FLIR Systems
Advanced Thermal Solutions

DC019U-F
TITANIUM User Manual

TITANIUM

User Manual

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1. Contents

2. For your safety

To ensure no damage to your FLIR Systems equipment, you or other people, carefully read the following recommendations before using your equipment. Then keep these instructions in a place easily accessible to all those which will have to use this camera

The importance of the consequences due to the non-observance of these instructions is highlighted in the following way:

This icon announces the instructions which MUST be read before using your FLIR Systems equipment to avoid possible physical risks.

In the event of dysfunction of your equipment, stop it immediately

If you notice smoke or an unusual odor releasing itself from your camera or the adapter sector, disconnect the adapter sector immediately, taking care not to burn yourself. To continue using the equipment in this case can be dangerous. Immediately contact FLIR Systems to check.

Do not use your equipment in a flammable gas environment

Do not use electronic material in the presence of flammable gas because that is likely to cause an explosion or a fire.

Do not dismount your material

Touching internal parts of the camera can be extremely dangerous. If your camera does not properly work, it must be urgently repaired by a qualified technician.

If your camera opens due to a fall or any other accident, unplug the power adaptor and immediately contact FLIR Systems.

Use appropriate cables.

Only use dedicated cable delivered by FLIR Systems to maintain conformity with your camera specifications.

CD-ROM

CD containing software and manuals must not be placed in audio CD players. Reading it can cause audition loss or damage the equipment.

Camera temperature

Depending on climatic conditions, the camera surfaces can be hot. Take care when holding the camera.

3. Precautions

To maximize the lifetime and get the best use of your FLIR Systems equipment, observe the following instructions when storing or using it.

Keep it dry
This device will be damaged if immerged in water or exposed to high temperatures.

Do not exceed the specified environmental conditions.
Your equipment may not function correctly after being subjected to extreme environmental conditions

Handle with great care the lenses and all moving parts.
Handle the objective gently, as well as connectors. These parts are particularly fragile.

Avoid abrupt changes of temperature
Abrupt changes of temperature, for example, if you enter a heated place in cold weather conditions, can cause condensation inside the device.

Do not drop your camera
The camera may not function correctly after being subjected to violent shocks or strong vibrations.

Do not expose the camera's detector to direct visible light without lens.
The camera performance may be temporarily degraded.

4. General Overview

4.1. Product Overview

The TITANIUM camera is especially designed for the most demanding users of infrared technology, carrying out thermal and radiometric measurements with the greatest sensitivity, precision and speed. The detector with the format 320x256 or 640x512 offers the greatest sensitivity, while keeping an extraordinary dynamic range as well as a perfect linearity. The image frequency is programmable and the sub-windowing modes are simple and flexible. The integration time is adjustable by increments of 1µs. External triggering allows the synchronization of the image with the most fleeting of events.

4.2. Packing Contents

The camera is delivered in a robust transport case.

1 TITANIUM Camera

1 Power Cable

1 USB Cable

1 Waterproof case

Optical cleaning tissue

1 CD ROM containing software and camera files

1 Camera User Manual

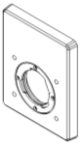
1 Camera Characterization file

Optional :

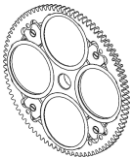
1 Camera LINK Frame Grabber (Optional)

1 Computer for camera command and image acquisition. (Optional)

1 or more additional lenses (Optional)

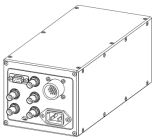


1 lenses interface for Janos lenses (Optional)



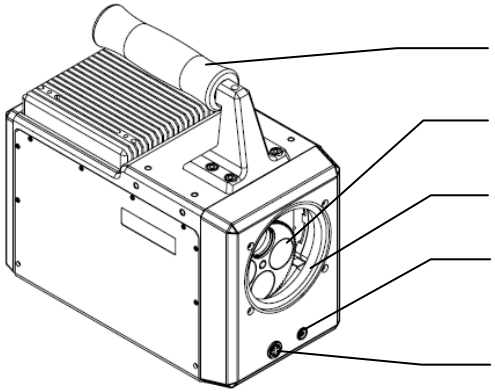
1 filter wheel with 4x1 inch filter holder (Optional)

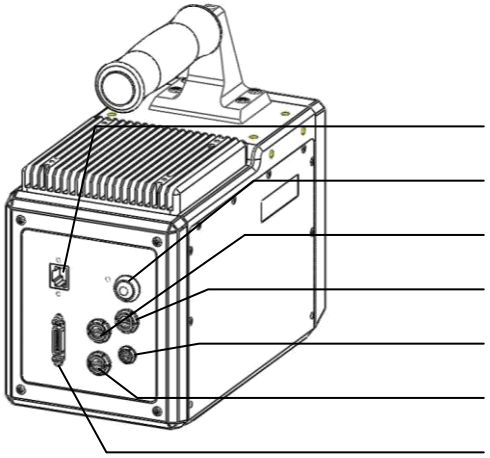
1 Tripod (Optional)

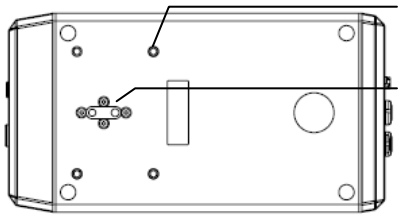


Splitter box for harsh environments (Optional)

