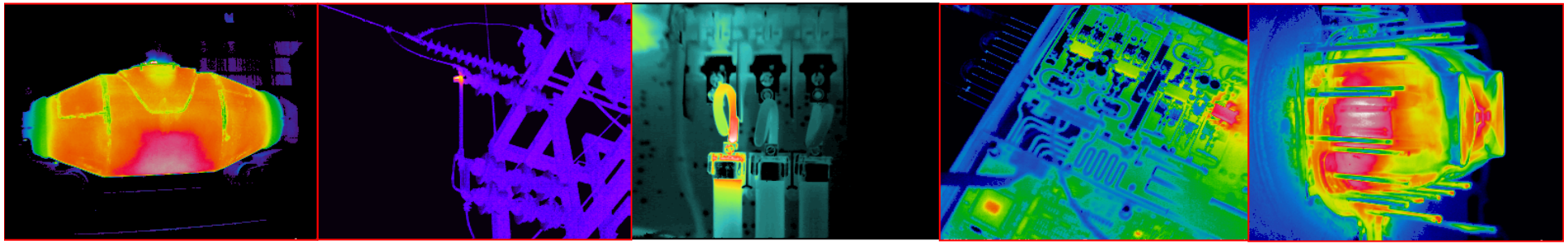
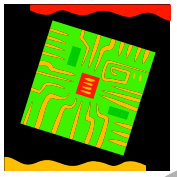
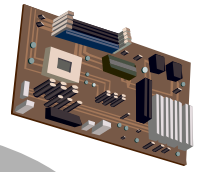
Infrared Imaging
A Practical Tool For Industry

A Basic Guide of Applications

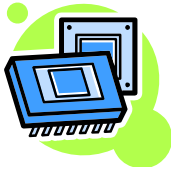


Applications in Electronics field

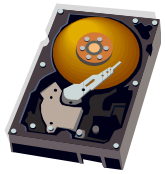


Device



Parts

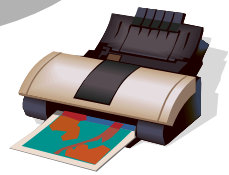


Case



- Downsizing
- Miniaturization
- Weight-saving
- High-speed
- High-output
- High-resolution
- High-definition
- Electrical power saving

Cooling device



Unit

Equipment

Lithium-ion secondary battery

- **Back ground**
  - Problems of heat generation and ignition
  - Prevention to circulate defective product
  - Quality improvement
- **Application example**

  1, R & D stage：

  Environmental test

  Analysis of defective product’s heat - generation pattern

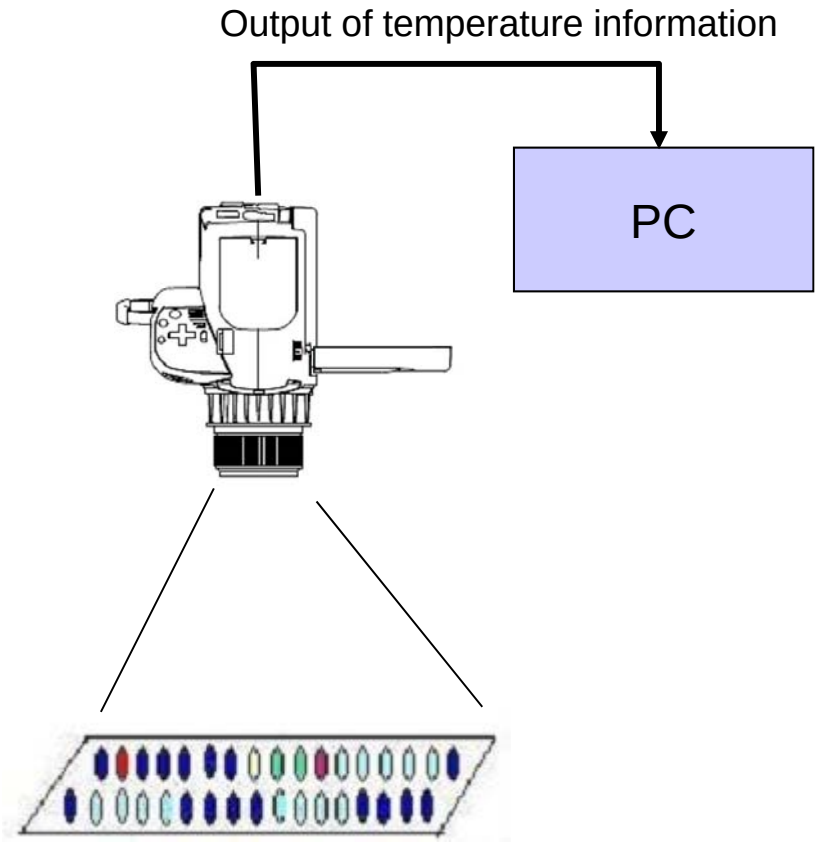
  2, Production stage：

  Charge-discharge inspection before shipment

  Exclusion of abnormal heat-generated product
- **Recommended model**

  R300SR which has wider angle- standard lens

  Optional wide angle lens is useful in some environment



Flat panel display＜LCD／Plasma＞

- **Back ground**
  - High brightness, high contrast and big-screen
  - Heat generation of inner parts and boards caused by sophisticated features
  - Prevention of image quality (brightness, color hue and contrast etc) degradation, due to increased temperature
  - Quality improvement
- **Application example**

  1, Analysis of LCD panel's temperature un-uniformity

  2, Prevention of heat generation on rear boar

  3, Quality improvement of related parts

  - Glass substrate, Polarizing film

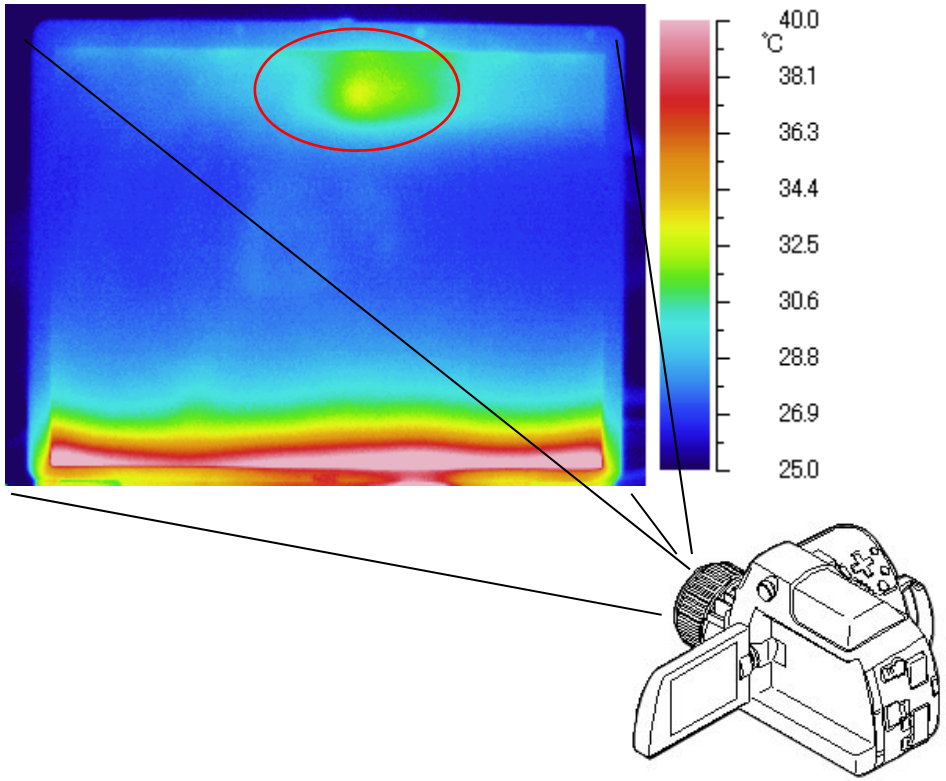
  4, Temperature checking of related manufacturing equipment

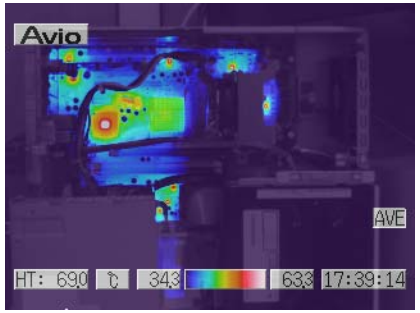
  - Color filter inspection system

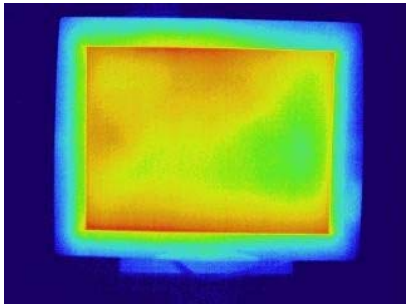
  Electric(al) hot plate
- **Recommended model**

LCD Panel: G100EX can be used for big screen

Board, panel: R300SR which has high spatial resolution







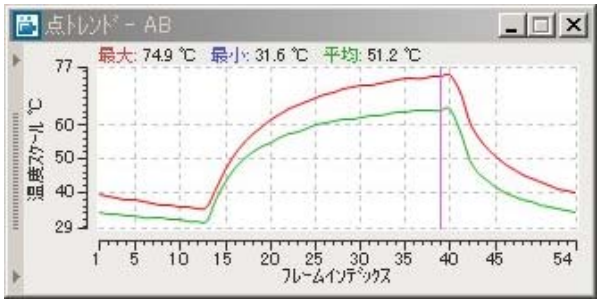
LED

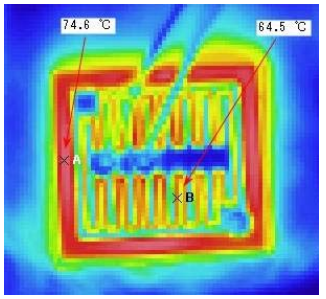
- **Back ground**
  - Restraining of operation temperature （Medical）
  - Long lived trend, uniformity（lighting）
  - Partial heat generation
  - Action to heat radiation caused by high brightness, highly function （Headlamps for automobile）
- **Application example**

