

Legat-5M

Voltage Stabilizer

Technical Certificate



1. Application

Legat-5 single-phase voltage stabilizer, hereinafter referred to as the stabilizer, is designed for providing different consumers with high-stable power supply.

The stabilizer is designed for use in non-explosive environment that does not contain abrasive and conductive dust, corrosive vapors and gases in concentrations of metals and destroy the insulation, at ambient temperatures from -10 to +40 ° C, relative humidity of 60 to 80% atmospheric pressure of 86 to 106.5 kPa.

2. Technical Brief

Operation voltage range, V	90-420
Maximum output current, A	2.2
Maximum output power (at input voltage of 180-259V), VA	500
Maximum output power at upper value of input voltage, VA	300
Output power, V	adjustable, 200-240, with the step of 1V
Output voltage stabilization accuracy, %	1.5
Input voltage range at preserved operability, V	90-450
Mains frequency, Hz	50/60
Amount of phases	single-phase
Maximum tripping time at abrupt input voltage deviation by 40V, sec	0.05
Efficiency factor at 160V<U _{BX} (U _{input})<240, not less than %	91
Power factor at stabilizer input at active output load of 500W, not less than	0.98
Nonlinear distortion factor of output voltage, not more than	1%
Overload multiplicity	1.5
Load tripping delay, sec	adjustable 0-300
Load shedding delay at overloading, sec	1-15
(depending on the overload extent with linear power-time relation of 110% - 15 sec, 150% - 1 sec)	
Allowable cosφ	0.4
Weight, kg	3,5
Dimensions, mm	230x90x170
Cooling	natural
Protection class (leaking)	IP20

Caution! It is strongly prohibited to put any objects, capable of blocking the air flow, onto the upper cap of the stabilizer.

3. Construction and Operation Principle

The stabilizer operation principle is based on output voltage adjustment by means of pulse-duration modulation. At the input and output of the device, there are analog filters, effectively smoothing the impulse noise in the circuit. The stabilizer has the applied transit scheme of a “neutral wire” – from the input to the output of the device, which allows connecting the consumer’s equipment, operability of which depends on input voltage phasing correctness.

The stabilizer has two operation modes:

- **VIP mode**, in which there is applied stabilization of **accurately** determined voltage with the error of ±1.5% within the output voltage adjustment (200-240V);

- **economical mode**, in which stabilization is accomplished beyond the established output voltage range. The output voltage within the limits, established by the user, equals the input

stabilizer

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voltage virtually without energy loss, which allows significant **saving** the electric energy. The minimum allowable range limit is 200V, the maximum one is 240V, which does not exceed the limits of technical information of the most of devices.

The stabilizer faceplate contains (see. figure):

- adjusting knobs for setting the output voltage and the stabilizer startup delay time;
- digital display for indication the input and output voltage, and for stabilizer load indication;
- fault indicators;
- 4A input fuse;
- output socket.

From the moment of the stabilizer startup, with the period of 3 sec the digital voltage display alternately shows the input voltage, the stabilizer loading percentage, and the output voltage, indicated by the corresponding indicators. The load is tripped after the time, established by the user (factory setting is 3 sec).

In case of output overload, the overload indicator starts to glow. In cases of tripping of voltages with high values of starting current (induction motors, demagnetizing systems of television kinescopes, high-power incandescent lamps), the output voltage reduction is allowable for the period of startup of the aforementioned devices. This function allows reducing the high starting currents and prevents the stabilizer output from shedding.

Recommendation: If the stabilizer Legat-5M operates on stand-alone gasoline (diesel) generator, the output voltage which changes the frequency and amplitude, has a large distortion (10%), the need to translate Dimo-stabilizer in Economy mode (with $\Delta \geq 10$ V).

In case of a load surge exceeding the 100% of power, the load will be cut off according to the linear power-time relation. In case of short circuit (SC), the integrated SC protection trips, the load is cut off and the SC indicator starts to glow. In such a case, to resume the load tripping one should either reset the stabilizer (by removing the plug from the mains socket), having preliminarily shut down some electric devices and reduced the power consumption to the allowed value, or remove the cause of SC.

If the input voltage becomes beyond the limits of the operation voltage range, the load will be cut off and the input fault indicator will start to glow. The stabilizer will automatically trip the load after input voltage resumption (with the delay, preset by the user). The stabilizer has the overheat protection. In case of overheat, the load is cut off and the overheat fault indicator starts to blink. After cooling the device, the load trips with the preset tripping time.

The Table 1 shows the correspondences between the possible fault variants and the fault indicators, as well as the methods of troubleshooting.

Table 1.

