

## **Abstract**

The purpose of the research done as part of the thesis, is hardware development of a heating ventilation and air conditioning (HVAC) controller, the Zone Module MP, in compliance with the standards set by Liewenthal Electronics Ltd. The purpose of the thesis as a document, is to capture in detail all the technical details that have gone into the development of the Zone Module MP device.

During the development process, requirements to the hardware are defined, based on customer requirements, as well as best practices of hardware development in Liewenthal Electronics Ltd.

This thesis contains a detailed technical description of the developed hardware – Zone Module MP and its primary subsystems such as power delivery system, analogue circuits and communication circuits. The functional description of the device are provided in order to put the device in context and give a broader understanding of its usage and overall importance in the HVAC system.

The thesis includes definitions used for verification work done on the prototype that was built as part of the hardware development of Zone Module MP, as well as test results that were obtained. As a result of this work, a complex HVAC controller device has been developed and certified for mass production for European markets.

This thesis is written in English and is 65 pages long, including 6 chapters, 34 figures and 10 tables.

## **Annotatsioon**

### **Kliimakontrolleri „Zone Module MP“ disain**

Töö eesmärgiks on kliimakontrolleri Zone Module MP väljatöötamine Liewenthal Electronics AS nõuetele vastavalt ja toote tehniliste lahenduste dokumenteerimine. Toote väljatöötamisel on aluseks võetud kliendi poolt esitatavad nõuded ja tootmise poolt kogutud parimad tavad.

Vastavalt kliendi poolt kehtestatud nõuetele on määratletud lahendusele esitatavad nõuded. Töös on kirjeldatud toote – Zone Module MP peamiste alamsüsteemide nagu toitesüsteemi, analoog sisendite ja sideliideste riistvaralist lahendust, antud ülevaade ehitatud prototüübi funktsionaalsusest ja kirjeldatud toote sertifitseerimiseks teostatud mõõtmisi ja avaldatud nende tulemused.

Töö tulemusena on valminud komplektne toode, mille disain on üle antud kliendile ja mis on läbinud vajalikud sertifitseerimised Euroopa turu jaoks ja läinud masstootmisesse.

Lõputöö on kirjutatud inglise keeles ning sisaldab teksti 65 leheküljel, 6 peatükki, 34 joonist, 10 tabelit.