



FLUKE®

***NEW* Fluke Thermography
Analytical Solution:
A Better Interpretation of
Thermal Data Behind Image**



Thermography Technology

See Beyond Temperature Readings

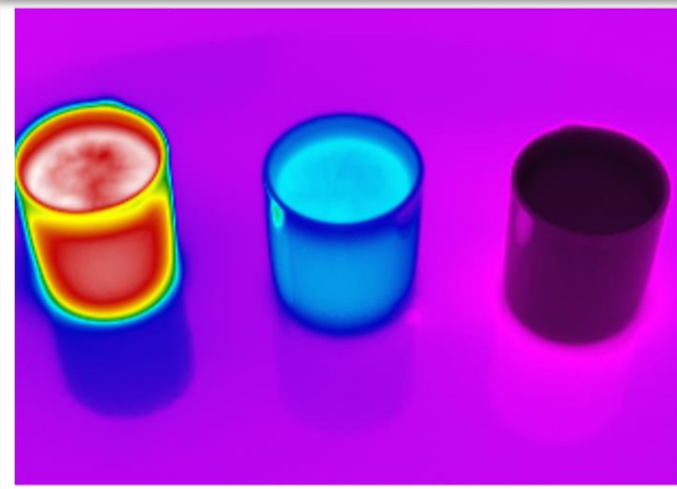


What is Thermal Image?

An image representing the surface temperature of the object:

BRIGHTER = HOTTER **DARKER = COOLER**

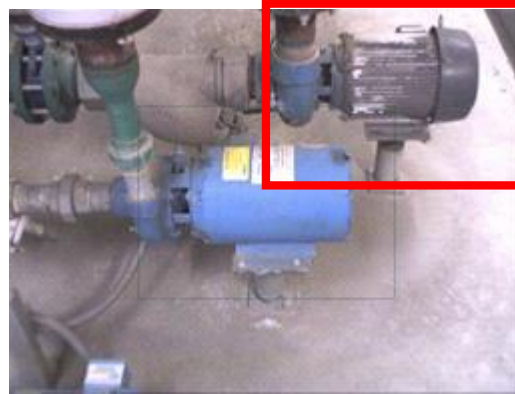
- Infrared cannot be seen (but can be sensed by our skin)
- Everything emits infrared radiation
- A camera converts the “infrared image” to a visible picture
- Infrared allows you to “see” things that you normally can’t



What is Thermal Image?



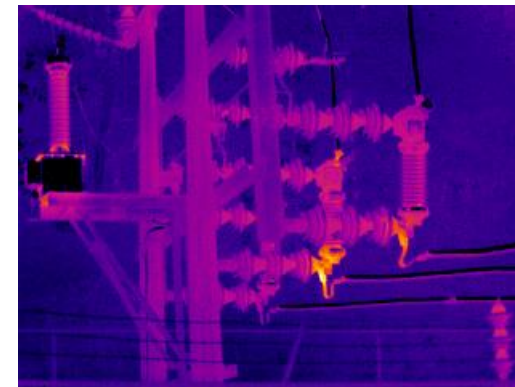
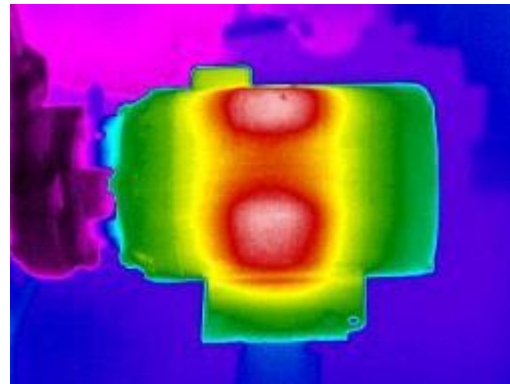
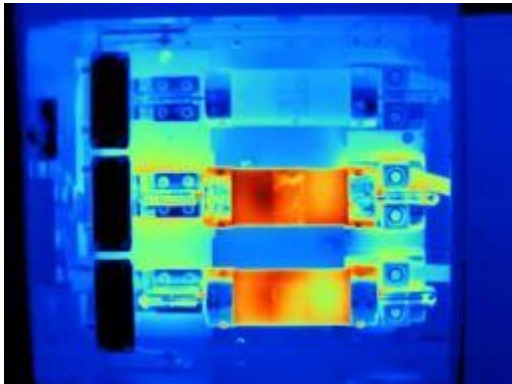
Electrical switchgear



Motor

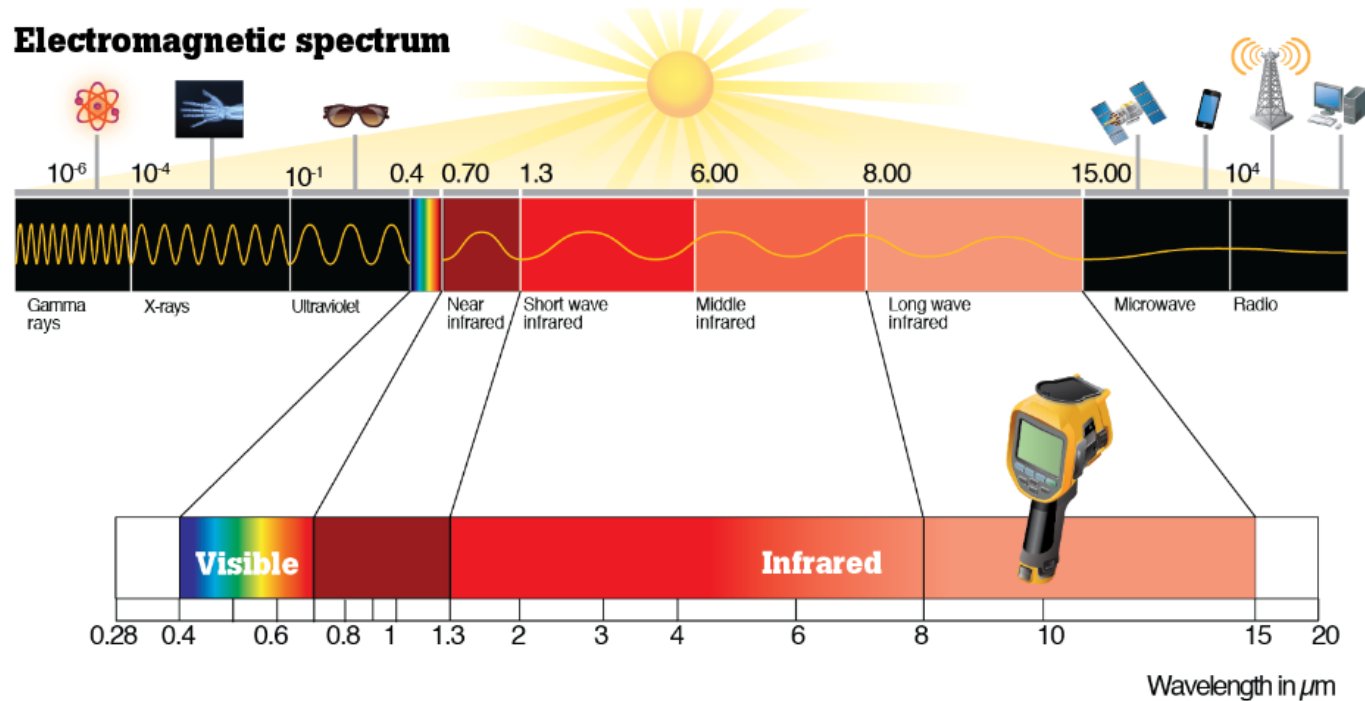


External electric pylon



How does Thermography work?

IR is a form of energy and is a part of electromagnetic spectrum. It is not visible to our eyes.



Infrared detector – Uncooled microbolometer inside thermal imager can capture infrared wave

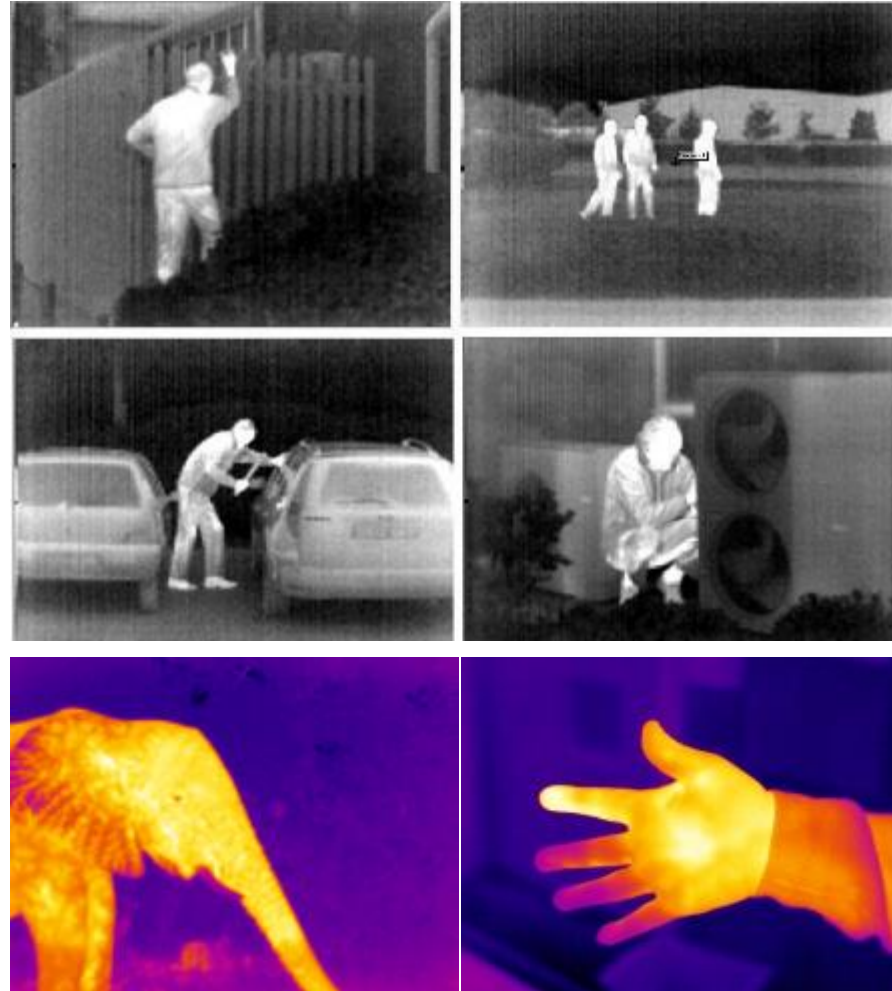
Typical array detector size 640x480 pixels



Applications of Thermography

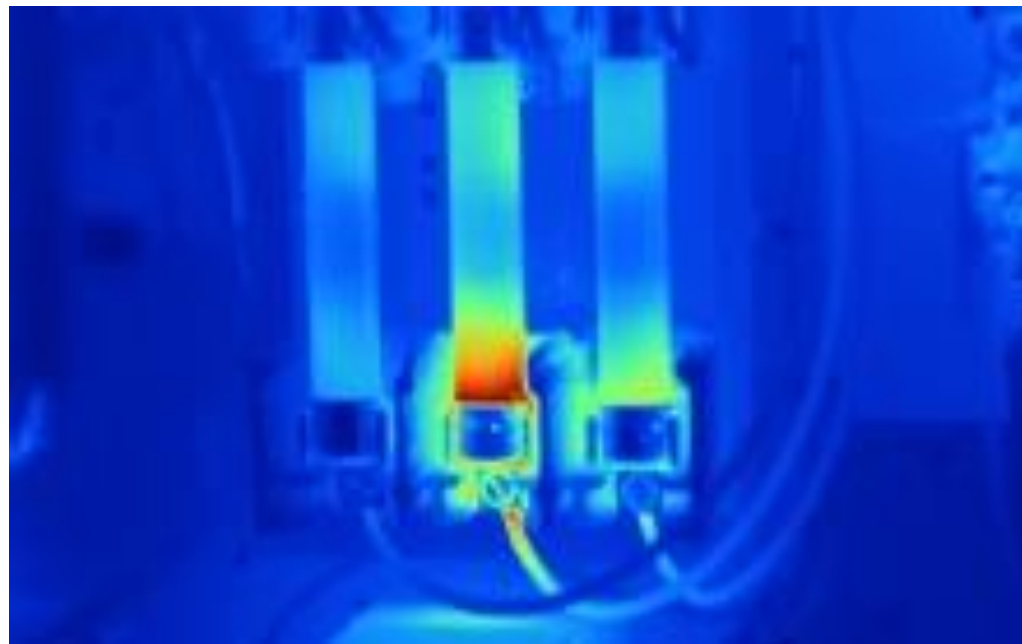
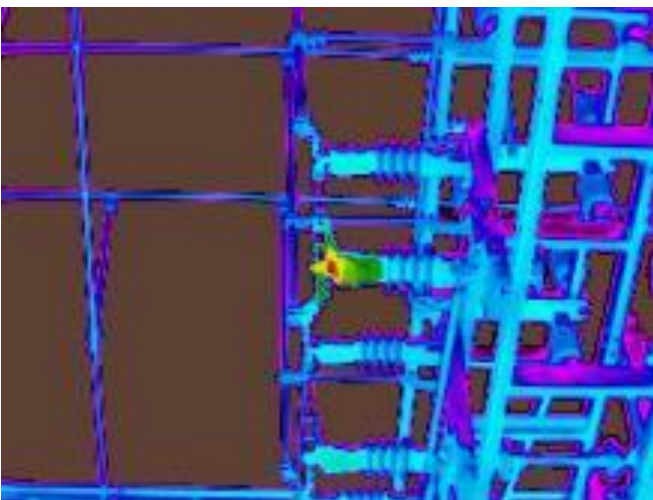
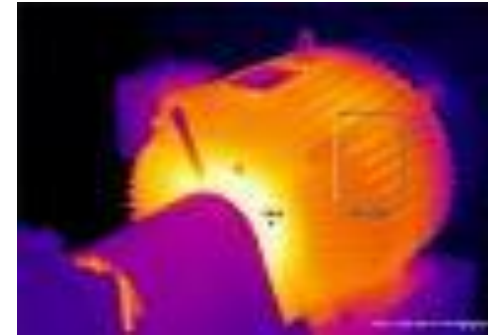
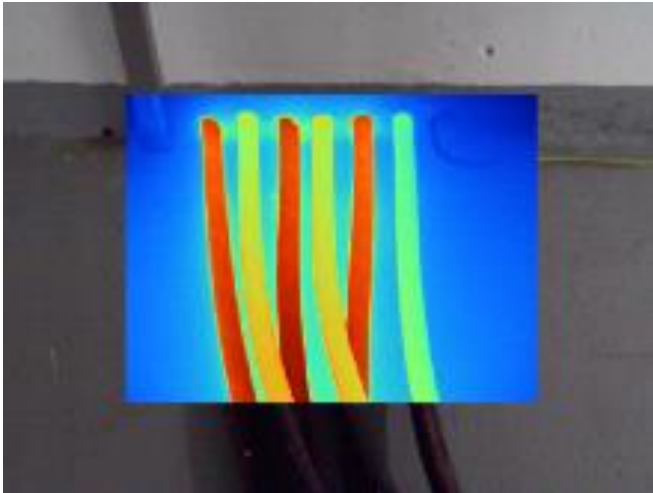
- Preventive Maintenance
 - Electrical
 - Mechanical
- Building Diagnostics
- R&D
- Security and Surveillance
- Military
- Fire
- Veterinary
- Medical

All these applications are primarily based on the visible image only



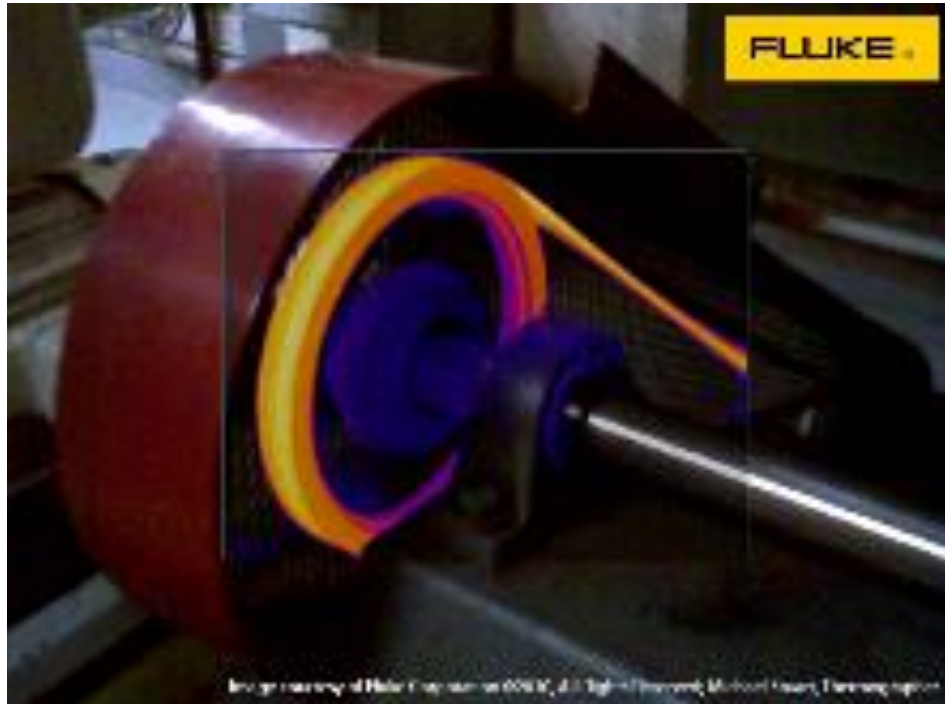
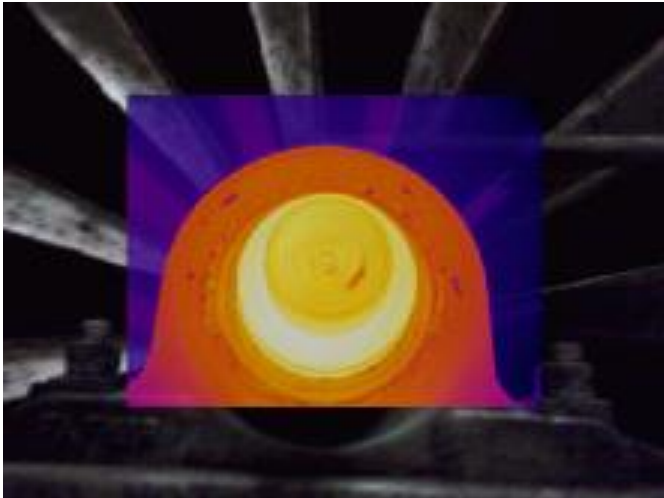
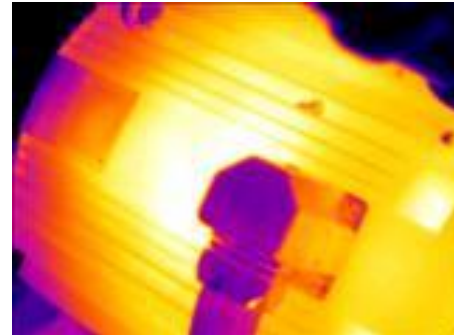
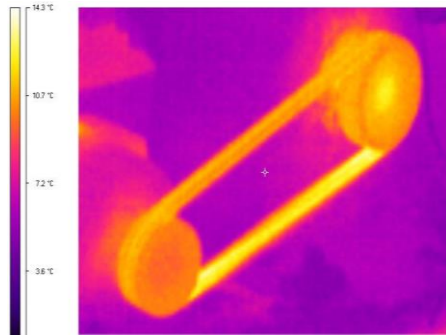
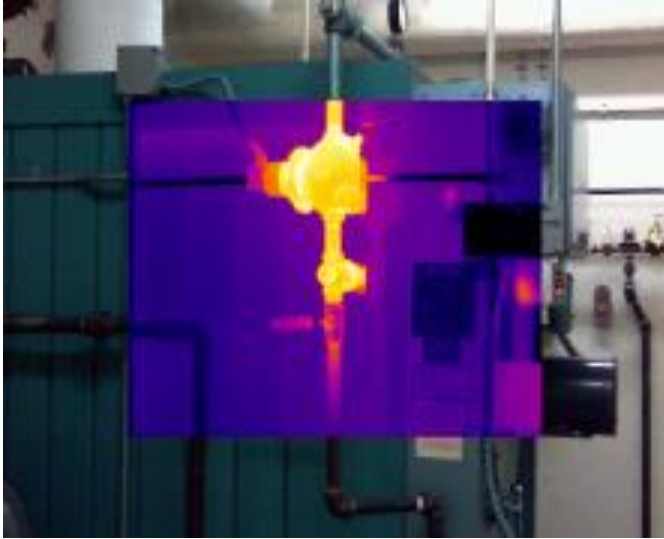
Applications of Thermography

