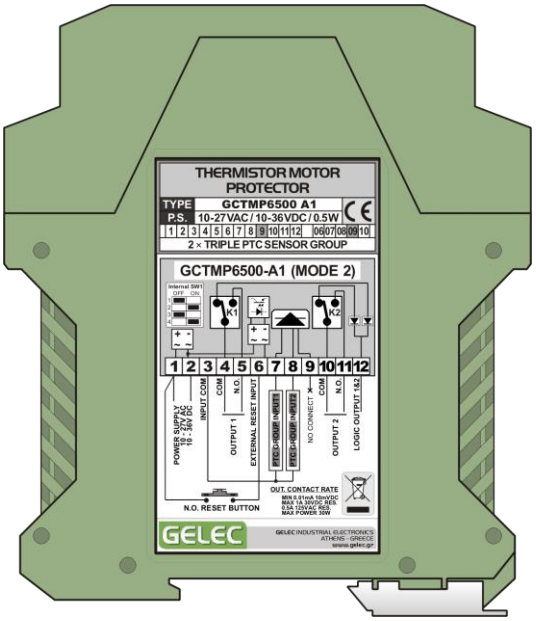
THERMISTOR MOTOR PROTECTOR
TMP6500



GELEC

INDUSTRIAL ELECTRONICS

CONTENTS

I. PRECAUTIONS!

There are no serviceable parts inside the **TMP6500** unit. Not to be opened by any unauthorized person. All repairs to the device must be carried out by the manufacturer or a qualified service engineer.

Improper handling may result in serious personal injury and considerable material damage. All connection and maintenance work must be carried out by qualified personnel.

RISK OF ELECTRIC SHOCK!

Use the correct voltage. The TMP6500 is designed for use with specific voltage only. Connection to a different voltage may cause fire, electric shock or other damage.

Do not touch the plug and the connectors with wet hands.

Disconnect the TMP6500 before cleaning it, to avoid the risk of electric shock.

Attempting to use a malfunctioning TMP6500 can be dangerous.

Do not block the ventilation slots on the cabinet of the TMP6500.

Keep liquids away from the TMP6500.
Spillage into the cabinet may result to fire, electric shock, or equipment damage. If a small object or liquid falls/spills into the TMP6500 cabinet, unplug the unit immediately. Have the unit checked by a qualified service engineer before using it again.

Set the TMP6500 in an appropriate location.
Do not install in a dusty, humid, or vibrating environment. Do not place it near heater, or air conditioner. Keep it away from air, steam, extremely high or low temperature or humidity.

2. MANUFACTURER'S WARRANTY, GENERAL TERMS AND CONDITIONS

Thank you for purchasing our product.

Our products have been manufactured with the latest technology, the highest quality components and have gone through rigorous quality control tests at the factory, before shipment. Make sure that the part number and type indicated in the identification label and pack correspond to the part number or type of your order. After receiving, inspect the unit to ensure that no damage have been caused during transportation.

GELEC and GELEC's authorized distributors warrant to the original purchaser that the product shall be free from defect in material and/or workmanship. The warranty period begins on the purchase date (proof of purchase by invoice or delivery note) and is valid for one (1) year.

In the event of malfunction during the warranty period attributable directly to faulty material and/or faulty construction and functional defects, GELEC and authorized distributors will, at their option, either repair or replace the faulty product with the same or similar model.

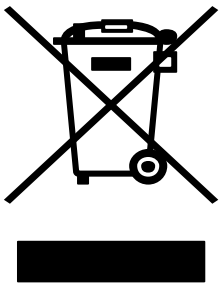
GELEC and authorized distributors shall have no obligation under this warranty, however, in the following cases:

- Any defect caused by freight damage, accident, disaster, faulty maintenance or improper handling.
- Any defect caused by modification, alteration, abuse, misuse or incorrect installation.
- Any defect of the product caused by improper repair by third party other than GELEC and GELEC's authorized distributors.
- Any incompatibility of the products with subsequent technical innovations or regulations.
- Any defect of the product caused by external equipment.
- Any defect of the product on which the original manufacturer's labeling has been altered or removed.

In case of complaint please contact our company or send the unit un-dismantled to your local dealer. Any necessary replacement parts and necessary repair work are totally covered free of charge.

All products are designed and produced by the manufacturer GELEC Co. Ltd to be in compliance with the EU norms applying to them. GELEC is not responsible for direct or indirect damages or malfunction caused by improper use or installation of the TMP6500.

3. DISPOSAL OF OLD ELECTRICAL & ELECTRONIC EQUIPMENT



This symbol, found on your product, indicates that this should not be treated as household waste when you wish to dispose it.

It should be handed over to an applicable collection point for the recycling of electrical and electronic equipment.

By ensuring this product is disposed of correctly, you will prevent potential negative consequences to the environment and human health, which could otherwise be caused by inappropriate disposal of this product.

The recycling of materials will help to preserve natural resources.

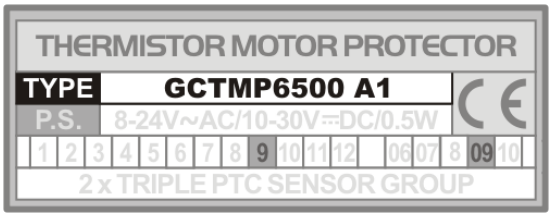
4. THERMISTOR MOTOR PROTECTOR TMP6500

This operator's manual explains the functions and operation of the **TMP6500**. It also gives some troubleshooting tips as well as general precautions to be taken when operating the unit. In order to ensure the best performance and effective use of the TMP6500, we recommend that you read the information in this manual carefully and follow the instructions contained.

This manual is a complete guide to the TMP6500 with information on unit user maintenance, unit installation and instructions on how to operate it. Do not touch any part of the TMP6500 the manual does not cover. Keep the manual for immediate reference. It should help in solving any operational questions you may have.

No part of this manual may be quoted, reproduced, stored in a retrieval system, transmitted, transcribed or translated into any other language in any form or by any means, electronic, mechanical, or otherwise, without prior written permission of **"Gelec Co. Ltd"**.

Although every effort has been made to ensure that this manual provides up to date information, please note that the contents in this manual and the unit specifications are subject to change without notice.



Do not forget to refer the exact type and version of your TMP6500 whenever you contact the manufacturer, asking for any further information. You can find this information on the identification label on the side of the unit.

5. BRIEF DEVICE DESCRIPTION

The TMP6500 is a thermistor motor protection tripping unit, which protects a motor or a transformer against thermal overload. It is designed to monitor the temperature of electric drives, transformer windings, bearings etc. in conjunction with PTC Thermistors that follow the ***DIN 44081-44082*** standards (single or triple sensors).

