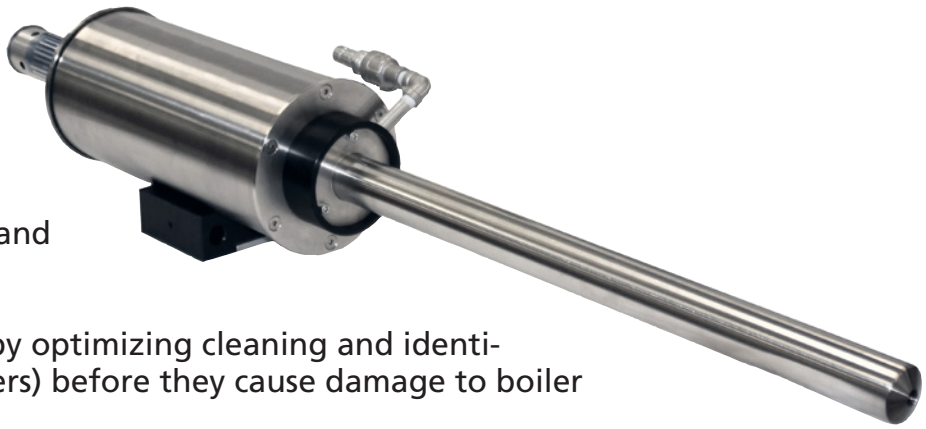
LUMASENSE™ TECHNOLOGIES

Combustion Imaging Solutions

Continuous Monitoring in Boilers and Furnaces

BoilerSpection SD

- **Capture lost boiler capacity** by reducing unnecessary cleanings
- **Increase efficiency** by improving heat transfer with precise knowledge of slag and ash buildup



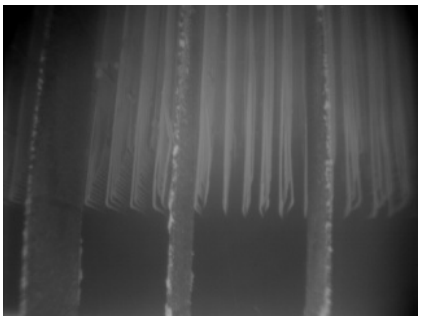
- **Lower maintenance costs** by optimizing cleaning and identifying large deposits (clinkers) before they cause damage to boiler tubes
- **Optimize fuel-switching** by directly and accurately measuring ash rate and uniformity as fuel changes
- **Manage combustion** by tracking uniformity of ash deposits

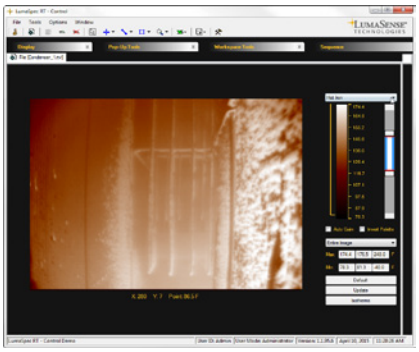
Increasing demand for efficiency, improved emissions and pressure to lower operating costs are the principal challenges faced by coal plant operators today. To solve these problems, plant operators need a view inside the boiler, furnace or kiln. This insight would provide the necessary information to effectively and optimally manage operations.

LumaSense Technologies, Inc., the global leader in light-based imaging for complex industrial applications has developed a turn-key solution for boiler and furnace applications. The new BoilerSpection system provides continuous, real-time, through-flame imaging plus is resilient and robust enough to withstand the harshest conditions.

BoilerSpection includes state-of-the-art optics, infrared cameras, an auto-retraction device, networking components and software to control the entire system remotely. The LumaSpec RT software is a powerful tool for analysis and historical trending, outputs to automation and DCS, along with a real-time web server to broadcast images over the plant's network. Additionally, LumaSense offers commission services, technical support and preventative maintenance for the lifetime of the system.

LumaSense's combination of unmatched infrared expertise and deep industrial experience results in the industry's best through-flame image quality to help coal plant operators achieve necessary efficiencies, best manage emissions and arrive at real cost savings.