ELECTRICAL APPLICATIONS



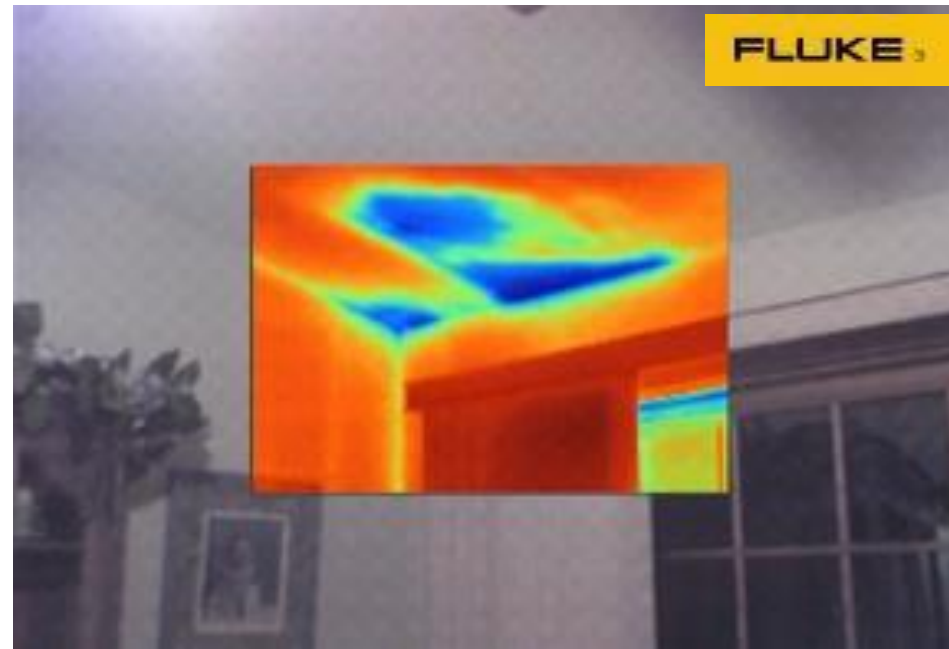
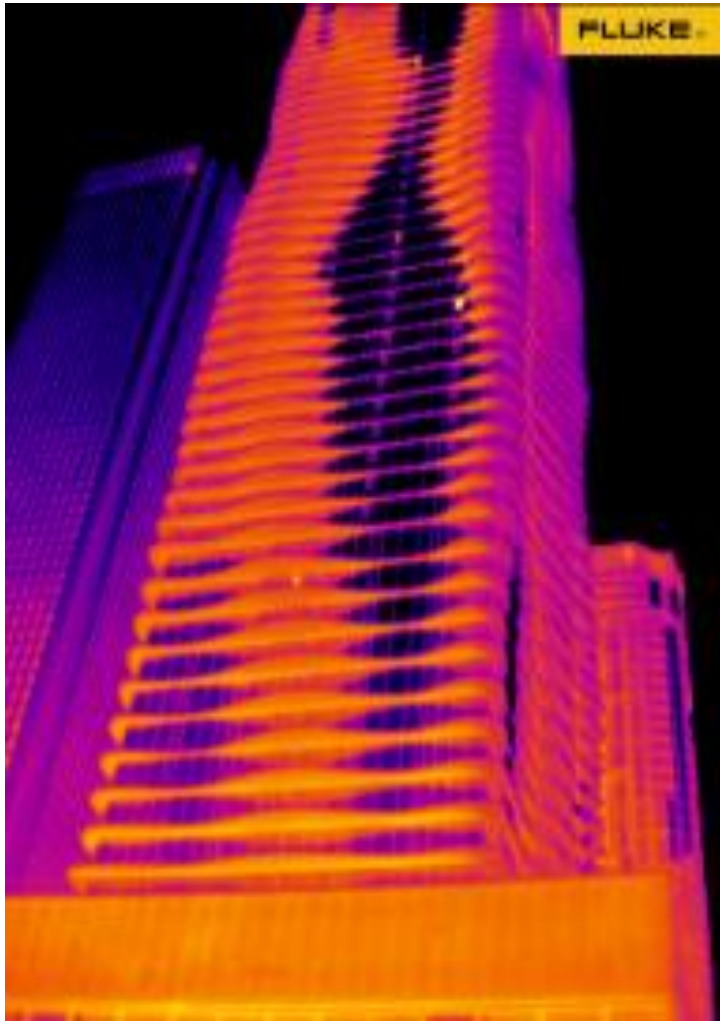
Applications of Thermography

MECHANICAL APPLICATIONS



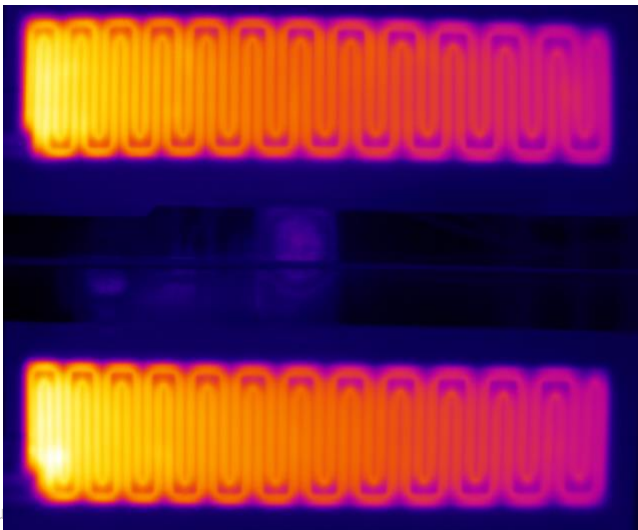
Applications of Thermography

BUILDING DIAGNOSTICS



Applications of Thermography

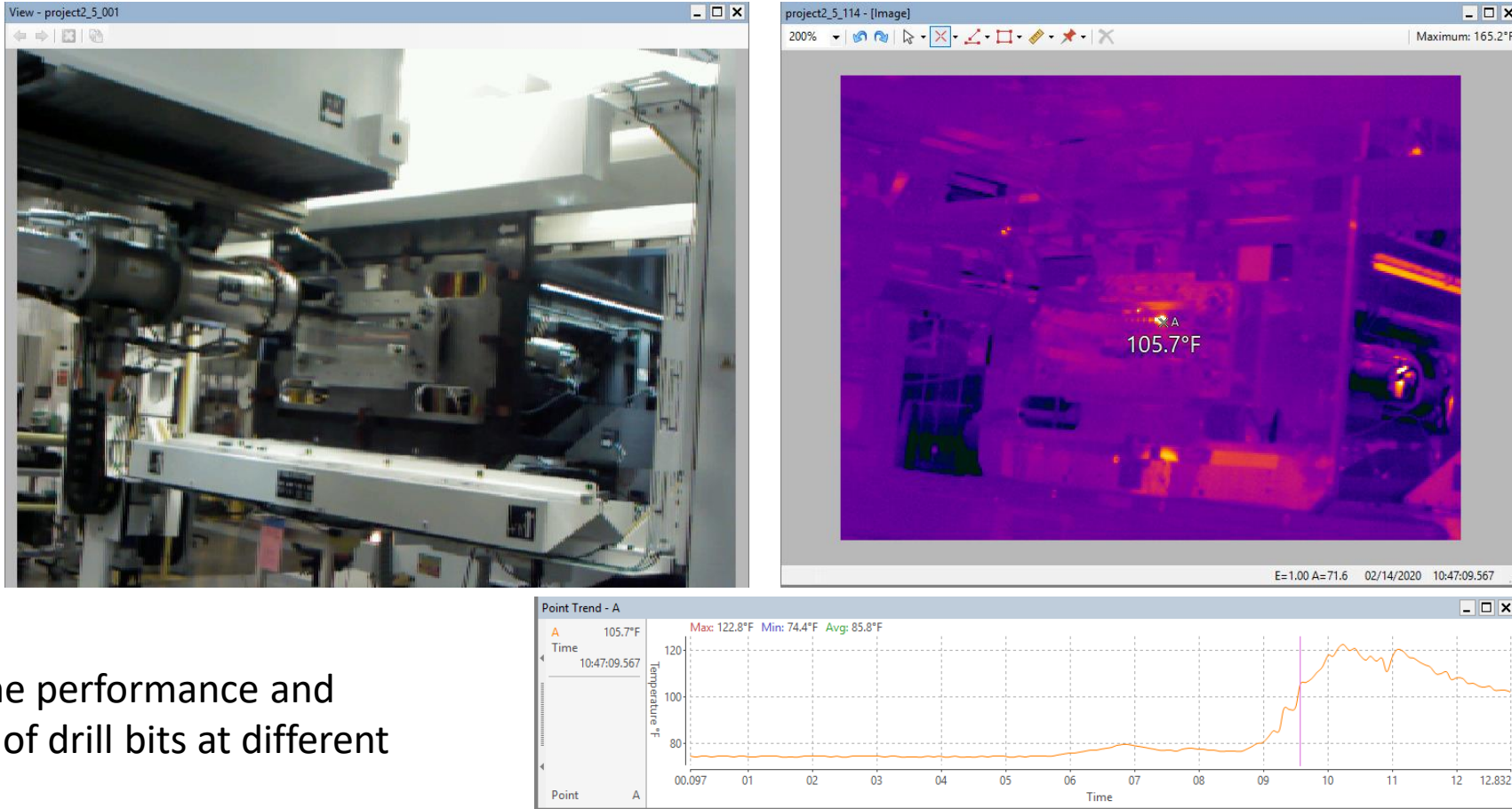
RADIOMETRIC STREAMING



Testing the de-icing performance on propellers.

Applications of Thermography

RADIOMETRIC STREAMING



Measuring the performance and temperature of drill bits at different speeds.



Advanced Thermographic Analysis

Fluke SmartView R&D Software



SmartView R&D



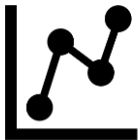
- Software for the analysis of streaming radiometric data



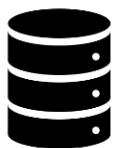
- Create and analysis radiometric video and images



- Customizable report templates and reports

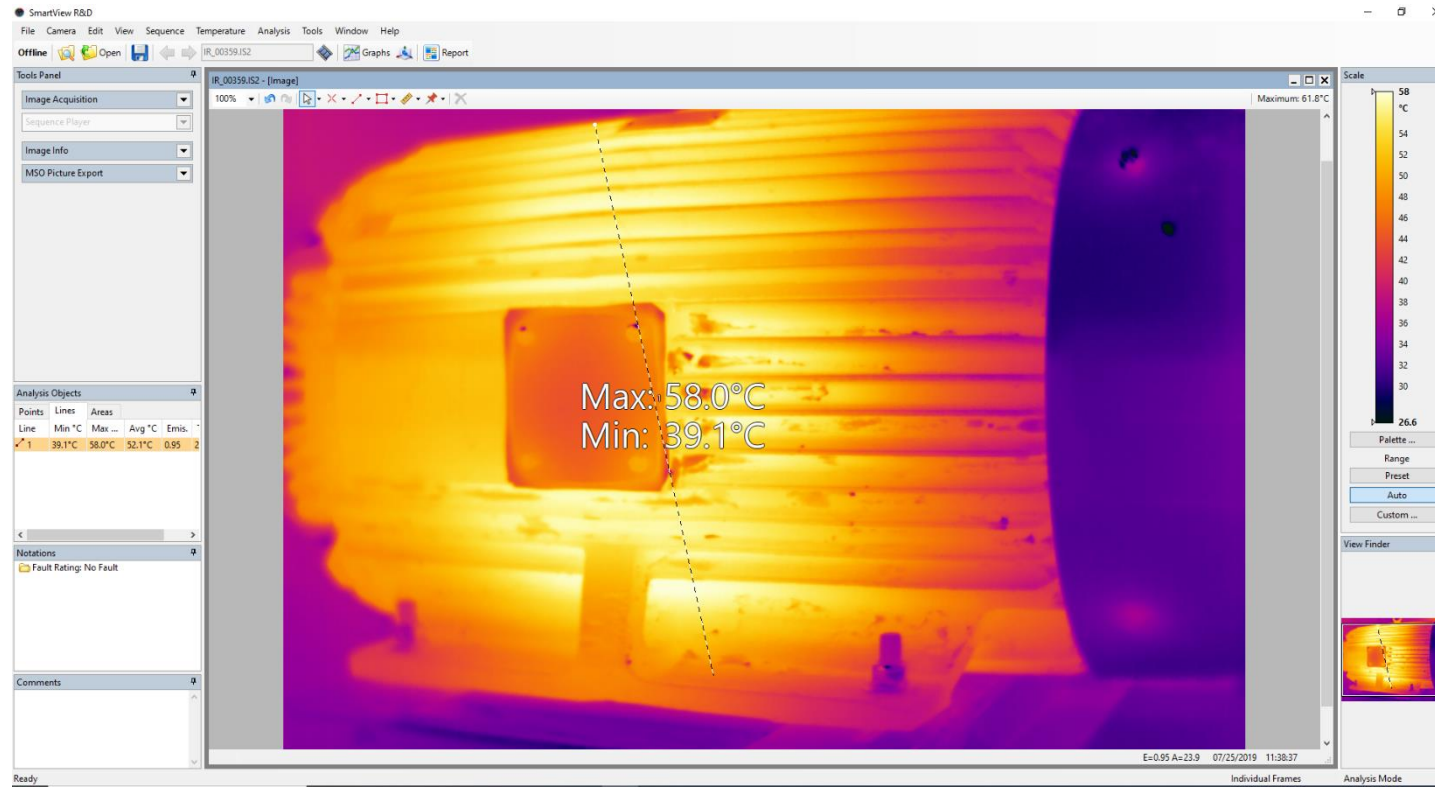


- Data trending tools



- Data exports

SmartView R&D Language

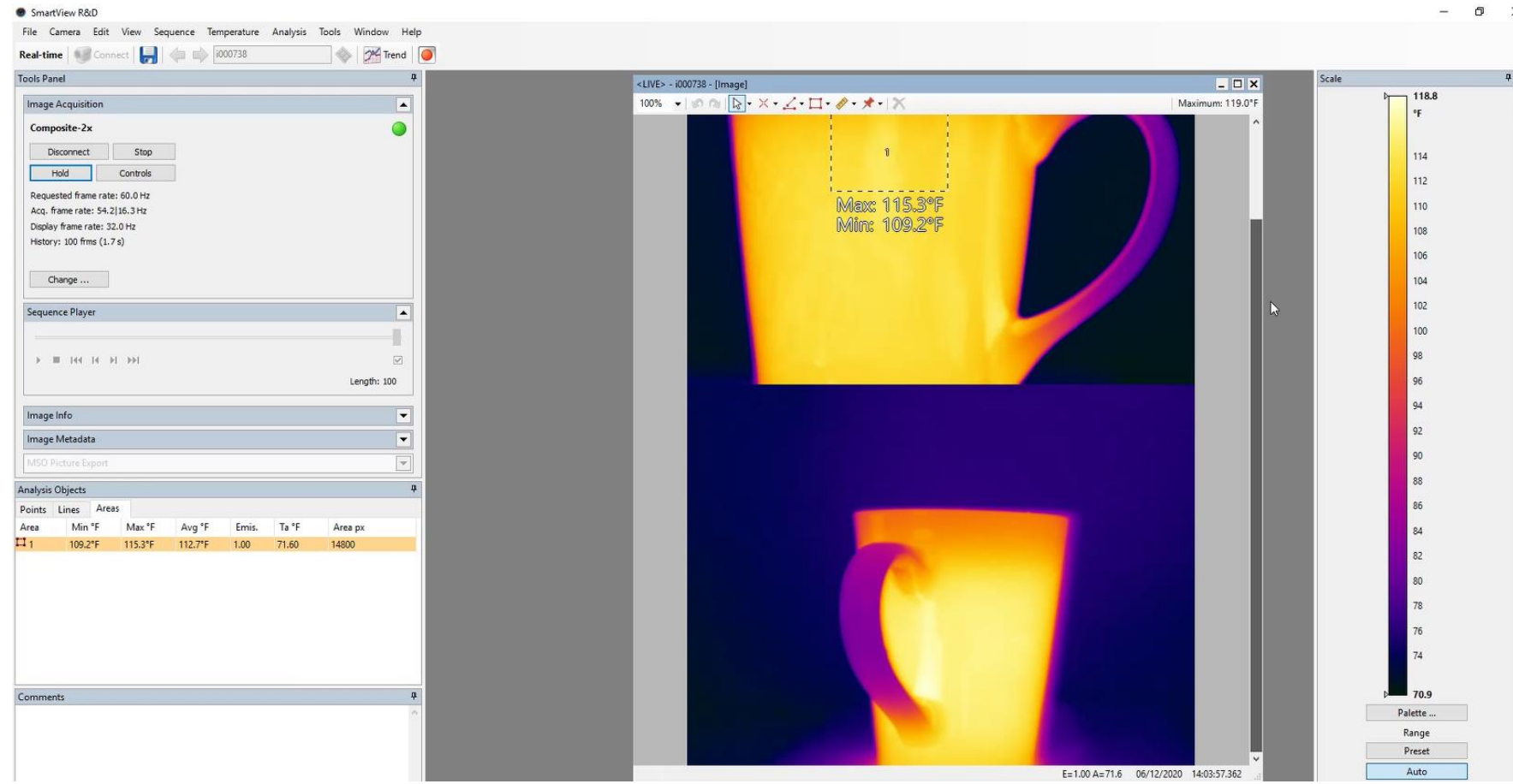


Currently offered in the following languages:

- English
- Chinese Simplified
- French
- German
- Italian
- Russian
- Spanish

FEATURE NO.1: RADIOMETRIC STREAMING

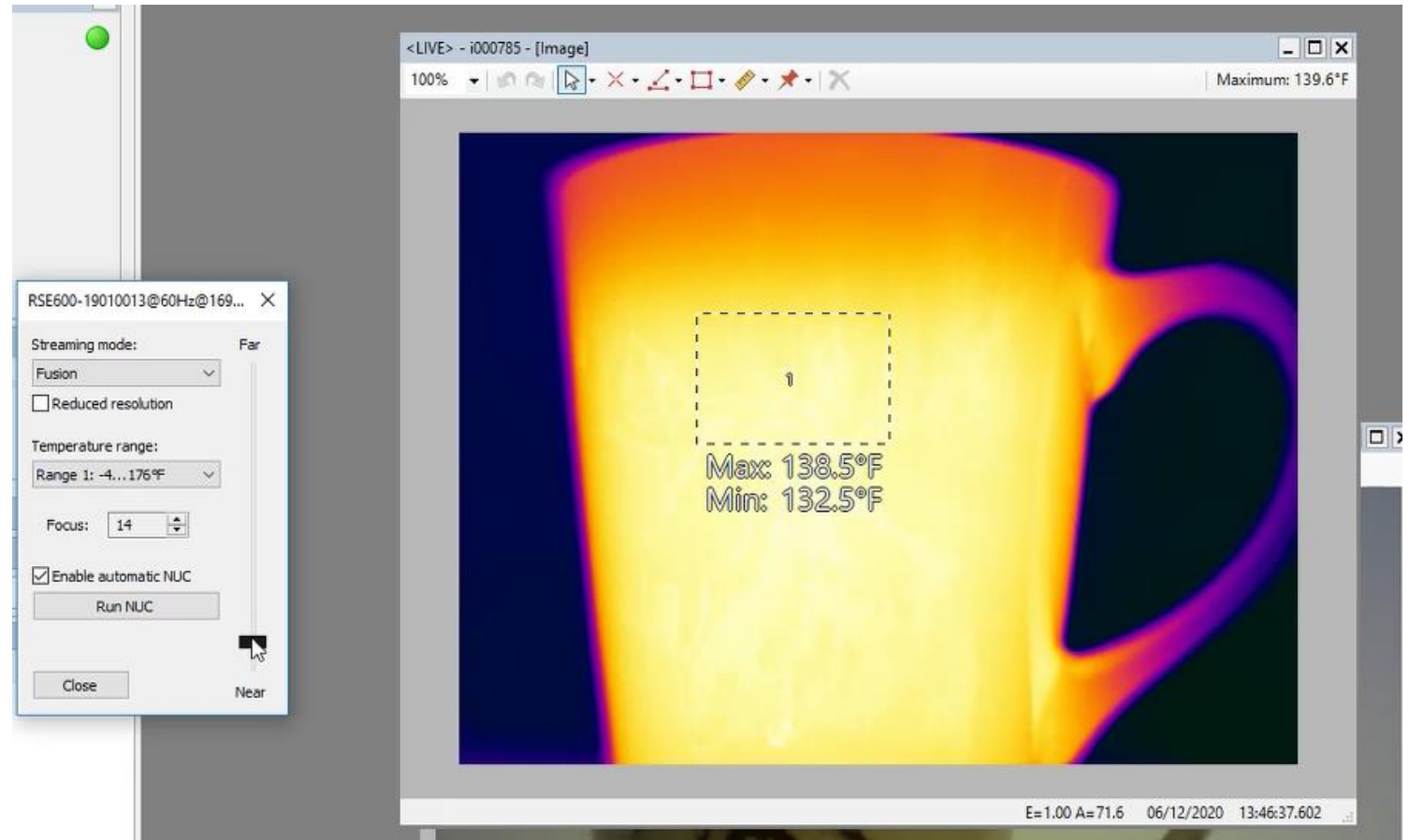
- Radiometric data streaming
- Multiple camera data streams



