Environmental supervision unit (ESU)

Hans Grönqvist
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Swerea IVF is part of the Swerea group

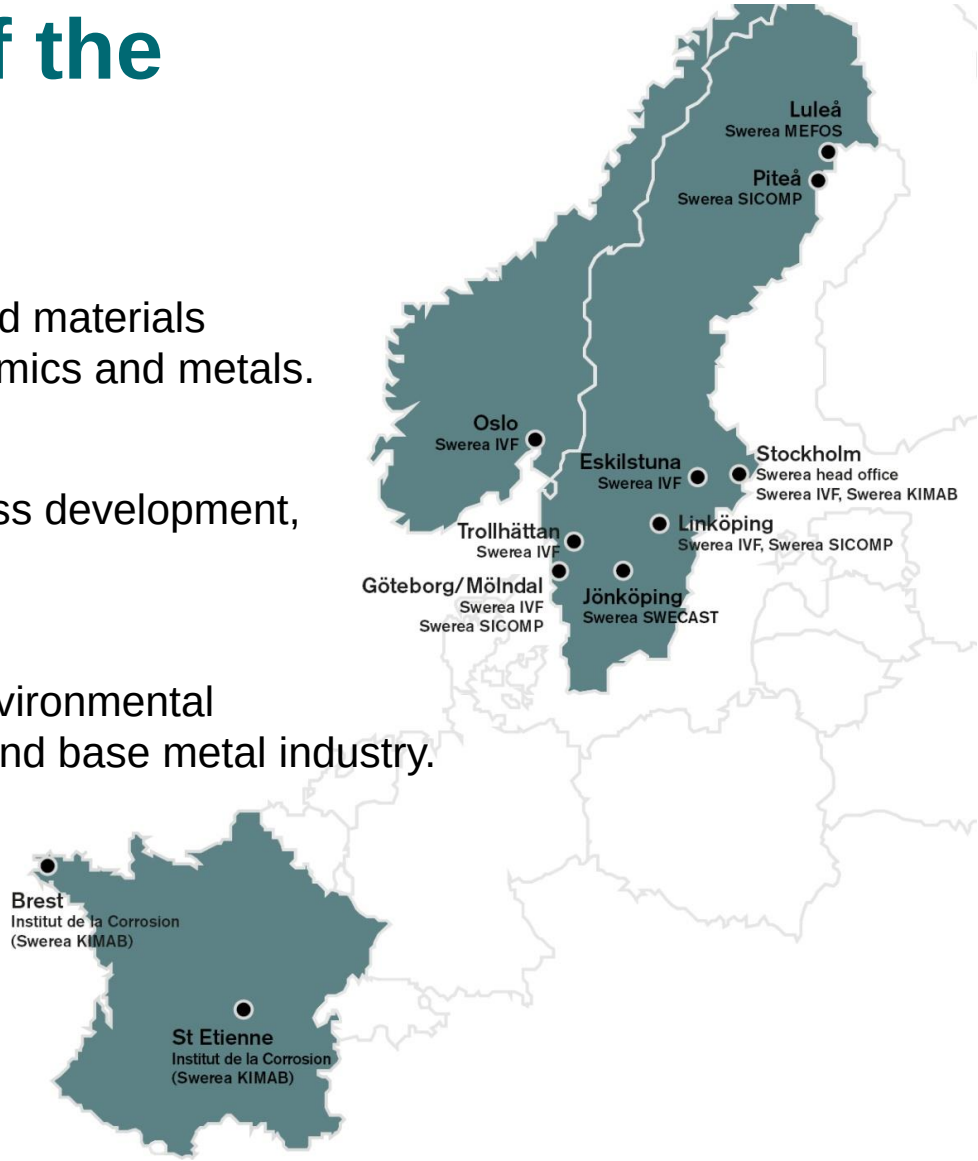
Swerea IVF
Industrial product development, process and materials development within textiles, polymers, ceramics and metals.

