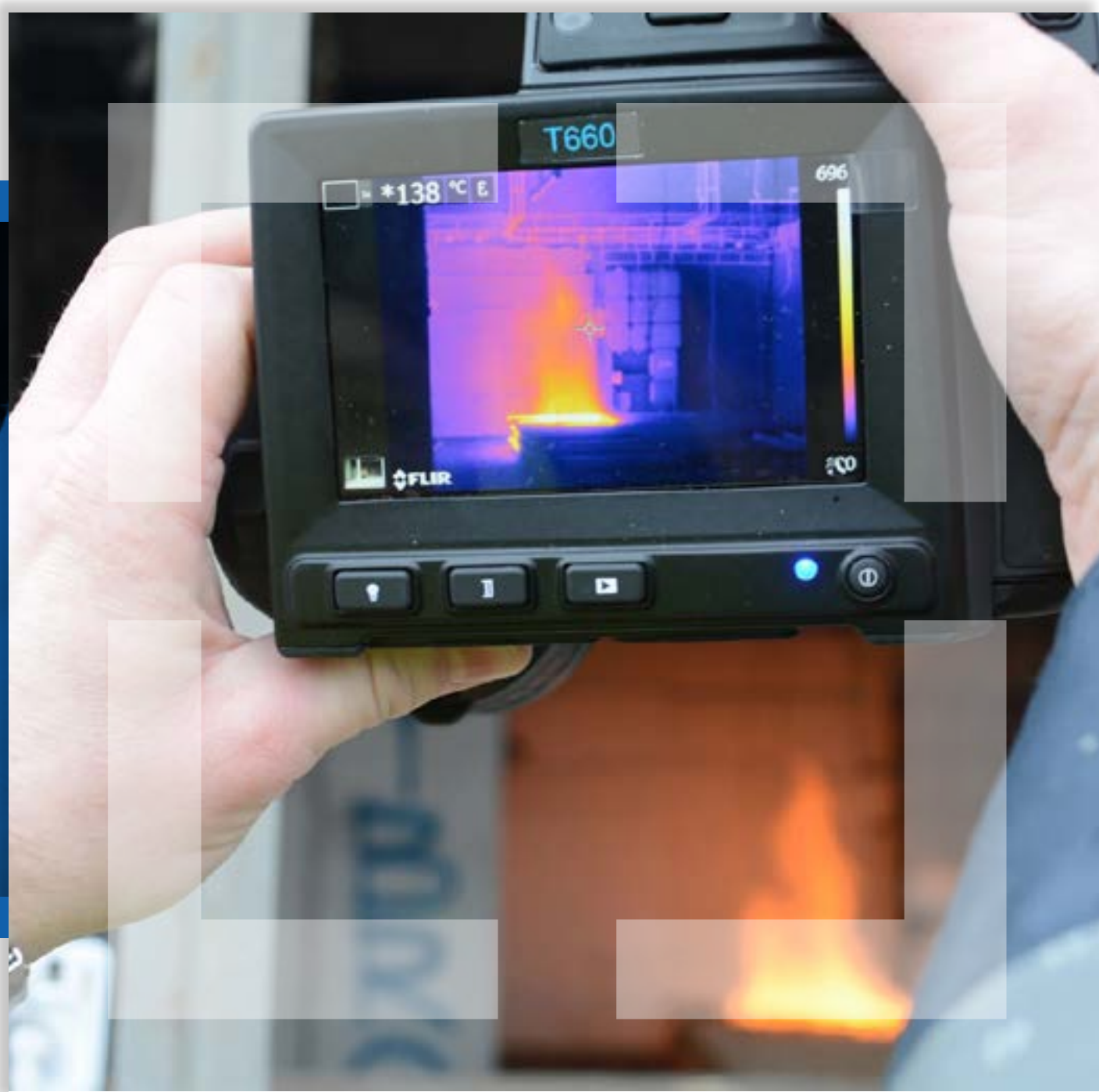


# Certification of thermographers

**CFPA-E Guideline No 3:2011 F**





## **FOREWORD**

The European fire protection associations have decided to produce common guidelines in order to achieve similar interpretation in the European countries and to give examples of acceptable solutions, concepts and models. The Confederation of Fire Protection Associations in Europe (CFPA E) has the aim to facilitate and support fire protection work in the European countries.

