


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 ~~test~~text

Add test

Test note

Test highlight

[AM 1]
v1.0: Ex-ample change

[AM 2]
v1.0: Ex-ample ad-dition

[AM 3]
v1.0: Ex-ample comment

[AM 4]
v1.0: Ex-ample highlight

1 Introduction

In this chapter, the purpose of this document and the context of the project are described.

1.1 Document Purpose

This document provides a requirements specification for software of a Micro Controller Unit (MCU) based radiator thermostat, which will be developed as part of a master project at Fulda University of Applied Sciences. This software should implement basic consumer functions and could 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 Concept

In this chapter, the overall concept and approach for the development of the radiator thermostat software is described. Additionally, the required hardware for development and testing is outlined.

2.1 Solution approach

In this project, a basic software for the device should be implemented including hardware drivers and general program logic. The description of the eQ-3 eqiva Bluetooth from [1] will be used as a reference for defining the functional scope of the software to be developed.

The software should be designed ready for prospective integration of the control algorithms and Matter-over-Thread standard. (For further details about this standard see [2].) The device is supposed to be used for smart home applications, specifically for the integration of the thermostat in Home Assistant, smart home applications and/or custom Application Programming Interfaces (APIs).

2.2 Hardware requirements

To ensure a degree of independence from the PCB design and mechanics, the software will be developed using a hardware set that resembles the final thermostat in terms of components and interfaces. This approach enables early software development and testing before the final PCB is available.

2.2.1 Hardware block diagram

A block diagram of the hardware setup for software development and testing is shown in Figure 2.1. Further, a list of required components is provided in section 2.2.2.

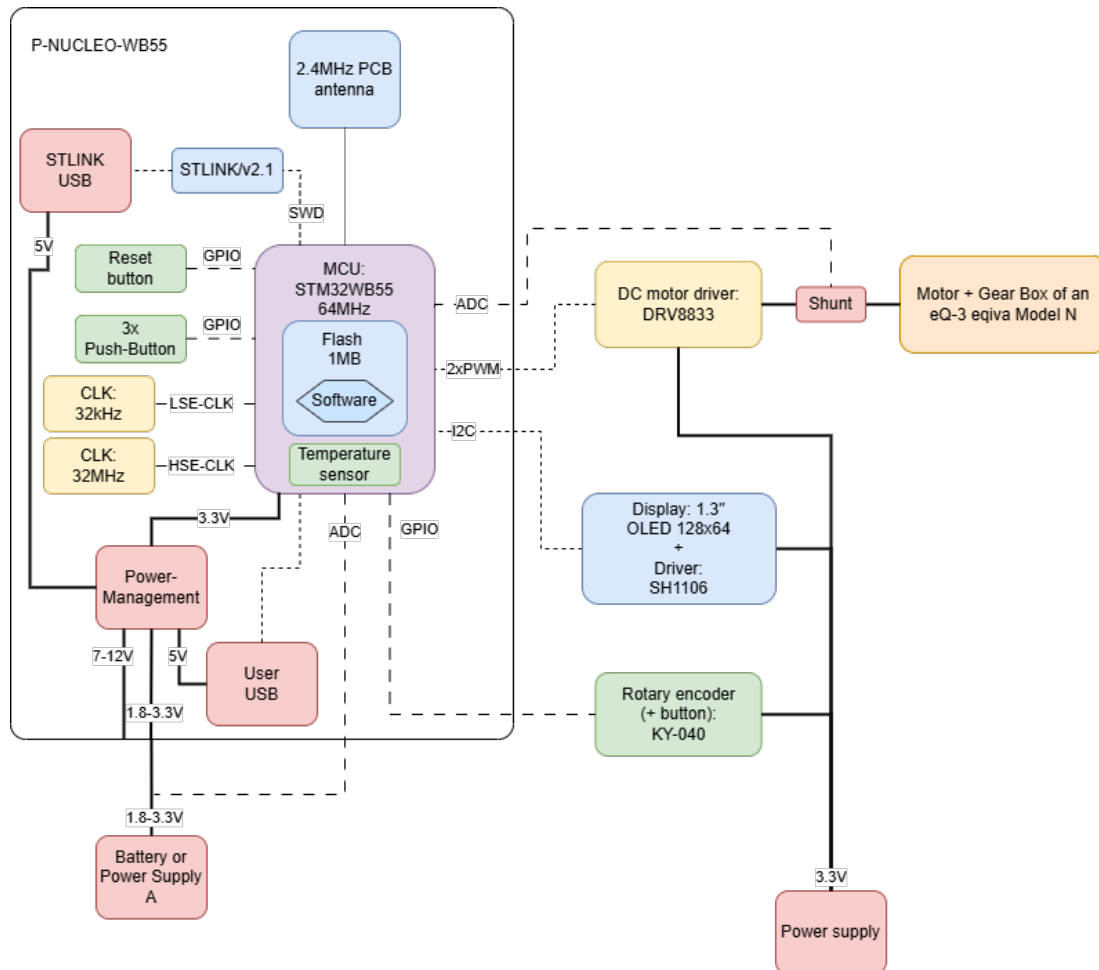


Figure 2.1: Hardware block diagram of the hardware set for software development and testing

2.2.2 Required equipment

For the software development and testing, the following hardware components are required:

- **P-NUCLEO-WB55** - MCU development board with Matter standard support
- **eQ-3 eqiva Model N** - Radiator thermostat with a C300 3V motor and gear box for disassembly (available)
- **DRV8833** - Motor driver module
- **Shunt resistor** - For current measurement of the motor
- **1.3" OLED Display incl. SH1106** - Display with an embedded driver
- **KY-040** - Rotary encoder
- **Connecting wires**
- **Breadboard(s)**

3 Requirements

3.1 Functional Requirements

REQ 1:

REQ 2:

3.2 Non-Functional Requirements

REQ 3:

REQ 4:

4 Planning

4.1 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.

4.2 Responsibilities

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

E-Mails and questions should be answered within 2 working days by both parties. If any problems arise, the advisor has to be informed as soon as possible.

Bibliography

- [1] eQ-3 AG, *Operating Manual BLUETOOTH® Smart Radiator Thermostat UK eqiva CC-RT-M-BLE-EQ*, May 2018.
- [2] Wikipedia contributors, *Matter (standard)* — *Wikipedia, the free encyclopedia*, [Online; accessed 28-October-2025], 2025. [Online]. Available: [https://en.wikipedia.org/w/index.php?title=Matter_\(standard\)&oldid=1318221979](https://en.wikipedia.org/w/index.php?title=Matter_(standard)&oldid=1318221979)

List of Abbreviations

CW	Calendar Week
MCU	Micro Controller Unit
PCB	Printed Circuit Board
API	Application Programming Interface