Infrared **Thermography**

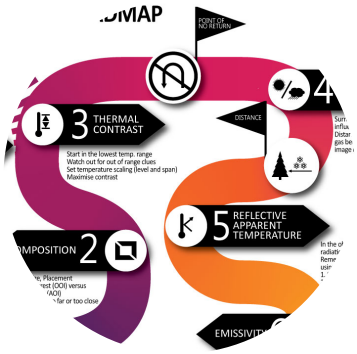
CATEGORY 1A,1, 2 & 3

Advance your skills and knowledge in the field of infrared thermography

YELLOTEC

Infrared Thermography **Category 1A**

Learn the 7 Measurement Rules© of Infrared Thermography.



IRT CAT 1A, The 7 Measurement Rules©, is the best introduction for any beginner Infrared Thermographer. For instance have you ever noticed that temperatures displayed by an infrared camera are sometimes obviously wrong?

Do you understand the difference between radiation and temperature? That IR cameras measure radiation and calculates temperature? Based on a number of variables controlled by the thermographer? This course will teach you the basics of Infrared Thermography, giving delegates a good theoretical and practical foundation to kick-start their understanding and application of Infrared Thermography.

Course **Detail**

Tailored for the newcomer to the world of Thermography; the course focuses on the seven basic rules to be followed when using a thermal camera in practice to measure temperature accurately enough to base sound engineering decisions on the results. On the first day, you'll learn the essentials of using a thermal camera effectively. Day two focuses on using the camera practically, taking images of real life equipment measurement and including the creation of a thermal report from the images taken with your own camera using the supplied software.

Who Should Attend

- First time Infrared Thermography Camera owners
- Basic training before attending Infrared Thermography Level 1 course

Course **Benefits**

This course accelerates the user's ability to use the thermal camera and the software for the purpose it was bought for - quickly and without fuss. It will enable you to put an expensive instrument to immediate good use, minimising the start-up time to produce the first thermal report correctly and with confidence.

What To Bring

Bring your camera and your laptop and our experienced thermographers will get you, your camera and your software up and running in two wonderfully interesting and valuable days.

Course **Outline**

Day One (Theory)

Introduction to the peculiarities and applications of infrared thermography.

1. Focus - Learn the "How To" of a thermal camera, and understand why focussing sounds easier than it really is, i.e. realising the difference between IR and Visual.
2. Composition – Understand the concept of the identification of an Object of Interest (OOI) and an Area of Interest (AOI); as well as collecting and presenting the thermal data correctly.
3. Thermal Contrast – Understand that cameras are not intelligent and can only display what it sees, and that thermographers need to adjust every image to reveal the real thermal patterns.
4. Environment - Adjusting for, and understanding the importance of, the influences of the atmosphere on your measurements.
5. Reflected Apparent Temperature – Understand that everything always reflects something and that your target is mostly a mirror! Learn the importance of T^{refl} and how to estimate it correctly.
6. Emissivity – Learn the practical craft of measuring and estimating emissivity and the importance of getting it right (Plus a few practical tips for the field).
7. Data Capture – Learn the practicalities involved with saving and working with thermal data.

The remainder of the afternoon is spent discussing the interpretation and analysis of field case studies.

Day Two (Practical)

1. Practice the measurement rules by performing thermal inspections.
2. Produce and prepare a report template in your software.
3. Managing thermal data and producing a thermal report.

Infrared Thermography **Category 1**

Become a Category 1 certified thermographer and gain a competitive advantage.

INFRARED TRAINING CENTER

This course prepares you for qualification as a category 1 certified thermographer.

You will learn about the basics of infrared, how to operate the camera under different conditions and for various purposes, how to do an appropriate judgement of the measurement situation in the field and identify potential error sources. You will be able to do IR inspections following written guidelines and to report the result of this inspection.

Course **Detail**

After a short introduction to thermography you will have hands-on training. The theory sections on heat and infrared will provide you with the basic knowledge needed to use the IR camera in the field, and to recognize and interpret thermal patterns. Strong emphasis will be put on the IR measurement techniques and the influence of emissivity and reflectivity on the measurement results.

You will train the measurement on real-life lab equipment and you will also learn how and when to use qualitative and quantitative thermography. A short introduction to inspection routines and reporting principles will finalize the lecture. Now you will be well prepared to create a short case study which you will present in front of the class. The course ends with an exam including multiple choice questions and thermogram analysis.

