PROJECT: ECOLOGICAL AND INNOVATIVE TECHNOLOGIES FOR RECOVERING INDUSTRIAL AREAS FROM LCA AND ENERGY EFFICIENCY POINT OF VIEW

2020-1-RO01-KA203-080223

# THERMOGRAPHY OF INDUSTRIAL ELECTRICAL INSTALLATIONS



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Rybaki17
Co-funded by the Erasmus+ Programme of the European Union

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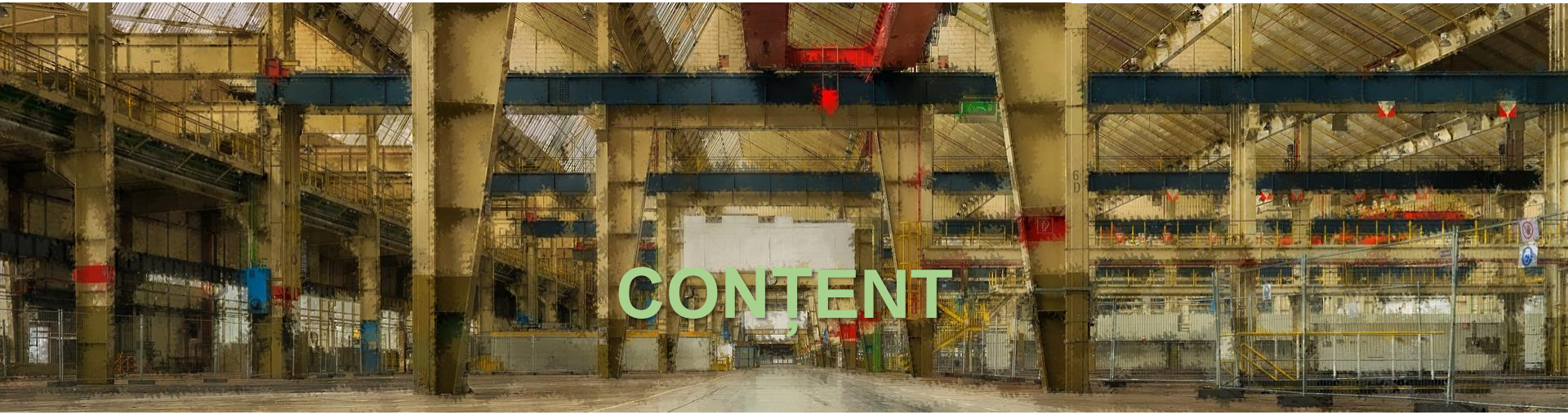

# CONȚENT

## 1. THERMAL IMAGING CAMERA

Thermal imaging cameras are instruments that measure thermal energy using transducers that use computational algorithms to determine the temperature of a body and obtain certain images.

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# 1. THERMAL IMAGING CAMERA

A thermal camera consists of **lens**, **a thermal sensor**, **processing electronics** and a **mechanical housing**.

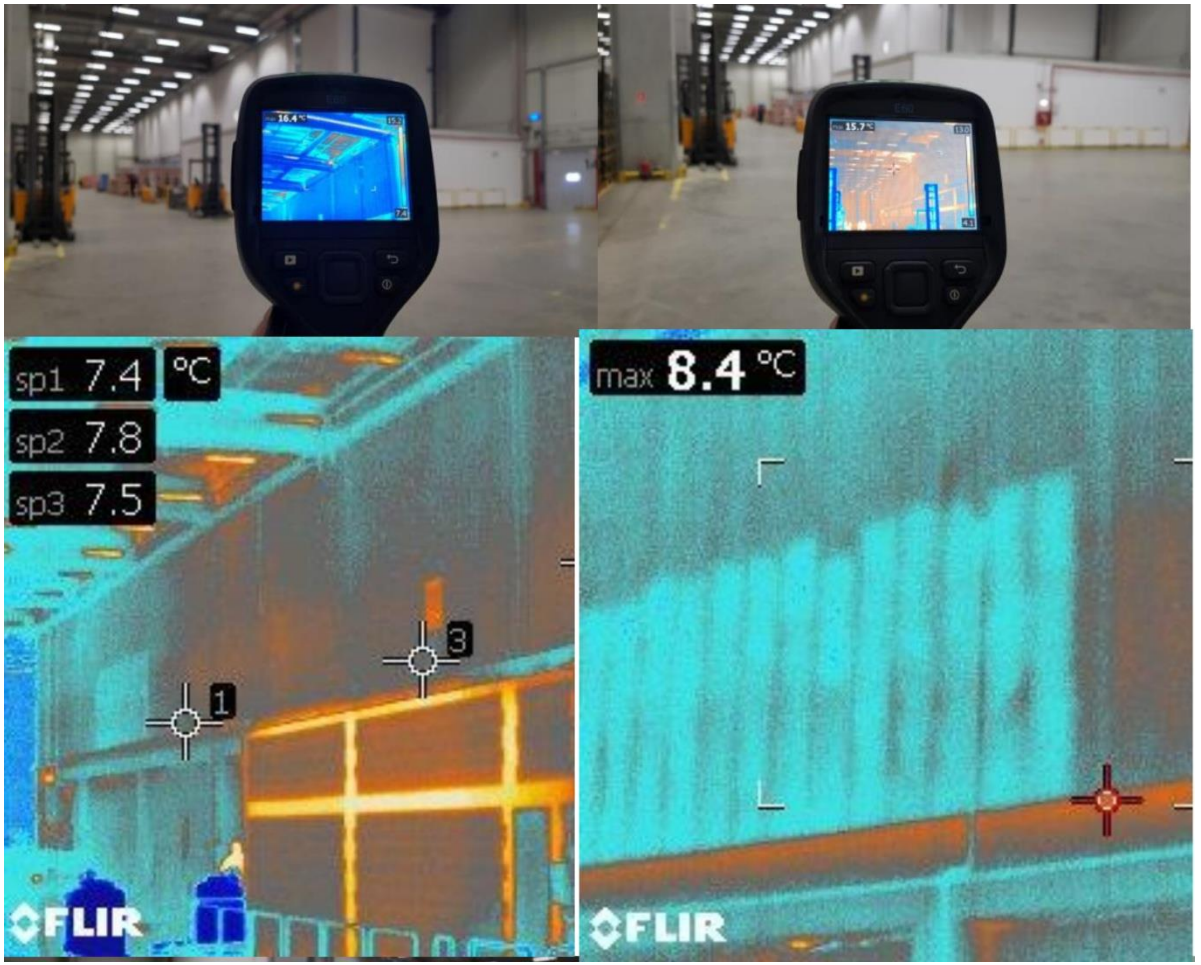
The lens focuses infrared energy on the sensor.

