optris
infrared measurements

Application Guide

Infrared Temperature Measurement Solutions for Industrial and Manufacturing Processes

EXPERTISE IN INFRARED TEMPERATURE MEASUREMENT TECHNOLOGY

Welcome to the world of Optris!

As one of the leading companies in non-contact temperature measurement, Optris looks forward to welcoming more satisfied customers who rely on its measurement technology, known for high quality and pioneering measurement and application concepts.

Trusted Infrared Technology from Optris

Since its foundation in 2003, Optris has been dedicated to advancing the field of non-contact temperature measurement. Today, Optris is a globally recognized provider of infrared cameras, pyrometers, software, accessories, and complete system solutions. With one of the most comprehensive product portfolios in the industry, Optris supports a wide range of temperature measurement applications across manufacturing, process industries, automation, research, and development.

From monitoring high-temperature metal processes and glass production to ensuring product quality in plastics manufacturing, battery production, electronics, and laboratory environments, Optris solutions are trusted worldwide to deliver precise thermal data. The broad portfolio enables customers to find the right solution for virtually any temperature measurement challenge, regardless of target material, temperature range, installation constraints, or environmental conditions. Combined with an exceptional price-performance ratio, Optris products offer advanced German engineering, reliable operation, and seamless integration into existing processes.

The application examples presented in this brochure demonstrate how Optris technologies help optimize processes, improve product quality, increase safety, and support innovation across diverse industries. The result is a versatile and future-proof portfolio, trusted worldwide for its quality, reliability, and ability to solve complex temperature measurement tasks.

Dr. Sascha Kienitz, CEO of Optris GmbH & Co. KG

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Discover the Optris YouTube Channel

Explore Optris infrared temperature measurement devices, including setup, properties, and special features.
The Optris YouTube channel provides an overview of the company and the world of infrared measurement technology.

The videos illustrate product functionality
and practical industrial applications.:

- **New products**
- **How to‘s**
- **Software tutorials**
- **Hands-on-trainings**

Metal Applications

INTRODUCTION

For more information about this Industry please visit our website:

Optris Website

https://optris.com

In metal production and processing, non-contact temperature monitoring is essential for optimizing procedures at temperatures up to 3500 °C, where contact thermometers have limited lifespans. Continuous monitoring is crucial in rolling mills, continuous casting plants, slag ladle cars, induction hardening, and die forging. Optris has developed infrared measurement devices for high temperatures and harsh environments, making temperature measurements on metal surfaces efficient and reliable.

Optris utilizes state-of-the-art infrared cameras and thermometers to ensure precise monitoring, crucial for maintaining safety and optimizing processes. Their short-wavelength technology minimizes measurement errors, providing accurate readings on shiny surfaces even under challenging conditions. Optris' two-color pyrometers compensate for varying emissivity, offering the highest accuracy available. Their robust, high-speed thermal imaging solutions are ideal for rapid processes, while features like dual laser sighting and customizable software integration enhance operational efficiency.

Challenges of Infrared non-contact Temperature Measurement

One significant issue is **emissivity variation**; different metals reflect infrared radiation differently, which can impact the accuracy of temperature readings.
Temperature gradients also pose a challenge. Metals often have varying temperatures across their surfaces, especially during processes like casting or forging.
Furthermore, **high ambient temperatures** and **process fumes** can interfere with IR measurement

Benefits of Infrared non-contact Temperature Measurement

Despite these challenges, IR non-contact temperature measurement offers substantial benefits in the metal industry:

- Precision in high-temperature environments / Real-time monitoring
- Measure temperatures without direct contact - reduces the need for physical interaction with hot metals
- Immediate adjustments during manufacturing processes
- Enhance overall operational efficiency
- Cost-effective: Improved product consistency and reduced waste

Metal Applications

STEEL FORGING

For more information about this application please visit our website:

Optris Website

https://optris.com

Challenges in Steel Forging – Temperature Control as a Critical Factor

Steel forging is a complex process that involves deforming metal at high temperatures to achieve specific shapes and metallurgical properties. A critical step in this process is shaping the heated steel in a press, a common technique in hot forging. The process begins by heating the steel blank to a precise temperature, typically between 900 °C and 1200 °C. This high temperature alters the steel's crystalline structure, making it plastically deformable. Monitoring the metal's temperature relative to its recrystallization point is essential to ensure the correct metallurgical properties are obtained.

Maintaining this temperature range is crucial, as even slight deviations can lead to significant product defects. If the steel overheats, it risks burning, compromising material integrity and causing brittleness. Conversely, if it cools too much, the steel becomes harder to forge, increasing the risk of structural flaws. Additionally, improper temperature control can result in damage to processing equipment, such as dies, rollers, presses, or hammers, leading to expensive downtime and increased maintenance costs.

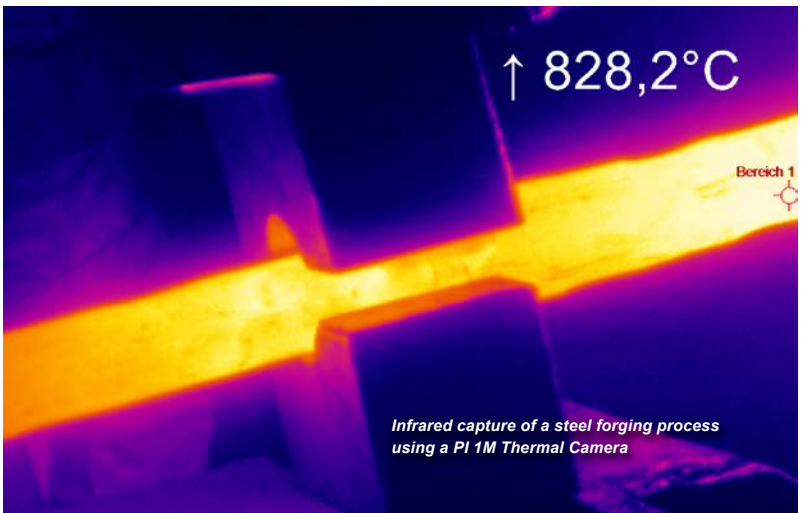
The Optris Solution

Optris infrared cameras, specifically the PI 1M model, are integrated into the steel forging process to provide continuous and accurate temperature monitoring. The camera is strategically positioned to have a clear view of the forging area, ensuring it captures the precise temperature of the steel as it undergoes deformation. The PI 1M features a highly dynamic CMOS detector with up to 764 x 480 pixels resolution, allowing it to capture detailed thermal images at a frame rate of up to 1 kHz, making it suitable for monitoring fast-moving processes. It is possible to monitor multiple production lines simultaneously with one IR camera, capturing and analyzing multiple temperature signals.

In scenarios with challenging environmental conditions, such as in open forging spaces with high levels of heat, smoke, and dust, the camera is housed in a protective cooling enclosure with air purge systems to maintain optimal functionality. The camera's spectral range of 0.85 to 1.1µm is ideal for measuring the high temperatures encountered in steel forging without interference from reflections or environmental factors.

Benefits using Optris

- Reliable temperature monitoring ensures consistent steel quality, significantly reducing material defects and waste.
- Continuous real-time feedback allows quick response to temperature deviations, minimizing equipment damage and downtime.
- Automated thermal surveillance decreases manual intervention, lowering labor costs and human measurement errors.
- Documentation of thermal data throughout forging facilitates improved quality assurance and regulatory compliance.
- Precise temperature uniformity control prevents thermal gradients, eliminating product cracking and enhancing production efficiency.



Infrared capture of a steel forging process using a PI 1M Thermal Camera

Recommended Products

PI 1M Thermal Camera
especially suited for measurements of metals defects and waste

Xi 1M ETH Thermal Camera
short-wavelength thermal camera designed for low-emissive materials

CTratio 1M Two-Color Ratio Pyrometer
For demanding point measurements in high-temperature applications

Metal Applications

METAL CASTING PROCESS

For more information about this application please visit our website:

Optris Website

https://optris.com

Overcoming the Limitations of Dip Thermocouples in the Casting Process

In metalworking, casting is a process where metal is heated until it becomes a liquid, then poured into a mold, typically using a crucible. The mold contains a negative impression of the desired shape, allowing the metal to solidify as it cools, forming the final casting. This method is particularly advantageous for producing complex shapes that would be challenging or uneconomical to create using other techniques.

Casting offers benefits like high surface quality and minimal material waste, but it also involves significant costs, primarily for mold tooling and the energy required to heat the metal. As the metal cools in the ladle, its temperature gradually decreases with each successive pour. If the temperature drops below a critical threshold, the casting may be incomplete, leading to defects. In such cases, the defective part must be discarded, wasting the energy invested in the process. To prevent this, it is crucial to monitor the casting temperature and halt the process if the molten metal drops below the optimal range. If necessary, the metal can be reheated to ensure a successful casting.

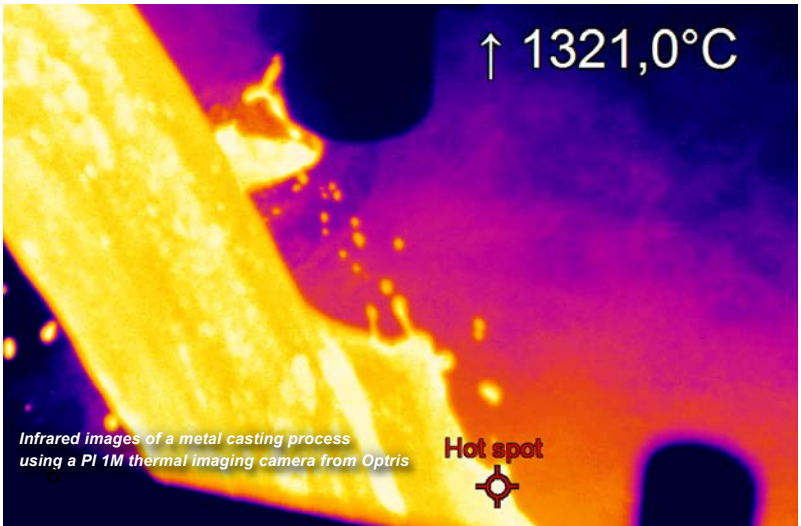
The Optris Solution

An infrared camera is essential for optimizing the casting process, offering real-time temperature monitoring that ensures molten metal stays within the optimal range. This level of precision significantly reduces the risk of defects such as incomplete casts or solidification shrinkage. By capturing detailed thermal data, the camera allows for immediate adjustments, preventing costly errors and minimizing material waste. It also monitors the cooling rate, promoting uniform solidification and high-quality surface finishes.

Measuring liquid metal temperature with long-wavelength infrared cameras presents challenges due to the metal's high reflectivity and varying emissivity, which can result in inaccurate readings. Short-wavelength infrared cameras, like the PI 1M or Xi 1M, provide a more effective solution by leveraging metal's higher emissivity at shorter wavelengths and the exponential increase in infrared radiation at these wavelengths. This approach yields more accurate temperature measurements, ensuring reliable data even in the most demanding metal-casting environments.

Benefits using Optris

- Reduces scrap rates by preventing defective or incomplete castings
- Lowers operational costs by eliminating frequent thermocouple replacements
- Enhances worker safety through non-contact temperature monitoring
- Improves casting quality with accurate, real-time thermal imaging
- Enables seamless automation and better control via continuous thermal data

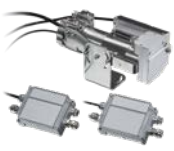


Infrared images of a metal casting process using a PI 1M thermal imaging camera from Optris

Recommended Products

PI 1M Thermal Camera
especially suited for measurements of metals defects and waste

Xi 1M ETH Thermal Camera
short-wavelength thermal camera designed for low-emissive materials



Xi 1M Industiral Package
for thermal monitoringunder harsh conditions, includes water cooling, Laminar air purge and shutter system

Metal Applications

INDUCTIVE HARDENING PROCESS

For more information about this application please visit our website:

Optris Website

https://optris.com

Precision Infrared Temperature Feedback in Induction Hardening Processes

A hardening process enhances wear resistance, surface hardness, and fatigue life by creating a hardened surface layer while maintaining an unaffected core microstructure. Induction hardening specifically improves the mechanical properties of ferrous components in targeted areas.

