

European Guideline



*Certification of
thermographers*

FOREWORD

The member countries of the Confederation of Fire Protection Associations Europe -CFPA Europe - have agreed to draw up common guidelines relating to particular fire prevention topics. The main purpose of such guidelines is to ensure consistent interpretation and practice across Europe by providing advice and information about recommended practice, model procedures etc., with the goal of making fire protection work easier and more effective.

The present set of guidelines concerns the practice of thermography, the technique used to measure temperature differences in, for example, electrical installations. In order for thermography to be carried out properly, it is essential that it be done by people who have the right skills and experience in this area.

These guidelines discuss the requirements which must be met by candidates seeking certification as qualified thermographers of heavy current systems. Overheating in electrical installations can result in a defective power supply and, in the worst case, fire. If the overheating is discovered in time, the defect can be rectified, saving property and possibly even human life. These guidelines are primarily aimed at those who perform thermography commercially, but are also for those who only carry out thermography within their own organisation.

Zurich, 18 August 2003
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Contents

1	Introduction	4
2	Scope	4
3	Requirements for qualification as a thermographer	4
3.1	Education and training	4
3.2	Training in thermography.....	4
3.3	Experience	4
3.4	Knowledge of thermography equipment.....	4
3.5	Other requirements	5
4	Requirements of candidates for certification	5
4.1	General requirements	5
4.2	Examination	5
4.3	The certificate's period of validity	5
4.4	Skills' maintenance	5
5	Course content for training candidates for certification as thermographers.....	6
5.1	Basic course	6
5.2	Refresher course and experience exchange workshop.....	7
6	Requirements for thermographic equipment.....	7
7	Reference	7

1 Introduction

Defective or overloaded electrical installations can cause overheating or short-circuiting, which can lead to fire. They can also increase the risk of production shut-downs. Early detection of such defects can help save valuable property and possibly even human life. Modern thermography equipment will aid the discovery and elimination of hot spots in electrical equipment and circuits but, for this to happen, it is essential that the equipments are operated by qualified personnel, who have the appropriate skills and experience in performing thermography.

A person who has been certified as a qualified thermographer has the documented ability to perform thermography correctly and efficiently on electrical equipment, the aim being to prevent fires occurring.

2 Scope

These guidelines specify requirements for thermographers who work on electrical installations to pinpoint possible defects, including fire risks. The necessary skills have been carefully identified; they will ensure that practitioners will carry thermography in a professional and responsible manner.

The guidelines also contain important requirements for the third-party certification of people qualified to perform thermography.

3 Requirements for qualification as a thermographer

3.1 Education and training

Candidates seeking certification as qualified thermographers must have the following education and training:

- a technical qualification which is at least equivalent to that of a trained electrician; or
- the training and education required under national legislation in order to be able to work on electrical installations.

Candidates seeking certification as qualified thermographers will have to be able to provide documentary evidence that they are familiar with current legislation, rules and regulations and they must stay abreast of changes thereof.

3.2 Training in thermography

Candidates seeking certification as qualified thermographers must have completed at least 35 hours' training in thermography, covering the elements described in section 5.

3.3 Experience

Candidates must have had at least 12 months practical experience of thermography. During this period, a candidate must have performed at least 100 hours of thermography, including at least 50 hours under the supervision of a certified thermographer.

Certified thermographers must carry out at least 400 hours of thermography work each year in order to retain their certification.

3.4 Knowledge of thermography equipment

Candidates seeking certification as qualified thermographers must be familiar with the functioning of thermography equipment (thermal imagers and handguns) and must be able to handle it so as to produce reliable results. Candidates must also be able to assess the equipments technical

Guideline No 3:2003

capabilities and diagnose and evaluate any discernible variations and determine whether an equipment's calibration is satisfactory.

An equipment must, as a minimum, have the technical capabilities specified in section 6.

3.5 Other requirements

Candidates seeking certification as qualified thermographers must be capable of acting impartially. For example, if the person is employed by an electrical contractor, the person must be independent of the business's other departments which supply, plan, install and/or service electrical equipment.

Candidates seeking certification as qualified thermographers must carry liability insurance to cover any faults or damage which they might cause in carrying out thermography tasks.

Candidates seeking certification as qualified thermographers must be familiar with and work according to "Thermography – Guide to the thermography of heavy current systems". See Ref. 1.

4 Requirements of candidates for certification

4.1 General requirements

Certification must be carried out by a certifying body which certifies personnel and should be accredited in accordance with EN 45013: General Criteria for Certifying Bodies.

