

TENDER FUNCTIONAL SPECIFICATIONS

Case no. 458436-25-MES-RUE

Purchasing and installation : Infra-red high-speed camera

SUMMARY

1	GENERAL OVERVIEW	3
1.1	PURPOSE AND SCOPE.....	3
1.2	BACKGROUND.....	3
1.3	AIMS	3
1.4	APPENDICES TO THE SPECIFICATIONS	3
2	DEFINITIONS	4
3	REQUIREMENTS	4
3.1	FUNCTIONAL EXPRESSION OF REQUIREMENTS.....	4
3.2	TYPE OF SAMPLES/FLUIDS AND OPERATING CONDITIONS	11
4	EXPRESSION OF CONSTRAINTS.....	11
4.1	LEGISLATION, REGULATIONS, STANDARDS IN FORCE	11
4.2	CE MARKING.....	11
4.3	SAFETY	11
4.4	IT – MANAGEMENT – SOFTWARE.....	11
4.5	USAGE ENVIRONMENT	12
5	ARRANGEMENTS FOR ACCEPTANCE OF THE EQUIPMENT AND ASSOCIATED SERVICES	12
5.1	WORKSHOP/FACTORY ACCEPTANCE (FACTORY ACCEPTANCE TEST).....	12
5.2	IN SITU ACCEPTANCE (SAT).....	13
6	LOGISTICAL REQUIREMENTS	13
6.1	EXPECTED IMPLEMENTATION CALENDAR.....	13
6.2	DELIVERY ADDRESS.....	13
6.3	PACKAGING - TRANSPORT - DELIVERY	13
6.3.1	Packaging - Transport.....	13
6.3.2	Unloading – Handling – IFPEN Intra-Site transfer.....	14

1 General overview

1.1 Purpose and scope

Purpose of contract:

This request addresses the need for IFP Energies Nouvelles, within the framework of energy transition and sustainable mobility, to acquire a high-speed infrared camera operating in the mid-infrared wavelength range. The objective is to study heat transfer phenomena and thermal runaway in batteries among other applications.

Associated services:

- Support for the first installation
- Training for the use of the camera
- Minimum 2 Years warranty : The warranty must cover all mechanical and electronic components of the IR camera, including calibrated optics.
- replacement availability for 10 years (?)

1.2 Background

1.3 Aims

1.4 Appendices to the specifications

Documents	Reference	Date	Rev.	attached version ¹	
				Electronic	Paper
Booklet on deviations from the Golden Rules	vf			<input checked="" type="checkbox"/>	<input type="checkbox"/>
Memo on safety in Rueil outside companies				<input checked="" type="checkbox"/>	<input type="checkbox"/>
Computer Questionnaire		07/02/22	V3	<input checked="" type="checkbox"/>	<input type="checkbox"/>

¹ Check if the document is appended to the specifications.

2 Definitions

Equipment	Infra-red high-speed camera
Bidder	A natural or legal person who is submitting a proposal in response to this request for tenders.
FAT – Factory Acceptance Test	Shop / Factory acceptance
SAT – Site Acceptance Test	In situ acceptance at the IFPEN site
Contract holder	Contract holder on completion of this tendering process

3 Requirements

3.1 Functional expression of requirements

In the following table, the priority level of the expected functions is as follows:

- **A – Essential function**

Function directly linked to requirements which must be provided

- **B – Important**

Function which is considered useful, but not at any price

- **C – Desirable/Optional**

Practical or comfortable, this function will only be selected if it does not incur significant costs or require major modifications.

Dissemination External	Reference 458436-25-MES-RUE	Version 2	Date 11/06/2025	Page 5/14
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Infra-red high-speed camera				
P	Functions expected	Expected performance		Acceptance min max
A	MWIR Wavelength Range	The IR camera detector must, at a minimum, operate in the MWIR wavelength range 1.5–5.4 μm . Proposals offering others spectral range options will be rated more favorably.		1.5-5.4 μm
A	Spatial Resolution	The spatial resolution of the full-frame image provided by the IR camera must be at least 640×512 pixels.		640 \times 512 pix in full frame
A	Full-Frame Acquisition Frequency	To meet the needs of various experimental configurations at IFPEN, the camera must support a minimum full-frame acquisition frequency of 1000 Hz. Offres exceeding 1200 Hz will be rated more favorably		Min 1000Hz
A	IR grade camera lens	The lens must be adapted to the wavelength range of the camera and allowing a resolution imaging of samples, with a spatial resolution better than 300 μm at a working distance of around 500 mm		Max 300 μm at 500mm
A	Acquisition Synchronization	Image or video acquisition must be triggerable by an external signal (typically TTL - 5V)		
B	Minimum Temperature Range	The required calibrated temperature range is 0-300°C. larger temperature range will be rated favorably. The calibration must remain valid for all window sizes (HxV)		0-300 °C
B	Maximal frame rate (windowed acquisition), excluding burst mode	The spatial resolution/sub-window size should allow acquisitions at $\geq 40,000$ Hz (excluding burst mode)		Min 40 000Hz
B	Thermal Resolution (NETD)	This parameter depends on integration time and optical aperture the value and the related conditions should be		~25mK