SmartView R&D

FEATURE NO.1: RADIOMETRIC STREAMING

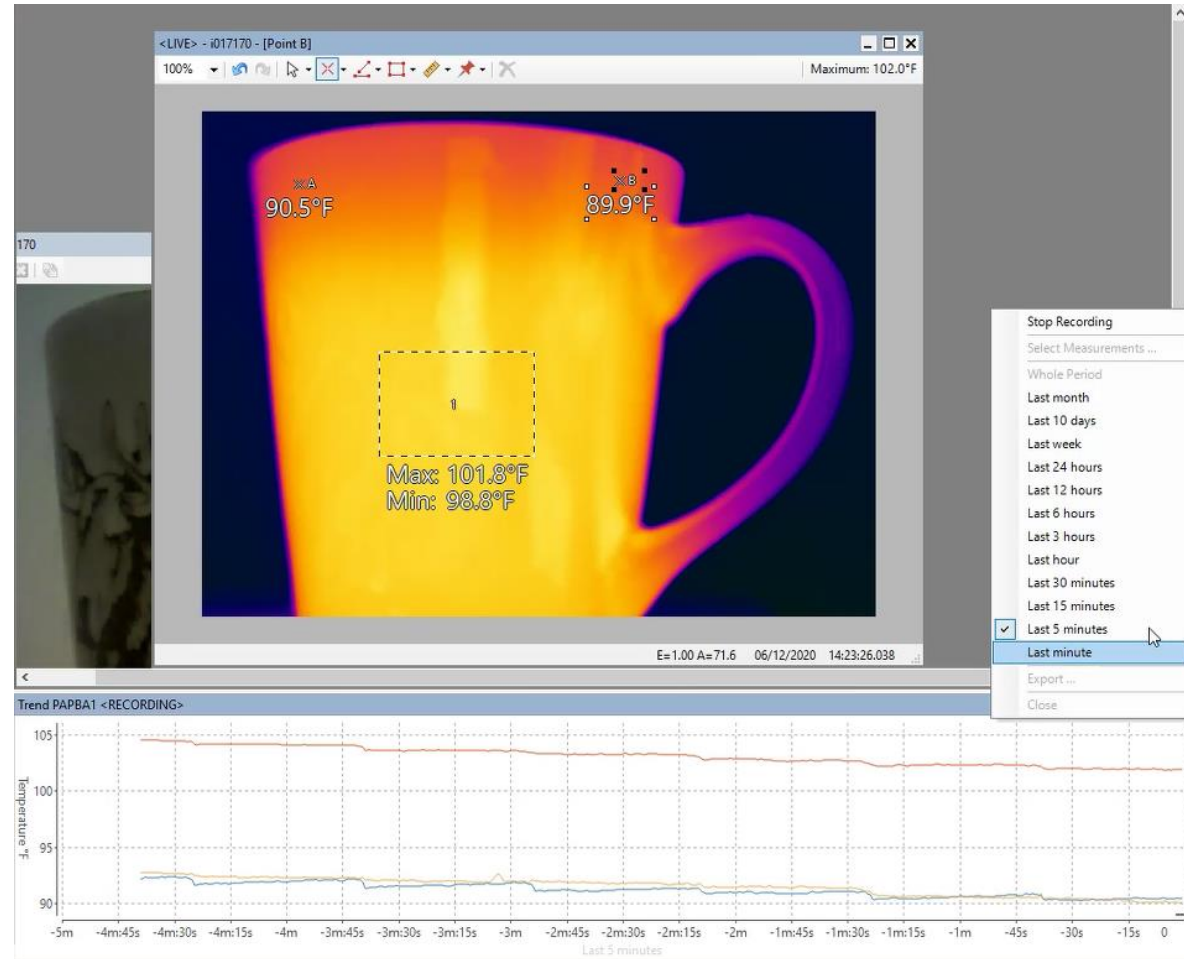
- Control camera from the software



SmartView R&D

FEATURE NO.1: RADIOMETRIC STREAMING

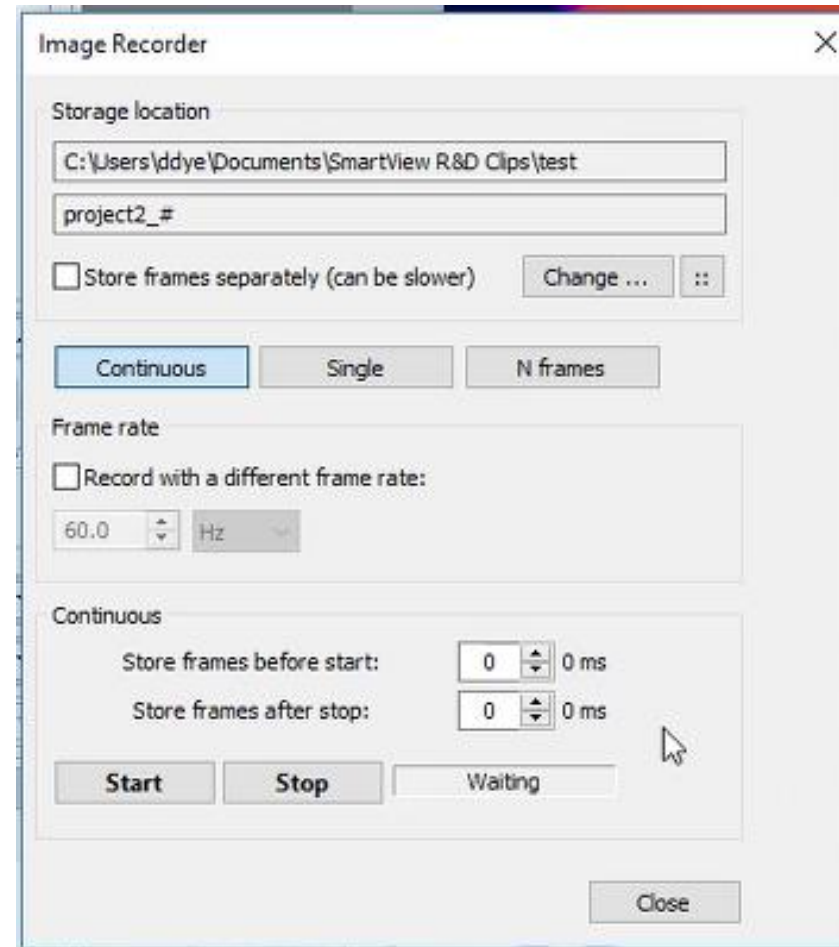
- Data trends recording (CSV)



SmartView R&D

FEATURE NO.1: RADIOMETRIC STREAMING

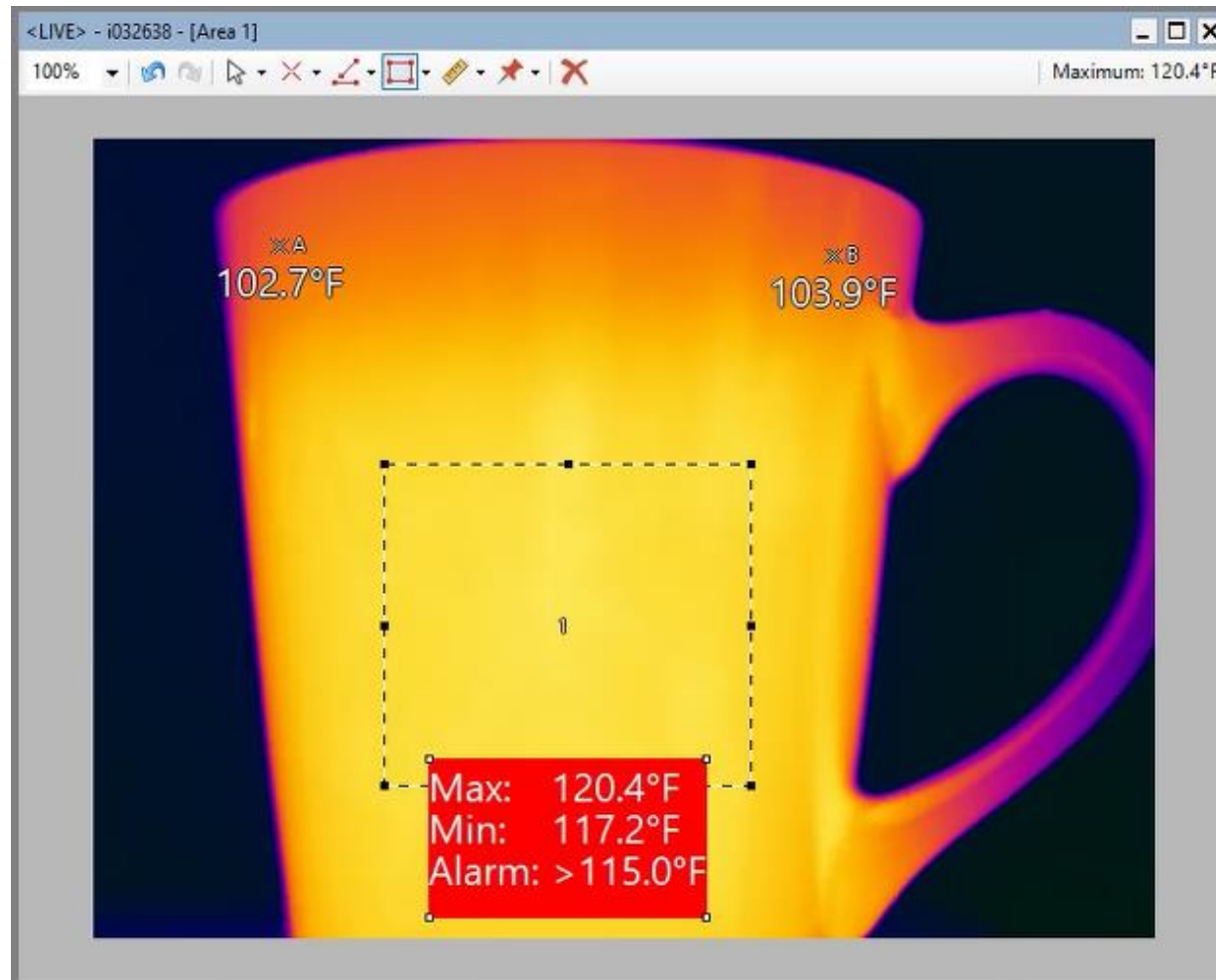
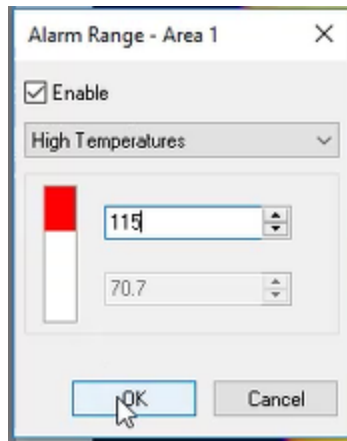
- Data stream recording, Continuous, Single, and N frames



SmartView R&D

FEATURE NO.1: RADIOMETRIC STREAMING

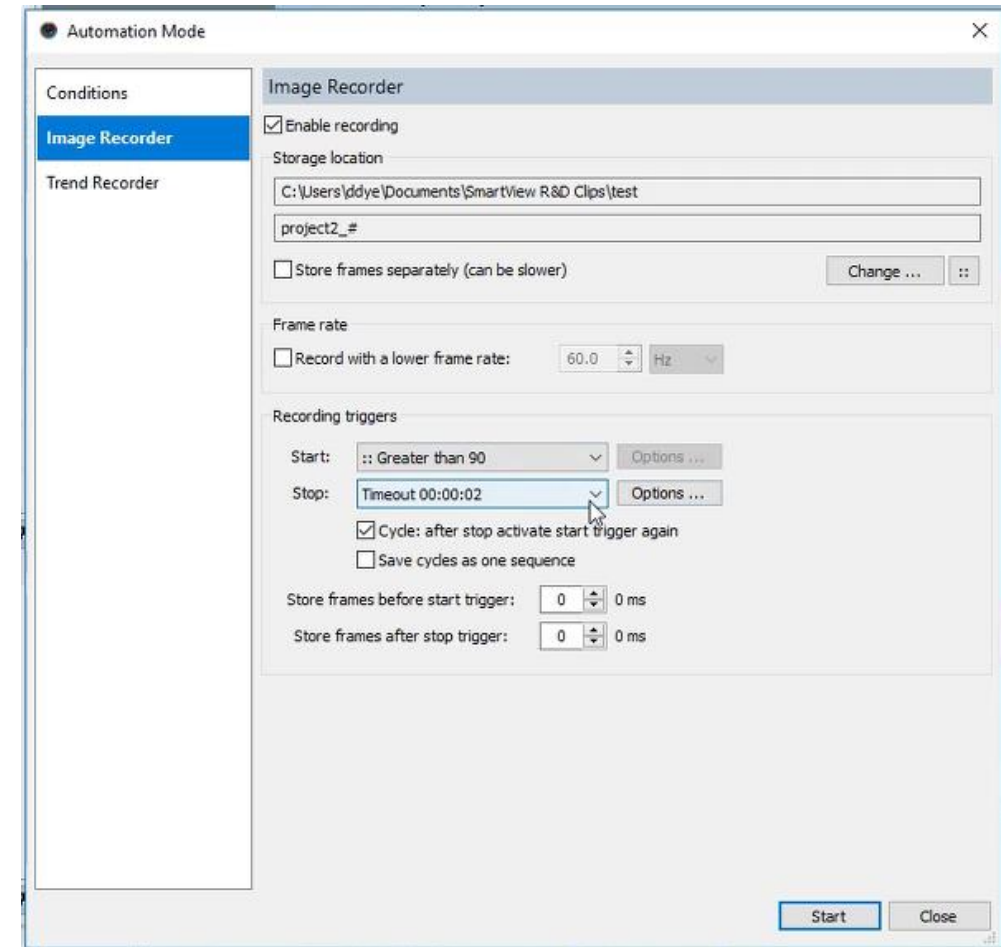
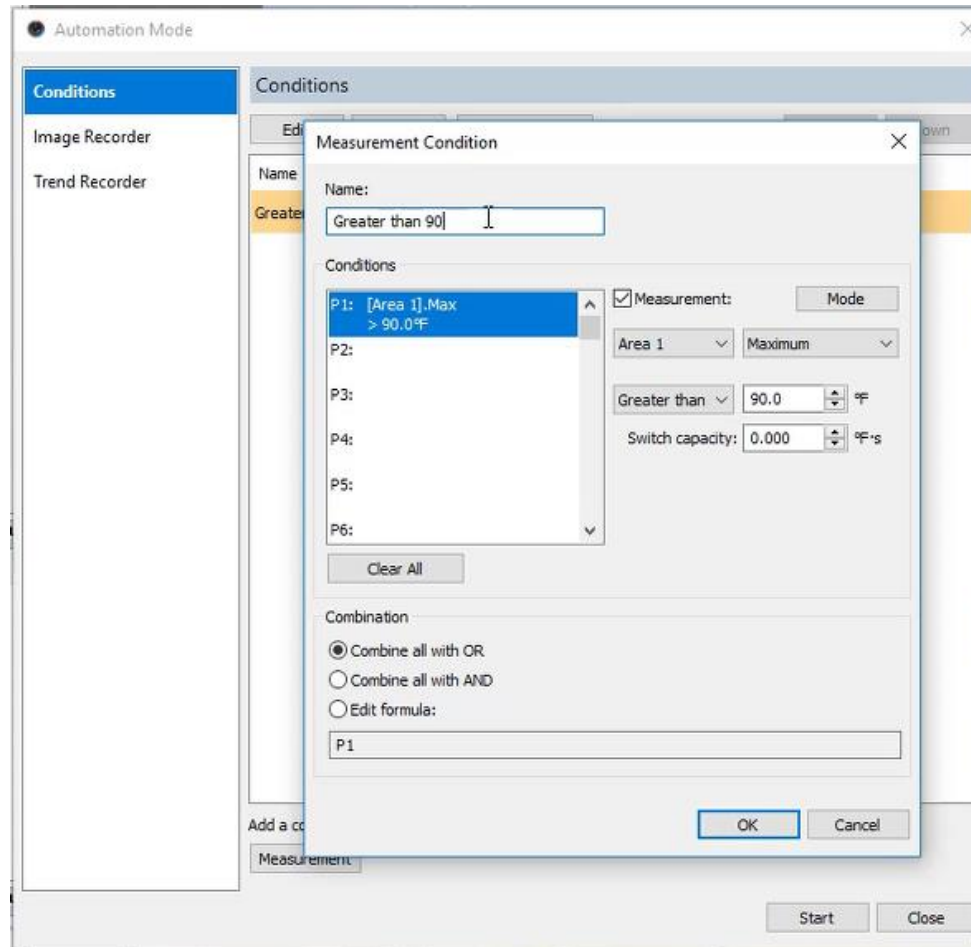
- Alarms