Favored for components subjected to heavy loading, induction hardening imparts high surface hardness capable of withstanding extreme loads. Fatigue strength increases through the development of a soft core surrounded by a tough outer layer, making these properties desirable for parts experiencing torsional loading and impact forces. This process is performed one part at a time, ensuring consistent dimensional movement across parts.

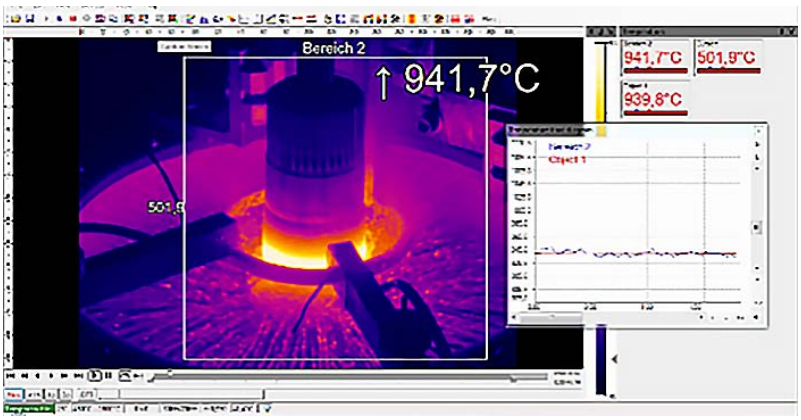
Typical applications of induction hardening include gears, shafts, axles, cam lobes, stampings, and spindles, particularly symmetrical parts, which benefit applications such as powertrain, suspension, engine components, and stampings. Materials treated include carbon steel, alloy steel, stainless steel, powder metal, cast iron, gray iron, ductile iron, and malleable iron.

The Optris Solution

Non-contact infrared temperature sensing is the best practice for thermal measurement in induction heating processes. These infrared instruments offer rapid and accurate temperature readings of objects in strong electromagnetic fields without physical contact. They can measure extremely high temperatures, up to 3500 °C, with a wide dynamic range and fast response time, ensuring quick and precise measurements. Notably, all IR sensors are positioned outside the electromagnetic field, and their readings remain unaffected by electromagnetic interference, unlike thermocouples.

The moving target, combined with steam or dust generated by water or oil, presents challenges for any optical system in detecting temperature. Typically, ratio pyrometers with narrow field of view are often preferred for inductive hardening applications. However, in some cases as here, especially for large-scale objects and moving inductors, a short-wavelength camera is the better choice. This option offers more flexibility, as the entire field of view can be used to detect the object.

Depending on the size, local conditions, and visual requirements, additional accessories like the Optris cooling jacket may be necessary to protect the infrared device.



Infrared recording with Optris PIXConnect software during the inductive hardening process

Benefits using Optris

- Enables precise control of heating phase through accurate surface temperature feedback
- Ensures consistent hardness and mechanical properties across complex, moving parts
- Operates reliably in high-EMI environments without signal disruption
- Improves process repeatability and documentation via thermal image archiving
- Minimizes risk of defects by equalizing obstructed views using hotspot detection

Recommended Products

CSvision Ratio Thermometer
with motorized focus, patented crosshair laser and video sighting (up to 3500 °C)

PI 1M Thermal Camera
provides real-time, accurate temperature distribution for target temperatures around 1000 °C without interfering with the process

CoolingJacket Advanced
Universal cooling housing for optris infrared thermometers and cameras

Plastic Applications

INTRODUCTION

For more information about this Industry please visit our website:

Optris Website

https://optris.com

In the plastic industry, infrared (IR) temperature measurement is essential for optimizing production processes and ensuring high-quality outputs. Accurate temperature control is crucial during plastic molding, extrusion, and cooling. Infrared thermometers and cameras provide precise, non-contact measurements that are indispensable in these high-temperature environments.

IR temperature measurement helps in monitoring the molding process, where maintaining optimal temperatures is vital to avoid defects like warping and inconsistent product quality. By providing real-time data, IR sensors enable manufacturers to make immediate adjustments, ensuring that plastic products meet stringent specifications.

During the extrusion process, accurate thermal monitoring ensures that plastic melts evenly and flows consistently, which is key to producing uniform profiles and avoiding material wastage. IR cameras also play a significant role in cooling applications, where precise temperature control prevents stress and deformation in cooling plastics.

Challenges of Infrared non-contact Temperature Measurement

Infrared (IR) non-contact temperature measurement faces specific challenges in the plastic industry. One significant issue is **emissivity variation**. Plastics exhibit different emissivity levels depending on their type and surface finish, which can affect the accuracy of IR sensors. Calibrating IR devices to account for these variations requires meticulous adjustment and regular calibration to maintain reliable readings. **High ambient temperatures** in processes like molding and extrusion can interfere with IR measurements. **Surface reflectivity** is another challenge: Plastic surfaces can be highly reflective, which may lead to erroneous readings.

Benefits of Infrared non-contact Temperature Measurement

Despite these challenges, IR non-contact temperature measurement offers substantial benefits in the plastics industry:

- Real-time monitoring - provide immediate temperature data
- Real-time capability ensures improved product consistency and quality
- Enhanced quality control - avoiding defects and waste
- Reduced energy consumption and lower operational costs
- Enhances overall production efficiency and quality

Plastic Applications

INJECTION STRETCH BLOW MOLDING (PET)

For more information about this application please visit our website:

Optris Website

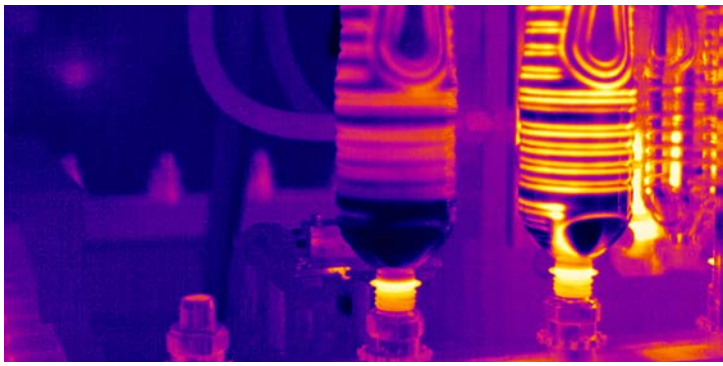
https://optris.com

High-Speed Manufacturing and the Risk of Temperature Deviations

The Injection Stretch Blow Molding process is a widely used method for manufacturing plastic containers, especially PET bottles. This process typically involves two stages. In the first stage, called injection molding, plastic preforms are created. These preforms resemble thick-walled plastic tubes with one open end that usually already includes the bottle's threaded neck for the cap. In the second stage, known as stretch blow molding, the preform is heated and then stretched and blown into its final shape inside a mold using compressed air.

Temperature control is critical during the heating of the preform. The preform must reach a specific temperature to soften appropriately, allowing it to be blown evenly into the mold. If the temperature is too low, the material may not stretch correctly, resulting in uneven wall thickness or incomplete formation. Conversely, if the preform is overheated, the material may become too thin, leading to weak spots in the bottle. Both scenarios can lead to quality issues.

Given the high speed of modern production lines, where hundreds or thousands of bottles are produced in a short period, precise and fast temperature measurement is essential to ensure product consistency and quality.

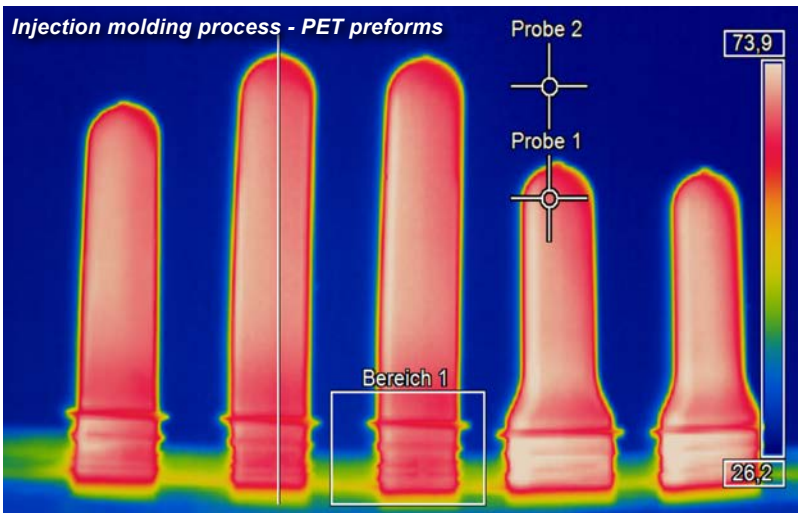


The Optris Solution

In the Injection Stretch Blow Molding process, the infrared pyrometers CTi LTfast and CTi 4ML are essential for precise temperature control. These sensors are strategically mounted to monitor the temperature of preforms as they are heated before entering the mold. The CTi LTfast offers an ultra-fast response time of just 6 milliseconds, which is crucial for high-speed production lines. With a temperature range from –50 °C to 1050 °C, the CTi LTfast can detect even the slightest temperature deviations, ensuring consistency in bottle production.

The CTi 4ML provides an even faster response time of 90 microseconds and measures temperatures from 0 °C to 600 °C. Its compact design, with a sensing head only 14 mm in diameter, allows it to fit into tight spaces within the machine. Its spectral range of 2.2 to 6 µm makes it ideal for materials like plastic, which may have varying emissivity, ensuring accurate temperature readings.

Both pyrometers deliver real-time data that can be integrated directly into the machine's control system via interfaces such as Modbus TCP or Ethernet IP. This allows for automatic adjustments in the heating process when temperatures deviate from the optimal range. Their high-speed measurement capabilities and reliability help maximize production output while maintaining the quality of the plastic bottles being manufactured.



Benefits using Optris

- Improved bottle quality through consistent and uniform preform heating
- Reduced scrap rates caused by overheating or insufficient softening
- Enhanced production stability at high operating speeds
- Faster reaction to process deviations minimizes downtime risks
- Compact sensors fit seamlessly into existing molding equipment

Recommended Products

CTi 4ML High-speed Pyrometer
Compact Two-piece Industrial Infrared 4M Pyrometer for Low-Temperature and High-Speed Applications

CTi LTfast
Compact Two-piece Fast Industrial Infrared Pyrometer with a larger temperature range

PI 450i Thermal Camera
IR camera for the detection of slightest temperature differences

Plastic Applications

WATER FILTER MANUFACTURING

For more information about this application please visit our website:

Optris Website

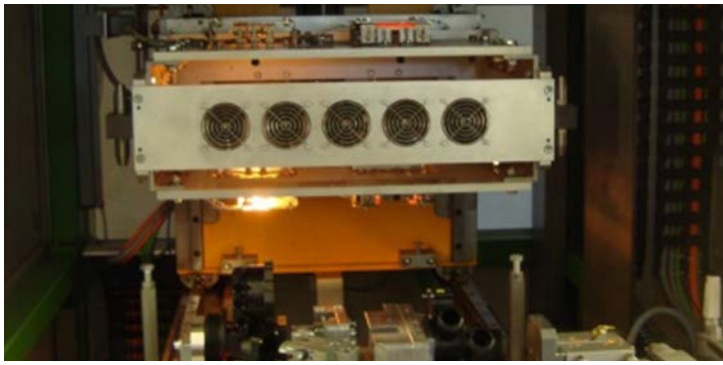
https://optris.com

Leakages of Plastic Joints due to incorrect Temperatures

Manufacturers requests a solution to monitor the heating and welding process of producing water filters. These filters comprise several plastic components that are welded together by heating and melting their edges using infrared emitters.

The manufacturers needs a reliable temperature measurement system that can accurately measure temperatures rapidly and automatically regulate the heating process in case of deviations. Additionally, it is crucial to detect any possible rejects accurately.

The manufacturing process for water filters is divided into several steps. Initially, raw materials, typically thermoplastics such as polypropylene (PP) or polyethylene (PE), are melted and molded into the desired shapes. These parts include the filter housing, filter elements, and connections. Once shaped and cooled, these plastic parts must be joined to create a seamless, watertight connection.