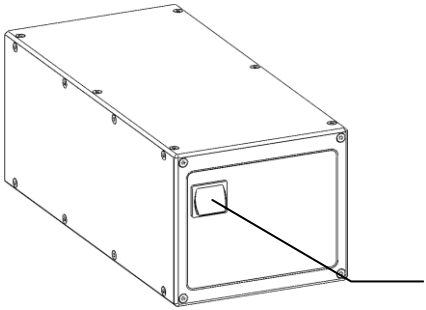
Camera description

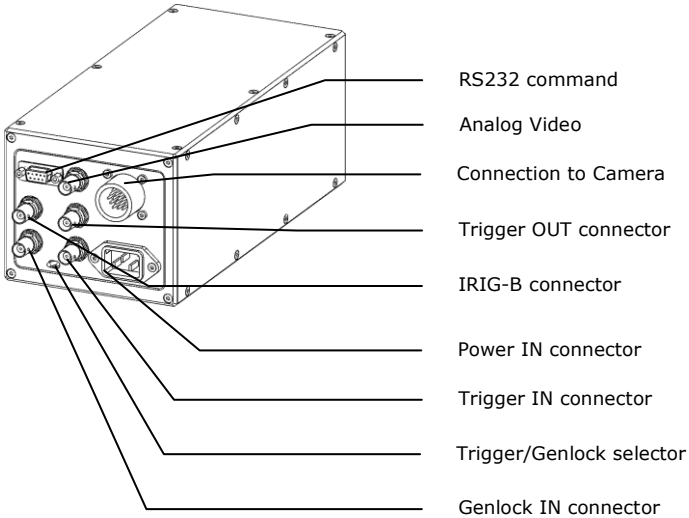






NB: When the camera configured for harsh environments (optional). The following module comes with the camera:





5. Starting with the camera

This part explains in detail all steps to be followed before using your camera for the first time.

5.1. Mounting the camera

Ensure you that the camera is posed on a stable surface or correctly screwed on the tripod.

5.2. Installation of the software on the computer

Software is pre installed on the computer

See software manual for installation instruction

Install frame grabber drivers, VirCAM acquisition drivers, Camera Command software CIRRUS & Altair software.

5.3. Connecting the camera

Connect the power cable on connector with the red reference mark.

Connect numerical cable USB or cam LINK, according to your use, between the camera and the computer.

If required connect the camera to a video monitor in order to control the image. Use a cable BNC 75 ohms or S-video which you will connect to the camera by using the video adapter provided with the camera (blue reference mark)

5.4. Powering the camera

The camera is turned on by pressing the ON/OFF button for 2 seconds. The camera will then start automatically. After a few seconds, 10s typically, the system displays a pattern on the video output.

Figure 1 : Pattern

It is necessary to wait some minutes (approximately 7 minutes) so that the camera is ready to take infrared images. The pattern is displayed during all this time.

5.5. Pointing and focusing

Before taking a measurement, ensure that the object is located at the center of the image and that focusing is optimized.

TITANIUM Cameras could control optional motorized lenses, and focusing is carried out by using the control buttons in the software.

The installation of a filter in the optical path modifies the focusing distance.
Refocus after positioning a filter.

5.6. Camera Power Off

The camera is turned off by pressing the ON/OFF button for 2 seconds.

Repeated Power on operations may reduce the lifetime of the equipment.
It is better to leave the camera operating during intervals of use of less than 2 hours

5.7. Precautions

Do not exceed specified environmental conditions.
Your equipment risks malfunction after being exposed to extreme environmental conditions.

Handle with great care the lens and all moving parts
Handle gently any additional lenses, as well as the connectors. These parts are particularly fragile.

Connection of cables
The connection and disconnection of the cables can be carried out at any time, camera on or off, computer on or off.

5.8. Training

This equipment and its use require knowledge of the field of infrared thermography in order to make best use of the camera and the processing of acquisitions.

FLIR Systems offers training schemes allowing you to use this equipment to its full potential. You can contact FLIR Systems in order to establish your training requirements.

6. Using your camera

6.1. Changing the lens

Lenses are fragile elements.
Take the greatest care at the time of their handling, particularly on the level of the lenses.

Lenses can be heavy.
Some lenses weight several hundred grams. Be careful not to be surprised by its weight.

- Lenses are mounted with a M80 thread.
- Turn gently the optic counter-clockwise while placing a hand below. It may be necessary to do some turns.
- Place caps on the lens and store it.

Never force on lens.
Check that optics is clean before assembling it in the camera. See section 7.1 for the maintenance of optics

- Remove the caps of the lenses that you wish to use and place it gently into the thread. Gently insert the lens and turn it clockwise.