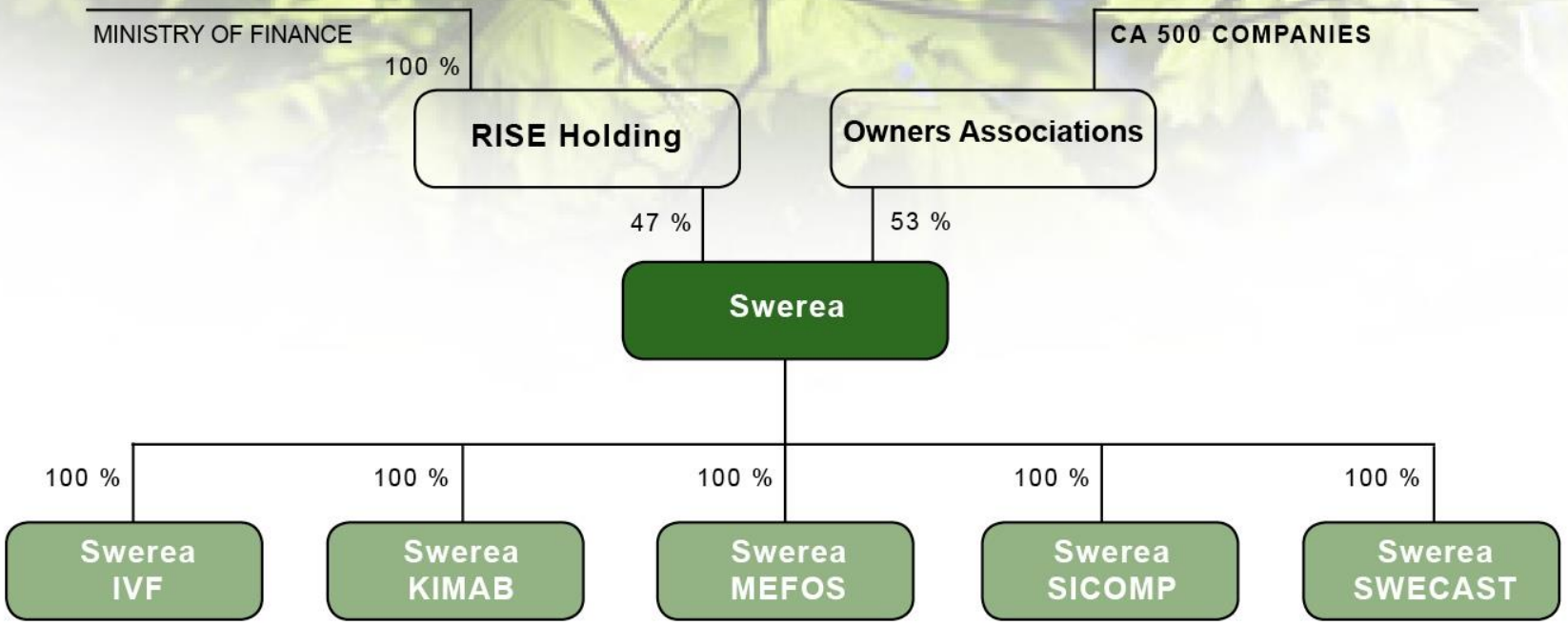
Swerea KIMAB
Materials applications, materials and process development, corrosion.

Swerea MEFOS
Process metallurgy, heating, machining, environmental engineering and energy efficiency for iron and base metal industry.

Swerea SICOMP
Composite materials, process and product development.

Swerea SWECAST
Cast metals – product, materials, process and environmental development.

