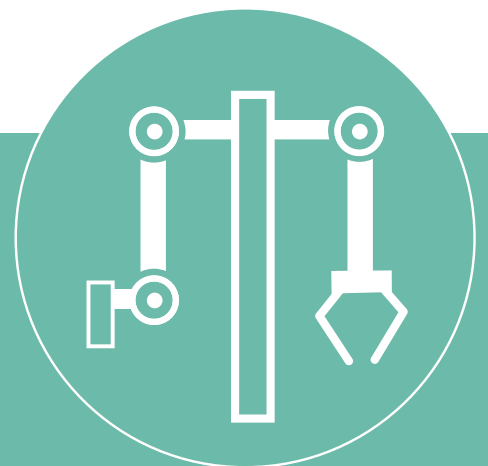


## Onboard Camera System

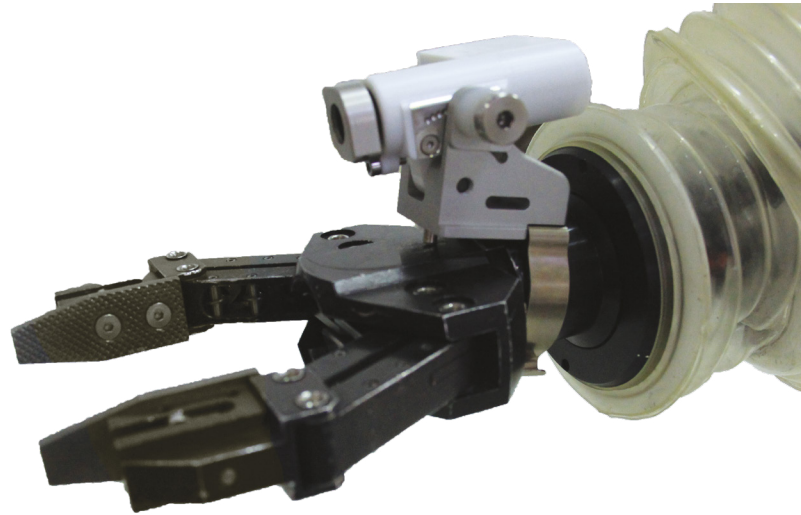
A new insight into  
working inside hot cells



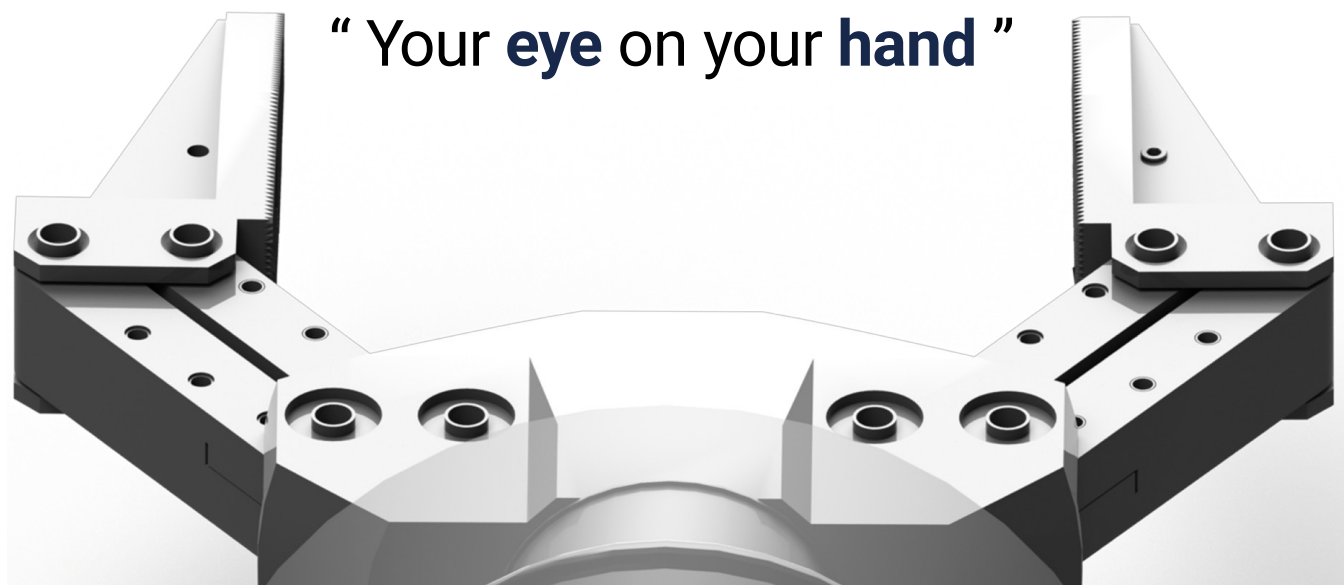
# An innovative system improving sight in hot cells: a cooperation between CEA\* and LaCalhene