6.2. Removing the lens interface

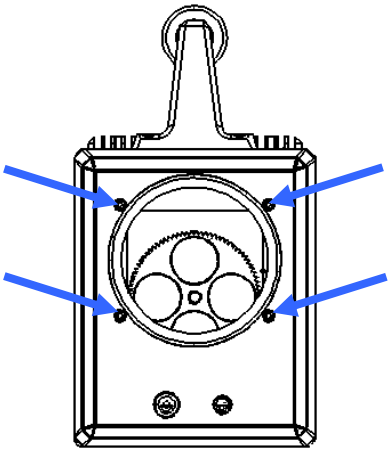
Lenses are fragile elements.
Take the greatest care at the time of their handling, particularly on the level of the lenses.

Lenses can be heavy.
Some lenses weight several hundred grams. Be careful not to be surprised by its weight.

- The lens interface of the camera, which also holds the filter wheel mechanism, can be removed so a custom lens interface can be installed.
- Turn gently the optic counter-clockwise while placing a hand below. It may be necessary to do some turns.
- Place caps on the lens and store it.

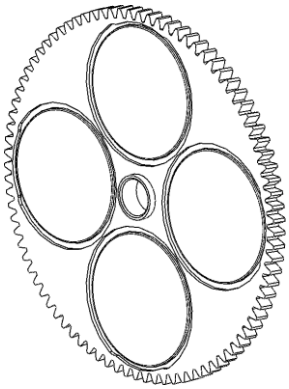
Never force on lens.
Check that optics is clean before assembling it in the camera. See section 7.1 for the maintenance of optics

- Unscrew the four screws located around the M80 thread using the appropriate 2.5mm BTR.

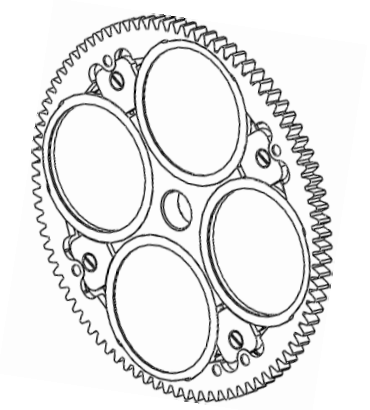


6.3. Filter wheel

Your TITANIUM camera comes with a 4-slots filter wheel. This wheel can be fitted with several filters at the factory.



You may also want to upgrade the wheel yourself by fitting some additional filters. For this you'll need our **optional 4-slots "filter removable" wheel**.



6.3.1. Inserting / removing a filter on the optional filter wheel

Filters are fragile elements. Handle them with the greatest care.

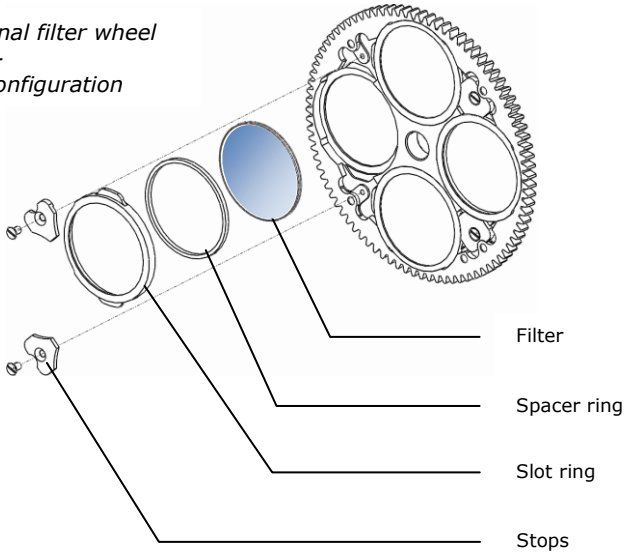
Pay attention not to touch a filter's surface with uncovered fingers – optical quality would be degraded by any grease or contaminant deposited on the surface.

Inserting or removing an IR filter requires a proper clean environment (e.g. clean room).

Use finger cots or gloves for any operation involving a filter.

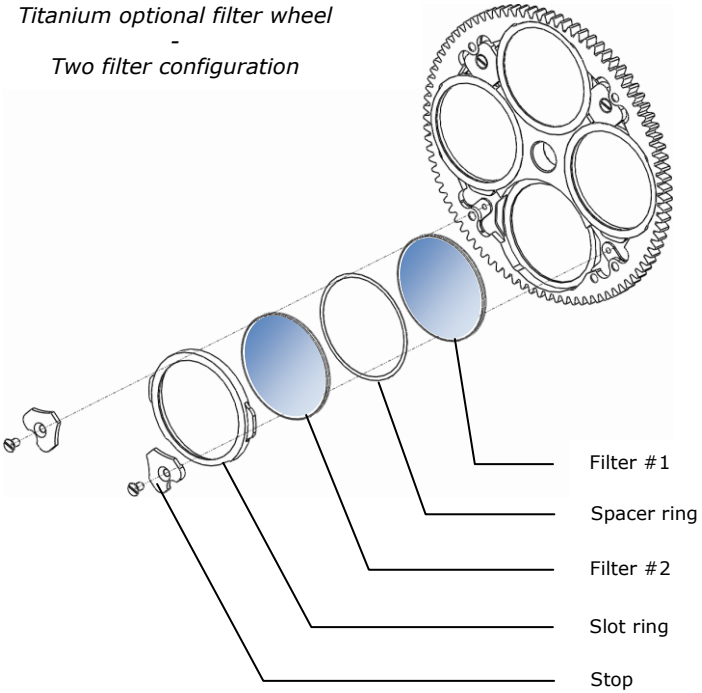
1. Remove the stops and the slot ring (holding the filter) with a 2.0 flat head screwdriver,
2. An IR filter has different coatings on each side (usually a metallic reflective layer and a colored or opaque layer): the metallic layer side needs to be placed towards the radiation source. Place the filter as recommended in the slot and secure it with the safety ring,
3. Place the slot ring carefully and tighten it gently.