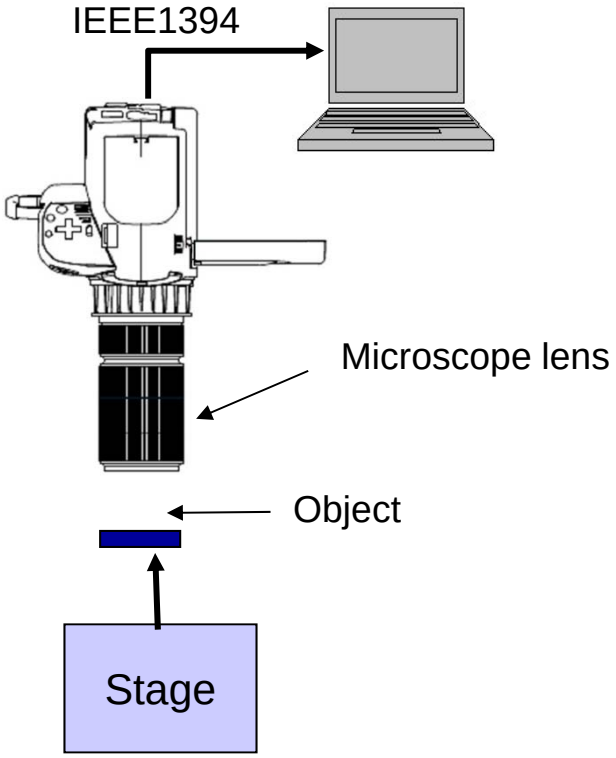
  1, R & D
    - Checking heat generating condition and temperature un-uniformity

  2, Q & C
    - Temperature inspection before shipment, temperature distribution inspection
- **Recommended model**

  H2640 with 25μm Close-Up lens

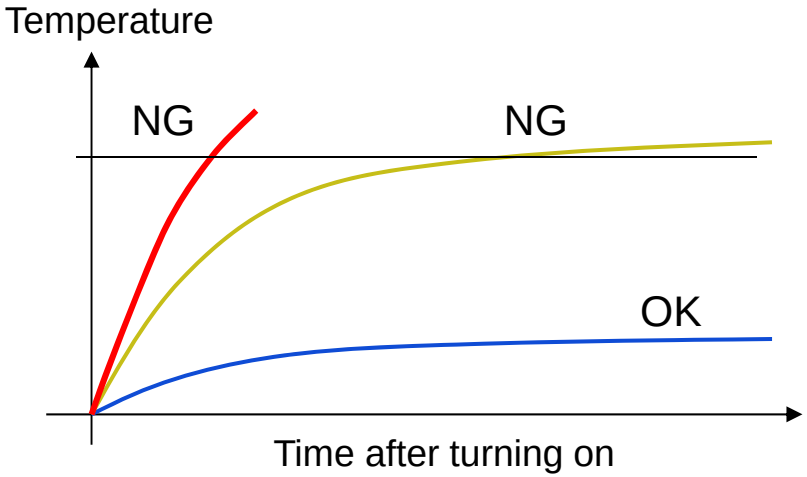


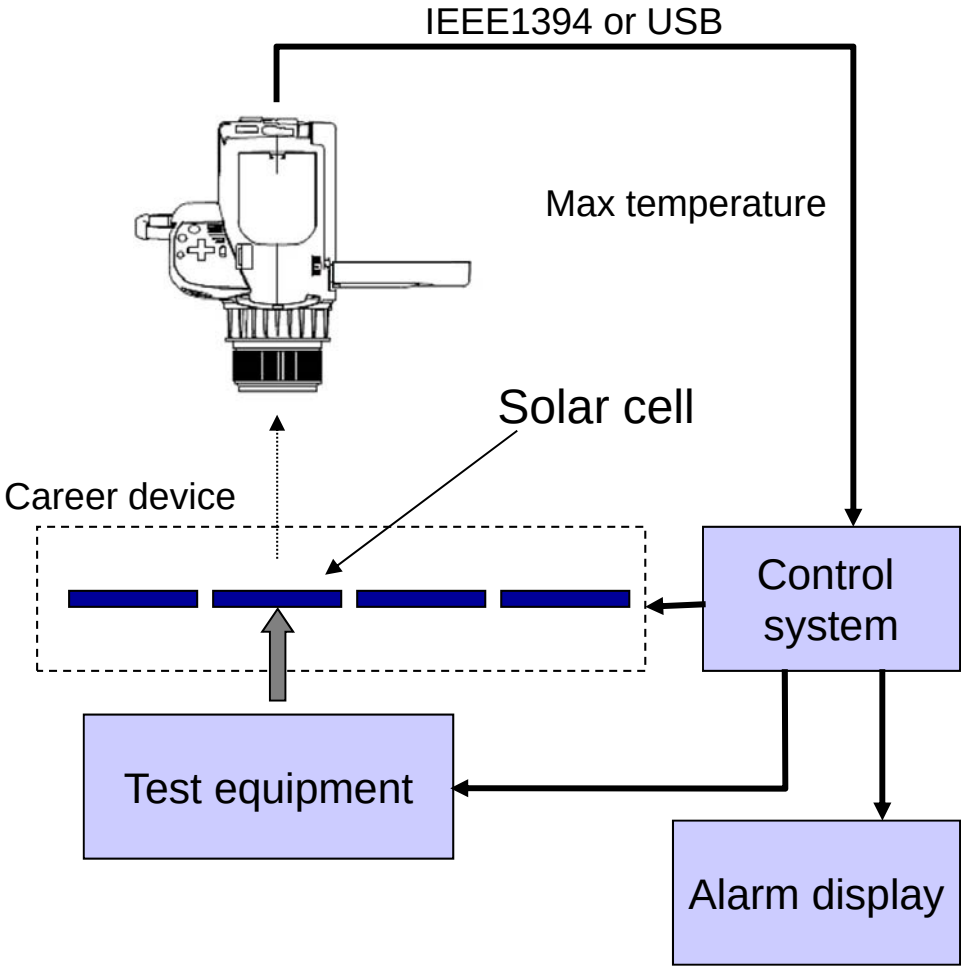




Solar cell

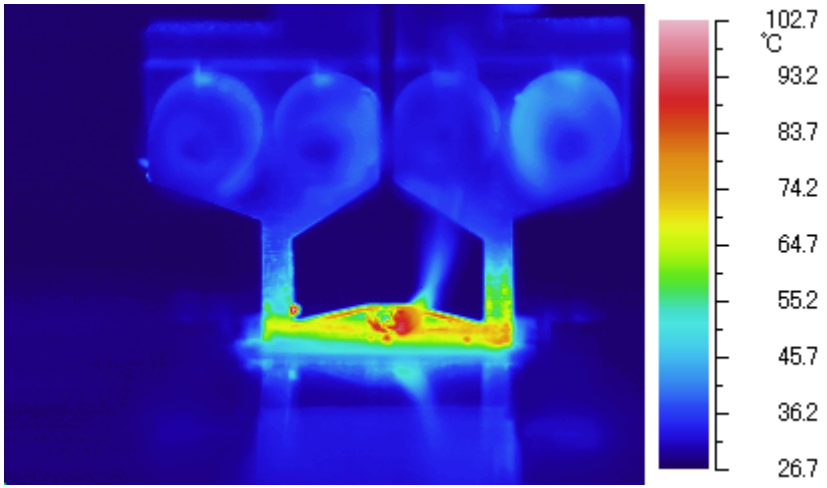
- **Back ground**
  - Quality improvement
  - Uniformity of characteristics
- **Application example**
  - Defectiveness of solar cell is determined from temperature elevation trend after turning on
- **Recommended model**
  - In case of solar cell:H2640 which has high spatial resolution
  - In case of module :R300SR which has wider angle standard lens

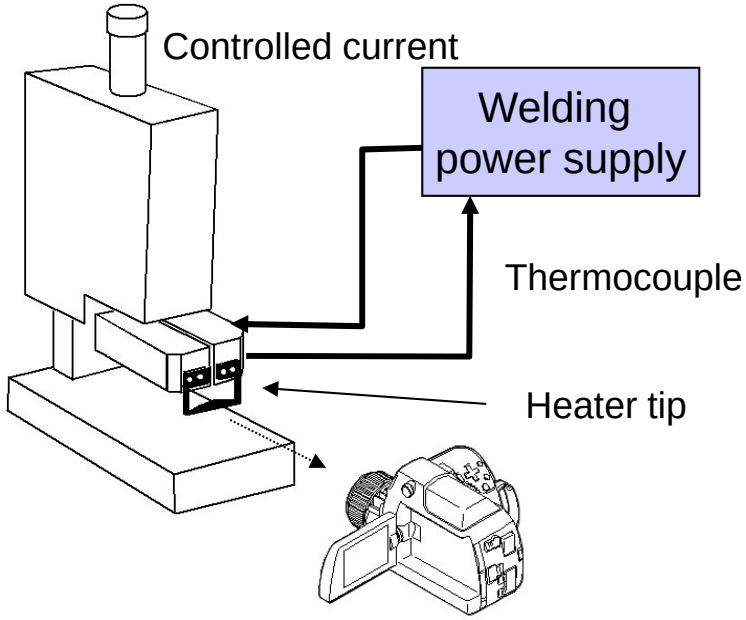




Joining equipment (heater tip)

- **Background**
  - Improvement of quality
  - Realization of uniform characteristics
- **Application example**
  - While the temperature monitor of the heater tip is measuring the temperature by a thermocouple at the center, there will be a difference of temperature between the t hermocouple and the heated surface during joining.
  - The deviation between the heating status at the contact surface with the work and the measured value by the thermocouple is clarified by the thermography.
  - The temperature profile is adjusted and it can be optimized.
- **Recommended model**
  - R300SR which can record thermal images in high speed via USB
  - Close-up lens is effective for small heater tips.