The sensor can come in a variety of pixel configurations from 80 × 60 to 1280 × 1024 pixels or more.
This is the resolution of the camera.

These resolutions are low compared to visible light images, because thermal detectors must detect energy that has much longer wavelengths than visible light, requiring each sensor element to be significantly larger.

# 1. THERMAL IMAGING CAMERA

Expertise and thermal scanning work



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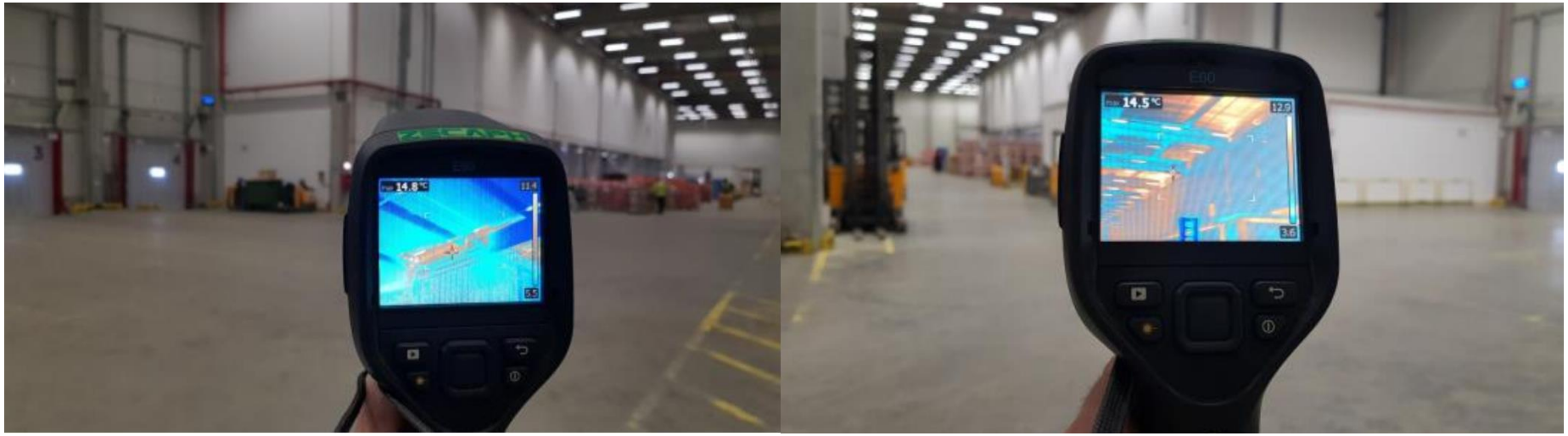
Expertise and thermal scanning work




In order to obtain a thermal image, the optical system of the thermal imaging camera is directed towards the installation being analysed, resulting in a signal on the screen which is converted into a thermogram.

