A Version History

A.0.1 AQUADA 170m+ - Version 0.1

Release Date: March-April 2025 **Developer:** Jan J **Status:** Initial Prototype

Description Version 0.1 was the initial prototype of the software, developed by Jan J in March and April 2025 using Python. This version focused on core functionality required to expedite data collection during blade tests, particularly the integration of two camera systems: an RGB camera and an Optris thermal camera. The software was designed to capture and analyse thermal data while simultaneously storing screenshots. It was a tool stored as a `.py` with a simple graphical interface which requested the data collection parameters such as regions of interest, intended for internal testing and validation of the concept.

Requirements

- **Hardware:**
  - RGB camera
  - Optris thermal camera
  - WIN8+ computer with python
- **Software:**
  - Python 3.11 runtime
  - Python libraries: cv2, matplotlib, scipy
  - Optris software (must be run at least once to generate calibration file structure)

Features

- Simultaneous screenshot capture from both RGB and Optris cameras
- Thermal data analysis from Optris camera
- Statistical output based on the performed analysis in the form of XY plots

A.0.2 AQUADA 170m+ - Version 0.2

Release Date: May 2025 (Delivered June 2025) **Developer:** Giacomo **Status:** GUI Implementation

Description Version 0.2 focused on converting the concept into a usable software while adhering to the requirements stated by Blaest. Jan's original code was translated into a GUI-based application by Giacomo during May 2025. This version retained the core functionality of v0.1 packaged into a graphical shell to increase usability. It was delivered to Blaest in June 2025 for a 30m fatigue test. Some features stated in the requirements were omitted due to time constraints, namely result reporting and video recording. The software was distributed as a standalone `.exe` file using pyinstaller, without any embedded security measures or assurances.

Requirements

- **Hardware:**
  - RGB camera
  - Optris thermal camera
  - 3D-printed camera holder
  - WIN8+ computer with administrator privileges available for proper function
- **Software:**
  - Packaged with pyinstaller (no external Python environment required)
  - No additional runtime dependencies
  - Optris software (must be run at least once to generate calibration file structure)

Features

- GUI shell for user interaction
- Core functionality from v0.1 retained
- Simplified deployment via executable file
- **No** result reporting or video recording
- **No** security assurances provided

A.0.3 Additional Software given to Blaest - June/July 2025

Description During the fatigue test on the 30m blade in June/July period additional small pieces of python code packaged with pyinstaller were given to expedite data collection and bug fixing process.

Centerer.exe This software tapped into the USB stream for both the RGB and Thermal camera and displayed it on the screen in a combined window and a red dot in the middle of each stream. Before the software was run the user was prompted to specify the camera source. Having Blaest run this software when the GUI version 0.2 failed allowed for easier tracing of issues.

Recorder.exe Software which recorded 1 minute of footage from each camera at a 30 FPS framerate. This was provided to supplement the lack of recording feature in v0.2. Just like for the centerer the user was prompted to provide a valid camera ID before the recording started. This software had no UI, prints in the command line notified the user of the current software's status. The output files were two `.mp4` files, one for each camera. The thermal camera recording held no thermal information, being stored as RGB.

Converter.exe Due to issues with the v0.2 version, the GUI version of the software did not collect data for most of the fatigue test run time. Instead, the Optris software was used to make use of the set up Optris thermal cameras. This resulted in most data being stored in the `.ravi` file format, which takes up 0.5GB of space per minute of 32Hz recording. To aid in the storage and sharing of data, the converter was provided. The software asks the user to specify the folder in which the `.ravi` files are located and then makes `.mp4` versions of those recordings. In the process all the thermal information is lost and the information is encoded as an RGB image where the brightest pixel is the highest temperature recorded and the darkest is the lowest temperature.

A.0.4 AQUADA 170m+ - Version 0.3

Release Date: June-July 2025 **Status:** First Checkpoint Release

Description Version 0.3 represents the software at its first checkpoint. Developed in June and July 2025, it fulfills all requirements outlined by Blaest in April. This version maintains the same hardware and software dependencies as v0.2 but is now distributed as an installer. It includes an "as-is" disclaimer and is prepared for third-party certification to ensure security compliance. New features were added to improve usability and reliability, including support for loading setup files and a recovery mechanism for resuming interrupted data collection.

Requirements

- **Hardware:**
  - RGB camera
  - Optris thermal camera
  - 3D-printed camera holder
  - WIN8+ computer with administrator privileges needed for installation, afterwards a normal user account sufficed
- **Software:**
  - Shipped as an installer (includes all dependencies and simplifies certification)
  - Same runtime environment as v0.2

Features

- Full compliance with Blaest's requirements
- Installer with disclaimer and certification readiness
- Setup file loading for faster configuration
- Crash recovery and session resume functionality
- Project Configuration with customizable timing parameters
- Region of Interest (ROI) and Reference Region selection
- Real-time Temperature Monitoring with live plotting
- Thermal Visualization with contour plots
- Data Recording including video capture
- Automated Reporting capabilities
- Project Recovery system for interrupted sessions

A.1 AQUADA 170m+ Version 0.4 (Current version)

Release Date: November 2025
Status: New SDK implementation

Description Version 0.4 represents a comprehensive refactoring of the software's internal engine. While the external user interface remains similar to Version 0.3, the backend has been restructured. This version specifically integrates the official `Optris SDK` and introduces a new Coordinators system to ensure precise synchronization between RGB and Thermal data.

Requirements

- **Hardware:**
  - Remains identical to Version 0.3 (RGB camera, Optris thermal camera, 3D-printed holder).
  - WIN11 computer.
- **Software:**
  - Shipped as an installer.
  - Updated: Now utilizes the official `optris.otcsdk` for Python, replacing the generic `DLL` wrappers used in v0.3.

Features

- **Native SDK Integration:** Replaced manual camera indexing with automatic detection and event-driven frame capture (`onThermalFrame`).
- **System Restructuring:** Introduced a `Camera Graph` architecture where each camera operates in an isolated thread node for better camera management.
- **Precision Synchronization:** Implemented new `SnapshotCoordinator` and `RecordingCoordinator` modules to mathematically align RGB and IR frames based on timestamps.
- **Background Processing:** Heavy tasks (like video writing and plotting) are now offloaded to dedicated service workers, unlike v0.3 where they could freeze the UI.
- **UI Improvements:** Updated the *Output Tab* to a 2x2 dashboard with live contour plots and added a "Focus Assist" zoom feature in the *Configuration Tab*.