



Part 1 – Annex 6

Technical Specifications

Contract number 24/00573

1 SPECIFICATION OF REQUIREMENTS AND ASSIGNMENT CRITERIA

FFI recognizes that several different camera technologies may satisfy our need for a general-use thermal imaging system. Therefore, requirements are mainly specified in terms of the foreseen uses of the system. Tenderers are invited to propose solutions and provide technical information as outlined below. FFI generally has a good understanding of thermal imaging technology, therefore we request several specific performance parameters, and generally encourage tenderers to supply detailed technical information. (Refer also to section 3.2 in the Tender Specifications regarding “confidential information”).

The contractor is asked to answer the specifications in a separate document, and that it is clearly stated which specification is being answered and make clear reference to any attached documentation.

1.1 Foreseen use

FFI needs a thermal camera system for the MWIR spectral range (about 3 to 5 micrometer wavelength) for use as a generic research tool. Representative examples of the foreseen uses are

- observation of thermal scenes at distances up to a few kilometers
- characterization of camouflage materials at tens of meters standoff distance
- various testing and inspection at close range

The camera will be used indoors and outdoors. It may also be of interest to place the camera on an airborne platform, but airborne use will not be driving the requirements.

The most important aspects of the camera system for our use are:

- imaging performance (spatial resolution and temperature sensitivity)
- flexibility and versatility
- trigger interface
- recording software functionality
- open interface and data format allowing FFI to develop own code for recording and analysis

Other desirable features are:

- a moderate degree of ruggedness,
- size and weight not excessive
- electromagnetic compatibility
- power consumption not excessive
- access to technical support.

1.2 Mandatory ("shall") requirements

1. The offer shall include the camera itself together with computer, software, power supply, cabling, storage and any other components needed for viewing of live imagery and recording of image data.
2. The camera system shall be sensitive in the spectral range 3000 to 4500 nm.
3. The NETD shall be better than 50 mK in a background temperature of 20 degrees C.
4. The camera shall have a filter wheel.
5. The camera shall have a built-in single-point offset correction that can be activated through software.
6. The camera shall have interchangeable optics.
7. The offer shall include optics with a field of view of 17 +/- 3 degrees.
8. Focus setting shall be motorized and controllable through software.
9. The pixel format shall be at least 1280x720.
10. Bad pixels and similar effects shall be handled in such a way that image processing can access the bad pixel map and similar information, for example via metadata. It shall be possible to disable bad pixel correction schemes.
11. The camera shall have provision for synchronization with external equipment through electrical input and/or output.
12. The camera shall have provision for real-time streaming of undegraded image data to an external computer.
13. Camera software for viewing and recording image data shall be included. All software shall be provided on a site licence, or on similar or better conditions for FFI, so that it can be freely installed on computers for controlling the camera system or viewing images. The offer shall include proposed terms for the software licence. To avoid problems in field repair and similar settings, copy protection schemes or activation over internet are unacceptable.
14. The camera shall deliver data formats that include raw digital data and temperature data. A traceable temperature calibration is not mandated, but may be quoted separately.
15. At least one undegraded image file format shall be documented in sufficient detail for FFI to develop code to read the data.
16. The camera shall provide a documented interface or API such that FFI can develop own code to fully control the camera and read out data in real time.
17. The IP rating for the camera itself, with connected cables, shall be at least IP53.
18. The camera shall be operational at atmospheric pressures down to the equivalent of 10000ft flight altitude, or 70 kPa.
19. All storage media in the system shall be removable in order to simplify use with classified data when needed. The delivery shall include two sets of storage media.
20. There shall be no devices for wireless communication mounted in the camera, computer or other system components.
21. Software and documentation shall be in English.
22. The delivery shall include reusable storage boxes suitable for shipping.
23. Export licence or similar documents shall be arranged by the supplier, if necessary, prior to delivery in order to avoid any delays.
24. The tenderer shall, as far as possible, when need be, repair existing (delivered) equipment instead of supplying new equipment. Documentation: Tenderer to confirm.

1.3 Desirable ("should") requirements

- a) The camera should be sensitive in a spectral range from about 1500 to about 5500 nanometers.
- b) The NETD should be significantly better than 50 mK in a background temperature of -10 degrees C.
- c) The camera should have a built-in two-point correction for offset and gain that can be activated through software.
- d) The offer should include itemized quotations for optics with wider and narrower field of view than that required in the previous section, including telephoto optics.
- e) The delivery should include a description of the signals between computer and camera head.
- f) The delivery should include a complete description of the data file formats used by the system, enabling FFI to read all stored data using own software.
- g) Radiometric recalibration by the user should be possible using blackbody sources.
- h) The IP rating for the camera itself, with connected cables, should be at least IP65.
- i) The camera should not be excessively susceptible to radio frequency fields or magnetic fields, and it should not emit excessive RF radiation.
- j) If radio communications provided as standard are removed per the requirement above (such as for WiFi/bluetooth units in a computer), they should be included in the delivery for possible later reinstallation.
- k) The tender should provide warranty for at least one year against failures (excluding failures resulting from misuse of the instrument), preferably several years.
- l) On-site training should be included in the tender, quoted separately (Annex 7).

1.4 Information required in the tender

- The tender shall include a summary description of the optical architecture and signal path, describing aspects such as filtering, cooling, apertures/stops, readout scheme, gain settings, and any schemes for resampling, bad pixel correction, or other manipulation of the raw signal.
- The tender shall include details about optical performance, such as optical throughput (for example given by F-number and pixel area), wavelength-dependent overall quantum efficiency, spatial resolution (MTF or PSF), nonuniformity (PRNU), bad pixels, readout noise, dark current, full well capacity, maximum frame rate, range of integration times, and type of image sensor used, as well as minimum time to failure (operating hours).
- The tender shall include complete user documentation for the system.
- The tender shall include information about software upgrade pricing policy (Annex 7).
- The tender shall include information about foreseen terms of export licence, if applicable.