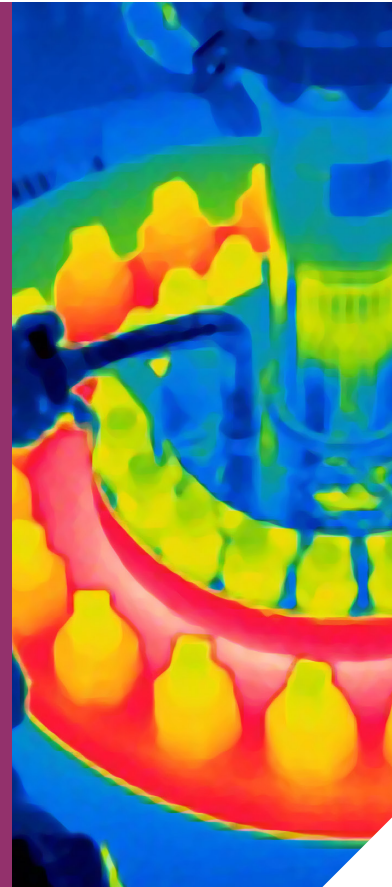


LUMASPEC™ RT

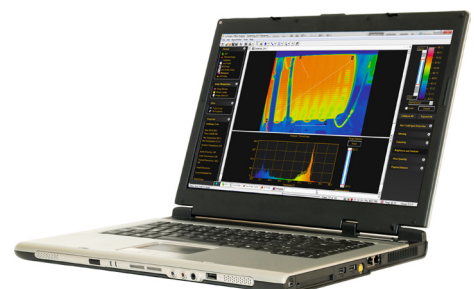
Thermal Imaging Software



Windows-based thermal imaging software that offers high-speed real-time data acquisition and image analysis capabilities

LumaSpec RT enables you to capture images, videos, and data with your thermal imaging camera as well as review and analyze the data with advanced analytical tools. Use LumaSpec RT to improve:

- **Profitability:** Reduce waste and improve yield by minimizing time to corrective action
- **Production:** Cut unscheduled downtime with early detection of process and equipment problems
- **Optimization:** Improve resource utilization efficiency with full automation
- **Quality:** Improve value with detection and removal of process defects
- **Safety:** Reduce hazards with early detection and warning of anomalies



LumaSpec RT

Real-time thermal imaging software for Advanced Energy thermal imaging cameras



Make sense of your process using thermal imaging and LumaSpec RT.

1 Learn

With LumaSpec RT software, you can use intuitive image and data display tools to understand the thermal characteristics of your processes, equipment, and products using Mikron® thermal imaging cameras. Display tools allow you to view thermal snapshots, real time camera feeds, captured sequences, or temperature profiles over larger areas or pinpoint locations.

2 Monitor

Ease of use and reliability are the cornerstone of LumaSpec RT's temperature monitoring tools. Dedicated temperature monitoring windows with the always on-top option ensures users will have at-a-glance security in knowing their process is under control. In a single click, users can take any analysis tool and make it a monitoring tool or set them up on the fly.

3 Analyze

LumaSpec RT software provides users with a vast array of graphing and analysis tools to characterize thermal data over distance, area, and time to thoroughly understand the temperature features of their subject matter. Using LumaSpec RT software analysis tools, users can quickly validate theory, isolate areas of specific interest, or identify uses for monitoring and alerts.

4 Automate

With LumaSpec RT's native integrated Alarm Tools, users can setup on-screen alerts or optional digital outputs to control processes and reduce time to corrective action to maximize safety and product yield. Combine multiple Alarms to validate deviations and eliminate false alerts ensuring operator confidence. LumaSpec RT's Alarm tools make sure you know when temperatures are not what they should be. Seamlessly integrate to existing plant DCS with the optional Analog, OPC or Modbus output modules.

Automation Tools

LumaSpec RT can help you automate.