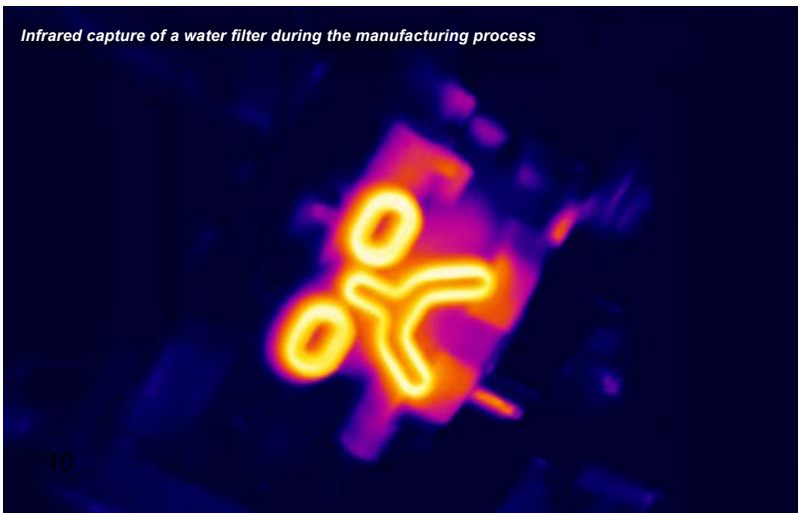
The Optris Solution

To address this issue, manufacturers employs the compact Spotfinder industrial cameras of the Xi series from Optris. This infrared thermal imaging cameras are ideally suited for OEM applications. The Xi 400 infrared camera fulfills the customer's primary needs: reliable temperature recording in the welding areas, rapid temperature measurement, and seamless integration into the process, enabling automation.

The Xi 400 IR camera measures temperature distribution with high optical resolution (382 x 288 pixels) and continuously monitors the heating of the weld seam in real-time. Its frame rate (80 Hz / 27 Hz) facilitates rapid temperature measurement, which is critical since the heating tools open for only a short duration.

Two Xi 400 infrared cameras—one for the upper mold and one for the lower mold—are installed on multiple systems. The motor focus integrated with the infrared imager ensures precise recording of the areas.

The PLC queries data analogously, and a good/bad signal is output. This allows immediate reaction to temperature deviations and ensures that only correctly welded water filters are processed further. This process is fully automated, with the cameras integrated into the production line via a process interface that ensures a simple connection to the plant's control systems.



Infrared capture of a water filter during the manufacturing process

Benefits using Optris

- Automated temperature control enhances welding precision and minimizes the risk of leaks.
- Real-time temperature data allows immediate reaction to deviations, improving quality assurance.
- Reliable rejection of defective filters streamlines the production process.
- Integration into the control system enables effortless process automation.
- Compact, cost-effective solution maximizes production efficiency without significant investment.

Recommended Products

Xi 400 LT USB Thermal Camera
Fixed long-wave thermal camera for detailed thermal profiles for monitoring in industrial settings

Xi 410 LT ETH Thermal Camera
Fixed Thermal Camera with Ethernet Interface for Standalone Operation

Xi 640 LT USB Thermal Camera
Combines high resolution, strong construction, and versatile connectivity for both industrial and research purposes

Plastic Applications

THERMOFORMING PROCESS

For more information about this application please visit our website:

Optris Website

https://optris.com

Controlling the Glass Transition Temperature in Thermoforming with Infrared Radiators

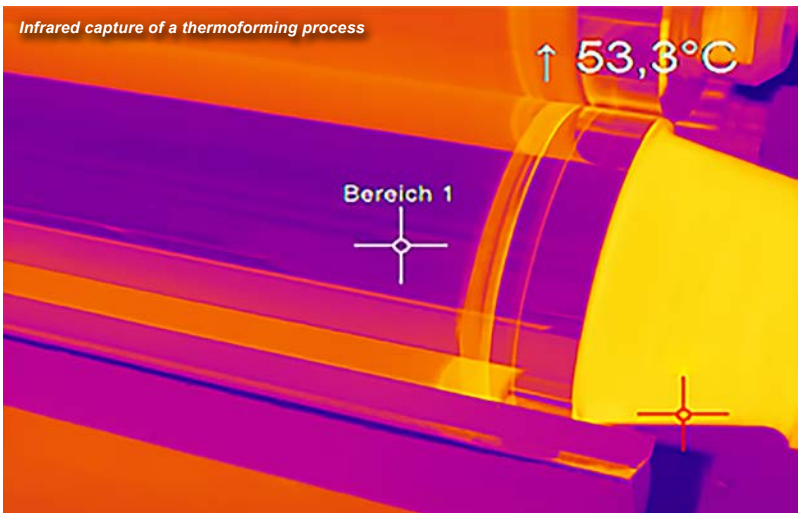
Thermoforming is a manufacturing process used to shape thermoplastic materials by heating a plastic sheet until it becomes pliable and then molding it into a specific form. This process is crucial in packaging, which is used to create food packaging, medical trays, and consumer goods packaging. In the automotive industry, thermoformed plastics are used for components such as dashboards, door panels, and interior trim. Additionally, thermoformed plastics are found in various consumer goods, including beverage bottles, functional shoe films, and other everyday products.

The thermoforming process begins by heating a thermoplastic sheet until it becomes soft and pliable, reaching its glass transition temperature. This step is essential as it allows the material to be easily shaped into the desired form. Infrared sensors are necessary to ensure the plastic reaches its glass transition temperature. Temperature monitoring can be challenging because the plastics are often less than 400 µm thick, and the process involves infrared heaters. To use infrared heating processes as efficiently as possible, the emissivity of the plastic material must be considered, determining whether the IR emitter should operate in the short, medium, or long-wave infrared range.

The Optris Solution

CTi LT sensors have been employed in an application producing inexpensive plastic packaging for grocery food items. Long-wavelength sensors are sufficient since the plastic film is thicker than 400 µm. The manufacturer has integrated several pyrometers in a line to monitor temperature inhomogeneities. If the temperature readings differ, the programmable logic controller (PLC) adjusts the power of the infrared heaters based on the temperature data received over analog inputs. The online thermometers are installed next to the infrared heaters, where the plastic film reaches its maximum temperature, to avoid any parasitic reflections. Despite this, the ambient temperature is significant, so the sensor must withstand temperatures.

The Optris thermoshock-insensitive feature of the pyrometer is crucial in this application, as it ensures accurate and reliable temperature measurements even in environments with rapid temperature fluctuations or nearby heat emissions. Optris supplies a range of mechanical accessories that greatly simplify the integration of their sensors into existing thermoforming machinery. These accessories make it easier for manufacturers to incorporate infrared temperature measurement systems into their machinery without extensive modifications. Moreover, the sensing head can be disconnected from the electronics box, simplifying installation and maintenance in complex machinery setups. This not only saves time but also reduces installation costs.



Infrared capture of a thermoforming process

Benefits using Optris

- Ensures uniform heating of plastic sheets for consistent product quality
- Minimizes material waste caused by overheating or underheating
- Enables real-time process control through integration with PLC systems
- Reduces energy consumption by optimizing heater output
- Simplifies retrofitting and maintenance with easy-to-integrate sensor setups

Recommended Products

CTi P3 Pyrometer
For thin plastic films, using a spectral range of 3.43 µm for temperatures between 35 °C and 600 °C. It can easily measure plastics thicker than 0.4 mm

CTi P7 Pyrometer
With 150 ms response time, it measures efficiency especially during the production of thin plastic foil. Emissivity adjustments support different material thicknesses

CTlaser P7 Pyrometer
Unique sensitivity at 7.9 µm. Aligns well with the absorption bands of many polymers, allowing to measure the material's true temperature

Glass Applications

INTRODUCTION

For more information about this Industry please visit our website:

Optris Website

https://optris.com

In the glass industry, infrared temperature monitoring is crucial for maintaining product quality and process efficiency. Glass production involves extreme temperatures, from melting raw materials to forming and annealing, where precise temperature control is essential. Infrared (IR) sensors and cameras provide non-contact temperature measurements, making them ideal for these high-temperature environments.

Accurate thermal monitoring ensures that the glass is processed within its optimal temperature range, preventing defects such as thermal stress, bubbles, and uneven surfaces. By using IR technology, manufacturers can detect temperature variations in real-time, allowing for immediate adjustments to maintain consistency and quality throughout the production cycle.

Enhanced safety is another significant advantage. IR sensors eliminate the need for physical contact with hot glass, reducing the risk of accidents and equipment damage. This non-contact capability also minimizes maintenance needs for temperature sensors exposed to harsh conditions.

Furthermore, IR temperature monitoring improves process efficiency. It allows for precise control of melting furnaces, annealing lehrs, and forming equipment, optimizing energy consumption and reducing waste.

Challenges of Infrared non-contact Temperature Measurement

High **ambient temperatures** in glass production environments, such as melting furnaces and forming stations, can impact the accuracy of IR sensors. These sensors need to be calibrated precisely to account for thermal interference and maintain measurement reliability. Additionally, the **reflective nature** of molten glass complicates temperature readings, as varying emissivity can lead to measurement inaccuracies. Adjusting the **emissivity** settings on IR devices is crucial but can be complex and time-consuming. **Dust and smoke** generated during glass processing can obstruct IR measurements. Moreover, **temperature gradients** within the glass during processes like annealing can pose challenges.

Benefits of Infrared non-Contact Temperature Measurement

Despite these challenges, IR non-contact temperature measurement offers substantial benefits in the glass industry:

- Accurately measure temperatures without physical contact, crucial for high-heat applications - improving safety for operators
- Precision helps in achieving the optimal thermal conditions for best product quality.
- Real-time monitoring - immediate adjustments preventing defects
- Lower maintenance costs for temperature measurement systems.

Glass Applications

GLASS TUBE PRODUCTION

For more information about this application please visit our website:

Optris Website

https://optris.com

Crucial Role of Precise Non-Contact Temperature Control in the Glass Forming Process

Industrial manufacturers in the glass industry requires a reliable and easy-to-integrate temperature measurement solution to monitor and control the temperatures of glass tubes during the forming process, with the ability to regulate heating if necessary.

Precise temperature control during the forming process is crucial. If the temperature is too high, the glass becomes overly liquid and cannot maintain the necessary shape and structure, leading to uneven wall thicknesses and diameters, which compromises the mechanical strength of the glass tubes. Conversely, if the temperature is too low, the glass mass becomes difficult to shape, potentially causing surface defects, incomplete shaping, or even complete breakage of the glass tube.

In tubular glass production, a continuous raw glass strand is drawn from a glass melt, which is slowly cooled and solidified on a straight guide before being divided into sections. Accurate temperature measurement and the installation of measuring systems are challenging due to the existing process conditions.

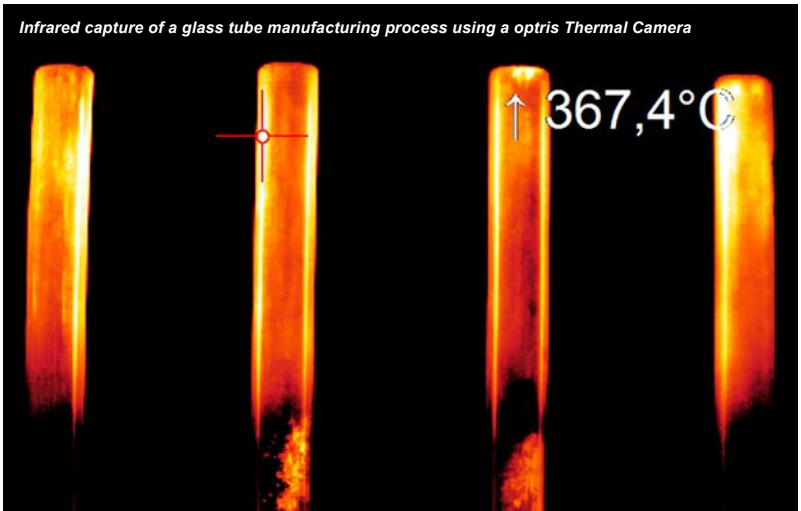
The Optris Solution

Optris provides the ideal solution for the industrial manufacturers with the CTLaser G5H infrared pyrometer. This innovative pyrometer is perfect for nearly all glass applications and is easy to integrate, even in challenging environments.

The CTLaser G5H measures in the spectral range of 5 µm and operates in temperature ranges between 100 °C and 1650 °C, making it highly sensitive and ideal for measuring glass surfaces. With a rapid response time of 80 ms, it adeptly detects quick temperature changes.

