

## INDUCTION HEATING

### The Opportunity

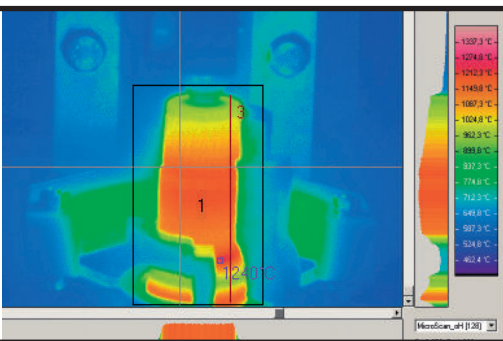
In order to reach optimal hardness during the induction hardening process, the metal workpiece must be heated rapidly for a defined period of time over a multi-step temperature profile. The quality and durability of the resultant parts are significantly influenced by the temperature accuracy and stability before the part is quenched.

The heating process and energy requirements can be optimized through the use of non-contact temperature measurement and adequate controllers. Infrared thermal imagers are capable of measuring a broad temperature profile to provide improved detail of thermal gradients across

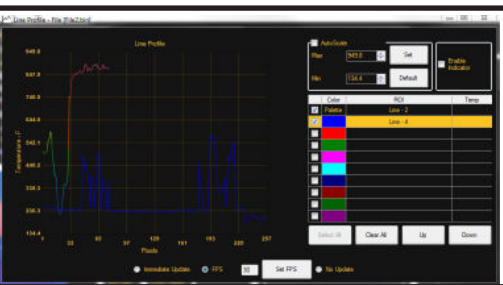
the workpiece, enabling further insight into the hardening process. While pyrometers provide accurate and precise temperature measurements at a single fixed point and enable the reproducibility that is critical in induction hardening processes. In addition, pyrometers are capable of very fast measurement speeds which is required for the rapid thermal changes of the induction process. The use of pyrometers, thermal imagers, and fast controllers for temperature monitoring and process control can increase the quality, accuracy, and repeatability of many heat treatment processes.



*Measurement in Hardening Processes*



*Thermal Image of Workpiece*



*Display of Several Measurement Lines*

### Our Solutions

#### Process optimization using a NIR thermal imaging system

- Measurement of a broad temperature distribution of the part by high camera resolution (up to 640 by 480 pixels)
- High measurement certainty (0.5% of measured value)
- Detailed data analysis, process monitoring and control using the LumaSpec™ thermal imaging process software

#### Process monitoring using pyrometers

- Precise and accurate monitoring of process temperatures at a single point
- Short wavelength detectors for high accuracy on metal products
- Measurement of very fast heating processes (short acquisition times up to 6 μs)

#### Process control by programmable controller (PI 6000)

- Specification of heat-up rates and of one or multiple holding steps to control the heat treatment process (within 250 μs steps)
- Facilitates holding of required working temperature through temperature-controlled hardening process
- High repeatability and process stability through online process control and reaction to each process variation



*Temperature Display at Controller*

### Your Benefits

- ✓ Fast and easy process optimization
- ✓ Robust, reproducible processes for improved control and monitoring
- ✓ Maintain and control process quality specifications
- ✓ Full-coverage process documentation to prove process reliability
- ✓ Flexibility thanks to controllers with multiple programs and external I/Os