# 1. THERMAL IMAGING CAMERA

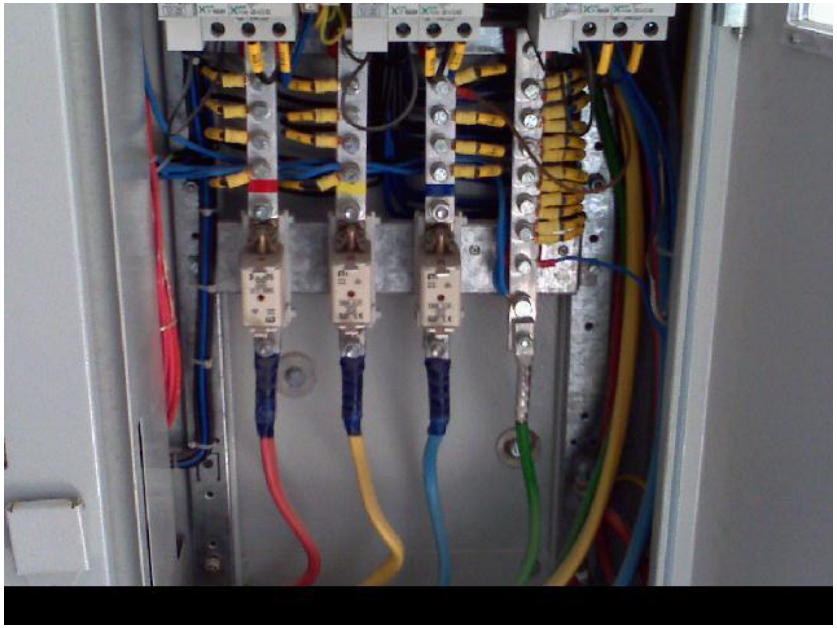


Image of a distribution box taken by a regular camera

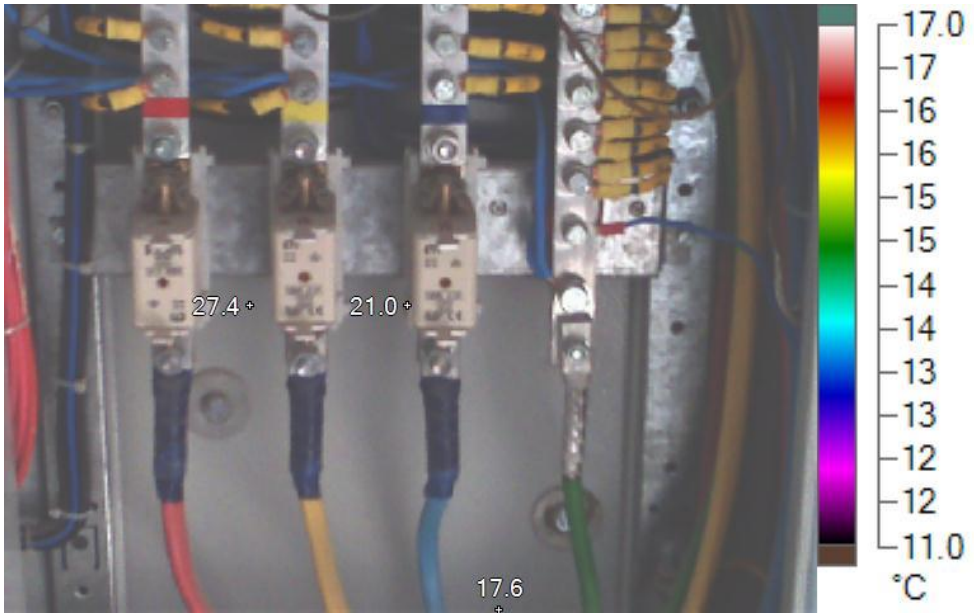
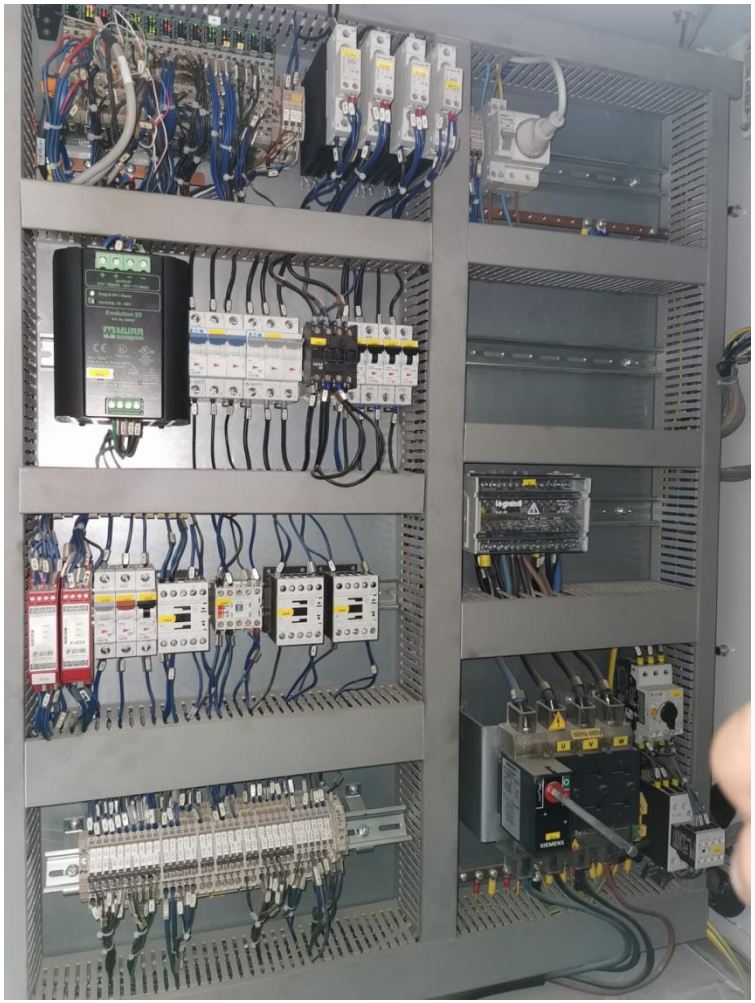
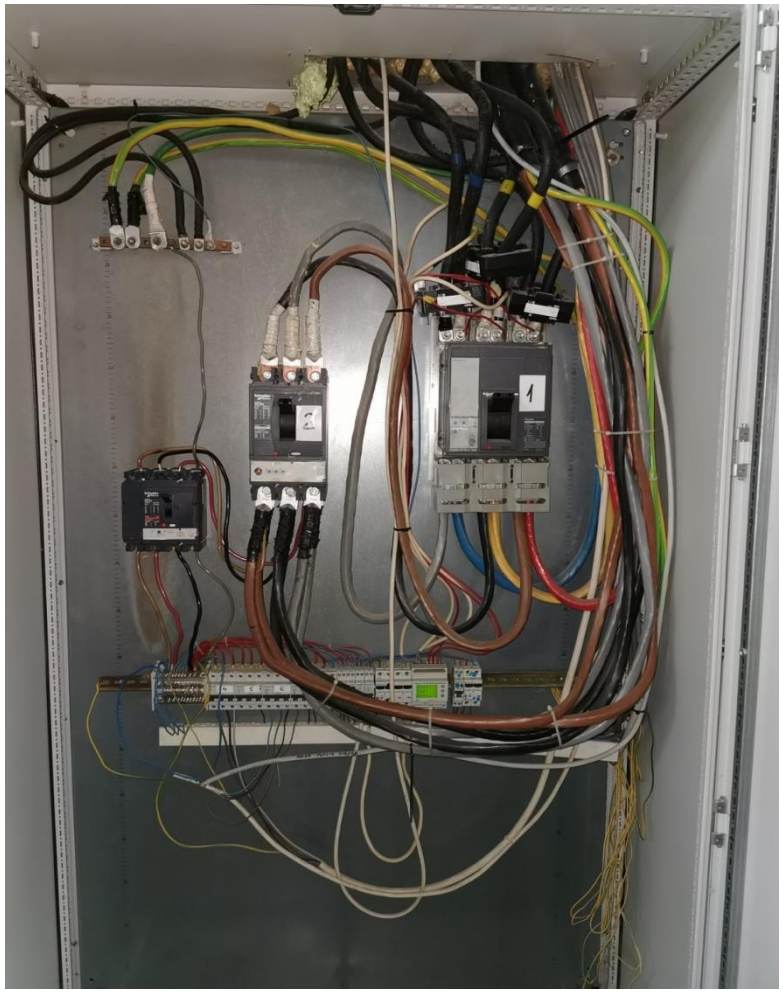



Image of a distribution box taken by a thermal imaging camera

# 1. THERMAL IMAGING CAMERA





## 2. DEFECTS AND PRECAUTIONS FOR USE


Caution: battery/accumulator with low capacity, which cannot ensure good operation.