Thermal imaging cameras are the ideal choice for process control / optimization and safety monitoring. You can use the data acquired, processed, and analyzed to control plant processes or provide alarms to the operator automatically through the plant DCS. LumaSpec RT software supports many standard communication protocols for connection to DCS including OPC, Modbus, and physical I/Os such as relays and analog outputs. Using these interfaces, you can transfer the alarms and other processed data generated to the plant DCS or to a data historian easily.

Data Archiving – Thermal images and thermal data might need to be archived for further processing, documentation or report writing. LumaSpec RT Control software package provides users multiple way of archiving the thermal data. The user can also economically analyze the events that caused an alarms using pre-buffered trigger logging tools integrated into LumaSpec RT. The software supports multiple rates for archiving under normal and alarm conditions.

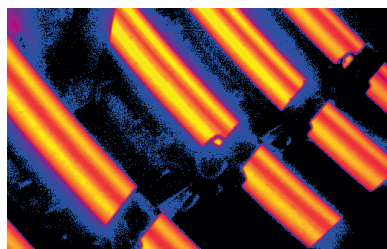
Close Loop Control – Real time control applications are those applications where time-critical integration with the plant control system (e.g., DCS, PLC or other control system) is required. For closed loop control LumaSpec RT acquires and processes a thermal image from the process. The results obtained can be returned to the DCS system

or PLC for closed loop control or for further business logic decision making. LumaSpec RT software can receive the input signals through image analysis (something detected in the thermal image), OPC, Modbus, or physical I/O input.

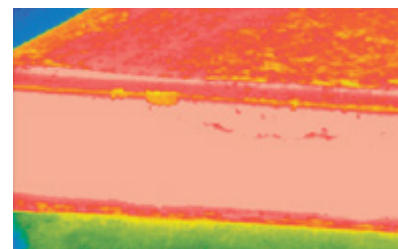
Auto Restart/Multi Camera User Configuration – Process and safety monitoring is usually carried out by operators in the pulpit or other locations LumaSpec RT software provides Auto restart functionality so that unplanned PC/Server shutdowns do not cause process halts that would interrupt plant processes. The software will automatically boot up, connect to the cameras and load the saved settings. During set up the user can define the settings including frame rate, ROI's, Analysis tools, Alarms and Communication settings.

APPLICATIONS

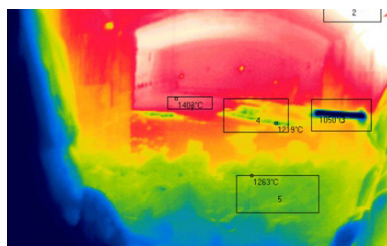
LumaSpec RT is used in many industries such as glass and metal processing.



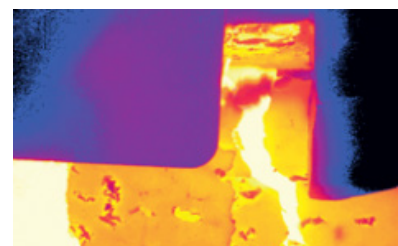
Metal continuous caster



Slab burr detection



Glass furnace



Forging

Features

ACQUISITION

- Acquire Image
- Remote Focus
- NUC
- Frame Rate
- Up to 24 Cameras

ANALYSIS

- ROI Move Tool
- Line Profile
- 3D Profile
- Histogram
- Isotherms
- Hot & Cold Spot
- Part Temperature Profile

ARCHIVING

- Normal/Alarm
- Error Logs
- Image Capture
- Video Capture
- ROI Data Archive
- Trigger Prebuffer