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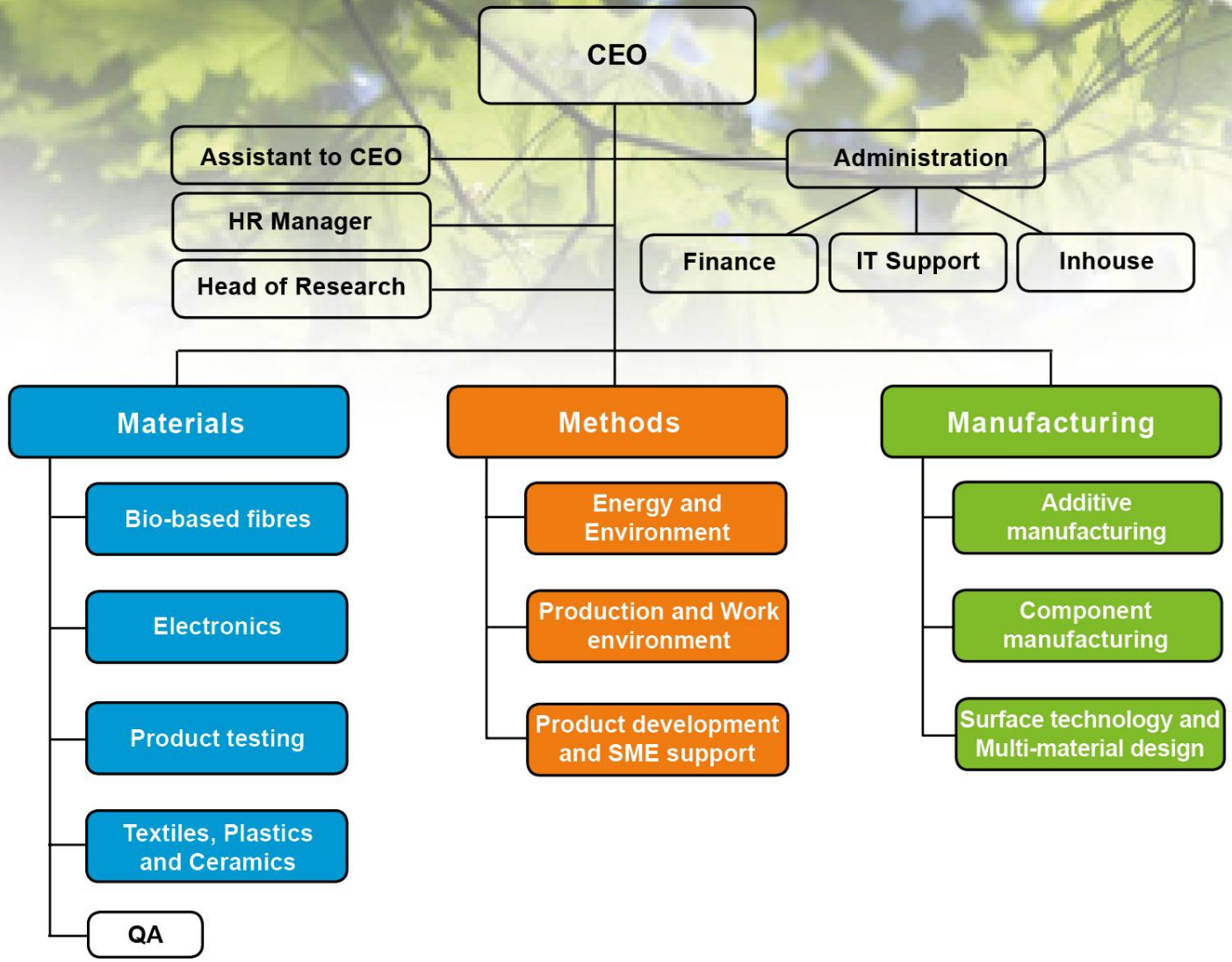
CEO
Assistant to CEO
HR Manager
Head of Research
Administration
Finance
IT Support
Inhouse
Materials
Bio-based fibres
Electronics
Product testing
Textiles, Plastics and Ceramics
QA
Methods
Energy and Environment
Production and Work environment
Product development and SME support
Manufacturing
Additive manufacturing
Component manufacturing
Surface technology and Multi-material design

Result of an ongoing EU-project Smarter Si

SMARTER - SI

Smart Access to Manufacturing for Systems Integration

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IK4 IKERLAN
Research Alliance