Inside hot cells for R&D or production, technicians usually work facing a shielded window with two remote manipulators. In some cases, this distance vision can make tasks requiring precision very inefficient, due to the distance, poor lighting and encumbered cells.

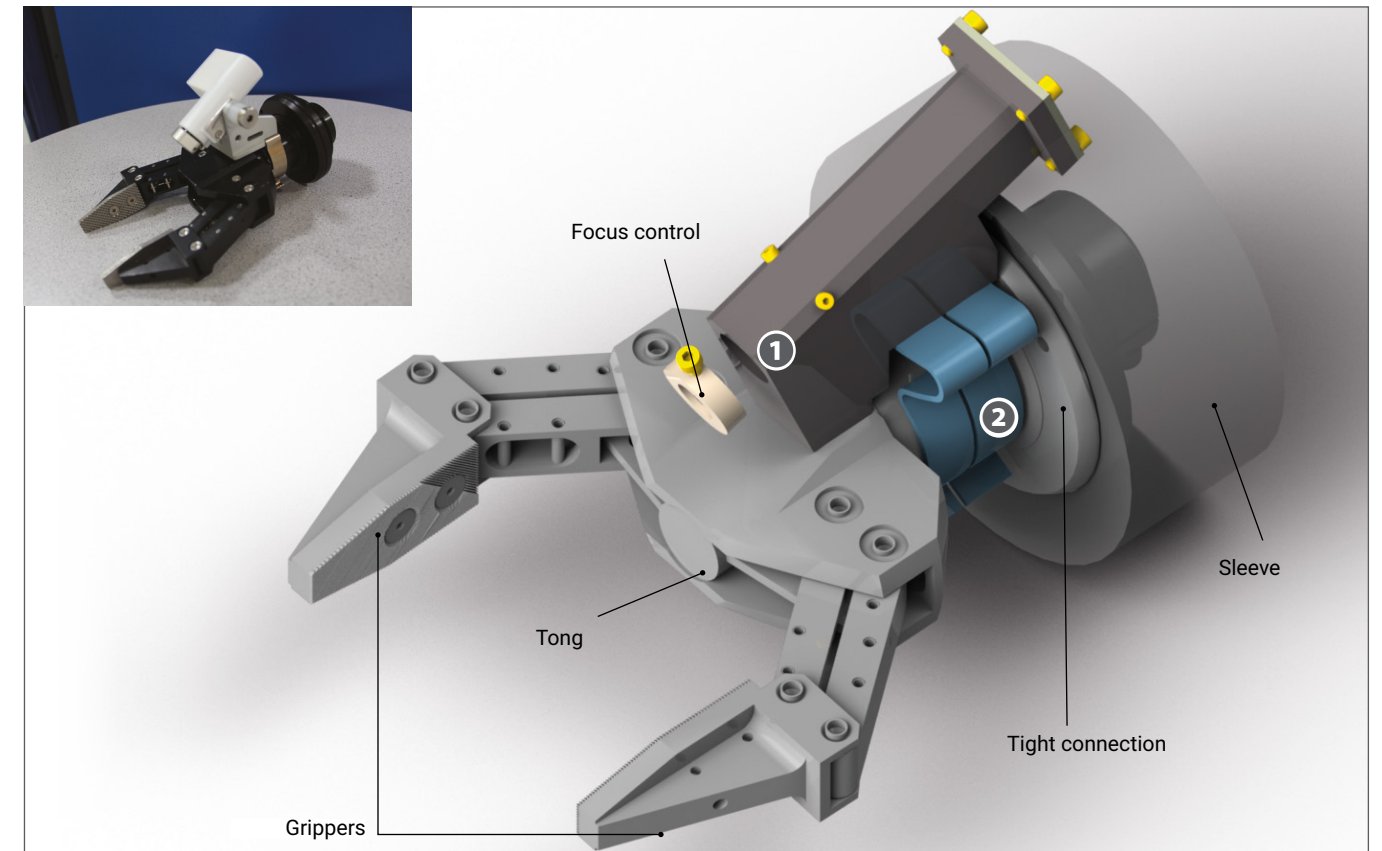
Several solutions have been tried out in the past, more or less successfully: A mirror situated inside the hot cell provides a view behind the equipment, fixed shielded cameras, small portable cameras that can easily be picked up by a manipulator arm.



