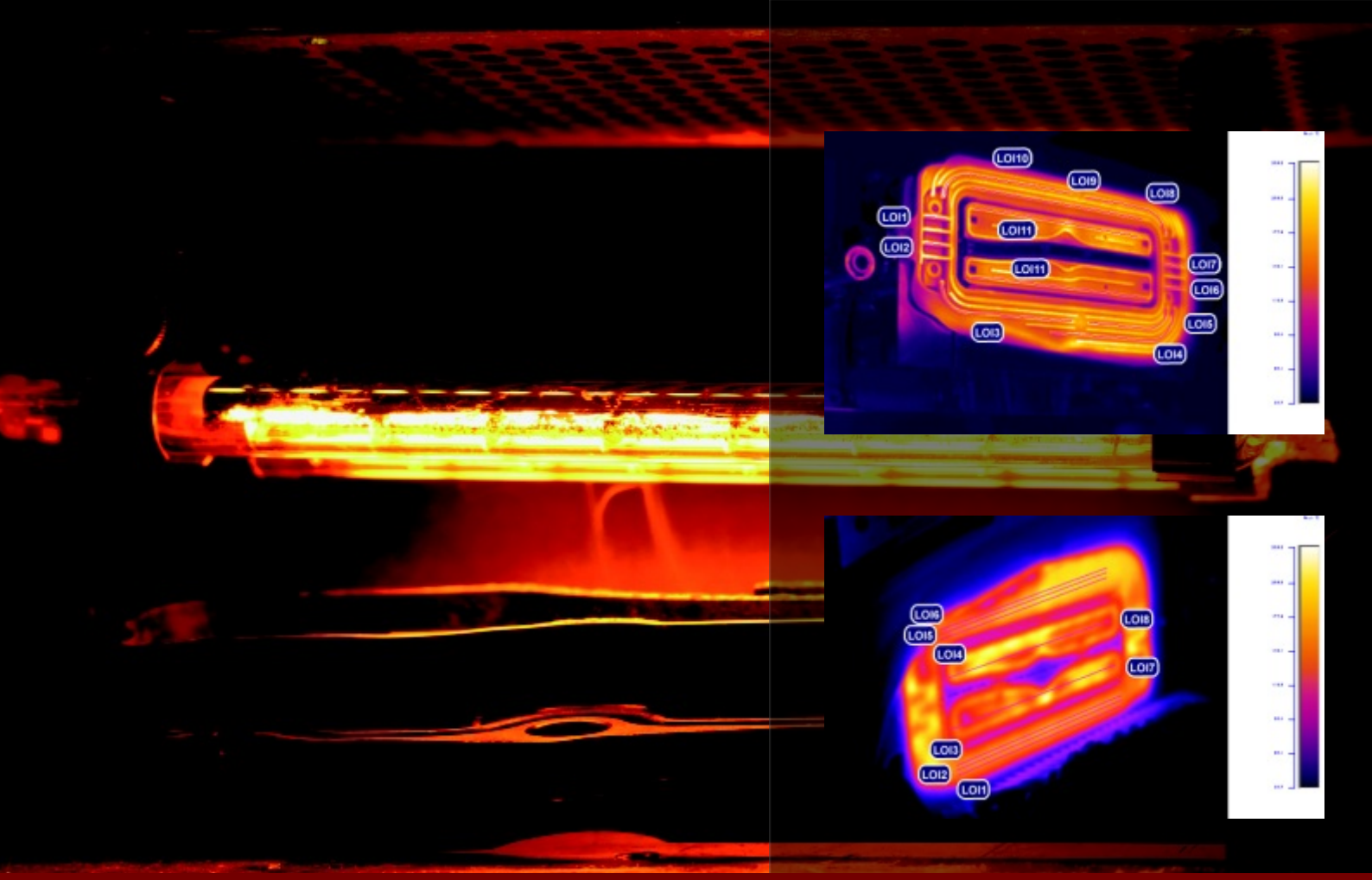


WeldCheck

Temperature Monitoring for Plastics Welding

- Ensures an Optimum Product Quality
- Cost Reduction by Minimizing Scrap
- Fully Automated Quality Monitoring
- Full Traceability of Process Temperatures
- Maximum Process Safety: Immediate Detection of Faults in the Welding System

Temperature Monitoring for Plastics Welding

The WeldCheck Thermal Imaging System serves as a key solution for inline monitoring of the process temperatures during the welding of thermoplastics. Installed directly into your welding machine, the system ensures a constantly high quality of the produced parts and provides a 100% traceability.

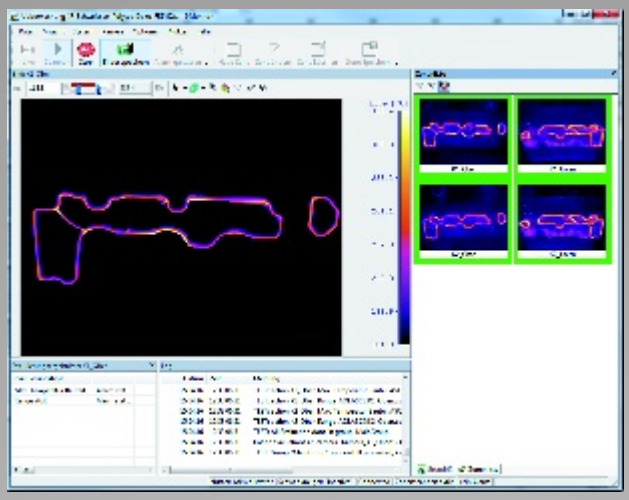
Because of numerous advantages, joining methods with a contactless supply of heat such as infrared welding or hot gas welding are increasingly utilized in plastics industry. With all these methods, the component temperatures are of vital importance to achieve a good weld. Because the temperatures are dependent on a variety of factors, they can vary greatly during the production process. Levels can be reached, where the material is damaged while on the other hand the surface of a part can also remain too cold. To ensure a consistently high product quality, the measurement and evaluation of the welding temperatures is thus an essential condition.

Monitoring with Infrared Imaging

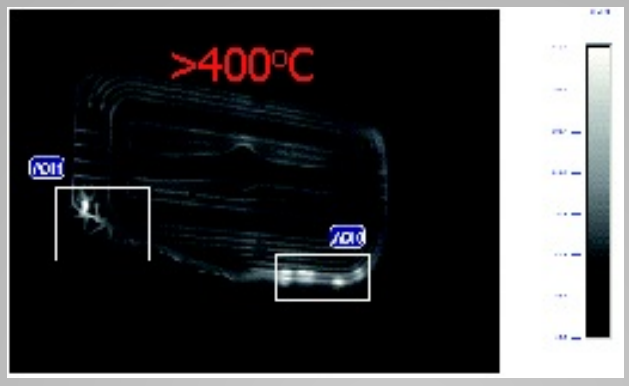
Thermal imaging with infrared cameras is the only applicable temperature measurement method for infrared or hot gas welding. Even complex and variable component geometries can be fully covered with the contactless measurements. The cameras provide an outstanding accuracy of up to ± 2°C and a high frame rate of 60 frames / second which are required due to the speed of the production process and the high cooling rate of the parts.

How does it Work

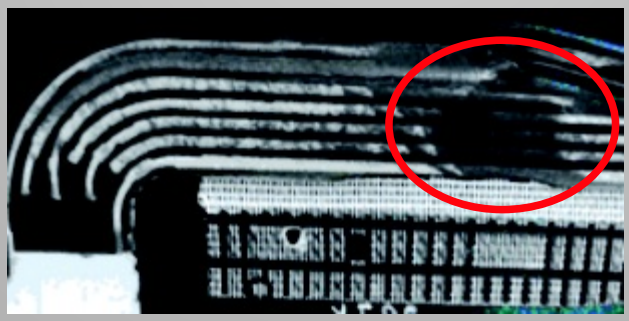
Thermal cameras measure the temperature distribution on the components in the upper and the lower tool immediately after the heating process. Based on a tool- and component-specific measurement plan the temperature data are assessed in real-time. If the temperatures are not within the preset limits, a signal is sent to the welding machine and the joining process can be stopped. All thermal images and the temperature data are stored, giving you full traceability and enabling dedicated analyses for optimizing the welding process.
If during production the tool or the component type is changed, the appropriate measurement plan will be loaded automatically.



WeldCheck Software User-Interface:
Temperature Distribution on the Components

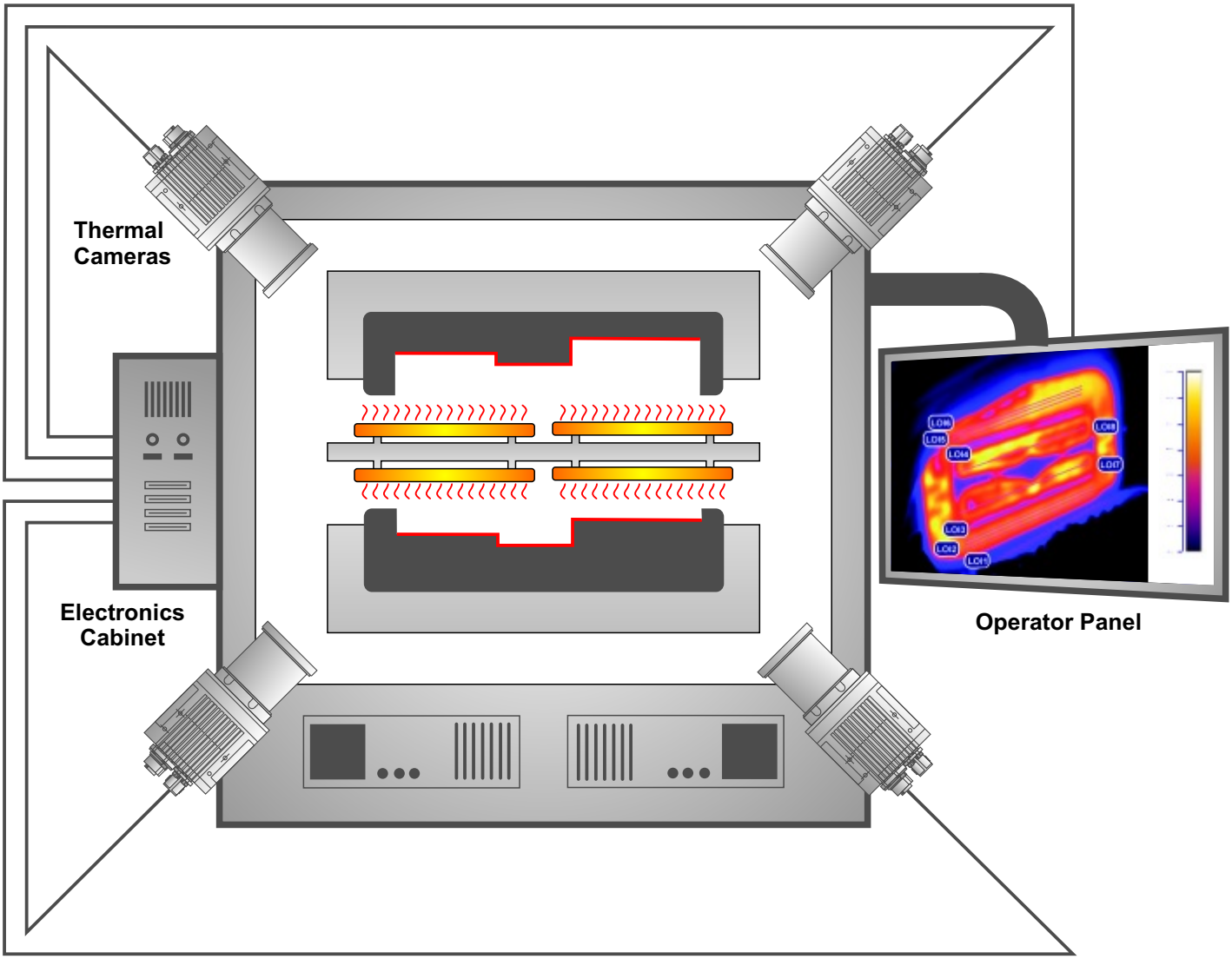


Temperature Distribution on a Component:
Local Temperatures exceed the Damage Threshold