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Hahn Schickard

CiS Forschungsinstitut für Mikrosensorik GmbH

csem centre suisse d'électroniq et de microtechnique

Cooperation with a Swedish SME

SMARTER - SI

Smart Access to Manufacturing for Systems Integration

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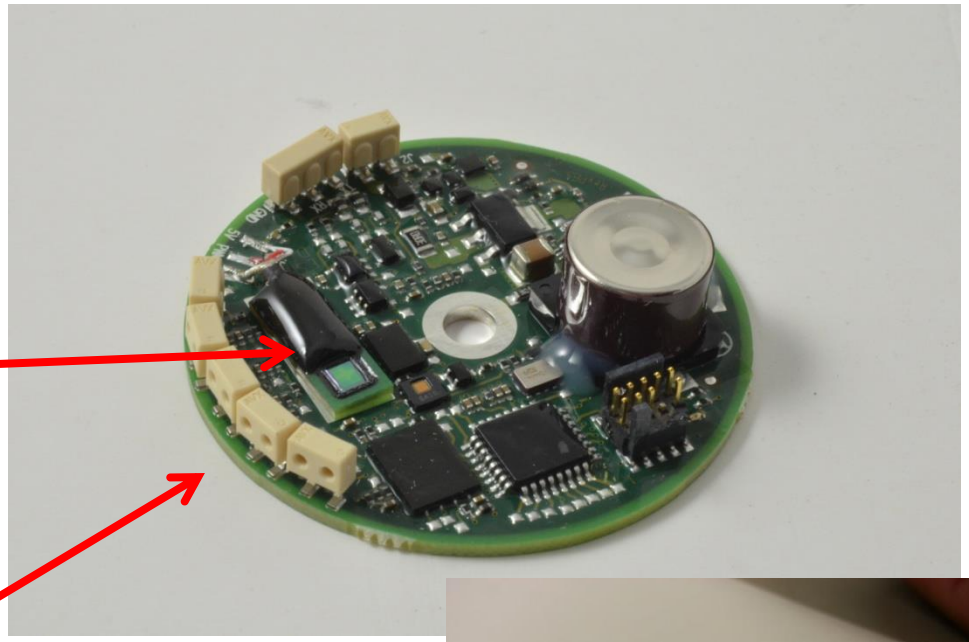
SME involved

SETEK Industrial Solutions

Hardware
Multi sensor unit

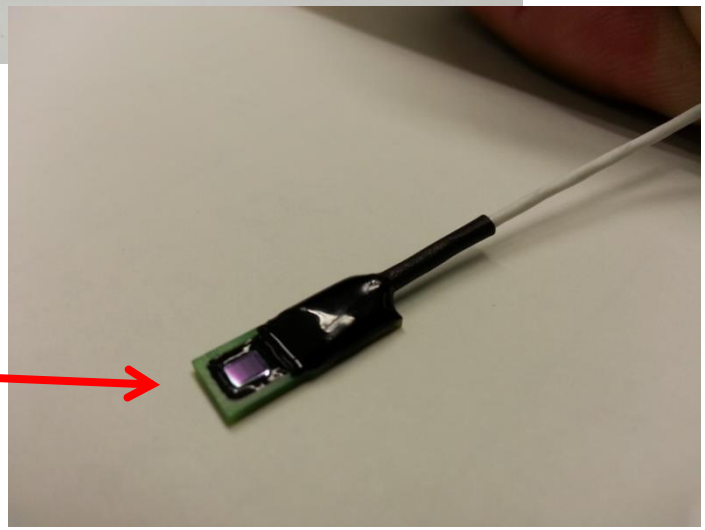
Sensors for:

Condensation (CiS)
Temperature
Relative humidity
Vibration



Ports for additional sensors

The unique condensation sensor from (CiS)



Background

- To be able to design an electronic units there is a need to understand the environment where the unit shall operate.

