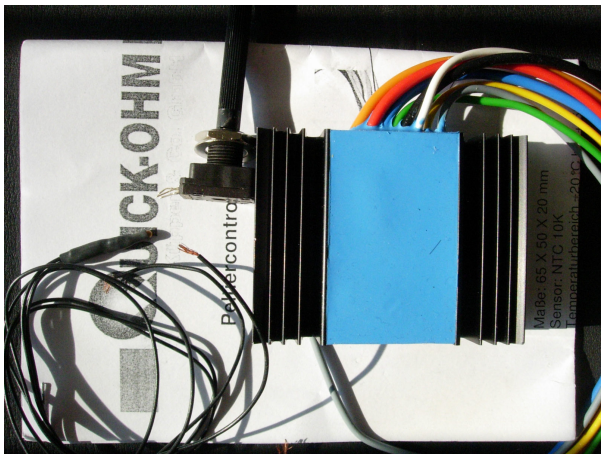
Peltier Controller QC-PC-C01C

User Manual

Temperature Controller for Cooling Applications



Delivery contents:

- 1 Peltier controller QC-PC-C01C
- 1 Temperature sensor NTC10KΩ(β=3977K)
- 1 Potentiometer 10KΩ
- 1 User manual

Technical specifications:

Dimension controller:	65mm x 50mm x 20mm
Temperature range:	-20°C…+50°C
Voltage supply:	10V…24V
Max. output voltage:	corresponding to input voltage
Max. output current:	10A

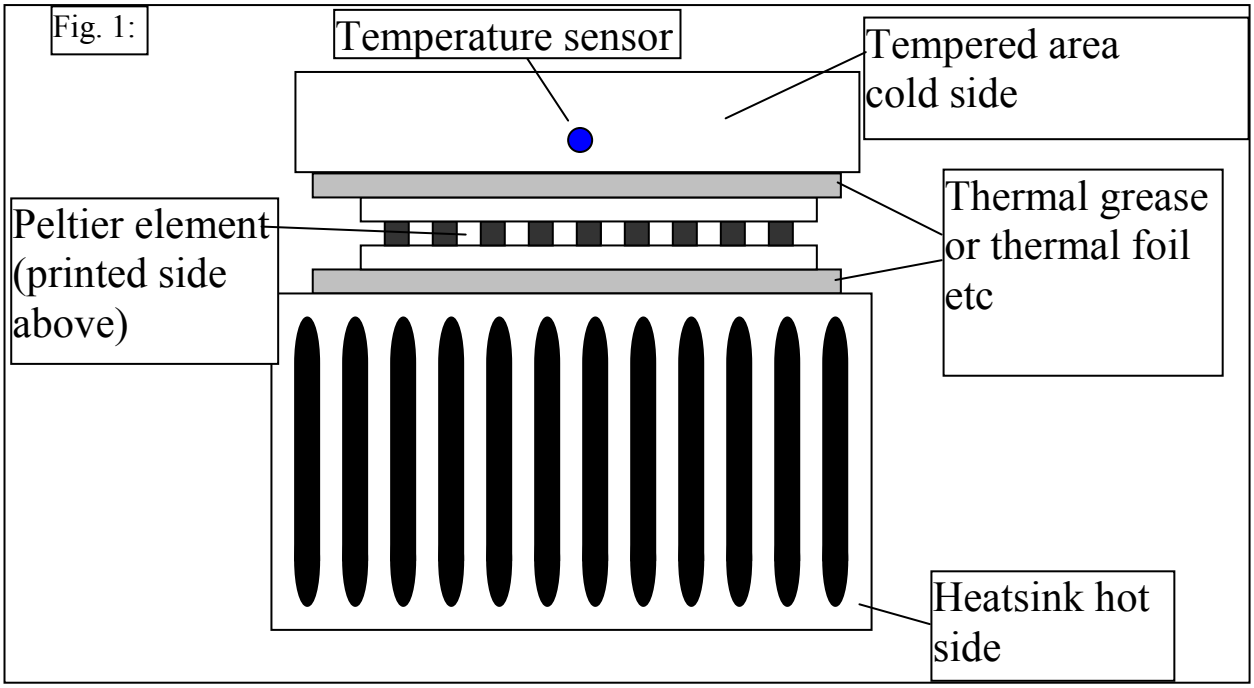
1. Usage of controller QC-PC-C01C

The controller QC-PC-C01C has been developed to cool down an object aided by a Peltier element and to keep the temperature constant. The controller runs with a minor voltage and must not get connected to a standard power supply. For the setup of a functioning control an electric wiring needs to be installed, which requires basic knowledge about electronics. Please only work on the device in a volt-free condition. Please consider that the controller and eventually triggered components may get destroyed, if they are applied inappropriately. Despite the fact that a minor input voltage is used, large currents occur, which initiate a significant heating at unprofessionally executed contacts and too thin wires, which might cause a blaze. Because of that, please read the user manual thoroughly and get some instructions by an electronics-specialist in case you are none. If you notice a heating inside of the wiring at any time, please switch the circuit volt-free immediately. If you follow the subsequent hints during the setup of your device, you will enjoy your controller and the used Peltier elements for a long time.