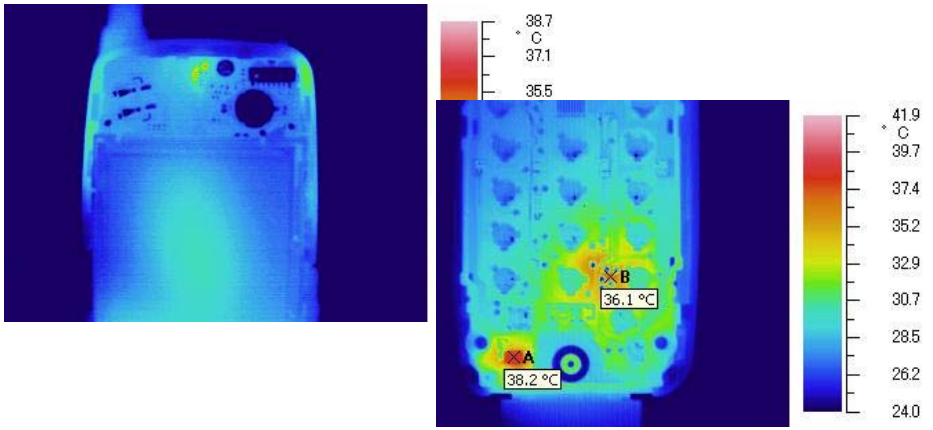


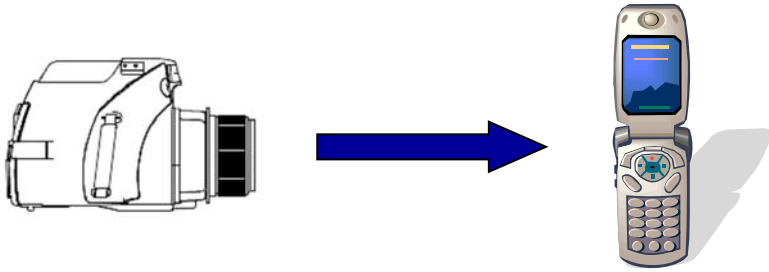


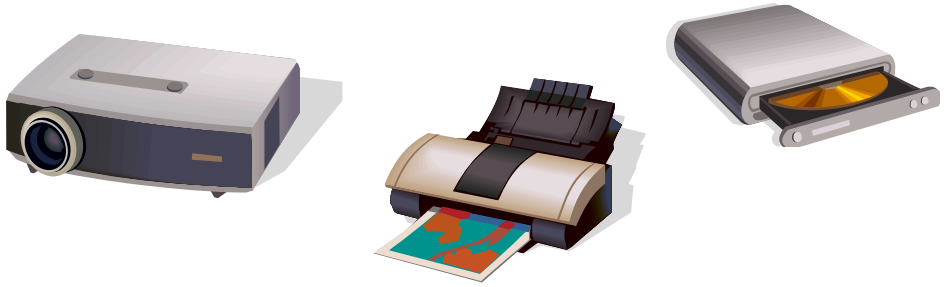
Mobile phone, car navigation system, and other electronic devices

- **Background**
  - Heat dissipation measures for small sized and highly functional devices.
  - Prevention of thermo-runaway and problem due to abnormal temperature
  - Reliability evaluation
- **Application examples**
  - Verification of heat generation during operation and environment test
  - Non-destructive test of defective section
  - Verification of temperature inside the housing
- **Recommended model**

  R300SR which has variety of functions and which can capture images easily via USB.

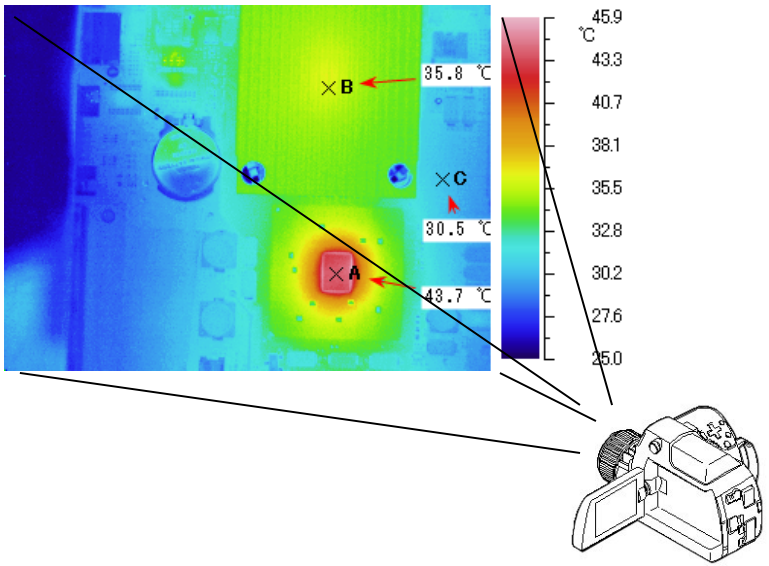


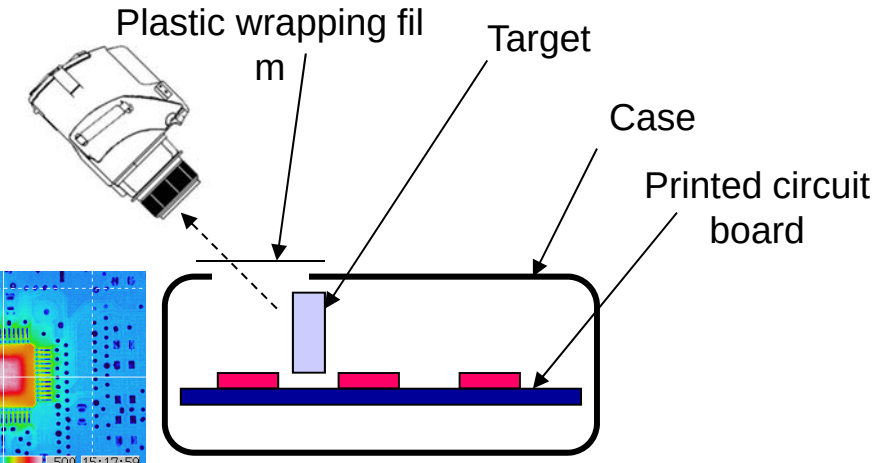


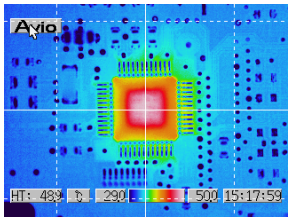


Thermal design of electronic equipment
(Measurement of temperature inside a housing)

- **Background**
  - Improvement of thermal balance
  - Improvement of reliability
- **Application examples**
  - Understand the heat balance of electronic equipment
  - Measurement of temperature rise of important component inside the case under room temperature condition.
  - When an electronic component is housed in a case, air temperature distribution surrounding that component is measured.
  - Measurement of temperature of important components in a case is estimated by adding temperature rise of the component to the air temperature.
  - A paper target is placed at a position of air temperature distribution desired to be measured, and measurement is taken by a thermography through a wrapping plastic film. (See illustration on the right.)

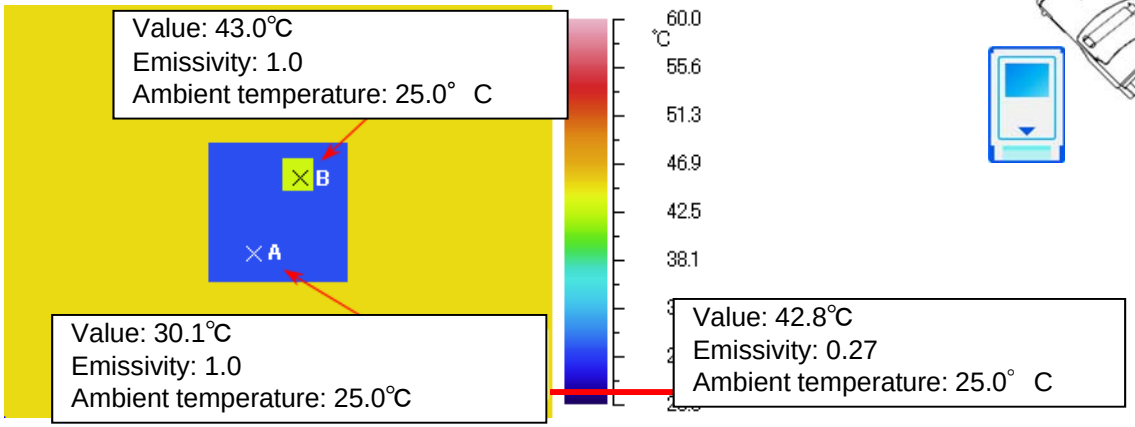


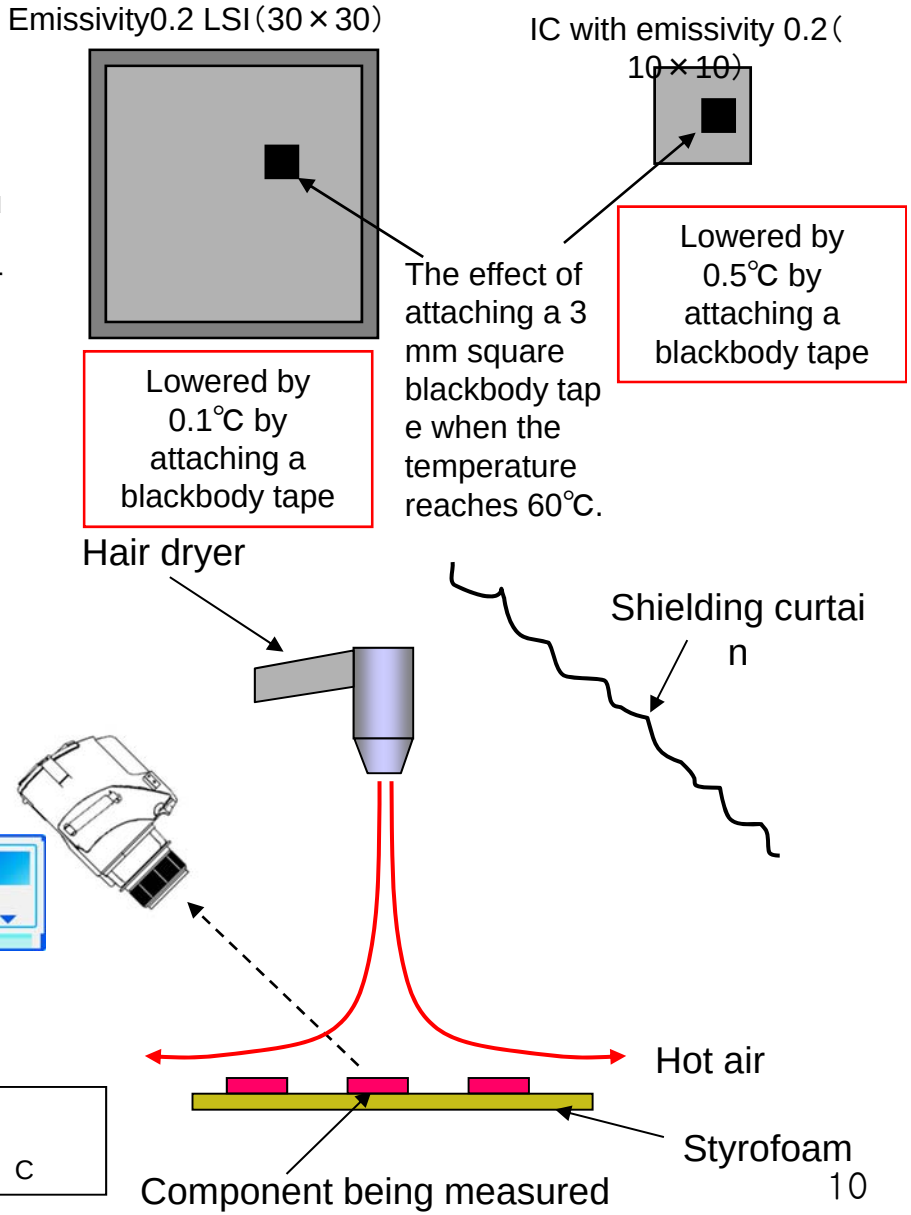




Thermal design of electronic equipment
(measurement of emissivity of a component)

- **Background**
  - Acquisition of emissivity data
  - Utilization for analysis of a thermal fluid
- **Application examples**
  - Emissivity data used in thermal fluid analysis can be measu red by a thermography.
  - A blackbody tape is attached on a component to be measur ed, and temperature of the heated section of the componen t is measured. (See illustration on the right.)
  - Heat the component evenly, using a hair dryer, up to the temperature close to that of an operating component. Place a shielding curtain so that the reflected temperature from the object is reflected to the ambient temperature without fail.
  - Record the thermal image, and obtain the emissivity using the thermal image analysis software.
  - Change the emissivity, and obtain the emissivity which will result in the same temperature as the one of the blackbody tape. (0.27 in the example below.)