- **Reliability is based on physics of failure.**

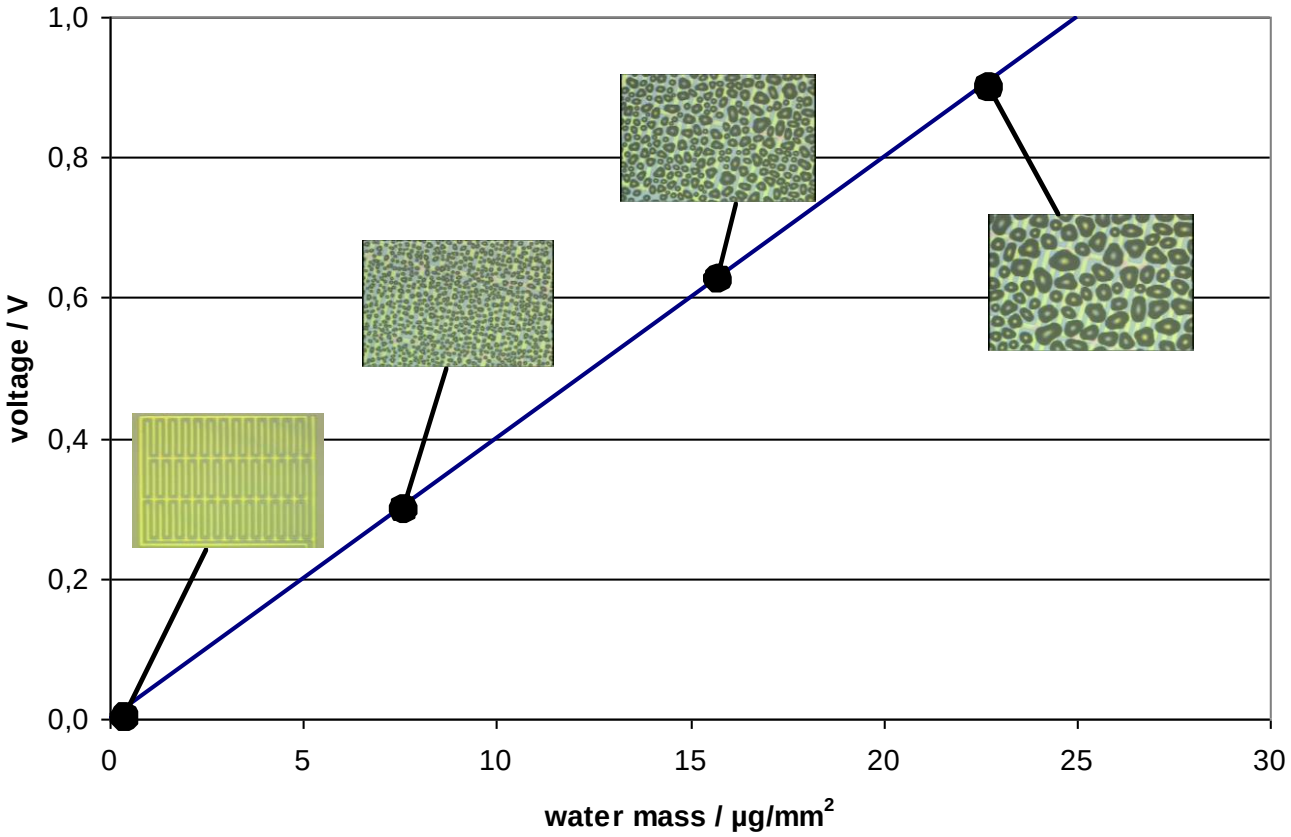
- The ESU is built to monitor that environment prior to the design.
- NB. Harsh environment

