

*"Nothing  
goes undetected"*



*"Designed to survive  
the harshest environments"*

*"Guaranteed  
radiation-tolerant"*

# RADCAM<sup>®</sup> Epsilon

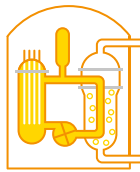
A color sensor camera that offers continuous viewing in the reactor containment building, and other radioactive areas.



**ISEC**  
MONITORING SYSTEMS

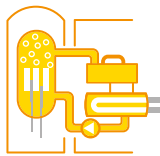
# 24/7 monitoring in any environment

The RADCAM® is a proven standard when it comes to advanced audiovisual process surveillance within NPPs.



## Pressure Water Reactor (PWR, VVER)

Primary circulation pump, containment area, steam generator, pressurizer, refueling floor, polar crane, pressure airlocks



## Boiling Water Reactors (BWR)

Primary circulation pump, control dry well, steam tunnel, refueling floor, overhead crane, pressure airlocks



## Heavy Water Reactors (CANDU, PHWR)

Reactor fuel wall, refueling floor, primary circulation pump, pressure airlocks



## Spent Fuel Storage

Spent fuel handling dry hot cells, dry spent fuel storage building

In close collaboration with the Swedish nuclear industry, we've built the RADCAM Epsilon, specifically designed for radioactive environments. RADCAM Epsilon identifies leaks and monitors equipment, while increasing safety and efficiency as it assists operations in decision-making.

With its patented neutron-absorbing outer body, high tolerance to gamma radiation, and an effective on-board cooling system, the RADCAM is designed to survive within the harshest of environments.

The RADCAM incorporates a new patented-protected mode that enhances its radiation protection, which makes it ultra-reliable in the reactor containment building

and other radioactive areas. The RADCAM also offers high availability, brilliant picture and sound quality, auto focus, 40x optical zoom, low light sensitivity and high temperature tolerance (up to 90 °C) – all requested features by reactor and turbine operators.

ISEC designed the RADCAM to be easily serviced. The camera module containing the CCD chip and lens is easily removed and replaced via two screws that are accessible through a service opening at the back the control logic.

RADCAM Epsilon can be acquired as part of a complete ISEC system, but it can also be integrated with an existing system.



Save plants up to 1.5 M\$/year



Equipment operation & monitoring



Configuration testing & training



Reduce doses exposure



Prevention & fire watch



Identify & monitor leaks



System & environment surveillance



## See the difference with RADCAM® Epsilon

The RADCAM Epsilon is more than a camera, it is a sensor platform that enable plants to generate critical metadata by adding additional modules to the camera:



Radiological data (built-in radiation damage sensors, Dose rate sensor)



Audio data (Microphone assembly)



Temperature data  
(Temperature sensor, Pyrometer)

Unlock the potential of metadata with the PMP software from ISEC.



## Simplicity

- Backward compatibility
- Advanced PTZ control
- Locally maintainable under 10 minutes
- Seamless IP integration



## Excellence

- Colour Resolution & image quality
- Optical zoom & Lights
- Very high return on investment
- Self-diagnostic and predictive maintenance program



## Endurance

- Neutron & Gamma protection
- Patented Protected mode
- High temperature
- Obsolescence free

## TECHNICAL SPECIFICATIONS

<b>Camera Module</b>	
Sensor	¼" day/night color sensor (670 TVL)
Signal system	PAL (NTSC available as option)
Backlight compensation	Yes
Gain	Auto / manual
Shutter speed	1/1 s to 1/10,000 s, 22 steps
Minimum lighting	0.7 lux at F1.6, 1/50s and 50 IRE
Optical zoom	40x f = 3.06 mm (wide) to f = 122.4 mm (tele)
Horizontal viewing angle	60.0° (wide end) to 1.6° (tele end)
S/N ratio	75 dB due to thermoelectric cooling
Minimum object distance	10 mm (wide end) to 1500 mm (tele end)
Focus / Iris	Yes, auto and manual
<b>Physical features</b>	
Pan / tilt	± 180°, .045° / ± 90°, .045° (variable speed)
Lamps	2 × 35 W following Pan-Tilt (>5 lux @ 30 m)
Size	H: 430 mm, L: 460 mm, W: 350 mm
Weight	30.3 kg (66.9 lb.)
Power Supply	230/110/100/24 VAC – 50/60 Hz
<b>Communication</b>	
Video output	BNC or balanced 2-wire (1 VPP/75 or 120 Ω)
Control output	LonWorks or Pelco D (RS-422 / RS-485)
Audio (optional)	FM over balanced 2-wire
<b>Environment</b>	
IP class	IP 65 (Sensor Module)
Operating temp.	5 – 65°C (40 – 150°F), max 90°C (195°F) up to 15 h
Humidity	0 – 100 % RH, non-condensing
Vibration	2 – 9 Hz 1.5 mm, 9 – 200 Hz acc. 5 m/s <sup>2</sup> Resistance for 6 magnitude earthquake
Pressure	5 Bar above normal atm. pressure
<b>Radiation</b>	
Radiation protection	Gamma and neutron protection
Camera design life	Gamma only radiation field: > 30 years Mixed radiation field (Gamma & Neutron): > 15 years
Total camera integrated dose	Gamma only radiation field: > 600 kGrays (60 MRads) Mixed Radiation field: > 150 kGrays (15 MRads)
Sensor radiation dose rate	> 3 Gray/h (300 Rad/h) continuous up to 1000 Gray/h (100 kRad/h) burst
Internal sensor	Internal radiation damage sensors
<b>Maintenance</b>	
Maintenance interval	MTBF > 10 000 h Between 24 and 140 months In average every 42 months (Data collected from 2010 to 2014 over 65 RADCAMs)
Items replaced at maintenance intervals	Sensor module & control module, lamps, fans.
Maintenance task	< 5 – 10 min replacement time Directly at camera position Done by maintenance department



**ISEC**  
MONITORING SYSTEMS

The innovative,  
cost-efficient choice  
in nuclear monitoring  
systems