TMP6500 is connected with the motor-embedded PTC thermistors and uses their abrupt resistance increase as a control signal for the tripping unit. When the nominal response temperature (T_C) is exceeded, the sensor acts as a thermal switch and activates a relay output for any use (disengagement of the load's power supply, alarm activation etc). When an acceptable temperature level is restored, the sensor resistance decreases to the reset level and the module permits either automatic or manual reset.

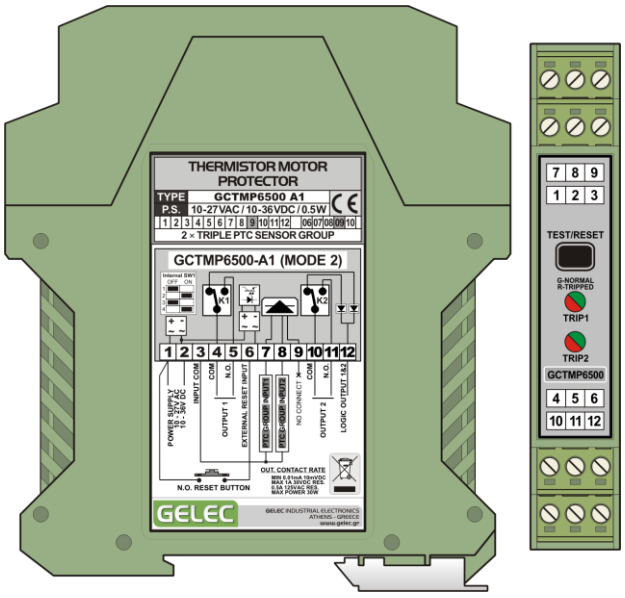


fig. 1

FEATURES

- 1 or 2 Motors control.
- Follows the *DIN 44081-44082* standard.
- Up to three PTC Thermistor groups.
- Auto or Manual Reset selection available.
- Overheating simulation feature for proper behavior confirmation.
- Fault diagnostics through display of short-circuits and disconnections in the sensor circuit.
- Adjustment of the *Control Temperature*, after contacting the manufacturer.
- Logic Output for further analysis.
- Remote *test/reset* button installation availability.
- For mounting on DIN rail NS35 (acc. to EN60715)
- Easy installation.

6. MAIN FUNCTIONS

OPERATING MODES

We can select one of the below operating modes with the internal ***Dip-switch SW1***.
Refer to page 16 for the appropriate dip-switch positions regarding the desirable mode.

1. *Latch/Non latch* mode selection (Manual reset / Auto reset).

   Warning!
   Units with the "Auto-reset" selection, must not be used in applications where the unexpected restart may lead to personal injury or material damage.

2. 1 Motor protection, through a connection with a PTC Thermistor or a triple PTC Thermistor group (Mode 1 - fig. 2). For this operating mode, only the K1 relay is available.
3. 2 Motors protection, through a connection with a PTC Thermistor each, or a triple PTC Thermistor group each. (Mode 2 - fig. 3).
4. 1 Motor with increased protection, through a connection with 3 single PTC Thermistors or 3 triple PTC Thermistor groups. (Mode 3 - fig. 4). For this operating mode, only the K1 relay is available.

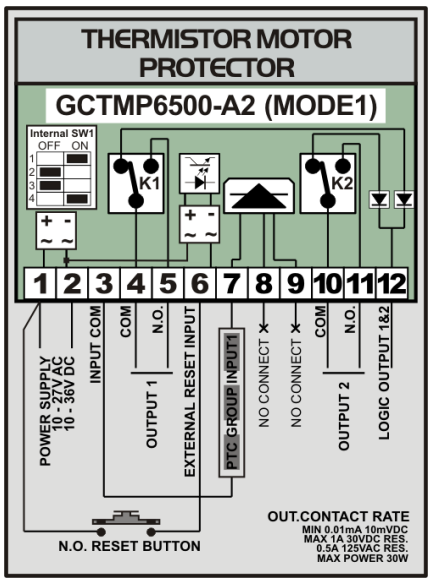


fig. 2

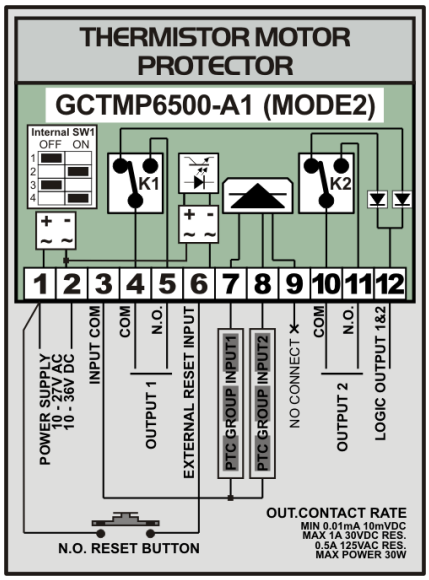


fig. 3

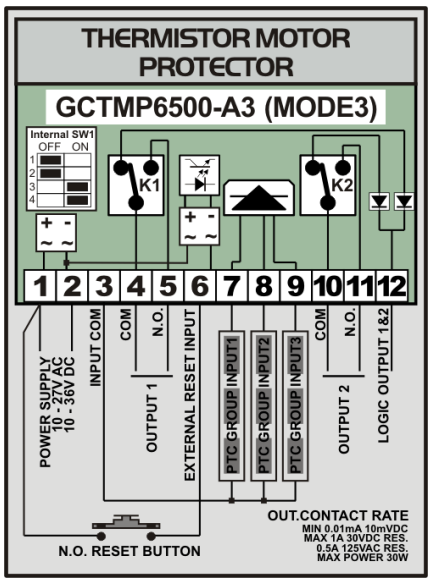


fig. 4

According to the selected operation mode, two micro-relays (K1 and K2) are activated and through their contacts they allow the motor operation when:

1. The device is power supplied and doesn't have any technical problem.
2. The motor temperature is lower than the Control Temperature (T_C).
3. There isn't any short-circuit or disconnection on any of the Thermistors.

DIN 44081/44082 - CONTROL TEMPERATURE SELECTION

The TMP6500 can also be adjusted for different Control Temperatures (T_C) than the PTC's nominal threshold temperature, depending on your application needs. The device is pre-calibrated in accordance with the ***DIN 44082*** standards (triple PTC Thermistor Group). For ***DIN 44081*** (single sensor) or for different Control Temperatures (T_C), you can follow a calibration procedure under the guidance of the manufacturer.