This pyrometer is exactly what manufacturers needs to monitor the temperature of glass tubes. Multiple units are acquired and seamlessly integrated into the production process. The CTLaser G5H's specialized spectral range of 5.0 µm is crucial for effectively measuring glass temperatures across various industrial processes. Selecting the appropriate wavelength is essential for measuring both surface and deeper layers of glass, with specific recommendations based on temperature levels and material properties.

The pyrometers are mounted at key points at a slight distance from the measuring points and aligned using the integrated double laser sight. Additionally, the CTLaser G5H is equipped with a water-cooling housing and an air purge attachment to handle the demanding environmental conditions.



Infrared capture of a glass tube manufacturing process using a optris Thermal Camera

Benefits using Optris

- Reduces defects by ensuring uniform glass tube temperature, improving mechanical strength and durability.
- Minimizes downtime through real-time, accurate monitoring and immediate adjustments during production.
- Eliminates risks associated with contact measurement methods, protecting fragile glass surfaces.
- Lowers maintenance and operational costs by preventing overheating-related damages and process interruptions.
- Improves overall process reliability, leading to consistent product quality and higher production efficiency.

Recommended Products

CTlaser G5 Pyrometer
High-Performance Two-piece Industrial Infrared G5 Pyrometer for Glass Applications with Laser-Sighting

PI 450i G7 Thermal Camera
targets glass using a 7.9 µm G7 band at the highest glass emissivity

PI 640i G7 Thermal Camera
Precision High-Resolution Thermal Camera and Line Scanner for the Glass Industry

Glass Applications

GLASS GOB

For more information about this application please visit our website:

Optris Website

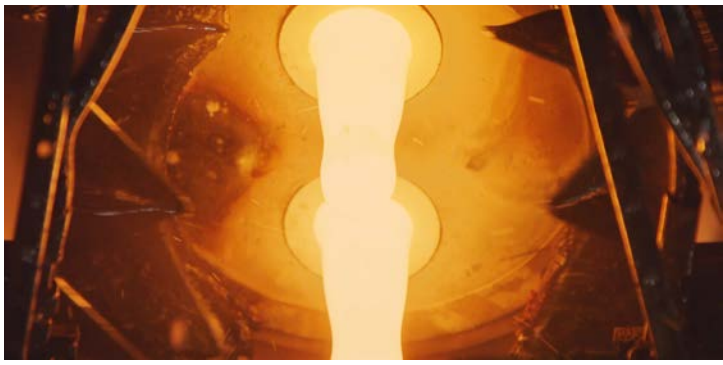
https://optris.com

Addressing Temperature and Quality Challenges in Glass Gob Processing

The production of container glass, particularly glass bottles and jars, is a highly automated and energy-intensive process that requires extremely high temperatures. The process begins with raw material preparation, where the primary ingredients are mixed in specific proportions to achieve the desired glass composition. This mixture, known as the batch, is then transported to a melting furnace.

The melting furnace operates at approximately 1500 °C, where the batch is melted and processed into a homogeneous glass mass. Once the glass mass reaches the appropriate consistency, it is directed to a feeder, which forms the glass into drop-shaped portions called gobs. These gobs, the precursors to the final glass containers, are cut at precisely calculated intervals and transferred to the forming machine, a critical step in shaping the glass.

Temperature control is crucial throughout the production process. If the gobs are too hot, they become overly liquid and fail to maintain the desired shape during molding. Conversely, cooling the gobs too quickly can induce stresses in the glass, which may lead to cracks or fractures later on.

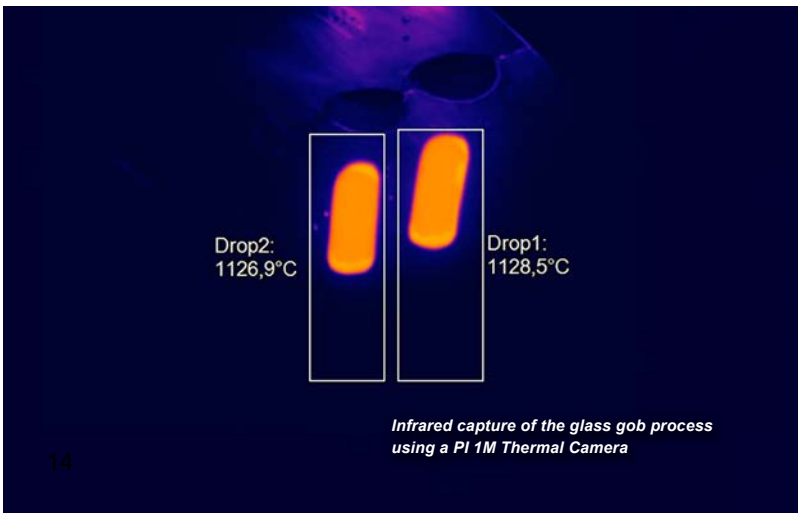


The Optris Solution

In this application, the Optris solution for monitoring glass gobs is the infrared camera PI 1M. This industrial, high-speed camera enables continuous and reliable monitoring of very hot and fast processes. To monitor the position and temperature of the gobs, two PI 1M cameras are installed to cover both the X- and Y-axis of the glass gobs during their transport from the feeder to the forming machine.

The PI 1M infrared camera allows operators to accurately read the position and temperature of each glass gob, preventing issues such as the glass gob hitting the mold's side wall. This reduces asymmetric temperature loss and results in higher quality bottles or other glass products. Additionally, the temperature of each gob can be recorded and saved, allowing for the quick detection and correction of temperature anomalies.

Using the free PIX Connect analysis software, measuring fields can be defined and permanently monitored. If there are any shifts in the transport path due to machine influences, the system can either inform the operator immediately or automatically correct the issue. This information can be communicated in various ways, such as through an alarm linked to the software or digital communication with the machine's controller.



Infrared capture of the glass gob process using a PI 1M Thermal Camera

Benefits using Optris

- Prevents gob deformation by ensuring consistent temperature during transport
- Reduces glass stress and defects through optimal gob cooling control
- Enables precise gob placement for improved forming accuracy and symmetry
- Supports early detection of process anomalies for quick corrective action
- Enhances production automation, reducing operator workload and manual adjustments

Recommended Products

PI 1M Thermal Camera
The thermal camera for metal and advanced ceramics combines precision, speed, and durability with a cost-effective approach

Xi 1M ETH Thermal Camera
operate independently and can handle internal temperature processing and hotspot detection without needing a computer

CTlaser 2MH Pyrometer
Built for the tough conditions of metalworking and advanced ceramics, the CTlaser 2M series sets a standard for high-temperature, non-contact pyrometry

Glass Applications

SAFETY GLASS PRODUCTION

For more information about this application please visit our website:

Optris Website

https://optris.com

The Importance of Infrared Measurement in Safety Glass Production

In the production process of laminated safety glass, two to three glass panes are typically bonded together using a polyvinyl butyral (PVB) film under heat and pressure. The goal of this process is to create a layer that ensures the shards stick together in the event of glass breakage, preventing injuries. This process is often carried out in autoclaves or under vacuum using heating systems to achieve the necessary temperature and pressure, ensuring a stable bond within the laminate.

However, the production of laminated glass presents several challenges. One major issue is that glass is naturally designed to transmit as little infrared radiation as possible. While this is beneficial for preventing the heating effects of sunlight, it poses a significant challenge regarding temperature measurement during the lamination process. Since the film between the glass panes cannot be measured directly, the surface temperature of the glass must be used as an indicator of the temperature inside the laminate. Furthermore, depending on the type of glass used, the lamination process is typically carried out at relatively low temperatures, around 40 to 60 degrees Celsius. These lower temperatures are difficult to measure accurately with conventional temperature sensors.

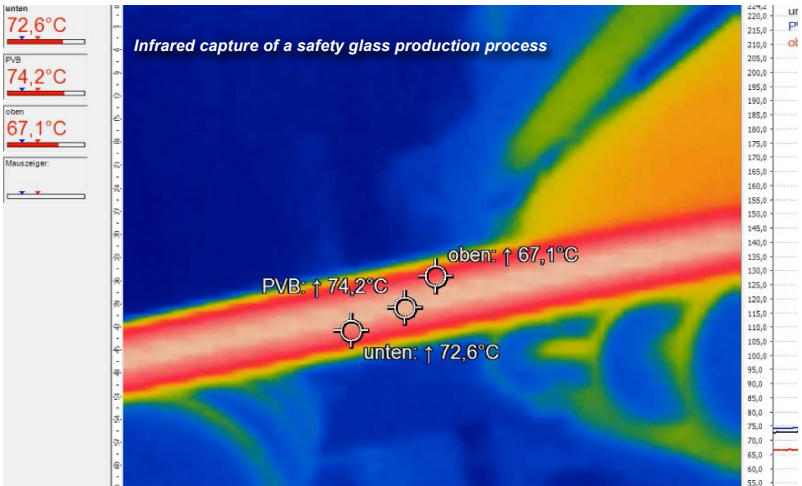
The Optris Solution

Optris infrared cameras and pyrometers provide advanced solutions for monitoring and optimizing this process. Due to glass's low emissivity and reflective nature, infrared technology tailored to specific wavelengths becomes necessary. Infrared cameras with a spectral range of 7 to 9 micrometers are particularly suited for this task, as they can accurately measure the glass surface temperature. Despite the material's limitations.

The optris PI 640i infrared camera excels in detailed temperature monitoring. Its 640 x 480 pixel resolution allows manufacturers to capture precise thermal images of the entire glass surface, ensuring consistent temperature distribution across the laminate. This is particularly important in large production environments where uniform heating is crucial to avoid defects in the final product.

The Xi 400 and Xi 410 infrared cameras are compact and versatile, making them ideal for installation in tight spaces within the production line. These models offer high precision at a more accessible price point, making them suitable for manufacturers looking for reliable temperature monitoring solutions without extensive budget requirements.

The Optris CT LT pyrometer is an exact, compact infrared sensor designed for point temperature measurement. In laminated glass production, it is typically used to measure the temperature of the glass surface in real time, serving as a reference point for the overall process.



Benefits using Optris

- Enables uniform heating, ensuring strong and consistent PVB bonding between glass layers.
- Minimizes product defects by identifying temperature deviations in real time.
- Reduces material waste and rework through early detection of lamination issues.
- Improves process efficiency by enabling quick, data-driven adjustments during production.
- Allows precise monitoring even in tight or obstructed equipment spaces.

Recommended Products

CTi LT Pyrometer
have strong industrial capabilities. Delivers precise non-contact temperature monitoring for even the toughest applications

PI 640i Thermal Camera
measures temperatures from –20 °C to 1500 °C in the 8–14 µm wavelength range, making it ideal for stationary monitoring in various industrial settings

Xi 400 LT USB / Xi 410 LT ETH
Thanks to their compact design, the Xi Series thermal cameras are ideal for use even in hard-to-reach processes with limited space

Automotive Applications

INTRODUCTION

For more information about this Industry please visit our website:

Optris Website

https://optris.com

Infrared (IR) temperature measurement is revolutionizing the automotive industry by providing unprecedented precision and efficiency in manufacturing processes. In automotive production, maintaining optimal temperatures is crucial for ensuring the quality and performance of components, from engine parts to electronic systems.

IR thermometers and cameras offer non-contact temperature measurement, which is essential for high-temperature applications such as metal casting, heat treatment, and welding. These advanced tools provide real-time thermal data, allowing for immediate adjustments and enhancing quality control. Accurate temperature monitoring prevents defects, such as warping or thermal stress, which can compromise component integrity.

In automotive assembly, IR sensors help manage the temperature of critical components, ensuring they meet strict performance standards. The ability to measure temperatures without physical contact also improves safety and efficiency, reducing the risk of equipment damage and minimizing maintenance needs.

Challenges of Infrared non-contact Temperature Measurement

Infrared (IR) non-contact temperature measurement faces several challenges in the automotive industry. One primary issue is **emissivity variation.** Automotive components are made from various materials, each with different emissivity characteristics. Accurate temperature readings **require precise calibration** to account for these variations.
High ambient temperatures and thermal interference from surrounding equipment can also affect IR sensor performance. Automotive manufacturing environments, generate significant heat that can disrupt IR measurements. Additionally, **surface reflectivity** can present challenges. Highly reflective surfaces can skew infrared readings.