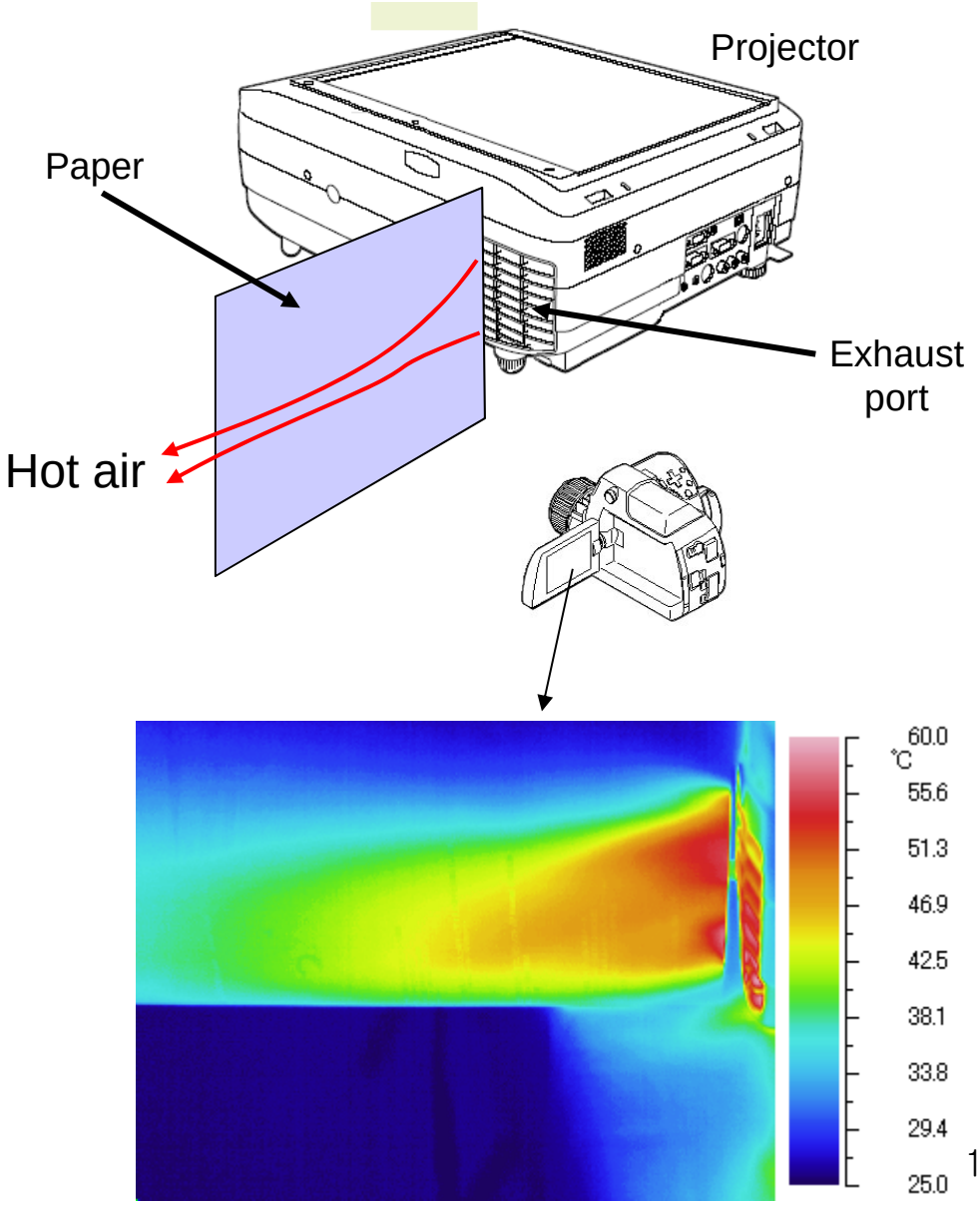




Thermal design of electronic equipment (heat current at the exhaust port)

- **Background**
  - Improvement of reliability
  - Improvement of temperature balance

- **Application example**
  - Temperature measurement at the exhaust port of an electronic equipment.
  - Place a paper with a small heat capacity at the position where the temperature distribution of air is desired to be measured.
  - Temperature of the paper and temperature distribution of a heat current at the exhaust port can be measured by a thermography.



Applications in automotive industries

Engine
Forging
Casting
- Engine block
- Cylinder
- Connecting rod/piston
- Head cover
- Alternator cover, etc.

Interior
Casting
Plastic molding
- Seat
- Instrument panel
- Steering wheel
- Air bag
- Door trim
- Floor mat, etc.

Exterior
Forging
Casting
Plastic molding
- Hood cover
- Fender panel
- Plastic bumper
- Window glass
- Gasoline tank (steel, plastic)

Driving, exhaust system
Forging
Casting
Performance evaluation
- Transmission
- Differential
- Power steering
- Catalyst
- Muffler, etc.

Conglomerate industry covering a wide range

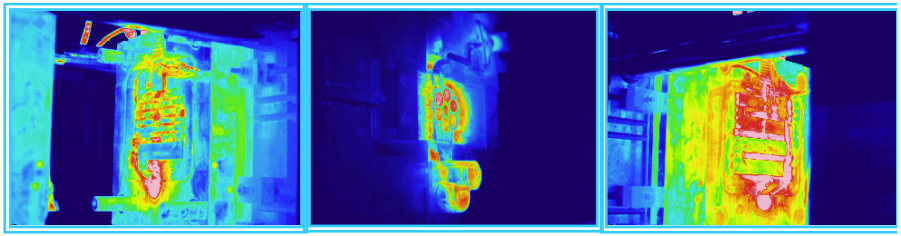
Electric system
Performance evaluation
- Harness (internal wiring)
- Periphery of the driver's seat (meters, air conditioner, audio)
- Various lamps
- Various motors (power window, etc.)

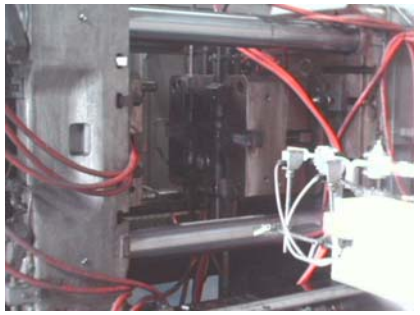
Tire
Performance evaluation
Casting
- Tire
- Aluminum wheel

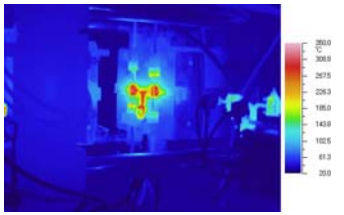
Under body
Forging
- Suspension
- Brake disk
- Brake rotor

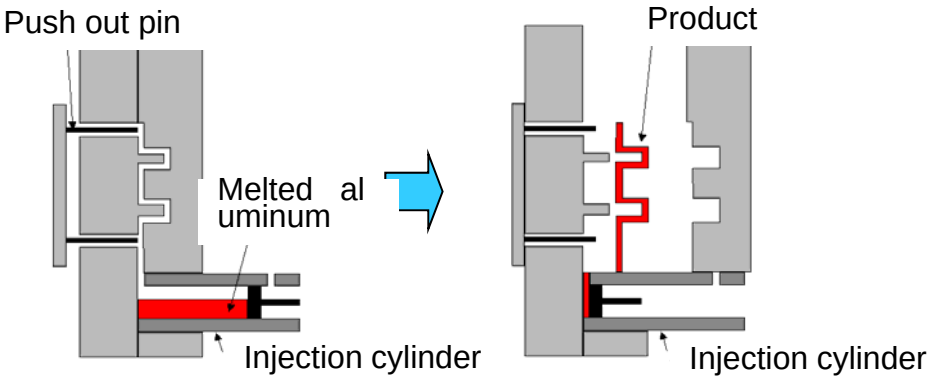
Casting (Aluminum die casting)

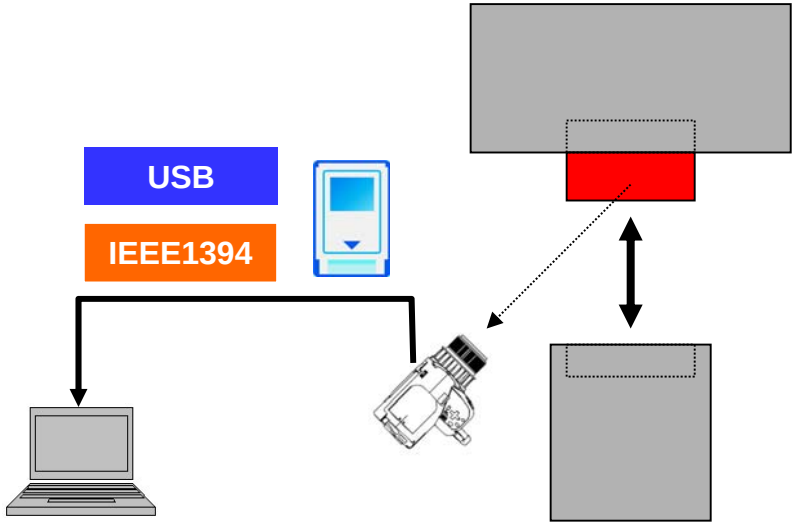
- **Background**
  - Prevention of problems by fixing parts together
  - Stabilization of quality
  - Longer life of metal mold, melting of metal mold
- **Application examples**
  - Monitor the temperature distribution on the metal mold surface during metal mold cooling after taking out the products or spraying the mold releasing agent.
  - Utilization in structure analysis and analysis of fluid flow and solidification process.







