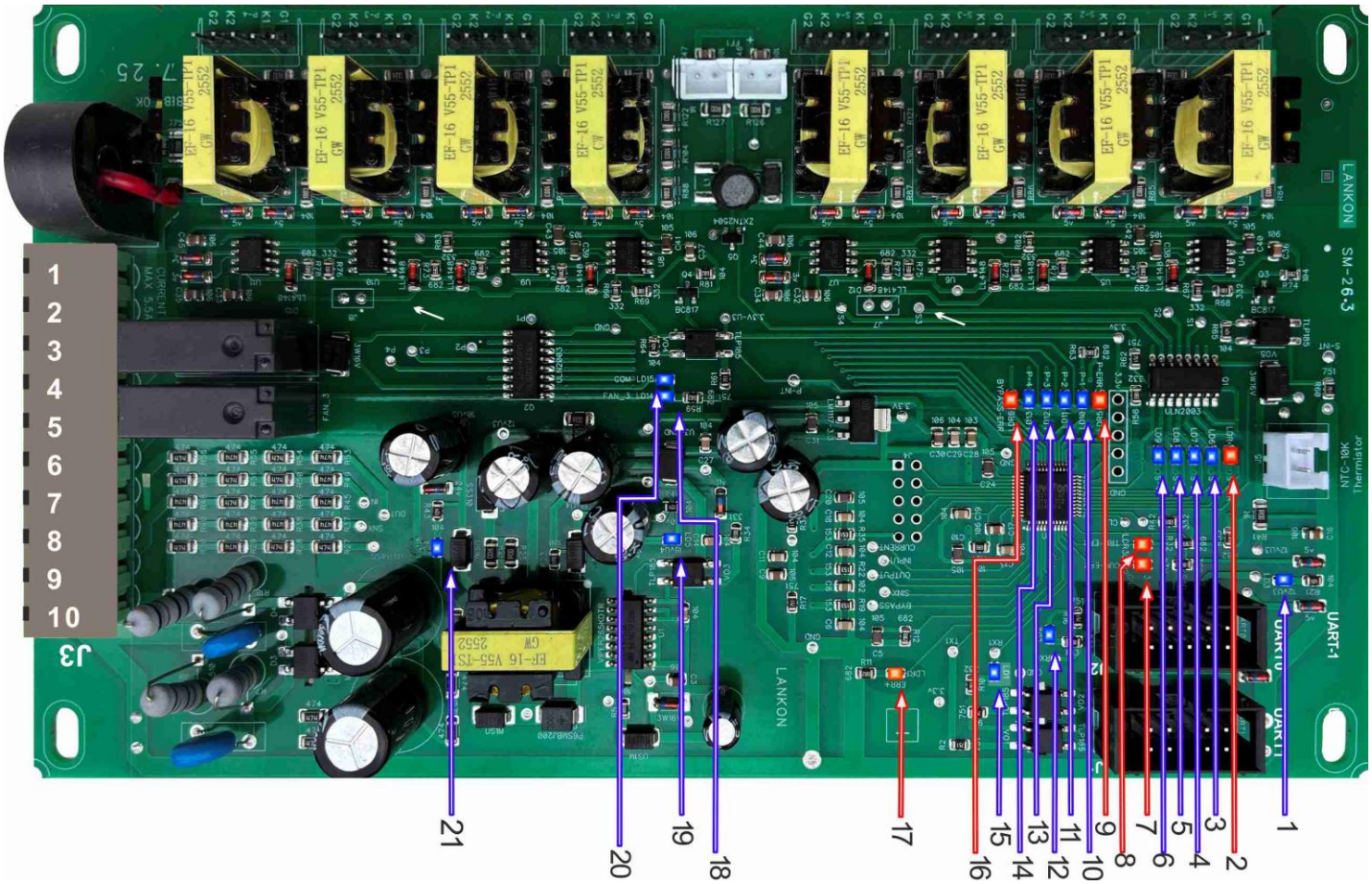
However, for manufacturing and technical service, the benefit of these LEDs is very significant:

- **A quick functional test can be performed on newly manufactured boards before they leave the production line**
- **During service, the stage at which a problem exists can be visually identified even without a measuring instrument**

- **Even in businesses new to production where the technical team has little experience, the LEDs make it easy to quickly identify and fix faults**
- **Saves time — because the module in which the fault is located is seen instantly, eliminating the need to check the entire board**

💡 In normal operating mode, the blue LEDs corresponding to the command should be lit or blink continuously, while all red LEDs should remain off. If any red LED is lit, technical intervention is required.