SmartView R&D

FEATURE NO.1: RADIOMETRIC STREAMING

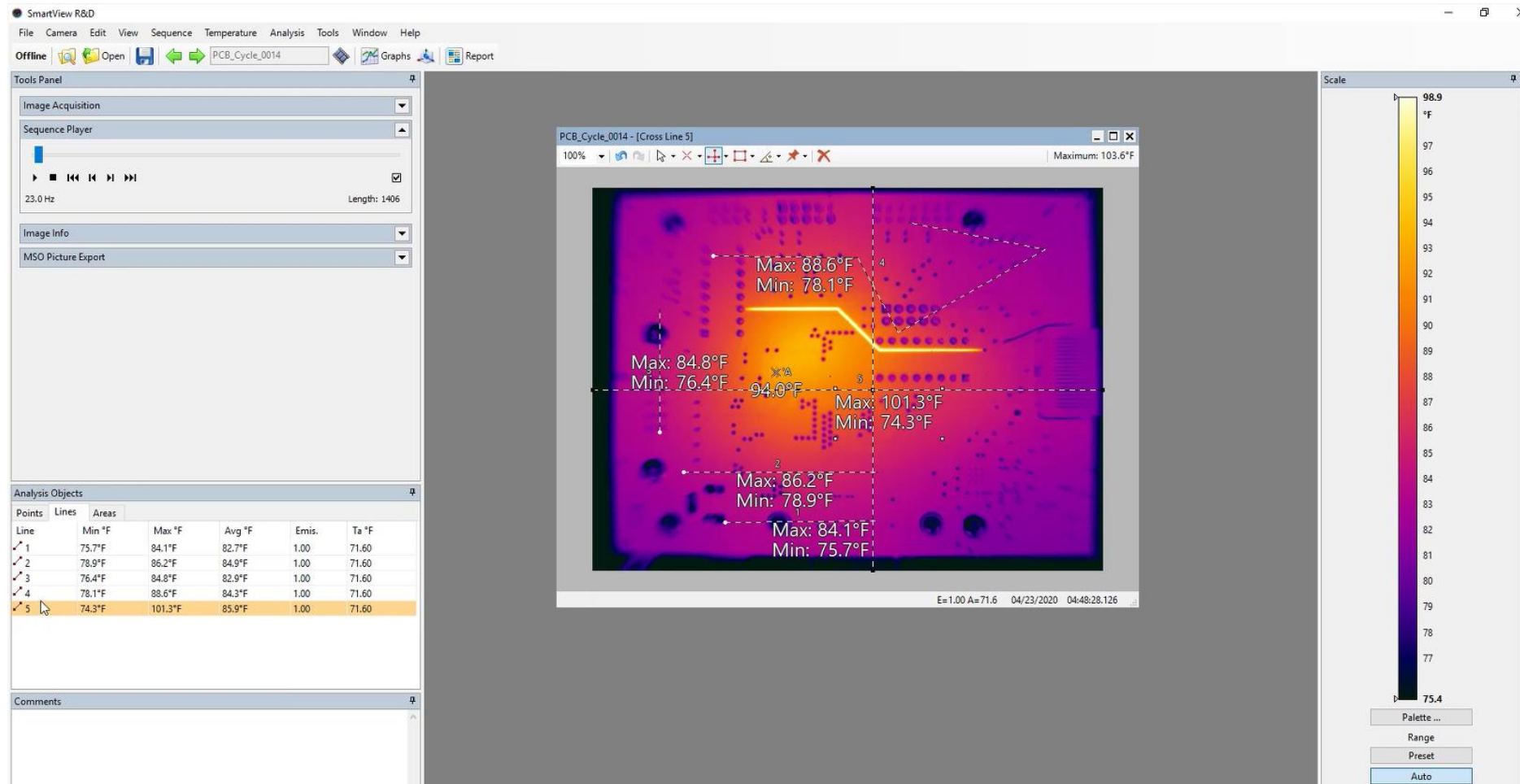
- Automation mode



SmartView R&D

FEATURE NO.2: ANALYSIS OBJECTS

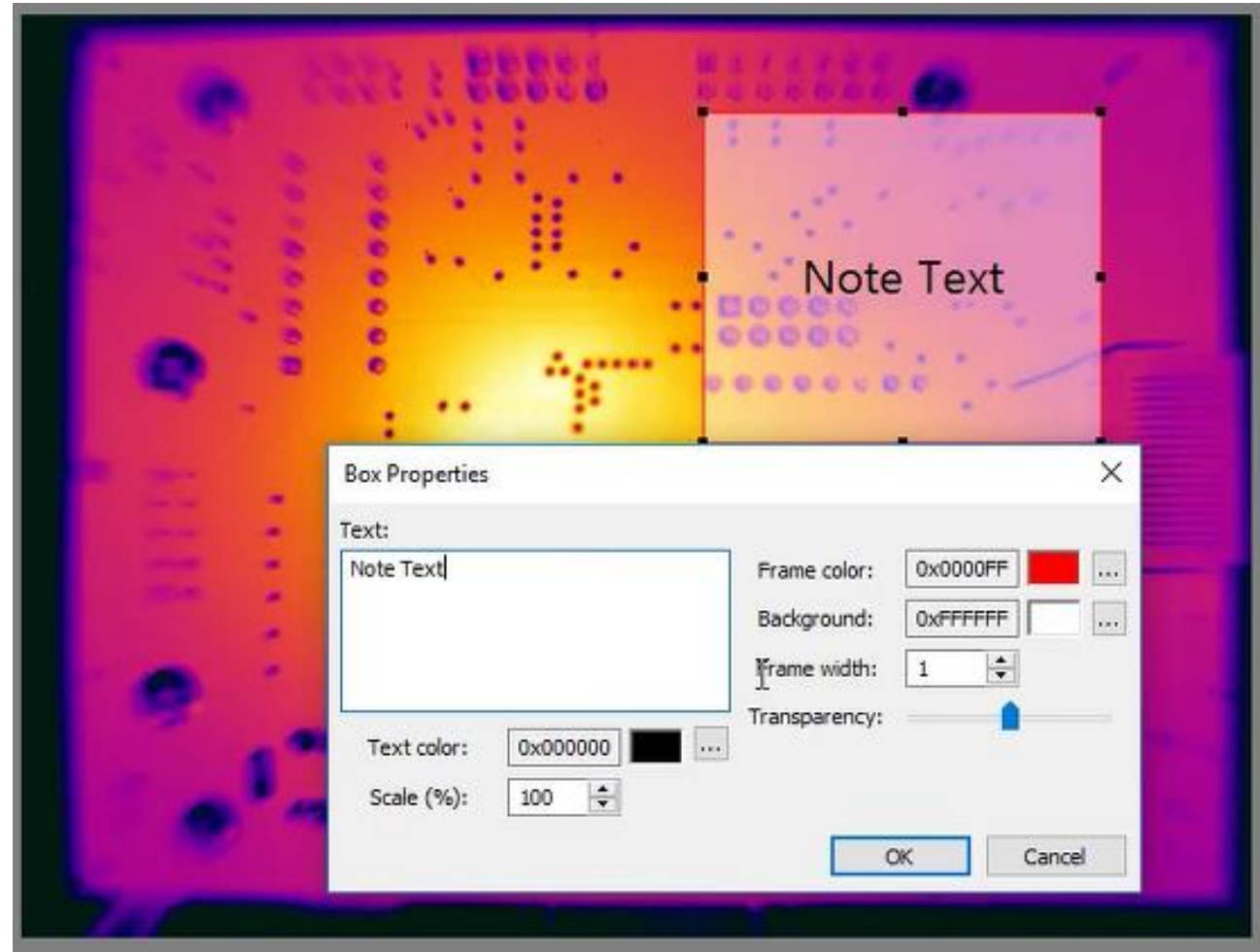
Analysis objects are used to interpret and annotate thermal information



SmartView R&D

FEATURE NO.2: ANALYSIS OBJECTS

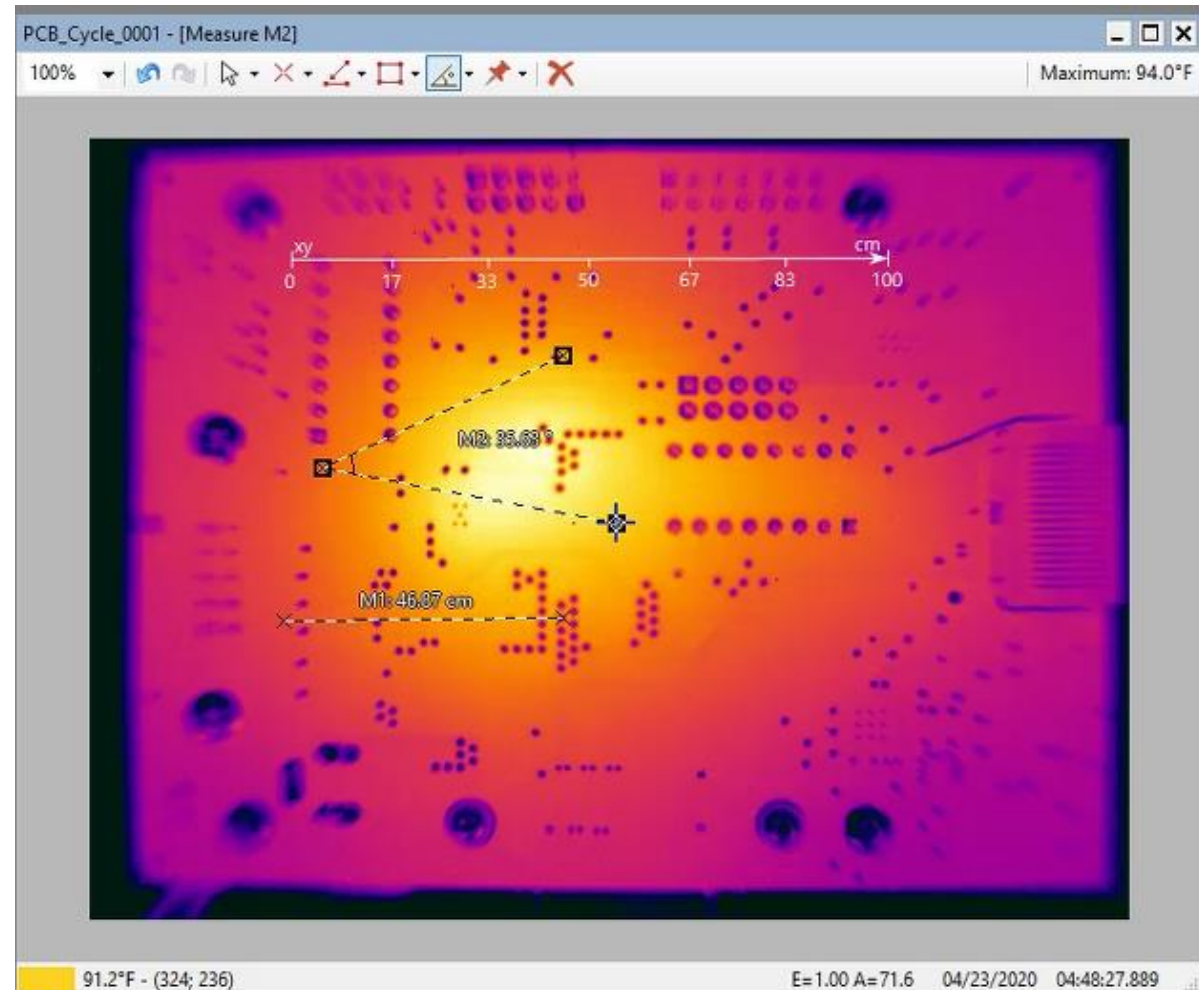
- Annotations
 - Notes
 - Arrows
 - Rectangles
 - Ellipses



SmartView R&D

FEATURE NO.2: ANALYSIS OBJECTS

- Measures
 - Rulers
 - Measure lines
 - Measure Angles

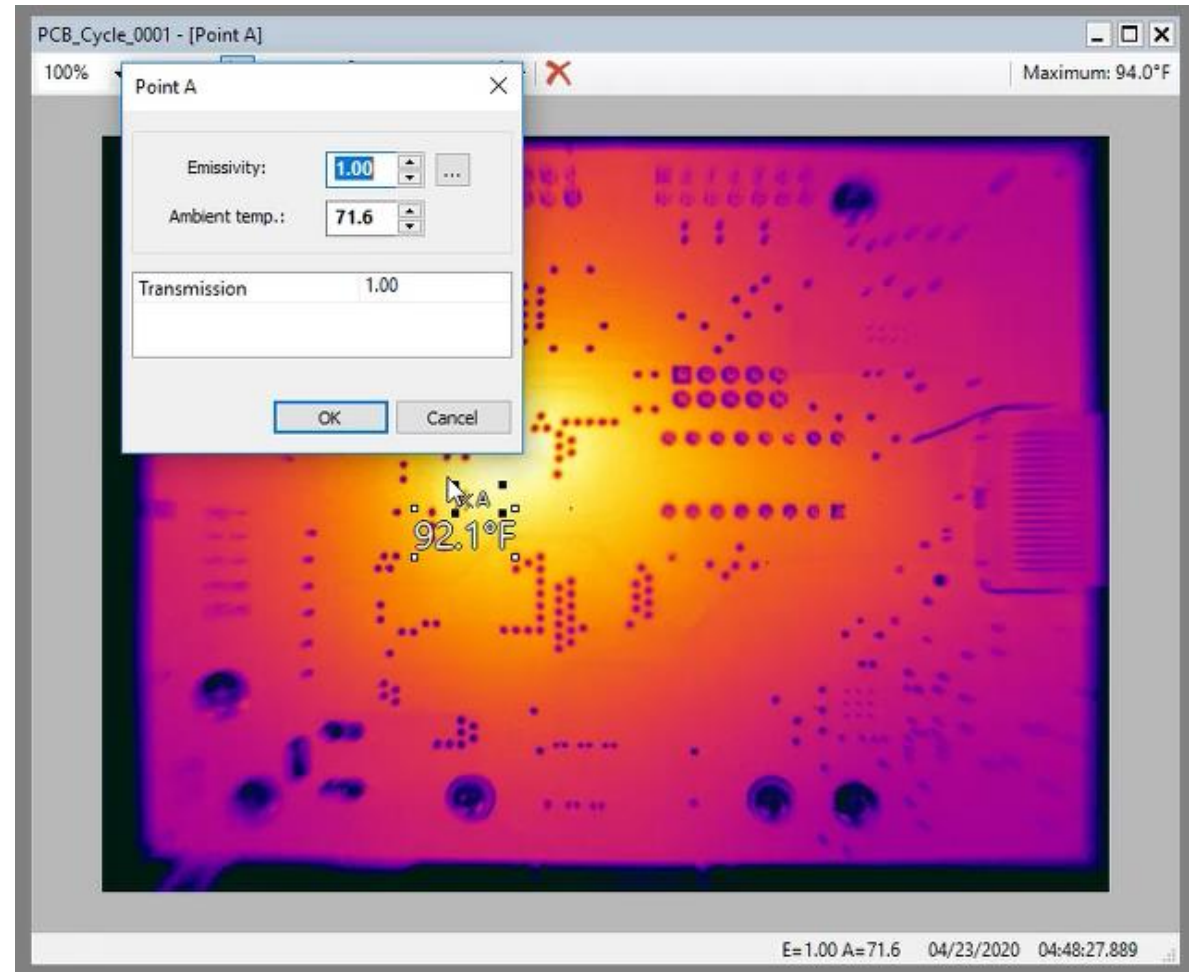


SmartView R&D

FEATURE NO.2: ANALYSIS OBJECTS

- Thermographic spot markers
 - Spot
 - Hot Spot
 - Hot/Cold Spots

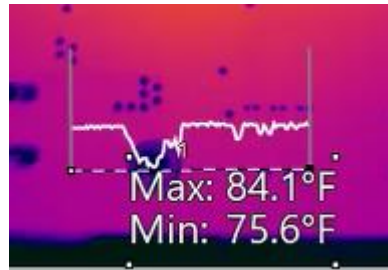
Analysis Objects			
Points	Lines	Areas	
Point	T °F	Emis.	Ta °F
+ A	92.1°F	1.00	71.6



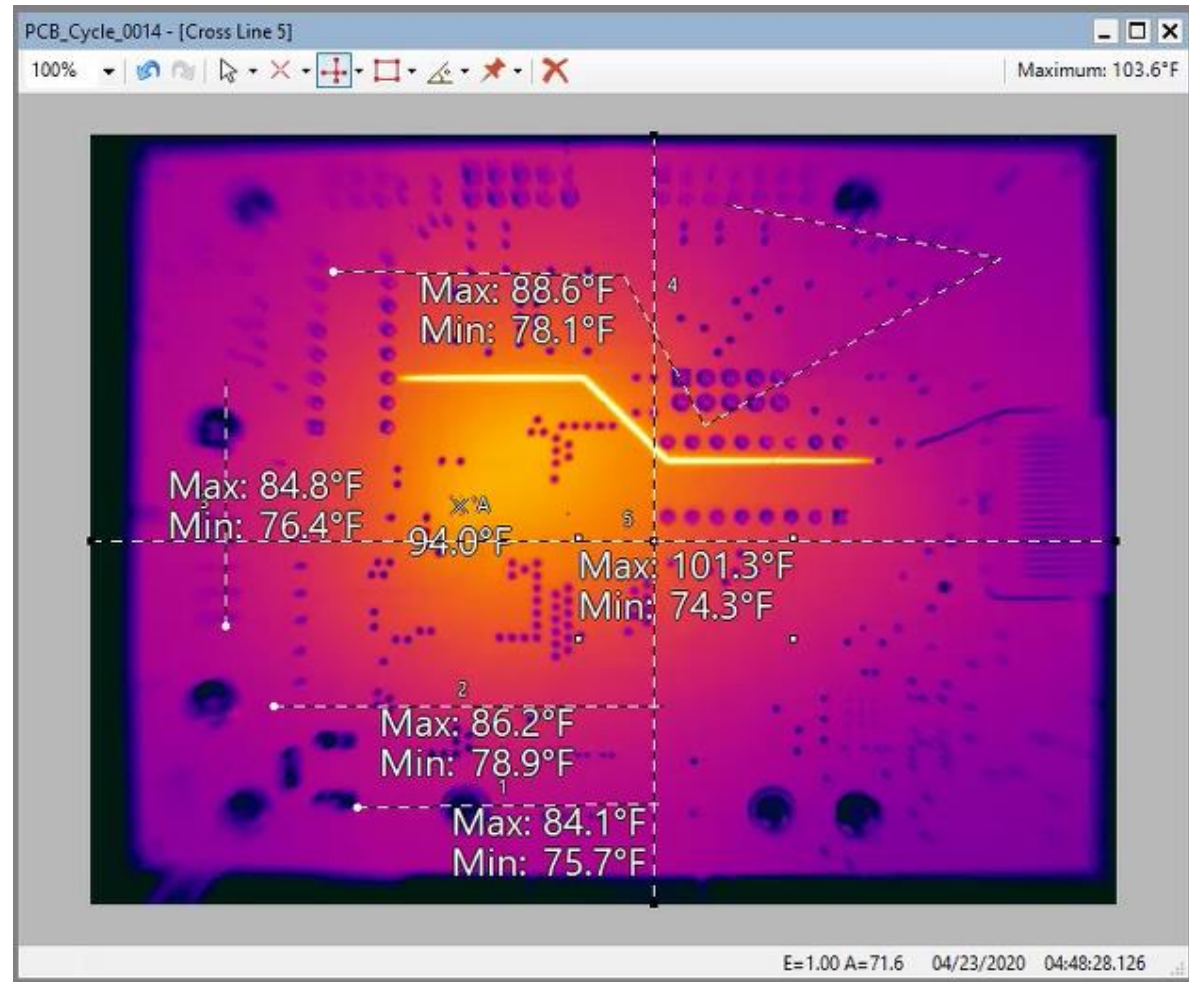
SmartView R&D

FEATURE NO.2: ANALYSIS OBJECTS

- Thermographic lines
 - Free lines
 - Horizontal/Vertical lines
 - Poly line
 - Cross line
 - On image profiles



Analysis Objects						
Points	Lines	Areas				
Line	Min °F	Max °F	Avg °F	Emis.	Ta °F	
1	75.7°F	84.1°F	82.7°F	1.00	71.60	
2	78.9°F	86.2°F	84.9°F	1.00	71.60	
3	76.4°F	84.8°F	82.9°F	1.00	71.60	
4	78.1°F	88.6°F	84.3°F	1.00	71.60	
5	74.3°F	101.3°F	85.9°F	1.00	71.60	

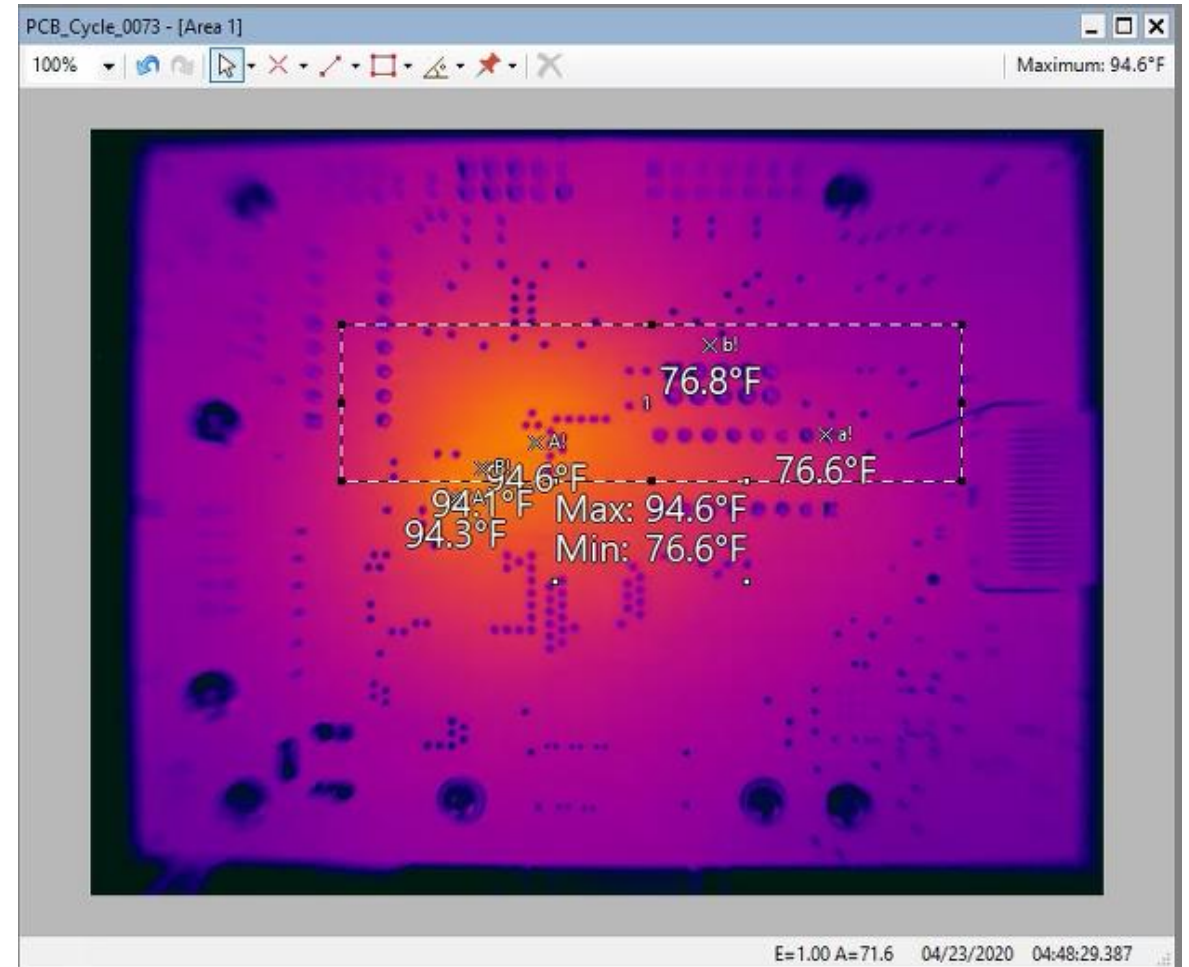


SmartView R&D

FEATURE NO.2: ANALYSIS OBJECTS

- Thermographic Areas
 - Rectangle
 - Ellipse
 - Circle
 - Polygon

Analysis Objects			
Points	Lines	Areas	
Point	T °F	Emis.	Ta °F
✦ A	94.3°F	0.95	71.6
✦ A!	94.6°F	1.00	71.6
✦ B!	94.1°F	1.00	71.6
✦ a!	76.6°F	1.00	71.6
✦ b!	76.8°F	1.00	71.6

