MiraTherm Radiator Thermostat Software Specification

Requirement Specification for a Master Project

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Change Log

Table 1: Document Change Log

№	Date	Version	Changed Chapters	Change Type	Editor
1	28.10.2025	1.0	All	Initial version	A. Menzel (AM)

Change testtext

Add test

Test note

Test highlight

[AM 1] v1.0: Example change

[AM 2] v1.0: Example addition

[AM 3] v1.0: Example comment

[AM 4] v1.0: Example highlight

1 Introduction

1.1 Document Purpose

This document describes requirements specification for software of a Micro Controller Unit (MCU) based radiator thermostat. This software should implement basic consumer functions and will be used as a base for research, development and production of smart heating controllers or thermostats.

1.2 Project Context

The master project will be realized as part of a bigger interdisciplinary development named “MiraTherm Radiator Thermostat”, which includes the following areas:

- **Mechanics**: Development of the thermostat’s power transmission mechanism for proper function with commonly used radiator valves, followed by the design of an enclosure.
- **Control algorithms**: Engineering of control algorithms to be used by the thermostat.
- **Electronics**: Development of the thermostat’s Printed Circuit Board (PCB) and its integration with mechanical components.
- **Software**: The subject of this work, development of the thermostat’s software and its integration with PCB components.

2 Requirements

2.1 Functional Requirements

REQ 1:

REQ 2:

2.2 Non-Functional Requirements

REQ 3:

REQ 4:

3 Planning

3.1 Time plan

The master project will presumably have the duration of 13 Calendar Weeks (CWs), which are divided into:

- CWs 44-45: Software requirements analysis.
- CW 46: Software architecture design.
- CW 47: Design of software interfaces.
- CW 48: Implementation and tests of software drivers.
- CWs 49-51: Implementation and tests of program logic.
- CWs 52-02: Paper writing.
- CWs 03-04: Final review and submission of the paper.

Each calendar week will approximately consist of $\frac{150\text{h}}{13} \approx 11.5$ hours of work.

3.2 Responsibilities

The whole work will be carried out by Alexander Menzel. The advisor for this master project will be Prof. Dr. Uwe Werner.

Alexander Menzel has to answer to E-Mails and questions from the advisor within 48 hours. If any problems arise, the advisor has to be informed as soon as possible.

4 Concept

4.1 Solution approach

4.2 Hardware requirements

To ensure a certain degree of independence from the PCB design, the software will be developed using a development hardware set, that resembles the final PCB in terms of components and interfaces.

4.2.1 Hardware block diagram

4.2.2 Required equipment

- **P-NUCLEO-WB55** - MCU development board with Matter standard support
- **STLINK V3 or V2** - debug probe
- **eQ-3 eqiva Model N** - Radiator thermostat with a C300 3V motor and gear box for disassembly (available)
- **DRV8833** - Motor driver module
- **1.3” OLED Display incl. SH1106** - Display with an embedded driver
- **KY-040** - Rotary encoder
- **Buttons**
- **Connecting wires**
- **Breadboard(s)**

List of Abbreviations

CW	Calendar Week
MCU	Micro Controller Unit
PCB	Printed Circuit Board