Titanium optional filter wheel
-
One filter configuration



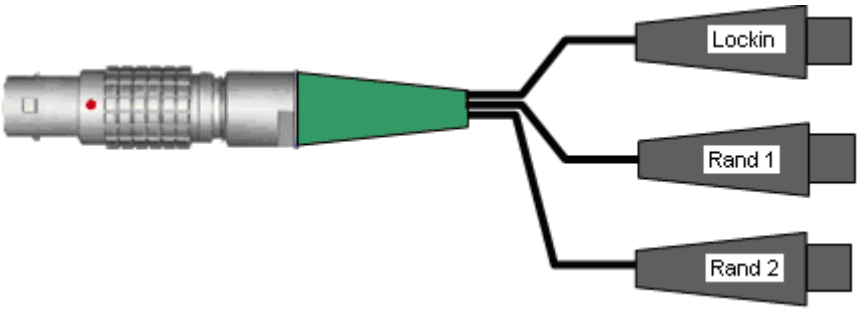
Note: there is enough thickness for two filters in one slot (when needed)**.** In this case, a different spacer ring is inserted between the two filters.

Titanium optional filter wheel
-
Two filter configuration



6.4. Lockin connection (Optional)

To use lockin option, you need an X0502 cable linked to the Titanium lockin connector.



Lockin
Input Range 10V peak to peak (AC only).

Rand 1
Input Range -5/+5V (AC + DC).

Rand 2
Input Range -5/+5V (AC + DC).

- Connect the signal to Lockin for stress measurement and motion compensation,
- Use Rand1 and Rand2 for Random analysis.

NB: These signals can be displayed in Altaïr's TimingGraph, thus allowing correlation of the thermal scene to external events.

7. Maintenance

7.1. Cleaning optical surfaces

The cleaning of all optical elements, in particular when coated, risks deterioration of it surface
Minimize cleaning by storing the optical elements in their case, or covering the element and its support by a protective cover when not used.

Dust cleaning procedure:

- Blow dust using a clean and dry gas (ultra jet 2000 gas duster).
- If dust remains, take a lens tissue (ref. Melles GRIOT: 18LAB020) and wipe surface gently in **only one** direction while making movements in the figure eight. Repeat the operation.
- If dust persists, fold a paper for lens using a grip, soak in propanol-2 RECTAPUR 20 (ref. PROLABO: 839.322) and wipe gently surface in **only one** direction while making movements in the figure eight. Repeat the operation.
- Start again previous step with acetone RECTAPUR (ref. PROLABO: 20065293).

Water, finger marks, oil or water spot cleaning:

Finger marks, oil or water spots must be cleaned **immediately**.

- Blow dust using a clean and dry gas (ultra jet 2000 gas duster).
- Using lens tissue saturated with propanol-2 RECTAPUR 20 and folded with one grip, gently wipe surface with the same movements in the form of eight (and in one direction). Repeat the operation.
- Repeat the previous step with acetone RECTAPUR to eliminate the scratches.

7.2. Storing

Put caps on lenses as soon as you finish using the camera.

Put the camera in its case and store it in a dry cool place, away from dust. Do not expose the case and its contents to temperatures lower than -40°C (-40°F) or higher than 70°C (158 °F).

8. Accessories

At the time of the writing of this handbook, the following optional accessories were available for this camera. Ask your retailer or FLIR Systems representative to obtain further details.

8.1. Additional lenses

FLIR Systems offers a range of additional radiometric lenses for the Titanium camera. These lenses are accompanied by a data sheet. They are assembled in addition to the lens integrated into the camera.

Note: you can use Janos lenses with our optional Janos lens interface (cf. p.7)

8.2. Long cables

Several lengths of cable are available, up to 50m. FLIR Systems also offers optical fiber repeaters or Ethernet Gigabit repeaters allowing operation at several hundred meters.

8.3. Interconnection / transformation cases

Several types of interconnection are available, allowing a transmission of the commands and digital video through optical fiber, Ethernet Gigabit or Camera Link.

8.4. Tripods / pan & tilt

FLIR Systems proposes a selection of tripods and motorized turrets for various uses.

8.5. Filters

We offer a vast range of infrared filters allowing spectral selection and/or attenuation of radiometric flux.

9. Diagnostics

If your camera does not function exactly as it should, check the following table before consulting FLIR Systems after-sales service or your FLIR Systems representative.