2. The basic principle:

The Peltier element is able to shift thermal energy from one side to the other. Hence the temperature decreases at that area the energy is extracted and increases where the energy is led to. To utilize that “heat pumping” a setup as it can bee seen in Fig. 1 has to be established.

Fig. 1:

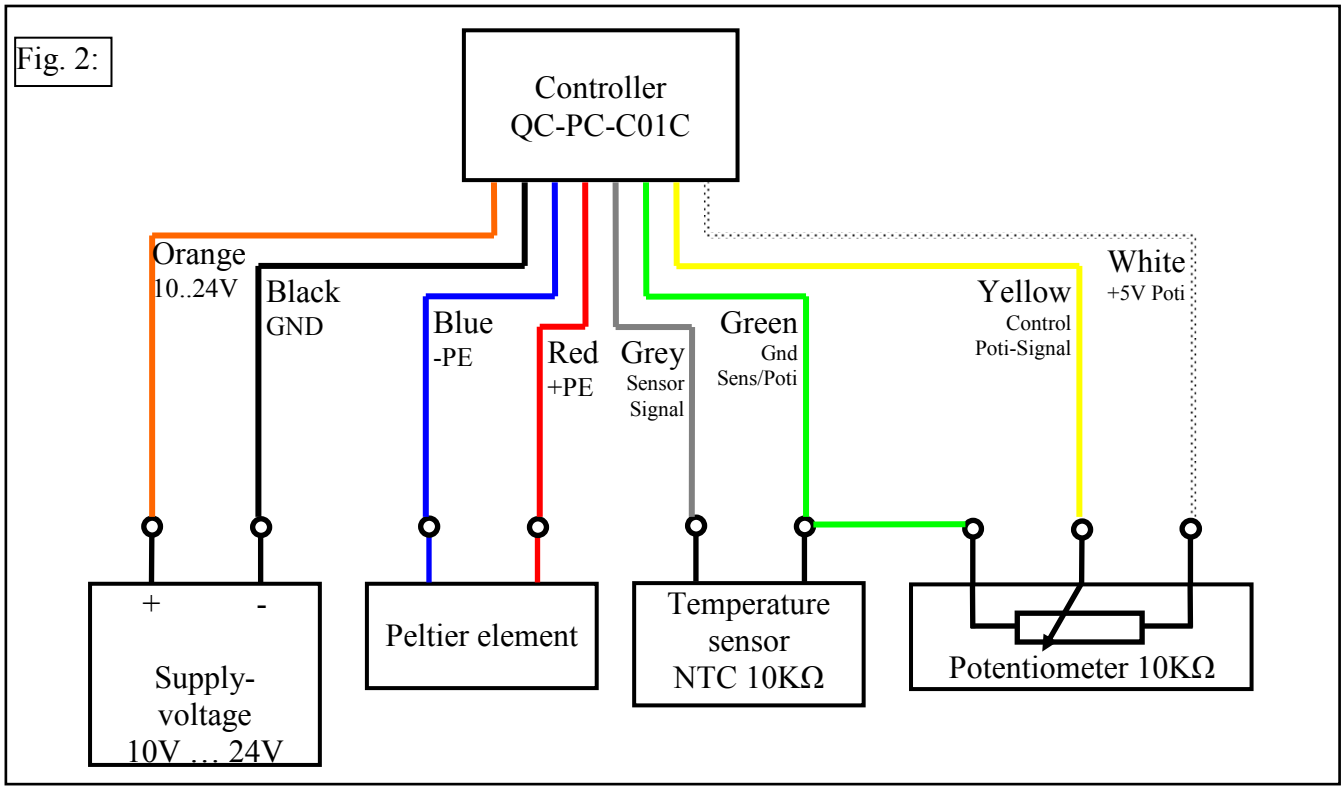


Here the basic composition, which is indispensable for the work with Peltier elements, is recognizable. There is an area that should be brought to a certain temperature. This area is equipped with a temperature sensor. On the other side the area is located where the heat gets extracted from or the redundant heat energy is led to in case of a heating and cooling application, respectively. In this second area the temperature is usually not surveilled. To prevent a collapse of the application induced by an excessive removal or feeding of heat, this area is contacted with the environment intensively. That implies that by the usage of a heatsink the surface gets enlarged multiply to establish the needed contact with the ambience. The size of this heatsink and the impeccable bonding between Peltier element and heatsink on the one side and between Peltier element and heating and cooling plate, respectively, on the other are the basic conditions for the determination of the performance of their setup. If you always focus on that basic structure, your results will be successful. Please visit the category ***Know how*** in the section of the heat management on our website indicated below to deepen your knowledge. Here you find tips and information in a comprehensible and visualized layout.