Dissemination	Reference	Version	Date	Page
External	458436-25-MES-RUE	2	11/06/2025	6/14

		detailed in the offer. The lower the value will be rated favorably depending on the testing conditions chosen	
B	Radiometric Accuracy	The proposed radiometric calibration must have an accuracy $\leq 2\%$ (at $2\text{-}\sigma$ confidence level).	Max 2%
B	Lossless Recording Capability	The camera must support continuous full-frame, full-speed data recording for at least 24 seconds without any data loss.	>24s
B	Exposure Time Management	Operator should have the possibility to manage the Exposure time manually. The possibility of automatically adjust the exposure time via the camera software, adapting to incident flux without operator intervention, to ensure optimal signal-to-noise ratio would be rated favorably	

Dissemination	Reference	Version	Date	Page
External	458436-25-MES-RUE	2	11/06/2025	7/14

Management / Software			
P	Functions expected	Expected performance	Acceptance min max
A	The PC will be provided by IFPEN	The tenderer will attach the IFPEN computer questionnaire, completed beforehand, to their bid, together with, if necessary, the specifications of the computer(s) required.	
B	Software capabilities	The software must allow full control of all IR camera functions, support video acquisition, and provide analysis tools. Ideally, it should be free of license, dongle, or annual subscription requirements. If not, a complete and perpetual license for at least 3 workstations must be included. Acquisition and post-processing must be possible simultaneously on these workstations.	
B	Recorded file exploitation	Matlab and Python routines for reading and processing the data files are strongly desired. If not available, the file structure must be fully documented to allow users to develop their own routines.	

¹ The IFPEN's IT department requires that antivirus software be used on all of its workstations and will assume responsibility for installing it. The product used by IFPEN is McAfee VirusScan 8.8 and the McAfee Agent 4.6 component. The tenderer will need to indicate whether there are any known incompatibilities between this antivirus software and the proposed software (or application) and/or whether its configuration needs to be optimized in order to reduce its impact.

Dissemination	Reference	Version	Date	Page
External	458436-25-MES-RUE	2	11/06/2025	8/14

Technical documentation			
P	Functions expected	Expected performance	Acceptance
			min max
A	Supply of user and maintenance manuals on delivery	<ul style="list-style-type: none"> Written in French or English Archived in electronic format. 	

Dissemination	Reference	Version	Date	Page
External	458436-25-MES-RUE	2	11/06/2025	9/14

Associated assistance, support, or training services			
P	Functions expected	Expected performance	Acceptance min max
A	Start-up assistance	The Contract holder shall be responsible for implementing all the means and resources necessary to get started with the Equipment until definitive acceptance is confirmed.	
A	Training of IFPEN operators	<p>A minimum of 2 days of on-site training must be provided for a group of 6 users, who may have no prior experience with IR cameras. The training must include hands-on sessions using IFPEN's test benches</p> <p>The purpose of this training stage is to:</p> <ul style="list-style-type: none"> • train users to use the Equipment, • train users to perform level 1 maintenance operations. 	

Dissemination	Reference	Version	Date	Page
External	458436-25-MES-RUE	2	11/06/2025	10/14

Maintenance and after-sales services

P	Functions expected	Expected performance	
		min	Acceptance max
A	Warranty	<p>Minimum warranty duration: 2 years from the date of the Equipment's qualitative acceptance, without reservations.</p> <p>Under the warranty, the Contract holder shall:</p> <ul style="list-style-type: none"> • ensure that the Equipment remains available, • carry out all preventive maintenance operations on the Equipment, • replace all equipment and spare parts supplied which are deemed faulty, • carry out all the necessary operations so as to repair any damage and / or re-establish normal usage conditions. <p>Coverage: diagnosis, dismantling, replacement and reassembly of the parts found to be faulty, and all costs relating to the movement of personnel and the packaging and transport of equipment in order to refurbish the Equipment. During the warranty period, the Contract holder undertakes to:</p> <ul style="list-style-type: none"> • On-site response time: 48 h • Part change time: to be contractually specified by the supplier 	
	After-sales service	In its bid, the bidder shall specify the maximum response time for handling all requests, as well as the maximum time for performing diagnostics	
C	Maintenance contract to be offered as an option	<p>Annual preventive maintenance</p> <p>Curative maintenance of parts and labor (device and accessories),</p> <p>Spare parts warranty:</p> <p>Support response time:</p> <p>Response time: to be proposed</p>	

3.2 Type of samples/fluids and operating conditions

None.