9.1. Diagnostic table

Problem	Action
Surface treatment of lens is scaled	Performances of optics will be degraded. Metrological measurements are not guaranteed any more (Altaïr - image in °C) ➔Contact FLIR Systems After Sale Service
The cooler does not make any more noise	First of all, check that the camera is properly connected and powered. Connections are correct? No ➔remake connections Yes ➔Contact FLIR Systems After Sale Service
The Stirling engine does not seem to reach its specified point	It always turns to full power. Check through CIRRUS software the temperature of the detector after 10 min of powering. It is close to temperature specified in the data sheet (+/- 2 K)? Yes ➔The temperature control is done correctly, but may be overworking the Stirling engine. Stay alert to any change that may require a preventive intervention. No ➔Contact FLIR Systems After Sales Service
Difficulty installing a connector	Pins are twisted? No ➔Engage the connector gently. Yes ➔Envisage the replacement of the cable. Contact FLIR Systems After Sales Service
Inconsistency of the IR image in Altaïr	Have you deactivated all process Plugin (Filter, threshold...)? No ➔Deactivate them. Is the image still inconsistant ? Yes ➔Check the cable and the connectors. No ➔The problem is solved.

Problem	Action
No image (black screen) but the cooler functions and the digital image is coherent	To check that the boot loader is displayed at starting on the analog video. Are connections correct? No ➔The monitor (or its connector) is at fault Yes ➔Activate the AGC under CIRRUS. Check the AGC parameters (Withdraw all the limitations in gain, offset and ROI). Does video monitor remain black? No ➔The problem is solved. Yes ➔Contact FLIR Systems After Sales Service
No Live image on Altair	Is the camera correctly connected and powered? No ➔remake connections Yes ➔Does Cirrus communicate with the camera? No ➔Contact FLIR Systems After Sales Service Yes ➔Check that external trigger is deactivated. Is the problem solved? No ➔Contact FLIR Systems After Sales Service
No image in external trigger mode	Check that synchro signal connected to the camera is LVTTL (0 – 3.3V) under 50 Ohms. No ➔Adjust the input signal Yes ➔Is the frequency of the signal in the range of the camera (from 3Hz to MAX frequency proposed by CIRRUS) No ➔Adjust the frequency of the signal Yes ➔Replace the external signal by a signal given by a function generator setup to square signal from 0 to 3.3V under 50Ohms and 25Hz. Do you get an image ? No ➔Contact FLIR Systems After Sales Service Yes ➔Check more precisely your synchronization signal. Eg. : 50 HZ noise, low voltage under 50 Ohms, Rising time to long, etc.
Altair Image presents lot of noise	Is your scene adapted to the temperature range in use? (eg. : wall at 20°C with a range of 100 - 350°C) No ➔Adjust the temperature range. Yes ➔Is the optical path clean ? (lens, filter, elements between the scene and the camera) No ➔Be careful that your measurement will not be coherent. Yes ➔Contact FLIR Systems After Sales Service

Problem	Action
Defect of image (mosaic) in corners	Bad quality of NUC or search criteria of Bad pixels too severe. Remake NUC and BPR. The problem is solved? No ➔Contact FLIR Systems After Sales Service
Strongly concentric image	Do a 1 point NUC to eliminate the Narcissus effect due to the filter. The problem is solved? Yes ➔The emissivity of the filmed object is too low (< 0,75). To give angle with the object with respect to the camera to remove a Narcissus effect (the detector is seen by reflection on the object) And/or paint the object filmed with a coat of very good emissivity paint
The image shows bubbles or honey comb structure	The detector had been exposed to strong visible light. Store the camera in its case with the lens cover until the pattern disappear. It can take from a couple of hour to up to few days, depending on the exposition. The problem is solved? No ➔Contact FLIR Systems After Sales Service

9.2. How to contact after sales service?

Before contacting the after sales service or your representative, note the serial number located on the camera. A FLIR Systems engineer will discuss the procedure with you.

FLIR Systems after sales service is reachable at the address:

customer@flir.fr

10. Technical data

10.1. Common Characteristics

Cooling Type	Integral Stirling cooler
Cooling Time	< 7mn @ 25°C ambient
Camera External Trigger	LVTTL (<300ns Jitter)
Frame rate resolution	0.1Hz step
Integration Time	3µs to 20000 µs programmable, 1µs Step
Power Supply	12 VDC / 5A
Power consumption	50W in cool down mode, 30W in steady state mode
Analog Video	PAL (50Hz) or NTSC (60Hz)
Remote Control	GigE / Camera LINK
Overall dim, (mm)	253x130x168 (w/o lens)
Weight (W/O lens)	4.950 kg
Water & humidity	IP54
Operational temperature range	-20°C +55°C
Motorized filter wheel	4 slots

10.2. 520M / 550M / 560M Characteristics

	520M	550M	560M
Detector Materials	InSb		
Number or Pixels	320x256 pixels		640x512 pixels
Spectral Response	3.6µm – 5.1µm (1.5-5.1µm optional)		3.6µm – 5.1µm (1.5-5.1µm optional)
Sub Windowing	160x128 pixels 64x120 pixels 64x8 pixels	160x128 pixels 64x128 pixels 64x4 pixels User defined	320x256 pixels 160x128 pixels 16x4 pixels User defined
Frame Rate	up to 175Hz Full Frame 11kHz@64x8	up to 383Hz Full Frame – 20kHz@64x4	up to 100Hz Full Frame – 4980Hz@16x4
Image Capture	Snapshot Integrate then Read mode (ITR)	Snapshot Integrate While Read mode (IWR) Integrate Then Read mode (ITR)	
Pitch	30µm x 30µm		15µm x 15µm
NETD	<25mK @ 25°C (20mK Typical)		
Aperture	F/3		
Digital Video	USB2 / CamLINK / GigE Ethernet (Optional)	CamLINK / GigE Ethernet (Optional)	

