1 OEM risk considerations

This document describes the risk factors that should be considered when implementing the EmStat Pico module and the EmStat Pico Core. First a short introduction of both products:

- The EmStat Pico Core is a dual channel potentiostat chip for high-volume and wearable applications.
- The EmStat Pico module is a tested and calibrated potentiostat module. It is based on the EmStat Pico Core, and very easy to implement on a PCB.

Both products are collectively referred to as EmStat Pico; otherwise, the specific term Core or module will be used."

1.1 Feedback loop

The EmStat Pico uses an analog feedback loop to control the potential between the WE and RE electrodes. An inherent property of feedback loops is that they can become unstable under certain loads. This can cause oscillation and/or high voltages up to the device limit on the output.

1.2 Data corruption

The EmStat Pico uses UART (TTL) communication, which has no inherent data integrity guarantee. It is recommended to use at least software flow control (XON/XOFF) to prevent data loss from buffer overflows.

In most cases, data corruption due to random bit flips is rare enough to not be a practical concern. However, in some cases, even rare data corruption is unacceptable. In other cases, the device may operate in a hostile environment, making data corruption more likely.

For users that are worried about this type of data corruption, the EmStat Pico supports a communication protocol extension that verifies all communication using a 16-bit CRC per line. This allows the detection of data corruption, but does not enable data correction. This extension is not enabled by default since it makes the communication protocol significantly harder to work with.

The CRC16 mode is documented in the “EmStat Pico communication protocol” document.

1.3 Watchdog timers

The EmStat Pico does not use a watchdog timer, since the widely variable measurement timing parameters make it impossible to implement a fully reliable watchdog timer.

If watchdog functionality is required, this can be implemented in an external controller. The person implementing the EmStat Pico generally knows the parameters of the performed measurements, so they are able to pick a reasonable timeout. It can then monitor the EmStat Pico’s communication and reset it if it takes too long to respond.

1.4 EmStat Pico Core

The EmStat Pico Core firmware does not come pre-calibrated. To ensure accuracy, the internal calibration routine needs to be run. The Working Electrode must be unconnected during this calibration. See chapter “Auto calibration” in the EmStat Pico communication protocol.

The accuracy of a system using the EmStat Pico Core should be externally verified after calibration to ensure it is within the required accuracy.

The EmStat Pico module on the other hand, is already tested and calibrated as a product and no additional calibration is needed.