Benefits of Infrared non-Contact Temperature Measurement

Despite these challenges, IR non-contact temperature measurement offers substantial benefits in the automotive industry:

- Optimized heating and cooling processes - Energy savings and quality enhancement
- Enhanced quality control
- Real-time monitoring of temperature ensures that components meet stringent quality standards
- Immediate adjustments preventing defects

Automotive Applications

RACECARS TEMPERATURE ANALYSIS

For more information about this application please visit our website:

Optris Website

https://optris.com

Challenges in Measuring Brake and Tire Temperatures

Formula Student is one of the most demanding student engineering competitions worldwide. Teams around the globe develop new race cars each year to test them at national or international events. FaSTTUBe, the Formula Student team of TU Berlin, utilizes modern technologies for their vehicle optimization, including Optris infrared pyrometers for monitoring brake and tire temperatures. One of the biggest challenges for them is to control the temperature of sensitive components such as the brakes and nearby parts. Excessive temperature exposure can lead to severe issues, from material fatigue to safety risks. Without continuous temperature measurement, a targeted analysis of temperature trends and performance optimization would be nearly impossible.

The challenge with brakes is that high temperatures arise quickly and are difficult to track manually. In past test runs, overheating has repeatedly caused material damage. Without precise temperature data, causes such as excessive friction or design flaws cannot be identified in time. Placing contact thermometers on moving parts is impractical. Tire temperature is also a critical performance factor. The optimal operating temperature must be consistently maintained to ensure maximum grip and even tire wear.

The Optris Solution

The FaSTTUBe racing team employs Optris CSmicro pyrometers for continuous temperature measurement. These pyrometers are characterized by their compact design, allowing easy integration into the race car. The sensors are mounted at critical points on the vehicle to measure brake disc and tire temperatures precisely. With a response time of only 8 ms, the sensors capture temperature changes almost in real time.

A crucial factor in choosing Optris pyrometers was their ability to function accurately even in dynamic conditions, where high-speed driving creates challenging measurement environments. The FaSTTUBe team has strategically positioned the sensors to avoid interference from road debris and aerodynamic influences while ensuring a clear view of the measurement zones. The team ensures precise readings even when extreme temperatures develop rapidly in braking phases by calibrating the pyrometers for different race conditions.

FaSTTUBe engineers rely on software solutions such as Optris CompactConnect for real-time visualization and post-analysis. The software allows engineers to set temperature thresholds and track trends over multiple test sessions. This approach provides insights into how different vehicle setups influence temperature distribution, enabling a more data-driven approach to optimization.

A CSmicro sensor installed in a race car measures the condition of the tires and brake disks

Benefits using Optris

- Enables early detection of critical overheating during dynamic vehicle testing
- Enhances tire grip and wear by fine-tuning suspension setups with thermal insights
- Reduces material damage through continuous brake temperature surveillance
- Supports long-term optimization by comparing temperature trends across test sessions
- Improves energy efficiency and safety in battery development with detailed thermal imaging

Recommended Products

CSmicro LT Pyrometer
Features a 15:1 distance-to-spot size ratio and temperature range from -50 °C to 1030 °C. Compact, rugged, and resistant up to 120 °C

CSmicro LTH Pyrometer
Unlike the CSmicro LT, it boasts a 22:1 distance-to-spot size ratio and operates up to 180 °C without cooling

CSmicro 2M Pyrometer
Easy installation in narrow spaces, making it ideal for integration into machinery, measuring hot metals like steel, tungsten, and iron up to 1600 °C

Automotive Applications

ANALYSIS OF BREAKDISCS

For more information about this application please visit our website:

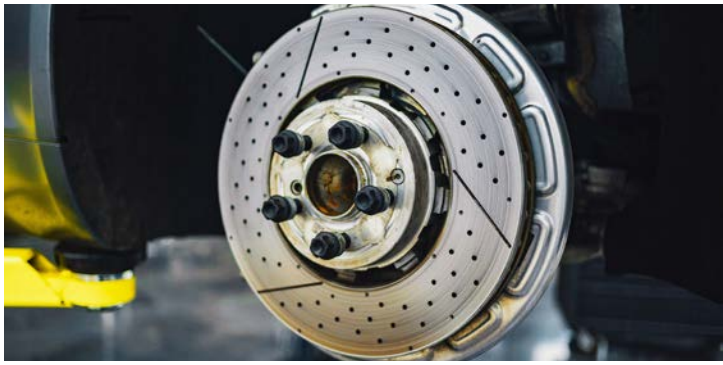
Optris Website

https://optris.com

Importance of Temperature Distribution Analysis of Brakes on the Test Bench

Understanding the thermal behavior of brake discs during testing is critical for optimizing their design and ensuring safety in automotive applications. A german Manufacturer, known for producing brake systems for specialized vehicles such as trailers and forklifts, conducts extensive research and development on their brake discs. They use test benches to simulate real-world conditions, monitoring the temperature distribution across the brake disc surface. The goal is to understand how heat is generated and dissipated during braking events, as uneven temperature distribution can lead to thermal stress and potential failure.

The testing process involves mounting the brake disc on a test bench where it undergoes repeated braking cycles. These cycles simulate scenarios such as descending steep gradients, which generate significant heat. A major challenge in this process is accurately measuring the temperature across the disc's surface, particularly given the disc's metallic nature, which has variable emissivity. Traditional methods like thermocouples or contact-based sensors offer limited insights, as they can only measure temperatures at specific points, and are prone to wear and damage due to friction.

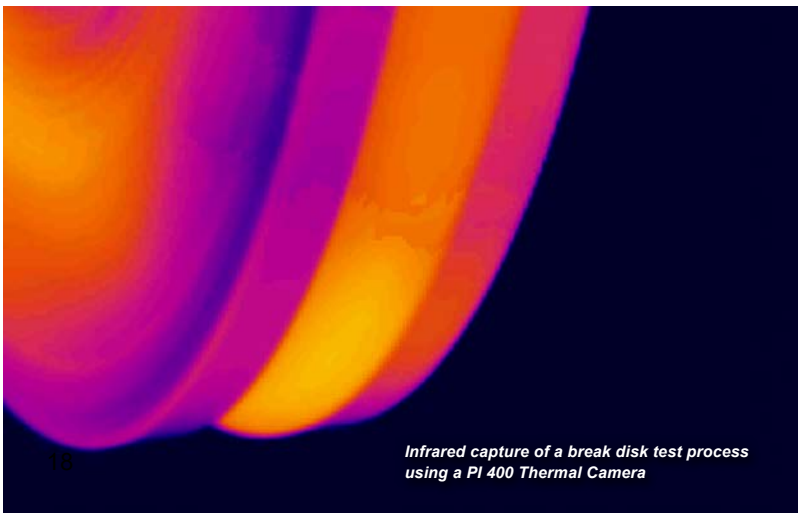


The Optris Solution

To address the challenges of accurate temperature measurement, the manufacturer integrated the Optris PI 400 infrared camera into their test bench setup. The PI 400 offers a precise, non-contact method to measure temperatures ranging from 20°C to 400°C, making it ideal for monitoring the thermal behavior of brake discs. The camera's ability to capture high-speed thermal images at up to 80 Hz allows for detailed analysis of temperature fluctuations during dynamic braking events.

The PI 400's fixed installation on the test bench ensures consistent and repeatable measurements. Its compact design and USB connectivity make it easy to integrate into existing systems, providing real-time data directly to analysis software. This setup allows engineers to monitor the entire surface of the brake disc, overcoming the limitations of single-point measurement devices like pyrometers. The high frame rate of the PI 400 is particularly beneficial in capturing rapid temperature changes, essential for understanding the thermal shock experienced by brake discs during testing.

Optris stands out as the preferred partner for thermal monitoring solutions due to its combination of high-performance infrared cameras, user-friendly software, and robust technical support.



Infrared capture of a break disk test process using a PI 400 Thermal Camera

Benefits using Optris

- Enables optimization of brake disc design through detailed thermal behavior analysis
- Identifies temperature hotspots that may lead to thermal stress or failure
- Supports real-time adjustments during testing to enhance safety and performance
- Reduces material usage and production costs through informed design decisions
- Prevents premature failures by ensuring effective heat dissipation strategies

Recommended Products

PI 400i LT Thermal Camera
Works in the 8–14 µm band, allowing it to cover a wide variety of materials. Built for continuous thermal monitoring

Xi 400 LT USB Thermal Camera
Fixed long-wave thermal camera for detailed thermal profiles for monitoring in industrial settings

CTlaser Fast LT Pyrometer
wide temperature range from -50 °C to 975 °C. Optimized for non-reflective surfaces, and works well for fast-paced manufacturing processes

Automotive Applications

SEAT HEATER TEST

For more information about this application please visit our website:

Optris Website

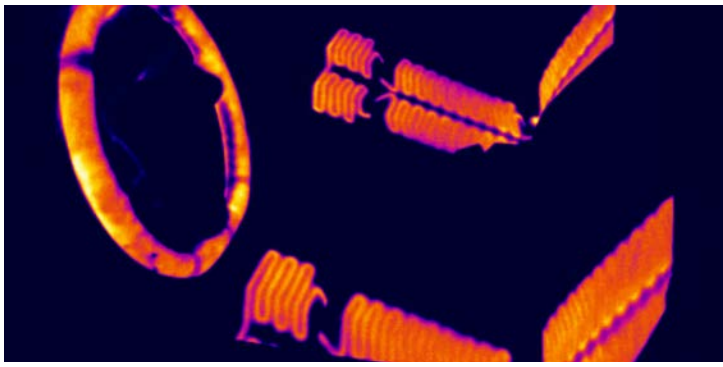
https://optris.com

Identifying Faulty Cable Connections Causing Malfunctioning Heating Elements in Car Seats

Heated seats are an excellent addition to any vehicle driven in cool weather or regions with harsh winters. The careful assembly of electronic components and controls during integration is essential to ensure reliable and lasting performance.

Heated seats operate via a heating element, a long strip of material that functions as a resistor. This resistor resists the flow of electricity, converting electrical energy into heat, which then warms the seat. Issues with the heater element are the most common problems with heated car seats. The heating wire is typically small and fragile, making it susceptible to breakage.

Testing seat heaters is crucial before they are installed in the seats, as faulty cable connections can lead to fires in the worst-case scenario. Manufacturers must ensure that these components are installed properly and function correctly, and to that end, they prefer a testing method that is faster yet just as reliable as manual testing.



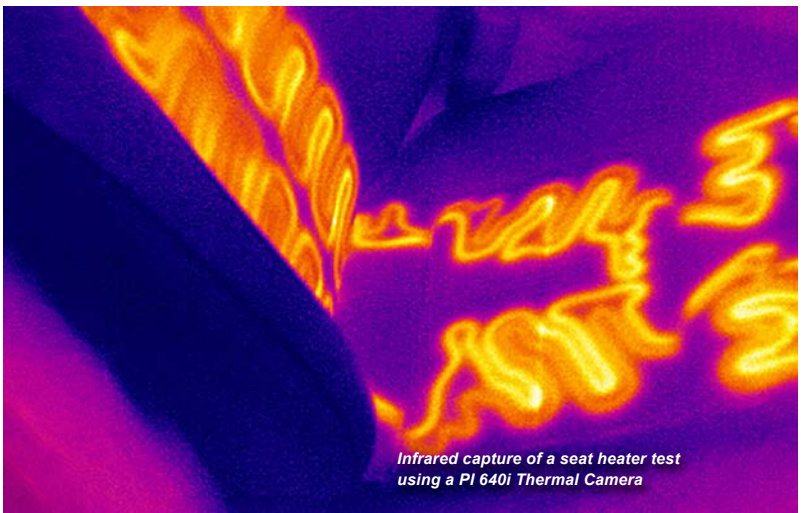
The Optris Solution

The solution to the manufacturer's challenges is the integration of an optris PI 640i infrared thermal imaging camera. This infrared camera, with VGA resolution (640 x 480 pixels) and an outstanding thermal sensitivity of 40 mK, is ideal for detecting even the slightest thermal differences with high accuracy and interfacing seamlessly with image processing software.