FAULT DIAGNOSTICS

The device has an automatic (and LED indicated) monitoring of the PTC Thermistor groups, for possible disconnections or short-circuits, which gives the ability to know whether the sensor circuit operates properly. In that case the device indicates***** the problem and de-activates the relay outputs. For proper operation, disconnect the device and restore the damage.

** Check page 11 about the LED behavior for each case.*

INPUT FOR EXTERNAL TEST/RESET BUTTON

A Normally-Open (NO) external button can be used to reset the device from distance whenever it is required. It has an equivalent outcome with the onboard *test/reset* button and could be very convenient in applications where the user access at the TMP6500 unit is difficult.

K1-K2 MICRORELAYS

The K1 and K2 micro-relays activate to supply:

1. **An independent *Normal-Open* contact** through which we control the motor power supply circuit.
2. **A logic output, through a diode.** In an application with multiple motors connected, we have the potential to connect all of the logic outputs in parallel and inform a PLC whenever any motor's temperature has risen above the T_C, or any PTC Thermistor group does not operate correctly. This output could also lead to an indication lamp, an alarm component or for any further use.

TEST/RESET FUNCTION

At the front of the TMP6500 there is a tactile button. This button is used as a *TEST* on demand for the output circuits of the device and the electrical automation of the application too. By pressing this button, an internal electronic circuit simulates the overheat condition in both channels (Trip 1 / Trip 2) and activates the relay and the logic output like the PTCs do, giving the ability to have a full circuit test.

This feature is an important additional function, as this PTC MOTOR PROTECTOR is crucial in the fail-safe meaning, protecting the motor windings of being over-heated and damaged. Frequent Test-runs will ensure the reliability of the motor protection procedure, eliminating the risk of faulty wiring or defective alarm components.

The *Test/Reset* button at the front of the device gives the ability to:

1. **Test the device during normal operation**. An overheating simulation takes place and we can confirm that the unit behaves properly in case of temperature excess, the presence of a short-circuit, or a possible disconnection in any PTC Thermistor group circuit. Frequent *test-runs* will ensure the reliability of the motor protect procedure, eliminating the risk of faulty wiring or defective alarm components.
2. **Reset the device after motor overheating.** When the *Latch mode* is selected from the internal dip switch SW1, a manual reset is needed. Note that an instant disconnection of the power supply also resets the device. The main precondition for the device reset is the motor temperature to drop below the acceptable level (T_{RS}). If you press the button when the temperature is still high, the device will not reset. (*fig. 9,10,11)*

   Attention!
   At mode 3, we are able to reset the device, only after the temperature drops below T_C and $R<R_{TRS.}$ at all three sensors. (fig. 11)

3. **Calibrate the device (*DIN 44081-44082 / Different T_C*).** The user interference in calibration is not recommended, as it may have affection in the proper function of the device. However, if an adjustment is necessary, it should be done under the guidance of the manufacturer.

INDICATION LEDs TRIP 1 AND TRIP 2

These multicolor LEDs change their colors indicating the unit status:

- **Orange color flashing (1Hz),** after we have supplied with power and during the initialization procedure.
- **Orange color flashing (4Hz),** if none of the operation modes is selected or more than one are selected.
- **Constant orange color,** after the registering of the values that were read during the calibration procedure.
- **Constant green color,** when the device is ready for normal operation.
- **Constant red color,** when we have temperature excess on the controlled motor and the device is tripped.
  - At Auto reset mode, the LED remains red until the temperature drops below T_C and $R<R_{TRS.}$ (*fig. 12,13,14*)
  - At Manual reset mode, the LED remains red until the above condition is satisfied and furthermore, the *Onboard* or the *External Reset button* has to be pressed. (*fig. 9,10,11*)
- **Green color flashing (2Hz),** if any of the PTC Thermistor groups are short-circuited
- **Red color flashing (2Hz),** if any of the PTC Thermistor group circuits are disconnected
- **Green and Red alternately flashing (3Hz),** during the calibration procedure.

(Always in compliance with the selected operating mode. Refer to pages 15 and 16 for more information.)

7. CONTROL UNIT TMP6500

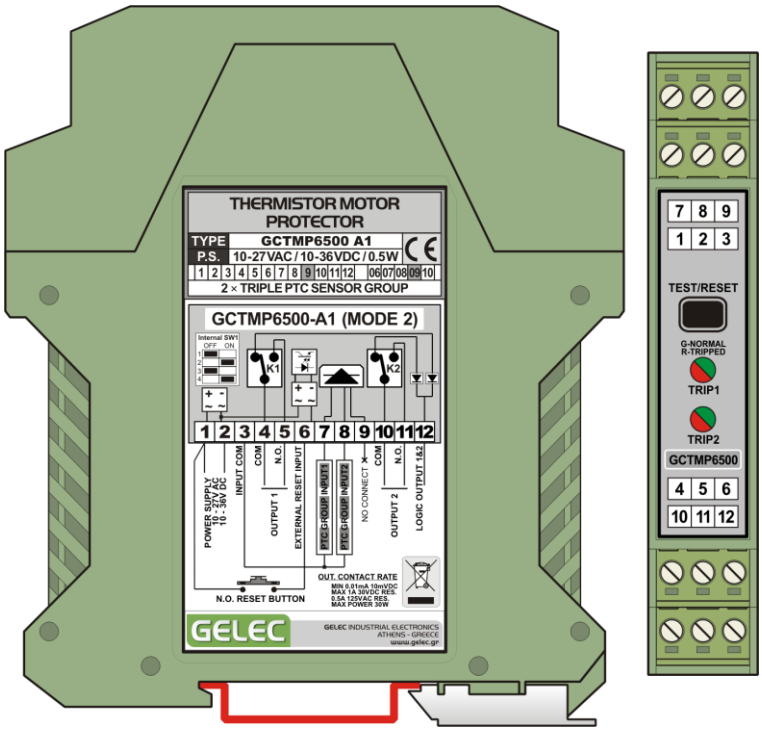


fig. 5

TMP6500 is a complete unit with built-in electric connection terminals, electronic board, in Thermoplastic case, suitable for electronic devices, for DIN NS35 rail mounting.

8. ELECTRICAL SECTION

POWER SUPPLY (Terminals #1 - #2)

The TMP6500 includes an integrated power supply circuit. The maximum power consumption is approximately 0.8W in total operation. Supply with Alternative Current **10-27Vac** or Direct Current **10 - 36Vdc**, either regulated or unregulated.