The class includes exercises and our trainers work with images, sketches, and simple diagrams to illustrate the theoretical parts in a descriptive way.

Who Should Attend

This course is designed for beginners in thermography with some experience in camera handling and limited IR knowledge, who want to take their first step to become a professional thermographer and want to qualify as a Category 1 certified thermographer.

Prior Experience & Equipment

No prior certification or experience is necessary to attend this course, although ownership of an infrared camera, laptop and software would be beneficial (bring along if possible).

Course **Benefits**

- The ITC is an Accredited Training Organization in conformance to the British Institute of Non Destructive Testing (BINDT) BS EN ISO 9001:2000 with certificate issued 25 May 2006.
- The ITC Infrared Thermography Category 1 Course is validated against the BINDT requirements for the structured training of Condition Monitoring practitioners.
- Learn the basics of infrared camera care and handling.
- Introduction to thermal imaging and measurement systems for predictive maintenance applications.
- Benefit hugely from an extensive overview of practical applications of Infrared Thermography.
- Collect quality data; make accurate temperature measurements using the infrared camera, and account for external influencing effects such as atmospheric conditions; (ambient temperature, distance & humidity) as well as Reflected Apparent Temperature and Emissivity using infrared cameras.
- Interpret thermograms and make informed decisions using heat transfer concepts to analyse thermal patterns in thermal images.
- See and experience the latest in infrared inspection report generation and database software.
- Avoid costly mistakes - learn to distinguish between hot spots and reflections, direct vs. indirect readings and qualitative vs. quantitative thermography.
- Challenge yourself with field applications labs that closely simulate real-world infrared applications.
- Learn the practical pitfalls and receive tips for performing thermal inspections in the plant.

Infrared Thermography **Category 1**

COURSE OUTLINE

Typically the mornings are spent on theory lectures and the afternoons on practical exercises with cameras and props.

1. Introduction to Thermography:
   - Introduction to infrared thermography
   - Why is temperature important?
   - Applications

2. IR Camera introduction:
   - Controlling the image
   - Measurement functions
   - Capturing an image
     - The “Big Three”
     - Temperature range
     - Optical focusing
     - Image composition
     - Storage devices
     - Practical tips

3. Basic Thermal Science:
   - Heat and temperature
   - Units for measuring temperature
   - Rules in thermal science

4. Basic Heat Transfer
   - Heat transfer modes
   - Conduction
   - Convection
   - Radiation heat transfer

5. The Electromagnetic Spectrum
   - Waves
   - The electromagnetic spectrum

6. Radiation Energy Exchange
   - Radiation energy exchange modes
   - Incident radiation
   - Exitant radiation
   - Blackbodies
   - Real life targets

7. Thermal Image Interpretation
   - Camera principle
   - Visual versus infrared
   - The thermal image
   - Apparent temperature and emissivity

8. Thermal Image Analysis Techniques
   - Thermal gradient
   - Camera tools for pattern enhancement
   - Thermal tuning
   - Image analysis – misleading patterns

9. Qualitative and Quantitative
   - Qualitative
   - Quantitative
   - Fault classification criteria
   - Baseline data

10. Infrared Measurement Techniques
    - Radiated energy and temperature
    - Calibration
    - Compensation for effects of the surroundings
    - Measurement conditions