Elemente de protecție deteriorate

## 2. DEFECTS AND PRECAUTIONS FOR USE

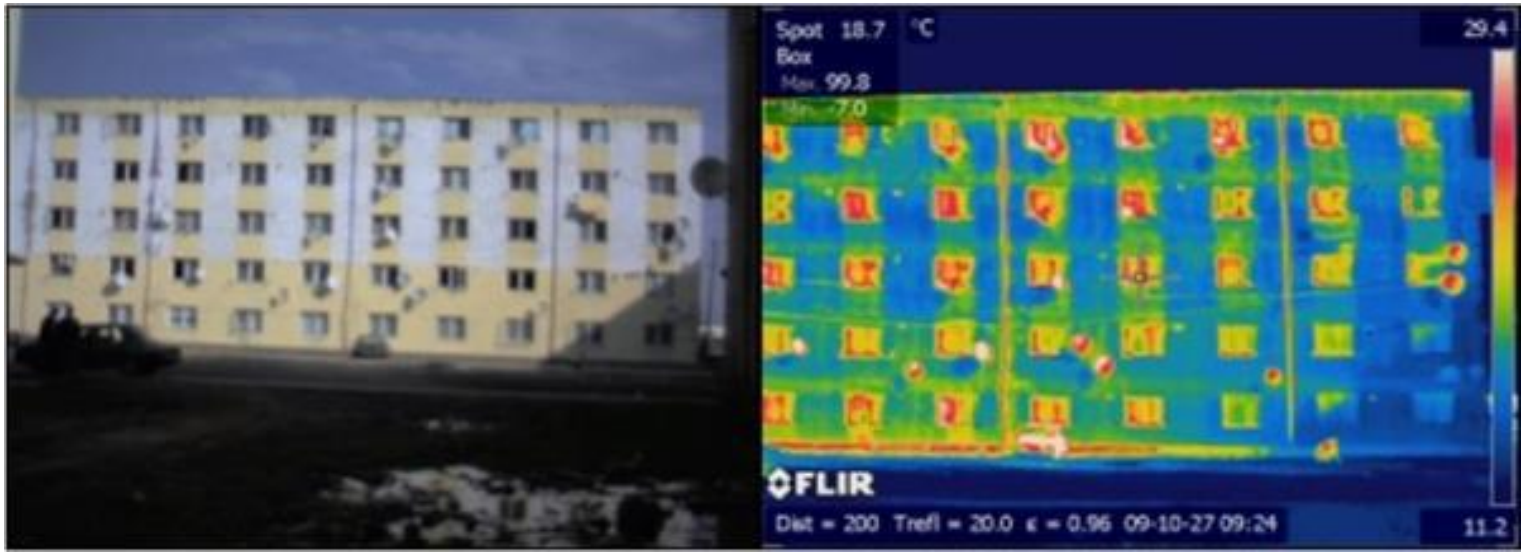
The use of thermal imaging cameras is prohibited if they are damaged and not functioning properly;

If the equipment is not in good working order, it shall be handed in for inspection and repair;

If the low battery indicator appears on the display, replace the batteries or charge the accumulators.

## 2. DEFECTS AND PRECAUTIONS FOR USE

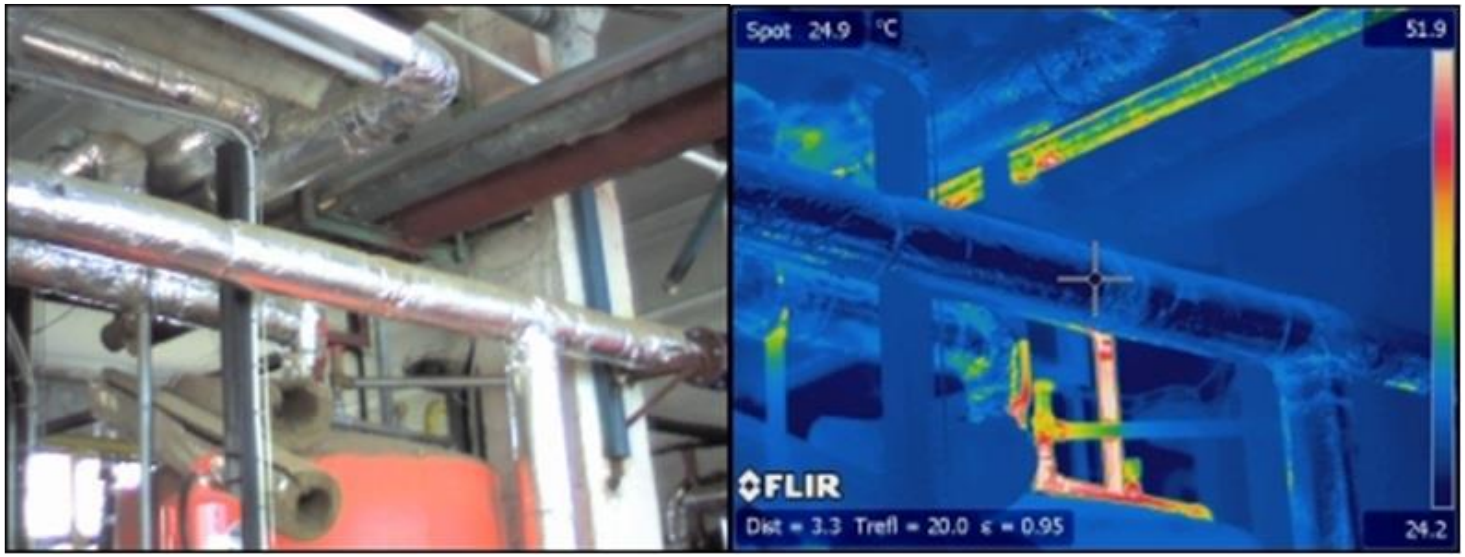
Applications of thermovision in construction