3. The electrical setup

To run the controller, a source of direct current voltage is necessary. All sources in the range of 10VDC to 24VDC are usable. Please consider that the controller is not adjustable to any current or voltage limits. I.e. the controller transfers the full voltage to the Peltier element, if in case of maximum cooling requisition the nominal temperature is much lower than the actual temperature. Therefore make sure that the supply voltage does not exceed the maximum permissible voltage of your Peltier element (flexible film heater) or concatenate several Peltier elements in series until the sum of all single voltages reaches at least the value of the supply voltage. Care has to be taken that only equal elements are wired up to guarantee a consistent distribution of the voltage. Fig. 2 depicts the wiring of the single components of the control circuit. The colors correspond to the colors of the wires of the controller.

Fig. 2:



If you follow this circuit diagram and use Peltier elements from QUICK-OHM, the imprinted side will get cold and the blank side will get hot.

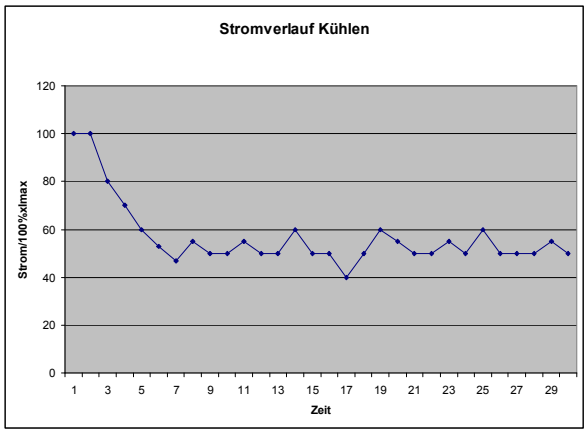
4. Adjusting the temperature:

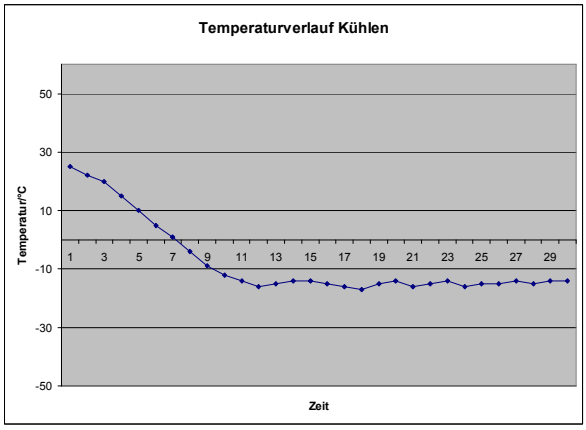
The controller regulates the temperature in a range from -20°C to +50°C. Please take into account that the controller is only able to cool. The achievement of e.g. 50°C is only possible, if the temperature of the hot side is higher, which makes the whole process to a cooling procedure. During the start-up it is helpful to apply marks to the potentiometer. If you pause between the left and the right end stop in some intermediate positions and measure the settled temperature with a thermometer, you will be able to draw up a scale by the utilization of the single positions of the

potentiometer. It is possible to integrate a display (QC-PC-D-100) into the circuit. This device identifies the nominal temperature from the position of the potentiometer and displays beside that one also the actual temperature.

The control behaviour:

The images schematically show the control history of temperature and current dependent on the time. The history represents exemplarily the so-called step response of temperature and current, caused by a change of the nominal value from room temperature to (here) -15°C. The diagram depicts the characteristic control behaviour. A harmonic control with ideal conditions for a long lifetime of the deployed Peltier elements can be identified.





5.Tips:

1. If the temperature of the heatsink (cf. Fig. 1) exceeds the temperature of the environment clearly, the heatsink is dimensioned too small. In this case either the heatsink has to be enlarged or a fan has to be applied to increase the performance.
2. The lowest temperature one-step Peltier elements can reach is located approximately 70K below the temperature of the hot side. Please take during the evaluation of your setup into account that due to thermodynamical reasons the temperature of the hot Peltier-side is always a little bit higher than it can be noticed on the heatsink.
3. Attach the temperature sensor at the area next to the section that has to be tempered, which is adjacent to the Peltier element, to measure the temperature the Peltier element actually reaches (cf. Fig. 1).
4. The heatsink must have the ability to lead away the sum of the transported heat energy and the electric energy.