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    - Radiated energy and temperature
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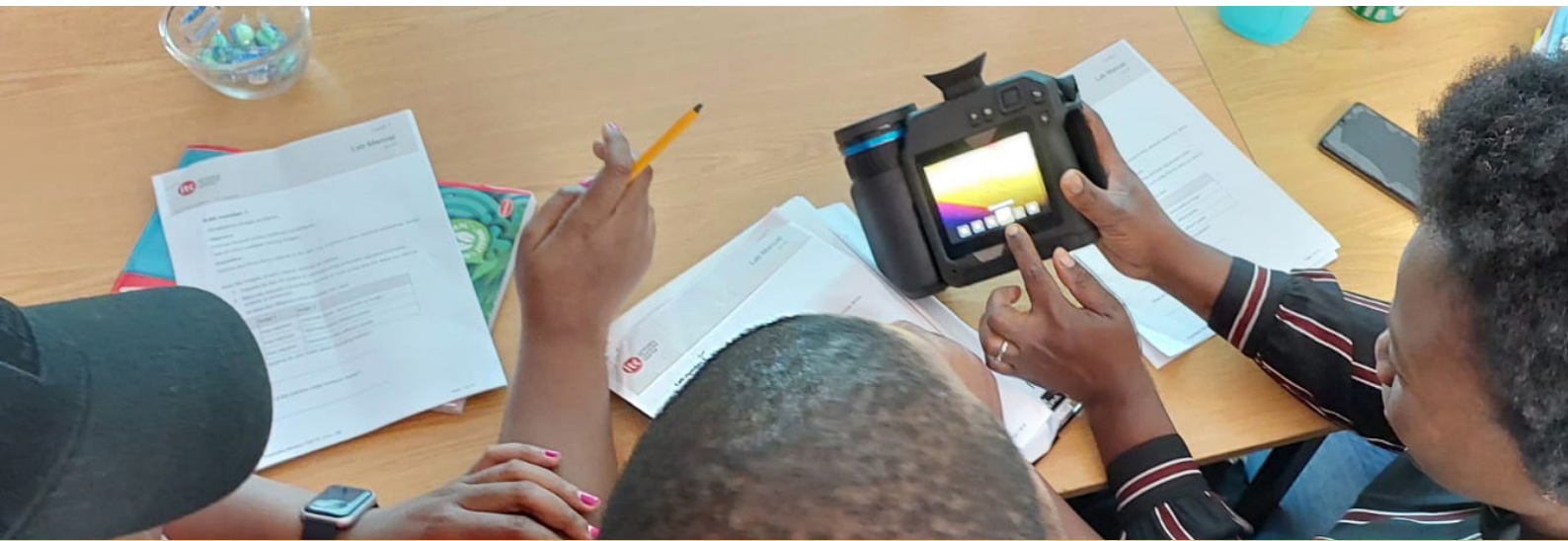
12. Thermography Guidelines



Infrared Thermography **Category 2**

Become a Category 2 certified thermographer and increase your IR knowledge.

INFRARED TRAINING CENTER

You will learn about topics in infrared thermography to both deepen and broaden your knowledge about infrared physics, heat science, infrared measurement equipment and its application.

This course prepares you for qualification as a Category 2 certified thermographer. As a Category 2 thermographer you shall provide guidance to Category 1 personnel in the areas of equipment selection, techniques, limitations, data analysis, corrective actions and reporting.

Course **Detail**

After a short introduction to certification levels and procedures, and related standards, you will take an initial test. During the course you will repeat and learn more about thermal science and heat transfer as well as gain advanced knowledge on IR theory and IR equipment. The course ends with a multiple choice exam.

The course includes advanced practical exercises and discussions about the participants' professional experiences and cases from the field. Thermal and infrared science theory are taught by using formulas, diagrams, and graphs. The focus is on steady-state processes, but transient mechanisms are also included.

Who Should Attend

This course is designed for thermographers holding a Level 1 certificate, who want to increase their knowledge about IR thermography and want to qualify as a Category 2 certified thermographer.

In Order to Attend

- You will hold a valid Categry 1 thermography certificate,
- You will have the recommended experience within thermography according to relevant standards,
- You will prepare a case study to be presented at the Category 2 course and submitted towards qualification at course closing.

Course **Benefits**

- Reinforce Category I infrared training concepts with refresher material covering the latest infrared camera, technology and thermal imaging application developments.
- Expand your thermography knowledge with new, more in-depth concepts in infrared theory, heat transfer and spatial resolution.
- Learn the basics of predictive maintenance thermography and overall infrared inspection program development.
- Learn to calculate avoided costs with Excel-based application software (included).
- Refine your image analysis and interpretation proficiency with in-depth thermal imaging survey and measurement techniques for predictive maintenance applications.
- Learn to measure emissivity of common materials.
- Improve your thermal analysis skills with more challenging laboratory and infrared field applications labs.
- The training course and exam follows the ISO 18436-7 Category 2 standards, and the ASNT SNT-TC-1A Level II standard.
- The course not only prepares the thermographer to carry out advanced thermal analyses and compile professional reports, it is also structured to prepare the delegate for the final examination on day five.
- The course is vendor neutral and delegates are encouraged to attend with any thermal camera.

Infrared Thermography **Category 2**

COURSE OUTLINE

Bring: Certified copy of valid Category 1 IRT Certificate, Scientific calculator, Thermal camera, laptop and software. Practical field assignment for presentation on day one.