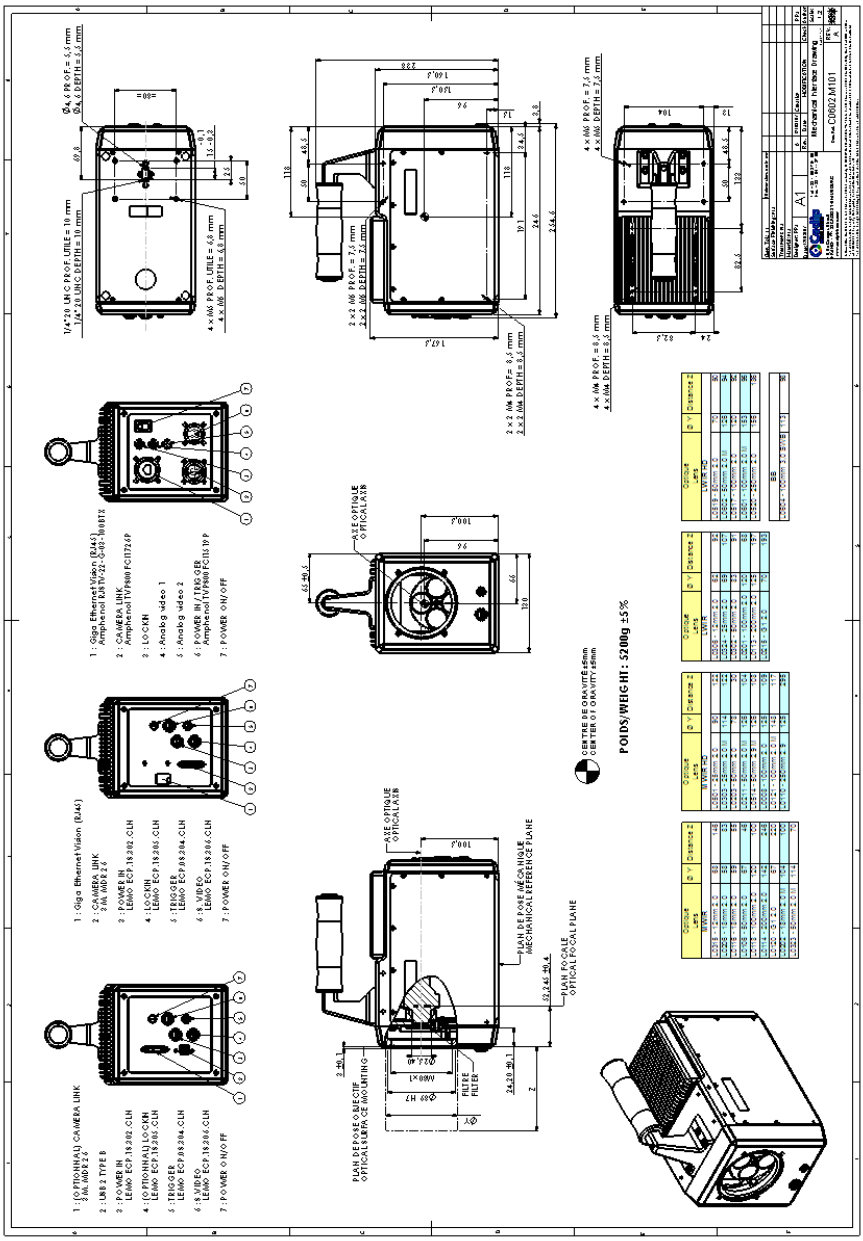
10.3. 530M / 530L / 570M Characteristics

	530M	530L	570M
Detector Materials	MCT		
Number or Pixels	320x256 pixels		640x512 pixels
Spectral Response	3.7µm-4.8µm	7.7µm-9.3µm	3.7µm-4.8µm
Sub Windowing	160x128 pixels & 80x64 pixels & User defined (64x2 min)		320x256 pixels 160x128 pixels User defined
Frame Rate	up to 250Hz Full Frame		up to 117Hz Full Frame
Image Capture	Snapshot Integrate then Read mode (ITR)		Snapshot Integrate While Read mode (IWR) Integrate Then Read mode (ITR)
Pitch	30µmx30µm		15µmx15µm
NETD	<20mK @25°C & 1300µs IT without filter	<25mK @25°C & 350µs IT without filter	<18mK @25°C & without filter
Aperture	F/2		
Digital Video	USB (for commands) / CamLINK / GigE Ethernet (Optional)		