G. Nicolae POPA, C. Maria DINIȘ, I. POPA, S. Ioan DEACONU, Thermal imaging cameras, useful measuring devices in engineering, XVII International - Multidisciplinary Conference "Professor Dorin Pavel - the founder of Romanian hydroenergetics" Sebes, 2011

## 3. AREAS OF USE

Applications of thermovision in thermal energy

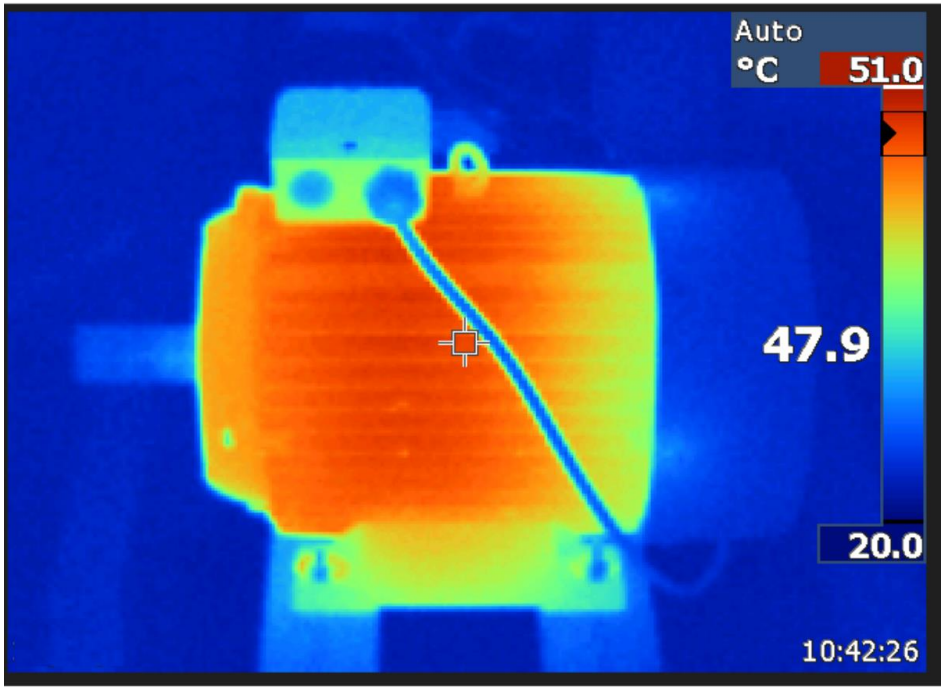



Overheating zones of circuits, in thermoenergetics

G. Nicolae POPA, C. Maria DINIȘ, I. POPA, S. Ioan DEACONU, Thermal imaging cameras, useful measuring devices in engineering, XVII International - Multidisciplinary Conference "Professor Dorin Pavel - the founder of Romanian hydroenergetics" Sebes, 2011