	Fault description	Fault indicator				Troubleshooting
		Input	Short circuit	Overheat	Overload	
1	Overheat	-	-	-	+	Reduce the total load power
2	Input SC	-	+	-	-	Remove SC, stabilizer on/off
3	input voltage $U_{BX} < U_{BX. \min}$ $U_{BX} < U_{BX. \max}$	+	-	-	-	Stabilizer not appropriate for this circuit
4	Thermal fault	-	-	+	-	De-energize the stabilizer, eliminate external sources of heat

4. USE OF PURPOSE

4.1. Preparing the Stabilizer for Operation

- perform the external inspection of the stabilizer to discover any damage to the housing and to the power cable;
- **make sure to provide ground connection to the circuit socket;**
- connect the stabilizer to the circuit without application of any load;
- apply load.

WARNING! Stabilizer Legat-5M represents a capacitive load (about 1.7 uF) to the mains, so when working from an independent gasoline (diesel) generator may be a spurious resonance winding of the generator with the specified input capacitance. The consequence of this resonance increases the output voltage at no-load generator and the input voltage for the regulator, which can be seen on the scoreboard stabilizer U_{in} . In order to rise in voltage due to resonance was negligible $10 \div 20\%$ to comply with the requirement: full power of the generator should not be less than 2 times the power of the stabilizer.

4.2. Adjustment

Economical mode. For performing adjustment one should separately set the lower and the upper limits of the output voltage range, when the output voltage is equal to the input one. Setting the lower limit is performed by turning the $U_{ВЫХ,В}$ ($U_{output,V}$) knob. The digital display shows the set voltage value on the background of three points. To save the set voltage value in the memory of the stabilizer and exit this setting, one should wait for 3-4 sec. To set the upper limit one should perform the aforementioned actions with the $\Delta U,В$ ($\Delta U,V$) (values are from 0 to 40), i.e. the output voltage can acquire values from $U_{ВЫХ}$ to $U_{ВЫХ} + \Delta U$.

If one sets zero value by turning the $\Delta U,В$ knob, the stabilizer will operate in the **VIP mode**. Setting the reset time is performed by turning the $T_{ВКЛ}(сек)$ ($T_{on}(sec)$).

5. Security measures

While choosing a stabilizer, one should take into account the total power consumption of the load.

Inside the housing of the stabilizer, there is voltage that is dangerous to life.

It is strongly prohibited:

- to crush the stabilizer;
- to connect to the mains and to operate an ungrounded stabilizer;
- to operate the stabilizer, when any of its housing parts is deformed so that it contacts the current-conducting parts;
- to operate the stabilizer at inefficient work of the switch, at the signs of smoke or smell, typical for burning insulation;
- to store and to operate the stabilizer in the rooms with chemically active or explosive environment.

WARNING! Do not put on top of the stabilizer of any objects that might impede the flow of air.

6. Maintenance

CAUTION! All maintenance works must be performed, when the plug is off.

7. Transportation and Storage

It is allowed to transport the stabilizer in the vertical position by any means of transport.

The stabilizer must be stored at the air temperature starting from -40°C to $+60^{\circ}\text{C}$ and at the relative air humidity – up to 80%.

In the storage room, there must not be any dust, acid and alkali vapor, which may cause corrosion.

8. Warranty

The manufacturer guarantees the failproof operation of the Legat-5 stabilizer within twelve months after the date of sale, provided:

- correct connection;
- manufacturer's quality control department seal integrity;
- integrity of the housing, no traces of unsealing, no cracks, chips etc.

When choosing a stabilizer is important to remember!

While choosing a stabilizer, one should take into account the total power consumption of the load, which you want to connect to the stabilizer. The total power – is all the power, consumed by an electric device, and it consists of active and reactive power (depending on the type of load). The active power is always specified in Watts (W), while the total power – in volt-amperes (VA). The devices are consumers of the electric energy, having both active and reactive components of the load. The total power (VA) and the active power (W) are interrelated by the $\cos\phi$ factor.

The active load. At this type of load, all the consumed energy is transformed into heat. Some devices have this component as the main one. Examples: incandescent lamps, heaters, electric stoves, irons etc.

The reactive load. All the other types. The reactive component of the power does not perform any useful work, it only serves for conducting magnetic fields in inductive receivers, while circulating all the time between the source and the consumer.

High starting currents. At the moment of start-up, any electric motor consumes the energy, which is several times bigger than in the normal mode. In case when the load contains an electric motor, which is the main consumer in the device (for instance, submersible pump, refrigerator etc.), its nameplate power consumption must be multiplied by 3 to avoid the stabilizer overload at the moment of starting.

Proceeding from all the aforementioned, it is recommended to choose the stabilizer model with a 25% margin of the load power consumption. You will provide the partial load mode of the stabilizer, thereby increasing its service life.