AUTOMATION

- OPC
- I/O Modules
- MODBUS
- ROI Trigger
- I/O Trigger
- User Profiles

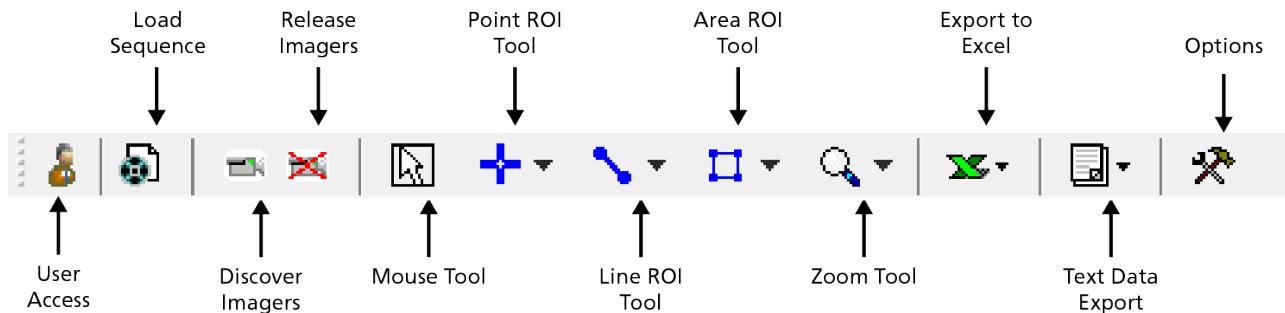
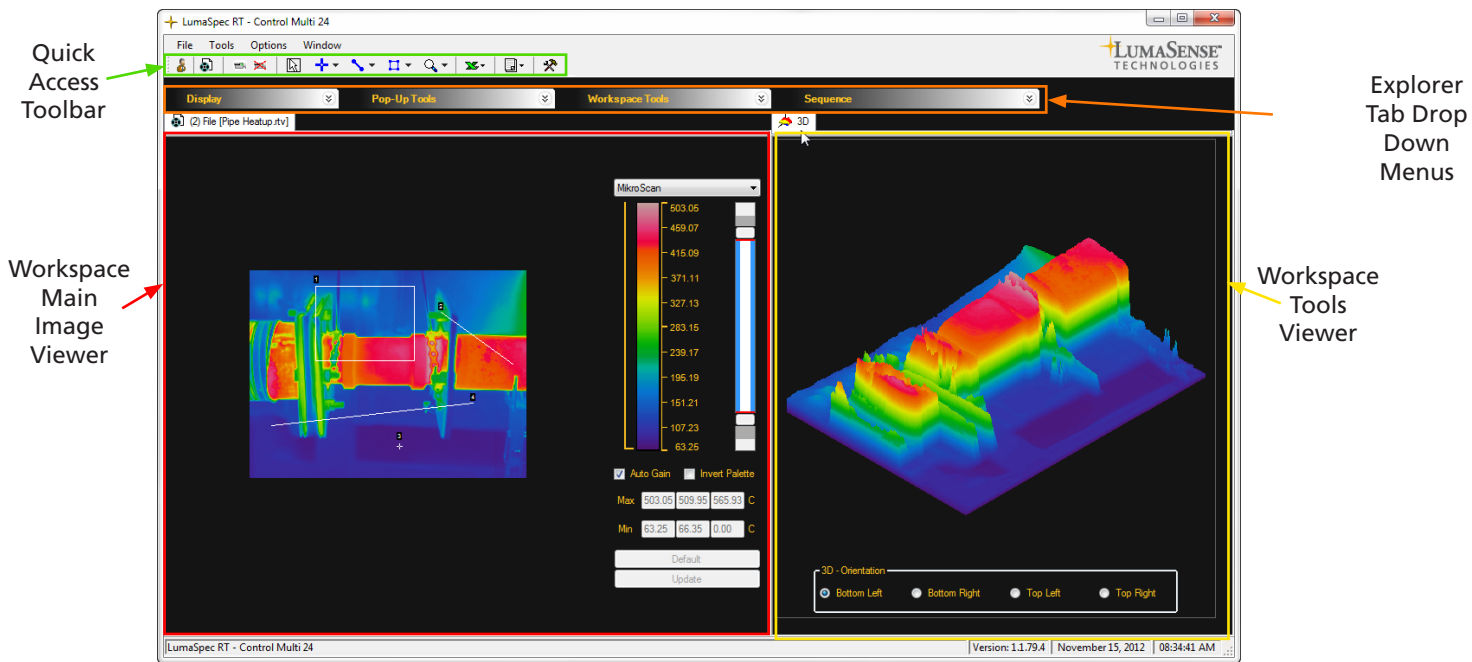
DATA EXPORT