Technical Data

IR Camera	
Wavelength	Narrowband 3.9 µm
Resolution	320 x 240
Detector Type	Uncooled Focal Plane Array VOx Microbolometer
Protective Housing	IP66 with Integrated Vortex Air Cooling
Measurement Range	500 to 1600 °C (932 to 2912 °F)
Ambient Environment	Up to 60 °C (140 °F)
Camera Weight	30 lbs (13.5 kg)

Lens	
Construction	Stainless steel with air cooling and purge
Field of View	50° H x 38° V
Focus	Manual
Protection	Sapphire window tip with air purge shield
Diameter	1.65” (42 mm)

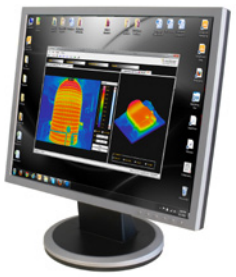
Facility Connection Requirements	
Power	110-240 VAC, two 15 AMP Lines to support six camera
Electrical Cabinets	All cabinets/panels are NEMA 4 / IP65
Air Supply	20-30 scfm at minimum 80 psi per camera

Automatic Retraction Device and Mounting	
Controls	Automated retraction if air or power is disrupted
Air Filters	Two stage filter system
Air Regulators	Included
Mounting	Weld or bolt on mounting plates
Waterwall Opening	2” (50 mm) gap
Weld-on thru Hole	2.5” (64 mm) circle
Furnace Pressure	Negative, balanced, or positive pressure

Networking	
Number of Cameras	Up to 24 to a single control room server
Camera Connection	100 Base T Ethernet
Field Switch Cabinet	NEMA 4 / IP66 enclosure with Ethernet Switch
Connection to Control Room	Fiber Optic Link, 50/125µm core/ cladding diameter multi-mode fiber, 850/1310nm wavelength

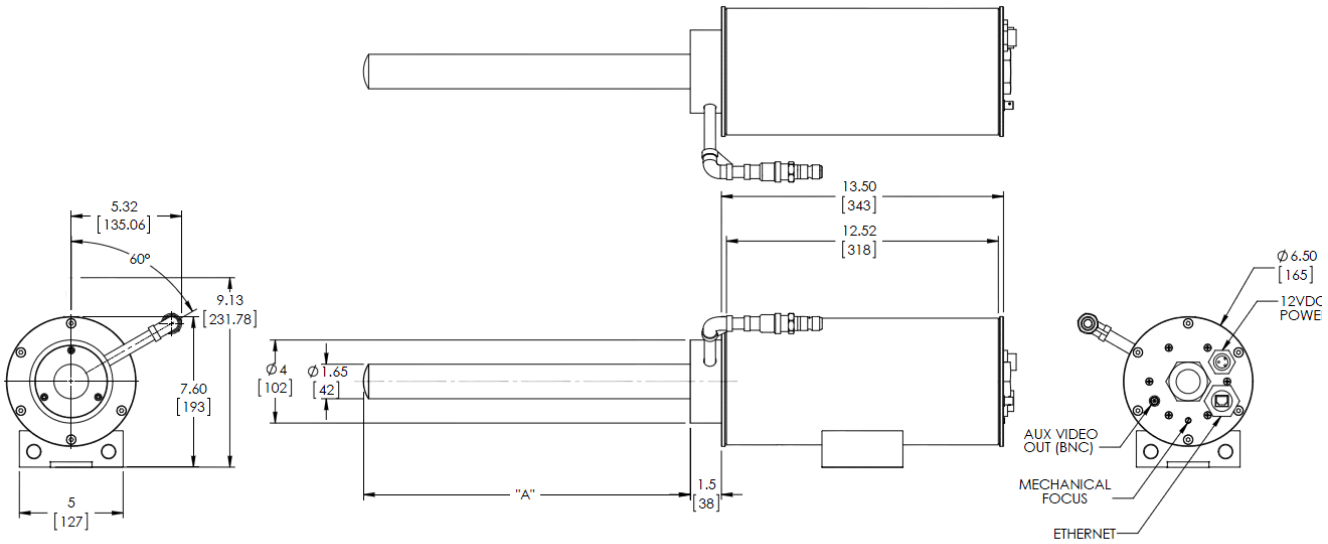
Salient Features of LumaSpec RT Control Software