Lower voltage will have as a result malfunction in the Thermal PTC electronic circuits, giving faulty measurement signals. Higher voltages will overheat the internal power supply circuit, and break temporarily or permanently the unit operation. There is not a blowable electrical safety fuse in the internal power circuit.

Connect the power source to the terminals #1 and #2. The polarity (+/-) is not crucial when supplying with DC (potential free), as the internal power circuit includes electronic components (bridge rectifier) for non-polarity connections.

The TMP6000 is designed for use with specific voltage only, so always use the correct voltage. A connection to a different voltage may cause fire, electric shock or other damages.

All the circuits operate with 5V voltage and the Thermistor voltage at Temperature Control (T_C) is < 2,5 V.

- INPUTS -

ANALOG INPUT 1 (Terminals #3 - #7)

Analog input for the first PTC Thermistor group. (**#3**=Common / **#7**=Analog input)
(Modes 1-2-3 - *fig. 2,3,4*)

ANALOG INPUT 2 (Terminals #3 - #8)

Analog input for the second PTC Thermistor group. (**#3**=Common / **#8**=Analog input)
(Modes 2,3 - *fig. 3,4*)

ANALOG INPUT 3 (Terminals #3 - #9)

Analog input for the third PTC Thermistor group. (**#3**=Common / **#9**=Analog input)
(Modes 3 - *fig. 4*)

DIGITAL INPUT - EXTERNAL RESET (Terminals #1 - #6)

Digital input for a Normally Open (NO) contact remote button, when a reset from distance is needed. Consult the connection diagram. (**#1**=P.S. / **#6**=Digital input)
(Modes 1-2-3 - *fig. 2,3,4*)

- OUTPUTS -

DIGITAL OUTPUT 1 (Terminals #4 - #5)

A Normally Open (NO) contact of the micro relay K1 ends up to this output, through which we allow or not, the operation of the motor, as seen on the operation diagrams, when:

- There is no short-circuit at the PTC Thermistor group 1 at mode 1.
- There is no short-circuit at the PTC Thermistor group 1,2,3 at mode 3.
- There is no disconnection at the PTC Thermistor group1 at mode 1.
- There is no disconnection at the PTC Thermistor group 1,2,3 at mode 3.
- There is no temperature excess at the PTC Thermistor group 1 at mode 1.
- There is no temperature excess at the PTC Thermistor group 1,2,3 at mode 3.
- The *test/reset* button is not pressed.
- Equivalently, the relay activates the (#4-#12) Logic Output as well.

DIGITAL OUTPUT 2 (Terminals #10 - #11)

A Normally Open (NO) contact of the micro relay K2 ends up to this output, through which we allow or not the operation of the second controlled device, as seen on the operation diagrams, when:

- There is no short circuit at the PTC Thermistor group 2 at mode 2.
- There is no disconnection at the PTC Thermistor group 2 at mode 2.
- There is no temperature excess at the PTC Thermistor group 2 at mode 2.
- The test/reset button is not pressed.
- Equivalently, the relay activates the (#4/#10-#12) Logic Output.

LOGIC OUTPUT (Terminals #4/#10 - #12)

The Logic Output is a clone of the main output, available through a diode. The Normally Closed (NC) contacts of the relays K1 - K2 end up to this output. Precondition for using the output #12, is the **(+)** of the control voltage***** to be connected to the terminals #4 and #10. So, whenever any of the micro relays K1 or K2 deactivates, a signal can be sent to a PLC, an indication lamp, an alarm etc.

When the operating mode 1 or 3 is selected, the K2 relay is programmed to automatically activate, in order to avoid the constant activation of the logic output.

