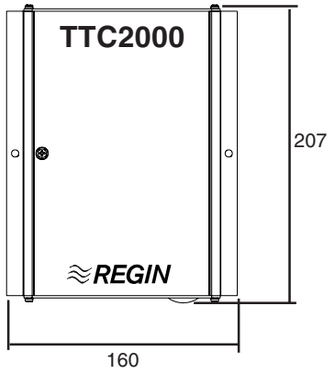
TTC2000



IMPORTANT: Read these instructions before installation and wiring of the product.

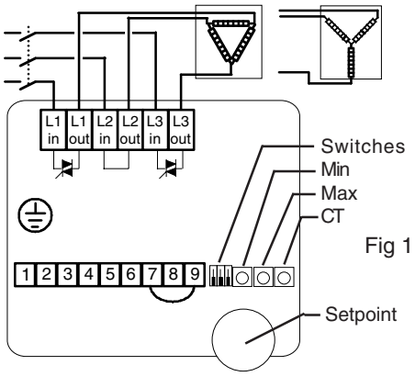


Fig 1

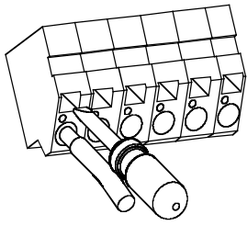


Fig 2

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INSTRUCTIONS

Triac controller for proportional control of electric heating

TTC2000 is a proportional controller for electric heating with automatic voltage adaption. TTC2000 pulses the whole load On - Off. The ratio between On-time and Off-time is varied 0 - 100% to suit the prevailing heat demand. The current is always switched at zero phase angle to prevent RFI.
TTC2000 is primarily intended for use with Regin TG-sensors for either supply air control or room control with maximum and/or minimum limiting of the supply air temperature.
TTC2000 can also be controlled by an external 0...10 V DC control signal.
TTC2000 can control both symmetrical Y-connected 3-phase heaters and symmetrical or asymmetrical Delta-connected heaters.
TTC2000 is only intended for electric heating control. The control principle makes it unsuitable for motor- or lighting control.

Installation

Mount TTC2000 on a wall or in a cabinet or other enclosure.
Mount TTC2000 vertically with the text right side up.
Protection class: IP30.
Ambient temperature: 0 - 40°C
N.B. TTC2000 emits approx. 45W of heat at full output which must be dissipated.
N.B. The front cover has no hinges and can fall out when the screw is unscrewed.

Wiring

Supply voltage (fig 1)
Terminals L1in, L2in and L3in.
Supply voltage: 210-255 or 380-415V AC
3 phase, 50 - 60 Hz with automatic voltage adaption.
Maximum current 25A/phase.
N.B. The supply voltage to TTC2000 should be wired via an all-pole switch with a minimum contact gap of 3mm.
N.B. TTC2000 must be earthed.

Load (fig 1)
Terminals L1out, L2out and L3out.
Resistive 3-phase heater without neutral.
Maximum load: 3300W/phase at 230V phase - phase voltage (25A).
5750W/phase at 400V phase - phase voltage (25A).
Minimum load: 530W/phase at 230V phase - phase voltage (4A).
920W/phase at 400V phase - phase voltage (4A).
The terminal block is of screwless type.
In order to open the clamping jaws, press a screwdriver into the upper, rectangular slot. See fig 2. Insert the wire into the larger round hole and remove the screwdriver. Check that the wire is securely clamped.

INSTRUCTIONS

Main sensor and external setpoint (figs 3-7)
Terminals 1 and 4. Low voltage. Not polarity sensitive.
N.B. Terminals 2 and 3 are internally connected and are used to simplify wiring when using external setpoint.
N.B. Choice of internal or external setpoint is made using switch 1.

Limiting sensor (fig 8)
Terminals 5 and 6. Low voltage. Not polarity sensitive.
When running room temperature control the supply air temperature can be limited to a maximum and/or a minimum. The limiting sensor is placed in the supply air duct after the heater.
Choice of function is made using switches 2 and 3. Choice of limiting temperatures is made on potentiometers Min and Max.
N.B. As limiting sensor TG-K360 must be used.

Figures

Fig 1: Wiring of supply voltage and heater.
Fig 2: Instruction for the screwless terminal block.
Fig 3: Wiring of room sensor TG-R530 or TG-R6xx when using internal setpoint.
Fig 4: Wiring of room sensor TG-R430 used as external setpoint and sensor.
Fig 5: Wiring of floor or duct sensor when using internal setpoint.
Fig 6: Wiring of external separate sensor when using TG-R4xx as external setpoint.
Fig 7: Wiring of external, separate sensor when using potentiometer TBI-xx as external setpoint.
Fig 8: Wiring of limiting sensor.
N.B. TG-K360 must be used.
Fig 9: Wiring of external control signal

Settings

Potentiometers
Setp. Setpoint 0 - 30°C.
Min Minimum limit for supply air temperature when running room temperature control.
Max Maximum limit for supply air temperature when running room temperature control.
CT Cycle time. 6 - 120 seconds.

Switches
1 Down = External setpoint in use.
Up = Internal setpoint in use.
2 Down = Minimum limit not active.
Up = Minimum limit active.
3 Down = Maximum limit not active.
Up = Maximum limit active.
N.B. Minimum and maximum limiting functions may be used separately or at the same time.