Temperature control using the PI 640i involves two main steps: visual inspection and functional testing of the heating mats installed in the seats. These mats consist of special heating wires, often made of metallic copper, which are evenly distributed to ensure consistent heat dissipation.

Following the visual check, a function test is performed. The seats are connected to a power source, and the heaters are activated. The temperature is measured continuously over a set period, with the infrared camera recording the temperature distribution on the seat surface and backrest. The primary goal of this test is to verify that the seat temperatures rise within a specified short period.

If all values are within the correct range, a signal can indicate that the car is ready to be released from the current station and moved to the next production stage. This automation has significantly reduced the production time, as the test only takes 30 seconds.



Infrared capture of a seat heater test using a PI 640i Thermal Camera

Benefits using Optris

- Reduces testing time from 15 minutes to 30 seconds
- Enables early detection of cable connection issues and wire damage
- Confirms safety systems function reliably before seats leave the station
- Ensures consistent seat temperature rise across all tested units
- Supports efficient production flow with automated pass/fail signaling

Recommended Products

PI 640i LT Thermal Camera
Measures temperatures from –20 °C to 1500 °C in the 8–14 µm wavelength range, making it ideal for (stationary) monitoring in various industrial settings

Xi 640 LT USB Thermal Camera
Operates in the long-wave infrared spectrum. It measures temperatures from –20 °C to 900 °C. Captures thermal images at 640 × 480 pixels

Xi 400 LT USB Thermal Camera
Works in the long-wave infrared spectrum (8–14 µm) and has a resolution of 382 × 288 pixels. Covers a temperature range from –20 °C to 1500 °C

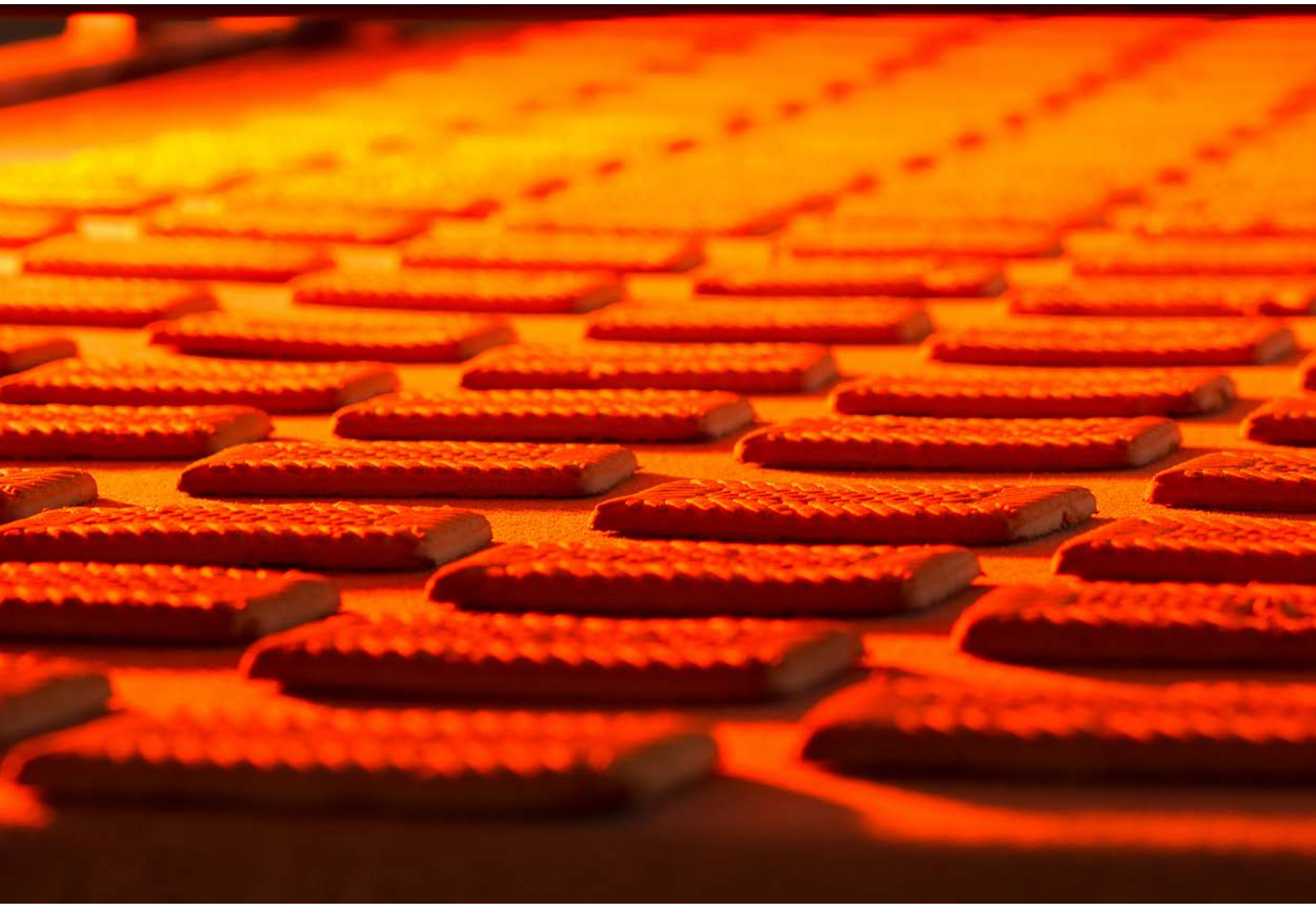
Food Applications

INTRODUCTION

For more information about this Industry please visit our website:

Optris Website

https://optris.com



In the food industry, IR temperature measurement is crucial for maintaining high-quality standards and ensuring efficient processes. High-speed temperature measurement (within just 90 microseconds) provided by IR technology enables precise monitoring in the fast-paced food and packaging industries. For example, in the bottling process of beverages with crown corks, maintaining the correct temperature is essential to ensure proper sealing and extend shelf life.

Additionally, non-contact temperature measurement allows accurate temperature monitoring of critical stages in food production, such as the spraying process for ice cream production. By accurately tracking temperatures, manufacturers can ensure that ice cream is processed at optimal temperatures, preventing issues like ice crystal formation and ensuring a smooth texture.

For applications like homogeneous hop drying in brewing, IR cameras offer real-time insights into temperature distribution across drying surfaces. This helps achieve consistent drying, essential for producing high-quality hops that meet stringent flavor and aroma standards.

Challenges of Infrared non-contact Temperature Measurement

IR technology provides highly accurate temperature measurements **without direct contact**, ensuring **precise control** over critical food processing stages. This is crucial for maintaining quality and safety in production. IR sensors enable real-time temperature monitoring at **high speeds**, which is essential for processes such as high-speed food production and packaging. This capability helps in detecting temperature deviations immediately and making necessary adjustments.

Benefits of Infrared non-Contact Temperature Measurement

Despite these challenges, IR non-contact temperature measurement offers substantial benefits in the food industry:

- IR technology ensures that food products meet quality standards
- Prevent issues like undercooking or overheating, which can affect the taste, texture, and safety of the product
- No direct contact with food products - minimizes risk of contamination
- Energy efficiency and cost savings
- Real-time temperature monitoring at high speeds

Food Applications

DOUGH PRODUCTION

For more information about this application please visit our website:

Optris Website

https://optris.com

Challenges in Achieving Uniform Heat Distribution in Dough Production

The industrial production of dough for cookies and pasta is a complex process that requires precise control and monitoring to ensure consistent quality and efficiency. After the ingredients are mixed and the dough is kneaded, the crucial baking or drying process takes place in large industrial ovens. This step is of paramount importance as it shapes the final texture, color, and flavor of the product.

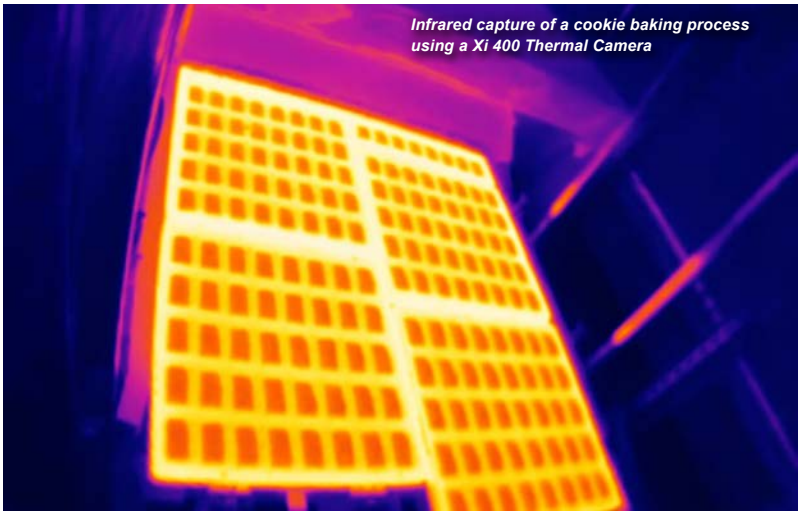
Manufacturers aimed to optimize exactly this heating and drying process while simultaneously conducting a quality inspection of the dough as it exits the oven, in order to offer their end customers products of consistently high quality.

A critical factor in the oven process is the even distribution of heat. To ensure a homogeneous product quality, the entire dough must be evenly heated. Uneven heat distribution can lead to undesirable results, such as inconsistent browning or texture variations. This is particularly important in cookie production, where uneven heat can cause burnt edges and a raw interior. In pasta production, uneven drying can lead to cracks or breakages, which can affect the shelf life and cooking quality.

The Optris Solution

To address the challenges in dough production, manufacturers implemented the Optris Xi 400 infrared camera, a highly compact and rugged industrial imager that offers precise temperature measurement across the entire production line. The Xi 400 features a high-resolution detector with 382 x 288 pixels, ensuring accurate temperature detection over a wide range from -20 °C to 900 °C. This range is particularly beneficial in monitoring the varying temperatures required during the dough heating and drying processes. The IR camera's superb distance-to-spot-size ratio of up to 390:1 ensures that even the smallest temperature variations can be detected across the production line, which is critical for maintaining consistent product quality.

The Optris Xi 400 IR camera is seamlessly integrated with manufacturers Programmable Logic Controller (PLC) system via serial communication, allowing the PLC to receive real-time temperature data and make necessary adjustments to the oven's heat distribution. The camera operates at an 80 Hz frame rate, which is ideal for monitoring the fast thermal processes involved in dough production. This real-time data feed enables the PLC to maintain the desired temperature throughout the baking or drying process, thereby preventing issues such as overheating or uneven cooking. To further optimize the implementation, the Optris Xi 400 can be equipped with an air purge unit to prevent dust and other contaminants.



Infrared capture of a cookie baking process using a Xi 400 Thermal Camera

Benefits using Optris

- Ensures consistent dough quality with fewer defects like burns or cracks
- Reduces waste by minimizing product rejects due to uneven heating
- Lowers energy consumption through precise, automated heat regulation
- Streamlines quality control with real-time thermal data across the line
- Simplifies system integration and maintenance within existing production setups

Recommended Products

Xi 400 LT USB Thermal Camera
Compact Industrial Fixed Thermal Camera with USB Interface

Xi 640 LT USB Thermal Camera
Operates in the long-wave infrared spectrum. It measures temperatures from –20 °C to 900 °C. Captures thermal images at 640 × 480 pixels

Xi 80 LT ETH Thermal Camera
Combines pyrometer functions with the wider abilities of a thermal imager. Works in the long-wave infrared range and measure from –20 °C to 900 °C

Food Applications

FROZEN MEAT SHREDDING

For more information about this application please visit our website:

Optris Website

https://optris.com

Protecting Equipment and Ensuring Meat Safety with Accurate Temperature Control

Recognizing the critical role of temperature in frozen meat processing, a food processor specifically requests precise noncontact temperature monitoring of frozen meat blocks. Their goal is to protect their shredding machines from damage and safeguard the meat from microbiological hazards.