***** *Do not exceed the relay contact rating.*

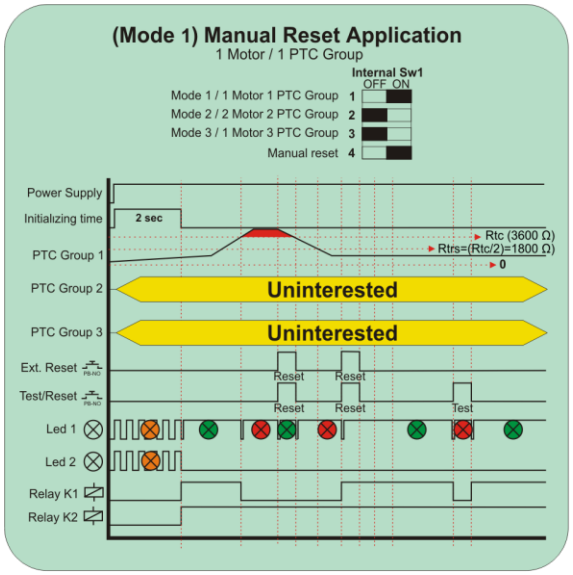


fig. 9

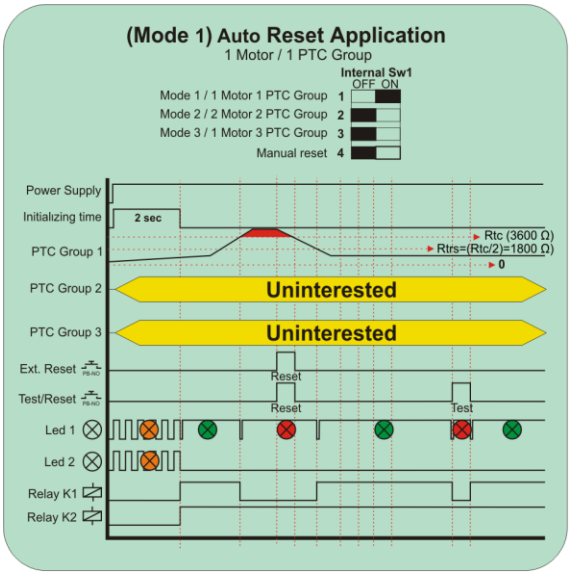


fig. 12

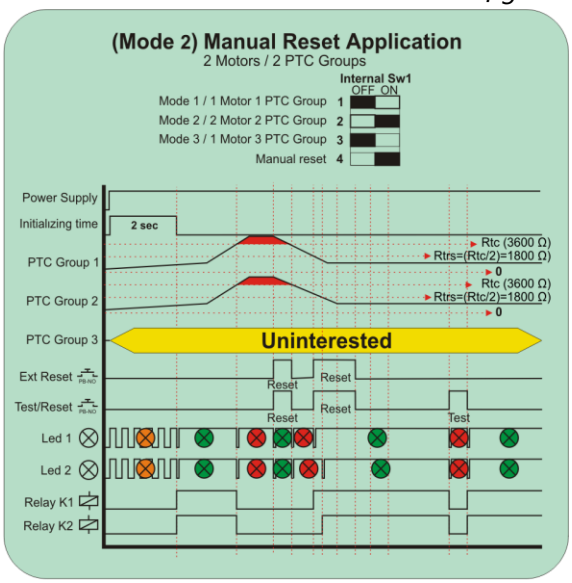


fig. 10

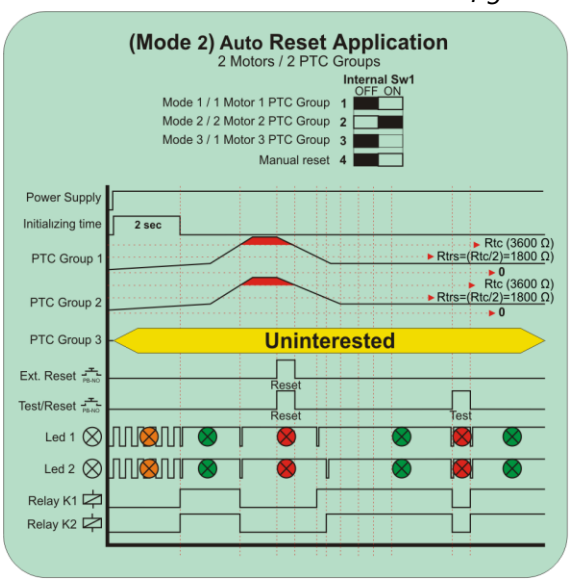


fig. 13

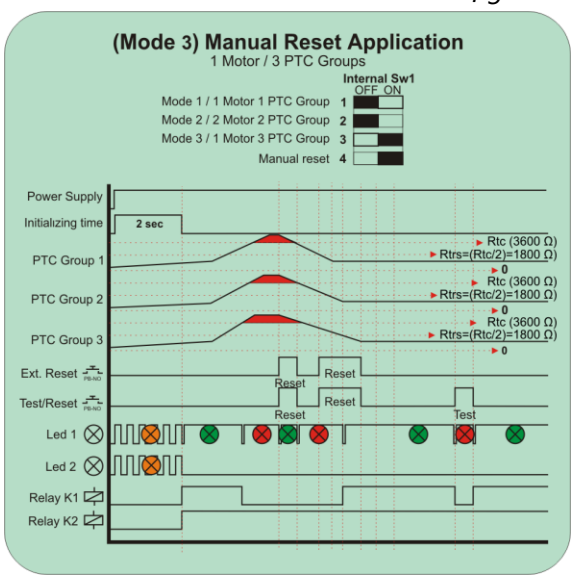


fig. 11

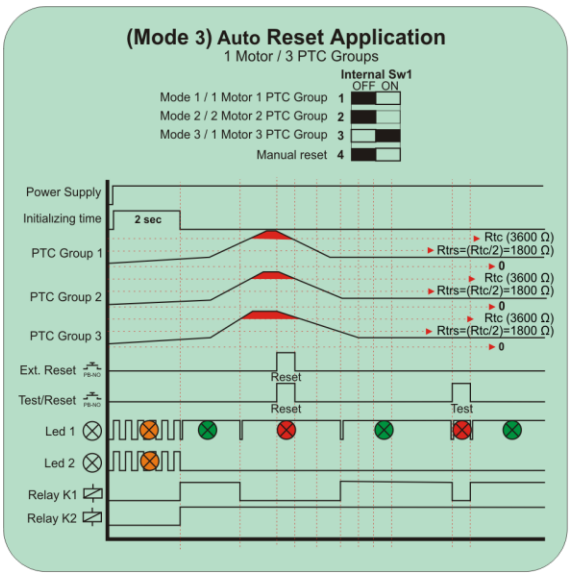


fig. 14

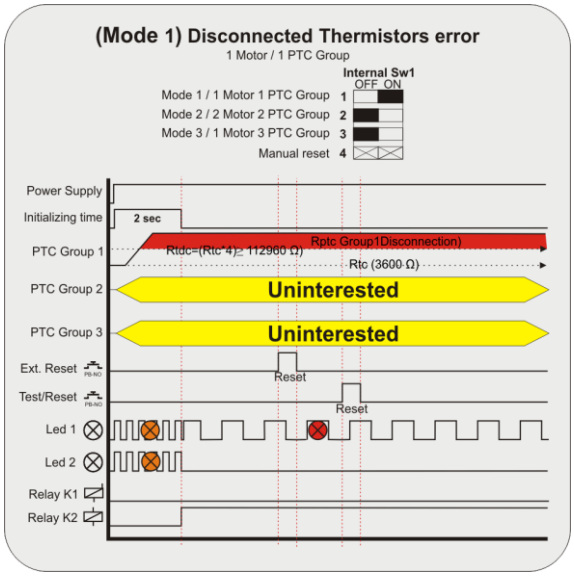


fig. 15

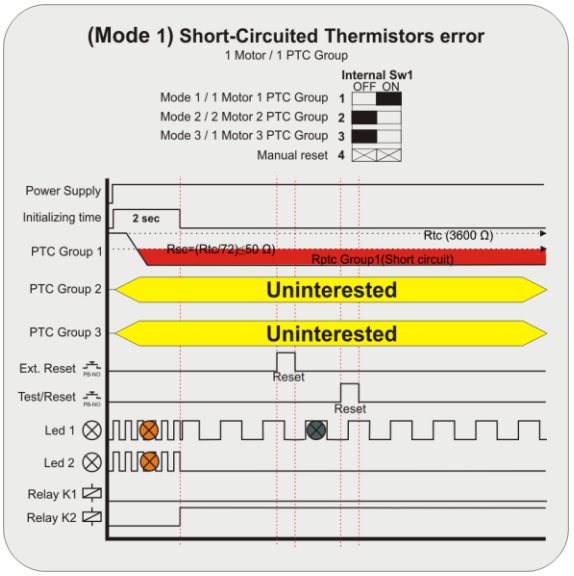


fig. 18

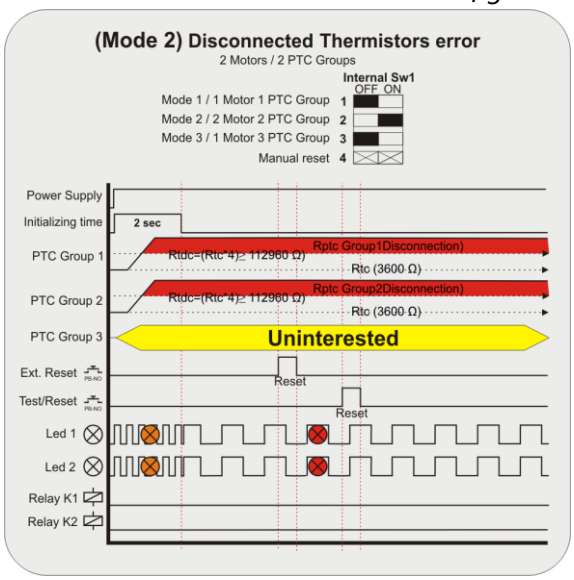


fig. 16

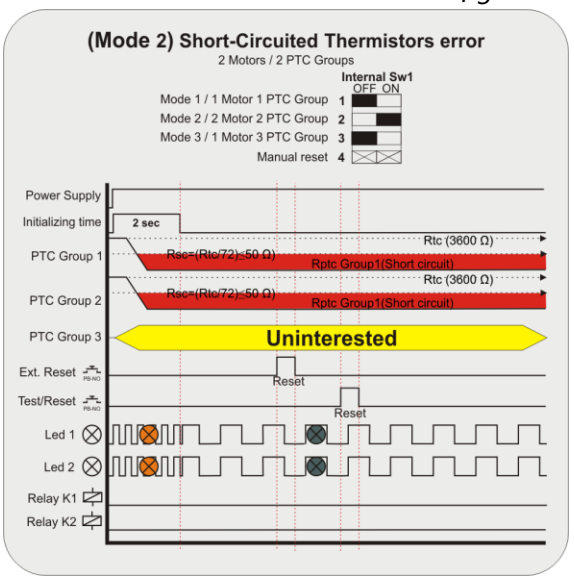


fig. 19

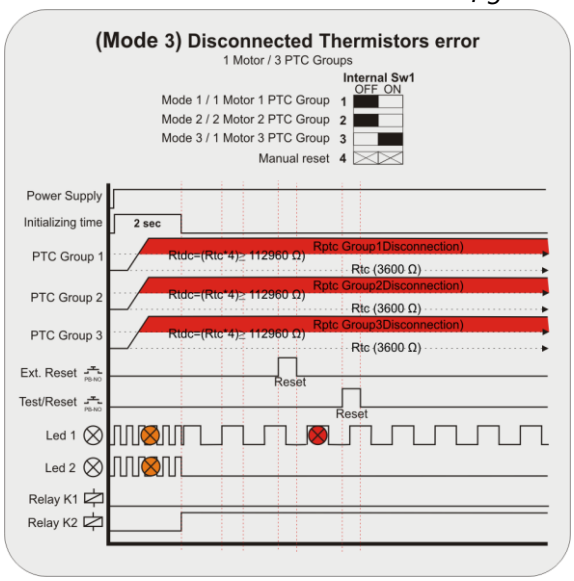


fig. 17

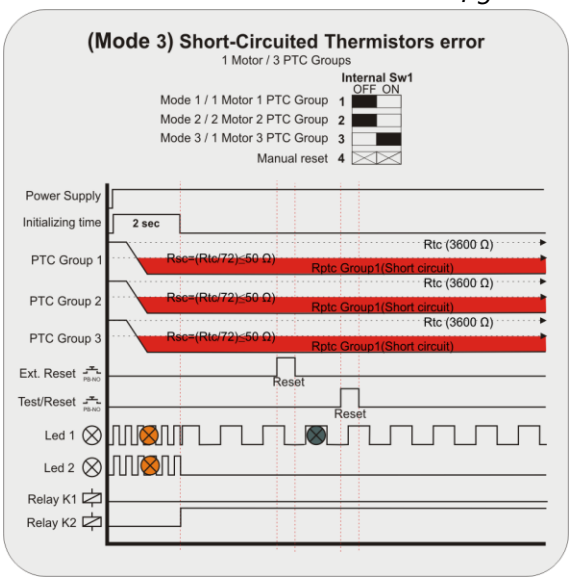


fig. 20

9. TECHNICAL SPECIFICATIONS

Place the TMP6500 in an appropriate location. Do not install in a dusty, humid, or vibrating environment. Do not place it near heater, or air conditioner. Keep it away from air, steam, open flame, extremely high or low temperature, and humidity.

Keep liquids away from the TMP6500. Spillage into the cabinet may result to fire, electric shock, or equipment damage. Do not block the ventilated slots above and below the unit. If a small object or liquid falls/spills into the TMP6500 cabinet, unplug the unit immediately. Have the unit checked by a qualified service engineer before using it again.

Always follow the instructions given by the manufacturer and use the TMP6500 according to its specifications.

The TMP6500 unit is composed of an electronic board in a Thermoplastic case (Polyamide PA 6.6), suitable and approved for electrical and electronic devices. It is designed to be installed at the inside of an electrical control panel, placed on an Ω-type
DIN NS35 mounting rail. (*fig.21*)