4 Expression of constraints

4.1 Legislation, regulations, standards in force

The Equipment supplied and the services provided by the contract holder shall comply with the regulations in force.

4.2 CE Marking

In accordance with regulations, the Equipment supplied must bear CE marking and be delivered with a CE certificate of compliance.

4.3 Safety

Safety is a priority concern for IFP Energies nouvelles' Directorate General. Personnel working at IFP Energies nouvelles sites will be required to comply with the following guidelines:

- Memo on Safety for external companies
- Deviations from the Gold Rules

4.4 IT – Management – Software

When a particular IT configuration (hardware, software) is proposed with the Equipment, the constraints relating to the IT configuration and the documents required must be specified in the Excel file annexed to the specifications. In particular:

- Computer equipment is purchased separately by IFPEN, in accordance with technical specifications given in the bid.

- Software

Installation sources (media or download link) and associated documentation must be shipped with the software.

Desktop office software (MS Office) can be delivered and installed by IFPEN's IT department.

- Licenses

Licenses must be provided with a license certificate, together with the EULA (End User License Agreement). This must include information about the duration of the license and any other restrictions governing usage.

- Workstation security:

The IFPEN's IT department requires that antivirus software be used on all of its workstations and will assume responsibility for installing it. The product used by IFPEN is McAfee VirusScan 8.8 and the McAfee Agent 4.6 component. The tenderer will need to indicate whether there are any known incompatibilities between this antivirus software and the proposed software (or application) and/or whether its configuration needs to be optimized in order to reduce its impact.

4.5 Usage environment

The Equipment must be installed in an environment with the following external parameters:

No specification.

These values are given for information. It is the responsibility of the bidder to conduct a visit of IFP Energies nouvelles' premises in order to establish that they meet the environmental and technical requirements imposed by the manufacturer. **A visit report must be submitted to IFP Energies nouvelles before any contracts can be entered into.**

The bidder is responsible for informing IFP Energies nouvelles of the environmental and usage constraints to which the Equipment is subject under normal conditions of use and maintenance. In particular:

- the utilities needed for the Equipment to operate:
 - voltage and electrical power requirements,
 - the required fluid types and network pressures,
- precautions for use,
- the necessary safeguards.

5 Arrangements for acceptance of the Equipment and associated services

5.1 Workshop/factory acceptance (Factory Acceptance Test)

This stage must enable IFPEN to see how much progress has been made on the Equipment's design and its compliance with the features, functions and performance described in the Functional Specifications.

The tests to be carried out are described hereunder:

Tests	Tested functions	Expected performance	Acceptance conditions
Test no.1 (describe)	Camera Temperature calibration	Temperature calibrated sensor on a range from 0 to 300°C	Accuracy <2% on the entire range
Test no.2 (describe)	Camera speed accuracy		A certificate that proves that camera speed accuracy is the same as indicated by technical performance specifications

5.2 In situ acceptance (SAT)

The acceptance tests for this step must be carried out at the IFP Energies nouvelles site, in accordance with the procedures described below:

Tests	Tested functions	Expected performance	Acceptance conditions
Test no.1 Camera control	Camera – Software communication	Software controls all the available camera functionalities	Software controls all the available camera functionalities -Possibility of modifying frame rate - Possibility of modifying image frame size
Test no.2 File recording	Recording performance	The software enables recording correctly the images in the different format proposed by the manufacturer	The files are correctly recorded and usable.
Temperature reading	Temperature measurement precision	Qualitative evaluation of camera response on a heated metal surface.	The temperature reading should follow the heated plate variations (between 25 and 250°C). Qualitative evaluation.

IFPEN undertakes to conduct the SAT tests within 1 month after delivery

Final acceptance shall be pronounced once IFP Energies nouvelles has signed the Acceptance Report.

Acceptance, as defined above, triggers the start of the warranty period.

6 Logistical Requirements

6.1 Expected implementation calendar

Requested delivery date: 30th October 2025

6.2 Delivery address

IFP Energies nouvelles, 1 - 4 Avenue de Bois Préau, 92500 Rueil-Malmaison, France

6.3 Packaging - Transport - Delivery

6.3.1 Packaging - Transport

The Contract holder shall assume responsibility for:

- the proper packaging of the Equipment and its accessories, required for its transport, The Contract holder shall be held liable for poor or insufficient packaging used to transport the Equipment.

Dissemination	Reference	Version	Date	Page
External	458436-25-MES-RUE	2	11/06/2025	14/14

- the transport of the Equipment and its accessories, from its workshops to the place of delivery indicated on the order.

6.3.2 Unloading – Handling – IFPEN Intra-Site transfer

When the Contract holder is in charge of installing the Equipment, as well as when there are special cases for loading, unloading or handling the Equipment, the Contract holder must:

- deliver the Equipment to its place of use; the person responsible for the delivery must first come to the Reception desk and hand over the delivery slip,
- unpack the Equipment.