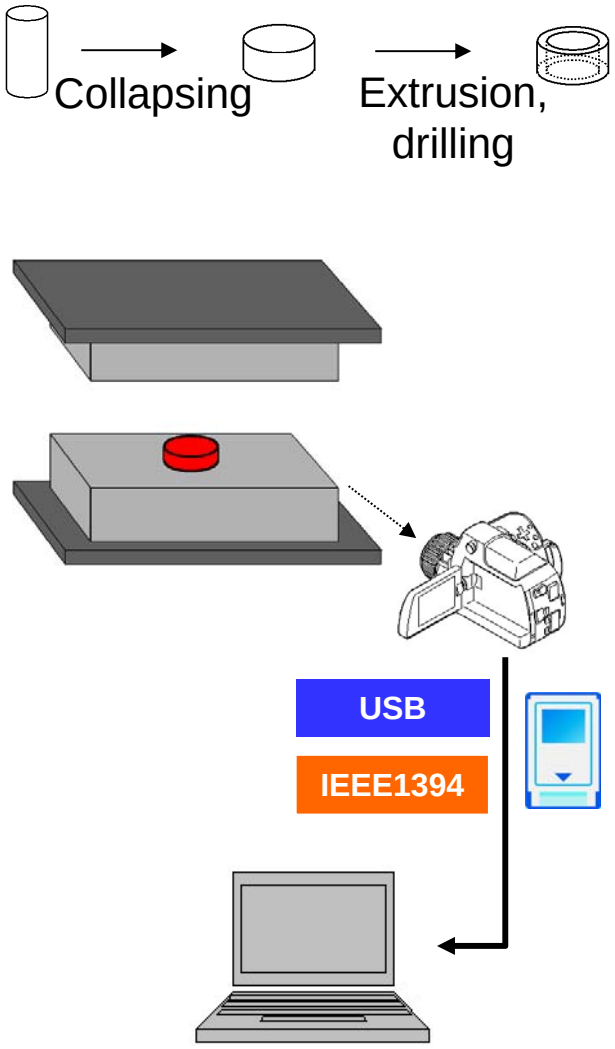




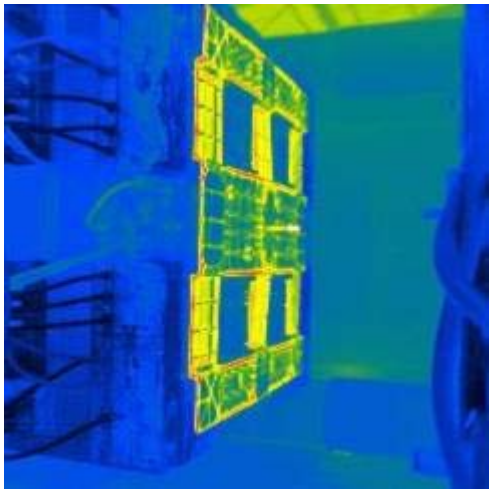
Forging

- Background
  - Prevention of facility/equipment problems
  - Stabilization of quality
  - Longer life of metal mold

- Application examples
  - Measure the temperature distribution on metal mold to check the processes
  - While the metal mold is heated to forging temperature by hot forging, inadequate temperature may cause cracking and excessive temperature may cause degradation of material quality. So, appropriate forging temperature must be selected.

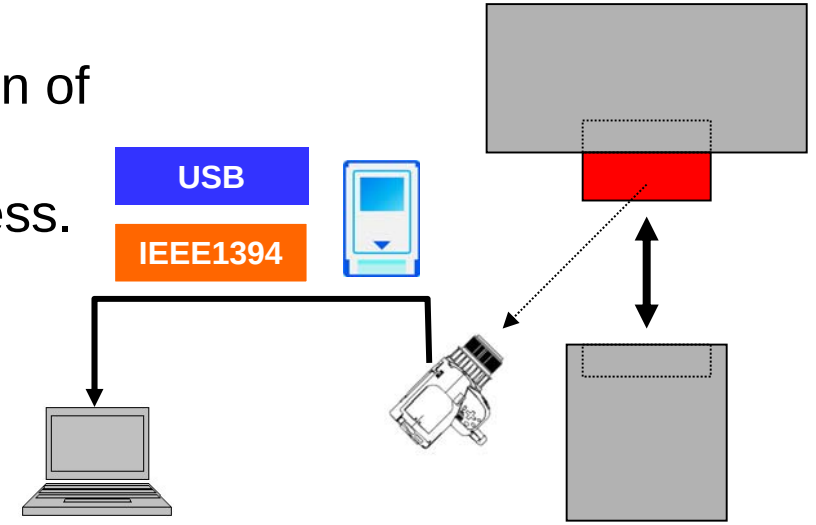


Plastic molding



- Background
  - Prevention of facility/equipment problems
  - Stabilization of quality

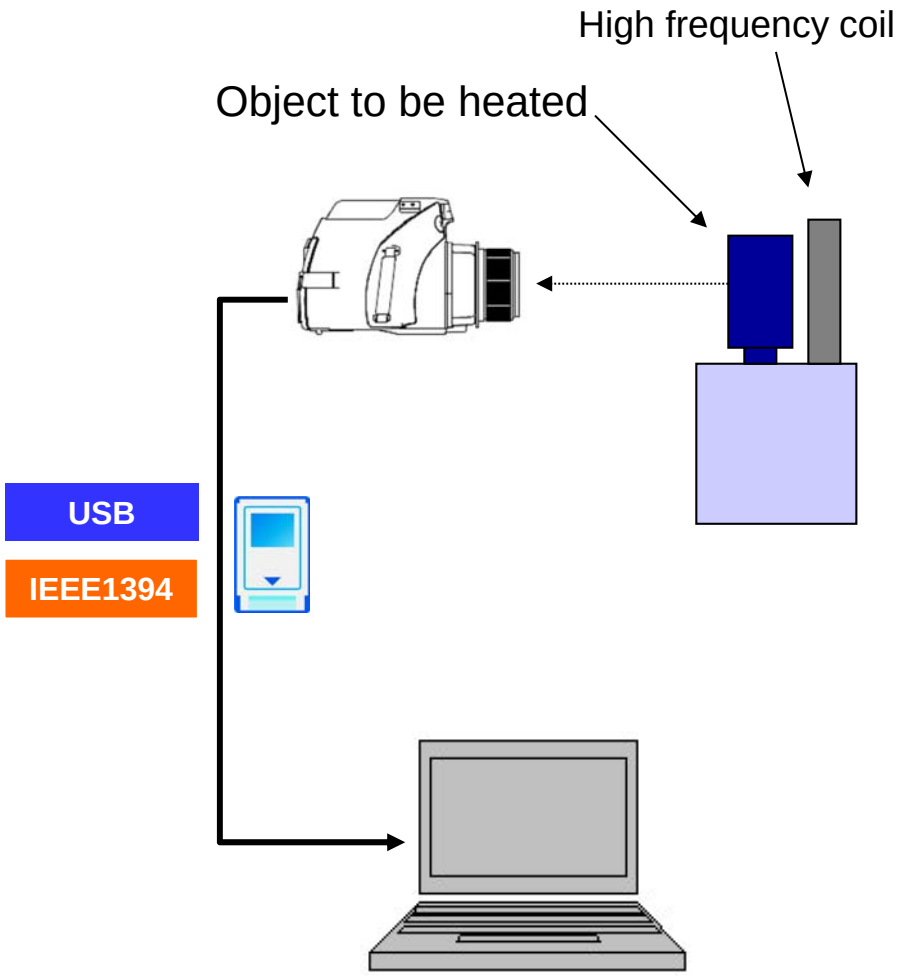
- Application example
  - Measure the temperature distribution of metal mold or plastic products immediately after the molding process.



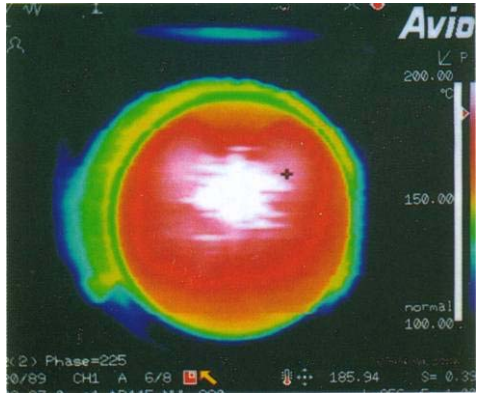
Quenching and tempering of components

- Background
  - Stabilization of product quality

- Application example
  - Measure the temperature distribution during high frequency heating.
  - By hardening the surface of mechanical components through high frequency heating process, mechanical characteristic (resistance to fatigue, in particular) as well as resistance to wearing is improved.

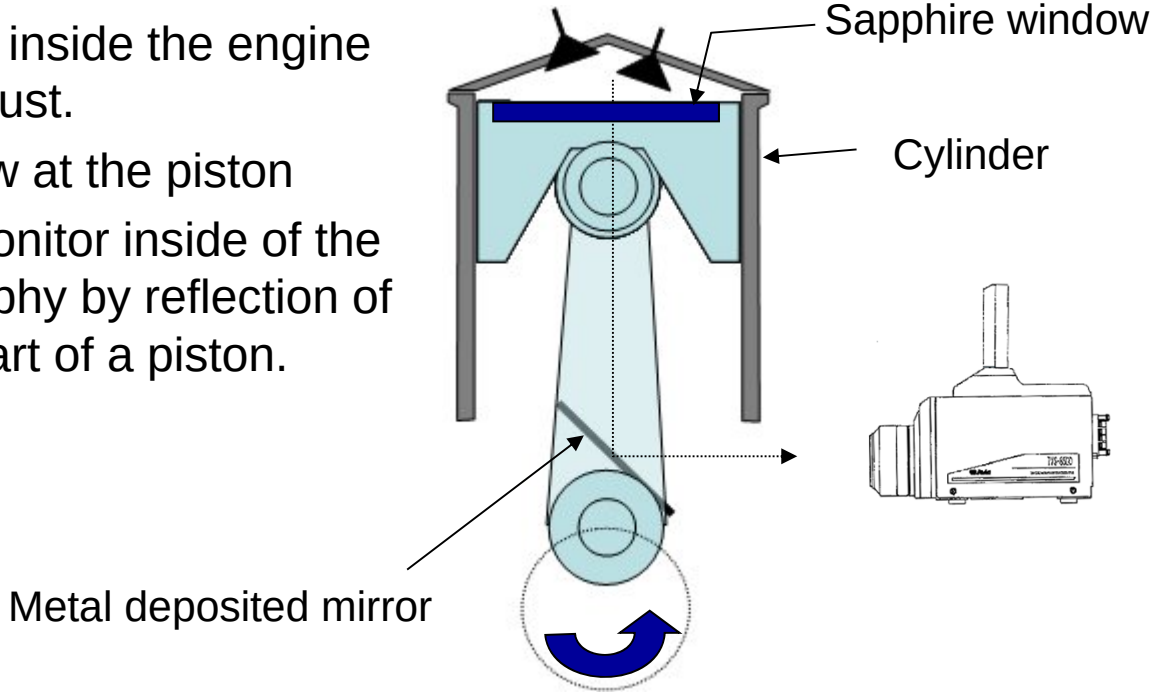


Engine



- Background
  - Improvement of engine performance efficiency
  - Exhaust emission control