In the rearward there is a clip for the mechanical mounting (lock) on the rail, with the release mechanism at the bottom. To insert the unit to the DIN guide, hang the top onto the rail, and then press to the bottom for the final clip on fastening. To extract it, pry downward on the latch with a screwdriver and pivot the module to the top. (*fig.23*)

A 30mm extra space on top and below the unit is needed for a proper ventilation and the connection wiring.

Units with the "Auto-reset" selection must not be used in applications where the unexpected restart may lead to personal injury or material damage.

Any wrong configuration in the wiring of the connection may cause fire, malfunction or permanent damage to the unit. For applications with different connection layout configuration, a customized version of the TMP6500 is being required. Contact us for more details.

ELECTRICAL CONNECTIONS

The unit is equipped with four groups of 3-terminal connectors, arranged in two rows (levels) located atop and at bottom of the unit. Insert and screw only one wire in each terminal, to be in compliance with VDE norms. The cable may be rigid solid from 0.2mm^2 up to 4.0mm^2 or flexible stranded from 0.2mm^2 up to 2.5mm^2 (24-12AWG), stranded with ferrule with plastic sleeve up to 0.75mm^2, stripped over 10mm length. (*fig. 22*)

Connect the power source to the terminals #1 and #2. The polarity is not important as the internal power circuit includes electronic components for non-polarity connection.

Supply with Alternative Current **10-27Vac** or Direct Current **10 - 36Vdc**, either regulated or unregulated. Connection to a different voltage may cause fire, electric shock or damage.