Operators have requested improvements to the visual aspect of their working conditions. The onboard camera system, manufactured under licence by the CEA, is one response to these requests. The camera is clipped directly onto the tongs instead of being held by them, so the remote manipulator can function while providing a close-up view of the work to be done.



\*CEA: Commissaire des Énergies Atomiques et aux Énergies Alternatives



## Principle

The camera clips onto the cylindrical seal between the sleeve and the tongs.

The Onboard Camera system consists of:

- **Inside the cell:** a camera (1) on its clip (2) and a cable for electrical supply in / video out.
- **Outside the cell:** a video screen or PC.

## Electrical Supply

The cable enters the cell via the cell's electricity supply installation. It may be cabled via the remote manipulator (attached to the sleeve).

## Onboard Camera - Mobile Part

- A small cylindrical camera weighing approximately 500 g (inside a PE casing).
- A camera available in black and white (9V) or in color (6V).
  - Black and white camera: ambient temperature: -10°C/+34°C.
  - Color camera: ambient temperature: -10°C/+44°C.
- A mobile casing housing the camera.
- A focus control enabling the operator to focus on very close or distant items. The focus control, which can rotate on 60°, is operated by a second remote manipulator.
- The camera viewing angle is adjustable by 5° steps from -20° to +35° with respect to the horizon. The operator can view either the tips of the tongs (close-up view) or further along the direction of the slave arm (cell view).



## Mounting

The camera adapts to all LaCalhene remote manipulator tongs (2018 and beyond).

The onboard camera unit can also be mounted on a fixed holder inside the cell.

## Advantages

- **Precise and close:** the camera on the tongs is close to the products being handled and the zoom can be adjusted inside the cell.
- **Better productivity:** operators' working conditions are improved.
- **Safer:** the recording software can supply supervision.
- **Mobile (accessible):** the operator can get a viewpoint from anywhere that the manipulator arm can reach. Small and light to keep arm movements free.
- **Easy to install and remove:** to install, immobilize the tongs that will hold the camera and press lightly downwards. Lift the camera upwards to remove it.
- **Economic:** the standard camera is small and light for economy and waste reduction.
- **Options available:** mobile casing made of stainless steel or polyethylene, shielded storage box to extend its lifetime.



# An adaptable system

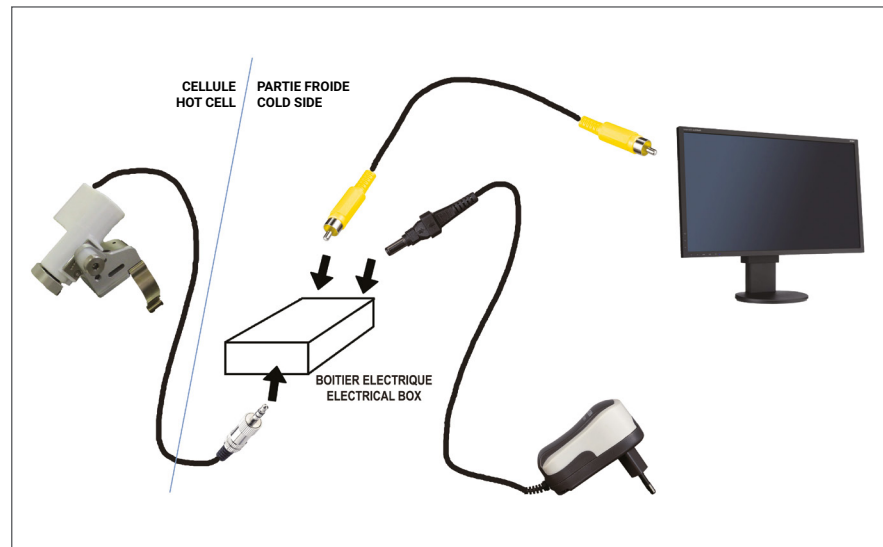
## Visualisation

The operator can visualize the image in two ways:

### A) Screen:

Connect the La Calhène system directly to a video screen with video access (RCA type).