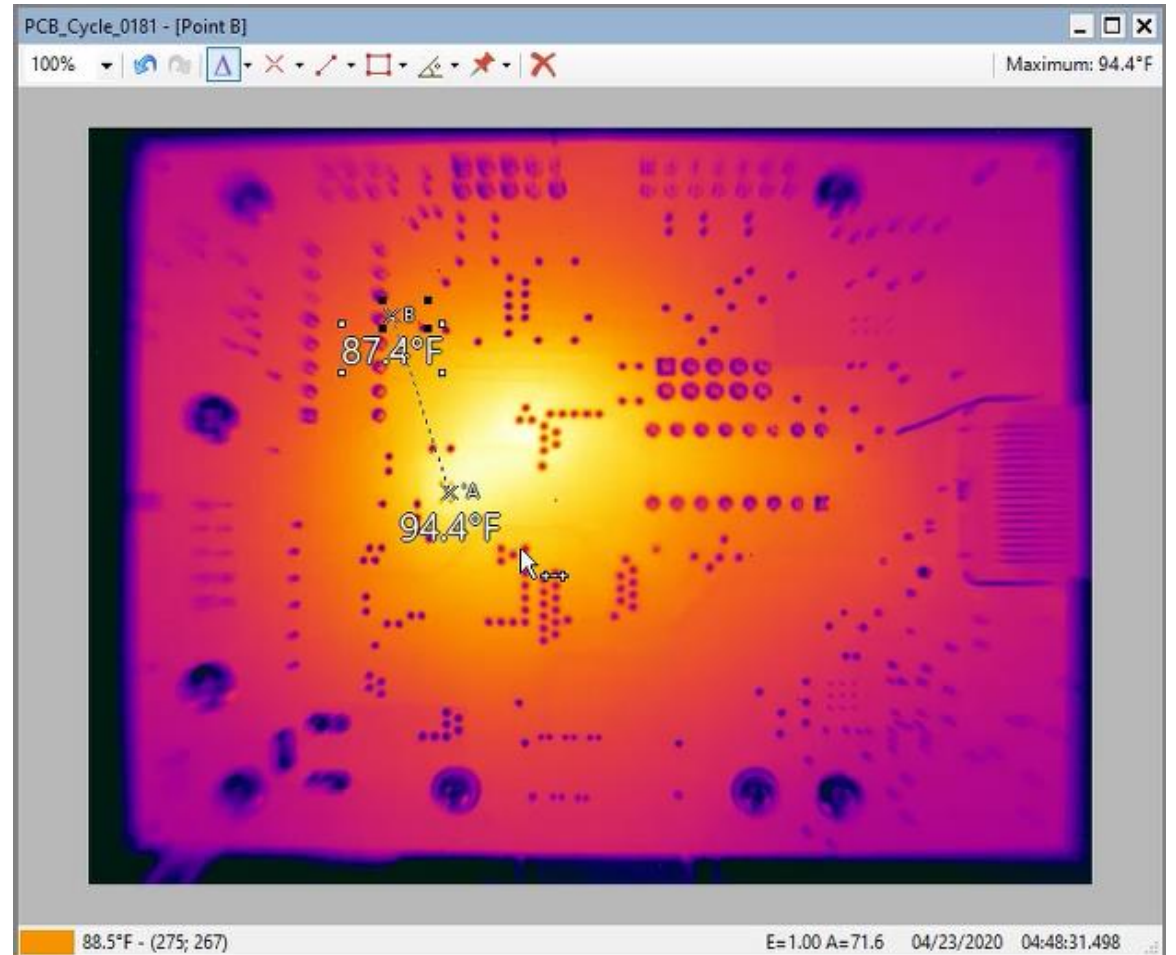


SmartView R&D

FEATURE NO.2: ANALYSIS OBJECTS

- Connection tool

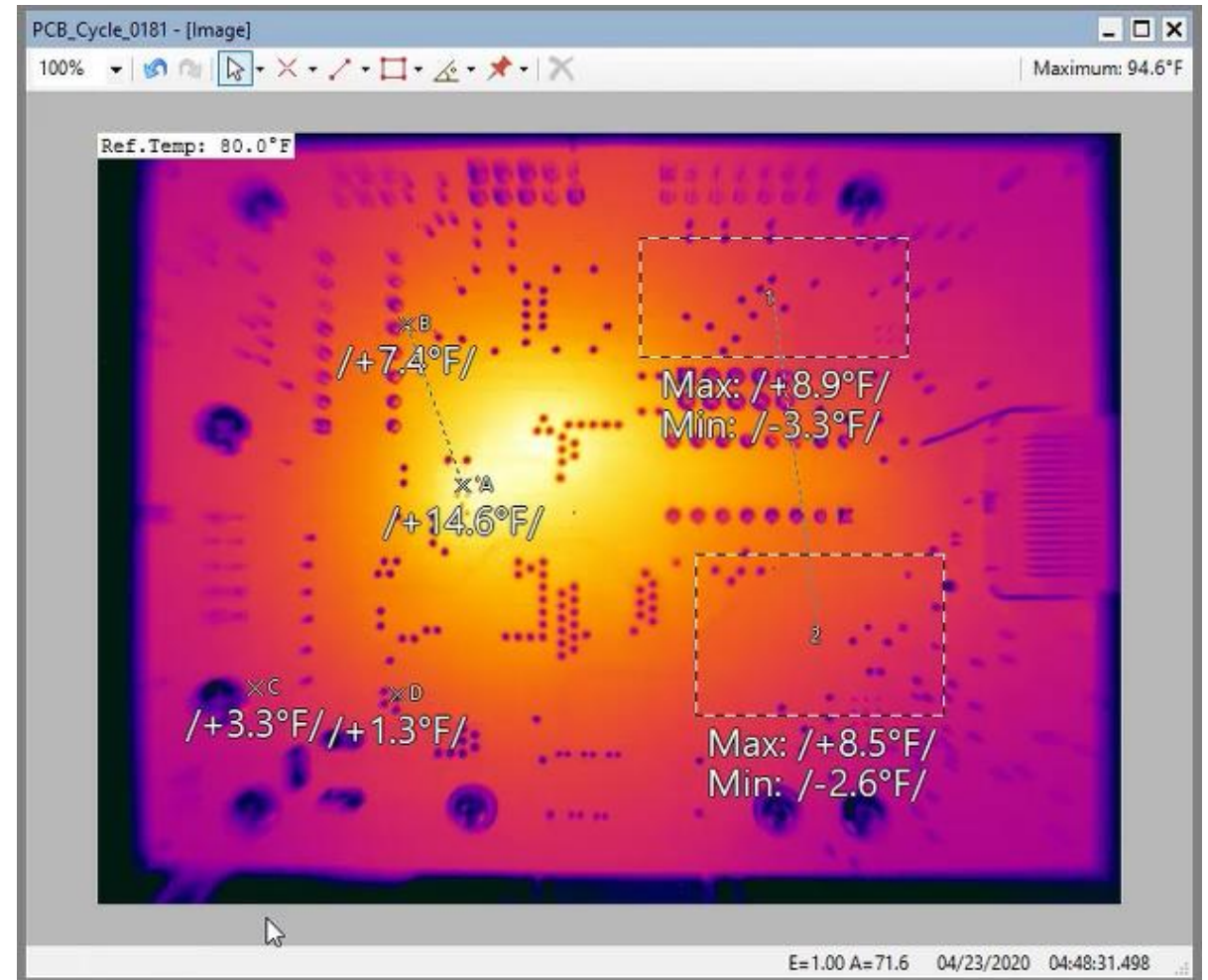
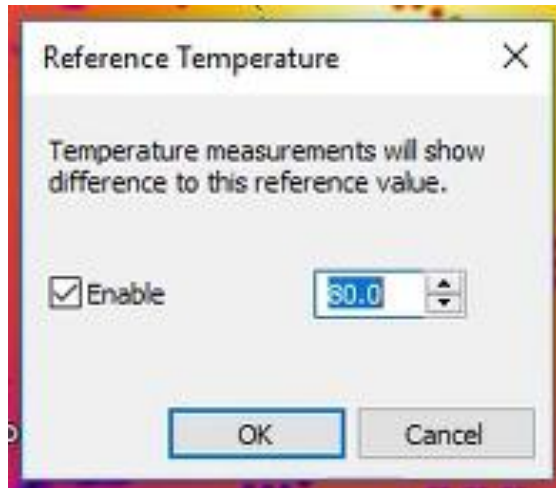
Analysis Objects			
Points	Lines	Areas	
Point	T °F	Emis.	Ta °F
✚ A	94.4°F	0.95	71.6
✚ B	87.4°F	1.00	71.6
△ B - A	-7.0	0.05	0.0



SmartView R&D

FEATURE NO.2: ANALYSIS OBJECTS

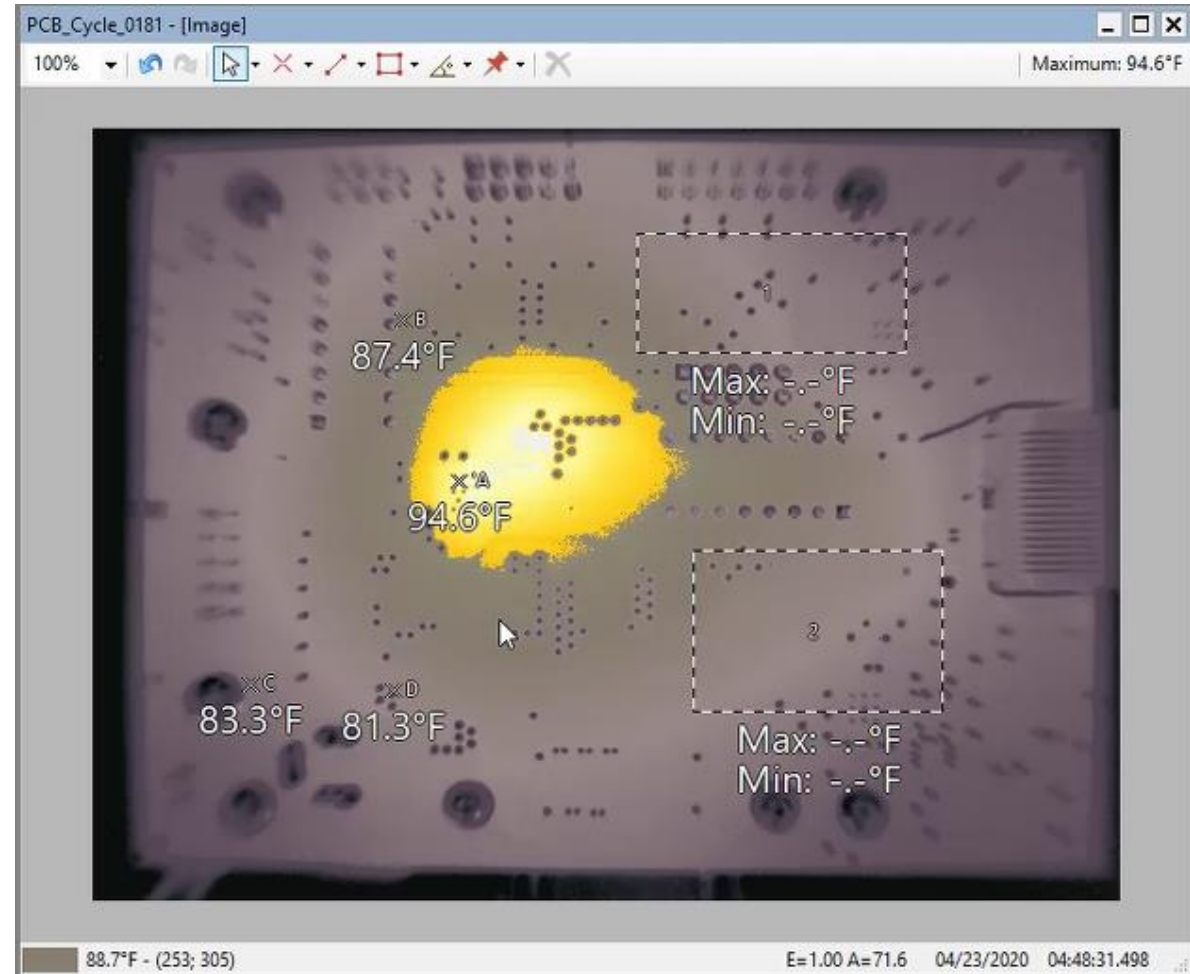
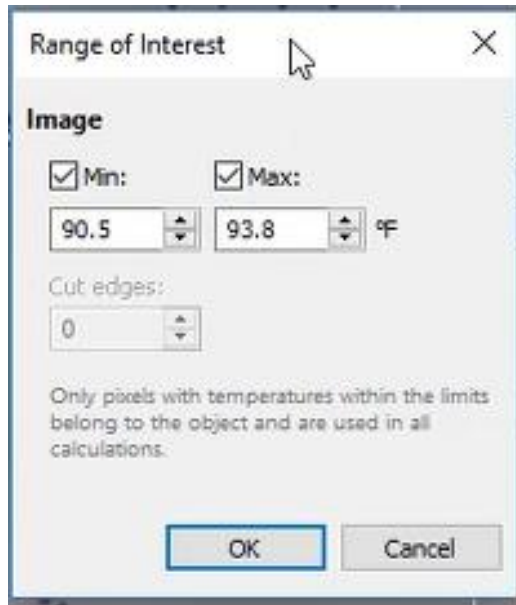
- Reference Temperature



SmartView R&D

FEATURE NO.2: ANALYSIS OBJECTS

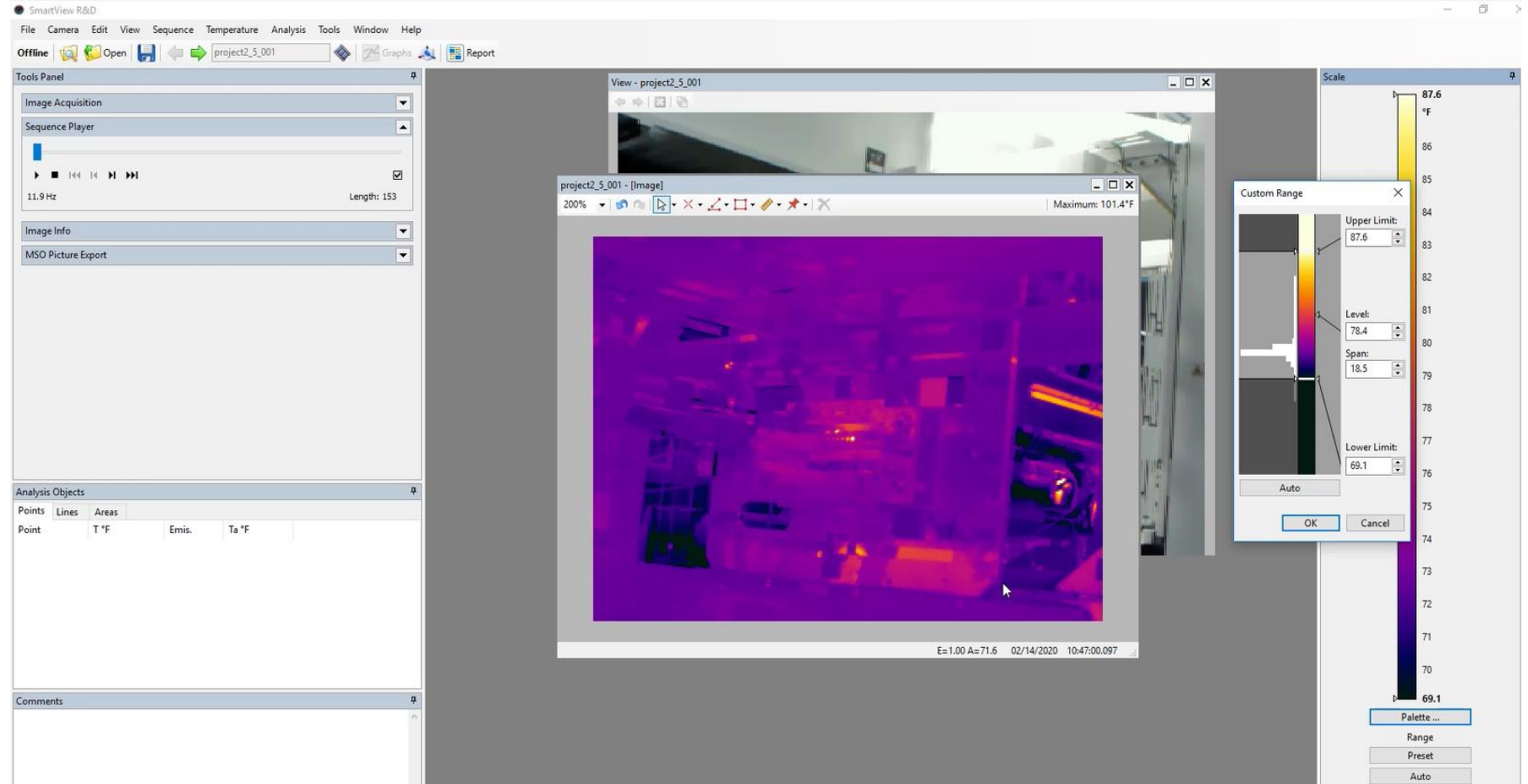
- Range of interest



SmartView R&D

FEATURE NO.3: TEMPERATURE SCALE AND PALETTES

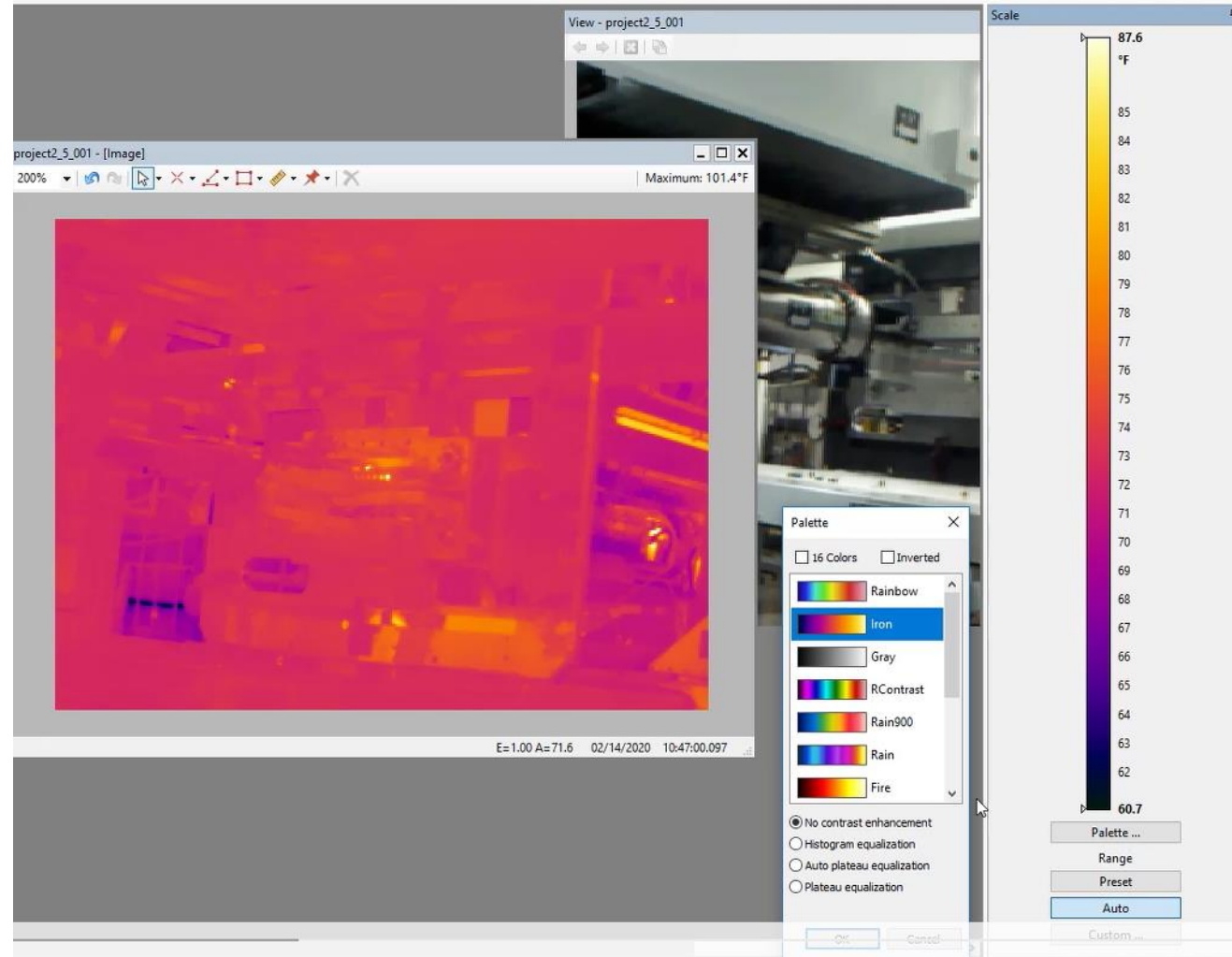
In a thermal image the range is the high and low temperature and the palette is the color scale applied against the different temperature values.



