

ORIGINAL USER MANUAL

AC Voltage Stabilizers Modalis

MR250ST

MR400ST

MR600ST

MR800ST

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This Manual certifies the technical specifications of the AC voltage stabilizers Modalis MR250ST (MR400ST, MMR800ST, MR800ST) declared by the manufacturer. This manual explains technical characteristics, operating principle, and operating procedures.

1. PURPOSE

AC voltage stabilizer Modalis (hereinafter referred to as "stabilizer") provides power for heating systems, electronic devices, and devices with single-phase sine-shaped voltage in situations when power source voltage is unstable.

Operating conditions:

- non-explosive environment without conducting dust, aggressive vapors, liquids, or gases in concentrations dangerous for metals or insulation;
- under a shelter or indoors, on land, no maritime and (or) hydrochloric mist, vibration, impacts, or dirt;
- ambient temperature range, °C - 1 – 40;
- relative humidity at 25 °C, max, % - 80;
- waterproofing and foreign bodies protection level according to EN60529 - IP20 (not sealed)

2. WHAT IS INCLUDED

Name	Quantity
AC voltage stabilizer	1
Manual	1
Wall mounting bracket	1
Packaging	1

3. TECHNICAL SPECIFICATIONS

The stabilizer provides:

- main technical specifications (table 3.1) in the entire range of input voltages;- automatic shut-off of the load when the stabilizer's output voltage is dangerously high or low for the connected load;
- automatic shut-off of the load when the stabilizer is overloaded or its output is short-circuited;
- display of main operating modes and reasons of a shut-off.

To ensure fire safety, the stabilizer has a thermal breaker, which prevents a risk of a fire outbreak in case of the transformer's overheating.

Table 3.1

Name specifications	Model			
	MR250ST	MR400ST	MR600ST	MMR800ST
	Values			
Output stabilized voltage (V) for operating input voltage ranging from 175 to 275 V	220...240			
Limiting range of output voltage (V) for input voltage from 160 to 285 V	200...252			
Input voltage frequency, Hz	50+/- 2			
Correction levels	7			
Rate of the output voltage adjustment, no less than, V/s	350			
Power ^{*)} , W	0...250	0...400	0...600	0...800
Efficiency, no less than, %	95			
Dimensions (HxWxD), no more than, mm	72x205x240			
Weight, no more than, kg	3	3.6	4	4
Duration of continuous operation, h	Unlimited			
Note: *) Allowed load during operation				

4. MAIN PARTS AND OPERATING PRINCIPLE

4.1 The voltage stabilizer consists of the following parts:

- case;
- power transformer with 7 taps for voltage stabilization;
- power switches (TRIAC);
- control and display circuits;
- input filter for interference suppression.

On the front panel there are the following displays (fig. 4.1): INPUT VOLTAGE, MIN, MAX, OUTPUT VOLTAGE, OVERLOAD

A power socket (with ground terminal) for plugging the load in is located on one of the side panels. The other side panel houses an automatic fuse 2A (MR250ST), or 5A (MR400ST, MR600ST), or 10A (MR800ST). It also houses a power switch and a cord for connecting the stabilizer to the power supply.

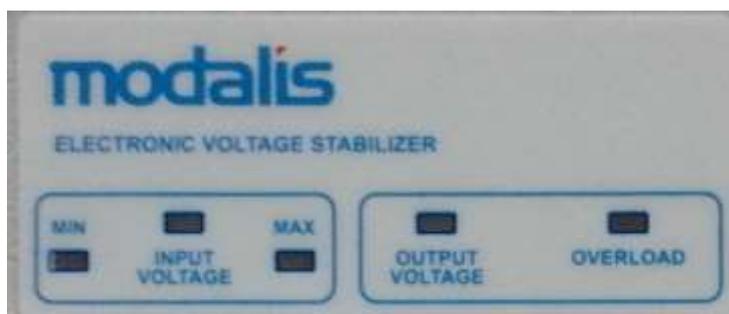


Figure 4.1 Stabilizer's Front Panel

4.2 Display

When the green light INPUT VOLTAGE is on, this means that the stabilizer is on and there is an input voltage.

When the green light OUTPUT VOLTAGE is on, this means that there is an output voltage.

When both the green light INPUT VOLTAGE and red light MAX are on, this means that the limiting input voltage is exceeded (« $U_{in} > 285 \text{ V}$ ») and the power is shut off. When both these indicators blink, the input voltage is outside the operating range ($270 \text{ V} < U_{in} < 285 \text{ V}$), but the power is still supplied to the load.

When both the green light INPUT VOLTAGE and red light MIN are on, this means that the input voltage is below the lowest allowed value (« $U_{in} < 160 \text{ V}$ ») and the power is shut off. When both these indicators blink, input voltage is outside the operating range ($160 \text{ V} < U_{in} < 175 \text{ V}$), but the power is still supplied to the load.