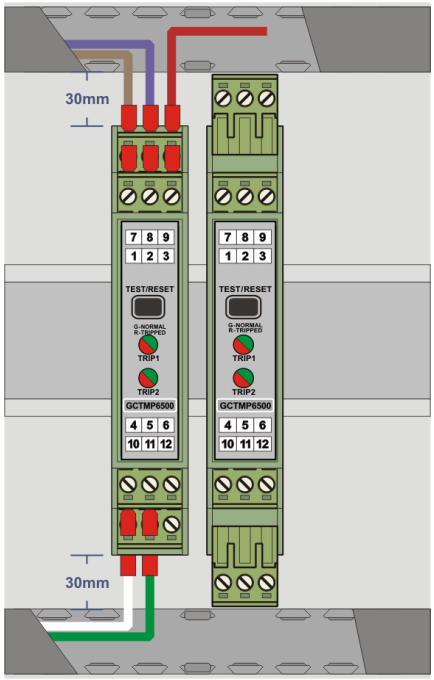


fig. 21

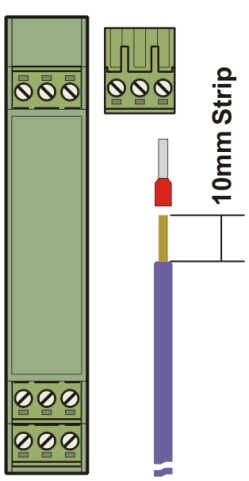


fig. 22

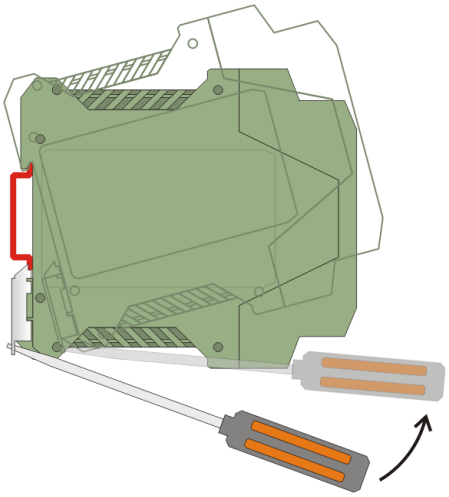


fig. 23

IO. ELECTRICAL CONNECTION DIAGRAM

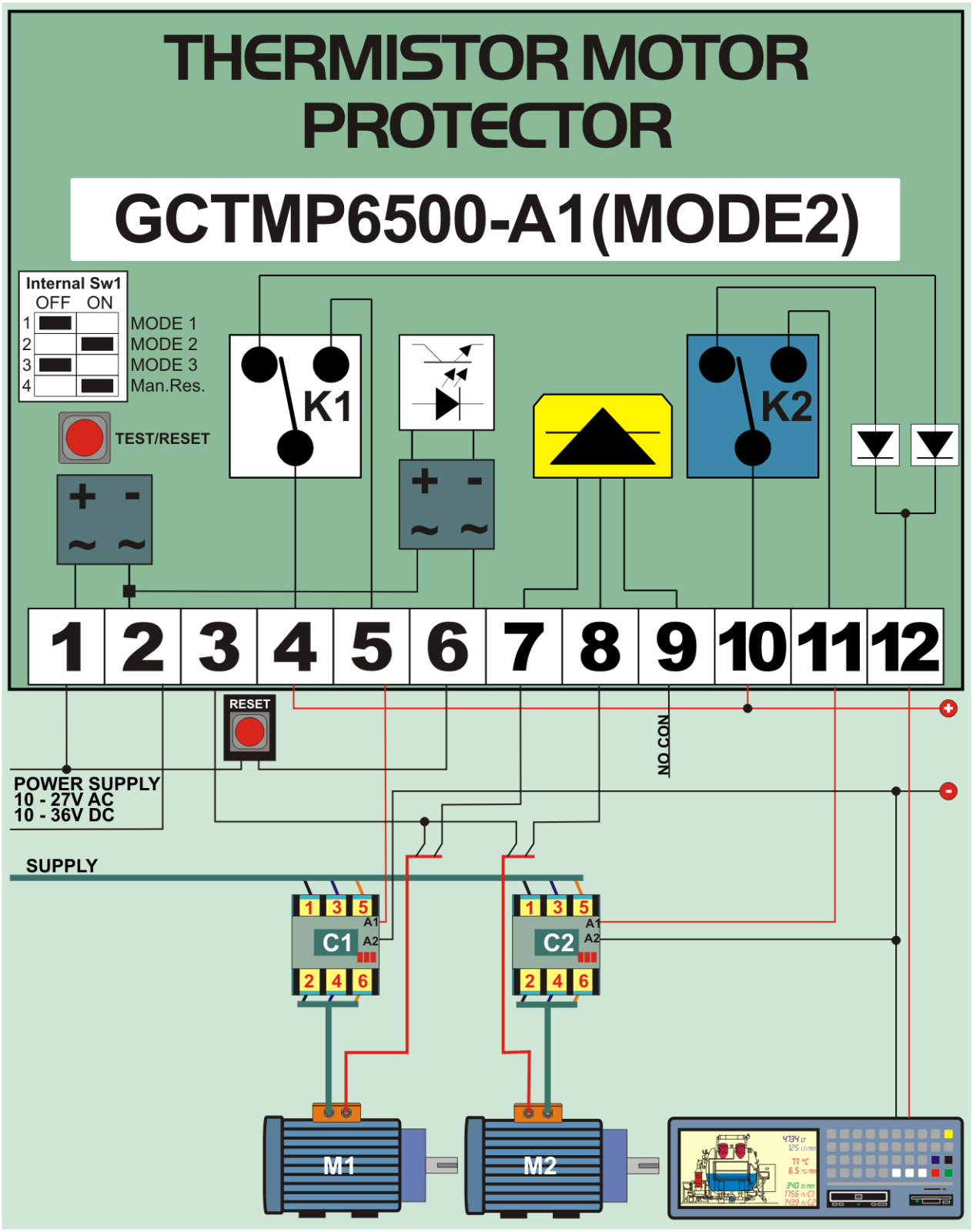


fig. 24

II. TECHNICAL SPECIFICATIONS

Power supply	Non-Polarized 10-36V DC / 10-27V AC
Frequency	50 - 60 Hz AC
Absolute supply limits	10 - 36Vdc
Power consumption	0.8W max.
Product class	III
PTC sensor input	Triple PTC Sensor Group
Number of sensor circuits	Two Independent PTC Circuits - TRIP1-TRIP2
PTC type	DIN 44081 / 44082 Specs
Voltage in sensor circuit	< 5 V (PTC Connected)
Initial resistance	≤ 2.5KΩ
Trip response value	> 3.6KΩ
Base Accuracy	± 5%
Manual reset circuit	Closed grounded loop circuit
Automatic reset	Auto in normal temperature regain
Output test circuit	Built-in tactile button at front
Output status indication	Multi-color LED
Digital output	2 × DPDT Relays - potential free
Output contact selection	N.C. by default (N.O. optional)
Relay contact resistance (Initial)	Maximum 50mΩ *at* 1 Amp 6 Vdc
Relay contact rating (Resistive)	0.5Amp 125 Vac *or* 1 Amp 30 Vdc
Maximum switching current	2 Amp
Maximum switching power	62.5VA - 30W
Maximum switching voltage	250Vac - 220 Vdc
Minimum switching load	0.01 mA - 10mVdc
Contact life	Min1x10^8 Mechanical Min5x10^5 Electrical (1A-30Vdc)
Logic output	Positive Bias 400V diode through N.O. contact
Digital input (external reset)	10-36 Vdc Non-Polarized (Passive)
Output	Local Powered 4-20mA current loop transmitter
Load resistance	100Ω ≤ R_L ≤ 1KΩ (depending on voltage supply)
Magnitude accuracy	±0.2% typical
Ratio match accuracy	±0.031% typical

Output impedance	**15mΩ typical**
Electrical connections	**5mm pitch screw connector terminals**