SmartView R&D

FEATURE NO.3: TEMPERATURE SCALE AND PALETTES

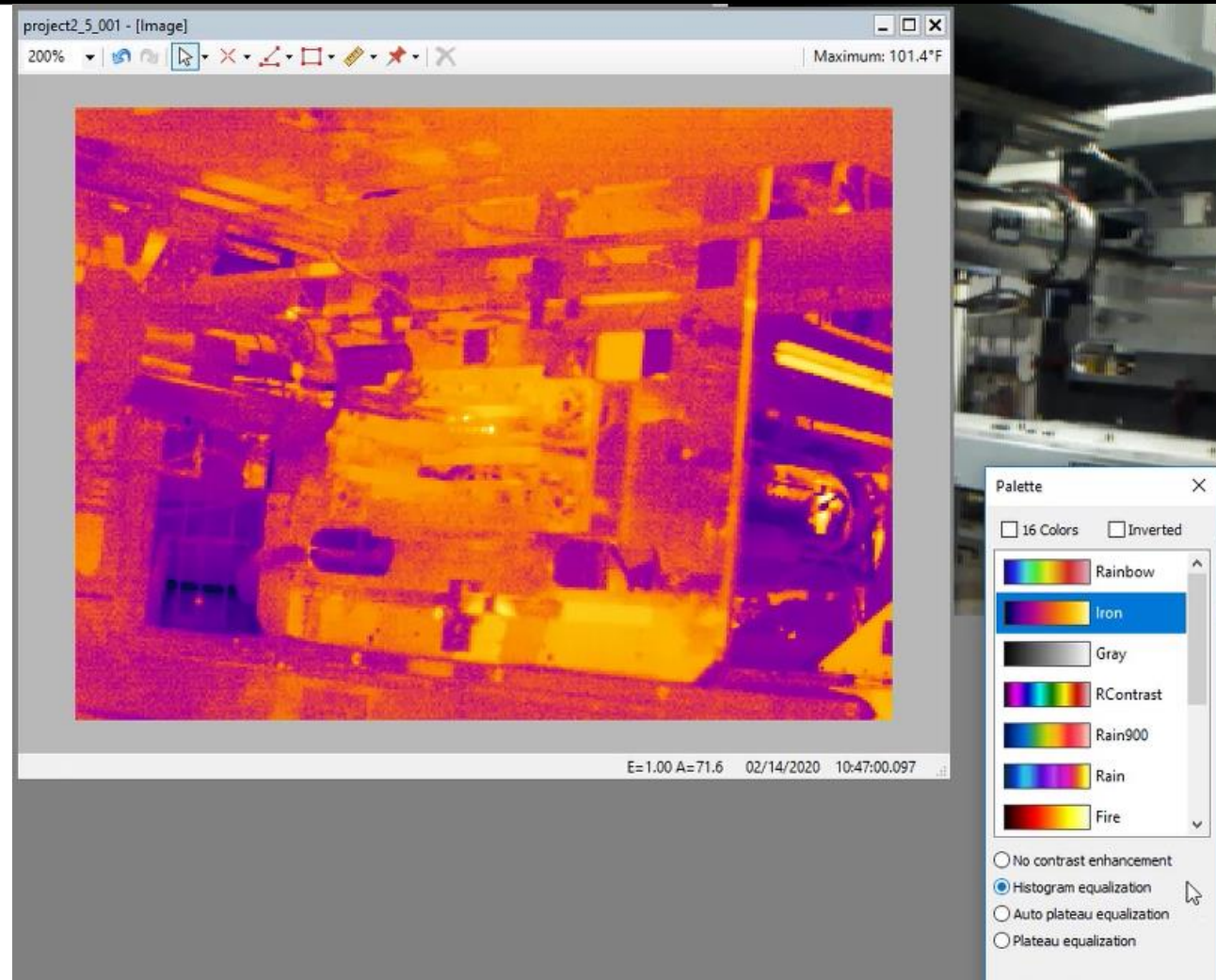
- 12 Palettes
- Temperature scale



SmartView R&D

FEATURE NO.3: TEMPERATURE SCALE AND PALETTES

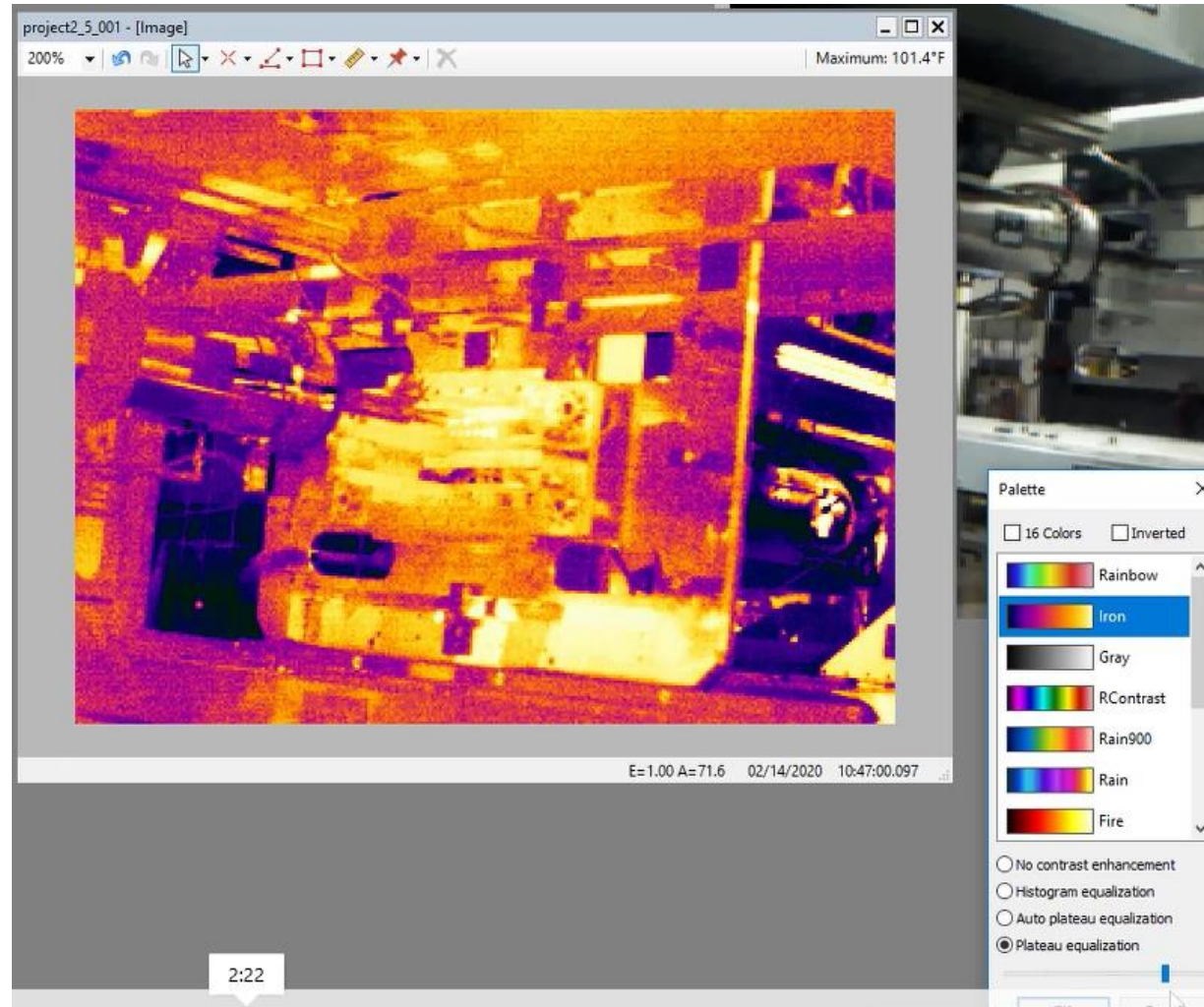
- Image Enhancement
 - Histogram equalization



SmartView R&D

FEATURE NO.3: TEMPERATURE SCALE AND PALETTES

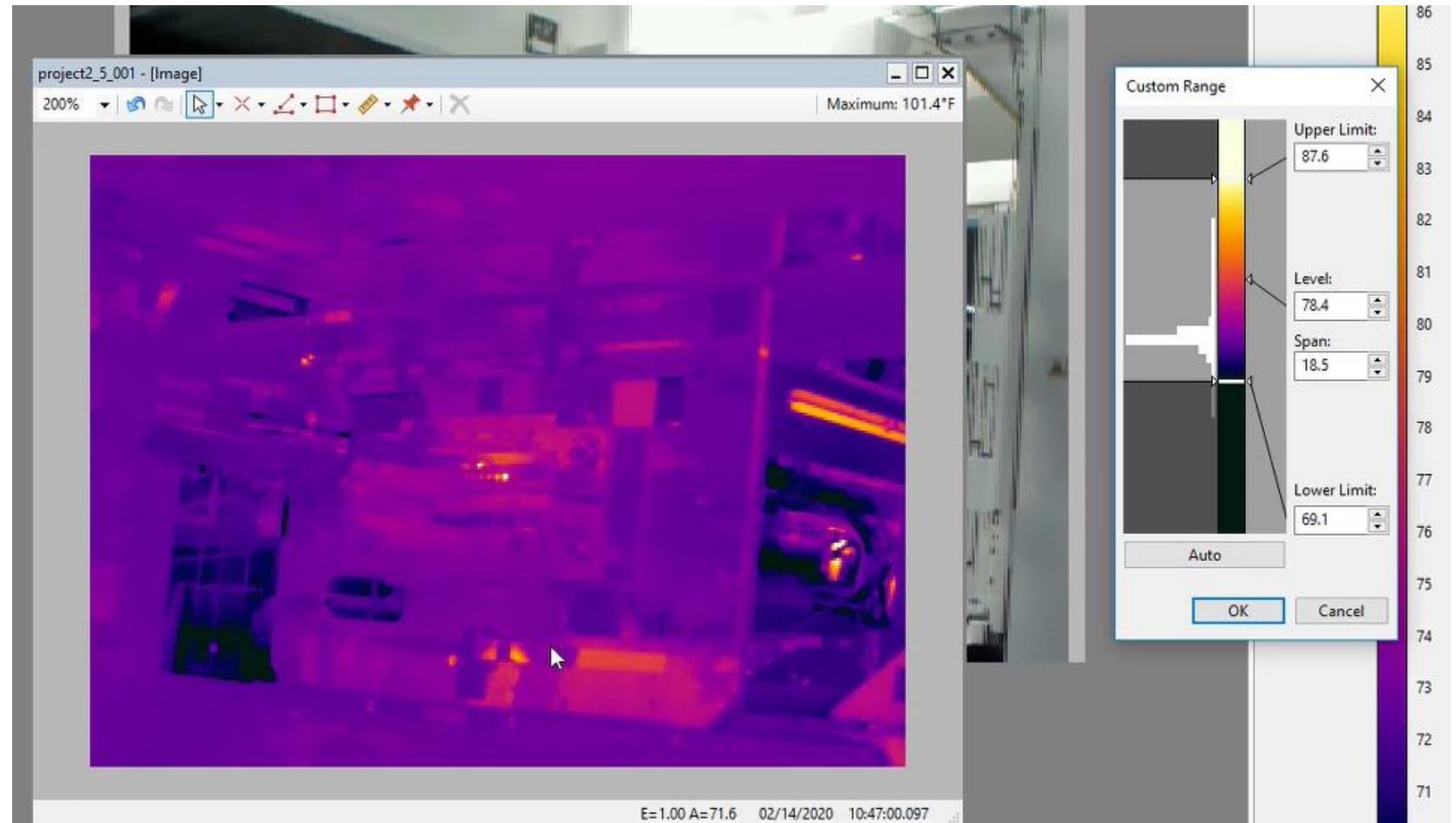
- Image Enhancement
 - Plateau Equalization



SmartView R&D

FEATURE NO.3: TEMPERATURE SCALE AND PALETTES

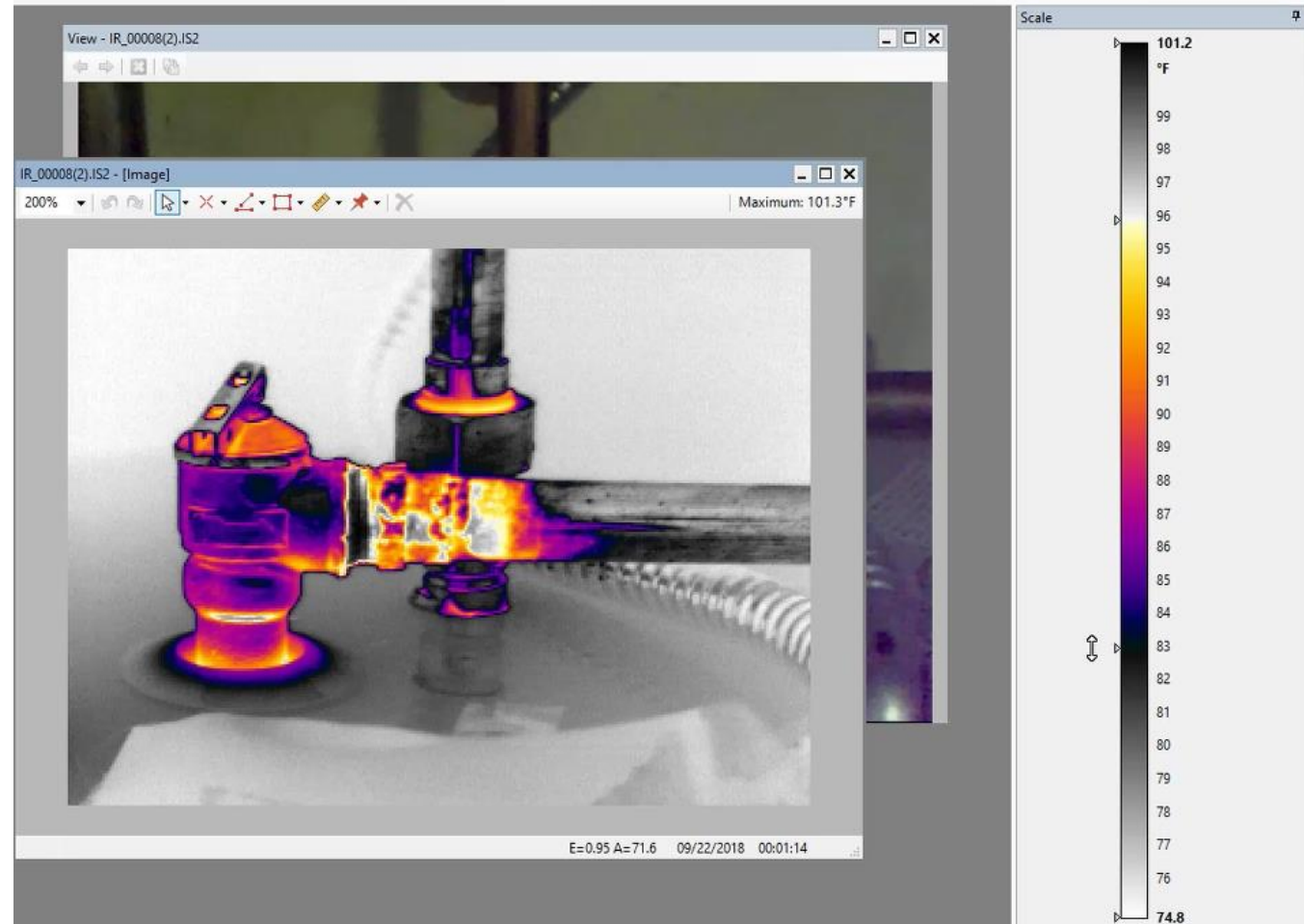
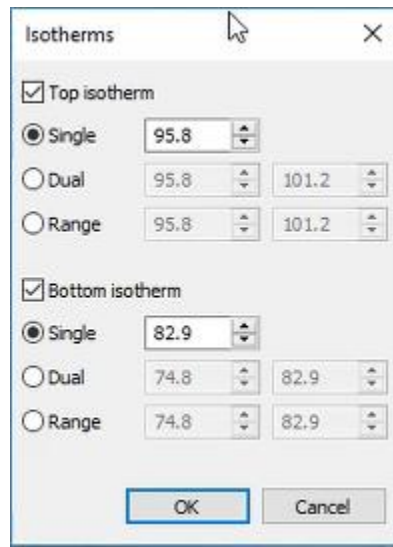
- Custom temperature range



SmartView R&D

FEATURE NO.3: TEMPERATURE SCALE AND PALETTES

- Isotherms



SmartView R&D

FEATURE NO.4: REPORTS AND EXPORTS

SmartView R&D has several features for reporting on thermal findings or exporting data to work in another application

The screenshot displays the SmartView R&D software interface. The main window shows a thermal image of a building facade with a color scale on the right ranging from 60.7 to 71.2 °F. A 'Report Generator' dialog box is open, prompting the user to select a template for the report. The dialog shows two template preview thumbnails labeled '1' and a list of installed templates including 'Building 2xDR - Sample.dot', 'Building 2xDR Plus - Sample.dot', and 'Condition Monitoring - Sample2.dot'. The 'Start' button is visible at the bottom of the dialog.