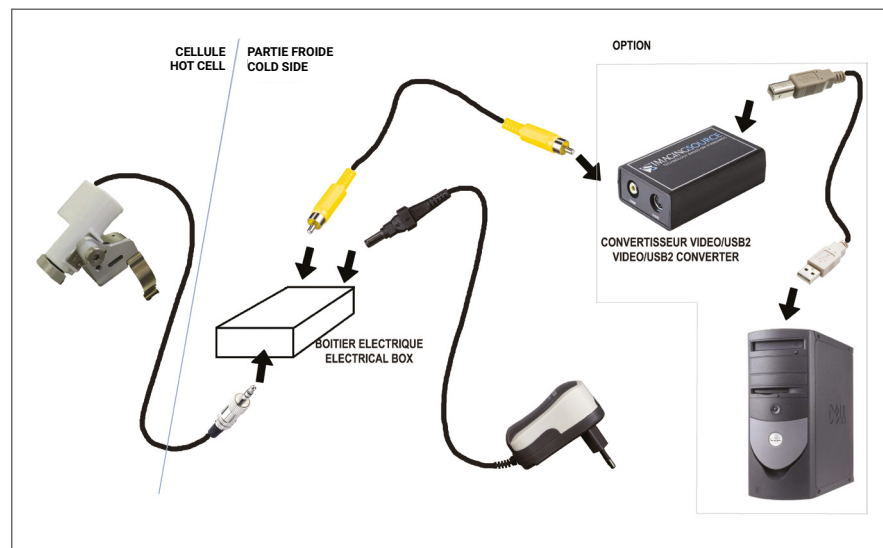
A 3m RCA/RCA cable is supplied.



### B) Computer:

Connect the LaCalhène system to a computer by selecting the Converter USB2/Video option.

Images can be captured in various ways, using free data acquisition software (freeware).



## Recording

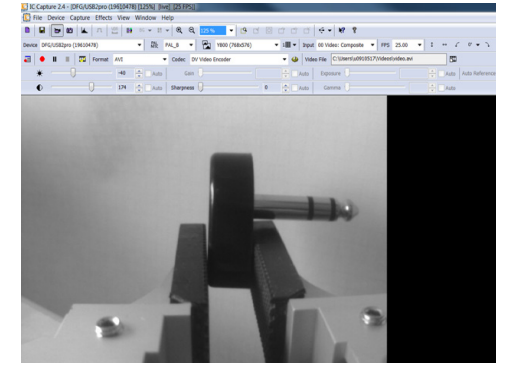
- Images and/or image sequences can be saved manually as BMP, TIFF ou JPEG files
- Image sequences can be recorded via a timer, e.g. 1 image per second over 24 hours
- Videos can be recorded manually in AVI or compressed format

## Image Capture

The operator can:

- Record and restore all the characteristics of the visualization system
- Save all the adjustments made, for future use
- Manage luminosity, contrast, zoom etc.
- Use the mirror function to flip horizontally and vertically
- Pivot the video stream live, horizontally and vertically, to 90°, 180° and 270°, using the softward

For more information refer to La Calhène Technical Manual (Installation and Operating) for image acquisition NT 3012-42.



Software Interface (The Imaging Source)



## Electrical Box

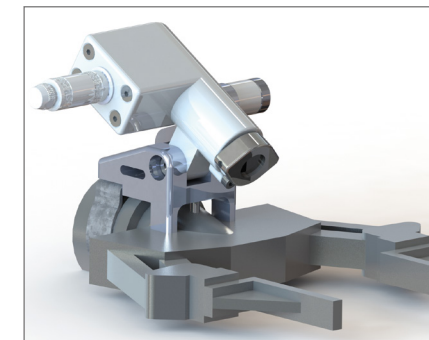
- The electrical box powers the camera and sends the video signal to the visualization device (screen or PC)
- POWER inlet: 6 or 9VDC supply (2.1x5.5 mm female socket)
- CAMERA port: supply + camera signal (3.5 mm jack socket – 3 pins)
- COMP outlet: video composite (cinch/RCA socket)
- Operating temperature: 0°C / +45°C
- Storage temperature: -20°C / +60°C
- Humidity: < 80% (condensation free)
- Dimensions (mm): 140 x 80 x 35