Terminal block configuration	**12-Ends / 4 blocks x 3 terminals in two rows**
Terminal block plating material	**High quality copper**
Clamping surface protection	**Galvanic nickel or tin plating surface**
Clamping parts resistance	**Electrolytic - rust - stress corrosion cracking**
Connection data	**IEC Rigid solid / 0.2 - 4.0mm^2** **IEC Flexible stranded / 0.2 - 2.5mm^2** **IEC AWG 24 - 12**
Housing box	**Semi-crystalline thermoplastic polyamide** **PA 6.6 case**
Inflammability class	**V0 (UL94)**
Waterproof protection	**No Protection (IP20)**
Installation position	**Inside an electrical control panel**
Mounting	**DIN rail NS35 (acc. to EN60715)**
Unit absolute dimensions	**W25mm H95mm D85 Mm**
Housing area	**W25mm H145mm D85mm**
Operating temperature	**-30 +85°C (-22 +185°F)**
Storage temperature	**-30 +85°C (-22 +185°F)**

EEC NORMS

The product "THERMISTOR MOTOR PROTECTOR" type "TMP6500" is designed and produced by the manufacturer "GELEC Co. Ltd." to be in compliance with the EEC norms applying to it.

Specifications are subject to change without prior notice.

12. DIMENSIONS

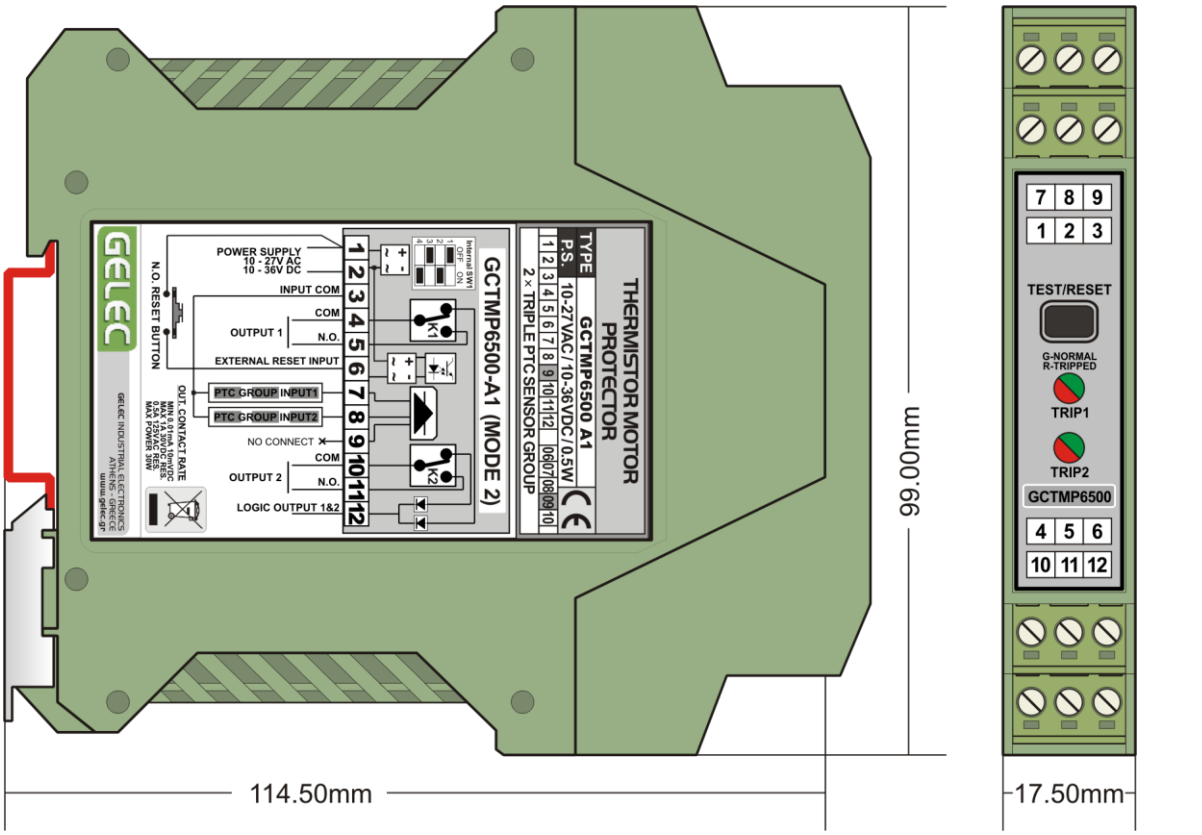


fig. 25

13. DECLARATION OF CONFORMITY

DECLARATION OF CONFORMITY	
THE MANUFACTURER:	GELEC Co. Ltd
ADDRESS:	4 Kikladon Str. 151 25 Marousi Athens - Greece
DECLARES THAT THE PRODUCT:	PTC MOTOR PROTECTOR
TYPE:	TMP6500
OPTIONS AND VERSIONS:	This Declaration covers all options and versions of this product.
Complies with the requirements of the European Directives: 89/336/EC - 92/31/EEC - 73/23/EC - 93/68/EEC	
And the following European Harmonized Standards have been applied: EN61000-6-4 ed. 2001 - EN61000-6-2 ed. 2001 - EN60950 ed. 2000	

INDUSTRIAL ELECTRONICS

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