10.4. 570L Characteristics

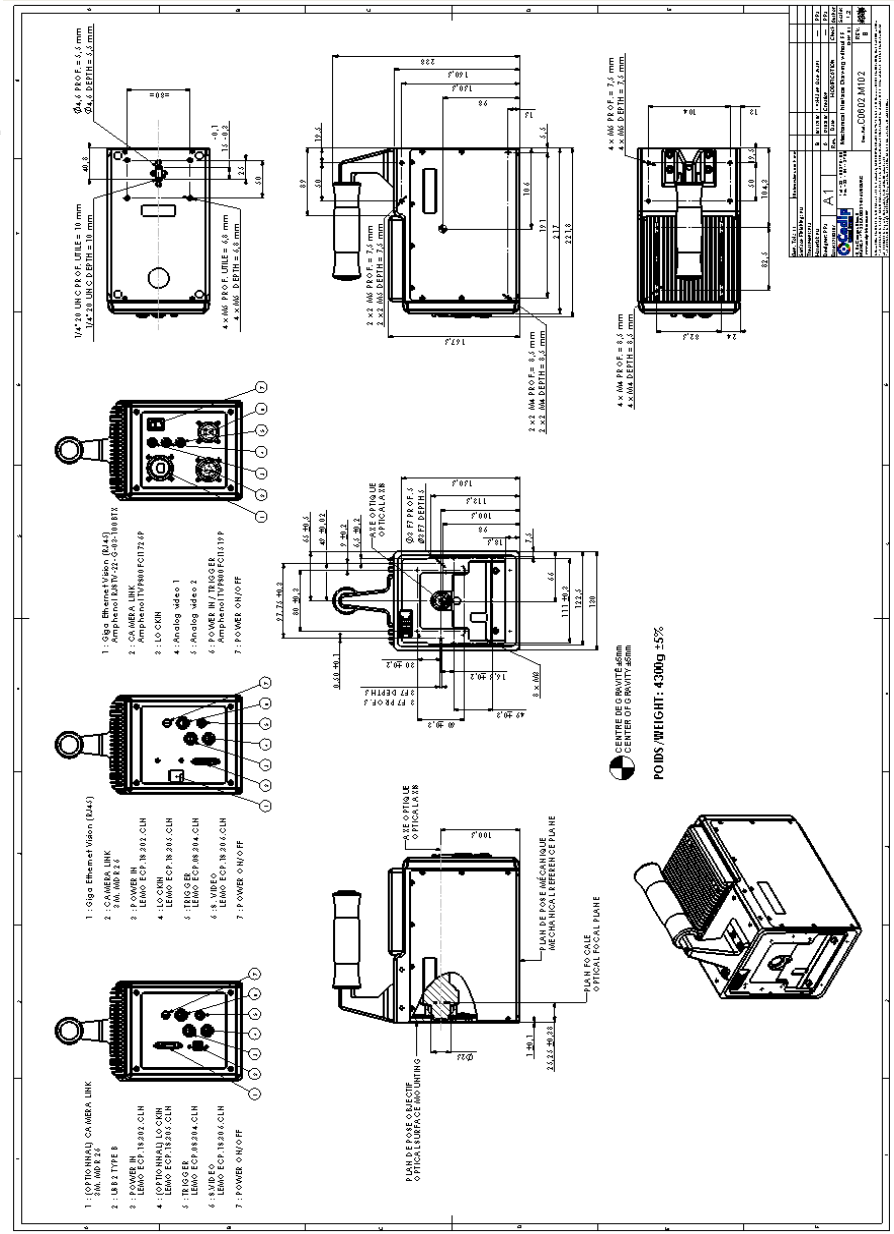
	570L
Detector Materials	QWIP
Number or Pixels	640x512 pixels
Spectral Response	7.5µm–9.1µm
Image Capture	Snapshot Integrate While Read mode (IWR) Integrate Then Read mode (ITR)
Pitch	20µmx20µm
Digital Video	CamLINK / GigE Ethernet (Optional)