1. Principles of infrared thermography:
   - Fourier's Law, Newton's Law of Cooling
   - Atmospheric transmission, Radiation reference sources
   - Planck's Law, Wien's Law, Emissivity, and factors affecting emissivity

2. Equipment and data acquisition:
   - Infrared camera selection criteria, Spectral bands, Thermal sensitivity (NETD), Lens selection, Optical resolution, and Operation of equipment
   - Image composition, Emissivity determination, Error source recognition, prevention or control, Waveband selection criteria
   - Recognizing and dealing with radiation, convection, and conduction
   - Effects of incorrect emissivity, Camera calibration and Environmental and operational conditions

3. Image processing:
   - Temperature measurement, and Comparative quantitative and qualitative thermography
   - Camera measurement tools, Measurement tools, Distance (atmospheric) correction, Emissivity correction
   - Statistical analysis , Image subtraction, Image montage and Temperature trending
   - General image interpretation guidelines, and General guidelines for establishing thermal severity assessment criteria

4. General applications

5. Diagnostics and prognostics

6. Condition monitoring applications:
   - Machinery engineering principles (components and construction)
   - Typical machinery failure modes and mechanisms and their associated thermal signatures
   - Severity assessment and acceptance criteria (engineering codes and standards)

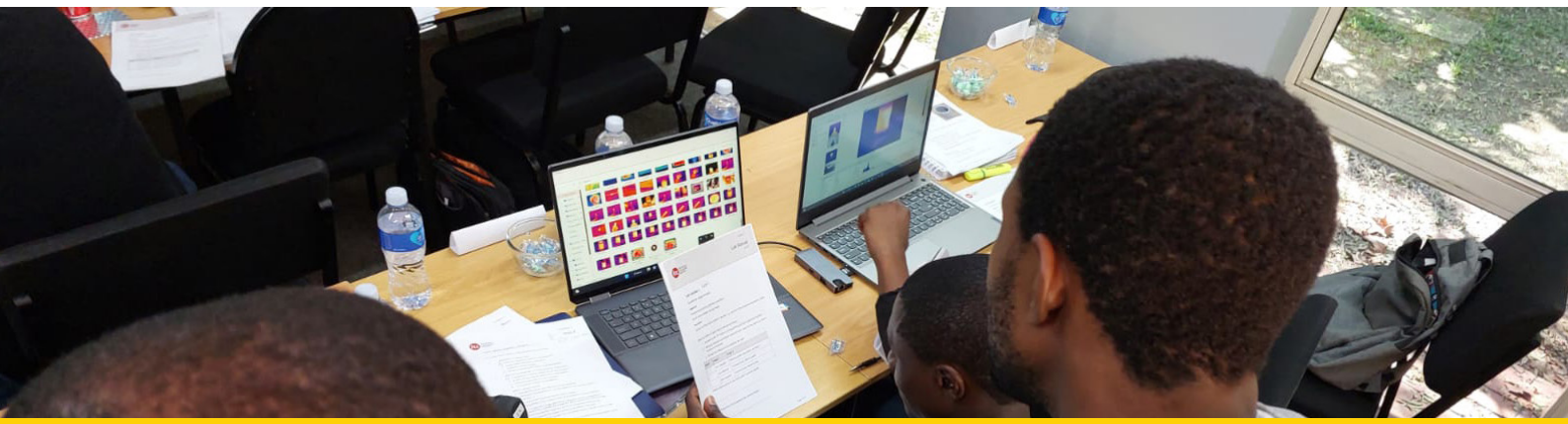
7. Corrective actions

8. Reporting and documentation (ISO International Standards)

9. Condition monitoring programme design
   - General principles, Technique selection, Measurement intervals
   - Reference temperatures, and Baseline temperatures
   - Procedure development

10. Condition monitoring programme implementation

11. Condition monitoring programme management
    - Safety, Equipment and Procedure management
    - Skills and competencies management
    - Database management
    - Managing corrective action implementation



Infrared Thermography **Category 3**

Become a Level 3 certified thermographer with advanced IR skills and knowledge.

This course assumes the attending delegate to be an advanced, experienced user of thermal cameras.

The attendee needs to be familiar with all theoretical and practical aspects of the technology as taught in Category 1 and 2. The delegate should preferably have in excess of two years practical IRT experience.