- Thermal Image - Excel
- ROI Data - Excel
- CSV Text

POST PROCESS

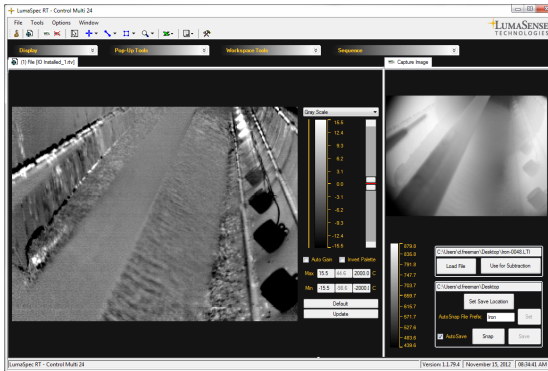
- Load Video
- Load Image
- Analyze
- AVI Video Export

Software Overview



Tools

Thermal imaging cameras are the ideal choice for process control / optimization and safety monitoring. You can use the data acquired, processed, and analyzed to control plant processes or provide alarms to the operator automatically through the plant DCS. LumaSpec RT software supports many standard communication protocols for connection to DCS including OPC, Modbus, and physical I/Os such as relays and analog outputs.



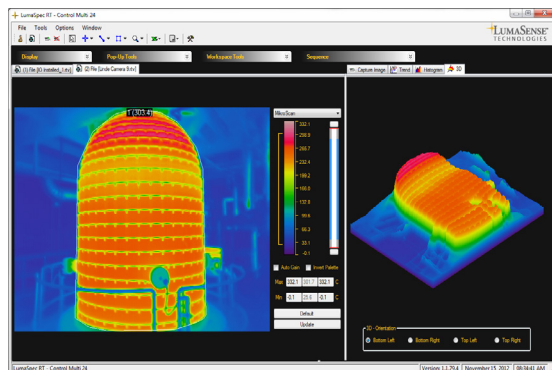
DISPLAY TOOLS

LumaSpec RT provides users with state-of-the-art image enhancement tools to visualize their process like never before. Preset color palettes and proprietary image enhancement algorithms (shown left) are just a two of the options available to view live and captured sequences using our intuitive user interface. LumaSpec RT supports simultaneous connections for up to 24 cameras or sequences.



POP-UP TOOLS

Monitor the most critical aspects of your thermal process using dedicated windows and LumaSpec RT's comprehensive analysis tools. Display temperature characteristics quickly and easily by camera using single click Open as Pop-up from the analysis window or generate on the fly. LumaSpec RT puts the information where you need it most, at your fingertips.



ANALYSIS TOOLS

Understand your manufacturing process more completely with LumaSpec RT's broad range of analysis tools including temperature profile, histogram, trend, and 3D rendering. Analysis can be based on thousands of regions or the entire scene. With a single click or user defined view, auto cycle users can switch between cameras and sequences for analysis updates.

Channel Name	A	Operator	B	Result
Line 3: Line 2	Line - 3 Max		Line - 2 Min	203.2
Poly 1 - Line 2	Polygon - 1 Max	+	Line - 2 Avg	562.4
Poly 1 / Line 3	Polygon - 1 Avg	/	Line - 3 Avg	0.9