Figure 3 — LED Indicators on the Board



8. Static Voltage Regulator Wiring Diagram — 3-Phase

As can be seen from the diagram, the contactor supply is taken from the ‘Output AC T8’ pin of the last phase (T) J3 terminal, enters pin com T-4, exits from com T-3, enters pin S-4 of the other phase (S), then exits from S-3 and enters pin R-4 of the last phase (R), from where it feeds the A1 terminal of the contactor coil. The A2 terminal of the coil is connected to the nearest suitable neutral point.

It is strictly required to connect a 0.1 to 1 µF capacitor in parallel to the AC contactor coil and all AC fan motors.

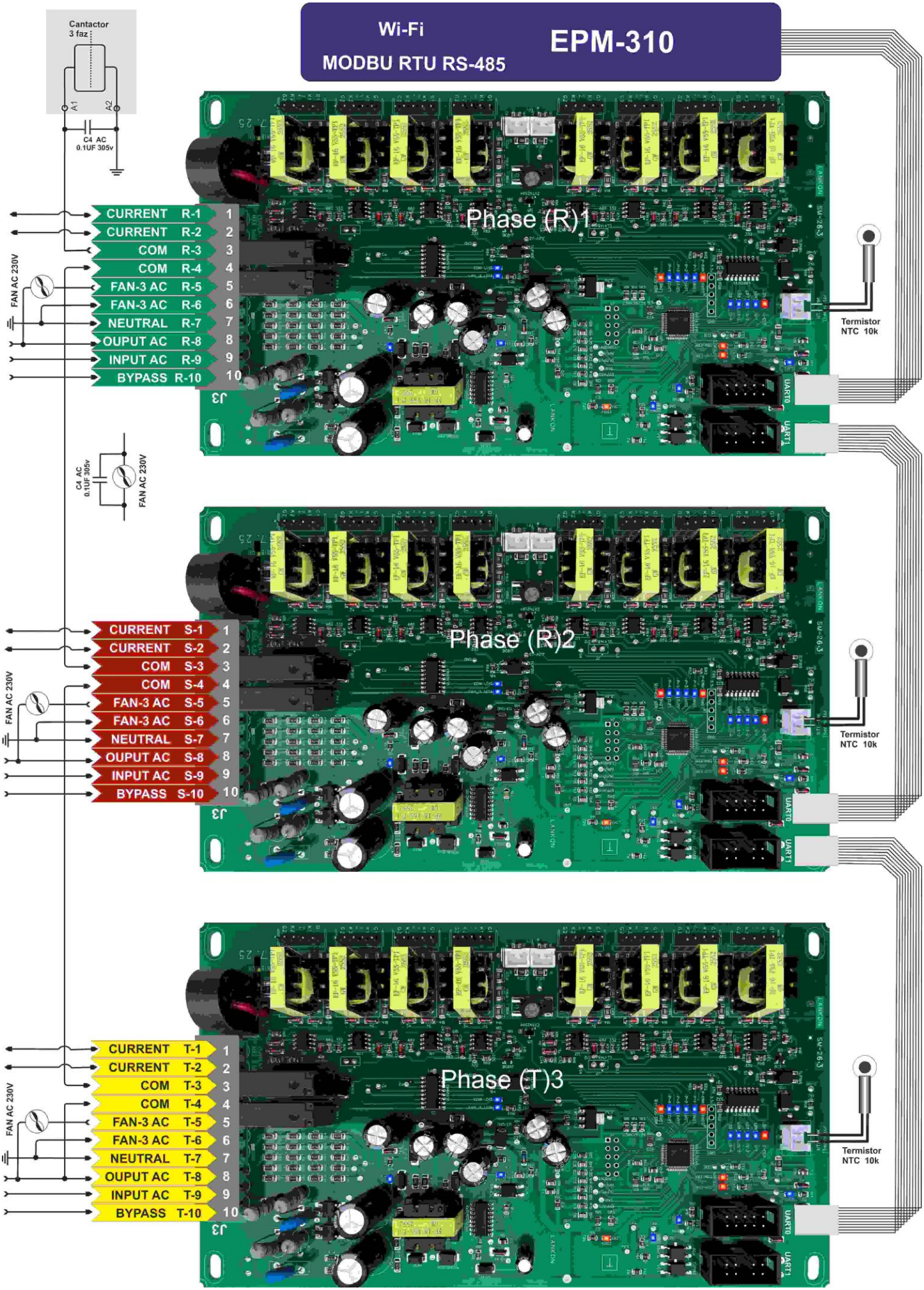


Figure 4 — Contactor, Fan and EPM-310 3-Phase Connection Diagram

9. Technical Specifications

The table below lists the basic technical parameters of the SM-2603 / EPM-310 board set. The final parameters of the manufactured regulator may vary depending on the selected transformer, thyristor module, and enclosure design.

