TP-2 Compact Power Sensor – System Design Description (SysDD)

ricbli-7

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1. Overview

This document describes the **TP-2 Compact Motor Power Sensor** system, which provides electrical measurement data such as voltage, current, and power for the AI ,0ore handling control and optimization system.

This implementation is designed to measure power reliably, stay properly calibrated, and work with other Arrowhead based systems.

2. Implementation

This implementation is based on the **PowerSensor_SysD** design document.

2.1 Implementation Language and Tools

- **Programming Language:** Python 3.11
- **Tools / IDE:** Visual Studio Code, Papyrus for SysML modeling
- **Libraries:** HTTP client library for data transmission; JSON for data serialization
- **Database:** MySQL (temporary local storage of measurement data)
- **System State:** Stateful (retains calibration and configuration parameters)

2.2 Functional Properties Implementation

- **Resources:** Analog to digital converter (ADC) for current and voltage sampling.
- **Data Handled:** Voltage, current, power readings.
- **Database Use:** Temporary MySQL table to store recent readings for calibration and diagnostics.
- **Result Provided:** Measurement data structure compliant with **PowerMeasurement_IDD**.

Operations implemented:

- **MeasurePower(): PowerMeasurement_IDD** – captures current power data and returns it through the PowerMeasurement service.
- **CalibrateSensor(referenceValue: Float): Boolean** – calibrates internal measurement constants against a known reference.
- **DiagnosticSelfTest(): Boolean** – executes a built in test to verify hardware functionality and sensor integrity.

2.3 Non-Functional Properties Implementation

2.3.1 Security

All communication between this system and external consumers is secured via HTTP over TLS (HTTPS) using Arrowhead TOKEN-based authentication.

2.3.2 Power Management

Low power operational mode supported during idle state to minimize energy consumption.

2.3.3 Internal Monitoring

Self test and calibration data are logged for diagnostics and reliability tracking.

2.3.4 Configuration

Configuration data accepted via secure HTTP requests. Parameters: calibration constants, sampling interval, and measurement scaling factors.

3. Services

The implementation is based on the following Arrowhead documents:

Type	Title	Reference
SysD	PowerSensor_SysD	—
SD	PowerMeasurement_SD	—
IDD	PowerMeasurement_IDD	—

Produced Services:

- PowerMeasurement_SD – provides live measurement data.

Consumed Services:

- None (standalone measurement producer).

4. References

- Arrowhead Framework Documentation: System Design Description (SysDD) Template.
- D7560E Embedded Intelligence Course Material, LTU, 2025.

5. Revision History

5.1 Amendments

No.	Date	Version	Subject of Amendments / Author
1	2025-10-16	1.0	Initial version of TP-2 Compact Motor Power Sensor SysDD (ricbli-7)