Alarm Name	Imager	ROI Channel	ROI Value	Alarm Type	Alarm Condition	Action	Alarm Value	Alarm Ack
Poly 1 Max	File [Datash...]	Polygon - 1	327.0	High	Polygon - 1 Max >= 325.0	Alarm	327.0	Alarm Ack
Line 2 - Ave	File [Datash...]	Entire Image	147.8	High	Entire Image Avg >= 150.0	Nothing		Alarm Ack
Line 3 Min	File [Datash...]	Line - 3	250.7	Low	Line - 3 Min <= 245.0	Nothing		Alarm Ack
Line 2 & 3 Max					Line 2 - Ave && Line 3 Min	Nothing	False	Alarm Ack
Poly & Line 3					Poly 1 Max && Line 3 Min	Nothing	False	Alarm Ack

ALARM TOOLS

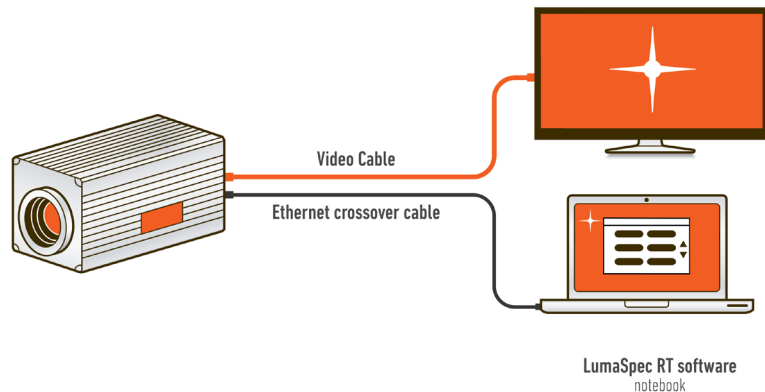
Let LumaSpec RT keep watch over your assets with flexible alarms that are simple and easy to setup. On-screen alerts or optional digital I/O can let you know immediately when temperatures are not what they should be. Combine alarms with AND/ OR logic to be notified only when you want to be. Create Computation Channels to display temperature relationships between regions or points of interest.

System Configuration

Advanced Energy's thermal imaging solutions offer flexible configuration options for single or multiple (up to 24) camera models. The system can be set up by connecting multiple cameras to a network device (switch) or by connecting the camera directly to a dedicated computer using a cross-over Ethernet cable. The camera can also be used with a desktop or rack mount PC or with a notebook PC for a mobile measuring system.

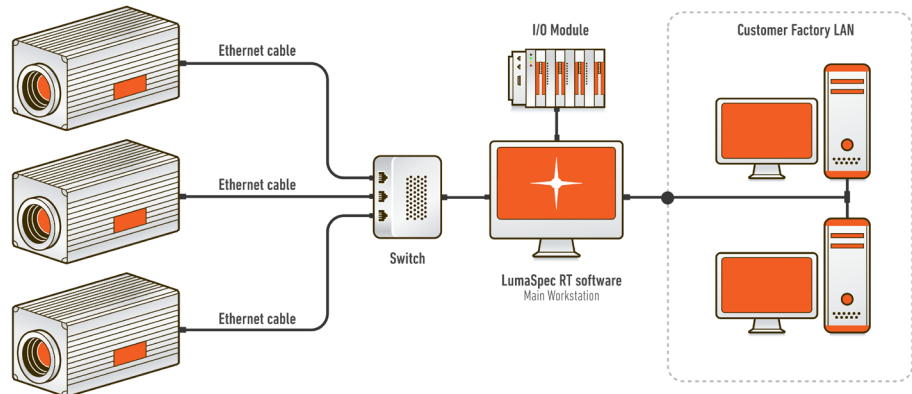
Standalone Configuration

For simple setups, connect your thermal imaging camera directly to a Windows™ based desktop or laptop computer that has LumaSpec RT installed.



Multiple Camera System

LumaSpec RT can support up to 24 cameras simultaneously depending on the purchased package. Network switches, common or dedicated networks, and programmable output devices are all supported with the same software.



