

Infrared devices have significant applications in welding processes, enhancing both quality control and efficiency. Here are some notable use cases:

#### Applications of Infrared Devices in Welding

##### 1. Monitoring Resistance Spot Welding

Infrared thermal imaging technology is utilized to monitor resistance spot welding (RSW) processes, which involve extreme temperatures. The FLIR SC-7650 infrared camera is employed in research to assess the quality of welded joints by detecting temperature variations around the weld points. This monitoring helps ensure that the metal is uniformly heated to its melting point, which is critical for achieving strong welds. The temperature data collected can indicate the welding strength, allowing for adjustments to be made if the average temperature deviates from specified standards

##### 2. Friction Stir Welding Temperature Measurement

A novel method has been developed using infrared thermal imaging to characterize the core zone temperature during friction stir welding (FSW). This technique combines theoretical modeling with experimental data to establish a relationship between surface temperatures and core zone temperatures. By employing support vector regression algorithms, researchers can predict peak and minimum temperatures in the core zone during the welding process. This method addresses challenges in real-time monitoring and provides valuable data for understanding the welding mechanism

##### 3. Research on Composite Material Joining

At the Materials and Joining Technology Laboratory (LWF) in Germany, infrared cameras are used to investigate innovative joining techniques for composite materials, such as carbon fiber. The ability to monitor temperature changes during welding allows researchers to optimize processes for new materials that present unique challenges in manufacturing and quality control. The active thermal imaging technique helps identify defects and ensure that joints meet performance criteria

##### 4. Quality Control in Welding Processes

Infrared thermography serves as a non-destructive testing (NDT) method in various welding applications. By analyzing thermal images, operators can detect inconsistencies or defects in welded joints without damaging the materials. This application is particularly valuable in industries where structural integrity is critical, such as aerospace and automotive manufacturing.

#### Benefits of Using Infrared Devices in Welding

**Enhanced Quality Assurance:** Real-time monitoring of weld temperatures ensures that processes remain within optimal parameters, improving overall weld quality.

**Predictive Maintenance:** Early detection of potential issues through thermal imaging allows for timely interventions, reducing downtime.

**Non-Destructive Testing:** Infrared technology enables thorough inspections without compromising the integrity of welded components.

In summary, infrared devices play a crucial role in modern welding applications by providing essential data for process optimization, quality control, and safety enhancement.