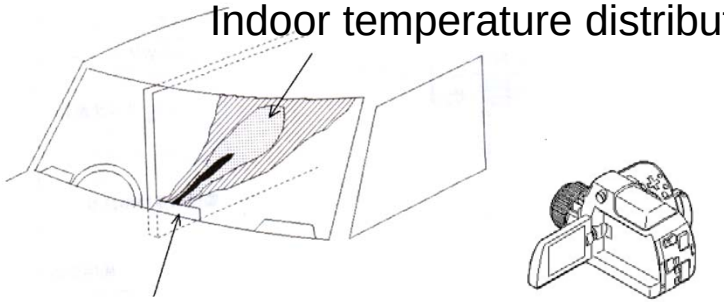
- Application examples
  - Measuring of temperature inside the engine during air intake and exhaust.
  - Provide a sapphire window at the piston head of an engine, and monitor inside of the engine using a thermography by reflection of the mirror at the bottom part of a piston.



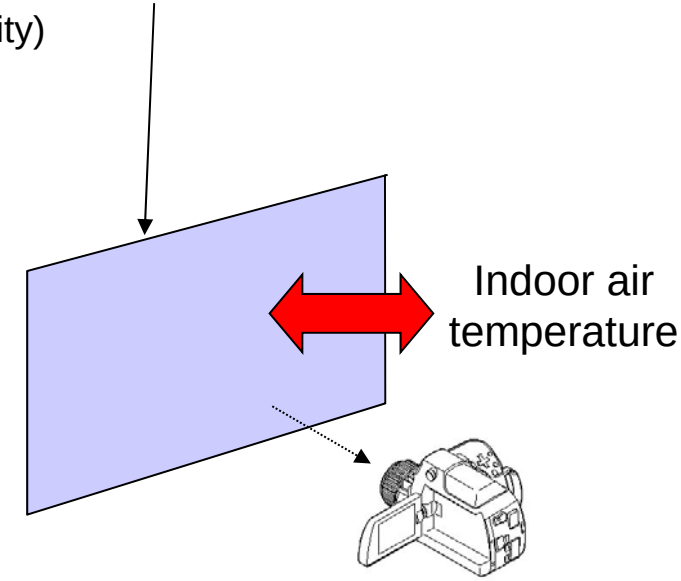
Air conditioner

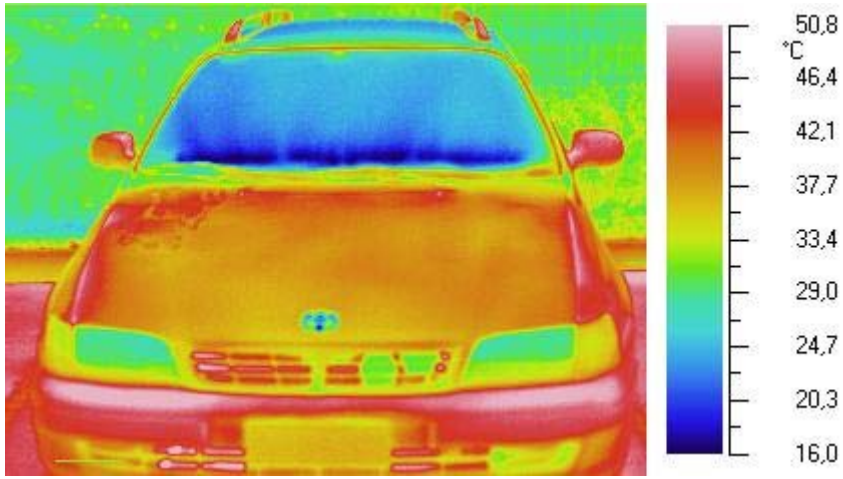
- Background
  - Improvement of interior comfort
- Application example
  - Measurement of interior temperature distribution
  - Place targets with small heat capacity, such as paper or Styrofoam, inside the car and capture their thermal images (visualization of air temperature).

Indoor temperature distribution



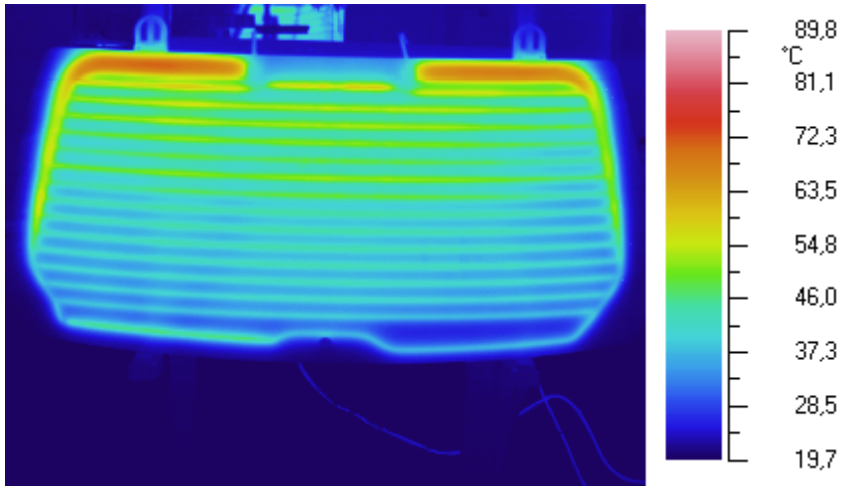
Targets for measuring indoor air temperature (paper, Styrofoam: objects with small heat capacity)

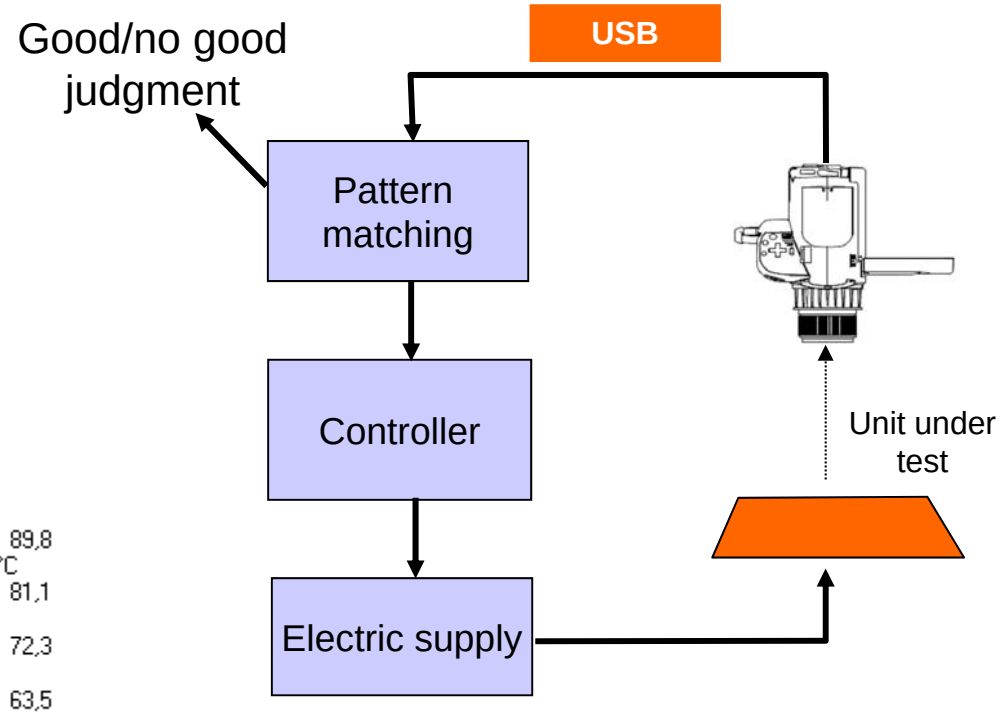




Defroster

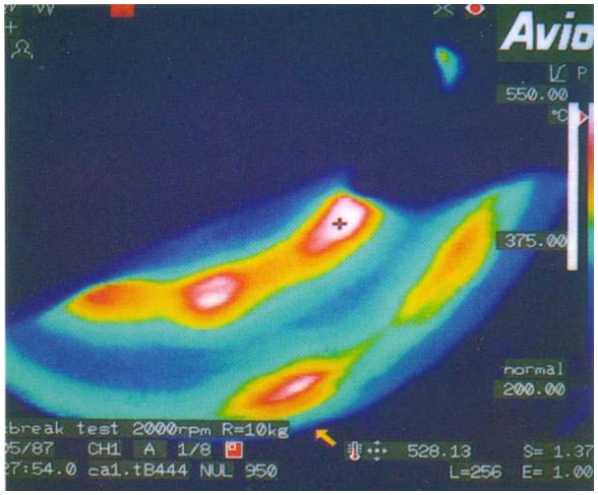
- Background
  - Quality improvement
- Application examples
  - Product inspection
  - Electrical test of defroster
  - Capture thermal image of the glass surface during heating
  - Good/no good judgment by comparing with the normal pattern during heating