NOTE: LumaSpec RT is designed to operate on a 32 or 64-bit Windows™ based computer with the following (minimum) components: Dual Core 1.5 GHz or faster processor, 4 GB RAM (running at 1600 MHz), Dedicated Video Card with 1 GB of 900 MHz DDR3 dedicated RAM, 7200 RPM Hard Drive with a 16 MB buffer and using a 3.0 GB/sec SATA bus, Gigabit Ethernet card that supports Jumbo Packets up to 9014 bytes.

Reference Numbers

812-0008-01	Software LumaSpec RT Viewer
812-0009-01	Software LumaSpec RT Basic
812-0029-01	Software LumaSpec RT Analyzer
812-0029-06	Software LumaSpec RT Analyzer Multi 6
812-0030-01	Software LumaSpec RT Control
812-0030-06	Software LumaSpec RT Control Multi 6
812-0030-12	Software LumaSpec RT Control Multi 12
812-0030-24	Software LumaSpec RT Control Multi 24

NOTE: LumaSpec RT Software is provided on a DVD in a DVD case. The latest version of the software and PDF documentation are included on the DVD. Each version of the LumaSpec RT software supports multiple languages (check our website for current languages supported). All versions of LumaSpec RT are compatible with MCS640, MC320, and M7500 cameras.

"Multi" indicates the maximum number of cameras that you can connect simultaneously with that package.

Software Packages

	Viewer	Basic	Analyzer	Control	
Image Acquisition & Camera Control	Remote camera control (focus, speed, uniformity correction, etc.)	X	X	X	X
	Adjustable emissivity, background, & transmission settings	X	X	X	X
	Adjustable image palettes including colors, span, & range	X	X	X	X
	Auto-gain for entire image or individual ROI	X	X	X	X
	Acquire images and save thermal data	X	X	X	X
	Save videos of thermal images	X	X	X	X
	Use exported images with LumaSpec Offline Analyzer	X	X	X	X
	Zoom up to 8x	X	X	X	X
	Playback and analyze recorded images / videos	X	X	X	X
	Auto range switching (for MCS640 camera)			X	X
	Pan and Tilt control support				X
	DualVision Thermal and Visual camera support				X
	Pyrometer integration				X
	Scene Registration for automatic ROI object tracking				X

Image and Data Analysis	Histogram	X	X	X	X
	Isotherms	X	X	X	X
	ROI processing (up to 32 ROIs per camera)		X	X	X
	Multiple types of ROI (point, line, area, etc) with temperature display		X	X	X
	ROI minimum, maximum, average, and standard deviation temperature information from every pixel		X	X	X
	3D Profile display		X	X	X
	Line Profile thermal chart		X	X	X
	Hot and cold spot detection		X	X	X
	Image Subtraction			X	X
	Trend charts of ROI measurements			X	X
	Orthogonal axis temperature profile tool (X-Y thermal plot)			X	X

Data Sharing	Save images as JPG or BMP	X	X	X	X
	Export recorded video as AVI movies	X	X	X	X
	One-click export to Microsoft Excel			X	X
	Text file data export tools			X	X
	Archiving Tools				X

Automation and Plant DCS	ROI Alarm tools			X	X
	Support for up to 24 cameras simultaneously				X
	Multi-camera configuration with camera auto start feature				X
	OPC protocol support				X
	Modbus protocol support (serial and Ethernet)				X
	Web page server				X
	I/O module support for relays and analog outputs				X
	Password controlled user access and user profiles				X
	ROI trigger with pre-buffer memory				X
	Trigger based on Alarm condition				X
	External inputs via I/O or protocols (OPC or Modbus)				X
Automated tour function with Pan and Tilt cameras				X	



For international contact information,
visit advancedenergy.com.

sales.support@aei.com
+1 970 221 0108

ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

AE's power solutions enable customer innovation in complex semiconductor and industrial thin film plasma manufacturing processes, demanding high and low voltage applications, and temperature-critical thermal processes.

With deep applications know-how and responsive service and support across the globe, AE builds collaborative partnerships to meet rapid technological developments, propel growth for its customers and power the future of technology.

PRECISION | POWER | PERFORMANCE

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