## 3. AREAS OF USE

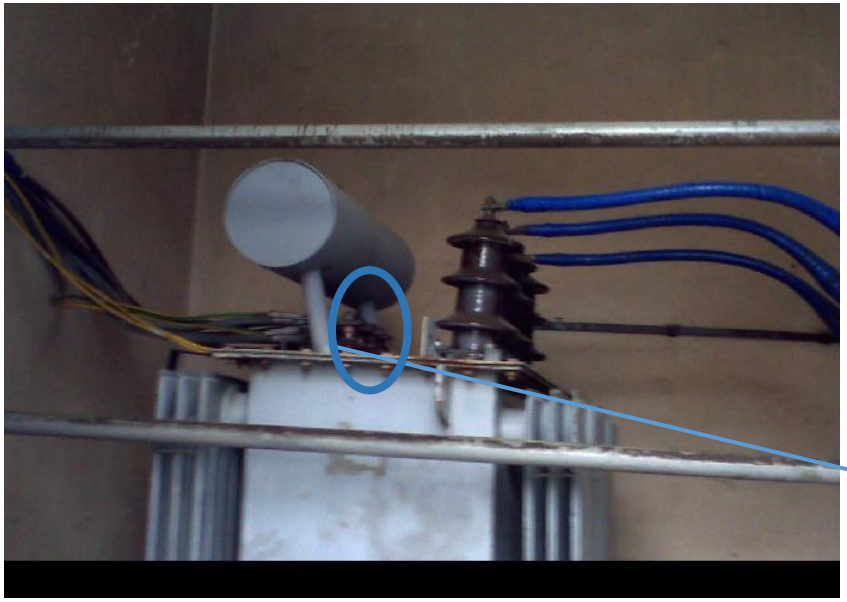
Electromechanical field




Electric motor operating at a maximum temperature of 50.0°C

## 3. AREAS OF USE

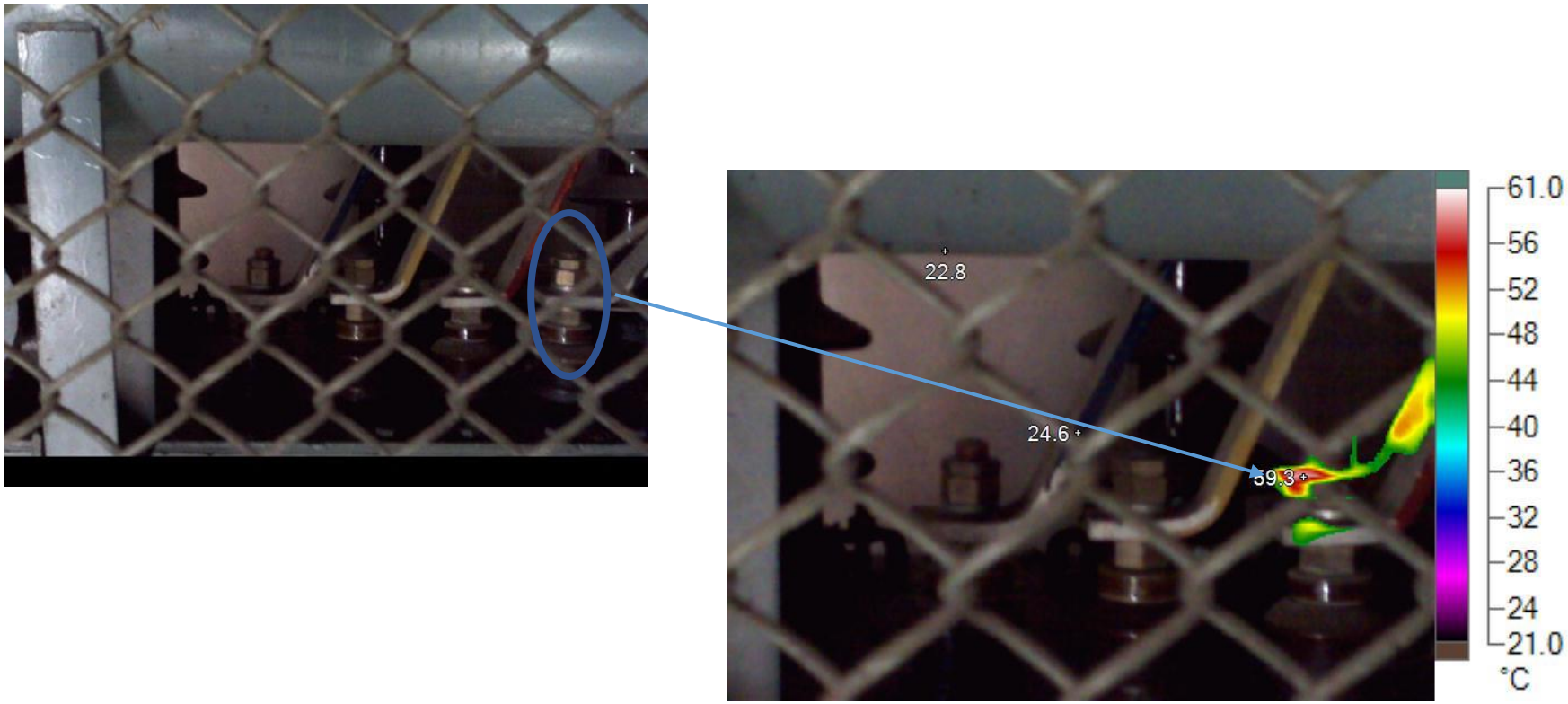
Industrial electrical installations




Weak contact at transformer low voltage terminal, phase R

# 4. PRACTICAL APPLICATIONS OF THE THERMAL IMAGING CAMERA

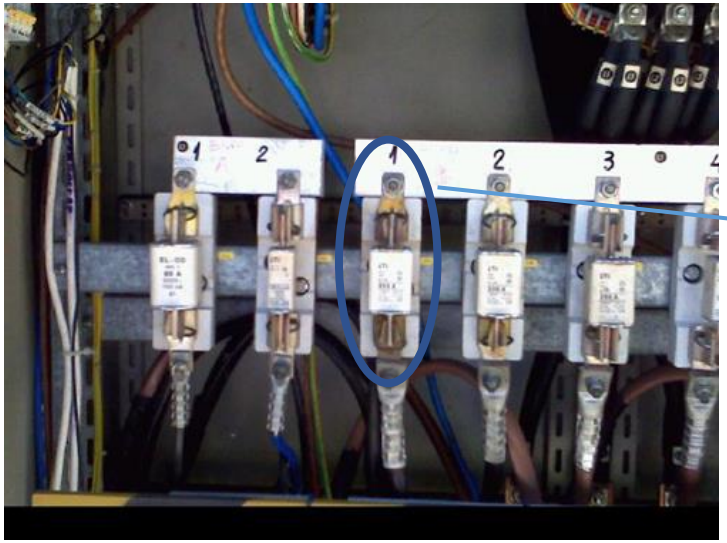
Checking low voltage terminals on a transformer