4.2 Examination

Candidates seeking certification as qualified thermographers must complete a written examination to test their knowledge of the subjects of 3.1, 3.2, 3.3, 3.4 and 3.5. The examination must be passed no later than 6 months after they have completed their training in thermography. See also 5.1. In order to be certified, the person seeking certification as a qualified thermographer must produce a course certificate or similar documentary evidence to show that they have appropriate knowledge of safety regulations. This includes, for example, relevant documentation to demonstrate up to date knowledge about safety while working on heavy current systems.

4.3 The certificate's period of validity

Certificates are valid for a maximum period of 5 years. In order to be issued with a new (renewed) certificate, the person must pass the examination described in 5.2.

4.4 Skills' maintenance

In order for the certificate to remain valid, the certified person must

- Participate in a combined refresher course and experience exchange workshop of at least 12 hours' duration, at least every 36 months. Course content as described in section 5.
- Regularly carry out thermography, amounting to at least 400 hours per year.

If these maintenance requirements are not met, the certificate must be withdrawn.

5 Course content for training candidates for certification as thermographers

5.1 Basic course

General

The course must be impartial and independent of specific suppliers and must have a duration of at least 35 hours. The course must provide theoretical and practical knowledge within the following areas:

- Thermodynamics and radiation
- Infrared measurement techniques
- General operation of equipments used for thermography
- Overview of applications of thermography
- Job reporting

Thermodynamics and radiation

The following topics must be addressed:

- Definitions of temperature, heat, thermal energy
- The physics of heat transmission: conduction, convection, radiation
- The laws of thermodynamics
- Black body theory, radiation laws
- The electromagnetic spectrum.

Infrared measurement techniques

The following topics must be addressed:

- Qualitative and quantitative analysis
- Image interpretation
- Temperature measurement; corrections for environmental factors
- Degree of accuracy; the possibility of incorrect measurements
- An equipment's technical capabilities and limits
- An equipment's measurement functions.

General operation of equipments used for thermography

The following topics must be addressed:

- Types of equipments
- Range of measurement and dynamics
- Thermal focussing
- Checking equipment calibration.

Overview of applications of thermography

The following topics must be addressed:

- How various thermal phenomena can be used to check the state or condition of a system
- General and special applications, overview and examples
- The basis for the thermographic inspection of power equipment
- Diagnosing and evaluating typical faults.

Job reporting

The following topics must be addressed:

- Report components and contents
- Filing.

The course ends with an examination. The examination is by multiple-choice questions.

Alternative

As an alternative, the ASNT (American Society of Non-destructive Testing) level 1 course can be used, as long as the above topics are covered and there is a final examination

5.2 Refresher course and experience exchange workshop

The goals are to maintain the knowledge which was gained during the skills training and further to develop and update the certified person's knowledge.

The course which is arranged by the certifying body, a course provider, a professional association or similar organisation – must have a duration of at least 12 hours and must revise the theoretical and practical topics within these areas:

- Thermodynamics and radiation
- Infrared measurement techniques
- Job reporting

Plus:

- New laws, rules, regulations and standards.

The course ends with an examination. The examination is by multiple-choice questions.

6 Requirements for thermographic equipment

People who have been certified as qualified thermographers must use equipments which fulfil the following technical requirements:

- Provide direct temperature reading in at least one selectable point at a time on the display
- Permit the measurement of the temperature in the entire image field
- Enable digital storage of image data
- Facilitate temperature analysis on digitally stored images (on the equipment or on a computer)
- Measure temperature to an accuracy of ± 2 deg C in the range 0 – 100°C and ± 4 deg C in the range 100 – 200°C
- Facilitate correction for distance, emissivity and reflected background radiation
- Permit geometric resolution during measurement: during practical use in the field, the degree of accuracy specified above must be complied with for objects with a size down to 1/50 of the display field width (objects 6mm wide or less)
- Record thermal resolution: at least 0.1 deg C at 30°C.

See also Ref. 1

An equipment's technical capabilities must be specified by the manufacturer/supplier. The manufacturer/supplier of the equipment must document its accuracy with a calibration certificate. The equipment's accuracy must be checked against that of a reference equipment of known accuracy at least once a year.

7 Reference

1. *Thermography – Guide to the thermography of heavy current systems* (Termografering - Vejledning i termografering af stærkstrømstekniske anlæg) , DTI Energiteknologi, Dansk Teknologisk Institut, 1993.