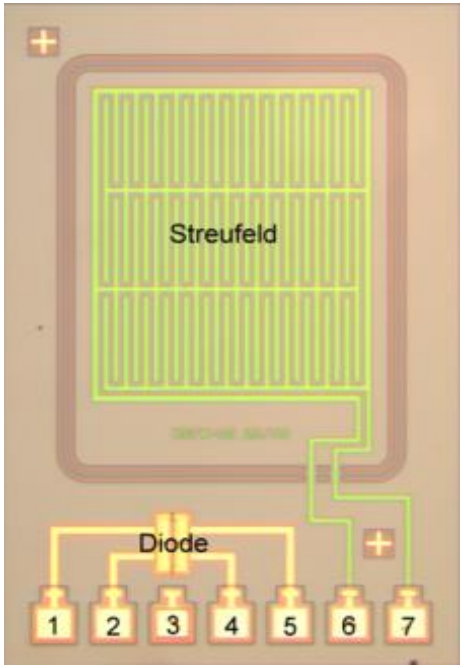
Design specifications

- **Temperature range: -40 – +125 °C**
- **Temperature ramp: 60 °K/min**
- **Current consumption: as low as practical, few mA at 12 V.**
- **Supply voltage range: 7 – 36 V DC**
- **Vibration level: maximum 65 G RMS.**

- **Diameter: 46 mm.**
- **Height: 12 mm**
- **Weight: 10 g**
- **Processor ARM Cortex M0+ from NXP.**
- **256 Mbit NOR flash**
- **Current consumption while measuring: 12-13 mA typical @13.6 V**

The condensation sensor



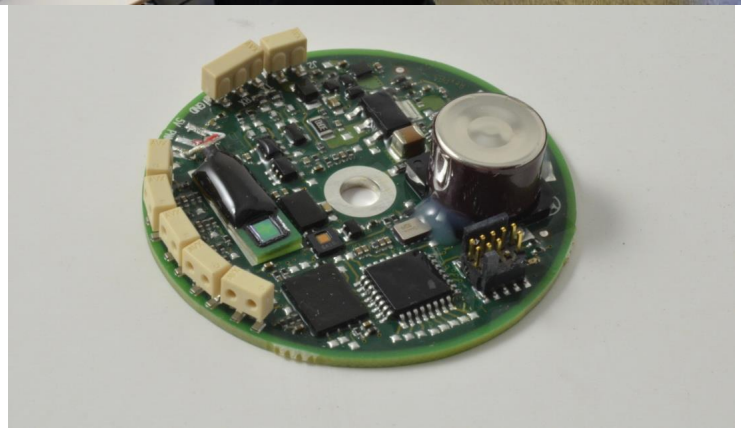


Performed tests HALT/HASS

- Thermal step stress test
  - -90 - +125 C
- Rapid thermal transition test
  - -40 - +125 C, 60 K/min
- Vibration step stress test
  - Random vibrations 5 – 65 G rms
- Combined environments test
  - Thermal shock 60 K/min combined with random vibrations

One big capacitor needed additional support.