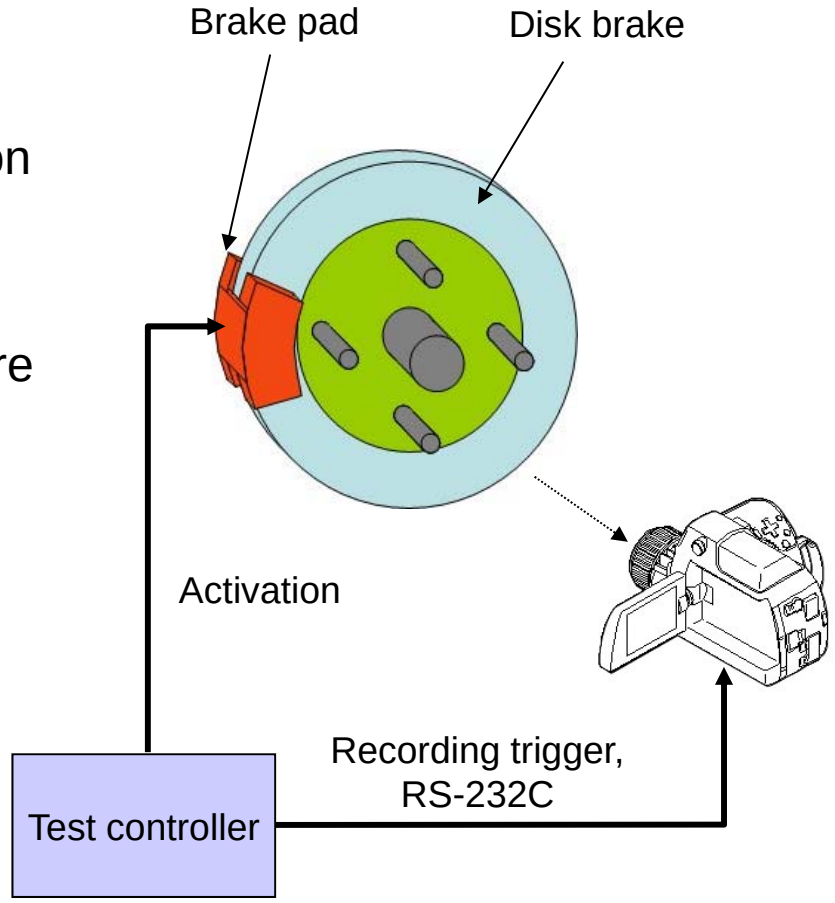




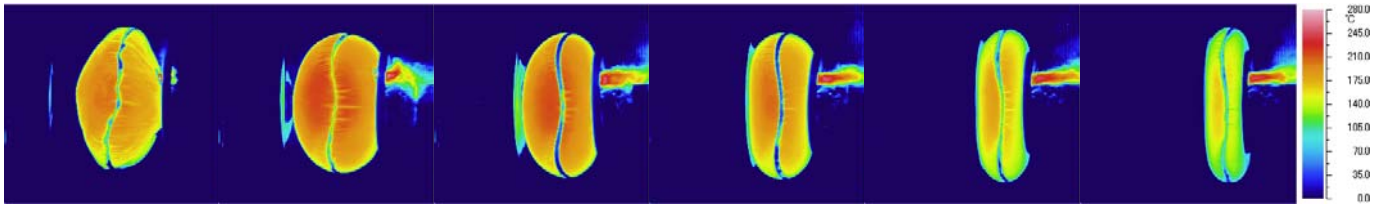
Brake

- Background
  - Improvement of reliability
- Application examples
  - Temperature distribution during activation
  - Understanding of temperature change after activation
  - For understanding of uneven temperature during activation due to disk rotating position.

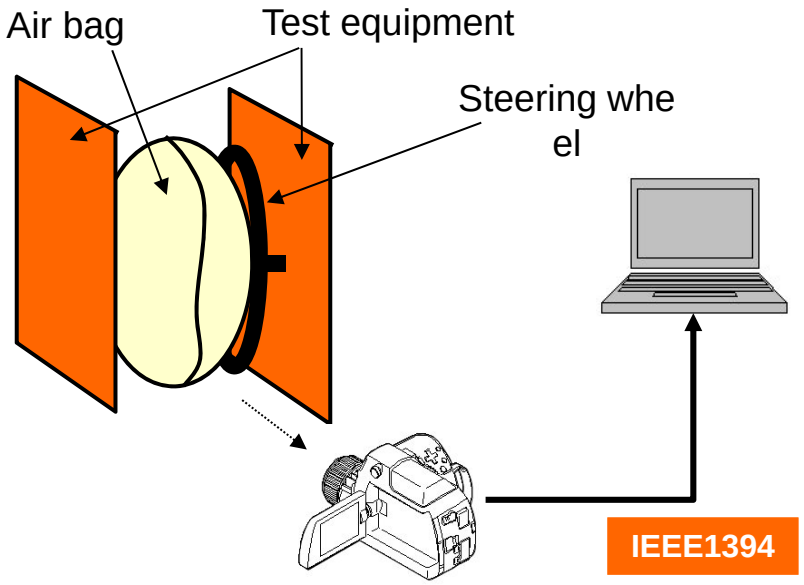


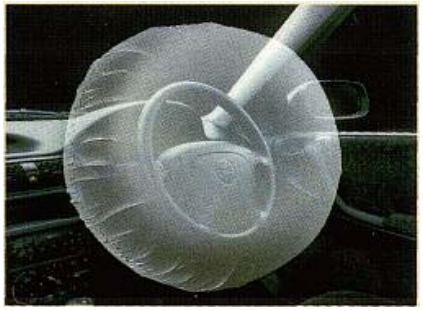


Air bag



- **Background**
  - Prevention of abnormal temperature at the time of activation
- **Application example**
  - Air bag is activated in high speed using test equipment, and temperature distribution is captured in high speed.
  - Because the air bag activation time is approximately 0.1 seconds.

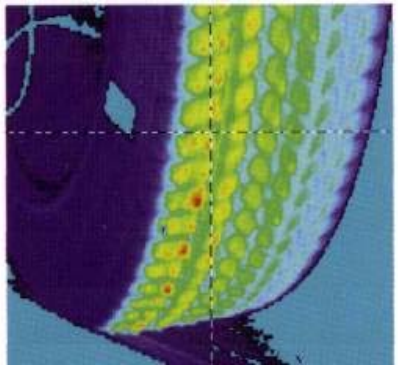


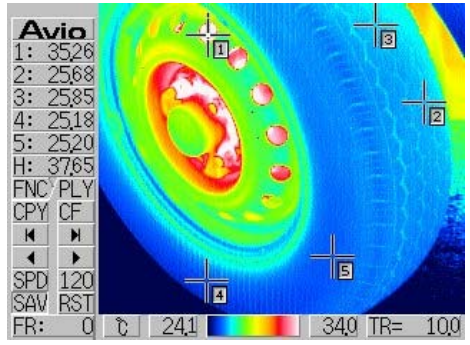


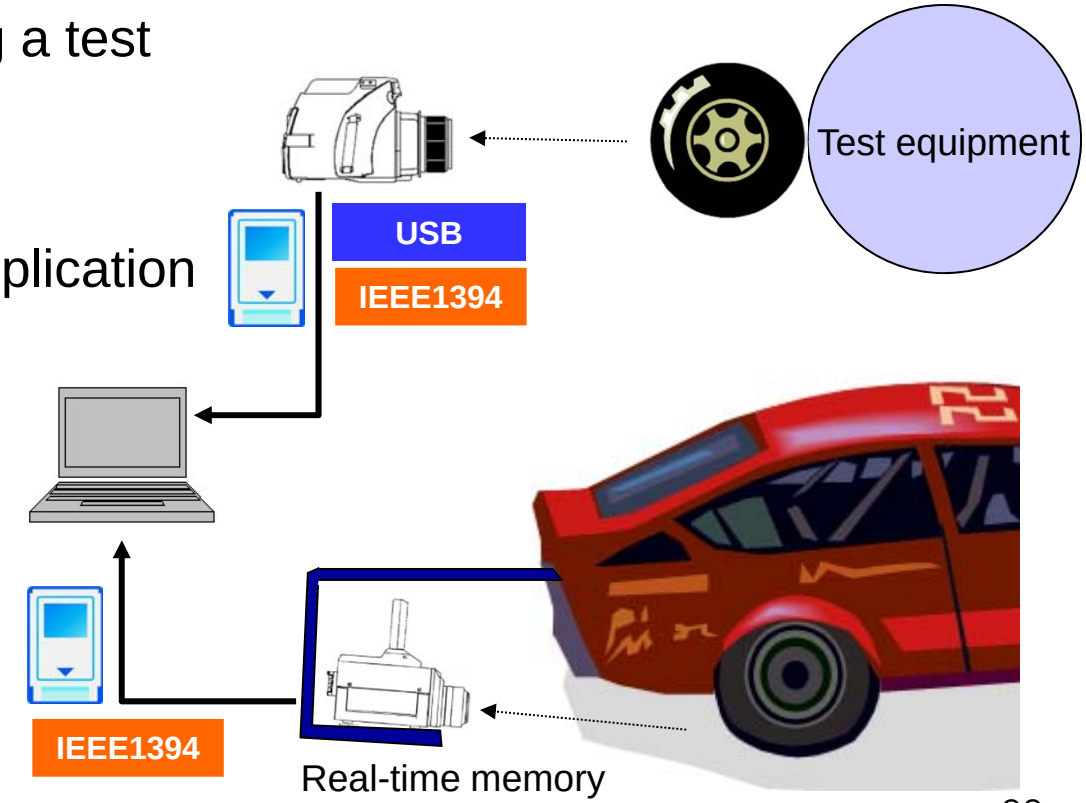
Real-time memory

Tire

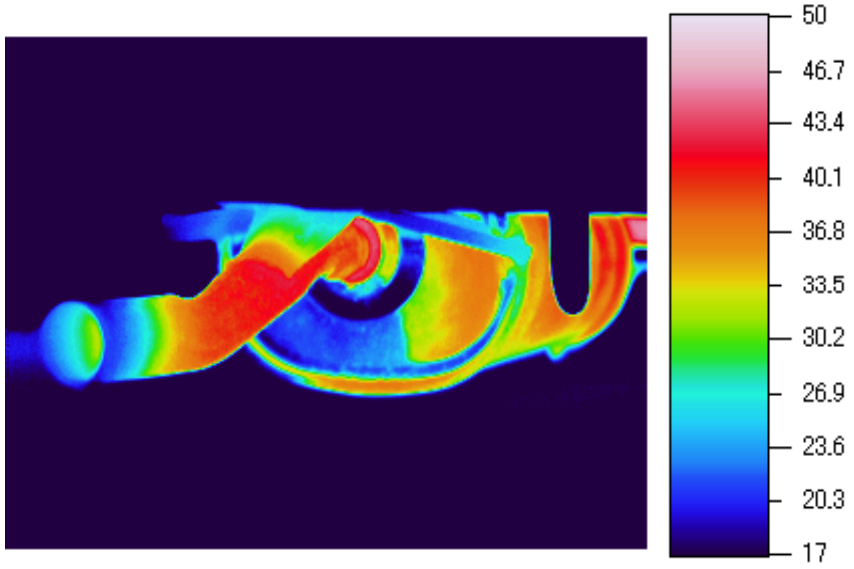
- Background
  - Improvement of quality
- Application examples
  - Temperature distribution during operation is measured using a test equipment.
  - Temperature distribution is measured during a brake application while the car is running.