Parameter	Value	Notes
Input Voltage Range	36 V ... 485 V AC	Wide input tolerance
Input Frequency Range	33 Hz ... 800 Hz	Very wide frequency band
Output Voltage	90 V ... 290 V AC	Adjustable from the menu
Output Tolerance	± 0,5 V ... ± 10 V	Depends on transformer winding step
Maximum Power (Single Board)	Up to 3000 kVA	Depends on transformer and thyristor selection
Number of Thyristor Modules	4 + 4 (8 pcs)	Input and output groups
Voltage Correction Speed	≤ 0.02 seconds	Electronic switching
Board Supply Voltage	12 V / 18 V DC	Provided via internal SMPS
Communication Interfaces	RS-485 Modbus-RTU, Wi-Fi, Ethernet	Web browser support
EEPROM Storage Capacity	72 × 3 records / phase	Fault and event logs
Operating Temperature	-10 °C ... +50 °C	With cooling fan
Storage Temperature	-20 °C ... +70 °C	Humidity: max. 95% non-condensing
Board Dimensions (SM-2603)	193 × 110 mm	M4 mounting holes at the corners
Terminal Type (J3)	10-pin / 5.08 mm pitch	Pluggable connection terminal

⚠️ The values above apply to typical operating conditions. Complete the thermal and electrical calculations before operating the system at maximum capacity.

10. Installation and Placement

Site Selection and Environmental Conditions

The static voltage regulator must be placed in an area that meets the following environmental conditions:

Criterion	Requirement
Ambient Temperature	Must be between -10 °C and +50 °C
Relative Humidity	Maximum 95% (non-condensing)
Altitude	Up to 2000 m above sea level (cooling factor decreases above this)
Floor Stability	Vibration-free, flat, and stable floor
Dust and Moisture	Area protected from excessive dust, condensation, and water splashing
Corrosive Environment	Must be kept away from chemical vapors and corrosive gases

Minimum Ventilation Clearances

The following minimum clearances must be left around the device for the cooling fans to operate effectively:

Surface	Minimum Distance	Description
Air Intake (Bottom)	200 mm	For free air flow
Air Outlet (Side)	300 mm	For dissipation of hot air

Side Panels	300 mm	Service and maintenance access
Ceiling (in enclosed areas)	500 mm	Air circulation

Grounding

Grounding the enclosure is mandatory for the safe operation of the device. The cross-section of the grounding conductor must not be smaller than that of the phase conductor. Insufficient or faulty grounding can lead to board failures, measurement errors, and the occurrence of dangerous voltages that threaten user safety.

⚠️ **Never operate the device without grounding. Lack of grounding creates a risk of electric shock.**

11. Warranty and Service Information

Warranty Coverage

SM-2603 and EPM-310 board sets manufactured by Lankon Engineering Group are covered by warranty against material and workmanship defects for a period of 12 (twelve) months from the date of delivery.

The following are covered under warranty:

- Manufacturing defects, material defects, and factory-related failures
- Electronic component failures arising under normal use conditions
- Faults caused by the board's own internal protection circuits

Conditions Not Covered by Warranty

The following conditions are outside the scope of warranty:

- Incorrect connection, overvoltage, or unsuitable operating conditions
- Unauthorized intervention, modification, or repair attempts
- Damage caused by natural disaster, lightning strike, fire, or flooding
- Installation or use contrary to the instructions in this manual
- Removal or alteration of the serial number or identification label on the board

Service Procedure

When a fault is detected in the device, follow these steps:

1. Disconnect the system from voltage and discharge it safely.
2. Note the LED indicators and the error codes shown on the display.
3. If possible, record the operating conditions at the time of the fault (input voltage, load, temperature).
4. Send the board to the Lankon Engineering Group service address in its original or equivalent packaging, or contact an authorized service engineer.

12. Contact Information

	Lankon Engineering Group
Website 1	https://gearsteady.com/documents
Website 2	https://github.com/Sabir392/devices
E-mail 1	info@gearsteady.com

License	GPL v3 — https://www.gnu.org/licenses/gpl-3.0.html
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