10.5. Mechanical interface with lens interface

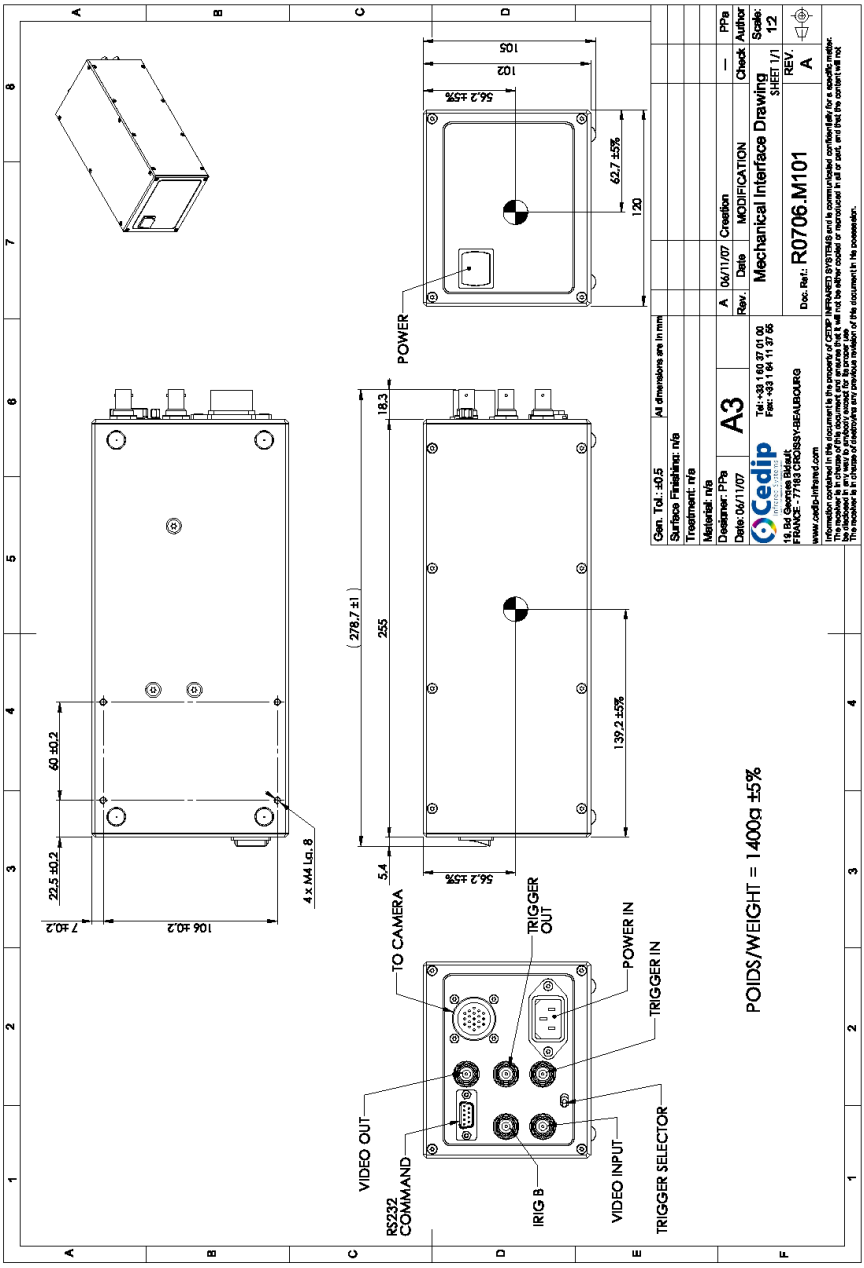


10.6. Mechanical interface without lens interface

10.



10.8.


POWER
TO CAMERA
TRIGGER OUT
POWER IN
TRIGGER IN
VIDEO OUT
RS232 COMMAND
IRIG B
VIDEO INPUT
TRIGGER SELECTOR
4 x M4 Lg. 8
POIDS/WEIGHT = 1400g ±5%
Mechanical Interface Drawing
Doc. Ref.: R0706.M101
REV. A
SHEET 1/1
Scale: 1/2
A3
Cedip
Tel: +33 1 60 37 01 00
Fax: +33 1 64 11 37 66
19, Bd Georges Bidault
FRANCE - 77183 CROISSY-BEAUBOURG
www.cedip-infrared.com

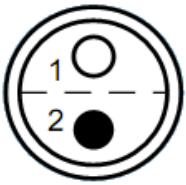
10.8.1. VIDEO connector

Connector reference: LEMO ERP1S306CLN
Mating part: LEMO FFA1S306CLAC42Z
Signal Characteristic: 75 Ohms

Signal	Pin #
Composite_Video	1
GND	2
SVideo_Chroma	3
GND	4
SVideo_Lumi	5
TX	6

10.8.2. Power supply connector

Connector reference: LEMO ECP1S302CLN
Mating part: LEMO FFA1S302CLAC52



Signal	Pin #
GND	1
+12V	2

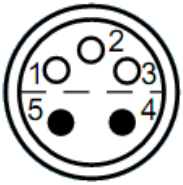
10.8.3. Trigger connector

Connector reference: LEMO ECP0S304CLN
Mating part: LEMO FFA0S304CLAC42Z
Signal Characteristic: 50 Ohms

Signal	Pin #	characteristic
Trigger OUT	1	LVTTL – 3.3V
GND	2	
Trigger IN	3	LVTTL – 3.3V
GND	4	

10.8.4. Lockin connector

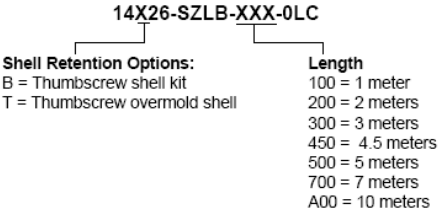
Connector reference: LEMO ECP1S305CLN
Mating part: LEMO FFA1S305CLAC42Z
Signal Characteristic: 10 MOhms



Signal	Pin #	characteristic
Lockin	1	0/+10V AC only
GND	2	
Random1	3	-5/+5V DC + AC
GND	4	
Random2	5	-5/+5V DC + AC

10.8.5. Cam LINK connector

Connector reference: 3M MDR26
Mating cable:



Signal	Pin #	Signal	Pin #
Inner Shield	1	Inner Shield	14
X0-	2	X0+	15
X1-	3	X1+	16
X2-	4	X2+	17
Xclk-	5	Xclk+	18
X3-	6	X3+	19
SerTC+	7	SerTC-	20
SerTFG-	8	SerTFG+	21
CC1-	9	CC1+	22
CC2-	10	CC2+	23
CC3-	11	CC3+	24
CC4-	12	CC4+	25
Inner shield	13	Inner shield	26