On the left side, the 'Tools Panel' contains several sections:

- Image Acquisition:** Shows 'OFFLINE' and 'Open' buttons.
- Sequence Player:** Includes play, stop, and refresh icons, with a duration of 11.8 min and Length: 3.
- Image Info:** A table listing properties and values:

Property	Value
System	TiX50
Filename	IR_00003(5).J52
Serial number	TiX50-19040006
Image size	640x480
Date	11/15/2019
Time	04:16:01
Calib. range	-4 - 212°F
Emissivity	0.95
	70.4%

- Analysis Objects:** A table showing analysis results for Line 1:

Line	Min °F	Max °F	Avg °F	Emiss.	Ta °F
1	61.6°F	70.3°F	67.0°F	0.95	70.50

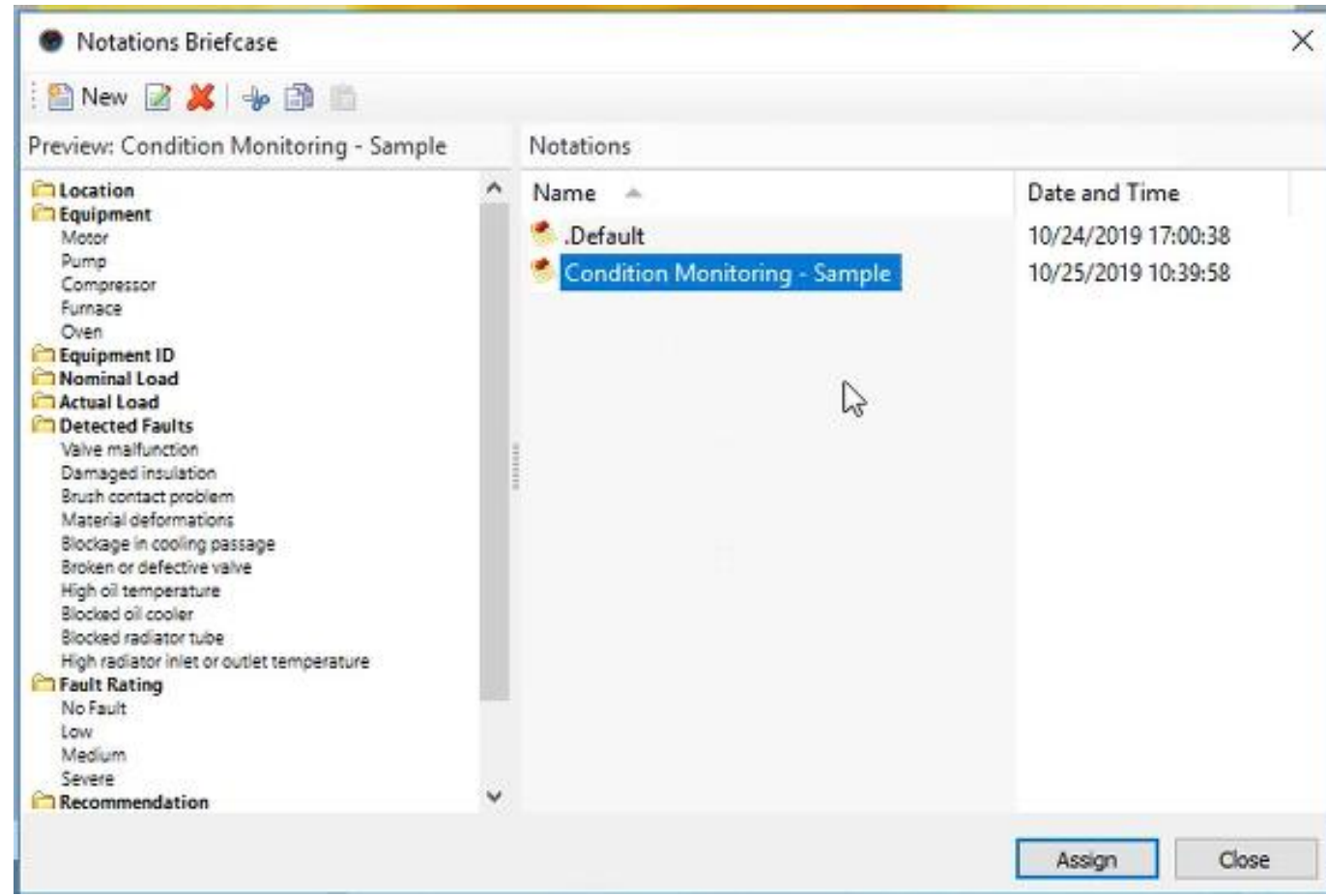
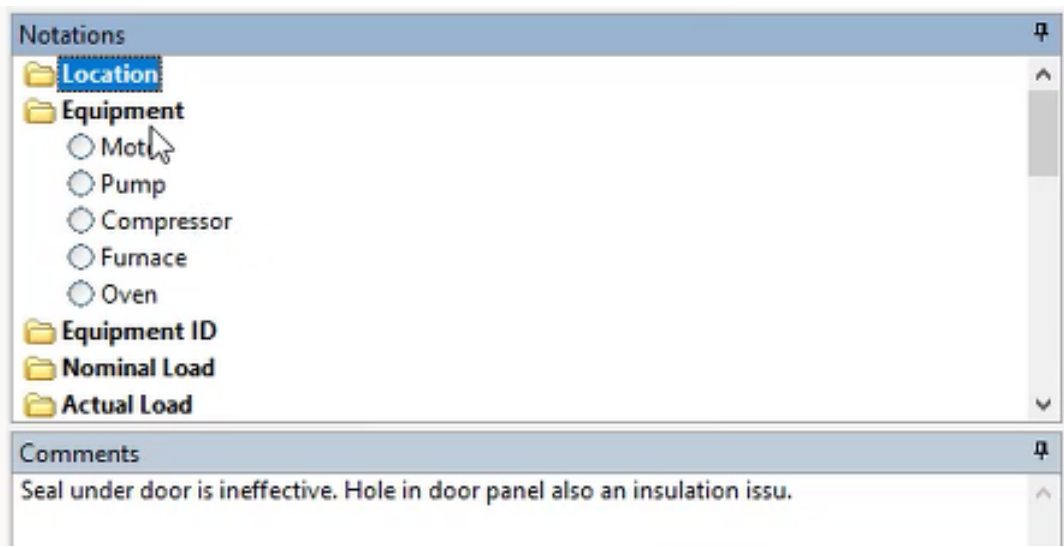
- Notations:** Shows 'Fault Rating: Medium'.
- Comments:** Contains the text 'Insulation missing above the window due to roof repair.'

At the bottom, a 'Profile - Line 1' graph shows temperature data along a horizontal axis from 1 to 40. A 'Scale' panel on the right provides a color key for the thermal image, with a 'Palette...' button and 'Range', 'Preset', and 'Auto' options.

SmartView R&D

FEATURE NO.4: REPORTS AND EXPORTS

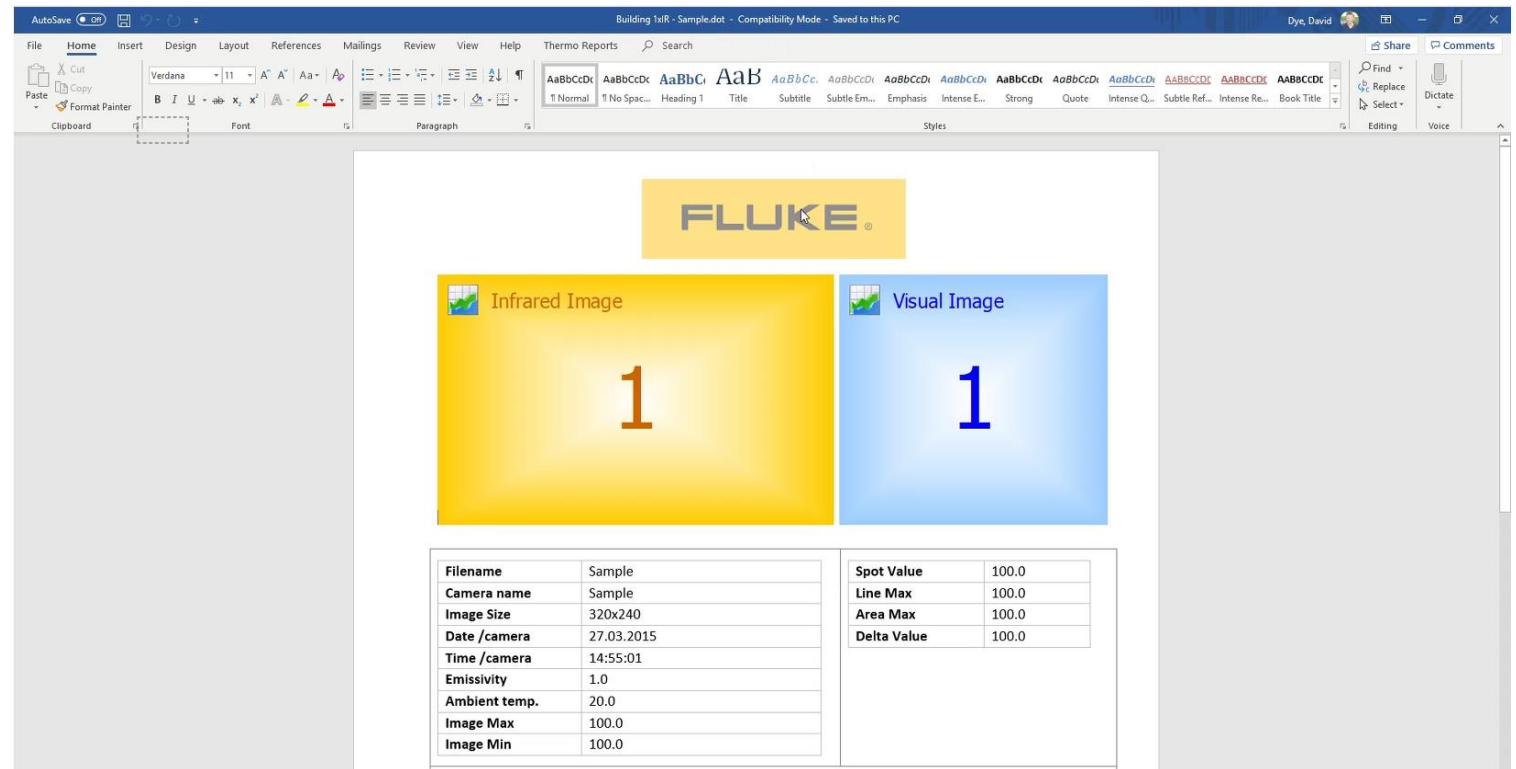
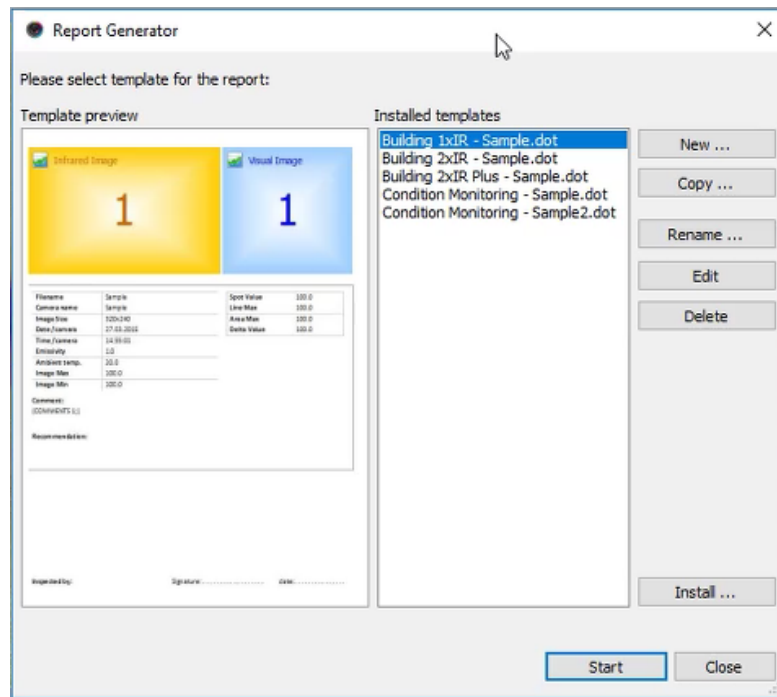
- Notations and comments



SmartView R&D

FEATURE NO.4: REPORTS AND EXPORTS

- Customizable report templates



SmartView R&D

FEATURE NO.4: REPORTS AND EXPORTS

- Reports

The screenshot displays a Microsoft Word document titled 'Document2 - Compatibility Mode - Word'. The document content includes a thermal image of a window with a color scale on the right ranging from 60.7 to 71.2. Below the image is a table with the following data:

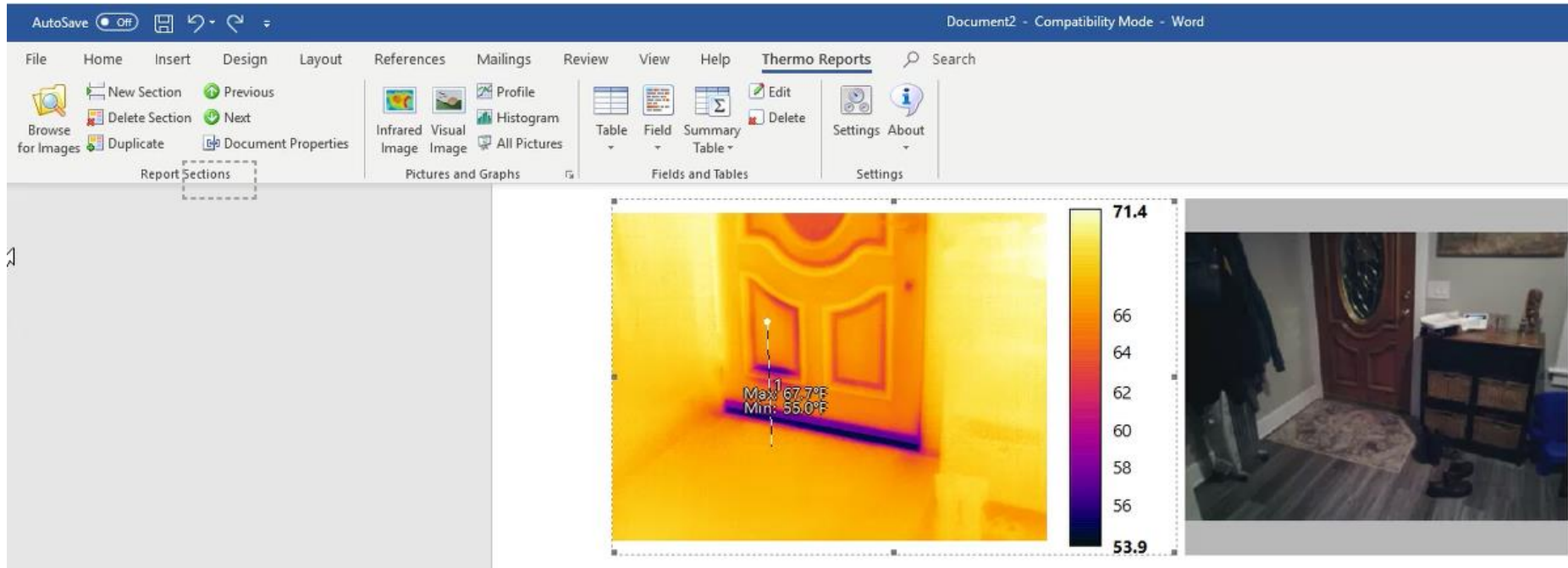
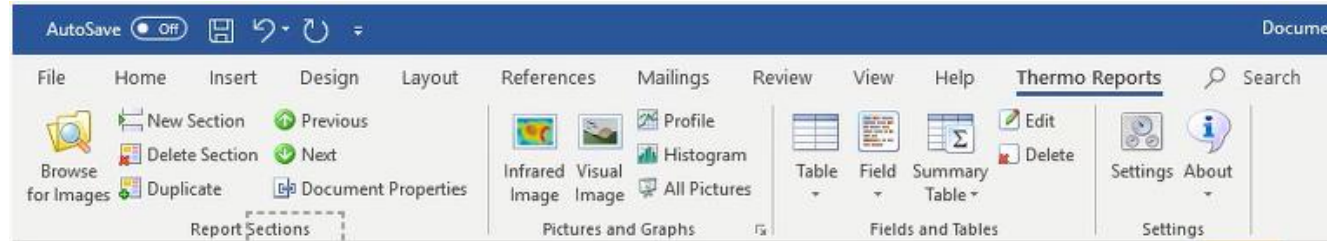
Filename	IR_00003(5).IS2	Line 1 Max	70.3°F
Camera name	TiX580		
Image Size	640x480		
Date /camera	11/15/2019		
Time /camera	04:16:01		
Emissivity	0.95		
Ambient temp.	70.5°F		
Image Max	71.8		
Image Min	60.2		

Below the table, there is a 'Comment:' section with the text: 'Insulation missing above the window due to roof repair.' and a 'Recommendation:' section which is currently empty.

SmartView R&D

FEATURE NO.4: REPORTS AND EXPORTS

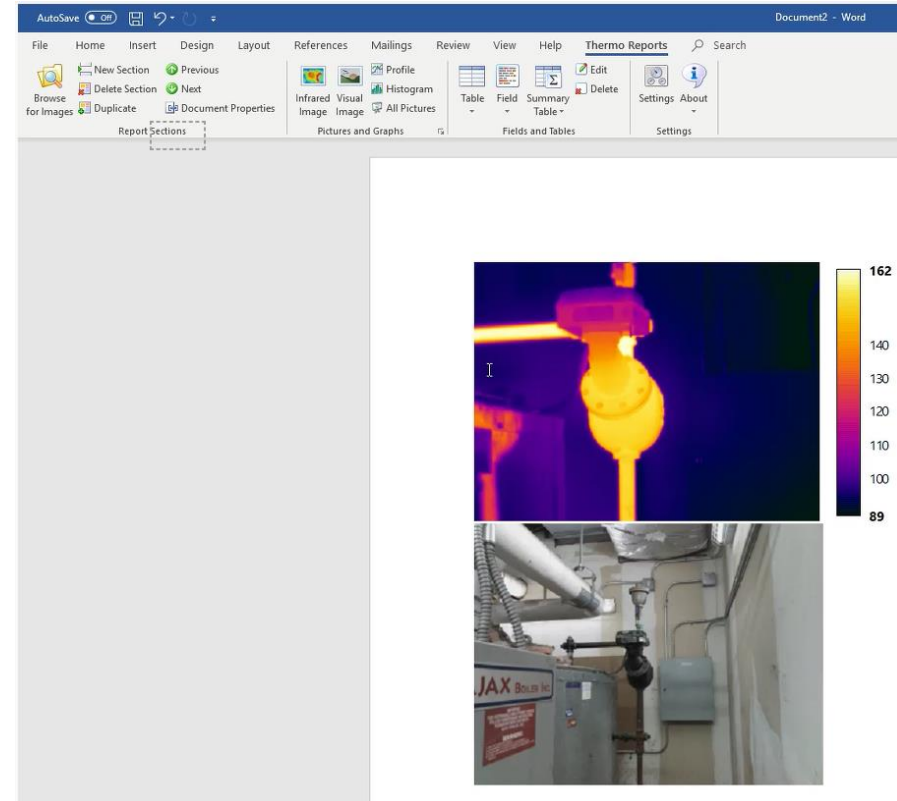
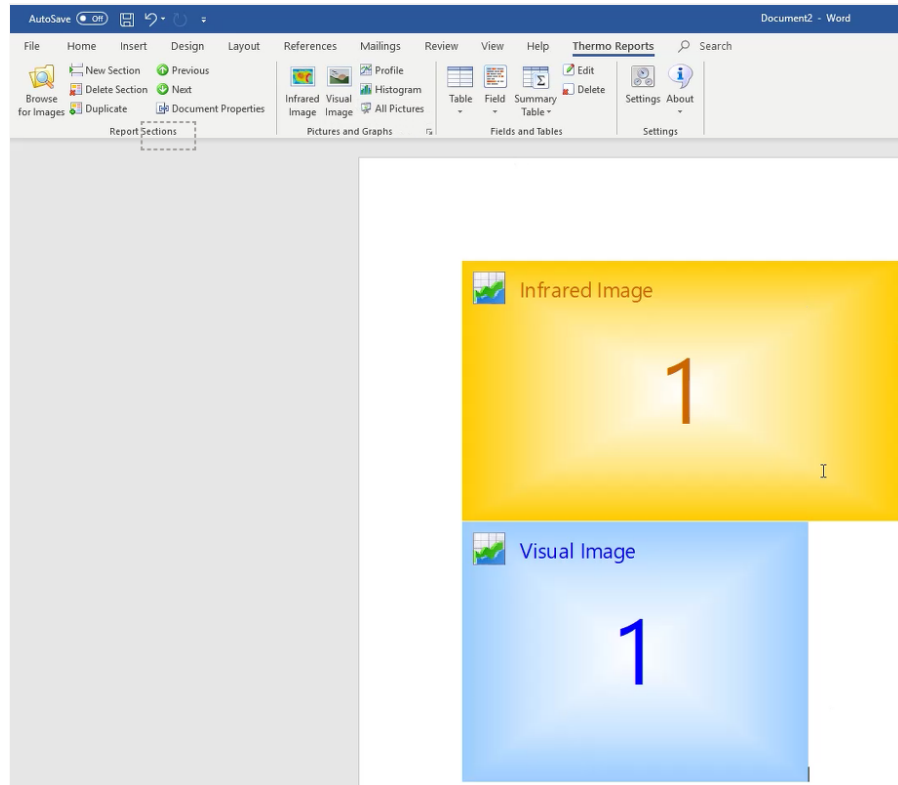
- Microsoft Work Plugin