## AC/DC Converter

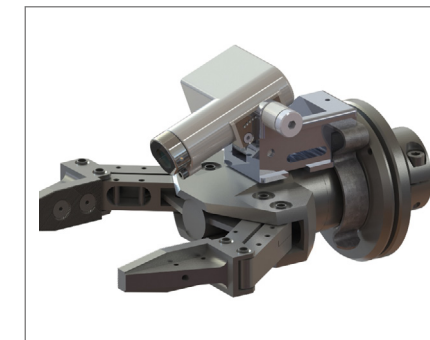
The electrical box is powered by a converter (universal voltage AC/DC 100-240 VAC, 50/60 Hz – 600 mA).

## Link between the hot cell and the cold side

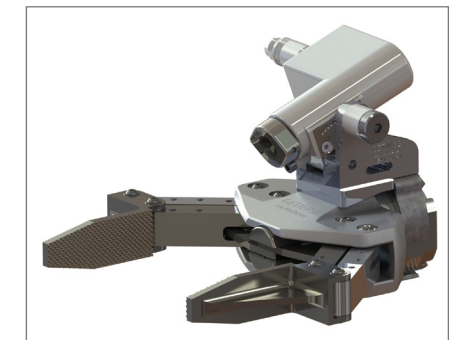
Maximum cable length between the camera in the hot cell and the electrical box on the cold side: 30 m.  
Note: this cable length allows for all types of installation.



Onboard camera system on PEM 78



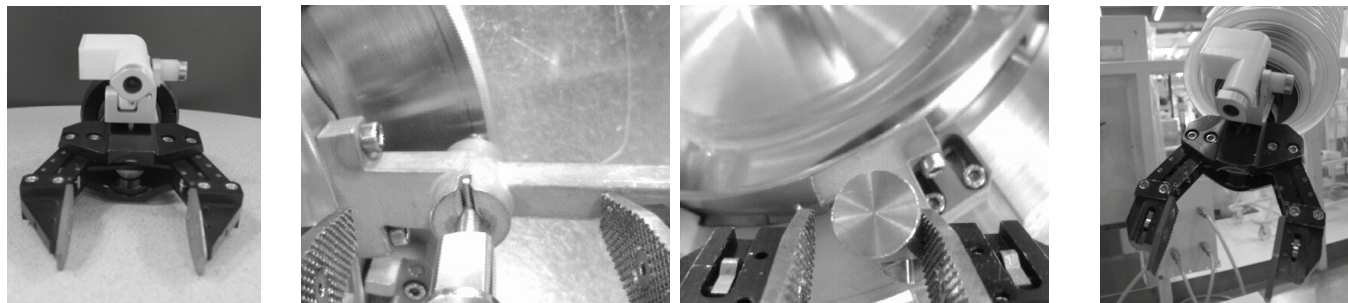
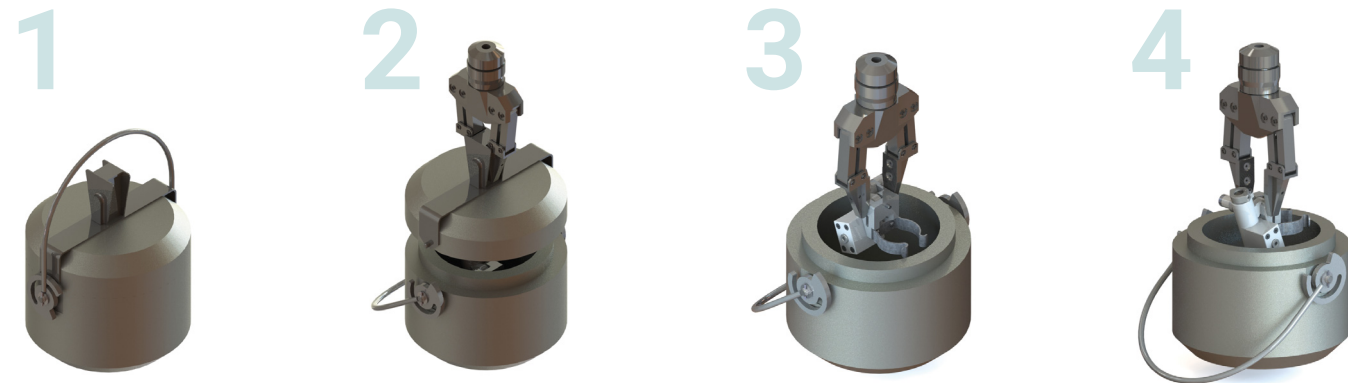
Onboard camera system on PMC 97