- Support for non-uniformity correction (manual & auto)
- Remote focus lens control for standard, wide angle, and telephoto lens
- Adjustable emissivity, background, and transmission settings
- Real-time display of thermal images with frame capture and sequence capture
- Includes 19 different color palates
- Auto-Gain available for entire image or ROI
- Multiple types of ROI including point, line, and area with temperature display
- Includes analysis tools like histogram, 3D profile, line profile, and temperature trend
- Alarm generation for entire or ROI image based on minimum, maximum, or average temperature
- Support for OPC and Modbus (Serial and Ethernet) protocol
- Analog, digital, and relay module
- Web server functionality
- Triggered capture based on alarm conditions
- Password controlled user access
- Digital zoom up to 8X
- Data export to text or Microsoft Excel (includes thermal image, ROI table summary/data, image data)
- Multi-camera configuration with camera auto start feature
- Image subtraction available
- Analyze previously recorded images



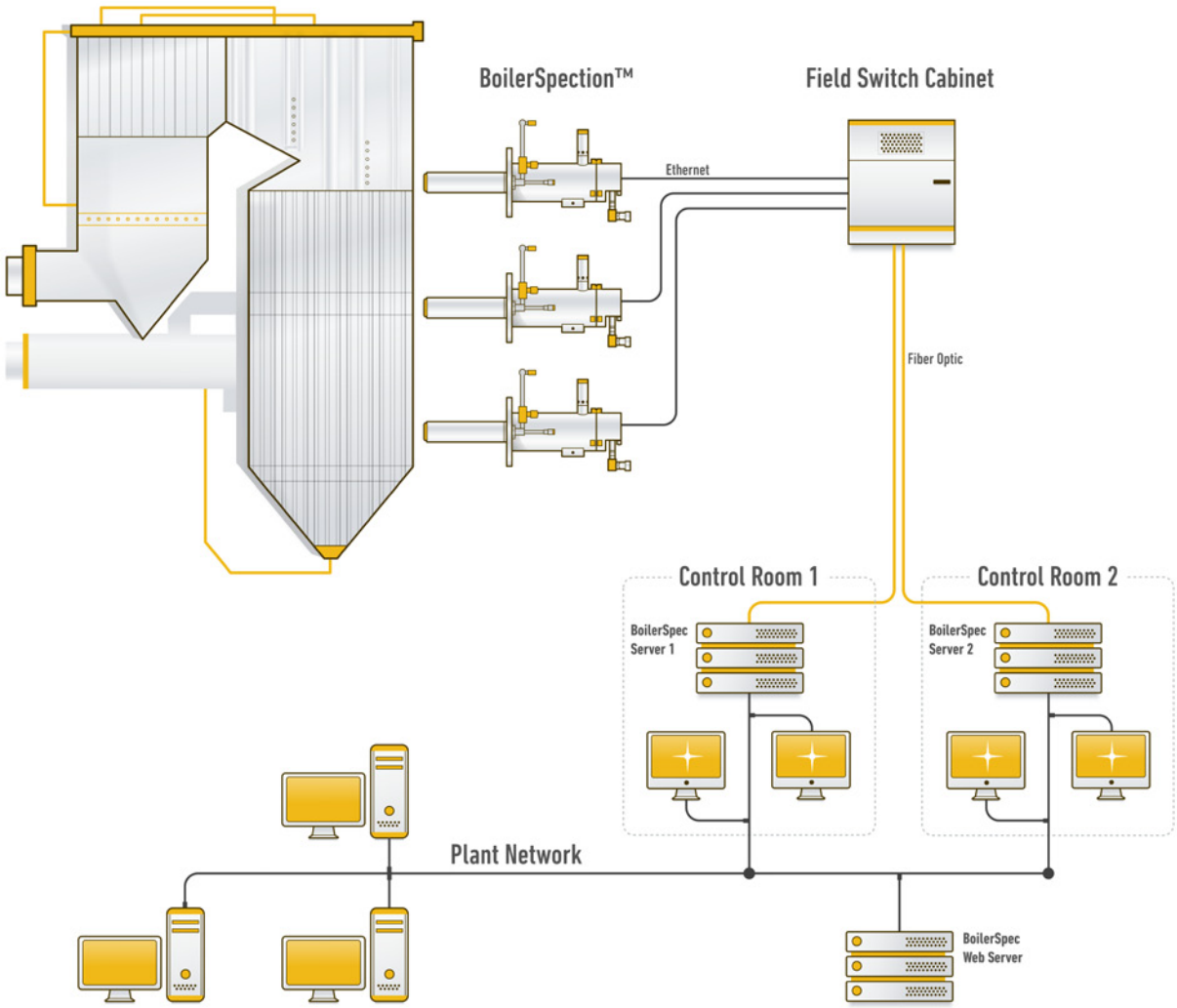
- Export captured sequences to AVI
- Image format compatible with LumaSpec Offline Analyzer software for advanced analysis and report writing
- Optional SDK
- Ability to connect up to 24 cameras (dependent on PC specs and FPS)
- Obtain min, max, average and standard deviation temperature information from every pixel
- Move ROI’s individually or as a group
- Hot spot detection and Isotherms
- X-Y plot feature