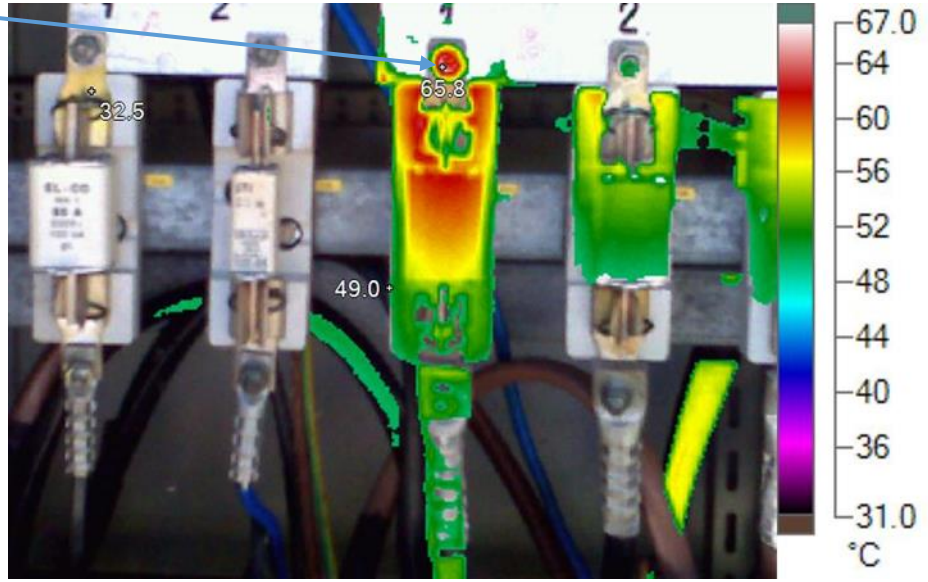



Weak contact at the transformer low voltage terminal, phase R

# 4. PRACTICAL APPLICATIONS OF THE THERMAL IMAGING CAMERA

## Checking the low voltage distribution board

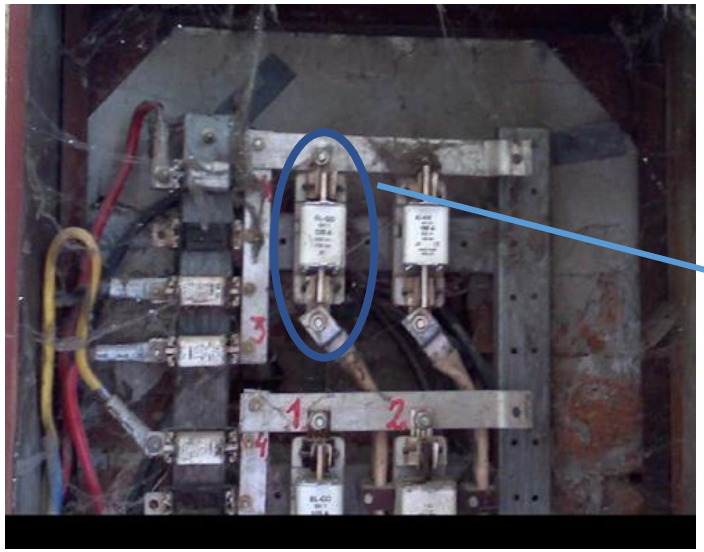



Poor contact on circuit 1 in the low voltage distribution board

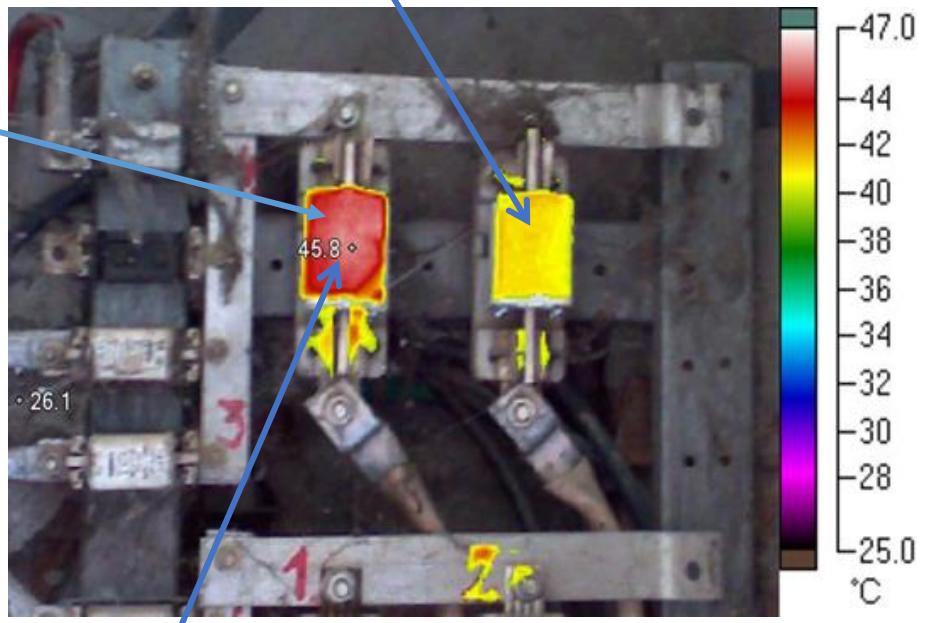
# 4. PRACTICAL APPLICATIONS OF THE THERMAL IMAGING CAMERA

Checking the low voltage distribution box



Circuit No 1 operates in overload at a temperature of 45,8°C.

Circuit No 2 operates normally with a temperature of 40-41 °C (yellow) )