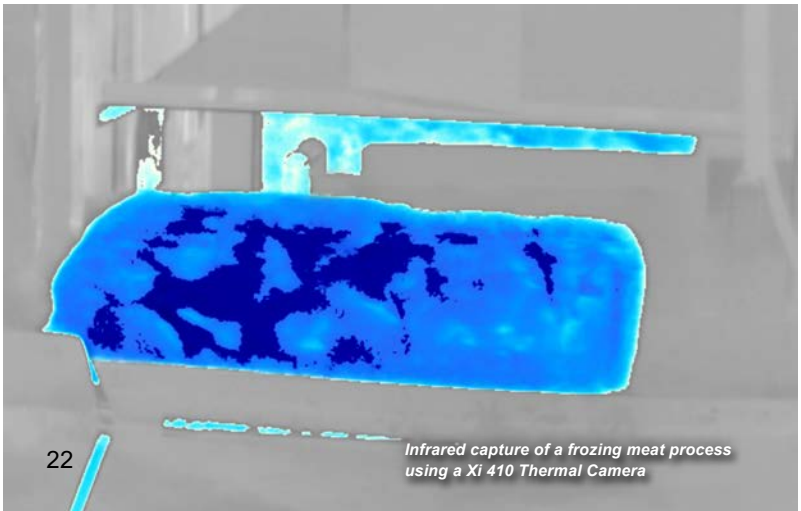
Accurate sensing technologies for temperature control are crucial in the industrial processing of frozen meat. This meat food process begins with delivering and storing raw frozen meat, kept at around -18°C or colder temperatures. Maintaining this temperature is essential to preserve the meat's microbiological safety and ensure uniform consistency during further processing. If the meat is too cold, significantly below -18°C, it becomes extremely hard and brittle, leading to challenges in cutting.

The ideal temperature range for shredding meat is between -12°C and -15°C. Within this range, the meat remains frozen but is not excessively hard, allowing for efficient shredding with minimal stress on the machinery. Accurate monitoring of these temperatures is therefore essential to maintain consistent product quality and prevent damage to processing equipment.

The Optris Solution

In this application, the Optris Xi 410 infrared camera is mounted next to the shredder, providing a precise and efficient solution for monitoring the temperature of frozen meat blocks during processing. The infrared camera measures the meat's temperature without physical contact, ensuring accurate readings and uninterrupted workflow. If the temperature falls too low, an alarm is triggered, prompting the system to slow down the process, allowing the meat to warm up gradually. This helps prevent equipment damage and reduces maintenance costs. Conversely, if the meat is too warm, another alarm activates, prompting an adjustment in cooling or an increase in processing speed. This ensures the cold chain is consistently monitored and maintained.

Equipped with a mid-resolution sensor (384 x 240 pixels), the Xi 410 delivers precise temperature measurements over a wide range, from -20°C to 900°C. Its motorized focus and compact design allow seamless integration into various applications, particularly in food processing industries. A standout feature of the Xi 410 is its ability to operate autonomously. With an auto hot or cold spot finder, the camera can directly output analog signals or trigger alarms when critical temperature thresholds are reached. This is especially valuable in frozen meat processing, where maintaining the ideal shredding temperature between -12°C and -15°C is crucial for efficient processing and equipment protection.



Infrared capture of a frozing meat process using a Xi 410 Thermal Camera

Benefits using Optris

- Prevents machine damage by avoiding excessively hard or soft meat entering the shredder
- Maintains consistent meat texture and shredding quality throughout the process
- Reduces microbiological risks by ensuring the cold chain remains intact
- Minimizes unplanned downtime and production interruptions through automated alarms
- Enables efficient, hands-free operation with real-time monitoring and corrective feedback

Recommended Products

Xi 410 LT ETH Thermal Camera
Fixed Thermal Camera with Ethernet Interface for standalone Operation

Xi 80 ETH Thermal Camera
Works in the long-wave infrared range and allows non-contact temperature measurement from –20 °C to 900 °C

CTi LT Pyrometer
For demanding point measurements in cold -temperature applications, starting at 50 °C

Food Applications

BOTTLE CAPS SEALING PROCESS

For more information about this application please visit our website:

Optris Website

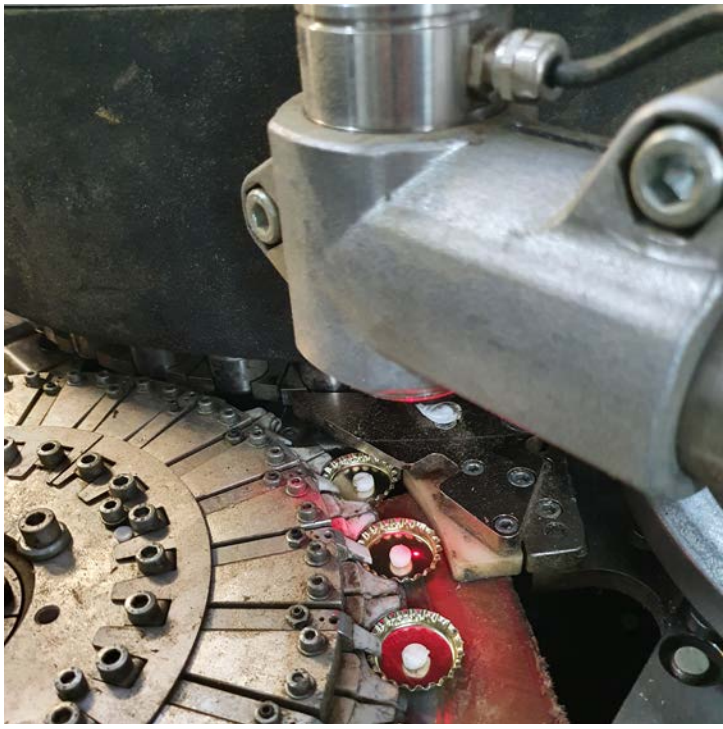
https://optris.com

Thermal Precision in Motion: Achieving Perfect Seals in High-Speed Bottling

In the fast-paced food and packaging industries, maintaining consistent quality and ensuring proper sealing of products is paramount. A critical aspect of this process is the sealing of bottle caps in bottling lines, which operate at speeds of up to 5000 caps per minute. This high-speed process requires precise temperature control to activate adhesive coatings effectively. Uniform heating is essential to ensure that the seal is applied evenly across the entire surface of the crown cork, ensuring proper sealing of the bottles later in the filling lines.

The challenge lies in achieving accurate temperature measurements on the small surface areas of these fast-moving bottle caps. Traditional temperature measurement methods often fall short due to slower response times or the inability to measure accurately on small spots. This can lead to uneven heating, resulting in poor seals, product wastage, and potential production delays.

Additionally, the high-speed nature of these processes demands temperature measurement solutions that are incredibly fast, reliable, and capable of operating under various environmental conditions without losing accuracy.



The Optris Solution

To address the challenges of fast thermal measurements, Optris has developed the specialized high-speed pyrometer, CTlaser 4M. This device is designed for ultra-fast temperature measurements, ensuring each crown cork is heated uniformly and correctly within the stringent timeframes required by modern manufacturing processes. Its exceptionally fast response time, capable of measuring temperatures within just 90 microseconds (µs), is crucial for applications where products move rapidly through production lines, such as the high-speed sealing of crown caps.

One key feature of the CTlaser 4M is its ability to measure temperature on very small spots accurately. This precision is achieved through its double laser sighting system, which precisely marks the measurement field. Additionally, the CTlaser 4M is built to withstand the demanding environments of high-speed manufacturing. It operates efficiently across a wide temperature range from 0 °C to 500 °C and can handle ambient temperatures up to 70 °C.

The precision of the CTlaser 4M is another significant benefit. Its ability to accurately measure small spots ensures uniform heating of every crown cork, reducing the risk of improper seals that can lead to product wastage and quality issues.

CTlaser 4M pyrometer measures the temperature of bottle caps during the high-speed process

Benefits using Optris

- Ensures consistent and reliable sealing quality at high production speeds
- Minimizes product waste by preventing improperly sealed bottles
- Supports real-time process adjustments for optimized thermal control
- Maintains accuracy even in harsh industrial environments
- Integrates easily into existing bottling systems without production disruption

Recommended Products

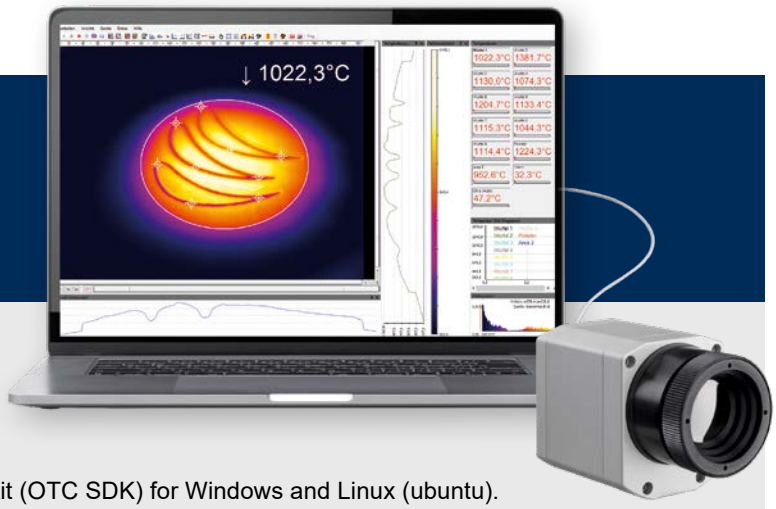
CTlaser 4M Pyrometer
Ultra-fast infrared thermometer (response time of just 300 microseconds) designed to provide accurate thermal data where speed is critical

CTlaser Fast LT Pyrometer
Features a high 50:1 optical resolution, allowing precise monitoring of small or distant targets

CTi 4M high-speed Pyrometer
The CTi 4M has an impressive exposure time of 110 µs. This feature makes it perfect for accurate temperature measurement in fast-paced or changing processes

optris Software Thermal Cameras

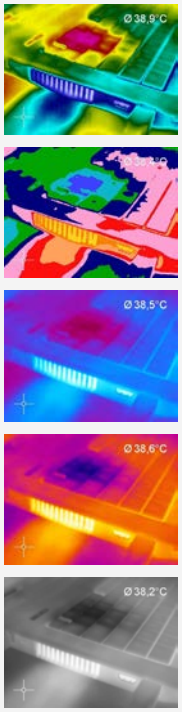
PIX Connect
Comprehensive
Thermal Camera Software



- No licensing restrictions & free of charge
- Modern software with intuitive user interface
- Display of numerous images in different windows
- Extensive analysis features and software development kit (OTC SDK) for Windows and Linux (ubuntu).

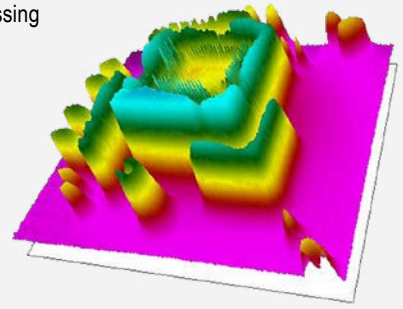
High degree of individualization for customer-specific imaging

- Various layout options for individual customization (window arrangement, toolbar)
- Temperature display in °C or °F
- Choice of individual measurement parameters tailored to the respective application



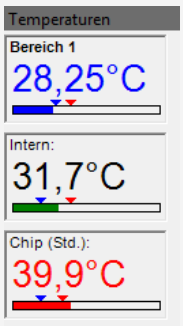
Detailed online and offline data analysis

- Detailed analysis with the help of measurement areas, automatic hot / cold spot search
- Logical linking of temperature information (measurement areas discrepancy, image subtraction)
- Slow-motion replay of radiometric datasets and analysis even without camera
- Editing of sequences, e.g. cut and save individual images
- Various color palettes to highlight thermal contrasts
- Adjustable signal processing (Max, Min, Average)



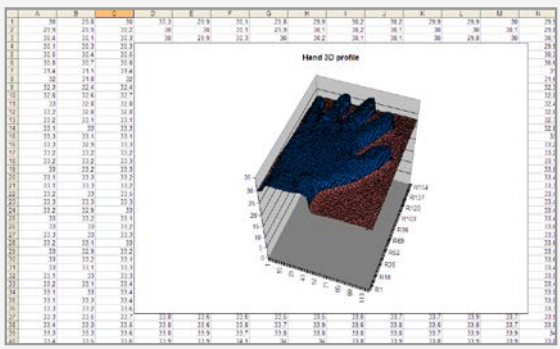
Automatic process control and quality control