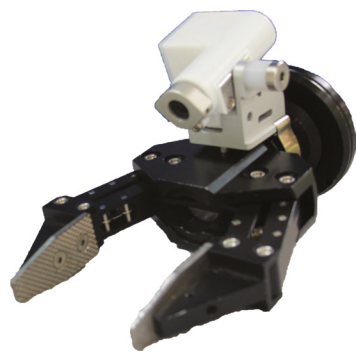
Onboard camera system on PGLC 2

# An "extra" from LaCalhene

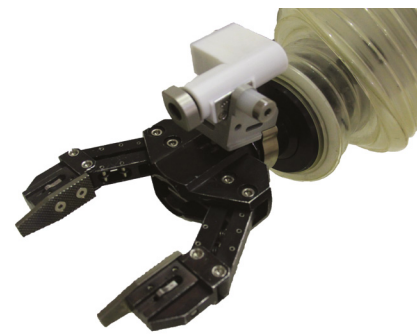
A shielded box to store your onboard camera system inside the cell extends its lifetime.



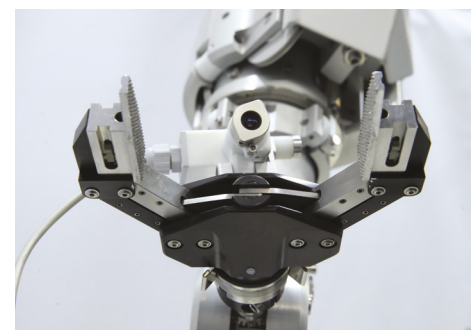
What the operator sees when a DPTE® is being opened



Onboard camera system on PMC97 tong



Onboard camera system on PMC97 tong and MT 120 arm with booting



Onboard camera system on PGLC2 tong with disconnectable grippers

# Onboard Camera System Configurator

## A new insight into working inside hot cells

### Standard version

<b>Camera</b>	Black & White <input checked="" type="checkbox"/>	Color <input type="checkbox"/>	
<b>Comments:</b>			
<b>Camera Connection</b>	Jack <input type="checkbox"/>	LEMO type <input type="checkbox"/>	Cable gland <input type="checkbox"/>
<b>Comments:</b>			
<b>Mobile Housing</b>	Polyethylene (PE) <input type="checkbox"/>	Stainless Steel <input type="checkbox"/>	
<b>Comments:</b>			
<b>Converter video/USB2</b>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
<b>Comments:</b>			
<b>Tongs used</b>	PEM 78 <input type="checkbox"/>	PMC 97 <input type="checkbox"/>	PGLC 2 <input type="checkbox"/>
<b>Comments:</b>			



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LaCalhene is an equipment manufacturer specialized in material to protect human beings in a hostile environment, protect a product against the surrounding environment, and protect the environment from hazardous products. Its customer base is half in the nuclear field and half in the pharmaceutical field.

In the nuclear sector LaCalhene supplies 4 product lines: remote manipulators, transfer systems (the DPTE® range, standard and special applications), Glove Box ports, and shielded casks for transfer / transport. LaCalhene supplies to 5 market segments: nuclear fuel manufacture, spent fuel recycling, radiopharmacy, laboratory / universities / units of research, and dismantling / decommissioning / sanitization.

On the basis of its long experience in the nuclear sector, Getinge La Calhène developed a set of solutions and equipment for the pharmaceutical industry, in particular for isolators and sterile transfer systems (DPTE® and DPTE-BetaBag®).

LaCalhene is an active member of:

