Workswell
PRODUCT CATALOGUE

#WSWcam

#InfraredOnYourSide

www.workswell.eu

WORKSWELL®
INFRARED CAMERAS AND SYSTEMS

Content

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About Workswell

COMPANY AND PRODUCT PORTFOLIO INTRODUCTION

Workswell is a Central European based manufacturing company with headquarters located in Prague and established in 2010. The company is focused on developing, producing and selling thermal imaging cameras, systems and solutions for Industrial, R&D, OEM and Medical applications.

WORKSWELL MISSION

"Our mission are deliveries of complex products & solutions, as well as individual elements for non-contact temperature measurement and data evaluation."

WORKSWELL PRODUCT PORTFOLIO

Workswell thermal imaging product portfolio is divided into the several divisions:

- systems for process control and automation
- UAV payloads including optical gas imaging cameras
- early fire detection systems
- systems for detecting elevated body temperature
- calibration sources

Workswell is also providing OEM products like **OEM cameras for drones**, **USB3 and GigE modules** for thermal cores and OEM ThermoInspector. You can find many of our products as part of a third-party solution.

Workswell products are suitable for many applications from many fields such a:

- process control
- industrial production
- technical diagnostics and inspection
- search and rescue
- research and development
- early fire detection systems
- non-destructive testing (NDT)
- precious agriculture

2010 Company Establishment

2011 System integrator

2013 First Workswell thermal camera

2015 Thermal camera WIRIS for drones

2016 Thermal camera SMARTIS

2017 30 partners worldwide

2018 MWIR gas imaging thermal camera

2019 Q1 Fire safety system SAFETIS

2019 Q2 Next generation of WIRIS thermal cameras

2020 Q1 Fever screening camera

2020 Q2 60 partners worldwide

Workswell WIRIS Pro

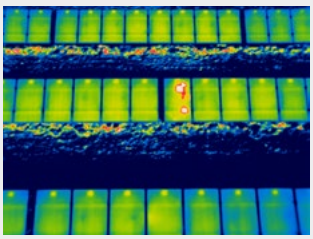
RADIOMETRIC DRONE THERMAL CAMERA

Workswell WIRIS® Pro has been designed first and foremost as an inspection camera. Its thermal camera is equipped with a LWIR microbolometric sensor with 640 × 512 px resolution (in the 7.5 – 13.5 µm range) and the **Super resolution** mode functionality providing an option to have the final thermogram in the **1 266 x 1 010 px resolution**.

The RGB camera comes with a Full HD (1920 x 1080 px) resolution and, most importantly, it provides an absolutely unrivaled optical ultrazoom **10x in real-time**. The highest possible temperature that the thermal camera can measure is **1 500 °C (2 732 °F)**.

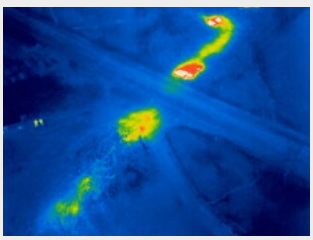
High measurement accuracy and precision metrology. We are aware that industrial applications can be very demanding when it comes to metrology and that at each stage.

Each thermal camera is precisely and individually manufactured and **calibrated**.

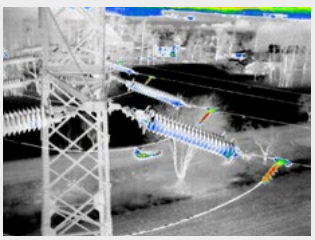


Photovoltaic panels inspection

Industrial pipeline inspection



Underground pipeline leakage detection



High voltage inspection

WIRIS Pro Key features description	
Super Resolution Mode	WIRIS Pro takes Super Resolution Mode 1.3Mpx IR images in one shot
Operating onboard system	WIRIS OS for full real-time data streaming and control during the flight • operating system ensures the full access to all camera functions • easy camera control via S.Bus, CAN bus, MavLink, RJ-45 or Trigger
10x Optical Antivibration zoom	Full HD 10x optical zoom camera with anti-vibration compensation
Thermal camera specification	
IR camera resolution	640 x 512 pixels
IR Super Resolution Mode	1 266 x 1 010 pixels (improvement of native resolution up to 1.3 Mpx)
FPA active sensor size	1.088 x 0.8705 cm
Temperature ranges	-25 °C to +150 °C (13 °F to +302 °F) -40 °C to +550 °C (-40 °F to +1022 °F) optional temperature range 50 °C to 1 000 °C (122 °F to 1 832 °F) optional temperature range 400 °C to 1 500 °C (752 °F to 2 732 °F)
Temperature sensitivity	Standard 0.05 °C (50 mK, 0.09 °F) or optional 0.03 °C (30 mK, 0.054 °F)
Accuracy	±2 % or ±2 °C (±3.6 °F) in temperature range 0 °C to +150 °C (32 °F to +302 °F), after camera stabilization • climate chamber and black body testing for all products
Frame rate	30 Hz or < 9 Hz
Spectral range / detector	7.5 – 13.5 µm / Uncooled VOx microbolometer
Calibration of each lens	Package includes a calibration certificate
Available lenses	18°, 32°, 45°, 69° (exchangeable lenses, all calibrated), visit FOV calculator
Protective filter on lens	Filter protects the lens against external damage during the flight
IR Digital zoom	1 – 14x continuous
Digital visual camera	
Resolution	1 920 x 1 080 pixels (Full HD), 1/3" sensor Auto white balance, Wide dynamic range Backlight compensation Exposure and Gamma control
Optical zoom	10x optical zoom with vibration compensation
View angle	ultra zoom 6.9° - extra wide 58.2°, focal 33.0 mm - 3.3 mm
Noise reduction	Special 3D noise reduction function
Focus	Autofocus with Direct Focus Zoom synchronization
Memory and data recording	
Memory	Internal high-speed SSD 128 GB or 256 GB for image and video recording External slot for Micro SD card & USB 2.0 for USB stick for taking images
Image and video formats	Radiometric JPEG images and Digital camera Full HD JPEG images Radiometric TIFF images (Pix4D and Agisoft compatible for 3D modeling) Digital camera h.264 encode video HD recording Radiometric full-frame IR recording (raw data recording in 30 Hz or < 9 Hz)

Workswell WIRIS Pro^{Sc}

THERMAL CAMERA FOR THE MOST DEMANDING APPLICATIONS

Workswell WIRIS Pro^{Sc} is a state of the art thermal imaging camera used for the **most challenging applications** like a geological, archeological and forest research, ecological and enviromental research, structural research of buildings (dams, chimneys, bridges) etc.

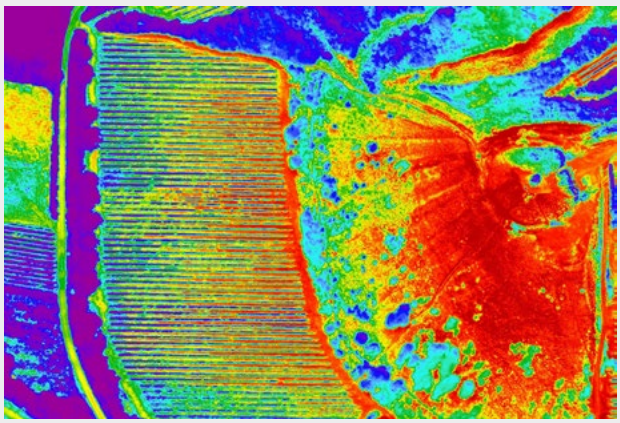
Workswell WIRIS Pro^{Sc} camera is designed for applications requiring the **highest temperature sensitivity and accuracy**, excellent service and software support. That's why the camera is offered in a **research and education kit** with **WIRIS Data SDK** for users application development and **WIRIS Ethernet SDK** for ethernet application development.

We want you... to measure accurately. Each WIRIS Pro^{Sc} thermal camera is **precisely calibrated in the climatic chamber**. Not only is the accuracy of the thermal camera when measuring different temperatures, but also at different operating temperatures. We managed to achieve unmatched measurement accuracy in the field of aerial thermography, ie. **±2 °C or ±2 % (±3.6 °F)**.

Many interfaces (CAN, S.BUS, Ethernet, USB and more) make Workswell WIRIS^{Sc} a completely versatile system that can be placed on the DJI M600 Pro drone and the most drones by other manufacturers such as **AceCore Zoe**, **VideoDrone**, **Flydeo**, **Height Technologies** etc.

Workswell WIRIS Pro^{Sc} is the only UAV thermal imaging camera that can meet all the requirements of this extremely demanding application.

- highest thermal sensitivity (< 30 mk)
- really low temperature drift even during long flight
- very high homogeneity in thermogram



Water and plant management influence the local microclimate. By draining and removing greenery on large areas, we induce a desert climate, especially in cities or fields, that does not solve any technical equipment.

Thanks to this image, it is clear from which places in the landscape drought and loss of vegetation coming from. We can see that the naked hill on the right above the vineyard warms its surroundings and reaches through the vineyard.

We belive, that in terms of land management, Workswell WIRIS Pro^{Sc} is a useful tool. And with its help it is possible to localize, visualize and reverse local processes, the cause of which is currently considered global and the processes are considered as locally irreversible.

Workswell WIRIS Agro R

CAMERA DESIGNED TO MAP WATER STRESS ACROSS LARGE AREAS

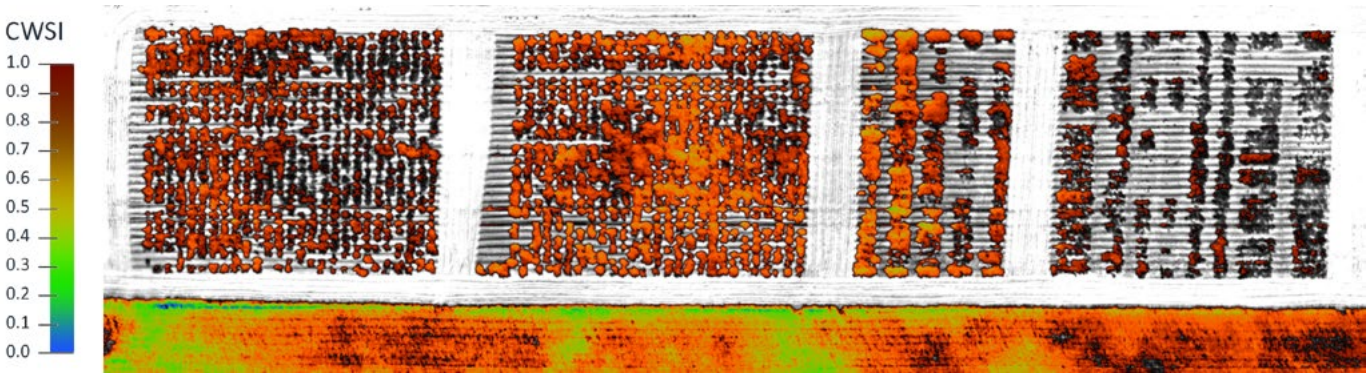
- BIOMASS COVER INDEX ONLINE EVALUATION
- AERIAL INSPECTION OF IRRIGATION SYSTEMS
- DETERMINATION OF ONGOING VEGETATION STRESS
- NEW PLANT BREEDING EVALUATION
- IRRIGATION CHEDULING BASED ON PLANT WATER STATUS
- AREAL DETERMINATION OF CWSI

Workswell's WIRIS Agro R is the first device of its kind **designed to map water stress across large areas in the field of precision agriculture**. The aim of this method and device is to determine the value of water stress in the plant stand.

Crop drought - actual and real value. In the dry season what we are usually interested in is the **actual effects of drought on crops**. These impacts are not only dependent on the condition of the so-called climatic drought, but also on the groundwater drought, the size of the plant root system, etc. Measuring the water stress of plants with CWSI (Crop Water Stress Index) camera will **help you to determine the actual and real effects of drought on the crop**.

WIRIS Agro R offers four different colourmaps. From the point of view of data rocessing it is not important which colourmap you choose. In the application point of view a suitable palette choice can be very helpful.

WIRIS Agro R Camera key features description	
CWSI onboard processing	Evaluation of Crop Water Stress Index (CWSI) onboard in real-time as well as temperature value
Operating onboard system	WIRIS OS for full real-time data streaming and evalution during the flight • operating system ensures the full access to all camera functions • easy camera control via S.Bus, CAN bus, MavLink, RJ-45 or Trigger
Biomass cover index in %	Real-time percentage calculation of the mass of the vegetation in RGB
WIRIS Agro R specification	
Sensor resolution	640 x 512 pixels
Real-time CWSI evaluation	Workswell patented WIRIS Agro R camera technology based on crop water stress index (normalized to value from 0 to 1) brings information about the crop stress and crop water management on large areas. The information can then be used to determine yield maps, manage irrigation or implement water management related remedies.
FPA active sensor size	1.088 x 0.8705 cm (LWIR band sensor)
Radiometry	Yes, temperature value in each pixel
CWSI evaluation range	0 – 100 % (100 % means very stressed)
Temperature sensitivity	0.03 °C (30 mK, 0.054 °F)
Field of view of the lens	45°
Color maps	4 color maps for CWSI and Water management evaluation
CWSI Range settings	Automatic or manual
CWSI digital zoom	1 – 14x continuous
Software ThermoLab	Yes, included in the package 2 licenses
3D mapping SW compatibility	Agrisoft and Pix4D
10x optical zoom RGB camera	
Resolution	1 920 x 1 080 pixels (Full HD), 1/3" sensor, Auto white balance, Wide dynamic range, Backlight compensation, Exposure and Gamma control
Optical zoom	10x optical zoom with vibration compensation
View angle	ultra zoom 6.9° - extra wide 58.2°, focal 33.0 mm – 3.3 mm
Biomass cover index	Calculation of the index in real-time with Threshold function
Focus	Autofocus with Direct Focus Zoom synchronization
Memory and data recording	
Memory	Internal high-speed SSD 128 GB for image and video recording External slot for Micro SD card & USB 2.0 for USB stick for taking images



INDEX COMAPRISON

CWSI
Crop Water Stress Index

Situation in a real time
See the current situation! You can se how "it works" and how to "improve it" in a real time. Intervention could be evaluated during a few hours.

Physiological process
You observe the actual crop's physiological process under given conditions at a given time. This is great, for example, for controlling of irrigation systems or locating vegetation infested by pests.

Before it's too late!
You can take actions before the crops die, ie when the stress is already occurring but the process is still reversible. The effectiveness of the intervention can be evaluated immediately after applying it.

VS

NDVI
Normalized Differential Vegetation Index

Dead or live
NDVI is used to detect live green plant canopies in multispectral remote sensing data. So you can only quantify the photosynthetic capacity of plant canopies in that time.

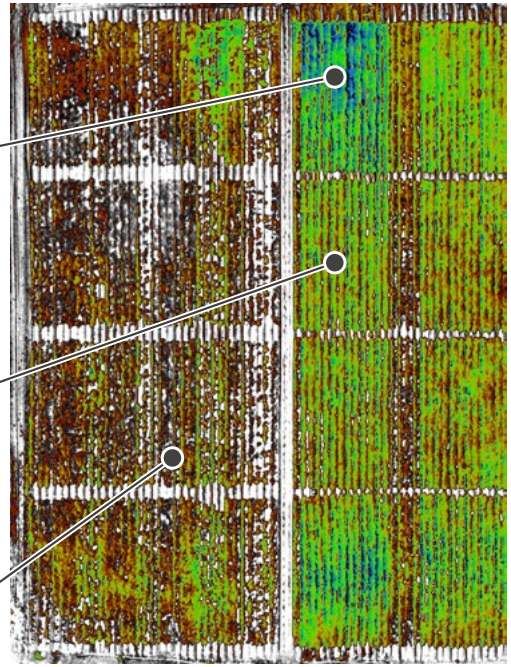
Not the process but the result
You observe the long-term effects of stress factors and environmental conditions on the state of vegetation but it is often very difficult to identify the causes.

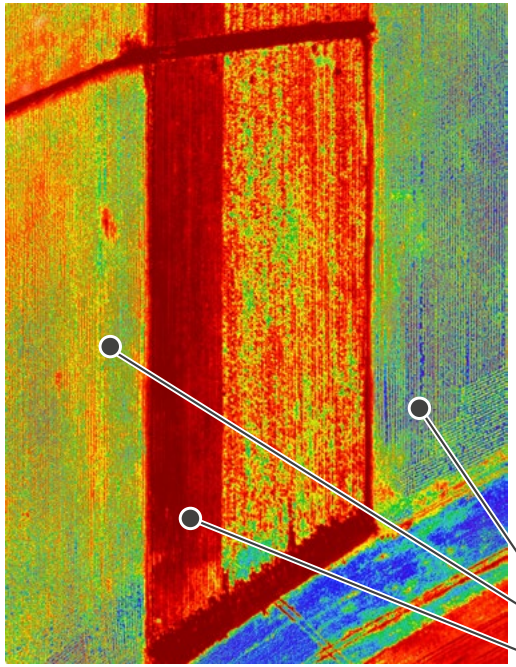
It is too late!
It is very difficult to make the right intervention as you cannot monitor the response quickly enough after applying the intervention. The NDVI shows the impact and result after longer period of time.

Water wasting
CWSI is very low. Water could be better distributed over the land or saved. No drought effect.

Under the correct irrigation
The water stress level corresponds to the current situation (sunny day, no precipitation). Irrigation helps prevent crop damage and works properly.

High level of stress
The irrigation system is not functioning properly and part of the crop is wilting. High level of water stress.





Index range 0.33 - 1
Crops are feeling better or worse, but it is not clear from the NDVI map why and whether they are currently under stress. Any corrective action to improve their condition will not be reflected quickly in the NDVI picture and will be difficult to evaluate.

Index range 0 - 0.33
Crop has already died and it is impossible to tell from the picture how this happened and what intervention would help. Corrective intervention does not exist.

Workswell WIRIS Security

UAV THERMAL AND VISUAL CAMERA FOR SEARCH & RESCUE

Workswell WIRIS® Security is a LWIR (7.5 – 13.5 µm) thermal camera for drones designed specifically for **search & rescue applications**, such as building and perimeter surveillance, searching for missing persons, fire-fighting operations etc.

This thermal camera is fully adapted to these applications with a **high-resolution thermal camera (800 × 600 px), 30x optical zoom in RGB spectrum**, search & rescue functionalities, excellent temperature sensitivity, as well as rugged mechanical construction made of lightweight aluminium.

High resolution and great thermal sensitivity. The thermal camera offers unrivaled resolution **800 × 600 px and thermal sensitivity 40 mK!** No other thermal imaging camera for drones will offer you the same parameters!

Great night vision RGB camera, 30x optical zoom and more. Workswell WIRIS® Security camera is equipped by incorporated specialized visual band imagery RGB camera with high sensitivity for dusk and night vision and possibility of optical ZOOM. Thus, the RGB camera image is clear even with minimum light of 0.0008 lux. Focal length is variable within interval of 129.0 mm – 4.3 mm and it equals up to **30x optical ZOOM**.

Workswell WIRIS Security also brings an interface enabling the widest range of connections to the drone, the control unit, an **external GPS sensor,** etc. **Wi-Fi low latency live video streaming** is also available.

WIRIS Security Key feature specification	
800px Infrared UAV camera	800 x 600 px IR sensor with 25 Hz frame rate (Worldwide shipping)
High sensitivity Night vision modes in visual Full HD camera	**Advanced Noise Reduction Technology** • filters noise from the image for clearer results in low-light conditions • the de-fog feature allows clearer viewing in foggy or misty scenes • when the feature is activated, the camera detects the haze level and automatically applies the required effects. **Auto IR-cut Filter Function** • in low-light conditions, the camera automatically switches from Day to Night vision mode • the IR-cut filter function allows to boost sensitivity for clear pictures in darkness. **Wide-D Image Processing Technology** • gives the ability to see clear, detailed images in high-contrast or backlit environments
Operating onboard system	WIRIS OS for full real-time data streaming and control during the flight • operating system ensures the full access to all camera functions • easy camera control via S.Bus, CAN bus, MavLink, RJ-45 or Trigger
30x Optical Antivibration zoom	Full HD 30x optical zoom camera with anti-vibration compensation
Thermal camera specification	
IR camera resolution	800 x 600 pixels
Scene range	-20 °C to +150 °C (-4 °F to +302 °F)
Temperature sensitivity	Extra sensitivity of 0.04 °C (40 mK, 0.072 °F)
Frame rate	25 Hz or 9 Hz
Spectral range / detector	7.5 – 13.5 µm / Uncooled VOx microbolometer
Available lenses	35 mm (21.2° x 16.2°), visit FOV calculator
Digital zoom	1 – 12x continuous
Digital visual camera	
Resolution	1 920 x 1 080 pixels (Full HD), 1/2.8” EXMOR R CMOS sensor
Optical zoom	30x optical zoom with vibration compensation and image stabilization
Minimum illumination	0.0008 lux (ICR on, Slow shutter 1/4s, High sensitivity on)
View angle / Focal length	Ultra zoom 2.3° - extra wide 63.7° / 129.0 mm – 4.3 mm
Focus and exposure time	Autofocus with automatic or manual exposure time control
Image enhancement	Auto-white balance, WDR, IR cut filtering, DEFOG, 3D Noise reduction
Memory and data recording	
Memory	Internal SSD 256 GB or 512 GB for image and video recording External slot for Micro SD card & USB 2.0 for USB stick for taking images

Workswell GIS-320

RADIOMETRIC DRONE CAMERA FOR GAS DETECTION

Under certain circumstances, thermal cameras are highly useful for detecting gas leaks and the presence of specific gases in the air.

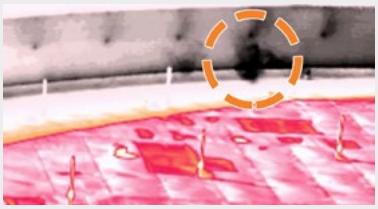
Workswell GIS-320 is a perfect solution to **detect gas leaks using drones or as handhald camera**. The combination of a thermal and digital camera brings you the opportunity of environment protection as well as human health and safety!

Wide spectrum of detectable gases. GIS-320 can **detect a wide spectrum of gases**, which are invisible to a human's eye. The Workswell GIS-320 has a **high sensitivity** with a range of detection between 3.2–3.4 µm.

Ready to fly combo. The Workswell GIS-320 thermal camera is fully compatible for instance with the Acecore Technologies drone NEO and both are available in a ready to fly combo. The camera is the **ideal solution for the unmanned air vehicles**. **Both can be fully operated by one standard RC controller**.

List of detectable gases: Benzene, Ethanol, Heptane, Ethylbenzene, Hexane, Isoprene, Methanol, MEK, MIBK, Octane, Pentane, Toluene, Xylene, Butane, Ethane, Methane, Propane, Ethylene and other gases.

Infrared Cooled Camera (MWIR)	
Resolution	320 x 240 pixels
Temperature ranges	Optional temperature ranges -20 °C...+350 °C (-4 °F...+622 °F)
Temperature sensitivity	0.015 °C (15 mK, 0.027 °F)
Frequency	30 Hz
Spectral range	3.2 – 3.4 µm, Cooled InSb FPA detector (MWIR)
Lens	24° x 18° or 14,5° x 10,8°
Focus	Automatic Motorized focusing, minimum focus distance 0.5 m
Zoom	Digital zoom 1 – 4x in infrared image
Special GAS detection mode	Yes
Temperature level adjustments	Yes, automatic, manual or moving span
Digital Visual Camera	
Resolution	1 920 x 1 080 pixels (Full HD)
Focus	Autofocus
Zoom	10x optical zoom with vibration compensation
Remote control & Video output	
Digital interfaces	S.BUS CAN bus (for DJI control and GPS coordinates) USB 2.0 (data transfer, video recording, FW update) MavLink
Video output	Digital HDMI 720p (1 280 x 720 px)
Memory and data recording	
Image and video formats	Radiometric JPEG images and Digital camera JPEG Full HD Radiometric TIFF (Pix4D and Agisoft compatible for 3D modeling) Digital camera h.264 encode video HD recording Radiometric full-frame IR recording (raw data recording in 30 Hz)
GPS tagging	MavLink External GPS A2 or A3 DJI compatible via CAN bus interface
Memory	Internal high-speed SSD 256 GB for image and video recording External slot for Micro SD card & USB 2.0 for USB stick for taking images
Temperature Measurement functions	
Measurement functions	Max temperature, Min temperature, Centre temperature
File format	Saved in radiometric (raw) format in JPEG, TIFF and video WSEQ



Payloads for Gremsy gimbals

CAMERAS COMPATIBLE WITH GREMSY S1, T7 AND PIXY WS

GREMSY

Payloads for Gremsy S1 (S1/S1V2/S1V3)

Gremsy S1 is the world's first ever small gimbal (camera stabilizer) with **onboard HDMI and SMA ports** fully supported for infrared camera WIRIS Pro. Developed based on Gremsy T1 technology with a larger camera cage, the **S1 can plug and play with various platforms** to provide **high precision pointing accuracies** for every industrial need.

S1 is first single arm gimbal made by Gremsy that supports multiple camera models. Gremsy S1 is the **most advanced single arm gimbal for industry experts** in the market. Small and lightweight.

COMPATIBLE CAMERAS

WIRIS Pro

WIRIS Pro^{Sc}

WIRIS Agro R

Payload for Gremsy PIXY WS

PIXY WS is a particular version of Pixy series, **specifically designed to fit Wiris Security camera** to provide for the most demanding metrological applications such as security, search and rescue.

Pixy WS is only 470g, what makes it one of the **lightest gimbals among Gremsy gimbals**. Built for a specific camera on tray, **no balancing nor tuning is required**. Pixy WS delivers **excellent quality stabilization**.

COMPATIBLE CAMERAS

WIRIS Security

Payload for Gremsy T7

Gremsy T7 brings the next level of industrial gimbals. Boasting a robust **design and powerful motor**, Gremsy T7 is the next level of heavy lifting gimbal for industrial applications.

With a **large camera cage and ability to carry up to 7 lbs**, the T7 expands the range of compatible cameras and is capable of loading multiple specialized sensors at once.

COMPATIBLE CAMERAS

GIS-320

Acecore Ready to fly solutions

ACECORE DRONES COMPATIBLE WITH WORKSWELL CAMERAS

Acecore ZOE

Acecore Zoe could offer max. **40 minutes fly time** with max. **6 kilograms payload weight** and **4 independent motors**. Acecore Zoe impressive flytime up to 40 minutes before changing battery packs and there is also option for a tethered solution for unlimited flight time.

Zoe has **triple redundant autopilot** that compensates any error. It is also equipped with **encrypted radio link** that guarantees a secured operation.

Zoe is compatible with George Base Station and different controllers may be used - Hereling George, FrSky George, FrSky GCS Pro and other options.

COMPATIBLE GIMBALS

Gremsy S1

Gremsy Pixy WS

COMPATIBLE CAMERAS

WIRIS Pro

WIRIS Pro^{Sc}

WIRIS Security

WIRIS Agro R

Acecore NEO

Acecore Neo is a very robust drone with a **maximum flight time of 25 minutes**, max. **payload 9 kg** and 8 independent motors.

The Acecore Neo drone is completely made of carbon fibers and it is ready for any weather coditions. The **triple redundant autopilot will compensate for any error.** Encrypted radio link guarantees a secured operation.

Done is compatible with **George Base Station**. The station can be selected as an accessory.

George is a modular base station that allows drone pilots to work with up to **three FPV displays** or other modules, which is capable of powering the controller and attachments through multiple flights.

COMPATIBLE CAMERA

Workswell GIS-320

COMPATIBLE GIMBAL

Gremsy T7

UAV application examples

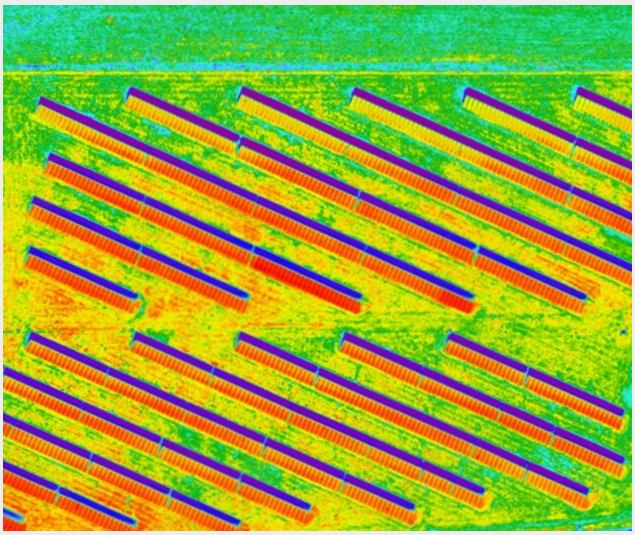
EXAMPLES OF TOP WIRIS CAMERA APPLICATIONS

Thermodiagnosis of photovoltaic power plants

The worldwide increased knowledge of the environment and the risk of exhausting non-recoverable energy sources is a reason that various methods of using alternative resources have been sought.

Solar energy is an inexhaustible source which, thanks to the programmes for the support of the construction of solar power plants is most often used.

A fast, cheap and reliable method where it is possible to check the quality of a large area of solar panels is thermodiagnostics using the Workswell WIRIS thermal imaging system attached to the drone.

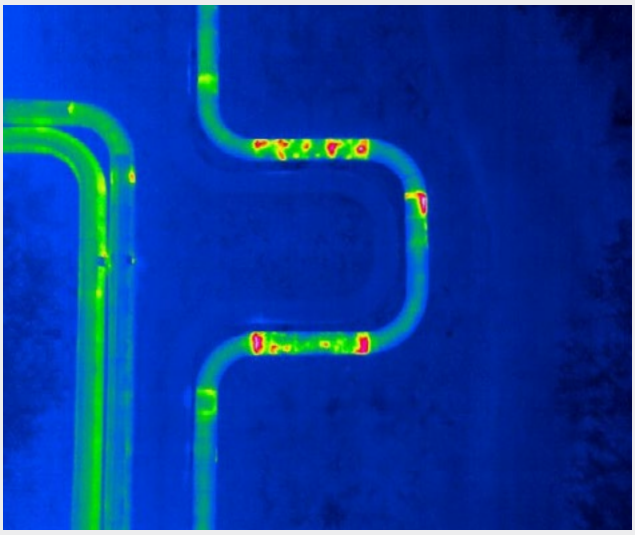


Pipeline inspection with thermal diagnostics

Pipeline – this is defined as a “special form of transport used to transport liquids (i.e. liquids and gases), or liquid mixtures with solid particles”.

The issue of thermographic pipeline inspection applies to long-distance piping systems supplying variable media with a temperature different from the temperature of the surrounding atmosphere.

By using thermographic systems, it is possible to determine and localize defects to pipeline insulation and leaks of the transferred media. In some cases, leaks can even be determined and localized in underground pipelines.

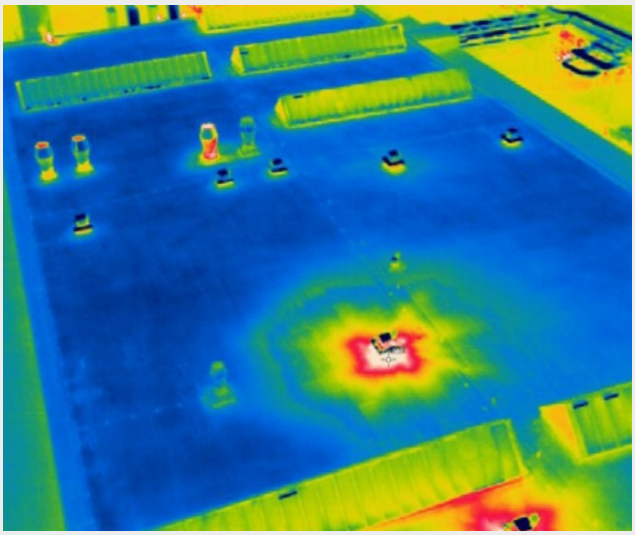


Thermodiagnostics of flat roofs

Flat roofs were originally built in areas with low rainfall. For example, they can be found in the architecture. In the modern era, the quality of insulation against atmospheric conditions increased so flat roofs appeared on factory halls as well as highly architecturally appreciated buildings.

The benefits of such roofs are that they save material, are less labour intensive, provide the option of variable roofing layouts and the potential use of roof areas. Thermal imaging systems provide the perfect tool to evaluate the technical condition.

The thermal imaging system located on the drone provides a fast and economical solution for surveying wide roofs on industrial sites.



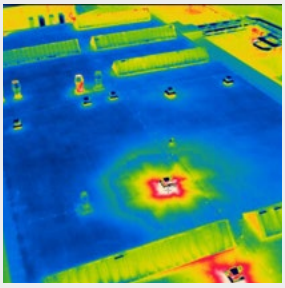
UAV application overview

LIST OF MOST COMMON WIRIS APPLICATIONS

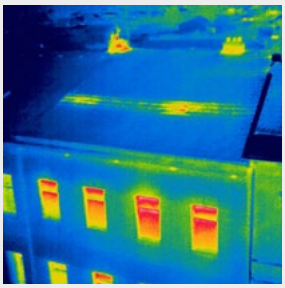
Photovoltaic panels

Pipelines inspection

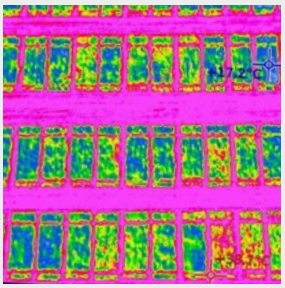
High voltage power lines



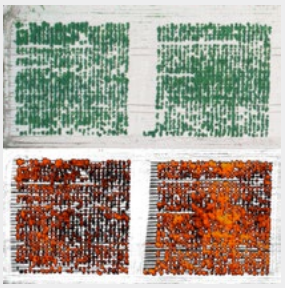
Checking flat roofs



Building diagnostics



Cultivation and phenotyping of cereals



Detection of water stress

Fakel burner inspection

Security applications

Firefighting

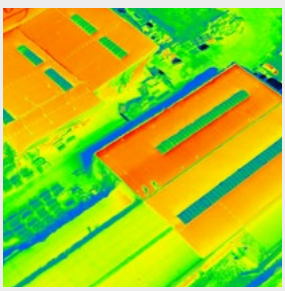
Gas leaks visualization

Roe deer mortality reduction

Drone based 3D thermal modeling

Monitoring in climate change research

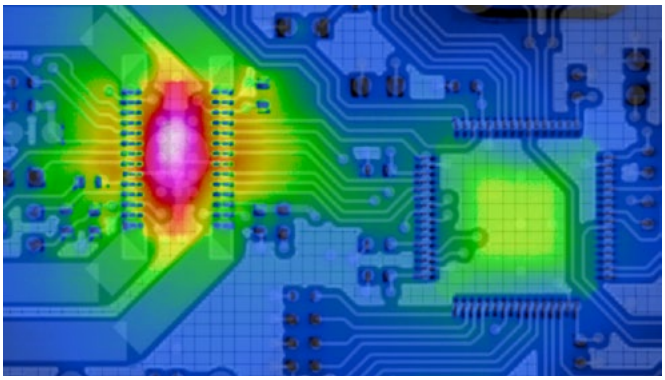
Improvement of potatoes phenotyping



Green roof inspection

WIC 2

STATIONARY RADIOMETRIC THERMAL CAMERA



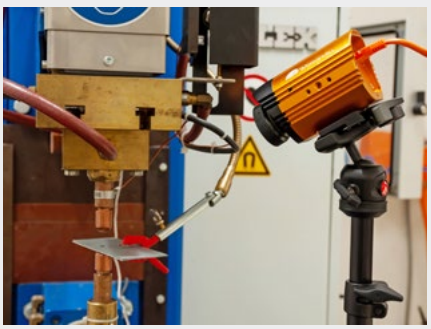
- IDEAL FOR INDUSTRIAL PROCESS CONTROL
- PRECISE TEMPERATURE MEASUREMENT
- USB3 OR GIGE CONNECTIVITY
- HIGH RESOLUTION AND GREAT SENSITIVITY

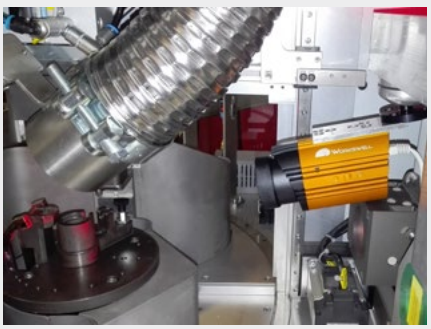
Product portfolio of **WIC thermal cameras** offers two different sensor resolutions that are **336 x 256 px** (WIC 336) and **640 x 512 px** (WIC 640) with a thermal sensitivity up to ≤0.03 °C (30mK). This thermal camera can be connected via **USB3 interface** (perfect for laboratory usage and for instance PCB analysis) and **GigE** (suitable for industrial applications and integration with manufacturing machines).

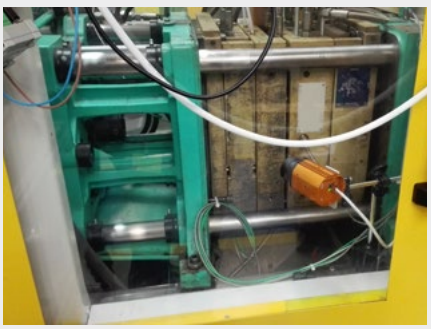
Workswell WIC in its USB3 variant has a **very low energy consumption** due to simple connectivity with a laptop without a need of additional power supply. Both thermal camera variants can be easily attached to a production line or a tripod, **protection rate of its IP65 enclosure** ensures the camera's protection against external factors.

Workswell ThermoLab software **automatically identifies the presence of the thermal camera**, sets an IP address, and ensures that the thermal camera is connected to your system. All WIC thermal cameras use 14 RAW data formats or directly calibrated temperature in each pixel. The thermal cameras picture can be displayed in different temperature color palettes.

Thermal and optical data	
Resolution	640 x 512 pixels and 336 x 256 pixels
Framerate	60 Hz / 30 Hz or 9 Hz
Temperature ranges	-25 °C to +150 °C (13 °F to +302 °F) -40 °C to +550 °C (-40 °F to +1022 °F) Optional up to 1 000 °C (1 832 °F) or 1 500 °C (2 732 °F) with special filter
Accuracy	±2 % or ±2 °C (±3.6 °F)
Temperature sensitivity	≤ 0.03 °C (30 mK, 0.054 °F) @ 30 °C (68 °F)
Spectral Range	7.5 – 13.5 µm
Dynamic range	14bit radiometric temperature data, 14 bit RAW data
Calibration	Yes, calibrated both temperature ranges
Detector Type	Uncooled VOx microbolometer
Lenses	Interchangeable and focusable, various field of view
Available Lenses	6.8mm, 9mm, 13mm, 19mm (See IFOV and FOV details in the table on page 6)
Focus	Manual continuous (Min. focus distance depends on lens)
Communication and Power Supply Interface	
Ethernet version	Gigabit Ethernet, RJ-45 connector
USB3 version	USB3, Thumbscrews lock micro USB connector
Analog video output	PAL/NTSC video format (only for USB3 version)
Input Supply Voltage	5 V DC for USB3, Power over Ethernet 48V type
Power Dissipation	< 1.3 W (max. 3 W during NUC calibration time)
Mechanical data	
Dimensions for USB3 version	97 x 65 x 63 mm for IP40 for WFOV, 186 x 65 x 63 mm for IP65 for WFOV,
Dimensions for GIGE version	106 x 65 x 63 mm for IP40 for WFOV, 179 x 65 x 63 mm for IP65 for WFOV,
Weight	360 g for GIGE WFOV model (without back IP65 cover)
Mounting and tripod	4 x 1/4-20 UNC thread and 10 x M4
Internal Protection	IP 65 with plugin back cover (IP 40 without)
Operating Environment	
Operating temperature	-15 °C to +50 °C (5 °F to +122 °F)
Storage temperature	-30 °C to +60 °C (-22 °F to +140 °F)
Humidity	5% to 95% non-condensing
Content of delivery	Workswell infrared camera, calibration certificate, software ThermoLab, cables, PoE (GigE version), download card, hard transport case
Thermal Camera Settings	
Source of image	As a source of image can be used full image (full sensor size) or only a part of the image specified by a rectangle ROI tool
Framerate	According to the camera you can change frame-rate from 1 Hz to 60 Hz

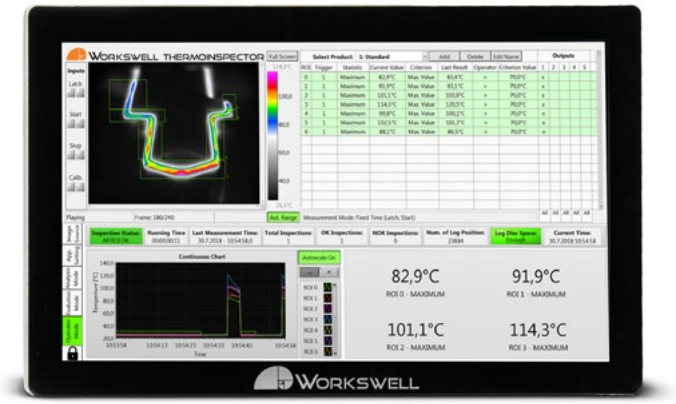






ThermoInspector

THERMAL INSPECTION SYSTEM



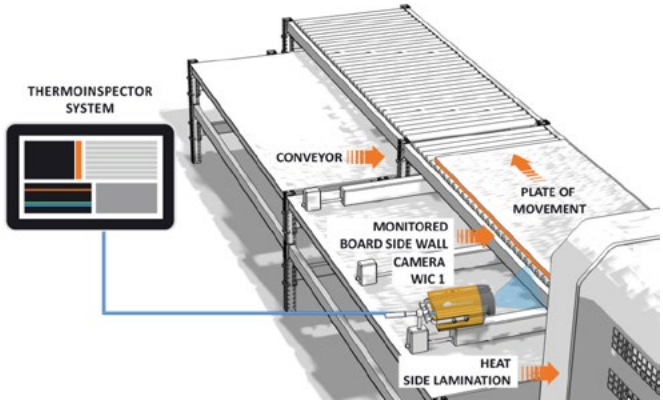
IDEAL FOR INDUSTRIAL PROCESS CONTROL

PRECISE TEMPERATURE MEASUREMENT

The Workswell ThermoInspector parameterized **NDT inspection system for inspecting production quality**. The ThermoInspector system is well-established in numerous areas of industry: **plastic, glass, steel, foundry, wood, paper and chemicals** etc.

The main part of the Workswell ThermoInspector system consists of a central unit and **up to four thermal cameras** that can be simultaneously connected to the system. The delivery of the system includes Workswell WIC thermal cameras with a high thermal sensitivity (up to 30 mK, 0.054 °F), a high temperature range up to 1 500 °C (2 732 °F) and a strong sealed enclosure (up to IP65).

The Workswell ThermoInspector is a programmable system made for **inspect quality production**, process control and NDT. A major benefit of this system is the wide-range options for the configuration including the appearance and evaluation of all functions. The system also allows to create programme modules for specific machine vision algorithms or videometry taht is required for some applications.



System overview	
Central controller units	Two versions: Passive central controller or Touchscreen central controller Camera ports: 4 x Gigabit PoE Ethernet, 2 x Gigabit Ethernet for PLC and internet / database connection Digital Inputs: 8 x isolated (24 VDC compatible) inputs Digital Outputs: 8 x open collector outputs Serial ports: RS232, RS485 Power supply: 6-36VDC USB ports: 2 x USB3 super speed ports for data uploading Embedded operating system optimized for multi-camera connection
Thermal cameras	Up to 4 connected WIC cameras per one central unit, two different available resolutions: 640 x 512 pixels, 336 x 256 pixels, several infrared lenses with manual focus system Lenses: Interchangeable and focusable, various field of view Framerate up to 60 Hz Temperature range: -25 °C to +150 °C (13 °F to +302 °F), -40 °C to +550 °C (-40 °F to +1022 °F), optional up to 1500 °C (2 732 °F) Accuracy: ±2% or ±2 °C Temperature sensitivity: ≤0.03 °C (30mK) @ 30 °C
Calibration	Yes, each camera has calibration certificate in the package
Cables and adapters	Digital input and output cable with terminal block for easy DIN rail mounting Ethernet cable for every delivered camera Optional power supply adapter for 230 VAC
Content of delivery	TIxx package: Touchscreen Panel Controller or Passive Controller (IR Software included, LCD, 4 PoE ports, isolated DIO, SW, 6-36 VDC), Cables (DIO 1 m, UTP 10 m, DIO board)
Power supply	
Controller Supply Input	6-36 VDC or 230 VAC (with optional adapter)
Camera Supply Input	Integrated in every Central Controller unit, Power over Ethernet supplying (POE included)
Power Dissipation	150 (Touch-screen controller version)
	120 W (Passive controller version)
Mechanical and environmental information	
Passive controller version	260 x 215 x 79 mm
Touchscreen controller version	22 inch panel, 538 x 329 x 53 mm
Camera dimension	106 x 65 x 63 mm for IP40 for WFOV, 179 x 65 x 63 mm for IP65 for WFOV,
Weight	3 kg for passive controller version 5.8k g for touchscreen controller version 360 g for every Thermal camera (without back IP65 cover)
Mounting	4 x M4 screws (Passive controller version) VESA interface 75mm and 100mm (Touchscreen controller version) 4 x 1/4-20 UNC thread and 10 x M4 (for every camera)
Internal Protection	IP 65 for thermal camera with plugin special back cover (IP 40 without) IP65 front panel of Touchscreen controller version IP40 for all passive controller version and another electronics
Thermal Camera Settings	
Source of image	**Fully radiometric streaming** for every thermal camera. User can use different cameras with different resolutions for same central controller in multi-camera configuration. Cameras can use variable speed from 1Hz to 60Hz, temperature range and trigger settings.

SMARTIS

SMART RADIOMETRIC THERMAL CAMERA

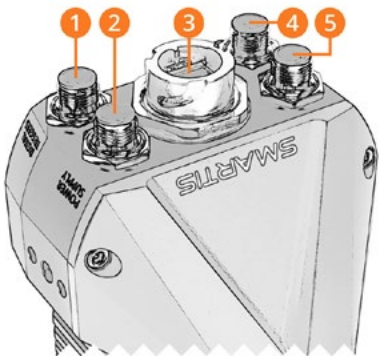
- BUILT-IN WEBSERVER FOR THE CAMERA CONFIGURATION
- TCP/IP INTERFACE FOR COMMUNICATION
- INPUTS/OUTPUTS FOR TRIGGERING AND ALARM OUTPUTS
- TEMPERATURE MEASUREMENT UP TO 1500 °C (2 732 °F)

SMARTIS is an all-in-one solution featuring a thermal camera, control unit, I/O card as well as a TCP/IP interface integrated within a single casing including an in-built webserver allowing system configuration

The Workswell SMARTIS thermal camera can be operated and configured independently without the need for a direct connection to a PC or a superior unit. The thermal camera is offered in resolutions of 336 x 256 px and 640 x 512 px. A LWIR (Long Wave InfraRed) microbolometer with the spectral range of 7.5 – 13.5 µm and different lenses.

The SMARTIS thermal camera has been designed for use in **process automation** so that it can autonomously control a separate smaller process however, could also become a part of the more extensive control system.

The measurement scope of the thermal camera ranges from -25 °C to 550 °C (13 °F to +1 022 °F), optionally up to 1500 °C (2 732 °F). Metrologic accuracy ±2% or ±2 °C (±3.6 °F) and sensitivity 0.05 °C (50 mK, 0.09 °F) have stood as priorities in the thermal camera's development.

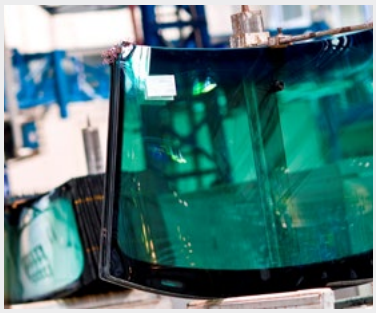


1. 4x digital input/output for trigger
2. Power supply
3. Ethernet TCP/IP with a RJ-45 connector
4. 4x current output (0-24 mA/12 V current loop)
5. 7x digital output (with an open collector)

SMARTIS Thermal Sensor	
Resolution	SMARTIS 336: 336 x 256 pixels SMARTIS 640: 640 x 512 pixels
Image Frequency	SMARTIS 336: 9 Hz, 30 Hz or 60 Hz SMARTIS 640: 9 Hz or 30 Hz
Temperature ranges	-25 °C to +150 °C (13 °F to +302 °F) -40 °C to +550 °C (-40 °F to +1 022 °F) Optional up to 1 000 °C (1 832 °F) or 1 500 °C (2 732 °F) with special filter
Temperature sensitivity	0.05 °C (50 mK, 0.09 °F)
Accuracy	±2 % or ±2 °C (±3.6 °F)
Calibration	Yes, the system includes the calibration certificate
Detector Type	Uncooled VOx microbolometer
Optics (FOV)	SMARTIS 336: 17°, 25°, 35°, 45° SMARTIS 640: 32°, 45°, 69°
Focus	Continuous Manual (fixed focusable, min focus distance depends on lens)
Spectral Range	7.5 – 13.5 µm
SMARTIS Communication and Power supply	
Networking	Ethernet 100 Mb/sec, RJ-45, Metal cable gland protection
Analog output	4-channel isolated Current loop (0-24 mA) / Voltage (±12 VDC, M12 circular thread)
Digital output	7 x Isolated open collector output (max 40 VDC), M12 circular thread
Digital inputs	4 x isolated high-voltage trigger inputs (max 36 VDC), M12 circular thread
Supply input	18 to 32 VDC, < 4 W (max. 5 W during NUC calibration), M12 circular thread
SMARTIS Built-in Functions	
Camera configuration	Built-in WEB server for easy and fast sensor configuration, Google Chrome or Firefox browser compatible, no external software required
Monitoring and Alarming	Extreme detections, MAX/MIN evaluations, Dynamic/Static measurements User Control Table (Logical rules and PLC features) Selectable digital output for specific ROI result (OR/AND operators)
Synchronization	Continuous (periodical or full-speed) or Triggered (Start/Stop, Latching)
Visualization	Real-time video streaming, Pallet settings, Overlay elements, Digital zooming, Numeric and statistical indicators, Input and Output overview panel
Security	Administrator/Operator password, locking functions
ROI	User definable measurement area (Point, Line, Polyline, Rect., Polygon, Circle) Multiple product selection for ROI presets (Manual or via Ethernet)

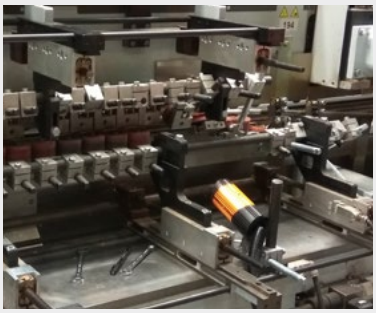
Applications

THERMAL INSPECTION SYSTEM



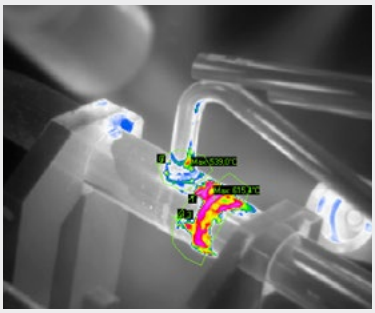
Monitoring the correct heating of the windscreen

In these times of modern cars, the heating of the rear window or windscreen is almost standard equipment of each new car. Heating is provided by small resistance wires inside each glass. If the wire is defective, a short circuit occurs in the area. These short circuit are very well recognisable with a WIC thermal imaging camera.



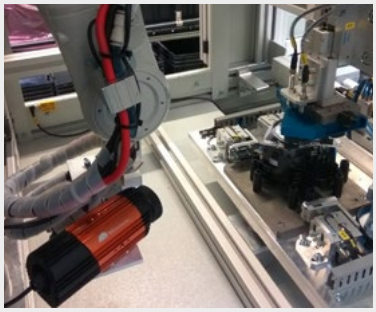
Surface temperature check when gluing laminate

Gluing laminate on chipboard under high pressure and at the stated temperature is an example of using ThermoInspector. Chipboard panels are machined with a high-pressure laminate that increases the resistance of the work boards to wear, moisture and heat. Process of laminate heating is monitored by thermal camera.



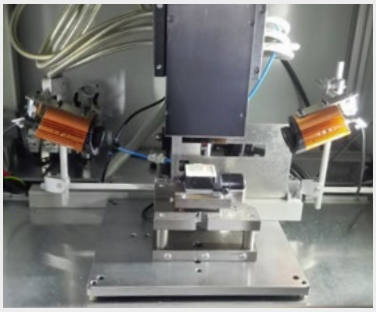
Temperature monitoring during aluminium soldering

Soldering is a method of joining parts with molten auxiliary material, the so-called solder with the melting point lower than the components to be joined. It is customary to distinguish the so-called soft and hard soldering, depending on the melting point of the solder.



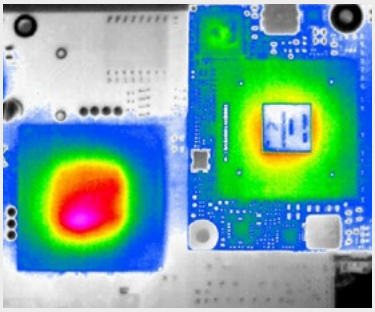
Temperature check when spot laser welding plastics

Plastic welding is one of the most widely used technologies in the industry today to permanently join parts together. There are several plastic welding technologies: hot body, hot gas, friction, and ultrasound and also laser welding. Laser beam welding is good for welding very small plastic parts because of the size of the beam.



Temperature monitoring during contour laser welding

Welding of plastic parts is nowadays a very used technology in the industry for permanent joining parts together. There are several types of plastic welding technologies: hot body welding, hot gas, friction and ultrasound but also laser welding.

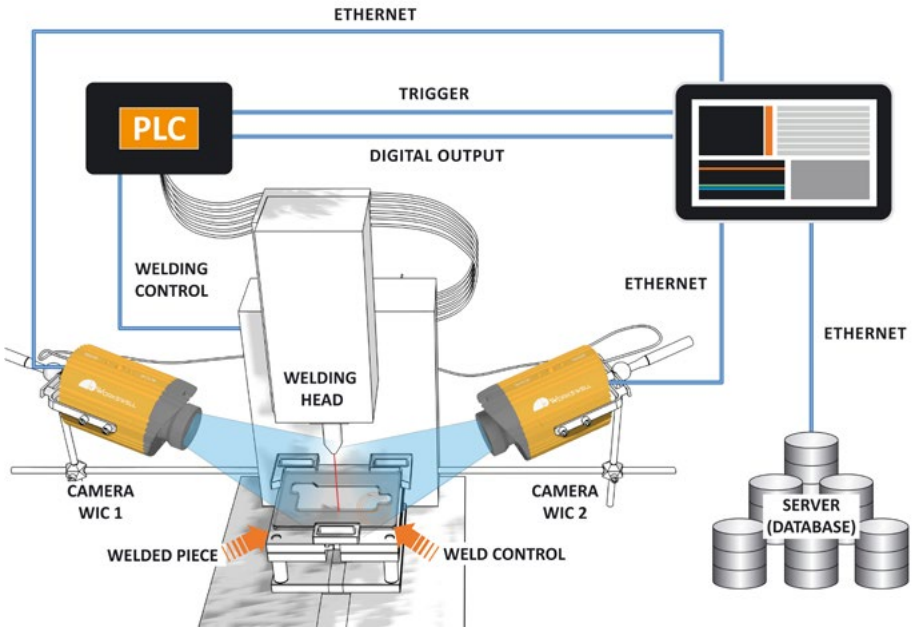


Printed circuit boards inspection by thermal imaging

When designing and producing printed circuit boards (PCB), it is very difficult to discover some manufacturing defects or design imperfections using traditional optical inspection methods. When supplying voltage to any PCB, the electric current starts to flow through the PCB and it starts to heat up.

Application - Laser welding

SURFACE TEMPERATURE MONITORING DURING CONTOUR LASER WELDING OF PLASTICS



Welding of plastic parts is nowadays a very used technology in the industry for permanent joining parts together. There are several types of plastic welding technologies: hot body welding, hot gas, friction and ultrasound but also **laser welding**.

Laser beam welding is advantageous for welding very small and narrow plastic parts due to the size of the laser beam. When placing several laser beams side by side we can create any shape and size of the welded contour.

The laser beam passes through a transparent part of the plastics and stops at the base part. At this point, the joint begins to heat until the two parts are joined together. **The process needs to be monitored to maintain a constant and long-term weld quality**.

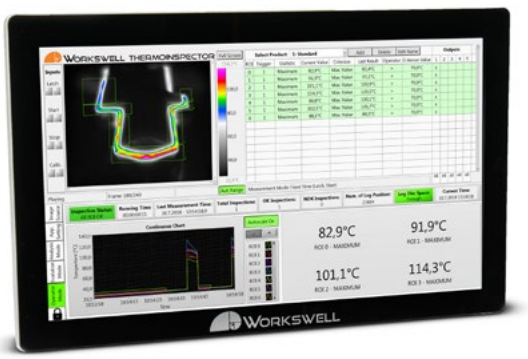
SETTING OF THE ASSIGNMENT

One of the leading automotive companies, Xxxxx, focuses on innovative solutions for compression-ignition and combustion engine support systems. In this case, the entire contour of the weld needed to be monitored when welding plastic parts of the DC motor case to reach the desired temperature and thereby to ensure that the weld is tight. The objective is, among other things, to achieve homogeneity throughout the weld contour to detect a damaged laser beam in the welding head and therefore to prevent the production of other non-compliant pieces. The data from each measurement were sent to the data archiving database for each specific piece.

SOLUTION OF THE ASSIGNMENT

To address the application, the ThermoInspector thermal imaging system was used, which is primarily intended for the applications **monitoring production processes**, **monitoring temperature stability and homogeneity** during processes, **input – output temperature monitoring**, etc., and where up to 4 WIC thermal imaging cameras may be connected simultaneously.

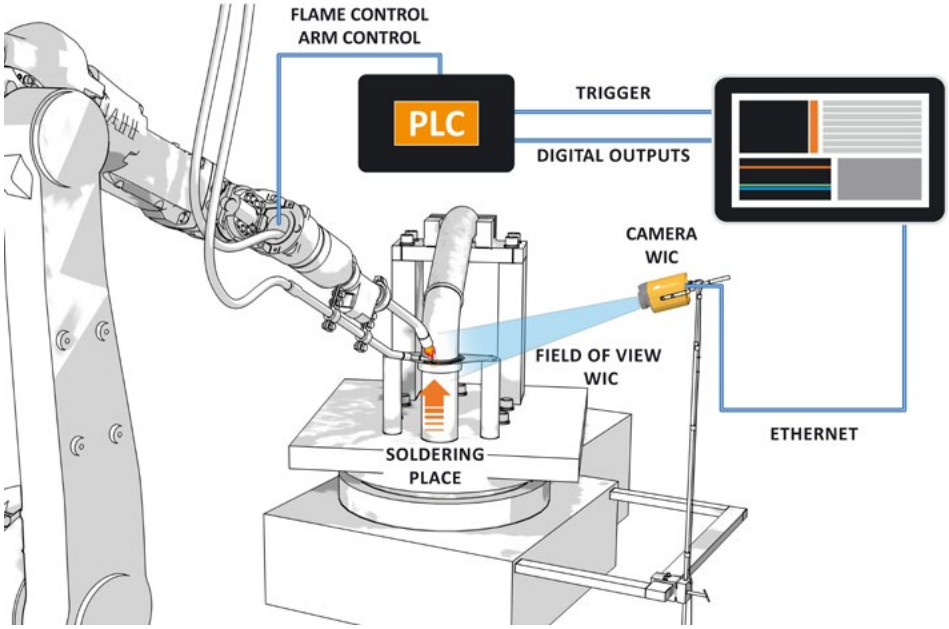
In this particular case, due to the size and shape of the welded parts, two WIC thermal imaging cameras were used which are connected to the ThermoInspector control unit via the Ethernet cable. The thermal imaging cameras were placed on the static holders facing each other, each on one side of the welded piece to cover the entire contour of the weld.



The system was configured to the Fixed Time Measurement Mode, which means that the camera monitors the respective areas in the image (ROI) for a fixed number of pictures after the trigger signal, in this case it is only one picture. The Trigger signal was brought to the ThermoInspector system from the control PLC and it is activated when the welding head starts to weld.

Application - Aluminium soldering

CONTINUOUS SURFACE TEMPERATURE MONITORING DURING ALUMINIUM SOLDERING



Soldering is a method of joining parts with molten auxiliary material, the so-called solder with the melting point lower than the components to be joined. It is customary to distinguish the **soft and hard soldering, depending on the melting point of the solder**.

Solders with the **melting point of up to ca. 450 °C are referred to as soft, above the temperature, as hard**.

Soldering methods may be distinguished mainly by the method of heating the soldered parts and solder. In the larger extent, we heat soldered objects and solder with hot gas flow or flame. Hard soldering ensures greater weld strength; it is used, for instance, for soldering aluminium or copper pipes.

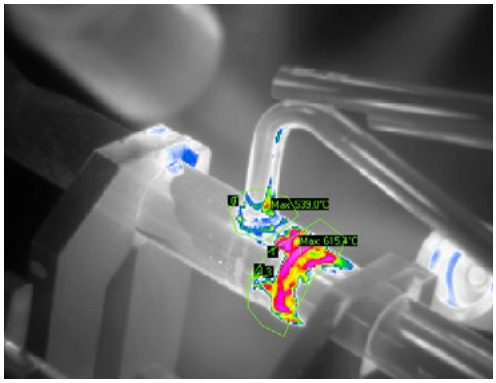
SETTING OF THE ASSIGNMENT

The company Xxxxx, one of the leading companies in the automotive industry, is involved in the production of automotive air conditioning and its components. In this case, the **temperature course needed to be monitored** during aluminium torch soldering to **reach the desired temperature** and therefore to ensure the proper soldering operation and a quality joint of the two air conditioning distribution pipes. The second assignment should ascertain the **weld temperature after cooling** with water to avoid burning the operator that takes the component.

SOLUTION OF THE ASSIGNMENT

However, in this particular case, only one thermal imaging camera connected to the ThermoInspector control computer via the **Ethernet cable** was sufficient. The thermal imaging camera was placed on a static holder to be as perpendicular as possible to the soldered area, but at the sufficient distance from the flame to prevent damage and influence the camera's accuracy by flame.

The system has been configured to the **Start/Stop Measurement Mode**, which means that the camera monitors the respective areas in the image (ROI) during the active incoming trigger signal, the measurement starts on the leading edge and ends on the trailing edge. The trigger signal was brought to the ThermoInspector system from the control PLC and it is activated when the flame starts to solder and deactivated when the soldering is terminated The second trigger signal comes when the soldered area gets colder with water.



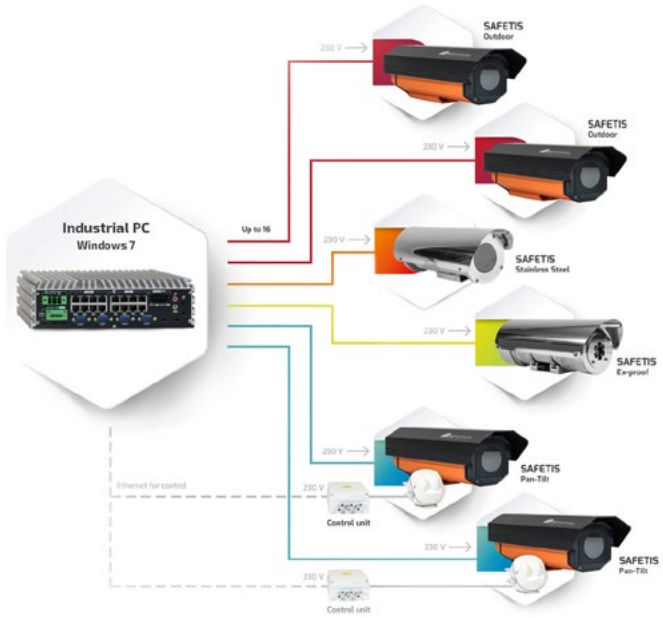
Here only a short signal from the PLC is sufficient. If the temperature limit on any of the ROI is not met, an alarm is displayed on the screen that informs the operator and **saves the appropriate record** to the control computer for each particular soldering.

Workswell SAFETIS series

SOLUTION FOR EARLY FIRE DETECTION

Workswell SAFETIS series is a family of products specially constructed for early fire detection. All cameras can be fully controlled via webserver, SDK or demo Labview application that all come with each camera FREE of charge.

- PRECISE EARLY FIRE DETECTION
- CONTROL VIA BUILT-IN WEBSERVER OR INDUSTRIAL PC
- REALTIME TEMPERATURE MONITORING
- FREE SDK AND DEMO LABVIEW APPLICATION



SAFETIS SYSTEM COMPONENTS

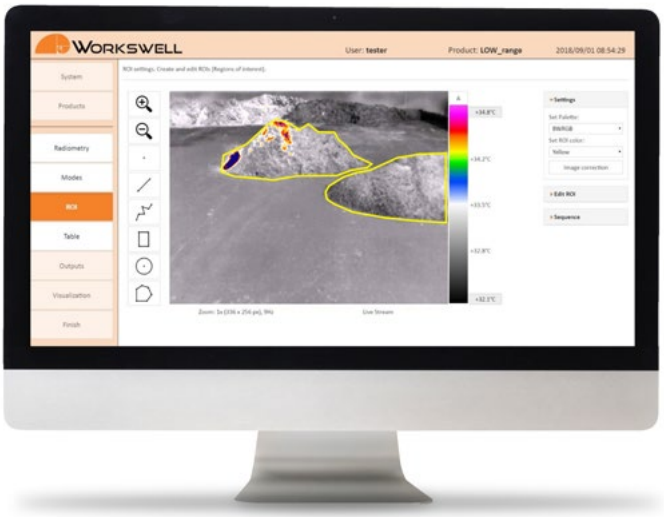
The following thermal cameras are included in the SAFETIS system:

- **SAFETIS Outdoor** - exterior version IP67
- **SAFETIS Indoor** - camera for interior purposes
- **SAFETIS Outdoor Pan-Tilt** - version with high level of IP67 coverage and PTZ positioning.
- **SAFETIS Stainless Steel** - designed to provide high resistance under external conditions in special fields of industry where there are highly corrosive influences.
- **SAFETIS EX-proof** – a specially modified cover designed to an environment with the risk of explosion. This camera has ATEX certification.

TYPICAL APPLICATIONS

Some of the typical applications of the SAFETIS system are used to monitor the following areas:

- **Industrial warehouses**, monitoring of perimeters
- Ammunition warehouses
- **Coal warehouses** and conveyors
- **Power plants and electric energy distribution systems**
- Agricultural warehouses, food warehouses
- **ATEX environment**
- **Depots** and incineration plants, warehouses for hazardous waste
- **Conveyor belts**
- Cement, chemical and industrial plants



SAFETIS camera main features

THE MOST IMPORTANT FUNCTIONS & PARAMETERS

HIGH TEMPERATURE SENSITIVITY

SAFETIS cameras as a fully radiometric thermal camera, enable, in addition to the **automatic detection** of the risk of the occurrence or the presence of the fire, also with **high sensitivity to evaluate a change of the surface temperature** (sensitivity is better than 50 mK).

Information about the surface temperature is important for the evaluation of the risk of flare-up as temperature trends are the **main information used to evaluate the risk of the occurrence of fire**.

Due to the high-temperature sensitivity, the system can record the minimum changes in the temperature. **The system's intelligence is, according to the setting of the operator and the adaptation of the system, able to prevent most false alarms.**

SAFETIS specification table	
Resolution	336 x 256 pixels or 640 x 512 pixels
Image frequency	9 Hz, 30 Hz for 336 px 9 Hz for 640 px
Temperature ranges	-25 °C to +150 °C (13 °F to +302 °F) -40 °C to +550 °C (-40 °F to +1 022 °F) optional range 50 °C to 1 000 °C (122 °F to 1 832 °F) optional range 400 °C to 1 500 °C (752 °F to 2 732 °F)
Temperature sensitivity	0.05 °C (50 mK, 0.09 °F)
Spectral range	7.5 – 13.5 µm
Detector type	Uncooled VOx microbolometer
Focus	Continuous manual (fixed focusable, min focus distance depends on lens)
Calibration	Yes, including calibration certificate
Web server	Yes, integrated with additional early fire detection functions
SAFETIS built-in functions (integrated web-server)	
Camera configuration	Built-in web-server for easy and fast sensor configuration, Google Chrome, Safari, Explorer or Firefox browser compatible, no external software required
Monitoring and alarming	Extreme detection, MAX/MIN evaluation Dynamic/Static measurement User Control Table, Selectable digital output for specific ROI result (OR/AND operators)
Visualization	Real-time video streaming, Pallet settings, Overlay elements, Digital zooming, Numeric and statistical indicators, Input and Output overview panel
Image correction	Non-Uniformity Correction asynchronous/synchronous/ triggerable
ROI	User definable measurement area (Point, Line, Polyline, Rect., Polygon, Circle) Multiple product selection for ROI presets (Manual or via Ethernet)
Others	Real-time Clock, Emissivity correction, Multiple languages
SAFETIS functions connected via SDK or demo Labview application	
Camera configuration	Camera is completely configured via SAFETIS SDK or demo Labview application
Number of cameras	Up to 16 cameras via SAFETIS Industrial PC
Monitoring and alarming	Advanced analytics functions, Extreme detection, MAX/MIN evaluation, Dynamic/Static measurements, User Control Table (Logical rules for PLC connection), Selectable digital outputs for specific ROI measurement analysis
Advanced analytics functions	Yes, eliminating of non-alarm triggers, eliminating of moving objects etc.
Recording	Pre-alarm recording function allows to start recording before the alarms appear
Image recording	Yes
Visualization	Real-time video streaming from up to 16 cameras, Pallet settings, Overlay elements, Digital zooming, Numeric and statistical indicators
Digital outputs	7 digital outputs on each camera

THE HIGH LEVEL OF IP67 COVERAGE AND MECHANICAL DURABILITY

Ensure sufficient resistance of the thermal camera, which also includes within demanding outdoor conditions. The thermal camera is fully radiometric with a resolution of **336 x 256 pixels** or **640 x 512 pixels** and with an image frequency of 9 Hz or 30 Hz.

BUILT-IN WEBSERVER OR DESKTOP PC

Each SAFETIS thermal camera can be communicated with through a **built-in web-server.** This server provides a basic image stream as well as options for advanced configuration and setting all necessary parameters. The multi-camera system can be built via demo Labview application or SDK that is included in the camera package!

WIDE RANGE OF LENS

To be able to adapt the thermal camera for the stated application, the offer includes four lens with field of view 69°x56°, 45°x37° a 32°x26° for 640 x 512 px and 45°x35°, 35°x27°, 25°x19° a 17°x13° for 336 x 256 px. Depending on the lens used, it is possible to monitor, for example, distant objects or, on the contrary, the surface of a nearby object with a wider area.

SAFETIS thermal cameras come with two temperature ranges: **-25 °C to 150 °C (13 °F to +302 °F)**, or -40 °C to +550 °C (-40 °F to +1 022 °F), with an external filter **up to 1 000 °C (1 832 °F) or 1 500 °C (2 732 °F).**

Workswell SAFETIS cameras

PRODUCTS OF SAFETIS SERIE

SAFETIS Indoor

Basic version of the system SAFETIS designed for indoor environment where temperatures do not drop below 0 °C. This is the **smallest type of SAFETIS** thanks to the simple and elegant design which allows to offer all the functions for early fire detection.

SAFETIS Indoor has **IP54** protection (or **IP67** with front cover lens cap) with no need of any special housing.

IP54 IP67

SAFETIS Outdoor

System is designed to meet requirement to be placed in **heavy outdoor conditions** which corresponds to a high degree of protection **IP67**.

The protective housing is equipped with internal heating including system to protect the germanium window from ice. SAFETIS Outdoor is a ready to use thermal camera for outdoor instalations.

IP66 IP67

SAFETIS Outdoor PT

The SAFETIS Outdoor Pan-Tilt version allows to set the SAFETIS camera to nearly any position, ie.: horizontal **0° up to 330°** (speed 6°/s), vertical **0° up to 360°** (speed 3°/s).

Each preset position which are changing in time could be programmed in advance. This is only used in cases where there is no need for continuous monitoring of the entire area.

IP66 IP67

SAFETIS Ex-proof

The special design of the SAFETIS EX-proof allows installation even in an **explosive environment** where strict standards and **ATEX certifications are required**. The most common use is therefore in petrochemical plants, mines or mills, but also in areas with high concentrations of alcohol in the air. The camera is designed for outdoor and indoor installations.

SAFETIS Stainless Steel

The protective cover of thermal camera SAFETIS Stainless Steel is designed to provide **resistance in extreme conditions** where it has very high corrosive effects or for instance is a ban on the occurrence of aluminum.

Also this SAFETIS thermal camera is designed for demanding outdoor or indoor use with a high degree of ingress protection **IP 67**.

IP66 IP67

SAFETIS Industrial PC

SAFETIS thermal cameras can **work autonomously** without the need for additional devices.

For cases where up to 16 SAFETIS cameras (of any type) need to be connected in one system, the SAFETIS Industrial PC (SI-PC) with special SDK and demo Labview package has been developed. The SI-PC thus enables work with all SAFETIS thermal cameras from the single control unit.

IP40

Early fire detection

MAIN PRINCIPLE OF SAFETIS CAMERAS FOR FAST FIRE DETECTION

PHASE 1: GRADUAL HEATING

Flames and even smoke have not started yet. There is only the risk of gradual warming. Even though the smoke detectors do not respond, the SAFETIS system records small changes and can respond in time.

PHASE 2: SMOKE GENERATION

Smoke detectors respond in this phase, i.e. at the time when the smoke is generated. However, this is the risky phase where a rapid escalation of a destructive fire can occur. The SAFETIS system responds a long time before the occurrence of this event.

PHASE 3: FLARE UP

In this phase, flames are visible and smoke is generated. Special CCTV cameras and the smoke detectors respond to this. Usually, this is too late and the loss of property or life frequently occurs.

ADVANCED 24/7 MONITORING

SAFETIS INDUSTRIAL PC WITH SDK OR DEMO LABVIEW APPLICATION

SAFETIS Industrial PC has been developed for complex early fire detection and protection requiring 24/7 monitoring. This allows you to prevent critical situations and fire hazards that can damage huge values of company properties. Thanks to advanced SAFETIS Industrial PC features, all alarms are activated even before any fire starts. The SAFETIS Industrial PC is available in two versions for up to 8 or 16 SAFETIS cameras connected at the same time.

CONNECTIVITY

- Up to 16 SAFETIS cameras at the same time
- Real-time streaming of each connected SAFETIS
- 8 digital outputs on SAFETIS Industrial PC
- 7 digital outputs of each SAFETIS camera

RECORDING & VISUALISATION

- Advanced visualization and recording functions
- Periodical recording of radiometric images
- Automatic recording of radiometric sequences up to 60s before alarm, during and after alarm

CONFIGURATION

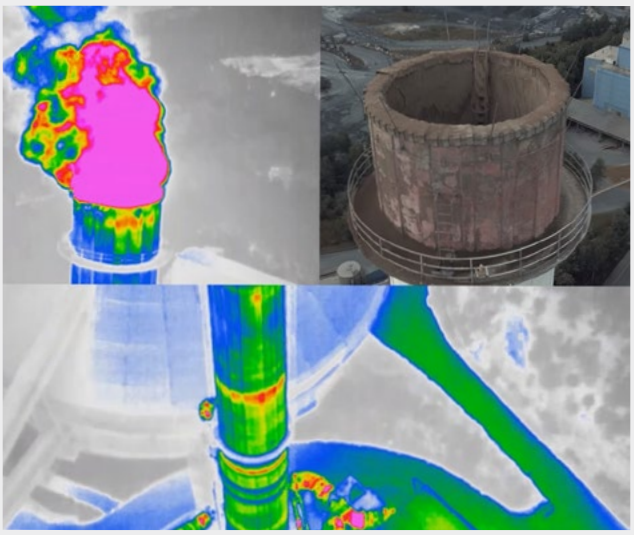
- Live graphs based on temperature values
- Position control of any connected Pan-Tilt SAFETIS
- Settings of all parameters of connected SAFETIS

SAFETIS application overview

MOST IMPORTANT SAFETIS APPLICATIONS

Thermal imaging monitoring of burning chimneys

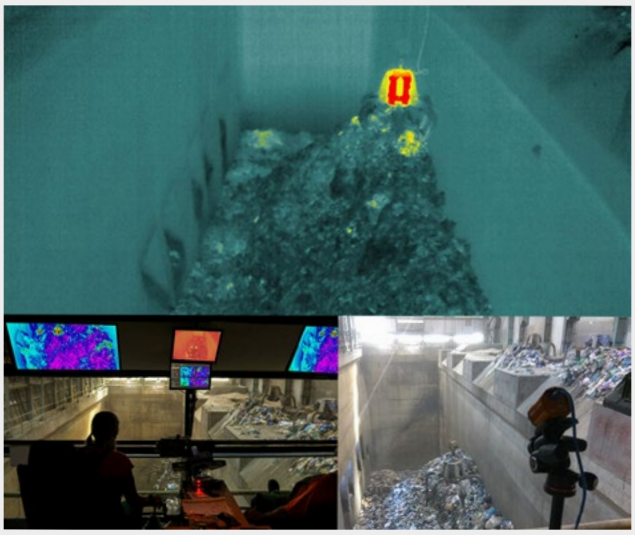
Many industries use chimneys to burn unwanted flammable side or waste products from normal operation. This system, under normal safe burning circumstances, is often used in the oil and chemical industries and in gas distribution facilities. **Before burning these substances can be hazardous either to people, as well as animals or plants, therefore, it is very important that gases escaping from these substances into the air, are not burnt haphazardly.** In a carefully controlled burning procests these compounds are neutralized and the impact on the environment is minimal. However, regulations require that this burning must be really safe. Therefore, it must be monitored. Mainly the ignition and flame setting phase must be monitored.



Thermal imaging monitoring of burning waste

The amount of waste produced worldwide is continuously increasing. The Czech Republic produces annually approximately 3.5 to 5.5 million tons of communal waste. At present approximately 75% of communal waste in the Czech Republic is stored on depots.

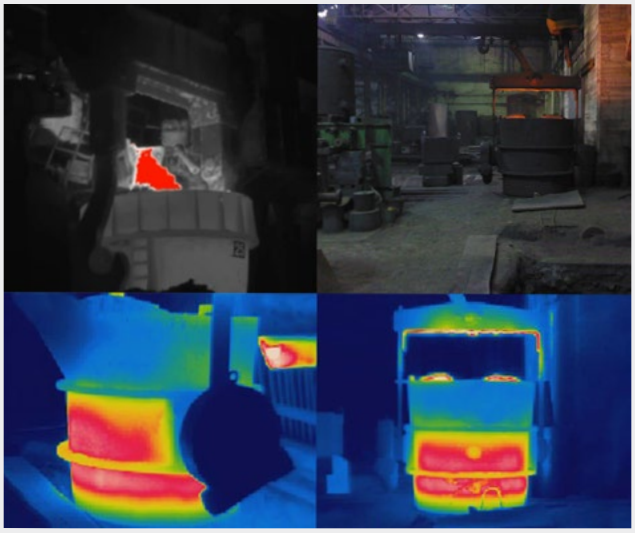
About **400,000 tons of this waste** is consequently thermally processed in waste incineration plants in Prague, Brno and Liberec which produces about **2.3 million gigajoules of heat and about 18,000 megawatt hours** gross production of electricity. For various types of waste products, thermal proceeding is practically the only suitable way of processing.



Thermal monitoring of Casting Ladle in Metallurgical Processes

The use of casting ladles for steel is currently one of the most used processes in the metallurgy. In order to ensure that the casting ladle, as a basis for the ladle metallurgy, has a sufficient service life, it must be made from high quality refractory materials.

However, during its use, it gradually wears out due to the erosive and corrosive effect of the molten steel, which can in extremity result in a tear and subsequent accident. The wear process can be slowed down by the proper use of the ladles that resides in keeping their work temperatures high and constant in ideal case. It is also necessary to ensure a quality permanent lining and insulation layer of the ladle.



Application - Waste bunker monitoring

THERMAL IMAGING MONITORING OF BURNING AND FIRES STARTING ON DEPOTS AND IN WASTE INCINERATION PLANTS

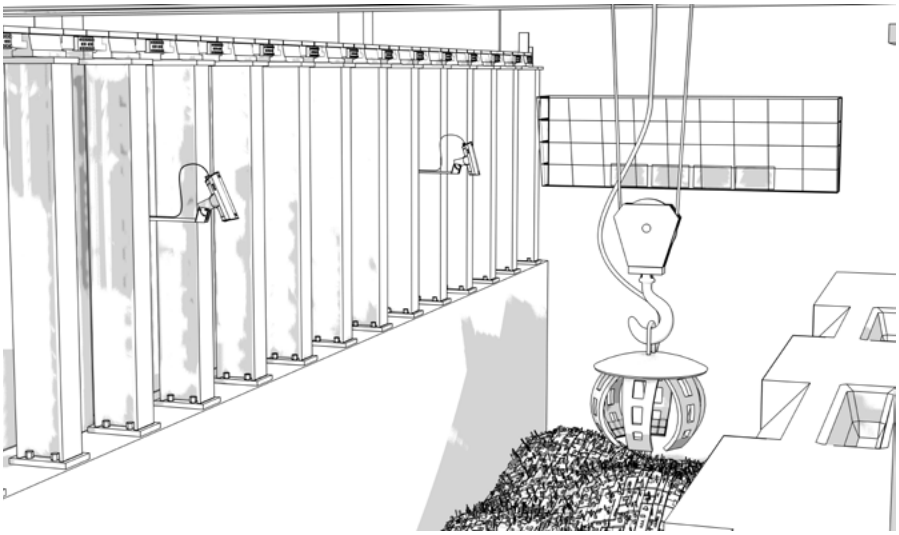
The amount of waste produced worldwide is continuously increasing. The Czech Republic produces annually approximately 3.5 to 5.5 million tons of communal waste. At present approximately 75% of communal waste in the Czech Republic is stored on depots. About 400,000 tons of this waste is consequently thermally processed in waste incineration plants in Prague, Brno and Liberec which produces about 2.3 million gigajoules of heat and about 18,000 megawatt hours gross production of electricity. For various types of waste products, thermal proceeding is practically the only suitable way of processing.

TASK SPECIFICATION

ZEVO Malešice combusts waste for conversion to thermal and electric energy. This energy is used for heating utility water and for heating residential houses. Waste fires when combusting waste is a real threat and this also applies to ZEVO Malešice. The most frequent reason for fire when combusting waste is spontaneous ignition during a reaction of chemical molecules and hot particles produced by vehicles transporting communal waste. A factor that increases the probability of self-ignition is the high concentration of methane which is released from the waste. To decrease the risk of fire, ZEVO Malešice decided to invest in a waste monitoring system from Workswell. The main objective of the system is to monitor waste placement and eliminate any threatening fires.

SOLUTION

To solve this application, the SAFETIS thermal imaging cameras system was used with special software primarily for monitoring the environment to detect any burning, ignition and significant temperature increases. **Up to 16 SAFETIS cameras can be connected** at the same time which can monitor wide areas. The stored waste in ZEVO Malešice can be **monitored continuously 24/7**, i.e. all the time the workplace is operating. For this specific application Worskwell delivered two SAFETIS 640×480 pixels resolution and 80°lens cameras.



The depots and incineration plants monitoring system from Workswell combines contact free SAFETIS thermal imaging cameras with a central unit and proprietary software, which duly warns the operator and notifies him of the threat of a fire starting. It can also activate automatic extinguishing by water guns due to the exact locality of the fire which the system provides

The software notifies operators, whenever the temperature in the area exceeds certain defined values. Visualization software is used in the operator's stations in the control room, so the **operators have all the necessary information**. Whenever there is an alarm the **operators are informed by an acoustic signal**. In addition to the thermogram, the software gives the operators a map of the area divided into sectors. This makes it easy for operators to determine places with increased temperatures. The long-term developments of temperatures in each sector are also displayed in synoptic charts.

Before the commissioning the whole system passed detailed testing with good results. In addition, SAFETIS cameras are price friendly and contribute to the overall cost efficiency of the depots and incineration plants monitoring system.

MEDICAS

THERMAL IMAGING CAMERA FOR ELEVATED BODY TEMPERATURE

- PRECISE HUMAN TEMPERATURE MEASUREMENT
- SIMULTANEOUS MULTIPLE PERSON FEVER DETECTION
- REALTIME ANALYSIS AND ALARMS
- HIGH MEASUREMENT PRECISION AND SENSITIVITY

Company Workswell due to the high global risk of spreading of infectious diseases has moved resources to build a face temperature scanning plug & play infrared imaging solution named Workswell MEDICAS.

That solution is based on a real-time continuous calibration using black body to achieve great accuracy and stability, thermal (640 × 512 px) and RGB camera.

CONTACTLESS TEMPERATURE MEASURING

The thermal camera Workswell MEDICAS allows to measure the temperature of the human skin and is therefore effective when the body temperature increases for instance due to virus infection. The average body temperature on the skin surface of a healthy human is in the range of approximately 35.8 °C to 37 °C (96.44 °F to 98.6 °F). If the human temperature (measured on the surface) exceeds 37 °C (98.6 °F), it may be an overheating of the body or a defensive reaction of the immune system to the infection of the organism - here the surface temperature can rise up to 4 °C (7.2 °F), ie. to 41 °C (105.8 °F). **Accuracy: ± 0.3 °C (± 0.54 °F)** (temperature accuracy according to reference blackbody)

IN THE PACKAGE

Camera head with lens, focus adapter, Lens protection cap, **Black body calibration source**, Black body Calibration certificate, Black body ball adapter, Micro SD card, 5 m Micro HDMI cable, 2 x Power supply adapter, 1x Software license for additional Desktop data analyzing, Wireless Keyboard, USB micro OTG, Quick start guide, Hard transport case

MEDICAS Key features description	
Dual camera face monitoring	Visual and Thermal camera face scanning in real-time with calibration
No PC needed for connection	MEDICAS Software for full real-time temperature scanning and control
Software onboard in MEDICAS	• operating system ensures the full access to all camera functions • easy camera control via Bluetooth USB keyboard or Ethernet
Accurate measurement	Black body radiation source included in the package for accurate and stable measurement in all time, real-time recalibration every 2s
Thermal camera and Black Body specification	
IR camera resolution	640 x 512 pixels
Temperature range	0 °C to +50 °C (32 °F to +122 °F) specifically calibrated for human face scanning
Temperature sensitivity	Standard resolution 0.03 °C (30mK, 0.054 °F) for thermal differences
Accuracy	± 0.3 °C (0.54 °F) (temperature accuracy according to reference blackbody at 4 m or 8 m focus distance and Black body calibration ROI region)
Frame rates	Exportable version worldwide (commercial) or dual use (commercial)
Spectral range / detector	7.5 – 13.5 µm / Uncooled VOx microbolometer
Black body calibration source	• Standard Black body accuracy better than ± 0.08 °C (0.14 °F) • High emissivity 100 mm diameter surface with precision digital PID • Continuous camera recalibration every 2 s via black body • Special pyramid surface for decreasing the reflection
Lens (field of view)	45° x 37° (spatial resolution 1.308 mrad), f/1.25
Number of people per minute	Unlimited – all people are measured in the field of view in real-time or in 4 Multi-ROI with DIO
Digital visual camera	
Resolution	1 920 x 1 080 pixels, 1/3” sensor for FULL HD images
Noise reduction	Special 3D noise reduction function with autofocus
Memory and data recording	
Memory	• Internal high-speed SSD 256 GB for image and video recording • External slot for Micro SD card for taking images
Image and video formats	• Radiometric JPEG images and Digital camera Full HD JPEG images • Digital camera h.264 encode video HD recording Encoded h.264 IR recording
Interfaces & real-time remote control	
Ethernet (RJ-45) port	• Video streaming and camera control via MEDICAS SDK • TCP/IP, RTSP server and FTP server available on the camera
DIO interface cable	DIO interface accessories (4x digital outputs, 4x digital inputs, CANH, CANL), Max inductive load 2A, Max resistive load 5A, power supply +24V
Micro USB 2.0 port	Mass storage access
USB 2.0 port	Direct keyboard connection for MEDICAS camera control
Micro HDMI video output	1 280 x 720 pixels (720p), Aspect ratio 16:9, Micro HDMI video output
Remote control system	MEDICAS OS ensures real-time control of all camera functions
Camera functions	• Real-time temperature correction via black body source • Measurement functions: Automatic hot spot detection • Temperature range settings: Manual to set the best visualization option • Two-level advanced alarm for illness detection with 2 different colors and in up to 4 Multi-ROI with DIO • Camera modes: Dual IR and Visible mode with real-time two-level alarms

MEDICAS Main features

THE MOST IMPORTANT FUNCTIONS & PARAMETERS

ADJUSTABLE LEVELS - FEVER, ELEVATED AND NORMAL TEMPERATURE

For clear visualization, Workswell MEDICAS works with three levels:

1. **Gray-white palette** is used for normal body temperatures (and ambient temperatures).
2. **Yellow** range is used for elevated temperature.
3. **Red** is for fever signaling.

The adjustable levels settings are shown on the temperature scale.

This way of displaying allows to optically filter out situations where there is no elevated temperature in the image and, on the contrary, to clearly and clearly identify the situation when a person with elevated temperature or fever occurs.

FEVER SCREENING STANDARDS: IEC 80601-2-59 AND ISO/TR 13154

World's two top international standards groups, the IEC and ISO, have published standards covering fever (i.e., febrile) screening. While IEC 80601-2-59 is focused on essential performance of screening cameras, ISO/TR 13154:2017 is operational guidelines for identifying febrile humans using a screening camera.

The Workswell MEDICAS thermal imager together with the Worksell BB200 black body have been **designed to meet the requirements of these standards** as much as possible. That's why Workswell MEDICAS offer parameters: uncertainty ± 0.3 °C (± 0.54 °F), sensitivity 0.03 mK, high resolution 640 x 512 px, but also features like: threshold temperature alarm system, start-up warning and more.

WHY WORKSWELL MEDICAS CAMERA

Standard infrared LWIR measurement works on ± 2 °C (± 3.6 °F) accuracy, which is absolutely not acceptable for this application.

Workswell MEDICAS is a unique infrared system which is **calibrated in real time** on a black body which **provides outstanding accuracy ± 0.3 °C (± 0.54 °F)** and high infrared sensor resolution 640 x 512 px.

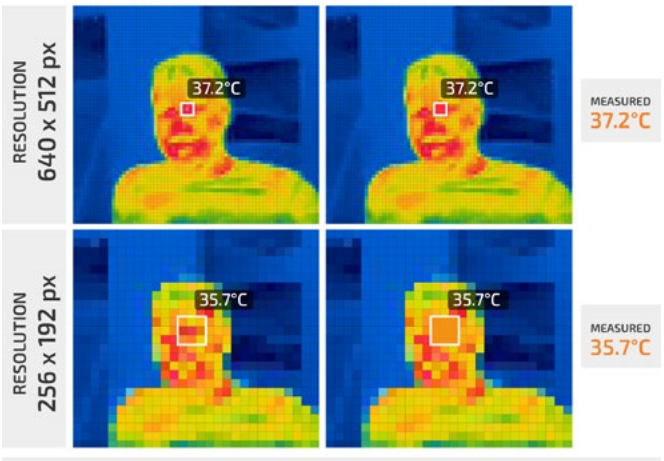
Thanks to this precision in measurement the fever could be detected by providing double visual alarm on:

- warning temperature
- critical temperature
- activate digital triggers and alarms

An operator of the system can easily recognize a person with the fever.

HUMAN TEMPERATURE SCREENING

How the different resolution influences the final temperature value



Maximum value is calculated as the average temperature in area of 3x3 pixels.

Medical

Black body BB200

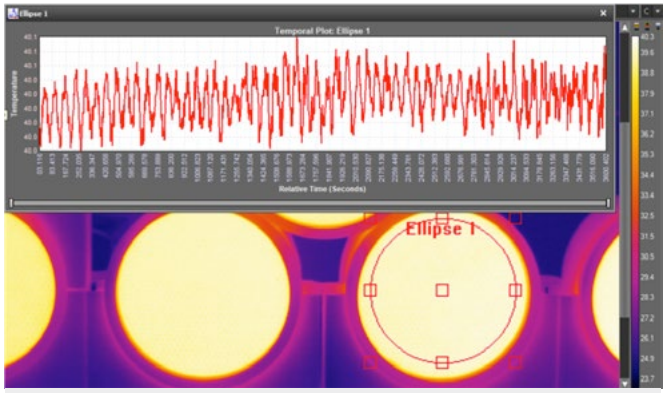
HIGH ACCURATE AREA BLACK BODY RADIATION SOURCE

Workswell BB200 is a high accurate area black body radiation source for infrared thermography. BB200 offering continuous temperature settings from **30 °C - 200 °C (86 °F - 392 °F) with 0.1 °C (0.18 °F) single step**. Surface is 100 mm diameter temperature stabilized area with pyramid shapes for increasing stability of emission and decreasing the reflective effects. Surface emisivity is 0.95 ± 0.005 for LWIR spectrum. Long-term time stability is better than ±0.08 % (precise PID regulation with 16 single thermal elements,measured/checked by certified external PT100 probe).

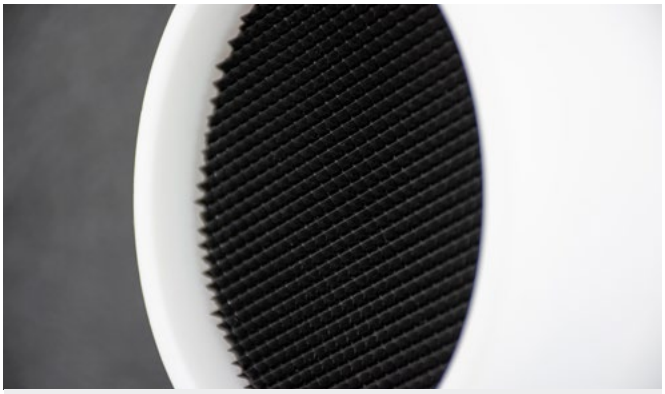
Temperature value can be saved to the memory and automatically loaded when the black body BB200 is connected to power supply. Memory function is also available. Mouting hole is a very standard 1/4-20 UNC thread. Housing material is a special teflon body with aluminum parts. The BB200 is also equipped with a OLED **display for visualizing** the set and actual surface temperature values.

BB200 Key features description	
Continuous temperature settings of BB200	30 °C – 200 °C (86 °F to 392 °F) with 0.1 °C (°F) single step
Big measurement area	100 mm stabilized diameter area with pyramid shapes for increasing stability of emission and decreasing the reflective effects
Outstanding stability	Temperature stability of the central area better than: • **± 0.05 °C / hour at 40 °C set-value (± 0.09 °F / hour at 104 °F set-value)** • **± 0.06 °C / hour at 100 °C set-value(± 0.11 °F / hour at 212 °F set-value)** • **± 0.07 °C / hour at 150 °C set-value (± 0.13 °F / hour at 302 °F set-value)**
BB200 technical specification	
Surface emissivity	0.95 ± 0.005 for LWIR spectrum
Temperature range	30 °C to 200 °C in continuous steps by 0.1 °C (86 °F to 392 °F by 0.1 °F) *(the lowest set-value must be higher about 5 °C (9 °F) from ambient temperature)*
Aperture diameter	100 mm
Long-term time stability	Better than ± 0.08% (Precise PID regulation with 16 single thermal elements, measured/checked by certified external PT100 probe)
Space thermal non-uniformity	≤ 0,3 °C (0.5 °F) (temperature dispersion)
Control interface	USB-C, RS485 control serial interface cable (optional)
Display	OLED Display: real-time temperature measurement, set-value, visualization
Temperature memory	Set temperature value can be saved to the memory and automatically loaded when BB200 connected to power supply, memory function available
LED signalization	LED signalization for different modes (warming, stabilization, cooling, electronics overheating)
Temperature units	Celsius and Fahrenheit (user configurable)
Power supply, weight & dimensions	
Input supply voltage	24 VDC, Coaxial 2 x 6.4 mm, outer shell – GND, power supply adapter 110/230 VAC included in the package
Power consumption (avg.)	24 W (up to 100 °C temp. range), 96 W (up to 200 °C temp. range)
Weight	< 1 200 grams without the tripod (tripod holder included in the package)
Dimensions (Diameter, Depth)	117 mm x 88 mm (without aluminium stand or cabling)
Mounting holes	1 x 1/4-20 UNC thread
Housing material	Special Teflon body with aluminum parts
Environmental	
Operating temperature range	10 °C to +30 °C (50 °F to +86 °F)
Storage temperature range	-30 °C to +60 °C (-22 °F to +140 °F)
Relative humidity	Non condensing conditions
In the package	Black body, calibration certificate, ball adapter, power supply, transport case

This blackbody meets the demand for a simple, cost effective but high accuracy calibrator for the calibration of thermal cameras used to screening febrile subjects. This is also the reason why this black body is used with the Workswell MEDICAS thermal imaging system and is part of the standard packaging.



Black body temperature stability



Black body surface detail

USB and GigE Modules

USB3 AND GIGE MODULES FOR FLIR TAU2 SENSORS

USB3 and GigE modules are compatible with all FLIR TAU2 9 Hz/30 Hz sensors (TAU2 640, TAU2 320/336, TAU2 160/162/168) and enable easy access to sensors data, their controls, and administration. FLIR TAU2 is operated and powered via a USB3 or a GigE interface. The whole internal electronic content is protected by an aluminium case. Workswell ThermoLab software for radiometrics data streaming is available.

Parameter	USB3 Module	GigE Module
Interface and Connector	USB3 Micro-B Receptacle	1000 Gb/s Ethernet RJ45
Communication Protocol	USB3	GigE
Power Supply	Power over USB3 (5 V)	Power over Ethernet (PoE), 250 mA maximum
Power consumption	280 mA maximum, average 150 mA	
Operational conditions	-10...40 °C, Noncondensing, Industrial version -40 °C to 60 °C	
IP Protection	IP40	
Pixel Depth	8/14 bits RAW data	
Pixel Resolution	640 x 512, 336 x 256, 324 x 256, 160 x 128	
Analog Video	PAL, NTSC	
Camera Control	Serial Command Protocol	
Module Dimensions	47 x 46 x 48 mm	46 x 48 x 54 mm
Weight	110 g	130 g (enclosured)

MAIN FEATURES

- Compatible with all TAU 2
- Configuration Software ThermoLab available
- Easy Connection to TAU2 cameras
- Metal Enclosure with fixing screws available
- Tutorial App with Linux &Windows dll
- Linux for ARM, Labview and Matlab available
- Low Power Module Consumption
- Automatic TAU2 Recognition
- Raw Data or Temperature Output
- Integrated analogue output
- Powerful measurement tools in ThermoLab
- NEW Special industrial version available
- Available to buy module without housing

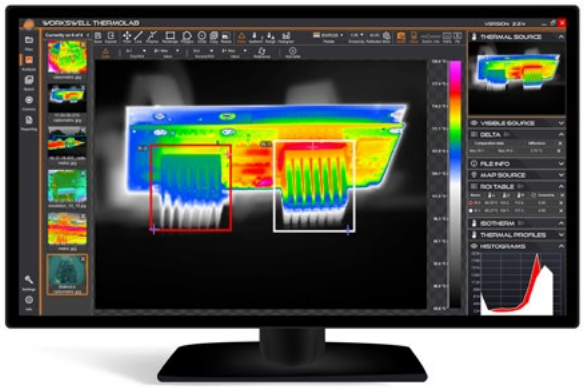
RADIOMETRIC DATA STREAMING

Workswell ThermoLab software automatically identifies the USB3 or GigE interface, FLIR TAU2 core type, or a faulty IP address setting. Depending on the core, the resolution is set to 8 or 14 RAW data formats.

USB3 interface is powered directly through the USB3 cable with no need for an additional external source. Its very low energy consumption lowers the need for a special cooling.

POWER SUPPLY

GigE interface is powered directly through the Ethernet cable (PoE) and its very low energy consumption lowers the need for special cooling. USB3 version is powered through USB cable.



SDK DEVELOPMENT LIBRARIES

Development libraries (SDK) for Windows and Linux x86 are included in the USB3 or GigE module delivery packages. This enables an easy integration and access to data.

Workswell ThermoLab software is available for each purchase and can be used for data analysis or special development libraries for Labview, Matlab, and Linux ARM.

OEM ThermoInspector

THERMOINSPECTOR FOR FLIR THERMAL CAMERAS

Workswell ThermoInspector is automatic inspection system for **thermal monitoring, analysing and evaluation**. It can be used for all welding, heating, cooling, soldering and other thermal processes in plastic, metal, biological, chemical and another manufacturing industry. The ThermoInspector can **measure, record and evaluate thermal information in real time and cooperate with existing machine control systems and PLCs**.

ThermoInspector system consists a Central Controller unit that supports **up to 4 thermal cameras**. All infrared cameras use **highly sensitive infrared sensors** and measure within a temperature range of up to +2 000 °C (3 632 °F.). Due to these extraordinary properties, it can continuously measure and evaluate thermal fields on the measured product surface of any material.

The system can consequently **check the thermal characteristics** such as thermal gradients, maximum or minimum temperature as well as **evaluate the dispersion of the temperature** along the thermal cut, check the speed of the increasing temperature in the selected area.

MANY CONFIGURATION OPTIONS

Workswell ThermoInspector automatically detects all infrared cameras. Customer can setup **different types of color palettes**, isotherms, manual temperature span or change camera temperature range. Intuitive graphical interface check user configuration and system integrity. Operator can place different types of measurement tools and check **real-time data streaming and values**.

KEY FEATURES

- Complete machine infrared vision package
- Plug and Play installation and easy setup
- Powerful full-screen operator visualization
- Graphs, tables, OK/NOK indicators and stats
- 8x digital inputs and outputs, 4x Ethernet ports
- Power over Ethernet cabling or 24 VDC

System overview	
Central controller units	2 possible versions: Passive central controller or Touchscreen central controller Camera ports: 4 x Gigabit PoE Ethernet, 2 x Gigabit Ethernet for PLC Digital Inputs: 8 x isolated (24 VDC compatible) inputs Digital Outputs: 8 x open collector outputs Serial ports: RS232, RS485 Power supply: 6-36 VDC USB ports: 2 x USB3 super speed ports for data uploading Embedded operating system optimized for multi-camera connection
Thermal cameras	Up to 4 connected LWIR cameras per one central unit, different GigE FLIR cameras such a Ax5, A315 and A615 with manual or automatic focusing Lenses: Interchangeable and focusable, various field of view Framerate up to 200 Hz Temperature range: -25 °C to +2 000 °C (13 °F to +3 632 °F) Accuracy: ± 2 % or ± 2 °C (± 3.6 °F) Temperature sensitivity: ≤ 0.03 °C (30 mK, 0.054 °F) @ 30 °C (68 °F)
Content of delivery	TIxx package: Touchscreen Panel Controller or Passive Controller (IR Software included, LCD, 4 PoE ports, isolated DIO, SW, 6-36 VDC), Cables (DIO 1 m, UTP 10 m, DIO board)
Power supply	
Controller Supply Input	6-36 VDC or 230 VAC (with optional adapter)
Power Dissipation	150 W (Touch-screen controller version) 120 W (Passive controller version)
Mechanical and environmental information	
Passive controller version	260 x 215 x 79 mm
Touchscreen controller version	22 inch panel, 538 x 329 x 53 mm
Internal Protection	IP 65 for thermal camera with external housing (IP 40 without) IP65 front panel of Touchscreen controller version IP40 for all passive controller version and another electronics
Thermal Camera Settings	
Source of image	Fully radiometric streaming for every thermal camera. User can use different cameras with different resolutions for same central controller in multi-camera configuration. Cameras can use variable speed from 1 Hz up to 200 Hz, temperature range and trigger settings. System measures current FPS, camera body temperature and communication stability.
Radiometry	Emissivity, windows transmission, Humidity, reflected temperature, athmosperic temperature and distance correction. Image can be rotated every 90 degrees.
Calibration	Each camera is supplied with special calibration file saved in ThermoInspector system. User can also set on-field 3point camera calibration.
Palettes and Isotherms	User can choose from 14 palettes – BlackRed, BlueRed, BWRGB, Fire, FLIR Iron, Gradient, Gray, Iron1, Natural, Rainbow, Sepia, Steps, Temperature, WBRGB. There are also several types of temperature isotherms (above, bellow, between) available.
Graphical environment and operator vizualization	
Measurement tools	ThermoInspector contains 6 measurement tools (Point, Rectangular, Elipse, Line, etc) with local selectable emissivity. User can define statistical markers such as Maximum, minimum, average, Deviation, Median.
Graphs and Values	Continuous or discontinuous time charts, temperature profiles and numerical indicators
History and logs	ThermoInspector can save criterion tables, measurement results, images and graphs.
Measurement and control modes	
Triggers and alarms	Independent triggers (camera selectable) – falling, rising edge or latch, Up to 5 alarm outputs
Evaluation modes	There are several types of evaluation modes. The most common applications use one time triggered measurement and afterwards evaluation. ThermoInspector can measure single shot image or sequence. For all 24h/7d applications you can use Non-trigger mode.

Camera housings

WORKSWELL PROTECTIVE CAMERA HOUSINGS OVERVIEW

IP66

FLIR Ax5 Protective case

Protective cases for thermal cameras from Workswell company are specifically designed and manufactured to ensure the long lasting protection of thermal imaging cameras FLIR Ax5 (FLIR A5, A15, A35, and A65). It ensures effective protection for thermal cameras against dust, water even in extreme conditions and industrial environments (IP66 protection level).

WHTC - Outdor camera housing

WHTC Workswell protective outdoor housing for thermal cameras is specially designed for using in various industrial, fire-safety and surveillance applications. The housing is suitable for different thermal cameras that can be equipped with smaller or bigger lenses. Housing offers effective protection IP67, integrated heater system and the germanium window. and easy access for installation.

IP66 IP67

EX-WHTC - Ex-Proof camera housing

Workswell EX-WHTC EX-proof protective housing for thermal cameras is specially designed for use in diverse industrial, fire safety, and surveillance applications where strict EX regulations must be met. The housing is suitable for thermal cameras that can be equipped with both small and large lenses.

SS-WHTC - Stainless steel camera housing

Workswell SS-WHTC Stainless Steel protective housing for thermal cameras are specially designed for use in extreme conditions. Industrial, fire safety, and surveillance applications that require resistance to corrosive elements are the aluminum-free SS-WHTC's natural environment.

IP66 IP67

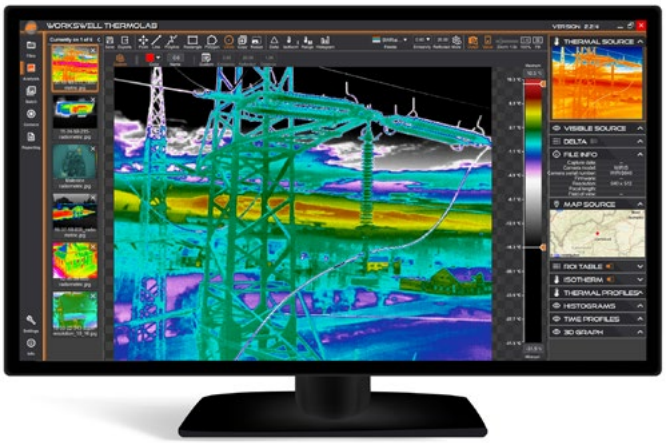
IP66 IP67

C-WHTC - Cooled camera housing

The C-WHTC, Workswell cooled protective housing for thermal cameras, is specially designed for application in industrial, fire-safety and surveillance sectors. When cameras are needed in extreme conditions with high temperatures and corrosive elements, the C-WHTC is there.

ThermoLab

TOOL FOR THERMOGRAM VISUALISATION AND ANALYSIS



Workswells ThermoLab software has been designed to perform detailed analysis and allow a user to edit, export data to different formats, and create comprehensive reports from thermograms.

All standard functionalities for analysing data are available within the program (temperature on the spot, minimum and maximum of the area, temperature profile, zoom, change in temperature scale, color palette, emissivity etc.) as well as extending functions such as the GPS location of where the picture was taken and being able to display RGB digital pictures.

BASIC FUNCTIONS

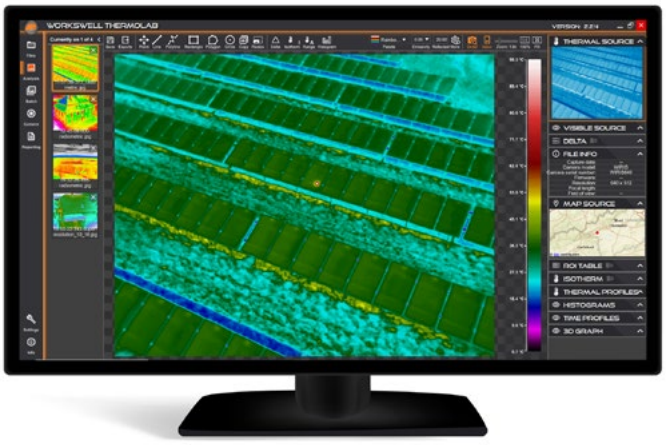
- Setting the measuring parameters for image and radiometric video, such as emissivity, reflected apparent temperature, and atmospheric parameters.
- Editing of radiometric images (thermograms), adding measuring functions into the image, changing the palette, changing the temperature range, activation / deactivation of alarm, etc.
- Insertion of measuring functions: measuring of temperature in the point, minimum and maximum in the area, polygonal and triangle area, temperature profile and other functions.
- Display of GPS coordinates on the map and in the case of radiometric video, the display of the GPS position of individual images and the whole trajectory.
- PDF reporting
- RGB image export (Workswell WIRIS).
- Radiometrics data export to Microsoft Excel (CSV file)
- Display of graph with the temperature development
- Compatible with **Microsoft Windows** and **Apple macOS**

Thermal Camera Settings	
Camera connection	Supported cameras: All Workswell cameras, Workswell GigE and USB3 modules for FLIR TAU2
Temperature range	According to type of camera you can set the temperature range to Low - usually -40 °C – 150 °C (-40 °F to +302 °F) or High - usually 0 °C - 1500 °C (32 °F to +2 732 °F) range
Source of image	As a source of image can be used full image (full sensor size) or only a part of the image specified by a rectangle ROI tool
Framerate	According to the camera you can change frame-rate from 1 Hz to 60 Hz
Calibration	Using Calibration button you can activate NUC (non-uniformity compensation) to reach the best image quality and camera signal stabilization
Play/Pause	Using Play/Pause icon you can start and pause real time image streaming
Start recording/ Snapshot	During radiometric thermal video acquisition (using Start capture button) you can save snapshots (Radiometric JPG) at the same time
Analog video settings	User can change analog palette and isothermal mode, insert spot meter into the image, select video standard (PAL or NTSC)
AVI Record	User can save live video streaming directly as AVI format. It is possible to change framerate and bitrate and display into the video Palette bar, Bottom bar and ROI
Thermal Image Settings	
Palette	User can choose from 14 palettes – BlackRed, BlueRed, BWRGB, Fire, Iron, Gradient, Gray, Iron1, Natural, Rainbow, Sepia, Steps, Temperature, WBRGB
Interpolation	To obtain a smooth image without pixelization, user can interpolate the image
Units	Temperature can be displayed and calculated in °C or °F
Acquisition Parameters	User can set basic parameters as Emissivity (continuously in range 0.01 – 1.0 with step 0,01) and Reflected temperature
Advanced Parameters	In ThermoLab can be set/changed other parameters as Atmospheric temperature, Humidity, Distance and Transmission of external optics
Temperature Range	Interactive temperature range can be used in manual or automatic mode. Using it you can change the color distribution of temperatures to e.g. highlight details.
Isothermal Mode	User can set Isothermal mode of the image. ThermoLab offers four types of isotherms: Below, Above, Between and Below and Above. You can change the color of isotherm and of course the limit values.

CAMERA SETTINGS

When connecting a Workswell WIC thermal camera through USB3 or the Ethernet (GigE), it is possible to parameterize the camera, set the parameters for measurement and **perform on-line measurement including recording data** in the form of individual images and radiometric video (radiometrics video streaming).

Measuring **reports can be produced** from the measured images, using the simple guide.



ThermoFormat

MASS THERMOGRAM DATA ANALYSIS

ThermoFormat Overview	
Image Loading	ThermoFormat is capable to open, process and export up to 70 images. There is also possibility to open visible images related to infrared images.
Image Processing	User is able to customize various parameters of images as palette, emissivity, ambient/atmospheric temperatures, humidity, distance or temperature range. These changes could be done on single image or applied on multiple loaded and selected images.
Image Export	ThermoFormat is not only capable to export one image. User is able to export multiple loaded images in one click, also with possibility of customizing final form of image.
GPS Support	If thermogram contains valid GPS data, ThermoFormat is not only able to show position on the map, but also includes GPS data in EXIF while exporting.
Temperature Units	User could change temperature units between °C and °F. The change and calculation are done with no need to restart application.
Thermal Image Settings	
Palette	User can choose from 17 palettes – BlackRed, BlueRed, BWRGB, Fire, FLIR Iron, Gradient, Gray, Iron1, Natural, Rainbow, Sepia, Steps, Temperature, WBRGB, BWIron, BWIronI, BWRainbow, BWRainbowHC, and RainbowHC.
Acquisition Parameters	User can set basic parameters as Emissivity (continuously in range 0.01 – 1.0 with step 0.01) and Ambient temperature.
Advanced Parameters	In ThermoFormat can be set/changed further parameters as Atmospheric temperature, Humidity, Distance and Transmission of external optics.
Temperature Range	Interactive temperature range can be used in manual or automatic mode. Using it you can change the color distribution of temperatures to e.g. highlight details.

Workswell ThermoFormat software is designed mainly for mass processing of huge amount of recorded thermograms.

If you need to **change the color palette, emissivity, or temperature scale** in all the recorded thermograms then the ThermoFormat will saves you a lot of time as it can perform all of these functions.

The ability to **export recorded thermograms** with EXIF metadata to create **photogrammetry and 3D models** can also be accomplished using this software.

Workswell ThermoFormat is the most frequently used program for **mass editing of thermograms produced by the Workswell WIRIS system** – thermovision system for drones. It is mainly used for thermography and creation of 3D models in cooperation with Pix4D or Agisoft software.

ThermoConnector

PLUGIN FOR DEWESOFT X2 SOFTWARE

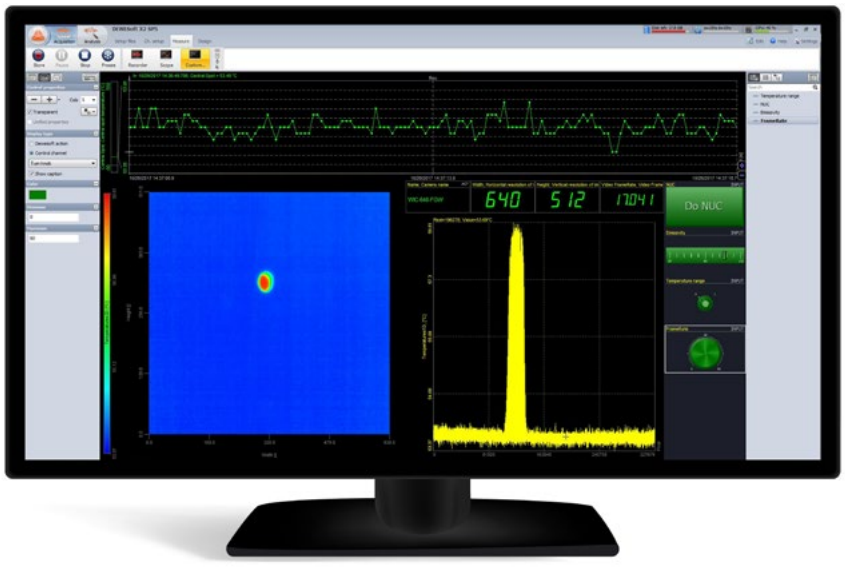
Workswell ThermoConnector is an application built for adding plugins into DEWESoft X2 software.

With ThermoConnector, the user can **add a plugin and utilize the special measurement** and display functions **supported by DEWESoft X2 software.**

The ThermoConnector plugin is most often used to **display and analyze data** provided by the connected thermal cameras through the utilization of the analytical and measurement tools of the DEWESoft X2 software.

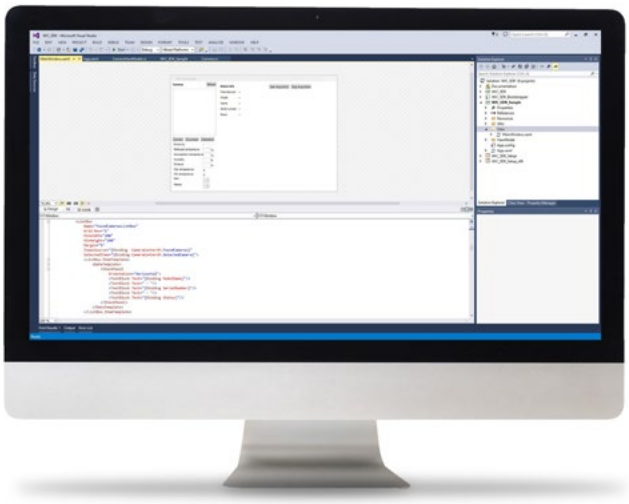
These cameras are supported:

- WIC, WIC2
- FLIR Ax5, FLIR A6x5
- FLIR hand-held cameras and so on



WIC SDK & Libraries

SOFTWARE DEVELOPMENT KIT FOR AUTOMATION CAMERAS



Workswell provides its WIC stationary thermal cameras with a **WIC SDK development libraries**. These development libraries contain the complete package needed for **user software design and implementation** on various operating systems and platforms.

SDK FUNCTIONS & POSSIBILITIES

- cameras connecting (Connect, Disconnect)
- image reading (Start Acquisition)
- radiometry setting (Set Emissivity, Atmospheric temperature, Humidity, etc.)
- administration of thermal cameras
- functions for working with the image (Get Maximum, Minimum temperature, Select pallets, Get RAW data, Get Temperature Data, etc.)

SDK COMPATIBILITY

The WIC Software Development Kit (SDK) is available for both **Windows** operating systems and **Linux** distributions. Older x86 processor PC platforms are supported as well as modern single-board systems on the basis of **ARM**, such as ODROID, **Raspberry**, **NVIDIA**, Tegra and Jetson. The client can choose a development library in the format of .dll, **Labview** VI, **Matlab Simulink** or **Dewesoft** plugin.

UNIQUE FEATURES

- Support for Windows and Linux operating systems
- Support for x86 (PC) and ARM processors
- Simultaneous connect more thermal cameras
- Support for Ethernet and USB3 interfaces
- Compatible with WIC resolution 640, 336 and 160 px
- 14 bit RAW format or full thermal data

SAFETIS SDK

SOFTWARE DEVELOPMENT KIT FOR FIRE SAFETY CAMERAS

SAFETIS SDK enables steaming and analysis of thermal data from SAFETIS thermal cameras in user applications. It enables the integration of the SAFETIS fire safety system into existing applications, or the development of new applications according to the current needs.

The SDK provides a wide range of functions for working with a thermal cameras, as well as image processing or response to individual temperature alarms.

The SAFETIS SDK also includes a functions for s**treaming and processing radiometric video.** Technically, the SDK provides the same functionality as controlling the SAFETIS camera via the web server. The SAFETIS SDK is compatible with all types of SAFETIS cameras.

WIRIS SDK

SDK FOR VIDEO STREAMING AND DATA MANIPULATION

Along with every Workswell WIRIS, we provide an SDK (Standard Development Kit) enabling you to develop your own applications. These libraries give access to low-level functionalities and enable the application developer to maximize the potential of the camera's hardware.

WIRIS DATA SDK

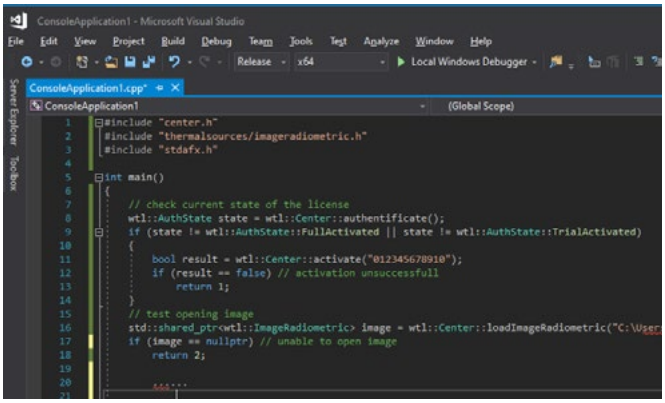
Library provides **interface for thermal images and sequences** recorded by Workswell Thermal Cameras. Developers can use this SDK to **create applications for loading, presenting and storing thermograms**.

Supported radiometric cameras:

- Wiris Pro
- Wiris Pro^{Sc}

Key Features:

- load thermograms to display thermal data
- use provided palettes and modify ranges to enhance presentation of measured data
- read and change thermal parameters of radiometric files
- examine thermograms with regions of interests(ROI) and alarms
- load, play and export from sequences of thermal images



COMPATIBLE CAMERAS

WIRIS Pro

WIRIS Pro^{Sc}

WIRIS ETHERNET STREAM SDK

This SDK is **designed to stream video** from the WIRIS and to control it **via an Ethernet connection**. The WIRIS camera runs the TCP/IP server, which can be controlled using simple text commands.

Supported cameras:

- WIRIS Pro, WIRIS Pro^{Sc}
- WIRIS Security

The WIRIS runs a TCP/IP server for the control. It can be controlled with simple text commands. The opened

server is similar to telnet protocol and can be used with telnet terminal software.

The WIRIS also runs RTSP server for streaming the visible and thermal video. it can be viewed with GStreamer, FFmpeg, VLC or other software capable of opening RTSP streams. FTP server is opened for data management.

COMPATIBLE CAMERAS

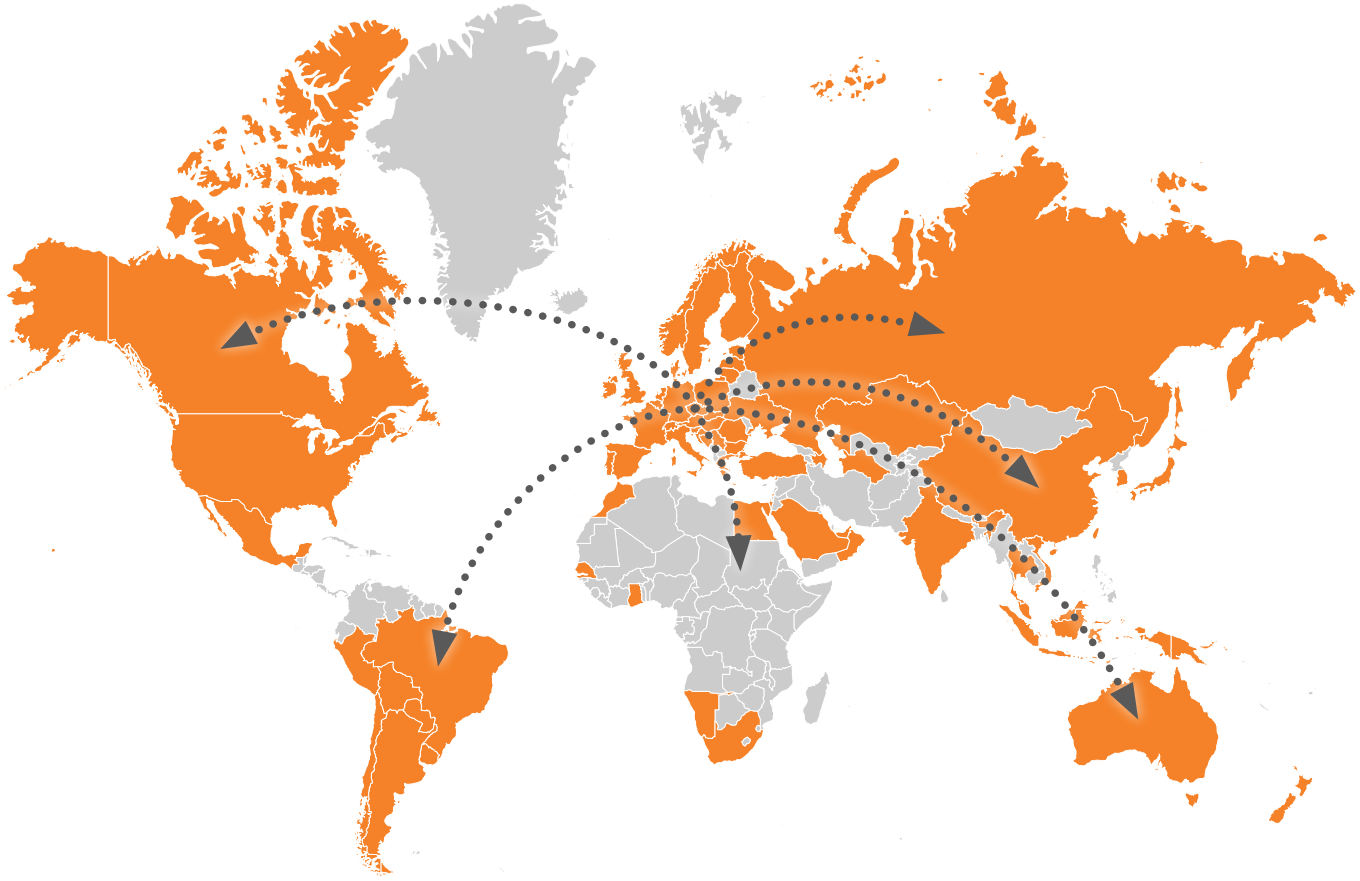
WIRIS Pro

WIRIS Pro^{Sc}

WIRIS Security

Contact information

WORKSWELL IN THE WORLD



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