Bad Weld due to Wrong Temperatures

WeldCheck - System Setup



Key Advantages :

- Ensures an optimum product quality and increases profitability
- Cost reduction by minimizing scrap parts
- 100% Traceability: Automatic storage of images, and measured temperatures
- Maximum process safety: Immediate detection of faults in the welding system
- Reduced set-up time

Key Features :

- Full monitoring of process temperatures even for the most complex welding contours
- Intelligent temperature evaluation for highly accurate measurement data
- Maximum modularity and scaleability: Variable number of cameras for adaptation to different tools and component geometries
- Automatic switching of measurement-plans for product- or tool-change
- Compact and robust design, maintenance-free

WeldCheck - Features

Intelligent Evaluation

Due to the often complex and filigran component structures (welding ribs) and together with additional impacts such as component distortion and tolerances, standard evaluation methods of thermal imaging almost inevitably lead to significant measurement errors.

In contrast, WeldCheck features analysis functions specifically developed for the demanding requirements of infrared and hot gas welding. The temperature analysis is based on free-form evaluation areas, which can be ideally adapted to any contour. The number of these evaluation areas is not limited, which allows a seamless monitoring of the temperatures even for the most complex welding geometries. In addition, an intelligent geometrical search routine compensates even large component distortions and insert tolerances by automatically repositioning the evaluation areas to the weld contour.

The dedicated evaluation functions of WeldCheck enable highly accurate continuous temperature readings for the entire welding contour, which guarantees a reliable detection of faulty components while avoiding unnecessary scrap.

Easy to Operate

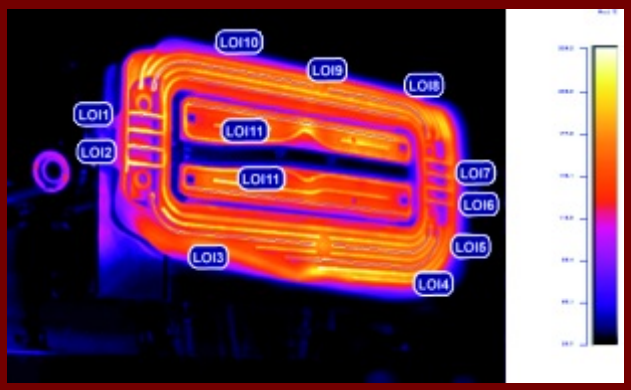
All settings for temperature measurement and evaluation are completely adjustable with the easy-to-use fully graphical operator interface of the software. During production the thermal images and the status of the parts are displayed. For bad parts the areas with temperatures outside the allowed limits are highlighted in the image. This way, the operator gets a clear impression about the location and severeness of a potential problem with the welding process.

For the offline evaluation of the thermal images recorded during production, WeldCheck comes with a separate, easy to use software-package. The powerful functions of this software enable dedicated analyses for the optimization of the welding process.

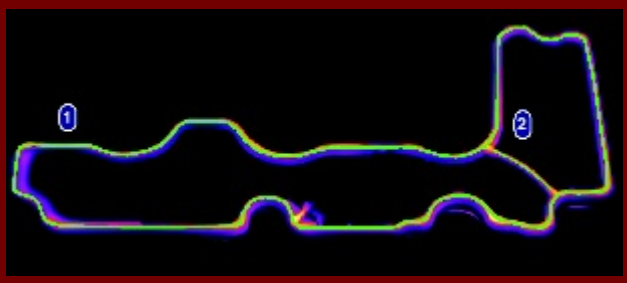
Easy to Integrate into the Welding Machine

The WeldCheck system consists of just two main components: The thermal cameras and a small electronics cabinet. The cameras are small enough to fit into any welding machine. They come with a mounting bracket which allows an easy installation and adjustment. In the electronics cabinet a small embedded computer with the software for the system control and temperature evaluation is installed. In addition, the cabinet contains all peripheral components like power supplies, a UPS as well as network- and interface-devices.

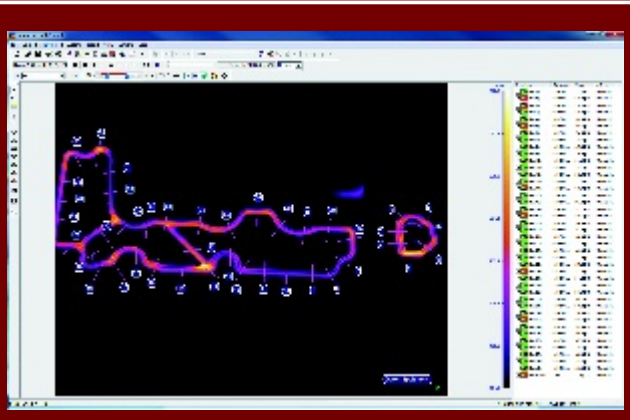
The whole system comes pre-configured and ready for installation.



Thermal Image of a Part with Evaluation Areas
The number of the free-form evaluation areas is not limited, allowing a seamless temperature monitoring even for highly complex welding geometries



Thermal Image with Evaluation Areas (Green Lines)
The free-form evaluation areas can be optimally adapted to the weld contour, allowing a continuous and highly accurate monitoring of the temperature distribution



Graphical User Interface of the Offlie Evaluation Software
Allows dedicated analyses for optimizing the welding process

WeldCheck - Features

Modular and Scaleable

Depending on the application, a WeldCheck system can comprise a varying number of cameras. To monitor the part temperatures in the upper and lower tool at least two cameras are required. However, for welding machines with exchangeable tools or for tools with multiple cavities a configuration with 4 cameras will often be the choice.
To allow a tailor-made adaptation to different welding geometries and component dimensions, cameras with varying resolutions as well as numerous lenses with different viewing angles are available.

Industrial Grade Cameras

The IRSX-series thermal cameras of the WeldCheck system are specifically designed for a reliable 7/24 operation in the harsh environment of a welding machine. With their industrial IP67 full-metal housing small enough to fit even in the tightest of space, the cameras can be installed without any need for an additional protective enclosure. An extended operating temperature range of up to 60°C guarantees a safe operation even at higher temperatures. To prevent dust formations at the lens, the cameras are already equipped with an air purge.

Comprehensive Interfaces

WeldCheck features various industrial interfaces to assure a seamless reliable and direct communications link to the PLC of the welding machine and to your production data recording system. This includes fieldbus digital inputs/outputs, ODBC for connecting to a database, as well as a data-telegram server for the exchange of data and commands via LAN.

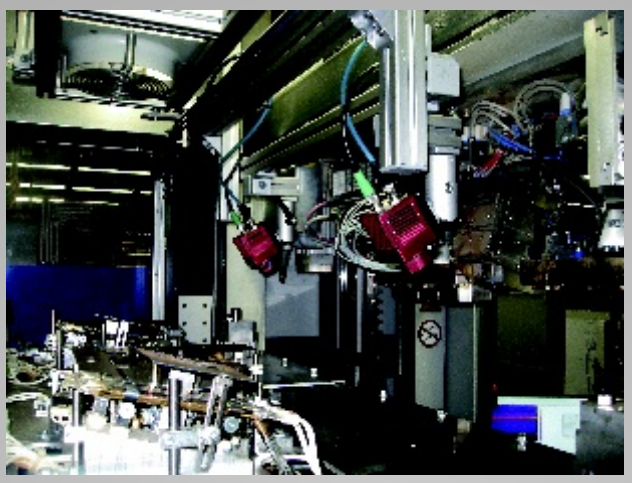
Robust and Fail-Safe Design

The entire system is tailored to the conditions of industrial production facilities. Integrated self-diagnostic functions continuously monitor all components. Any possible functional impairment will be immediately detected and indicated. All system states are displayed and stored in a log file which grants for a full traceability. With its intelligent reconfiguration-functions the system is able to eliminate most malfunctions without any user interaction.

Everything out of One Hand

The WeldCheck system including the cameras, the software and the peripheral hardware was consistently developed by Automation Technology to meet all challenging requirements of temperature monitoring during plastics welding.
All components are perfectly matched to give you the best possible performance.