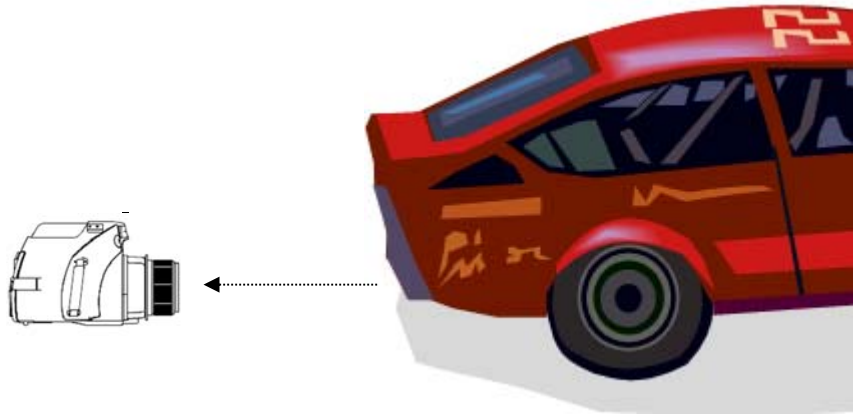


Muffler, catalyst



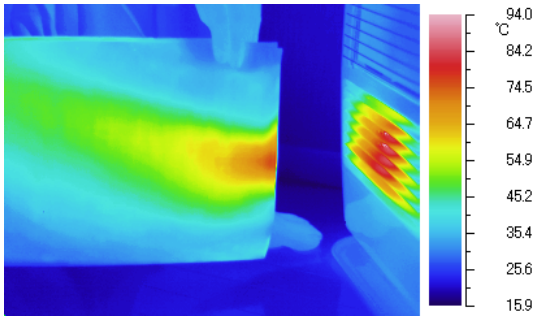
- Background
  - Improvement of quality
  - Improvement of catalyst action efficiency

- Application example
  - Temperature distribution is measured during activation

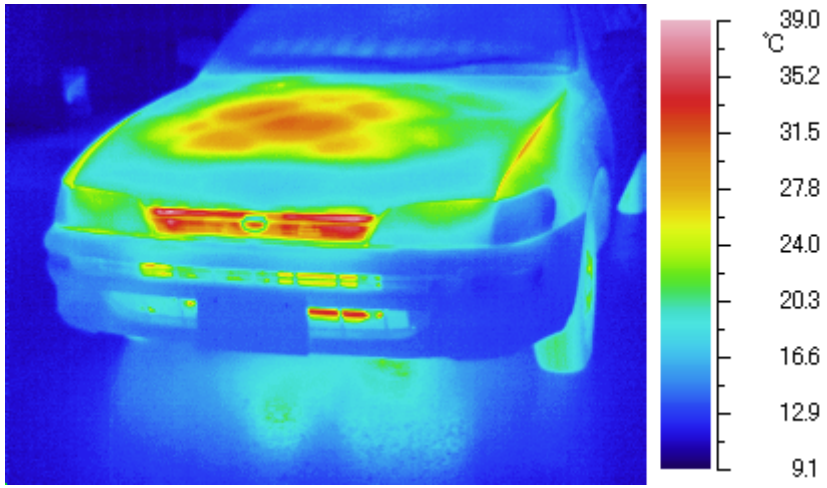


Engine exhaust heat

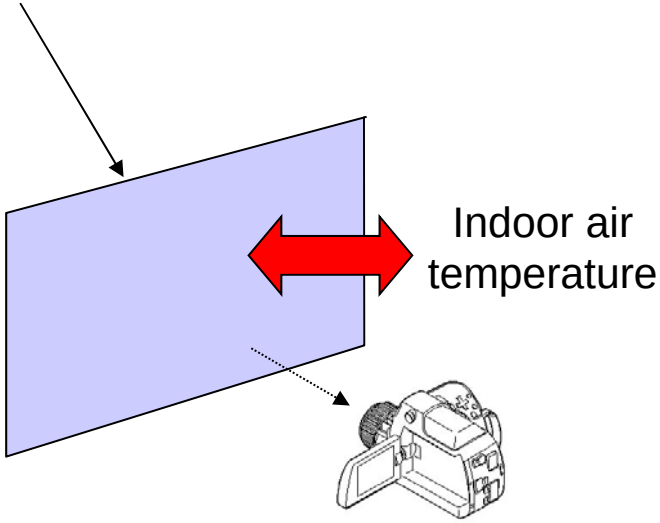
- Background
  - Improvement of quality
  - Temperature control of engine



- Application example
  - Measurement of temperature distribution on engine and its periphery.

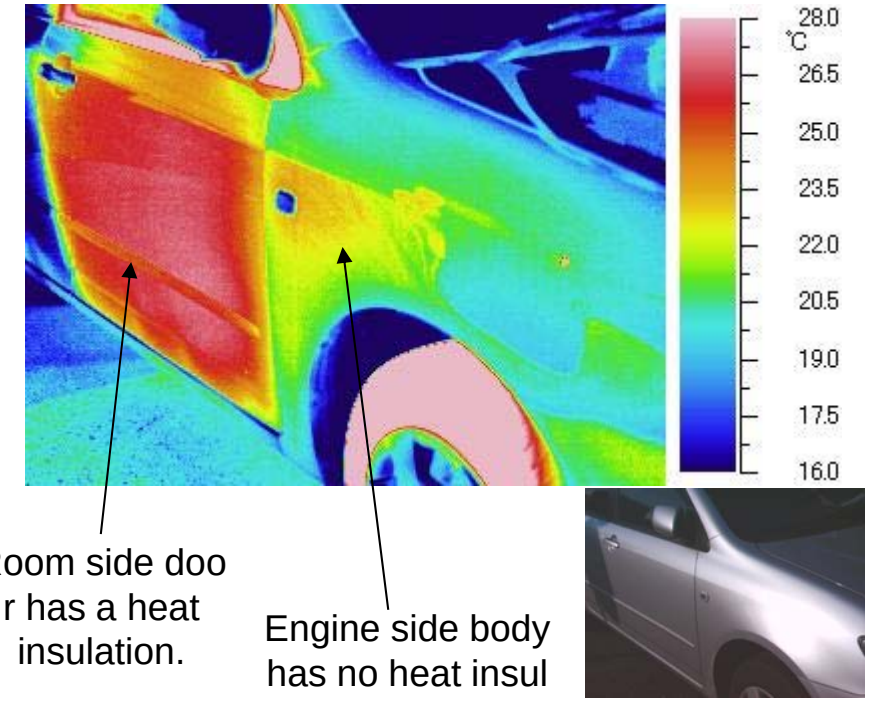


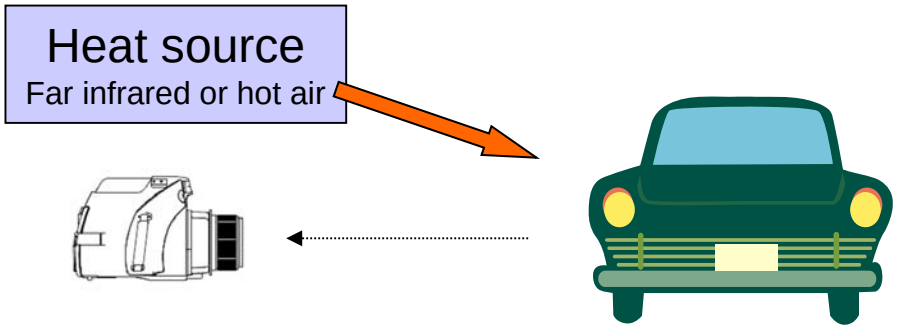
Target for temperature measurement of the engine and the surrounding air (object with small heat capacity, such as paper or Styrofoam).



Indoor heat insulation

- Background
  - Improvement of indoor environment
- Application example
  - Evaluate heat insulation performance based on the heat rise and temperature distribution of a car body by far infrared heating or hot air.

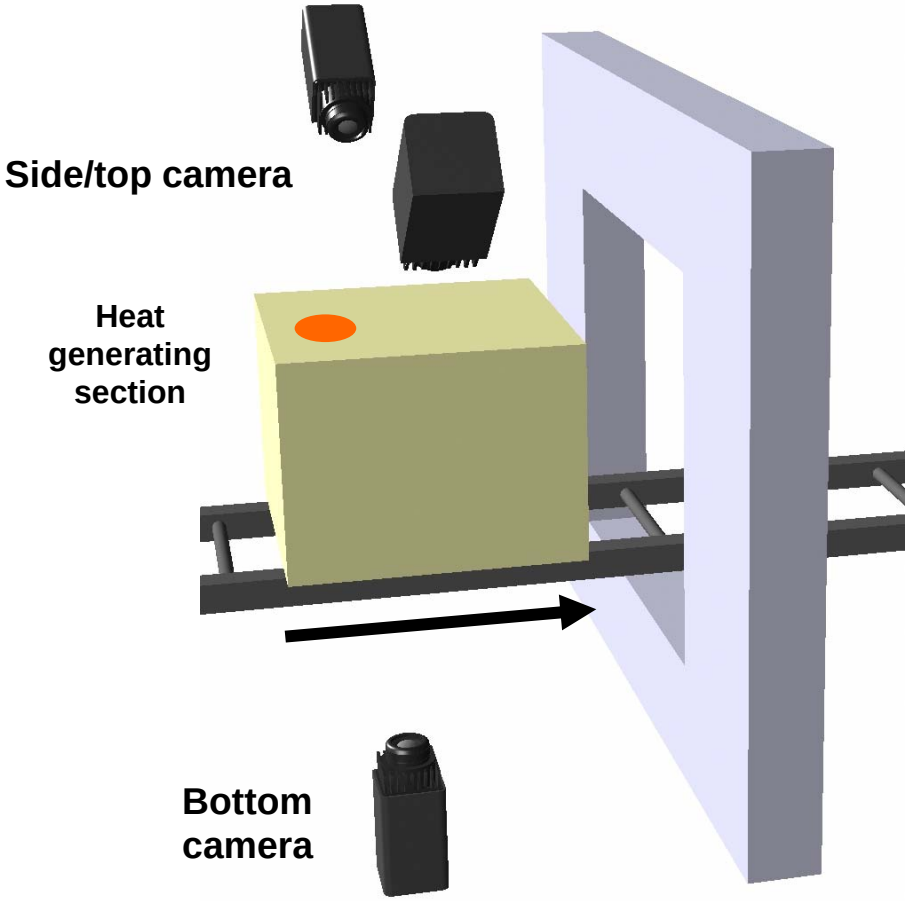




Disaster Monitoring

Automated warehouse

- Goods are measured by three monitoring control thermographies before entering the automated warehouse.
- Alarm is sent out when the temperature of the goods exceeds the preset temperature.



Garbage pit

- Natural fire on garbage is detected, and water is sprinkled.