TTC2000

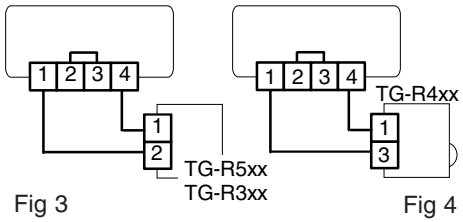

Fig 3

Fig 4

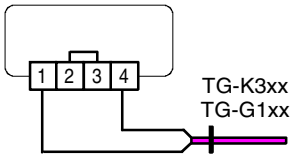

Fig 5

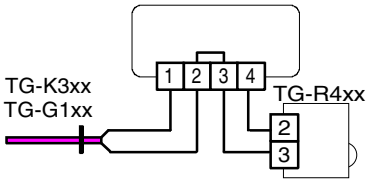

Fig 6

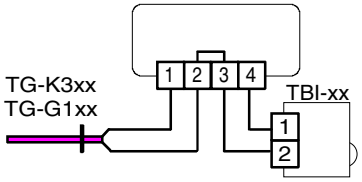

Fig 7

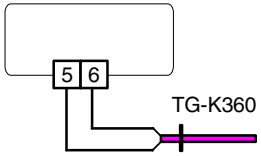

Fig 8

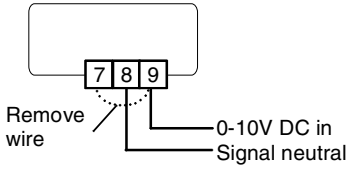

Fig 9

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INSTRUCTIONS

Control principle

TTC2000 pulses the full load On - Off. TTC2000 adjusts the mean power output to the prevailing power demand by proportionally adjusting the ratio between On-time and Off-time. The cycle time (=the sum of On-time and Off-time) is adjustable 6 - 120 seconds.
TTC2000 has zero phase-angle firing to eliminate RFI.
TTC2000 automatically adapts its control mode to suit the dynamics of the control object .
For rapid temperature changes i. e. supply air control TTC2000 will act as a PI controller with a proportional band of 20K and a reset time of 6 minutes.
For slow temperature changes i. e. room control TTC2000 will act as a P controller with a proportional band of 1.5K.

External control signal

TTC2000 can also be run against an external 0 - 10V DC control signal. Remove the wire strap between terminals 7 and 9 and connect the control signal as shown in figure 9.
0V input signal will give 0% output and 10V input will give 100% output. Minimum and maximum limit functions are not active when using an external control signal.
NOTE: Do not leave the input unconnected since an open circuit will not give 0% output but approx. 50%.
To ensure 0% output when no control signal is connected the control input should be short-circuited.

TT-S1

The power handling capacity of the TTC2000 can be increased by using the TT-S1 relay control board. On increasing heat demand theTTC2000 will primarily activate the triac controlled output. When this is running at full output the TT-S1 relay output will be activated and the triac controlled output will be reduced. For best control the two part loads must be of equal size. For wiring diagram and more information, see the instructions for the TT-S1.

Start-up and fault finding

1. Check that all wiring is correct and that the sensor selector switches are in the correct position.
2. Measure the resistance between terminals L1out - L2out, L1out - L3out and L2out -L3out:
   At 230V phase-phase voltage: 10.6Ω<R<66.4Ω.
   At 400V phase-phase voltage: 18.4Ω<R<115Ω.
3. Connect supply voltage and turn the setpoint knob to the maximum value. The LED on the TTC2000 should be continuously on or pulse on/off with longer and longer ontime and eventually be continuously on.Turn the setpoint to the minimum value. The LED should be continuously off or pulse on/off with longer and longer offtime and eventually be continuously off. At a certain position (within the proportional band) the LED will pulse On-Off as the TTC2000 pulses current to the heater. The pulse cycle period is approx. 6 -120 seconds depending on the setting of the CT-potentiometer. Check with a clamp-on ammeter that current is flowing to the heater.

INSTRUCTIONS

Something wrong?

4. Remove wiring to external sensor (and setpoint if any). Measure the resistance of the sensor and setpoint separately**.** The potentiometer resistance varies 0- 5kΩ between the lower and upper end-point. The sensor resistance varies between 10kΩ and 15kΩ between the upper and lower ends of the sensor temperature range. I.e. a TG-K330 has 15kΩ at 0°C and 10kΩ at 30°C. The resistance changes by 167Ω/°C.

5. Leave the sensor terminals unconnected. Set all switches in the downward position. Switch the voltage on.
   TTC2000 should give full uninterrupted power and the LED should be lit. Check with a clamp-on ammeter that current is flowing to the heater.
   If the LED is not lit and no current is flowing: Check that you have power on terminals L1in, L2in and L3in and recheck the positions of the sensor selector switches. If OK the TTC2000 is probably faulty.
   If the LED lights up but no current is flowing: Recheck the heater resistance as above. If OK the TTC2000 is probably faulty.

6. Shut off power and short-circuit the sensor input 1 and 4. Switch on power again.
   TTC2000 should not give out any power at all and the LED should be extinguished. Check with a clamp-on ammeter that no current is flowing to the heater.
   If the LED is extinguished but current is flowing to the heater the TTC2000 is faulty.
   If the LED is lit, recheck the shorting of the sensor input terminals. If OK the TTC2000 is faulty.

7. If everything is OK this far the TTC2000 and the sensor/setpoint are OK.
   Shut off power, remove the wire strap from the the sensor input terminals and reconnect external sensor(s) (and setpoint if any).Set the switches to their correct positions. Connect power.

EMC emissions & immunity standards

This product conforms with the requirements of European EMC standards CENELEC EN 50081-1 and EN 50082-1 and carries the CE mark.

LVD

This product conforms with the requirements of the European LVD standards IEC 669-1 and IEC 669-2-1.