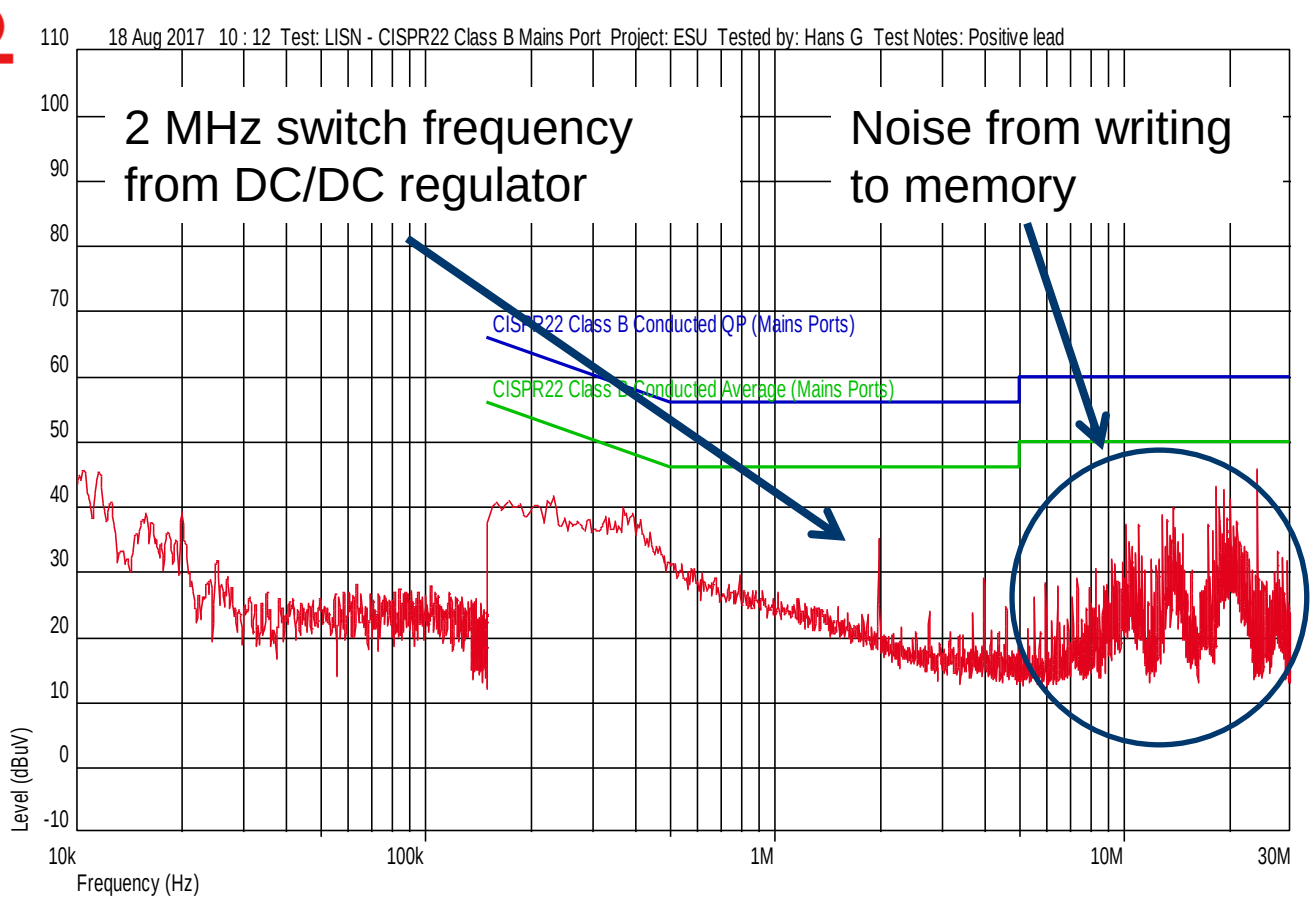
Has been fixed.



Performed tests EMC

- Emission tests both conducted and radiated.

Pass. Based on CISPR 32.



Testing at an industrial reference group

Power and productivity
for a better world™

Key points

- **A lesson learnt from the initial work with the industrial reference group is that everyone has their own unique needs.**

- **Therefore:**
- The ESU is modular and can be equipped with a variety of sensors.
- Simple to adopt the software for measurement intervals etc.
- Simple data structure for later analysis.

Next steps

- **Feedback from the Industrial reference group** are expected the coming month.

- **Marketing efforts** to other application areas.
  - Defense systems, construction, ventilation systems…

- Before the end of the EU-project we expect some **simplifications to the manufacturing process** of the ESU and an investigation of additional use of the condensation sensor.

Contact points

- **Swerea IVF (general issues)**
  - **Dr. Hans Grönqvist hans.gronqvist@swerea.se**
  - **Dr. Dag Andersson dag.andersson@swerea.se**

- **SETEK Elektronik (intrest in the ESU)**
  - **CEO Hans Richert h.richert@setek.se**

- **CiS (on condensation sensor)**
  - **Dr. Arndt Steinke asteinke@cismst.de**

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  - **Arndt Steinke** **CiS**
  - **Hans Richert** **SETEK Elektronik**
  - **Peter Lagerkvist** **Niranova (Part of SETEK)**

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