SD Dimensions



BoilerSpection System Configuration

Typical installations have anywhere between three (3) and twelve (12) cameras per boiler. BoilerSpection is configurable to meet different requirements.

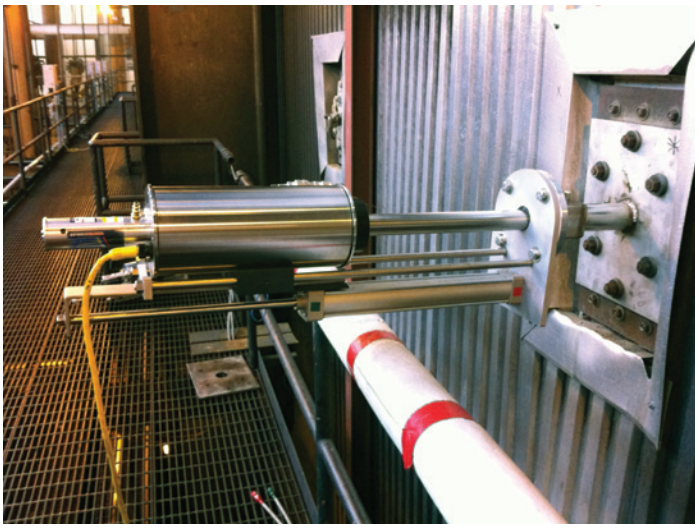


Installation

The BoilerSpection system can be installed and commissioned either while the boiler is operating or during an outage. The cameras system mounts to the furnace wall via a mounting plate. LumaSense offers a choice of weld-on or bolt-on mounting plates. Exact dimensions can be customized by request.

The standard BoilerSpection system has the following requirements:

- Facility connections
- Ports with a 2" (50 mm) clearance
- Less than 330' (100 m) distance between cameras and the field switch cabinet
- Less than 820' (250 m) distance from field switch cabinet and control room
- Instrument grade air



Ordering and Configuration Details

Available Options

- LumaSpec RT web server functionality for remote broadcasting of data over plant network(s)
- I/O outputs and relay outputs for DCS, PLC, or connection to trigger cleaning equipment
- Interface for 3rd party plant historical archiving programs
- OPC and Modbus Support (Serial and IP)
- RAID memory systems

Service Offerings

- Installation and commissioning
- Preventative maintenance
- Training
- Extended warranty

Available Documentation

- User manual
- Installation planning guide
- Mounting drawings
- Mechanical drawings

LumaSense Technologies **Awakening Your 6th Sense**

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