Course **Benefits**

- The training course and exam follows the ISO 18436-7 Category 3 standard, and the ASNT SNT-TC-1A Level III standard.
- The course is unique in that it combines practical workshop sessions with the relevant theory required by ISO 18436-7. The level 3 demonstration kits that are included in the price of the course, allow delegates to conduct their own practical workshop exercises (without having to share with other delegates), and then take these kits back to their workplace and show off their newly acquired skills.
- The course not only prepares the thermographer to carry out advanced thermal analyses and compile professional reports, it is also structured to prepare the delegate for the final examination on day five.
- The course is vendor neutral and delegates are encouraged to attend with any thermal camera.

Course **Outline**

The contents of this course closely follow the requirements of ISO 18436-7 and contain as minimum the following:

1. Principles of infrared thermography (IRT) :
   - Fourier's Law, Newton's Law of Cooling
   - Atmospheric transmission, Radiation reference sources
   - Planck's Law, Wien's Law, Stephan-Bolzmann Law, Emissivity and its influencing factors.
2. Equipment and data acquisition:
   - Infrared camera selection criteria, Spectral bands, Thermal sensitivity (NETD), Lens selection, Optical resolution, and Equipment Operation.
   - Image composition, Emissivity determination, Error source recognition, prevention and control, Wavelength selection criteria.
   - Recognizing and dealing with radiation, convection, and conduction.
   - Effects of incorrect emissivity settings, Camera calibration and Environmental and operational conditions.
3. Image processing:
   - Temperature measurement, Comparative quantitative and qualitative thermography techniques.
   - Camera measurement tools, Advanced Software Measurement tools, Distance (atmospheric) correction, Emissivity correction
   - Statistical analysis , Image subtraction, Image montage and Temperature trending
   - General image interpretation
4. General applications
5. Diagnostics and prognostics
6. Condition monitoring applications:
   - Machinery engineering principles (components and construction)
   - Typical machinery failure modes and mechanisms and their associated thermal signatures
   - Severity assessment and acceptance criteria (engineering codes and standards)
7. Corrective actions
8. Reporting and documentation (ISO International Standards)
9. Condition monitoring guidelines, and General guidelines for establishing thermal severity assessment criteria
10. Condition monitoring programme implementation
11. Condition monitoring programme management:
    - Safety, Equipment and Procedure management
    - Skills and competencies management
    - Database management
    - Managing corrective action implementation

Valid Category 2 Certificate, Thermal camera, Laptop with installed reporting and analysis software, scientific calculator, open mind…

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Training **Courses:**

- Infrared Thermography *IRT Basic, CAT 1, 2 and 3*
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- Asset reliability practitioner *ARP CAT 1 and 2*
- Field Lubricant Analysis *Noria Level 1, 2 and 3*
- Machinery Lubrication *Noria Level 1 and 2*
- Oil Analysis Series *Level 1, 2 and 3*
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- Balancing
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- Failure Analysis
- Condition Monitoring for Engineers
- IRIS M Motion System Training

Visit **www.yellotec.co.za** for the latest **Online Training** on offer.

Courses offered are either presented under license from International Certification Bodies or are in accordance with ISO requirements.

INFRARED TRAINING CENTER

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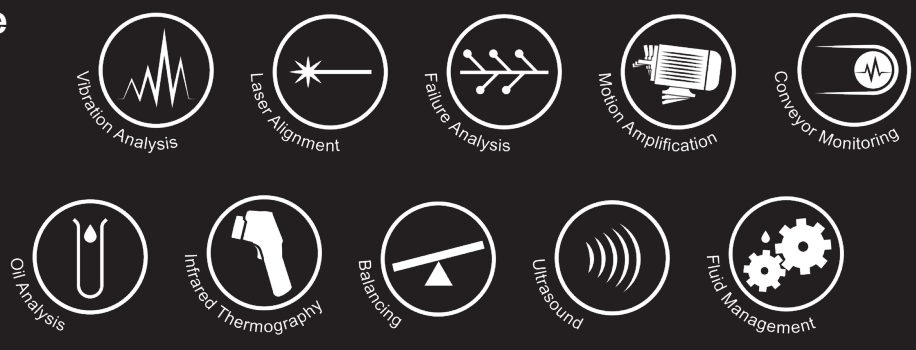
All of our public training courses can also be conducted as in-house private courses.

If you have 10 or more attendees, consider the benefits of an in-house session conducted in the privacy and convenience of your facilities, or a meeting site of your choice. Please contact us so that we can understand your requirements, explore the benefits and make it happen.

Yellotec stands proud in the belief of its founder that all failures are preventable.

We are a solution oriented company focused on Machine Health and Reliability through the application of advanced technologies.



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