When the OVERLOAD light is on, the load is shut off due to an overload. When the OVERLOAD light is blinking, the shut-off countdown is in progress.

4.3 Operating principle

The stabilizer uses power switches to perform automatic dial switching of the power autotransformer's taps depending on the input voltage.

A structural diagram of the stabilizer is given in fig. 4.2.

When the stabilizer is turned on, the input voltage passes through the input filter (1) and goes to the power switches (2). These switches are connected to the autotransformer's coils (4). The control circuit (3) turns the power switches (2) on sequentially, thus changing the autotransformer's turns ratio, depending on the input voltage value measured by the circuit (6). This leads to the increase of the output voltage from the minimum to a value from within the range specified by table 3.1. If the input voltage is in the 160-285 V range, then the load relay (7) will be turned on within 1-2 sec, and a stabilized voltage will be fed into the stabilizer's output power socket. If the input voltage fluctuates within the operating range, the control circuit (3) tunes the output voltage to within the required precision using power switches (2).

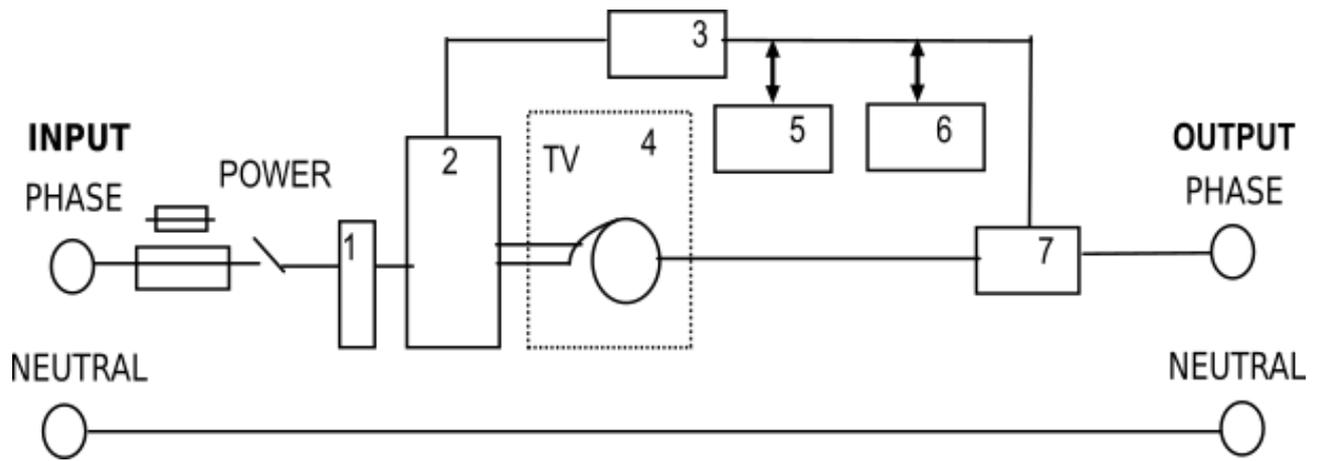


Figure 4.2 Structural and functional diagram of the stabilizer

1 – input filter, 2 – power switches, 3 – control circuit, 4 - autotransformer, 5 – indicating circuit, 6 – current and voltage measuring circuit, 7 – output relay.

Then both green lights INPUT VOLTAGE and OUTPUT VOLTAGE are on (5).

If the input voltage falls outside the operating range, the control circuit is no longer able to maintain the required output voltage. In that case the stabilizer will only adjust the input voltage by keeping the output voltage in the range **200...252 V** (either MAX or MIN light is blinking).

If the input voltage is higher than the critical upper limit ($U_{in} > 285V$), the output voltage will be disconnected from the load. The OUTPUT POWER light will turn off, while the MAX light will turn on. If the input voltage gets back within the 160-275 V range, the output voltage will be turned on automatically. The MAX light will turn off, and the OUTPUT VOLTAGE light will turn on.

If the input power is lower than 160 V, the output voltage will be also turned off, the OUTPUT VOLTAGE light will turn off, and the MIN light will turn on. If the input voltage gets back within the 170-285 V range, the output voltage will be turned on automatically. Then the MIN light will turn off, and the OUTPUT VOLTAGE light will turn on.