SmartView R&D

FEATURE NO.4: REPORTS AND EXPORTS

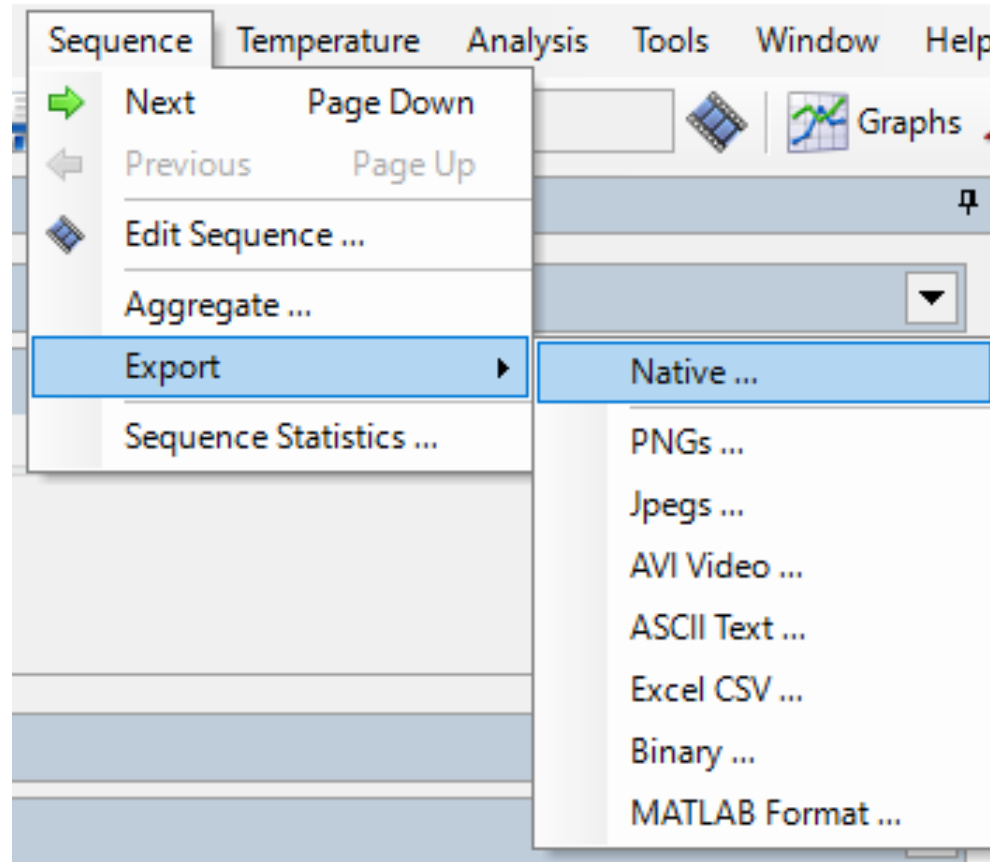
- Create templates



SmartView R&D

FEATURE NO.4: REPORTS AND EXPORTS

- Exports
 - PNGs
 - Jpegs
 - AVI Video
 - ASCII Text
 - Excel CSV
 - Binary
 - MATLAB format



Fluke Thermal Cameras for Streaming – RSE Series



Fluke RSE300/RSE600 Infrared Cameras

- Lab analysis
- Research / Quality testing

Typical application

- Temperature analysis for lab R&D
- Real time testing of products pre-production or for quality assurance

Data connectivity

- Integration with SmartView R&D desktop software for streaming data and image editing

Environment

- Best suited for the lab or temporary jobs on the plant floor

POLL QUESTION No. 3



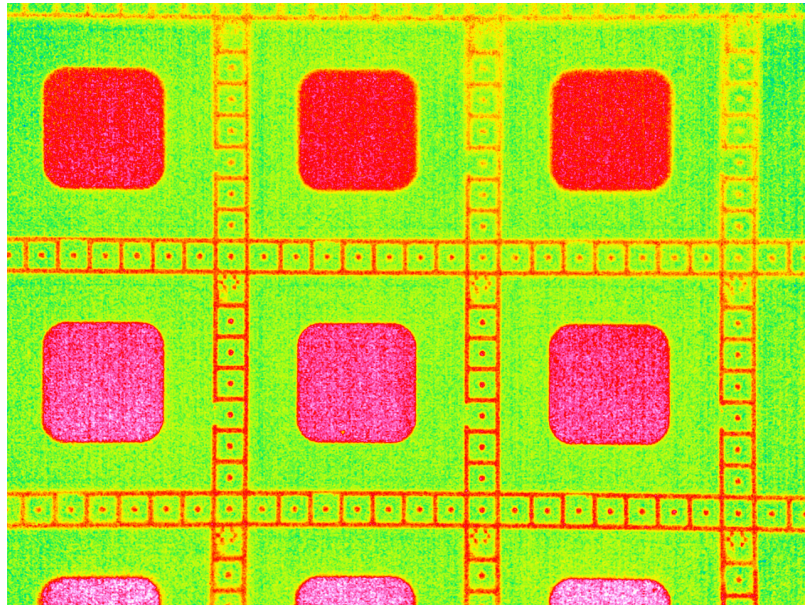
Which of the following features does New Fluke SmartView R&D Software have? **(Click only one answer)**

- A. Radiometric streaming
- B. Analysis objects
- C. Time scale and palettes
- D. Reports and exports
- E. All above

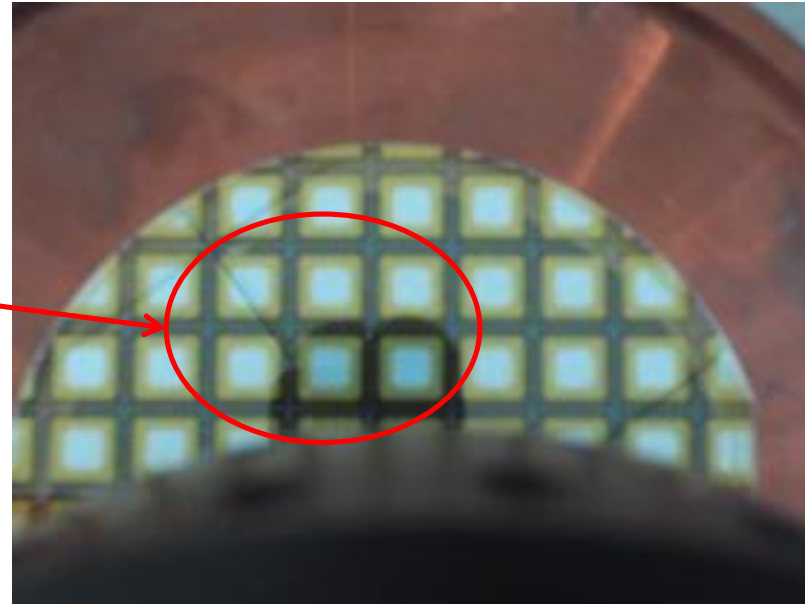
SmartView R&D Applications

PERFORMANCE EVALUATION OF ELECTRONIC COMPONENTS

Advanced thermographic analysis is applied to evaluate the performance of electronic parts in μm scale: chips, PCBA board, small electronic components



Thermal image of electronic chip

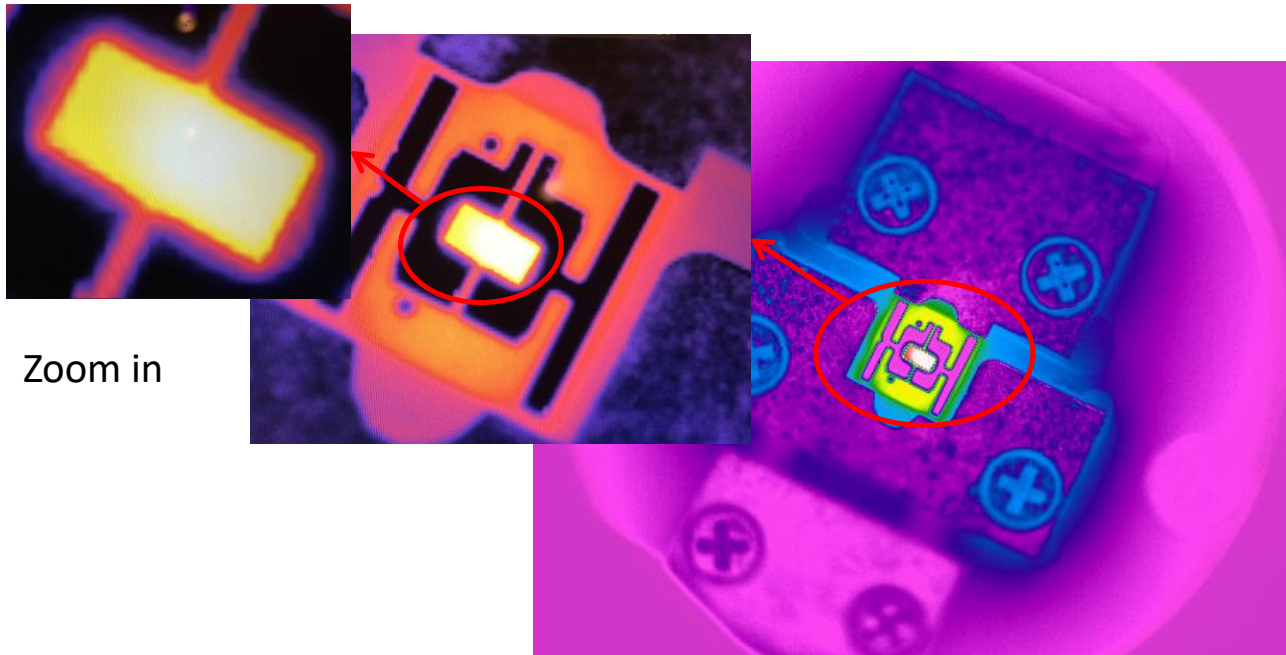


Chip lattice

SmartView R&D Applications

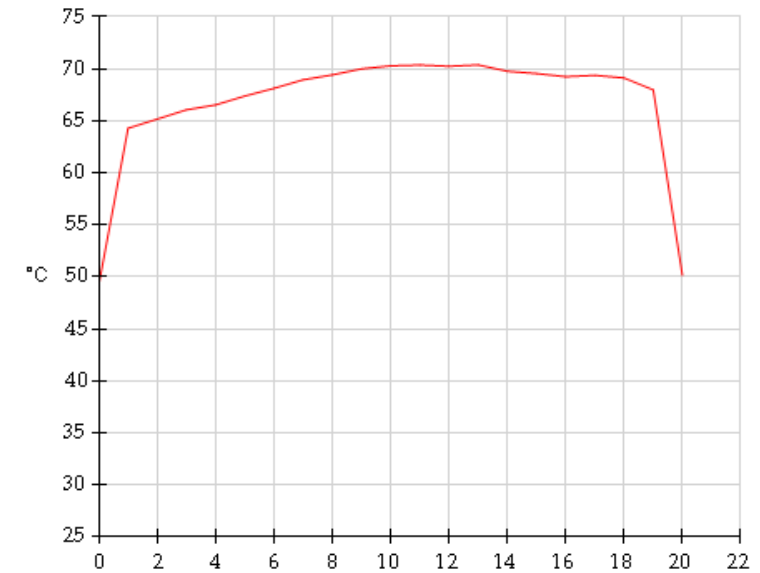
PERFORMANCE EVALUATION OF LED CHIP

Advanced thermographic analysis is applied to evaluate the thermal distribution of LED chip



Zoom in

LED chip shows uneven thermal distribution

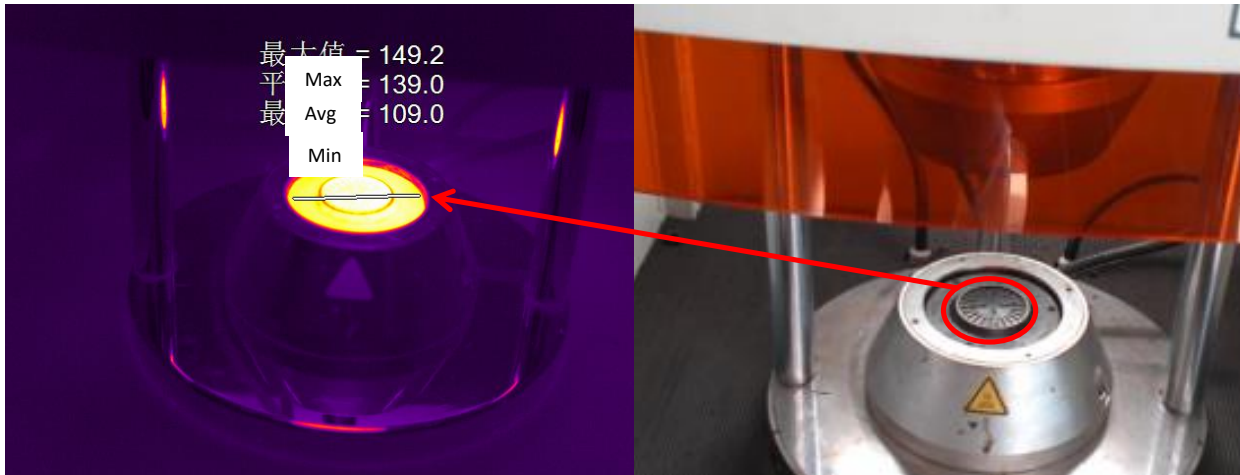


Temperature distribution of chip surface

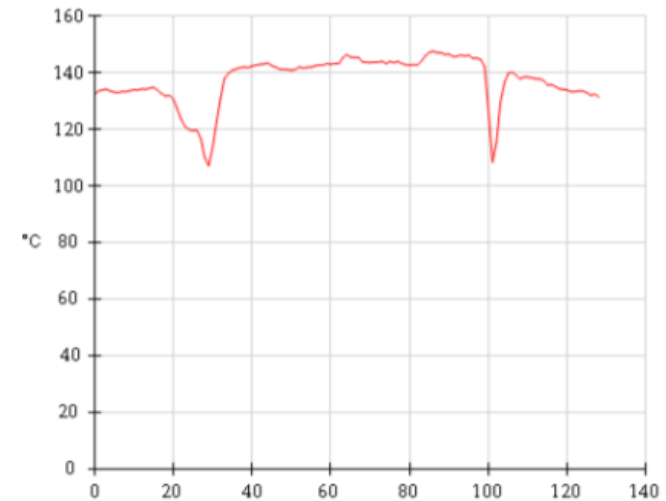
SmartView R&D Applications

PERFORMANCE EVALUATION OF MATERIALS IN CHEMICAL PROCESS

Advanced thermographic analysis is applied to evaluate the temperature changes of materials in chemical process, such as vulcanization of rubber



Vulcanization process of rubber

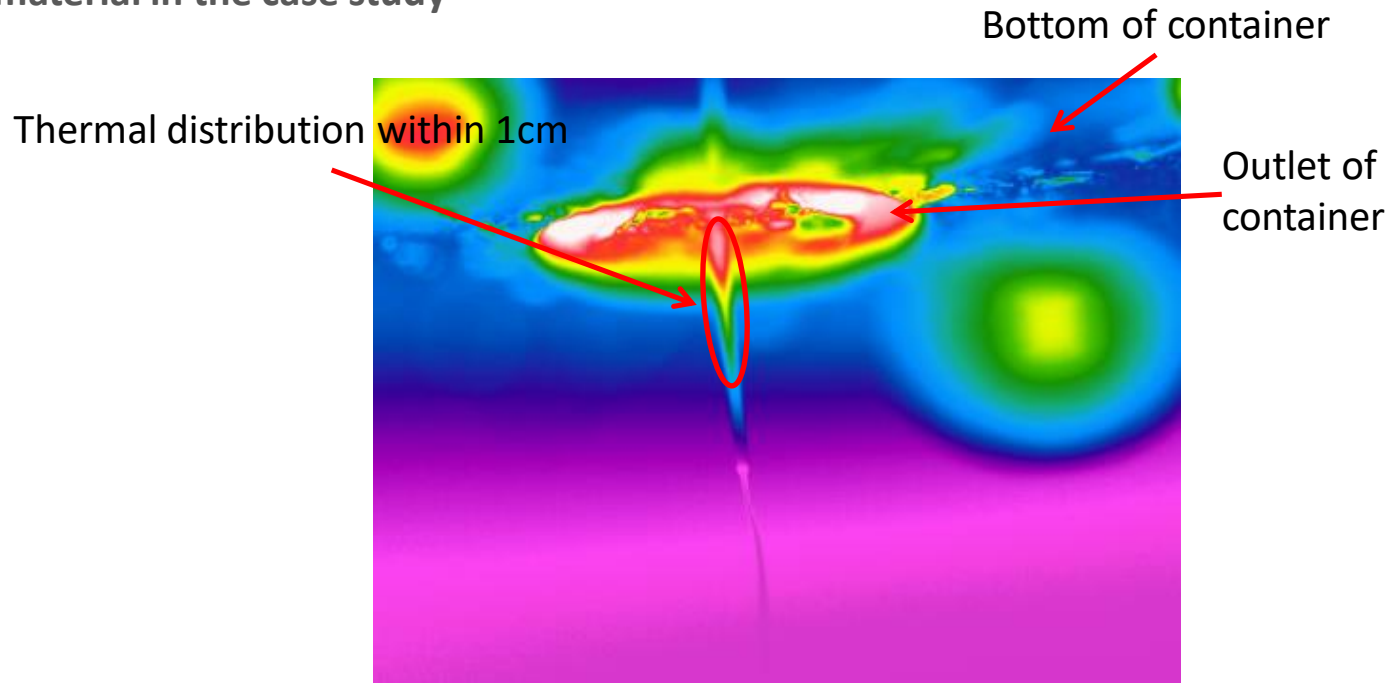


Temperature distribution of rubber surface

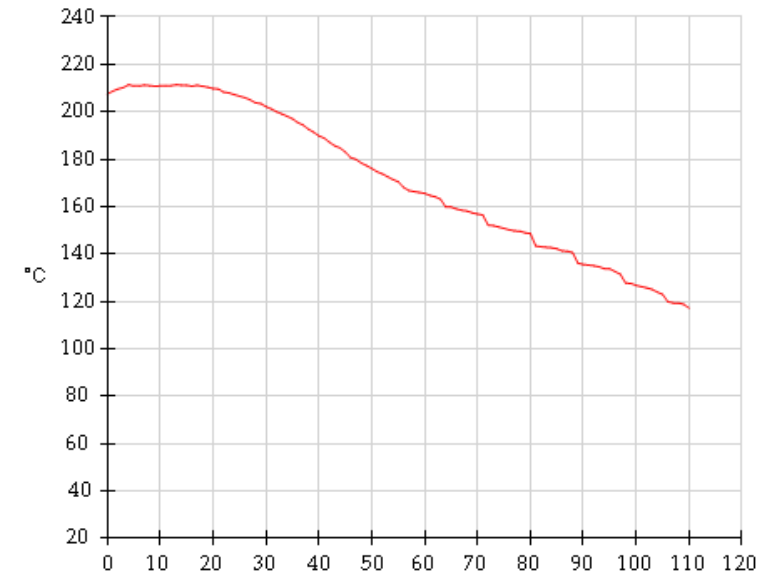
SmartView R&D Applications

THERMAL EVALUATION IN MELTING MATERIAL

Advanced thermographic analysis is applied to evaluation the temperature distribution of melting materials, such as filamentary material in the case study



Melting of filamentary material



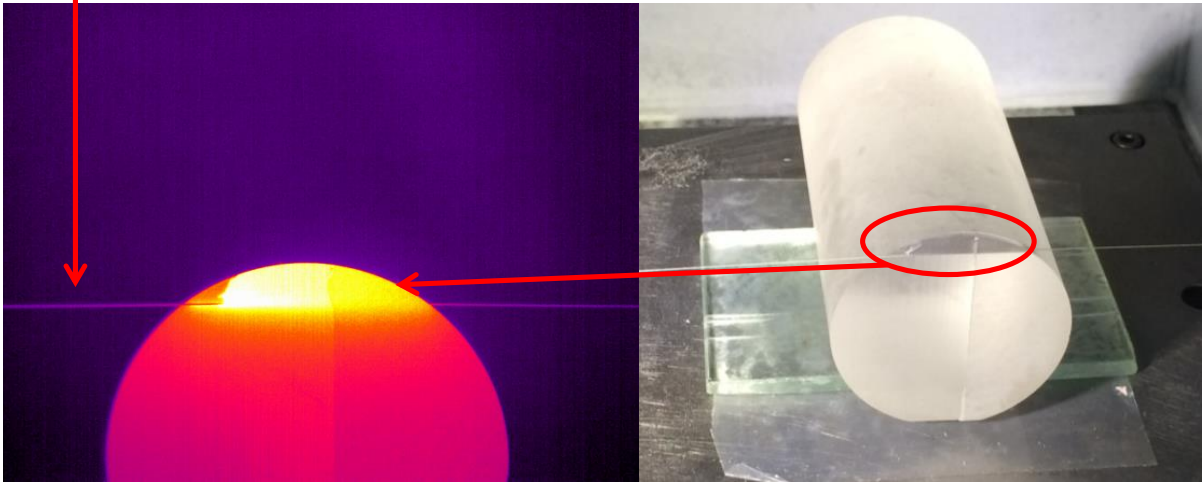
Temperature distribution at the targeted part

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TEMPERATURE MONITORING IN HIGH PRECISION CUTTING

Advanced thermographic analysis is applied to monitor and evaluate the temperature distribution of cutting tools and materials

250 μm diamond cutting line



High precision cutting of diamond



Temperature distribution at the cutting line



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