

task_70jig4yzznocarsq_with_calculation

Student Group

First Name	Surname	Matrikel Nr.

Table of Contents

Exercise E1 Temperature-dependent Resistance (written test, approx. 6 % of a 60-minute written test, WS2022)	2
--	---

temperature dependent resistance, power, heat, exam ee1 WS2022

Exercise E1 Temperature-dependent Resistance (written test, approx. 6 % of a 60-minute written test, WS2022)

A refrigerator exhibits a temperature-dependent resistance. The circuit has a resistance of $10 \text{ k}\Omega$ at 25°C . Its temperature coefficients are: $\alpha = 0.01 \frac{1}{\text{K}}$ and $\beta = 71 \cdot 10^{-6} \frac{1}{\text{K}^2}$.

Result
The temperature inside the refrigeration system can reach down to -40°C .

Calculate the resistance of the thermostat at -40°C .

$$R = 6.5 \text{ k}\Omega$$

Resistance of the resistor R depends on the current I and generated heat. Therefore, a solution is to limit the heat up the refrigeration system.

Therefore, with constant U and increasing R the power decreases. Ten times more resistance decreases the heat flow to one-tenth.

$$R = R_0 \cdot (1 + \alpha \cdot \Delta T + \beta \cdot \Delta T^2)$$

with $\Delta T = T_{\text{end}} - T_{\text{start}}$

$$R = 10 \text{ k}\Omega \cdot (1 + 0.01 \frac{1}{\text{K}} \cdot (-40^\circ\text{C} - 25^\circ\text{C}) + 71 \cdot 10^{-6} \frac{1}{\text{K}^2} \cdot (-40^\circ\text{C} - 25^\circ\text{C})^2)$$

From: <https://mexle.te.hs-heilbronn.de/> - **MEXLE Wiki**

Permanent link: https://mexle.te.hs-heilbronn.de/ee1/task_70jig4yzznocarsq_with_calculation

Last update: **2023/04/02 00:44**

