# Integrated Temperature sensing Module for Vapor Decontamination monitoring

Degree programme: BSc in Micro- and Medical Technology | Specialisation: Sensor technology
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Industrial partner: Gjosa SA, Biel/Bienne

Stagnant water, such as that accumulated in shower hoses that have not been used for some time, is perfect breeding ground for bacterial diseases such as legionnaires' disease. This is why Gjosa SA has developed a steam disinfection system for its shower showerheads. The aim of this bachelor's thesis is to develop a system for measuring the temperature of this steam, in order to ensure that the temperature required for this process is reached.

## Introduction

Gjosa SA produces showerheads that save up to 80 percent of water during their use. These showerheads find their main use in places such as hotels, hospitals or retirement homes. This means that some of these showerheads are not used for a long time, creating stagnated water at room temperature, which is perfect for the proliferation of bacteria such as legionnaire's disease. To overcome this problem, Gjosa showerheads can be disinfected with a decontamination cycle that uses hot steam. However, this process must be controlled and demonstrable, which is why in this bachelor's thesis a steam temperature measurement system is developed, which records the temperature to ensure good quality control of the process.

## Methods

The main task of this system is to measure the temperature of the steam coming from the vapor unit. It was decided to take this measurement at the exit of the steam from the showerhead, so as to be sure that the temperature is actually sufficient for the entire disinfection cycle. Other features are also implemented, such as a safety switch, which allows disinfection to start only when activated, and an optical warning in the form of LEDs and an OLED screen showing the temperature reached.

For the prototype, the necessary mechanical components were created and the system was programmed. Tests were then carried out under real operating conditions, i.e. with steam at disinfection temperature and pressure at 6 bar. In this way, both impermeability and temperature measurement were tested at the same time, as well as the permanence of the shower head in the system once the pressurized water had passed through it.

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## Results

To choose the sensor to be used, a test was carried out on 2 sensors, a PT100 and a thermocouple. This test was done in boiling water. From the figure below (Figure 2) we can see that the PT100 sensor has a significantly faster reaction time as well as a final value of 99°C. This is why this sensor was chosen. In addition, the sensor will also be tested with the steam generator as part of the complete measuring system.

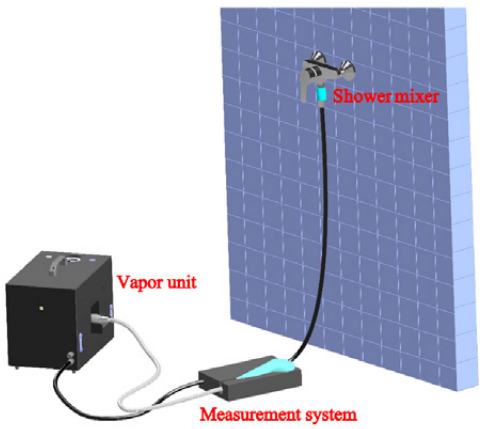


Figure 1 - CAD drawing of the complete vapor decontamination system

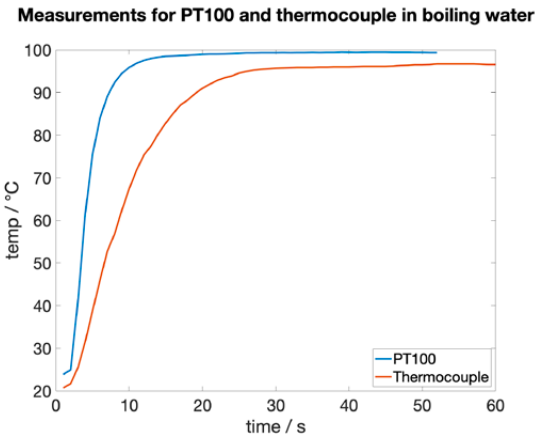


Figure 2 - Time response of two different sensors submitted to a boiling water burst