THREE-PHASE AC RELAY WITH OVERHEAT PROTECTION
MO26-T

USER'S MANUAL

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CONTENTS

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If you need information about the product, which is not shown in this user's manual or which concerns the specific application of our product, please contact the sales office to the manager who is responsible for your enterprise.

Engineers "Electrum AV" have a lot of experience in the design, manufacture and application of powerful force devices and smart drivers and has already implemented a large number of individual decisions. If you need power modules and drivers that are not included in the package, as well as products with differences from the standard devices in specifications or design, please contact to our managers and specialists who will offer you best solution for your application.

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1. APPLICATION AND PRODUCED MODULES

A solid state thyristor optoelectronic three-phase AC relay (MO26-T) with «normally opened» contacts, with function of power thyristors protection against overheat, are intended to use in equipment of automation devices as a commutating element with maximum peak voltage 1200 V or 1600 V and rms current for each phase up to 250 A. AC relay (hereinafter – modules) are represented with the following versions:

By control types:

MO26MA – control voltage 5…32 V with phase through “zero” junction control.

By type of power assembly:

Peak voltage 1200 V with an amount of maximum rms current 25,40,63,100 A.

Peak voltage 1600 V with an amount of maximum rms current 25,40,63,100 A.

On figure 1.1 is shown the module name explanation.

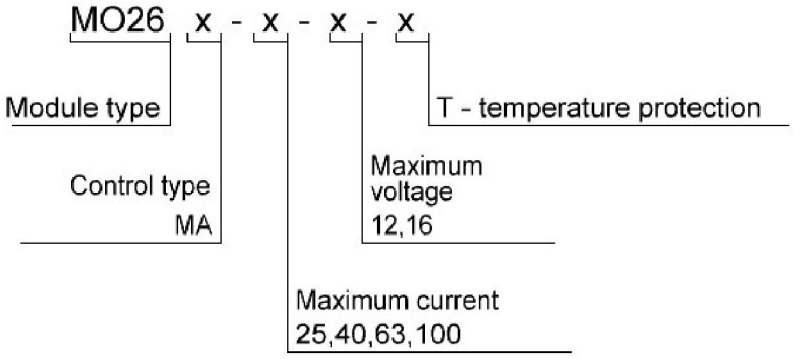

Figure 1.1 – Module name explanation.

For example, module MO26MA-100-12-T: a module with the control voltage 4…32 V, with the phase through “zero” junction control, with the peak voltage 1200 V and maximum rms current of the each phase 100 A.

2. GENERAL DESCRIPTION

The functional module circuits combined with the connecting circuits is represented on Figures 2.1.

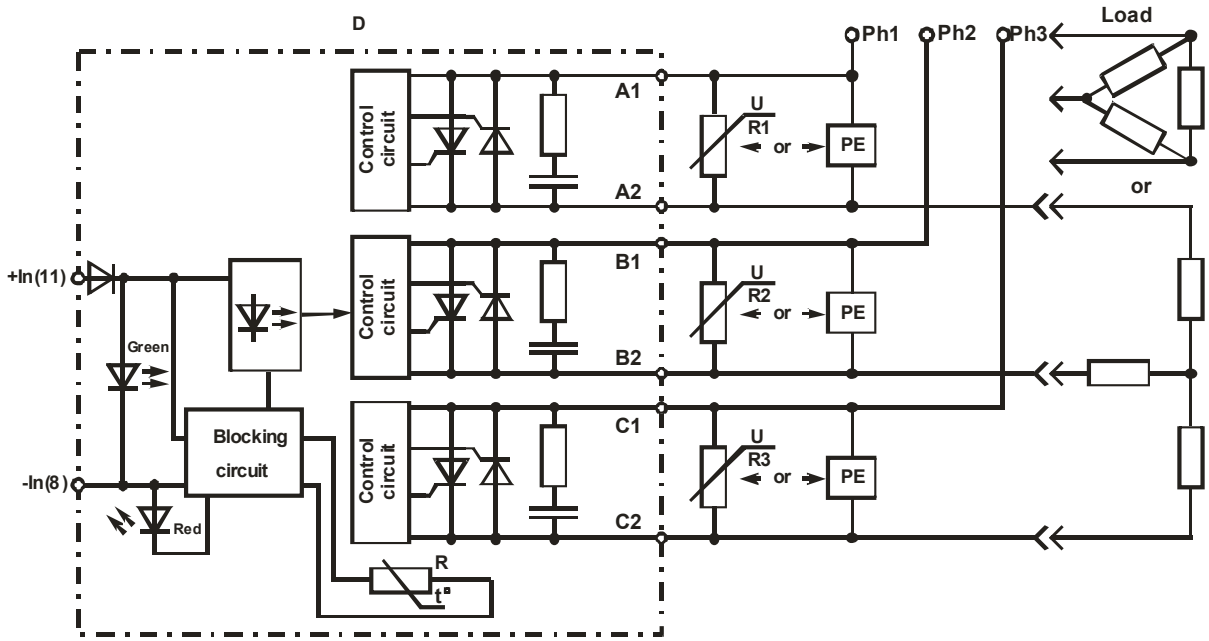

Figure 2.1 – Functional module circuit

Where:
D – module
«Red» - a red LED light that indicates the temperature protection operation;
«Green» - a green LED light that indicates presence of control voltage.
The parameters of internal RC-circuit: R = 20 Ω, C = 0.01 μF
R1, R2, R3 – protective varistors of types FNR; JVR with classified voltage:

$U_{cl} = U_s^{rms} \cdot \sqrt{2} \cdot 1.1$ $\quad$ $U_{peak} > U_{cl} + 150$ V

Ph1, Ph2, Ph3 – phases of commutating voltage

When the radiator reaches the limit temperature the modules is switched off, the red LED light switches on and disconnects the module external circuit. After temperature drops lower than the limiting value the protection will be removed. If the accident is not disposed then the above described process continues as long as it is defaulted.

There is a protective diode in the input circuit that protects the input circuit against incorrect voltage supply.

3. BASIC PARAMETERS

Basic parameters and maximum permissible module parameters at temperature 25^0C are represented in Tables 3.1 – 3.2.

Table 3.1 – Basic and maximum permissible parameters of modules' control

Parameter name, unit	Symbol	Value
Input current at minimum switch-on voltage (max), mA	I_{ON}	30
Input current at maximum switch-on voltage (max), mA		75
Switch-on control voltage, V	U_{ON}	5…32
Switch-off control voltage (max), V	U_{OFF}	-3.5…0.8
On/off time at frequency 50 Hz (max), ms	$t_{on/off}$	10 / 10
On/off time at frequency 400 Hz (max), ms		1.25/1.25
Temperature of temperature protection operation (typical), °C	T_P	100

Table 3.2 – Basic and maximum permissible parameters of power modules' circuits

Parameter name, unit	Symbol	Maximum module current, A			
		25	40	63	100
Repetitive pulse voltage: reverse / in close state (max), V for modules of 12-th class	V_{DRM} /V_{RRM}	±1200			
Repetitive pulse voltage: reverse / in close state (max), V for modules of 16-th class		±1600			
Commutating voltage (rms), V for modules of 12-th class	$V_{O(RMS)}$	~ 40…430			
Commutating voltage (rms), V for modules of 16-th class		~ 40…750			
Commutating current (rms), A	$I_{O(RMS)}$	0.2…25	0.2…40	0.2…63	0.2…100
Surge current in open state at t=10 ms (max), A	I_{TSM}	200	300	750	1250
Repetitive pulse current in close state / reverse current (max), mA	I_{DRM} / I_{RRM}	±3			
Pulse voltage in open state at I= $I_{O(RMS)}$ (max), V	V_{TM}	1.5			
Critical current rise rate in open state (max), A/μs	$(di_T/dt)_{crit}$	150			
Critical voltage rise rate in open state (max), V/μs	$(du_d/dt)_{crit}$	1000			
Junction-base thermal resistance (max), ºC/W	$R_{thjc\ t}$	1.0	0.7	0.6	0.3
Junction temperature (max), °C	T_J	125			
Insulation strength (DC, 1 minute), V	V_{ISOL}	4000			

4. INSTRUCTIONS FOR USE

General requirements

It is recommended to operate the module at operating value of the average current not more than 80% from specified in the name of the module and the junction temperature not more than (70÷80)% from the maximum one.

It is not allowed to operate the module in modes atНе допускается эксплуатация модуля в режимах at simultaneous influence of two or more maximum permissible values.

In the electric circuit of equipment with using of the modules should be provided the fast-speed protection against prohibitive overloads, SCs and commutating overloads.

Module mounting

The module is mounted in the equipment to cooler (chassis, application housing, metal plates, etc.) in any orientation with screws M5 with torque (5±0.5) N·m, with obligatory installation of flat and spring washers. The module should be located in such a way to protect it against additional heat from neighbor elements. The planes of cooler ribs should be oriented in the direction of air flow.

The contact area of the cooler should have roughness not more than 2.5 μm and flatness tolerance – not more than 30 μm. Cooler surface should not have any rough edges, honeycombs. There should not be extraneous particles between the module and cooler. To improve the heat balance the module installation to mounting area or cooler should be carried out by instrumentality of heat conducting pastes or having similar heat conducting properties.

When mounting, you should provide uniform pressure of module housing to cooler. For this purpose you should tighten all screws uniform in 2 – 4 steps by turns: first, located on one diagonal, then on the other one. When dismounting the module the screw tightening should be done in the reverse order.

Not earlier than in 3 hours after mounting the screws should be rotated to the end, keeping the prescribed torque, because the part of heat conducting paste under pressure will outflow and the fastening can fail.

You can install the several modules without additional insolating spacer to one cooler, on condition that voltage between outputs of different modules will not exceed the minimum value of isolation breakdown voltage of each of them or when cooler is grounded.

Connection to module

Electric wires and cables will be connected to power contacts of the module by means of screws M6 or M5 with torque (4 ± 0.5) N·m or by means of bolts M8 or M10 with torque (5 ± 0.5) Н·m and the washers that are supplied in the pack.