Thermal Camera of the IRSX-Series



IRSX Thermal Cameras installed in an Infrared Welding Machine

Electronics Cabinet with Embedded Computer and Peripheral Components

WeldCheck - Technical Data

IRSX Thermal Cameras

Maintenance-free thermal cameras with un-cooled detector. The cameras are consistently designed for industrial applications, featuring intelligent processing functions and a Standard-GigE-Interface for data exchange. They are calibrated with an extended measurement range of up to 550°C for measuring absolute temperatures with high accuracy.

Model	IRS336	IRS640
Detector Resolution	336 x 256	640 x 512
Measurement Range	-40°C – 550°C	
Measurement Accuracy	±2°C (±3.6°F) or ±2% of reading	
Thermal Resolution	<50 mK (f/1.0)	
Frame Rate	9 Hz or 60 Hz (*)	
Detector Type	Focal Plane Array (FPA), uncooled Microbolometer	
Spectral Range	7.5 to 13 µm	
Interface	Gigabit Ethernet	
Input Voltage	10 - 24 VDC	
Power Consumption	< 6 W	
Operating Temp. Range	-40° to +60°C (non condensing)	
Storage Temp. Range	-50° to +80°C (IEC 68-2-1 and IEC 68-2-2)	
Humidity	0 to 95% relative humidity (IEC 60068-2-30)	
Bump	200g (IEC 60068-2-29)	
Vibration	4.3g (IEC 60068-2-6)	
Dimensions	55 x 55 x 77 mm (w/o lens, w/ connectors)	
Weight	270 g (w/o lens)	
Air Barrier for Lens	Installed	
Protection Class	IP 67 (IEC 60529)	
Lenses	**Field of View H° x V°**	
6 mm	51° x 40°	84.5° x 72°
7.5 mm	42° x 32°	72° x 60°
9 mm	35° x 27°	62° x 52°
10 mm	32° x 25°	57° x 47°
12 mm	26° x 21°	49° x 40°
13 mm	25° x 19°	45° x 37°
18 mm	18° x 14°	33.6° x 27°
19 mm	17° x 13°	32° x 26°
25 mm	13° x 10°	24.5° x 20°
35 mm	9.3° x 7.1°	18° x 14°
50 mm	6.5° x 5°	12.4° x 9.9°

Electronics Cabinet

Small electronics enclosure for assembly at the welding machine. In the electronics cabinet a small embedded computer running the software for the system control and temperature evaluation is installed. In addition, the cabinet contains all peripheral components like power supplies, a UPS as well as network- and interface-devices.

Cabinet	
Dimensions	500 x 500 x 210 mm
Material	Sheet steel, powder coated (RAL 7035)
Installed Main Components	
Computer	Simatic Microbox PC IPC 427D • Processor Intel Core-i7 • 8GB DDR3-RAM • 2x 10/100/1000 MBit/s Ethernet Rj45 • 4x USB 3.0 • 250GB HDD
Fieldbus Digital I/O	WAGO Series 750 Standard configuration: • 1x Fieldbus coupler, 750-352 • 1x 16 channel digital input module 24VDC, 750-1406 • 2x 16 channel digital output module 24VDC, 750-1504 • 2x 2 channel relay module, 750-514
Network Switch	Moxa EDS-G205 5 port Gigabit Ethernet switch
Power Supply	WAGO Espitron ECO Power • Nominal input voltage: 110...240 VAC • Nominal output voltage 24 VDC • Output current 10A
UPS	WAGO Epsitron, 24VDC, 20A • Nominal input voltage: 24 VDC • Nominal output voltage 24 VDC • Output current 20 A

Interfaces	
Ethernet Link	ODBC
Digital I/O, 24V Input/Output, Potential-Free (Fieldbus Module)	SQL Database

Scope of Delivery

- IRSX thermal cameras, optimally adapted to the welding application (number, detector resolution, lens configuration)
- Adjustable mounting brackets for thermal cameras
- Cables, 1 set for each thermal camera:
  - Ethernet cable with M12 connector, length 10m
  - Power cable with M12 connector, length 10m
- Electronics cabinet with installed components
- Software WeldCheck, installed on the embedded computer in the electronics cabinet and pre-configured
- Software for offline evaluations of recorded thermal images

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