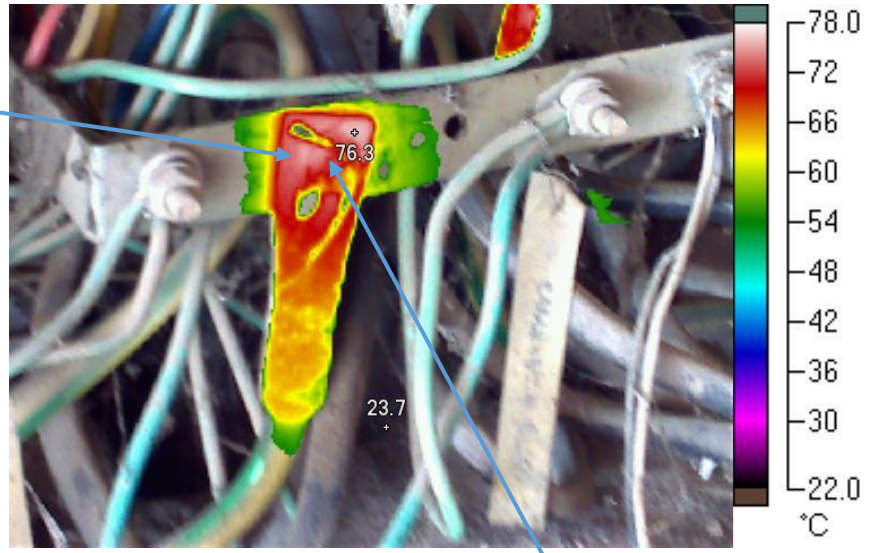



Weak contact in circuit 1 of the low voltage distribution box

# 4. PRACTICAL APPLICATIONS OF THE THERMAL IMAGING CAMERA

Checking the null busbar at the low-voltage electrical installation

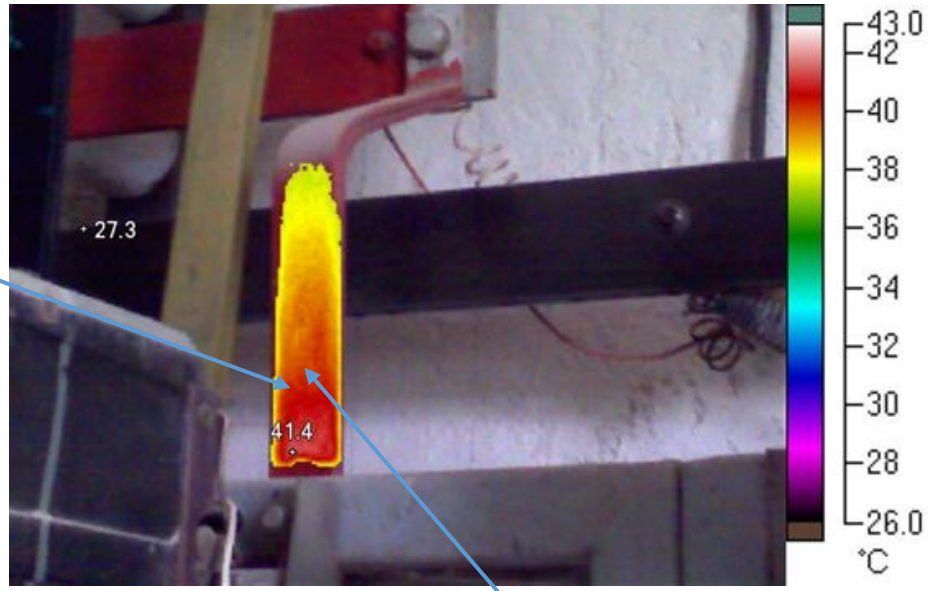
Null conductor connected to the null busbar




Null conductor connected to the null busbar operates at a temperature of 76.3°C

# 4. PRACTICAL APPLICATIONS OF THE THERMAL IMAGING CAMERA

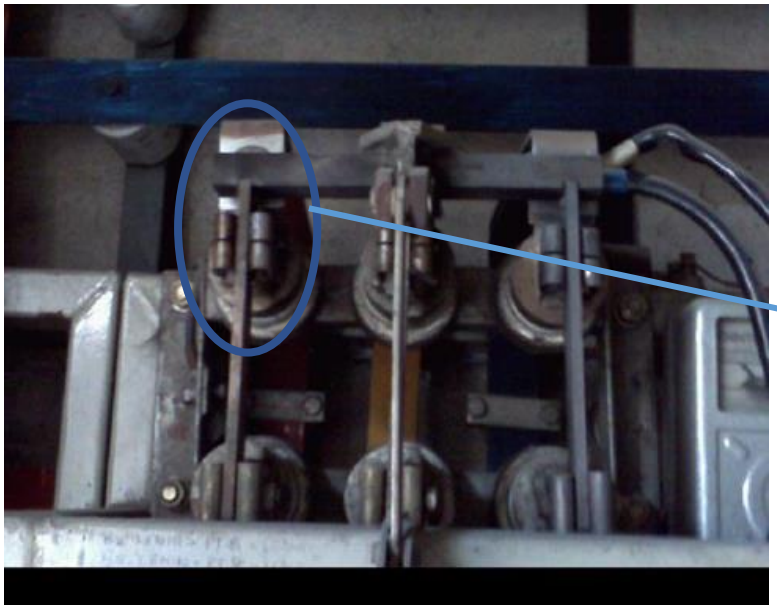
Checking the busbar connection to a low-voltage switch

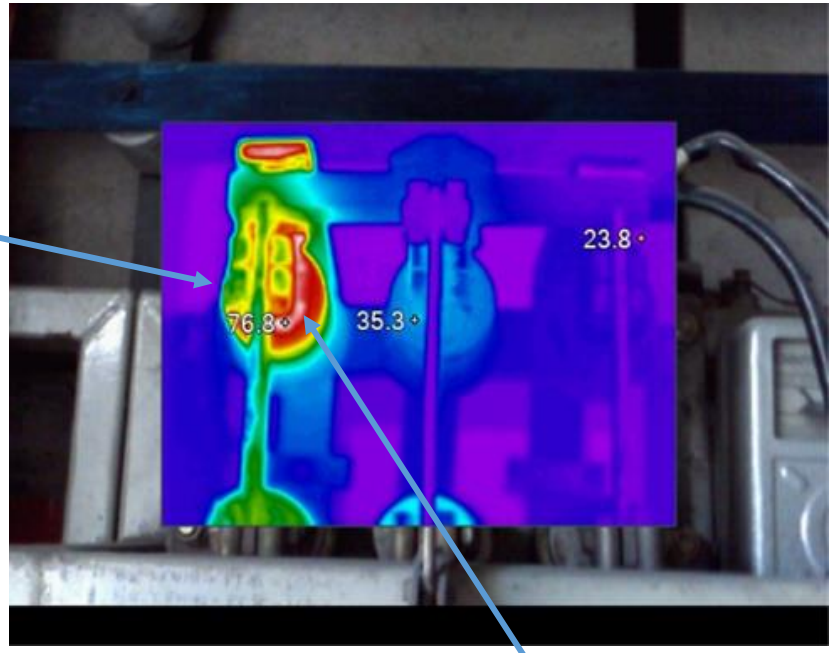



The busbar connection to the low-voltage circuit breaker operates with poor contact and a temperature of 41,4 °C.

# 4. PRACTICAL APPLICATIONS OF THE THERMAL IMAGING CAMERA

Low voltage separator check






The low-voltage separator operates in unbalanced mode at a temperature of 76,8 °C

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## 5. CONCLUSIONS

- Most of the defects identified are related to connecting elements that have imperfect and oxidised contacts that are easy to repair. Eliminating these defects reduces the loss of electricity;
- By using thermal imaging cameras in preventive maintenance, vulnerable points that cannot be found during the inspection of industrial installations are easily found and thus all sources that can lead to major defects (breakdowns of industrial installations) are eliminated;

## 5. CONCLUSIONS

- There are situations where the areas analysed with thermal imaging cameras are complex and the infrared image is not easy to analyse, so the facility has been implemented that when an infrared image is taken, an image in the visible range is automatically recorded;
- **Advantages**: non-contact temperature measurement; ability to measure an accurate temperature; quick detection of existing problems; detection of vulnerable points and visible analysis of temperature increases; identification and location of the fault and depending on the severity the maximum time in which the installation/equipment has to be repaired is determined; cost reduction due to equipment failure.

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# CONTACT

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