Power wires should be connected by means of connectors with corrosion-inhibiting cover, which are purified of foreign layers. When the screws (bolts) are tightened it is recommended to fasten the connection with paint. It is recommended to tighten screws (bolts) repeatedly in 8 days and in 6 weeks after the start of operating. Afterwards tightening should be controlled at least once a half year.

The controlling module outputs (gate and control source output) are intended for mounting by means of soldering or split connectors. Permissible number of module outputs' re-soldering during electronic (assembly) edit is three. Outputs soldering should be performed at temperature not higher than (235±5) °C. Soldering duration is not longer than 3 sec.

When mounting and operating it is necessary to make protection measures against static electricity impact and overvoltage in gate circuit; on mounting personnel should use a ground band and grounded low-voltage soldering irons with transformer supply.

Operational requirements

The module should be used under mechanical loads in accordance with Table 4.1.

Table 4.1 – Mechanical loads impact

External exposure factor	External exposure factor value
Sinusoidal vibration: - acceleration, m/s^2 (g); - frequency, Hz	 150 (15) 0.5 - 100
Multiple-acting mechanic shock: - peak shock acceleration, m/s^2 (g); - shock acceleration duration, ms	 40 (4) 50
Linear acceleration, m/s^2 (g)	5000 (500)

The module should be used under climatic loads in accordance with Table 4.2.

Table 4.2 – Climatic loads impact

Climatic factor	Climatic factor value
Reduced ambient temperature: - operating, °C; - maximum, °C	 - 40 - 45
High ambient temperature: - operating, °C; - maximum, °C	 + 85 + 100
Relative humidity at temperature 35 °C without moisture condensation, %, max	98

Safety requirements

1. Working with the module should only be performed by qualified personnel.
2. Do not touch the power terminals of the module when applying a voltage.
3. Do not connect or disconnect wires and connectors while the power to the circuit module is applying a voltage.
4. Do not touch the module radiator, if it is not grounded in and is applying a voltage on it.
5. Do not touch the cooler and the module housing during its operation, since their temperature can be very high.
6. Immediately turn off the power supply of the module if it discharges smoke, odor or abnormal noises, check if the module correctly connected.
7. It is not allowed penetrating water and other liquids to the module.

5. RELIABILITY REQUIREMENTS

The manufacturer guarantees the quality of the module all the requirements of the passport if the consumer observes terms and conditions of storage, installation and operation, as well as guidance on the application specified in the user's manual.

Operating warranty is two years from the acceptance date, in the event of requalification – from the date of requalification.

Reliability probability of the module for 25000 hours must be at least 0.95.

Gamma percentage life ($T\gamma$) of module at $\gamma = 90\%$ in typical operation conditions should not be less than 50 000 hours within lifetime.

Gamma-percent service life of the modules, subject to cumulative operating time is not more than gamma-percent life, not less than10 years, at $\gamma = 90$ %.

Gamma-percent storageability time of the modules, at $\gamma = 90$ % and storing – 10 years.

6. OVERALL AND CONNECTING DIMENSIONS

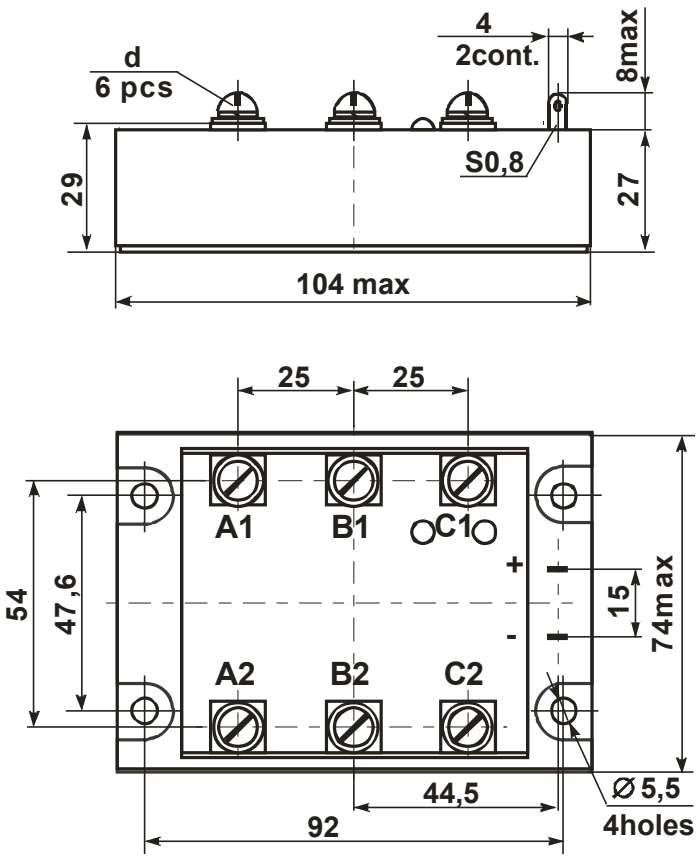

Figure 6.1 – Overall drawing of modules MO26-T

d – M5 for modules 25, 40, 63 A;
d – M6 for modules 100 A

Precious metals are not contained.

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