If the stabilizer's load (power consumption) exceeds the acceptable upper limit value (it is shown in the line "Power" for each stabilizer model), then the OVERLOAD light starts blinking; then the stabilizer's load is shut off (the INPUT VOLTAGE light turns off, and the OVERLOAD light turns on). Then the stabilizer will turn on again, but if the overload continues for more than 10 seconds, the stabilizer will be shut off again. Once this happens, the stabilizer can only be turned on again after the reason for the overload has been eliminated. The stabilizer should be started by repeating all steps indicated in the chapter "Preparation and operating procedure". The duration of the light's blinking depends on the magnitude of the overload. If the load exceeds the allowed value by a factor of 2 or less (one-time overload), then the light will blink for about 15 s. In case of a two-fold overload the light will be blinking for no longer than 2 s. If the overload is four-fold or higher, the power turns off virtually immediately.

5. SAFETY MEASURES

WARNING!



Total power consumption of all electric devices plugged into the stabilizer should not exceed the indicated power.

- 5.1 Do not allow foreign objects or liquids to get into ventilation openings of the stabilizer's case.
- 5.2 In case of a malfunction, or to perform any maintenance operations that require opening the stabilizer's case, the stabilizer should be turned off and unplugged from the power socket.
- 5.3 If the power cord gets damaged, it should be replaced by the manufacturer, a service center representative, or another qualified professional.



DO NOT:

- operate the stabilizer in a potentially explosive or chemically active environment in which there is a risk of damage to metals or insulation;
- plug a stabilizer that is not grounded into the power source, and operate such a stabilizer.



The stabilizer must be grounded through the ground terminal of the power cord used to connect the stabilizer to the power supply.

- operate a stabilizer if the case is damaged and its parts came into contact with conducting parts; if there appears a smoke or smell of burning insulation; if the noise or vibration increases.
- plug in electromotors (separately or as part of some equipment) with the nominal load power of more than one third of the maximum stabilizer's power (a motor's power is usually indicated in its manual).

6. PREPARATION AND OPERATING PROCEDURE

- 6.1 Following shipping at subzero (°C) temperatures or in high humidity conditions, store the stabilizer under normal air conditions for at least 4 hours before it can be operated.
- 6.2 Inspect the exterior of the stabilizer. Make sure there are no damages to the case or the power cord.
- 6.3 The stabilizer should be wall mounted.
- 6.4 To mount the stabilizer on a wall:
 - disconnect the bracket from the stabilizer's back panel by pressing down on the bracket's edge. Mount the bracket on the wall (see fig. 6.1).



WARNING!

The use of abrasive materials, synthetic cleaning products, and chemical solvents may lead to the damage of the case surface, circuits, and indicators of the stabilizer. Liquids or foreign objects getting inside the stabilizer may cause its failure.

8. TROUBLESHOOTING

Table 8.1

Problem signs	Possible cause	Actions
There is no output voltage, and none of the lights are on	The automatic breaker tripped	Push the button of the automatic breaker
	Power cable's break A switch is malfunctioning	Repairs should be done at the service center or by the manufacturer
There is no output voltage, and one of the lights is on.	Other issues	
There is an output voltage, but none of the lights are on.		

9. SHIPPING AND STORAGE

9.1 The stabilizer should be shipped in original manufacturer's packaging by any type of ground transport (in closed unsealed containers), by river, sea, or air (in closed sealed containers) without any limitations on distance or speed.

9.2 The stabilizer should be stored in the manufacturer's packaging in heated ventilated spaces at temperatures from minus 40 °C to +35 °C at relative air humidity below 80%.

The storage space should be free of dust and mist of acids or alkalis that could cause corrosion.

10. MANUFACTURER'S WARRANTY

This product carries a 24 months manufacturer's warranty, starting from the purchase date, providing the purchase date was before the expiration of guaranteed storage life. The guaranteed storage life of the stabilizer is 36 months from the date of manufacture. When there is no dated proof of purchase, the purchase date for purposes of this warranty will be the date of manufacture.

If the stabilizer fails due to manufacturer's defects within the warranty period, the client has the right to have the stabilizer repaired free of charge. In this case the warranty period will be extended by the time the repairs took.

ATTENTION! The manufacturer is not liable for any health or property damage if the operating guidelines stated in this Manual were not followed.

ATTENTION! Make sure that the factory and store receipts are filled out correctly. They must clearly state: the manufacturer, retailer, date of manufacture, date of purchase; they must bear the manufacturer's and the retailer's seals, and **BE SIGNED BY YOU**.

The warranty is voided in the following cases:

- the rules of storage, shipping, mounting, and operating stated in this Manual were not followed;
- the original factory receipt or the proof of purchase is missing;
- the warranty card is missing;
- the stabilizer was repaired, disassembled, or otherwise tampered with by unauthorized persons or companies;
- the stabilizer shows mechanical damage, traces of chemicals or foreign objects inside it;
- the stabilizer was damaged due to no fault of the manufacturer;
- the stabilizer was not used as intended.

ATTENTION! The manufacturer reserves the right to make changes in the design of the stabilizer without advance notice or modification of this Manual, as long as the said changes do not adversely affect the stabilizer's technical specifications.