- Individual setting of alarm thresholds depending on the process
- External communication of software via COM-ports, DLL
- Adjustment of thermal image via reference values
- Definition of visual or acoustic alarms and analog data output



Video recording and snapshot function

- Manually or triggered data gathering
- Radiometric video sequences (*.ravi)
- Radiometric snapshots (*.tiff, *.csv for analysis in Excel)



For further information about our software, please visit our website

Optris PIX Connect

https://optris.com/software/pixconnect/

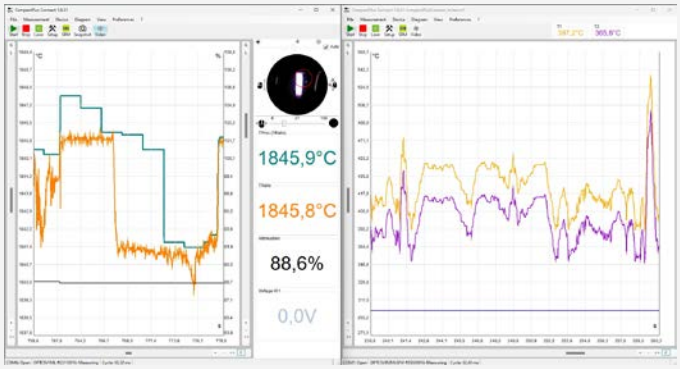
optris Software Pyrometer & IRmobile App

Software CompactConnect / CompactPlus Connect

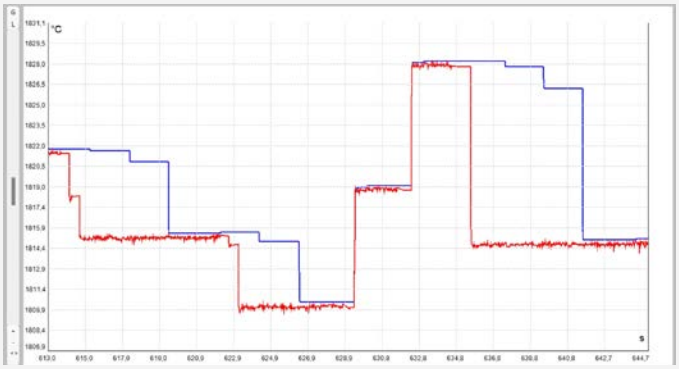
Suitable for all optris infrared thermometer of the high performance series and compact line

- Analysis and documentation of temperature data
- Graphic display and recording of the measurement values
- Setup of sensor parameters and signal processing functions
- Remote control of the sensor
- Automatic snapshots (time or temperature dependent) to control and document the process
- Multiple software instances are possible
- Softwares offers advanced signal processing and and the automation of process control
- There is no additional cost and no limitation in licensing

With pyrometers featuring video sighting technology, the video images can be displayed and optimized directly within the CompactPlus Connect software.



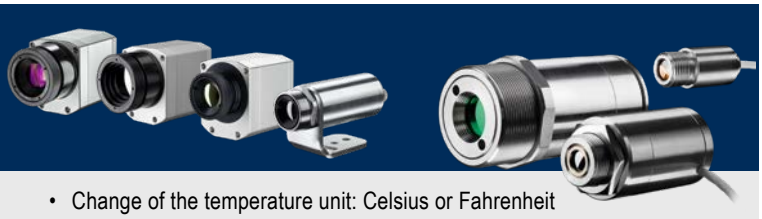
The software enables the starting of different stages to display multiple sensors simultaneously, increasing flexibility and usability in diverse environments.

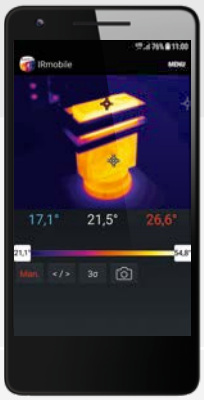


The CompactPlus Connect software offers advanced signal processing capabilities, including smart averaging, peak hold, and valley hold functions.

IRmobile App

Tool for all optris pyrometers and thermal cameras





- Change of the temperature unit: Celsius or Fahrenheit
- Integrated simulator
- Save / load configurations and Temperature-time diagrams

Pyrometer

- Alignment of the sensor via live video image with integrated simultaneous temperature display (CSvision)
- Adjustment of emissivity, transmissivity and other parameters
- Scaling the analog output and setting the alarm output

Thermal Cameras

- Live IR image with automatic hot and cold spot search
- Taking snapshots and analyze them later with PIX Connect software
- Adjustable camera features like temperature measuring range, frame rate and selectable color palettes

GET IT ON Google Play

Supported for

- PI and Xi series and all pyrometers
- For Android devices from version 5.0 or higher with Micro-USB or USB-C connectors that support USB OTG (On The Go)

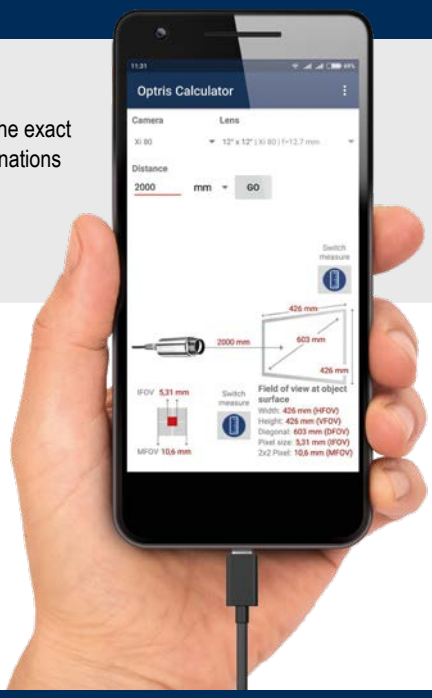
Optris Calculator

Combines the measuring spot size calculator of the IR pyrometers and the optics calculator of the Thermal cameras

The measuring spot size of the respective device is calculated for each distance

Pyrometers

- The spot size calculator determines the exact spot size for all sensor / optics combinations for any entered distance
- For reliable measurements



Thermal cameras

- Based on camera / lens combination and the distance to the object, the measuring field dimensions and pixel size are calculated precisely.
- Ensures an optimal positioning of the camera and the avoidance of measuring errors

Features

- Calculates for each distance the measuring spot size of the respective device
- Always the current software and features through regular updates

Supported for

- All android devices (5.0 or higher)
- iOS devices

Available on the App Store

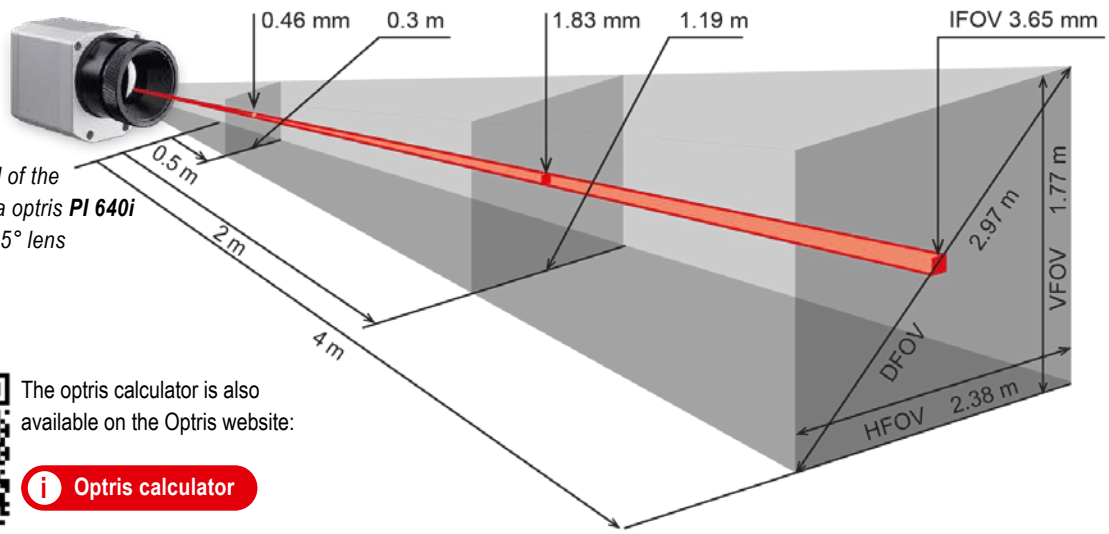
GET IT ON Google Play

Precise Measuring at various Distances

The ideal choice allows to focus opjects at various distances. From close and standard distances right up to large distances. The IR cameras of the optris PI series allow for changing between several lenses.

With infrared cameras there are various parameters which display the relationship between the distance from the measuring object and the size of the pixel on the object plane. In choosing the correct lens, the following should be taken into account:

HFOV	Horizontal expansion of the total measuring field on the object plane
VFOV	Vertical expansion of the total measuring field on the object plane
IFOV	Size of individual pixels on the object plane
DFOV	Diagonal expansion of the total measuring field on the object plane
MFOV	Recommended, smallest measuring object size of 3 x 3 pixels or 2 x 2 pixels when using the PI microscope optics or the Xi 80, respectively



*Measuring field of the infrared camera optris **PI 640i** using a 33° x 25° lens*

The optris calculator is also available on the Optris website:

Optris calculator

The optris Website - Find your Answer here!

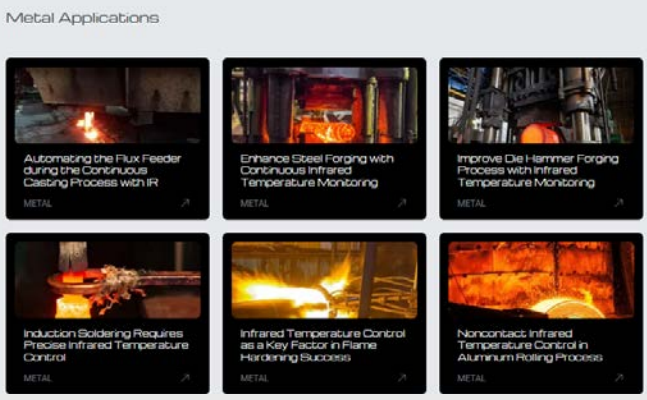
All topics in one place!
Please visit our website:

Optris Website

https://optris.com

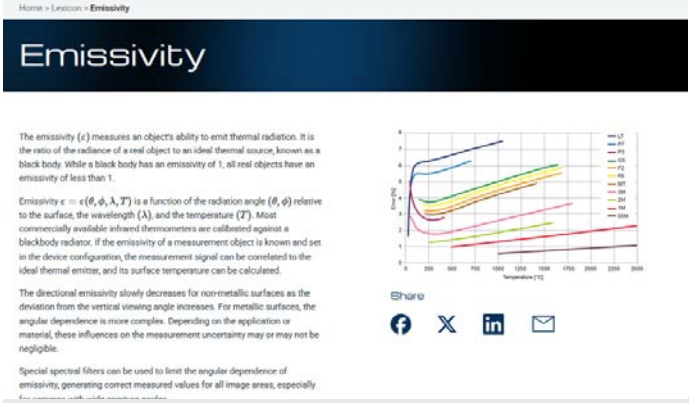
Features include:

Articles on practical Applications using Optris Devices

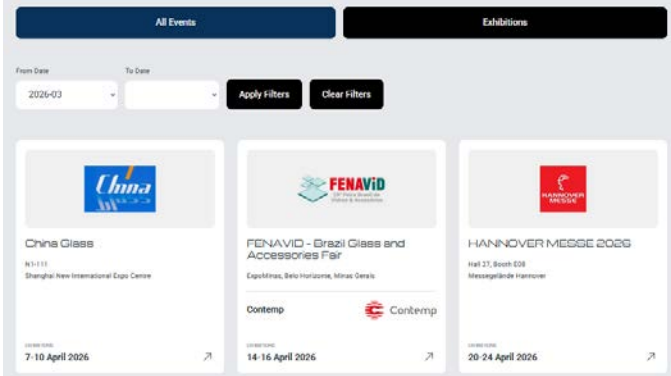


Detailed product descriptions and specifications

Extensive Technology Section (Lexicon, White Papers, FAQ)



Upcoming Optris Events - Come meet us in Person



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when temperature matters

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