The market imposes new demands for quality and safety. Today fire protection forms an integral part of a modern strategy for survival and competitiveness.

The guideline 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.

The proposal of this guideline has been produced by DBI - Danish Institute of Fire and Security Technology and the author is Ib Bertelsen from DBI.

This guideline has been compiled by Guidelines Commission and adopted by all fire protection associations in the Confederation of Fire Protection Associations Europe.

These guidelines reflect best practice developed by the countries of CFPA Europe. Where the guidelines and national requirement conflict, national requirements must apply.

Zürich, 9 May 2011  
CFPA Europe

Dr. Hubert Rüegg  
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Stockholm, 9 May 2011  
Guidelines Commission

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## **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. 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 main aim being to prevent fire from occurring.

## **2 Scope**

This guideline specifies requirements for thermographer 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 guideline also contains important requirements for the third-party certification of people qualified to perform thermography.

It should be noted that the national certification organisation may have additional requirements.

## **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.

The training must be done by an established training institute. A training plan must be available which contains the purpose of the training, a training program (contents of the training course), the teachers name and competence, the equipment used and the demonstration material and literature which are being used. The trainer must have education at least at level III for Thermography Training.

### **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 or what is decided to be recommended by a certifying body.

The training period must not exceed 15 months.

Certified thermographers must carry out at least 300 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 capabilities and diagnose and evaluate any discernible variations and determine whether an equipment's calibration is satisfactory. The candidate shall be competent to validate the equipment as described in section 6.

### **3.5 Other requirements**

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 the relevant documents for the type of business or company where the candidate is performing thermography.



## **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 (if national required) in accordance with EN ISO/IEC 17024 "Conformity assessment -- General requirements for bodies operating certification of persons".

### **4.2 Examination**

Candidates seeking certification as qualified thermographers must complete a written examination to test their knowledge of the subject of section 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 section 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.

### **4.3 The certificate's period of validity**

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

If section 4.4. is met no need for new examination is needed.

### **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 5.2
- regularly carry out thermography, amounting to at least 300 hours per year
- the work shall include analysing the results and writing reports
- training for national electrical safety regulations shall be refreshed every 36 months.

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 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 must be addressed:

- definitions of temperature, heat, thermal energy
- the physics of heat transmission: conduction, convection, radiation
- the laws a thermodynamics
- black body theory, radiation laws
- the electromagnetic spectrum.

### **Infrared measurement techniques**

The following topics must be addressed:

- quantitative 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 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
- 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 shall be able to validate the equipment has the following described capacity:

- provide direct temperature 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 with an accuracy of  $\pm 2$  degrees Celsius ( $^{\circ}\text{C}$ ) in the temperature range  $0 - 100$   $^{\circ}\text{C} \pm 4$   $^{\circ}\text{C}$  in the range  $100 - 200$   $^{\circ}\text{C}$
- facilitate correction for distance, emissivity and reflected background radiation
- permit geometric resolution during the 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 6 mm wide or less)
- record thermal resolution: at least  $0.1$   $^{\circ}\text{C}$  at  $30$   $^{\circ}\text{C}$ .





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 per year.

## **7 Inspection report**

### **7.1 Reference**

The inspection report will include:

- the inspection date or period;
- model and characteristics of the camera and software used;
- the name of the operator involved and a valid copy of his attestation of competence;
- date of the certification and its experience data;
- the name and title of the contact person/ requestor.

### **7.2 Liste**

The inspection report will include the list of electrical equipment and installations supplied by the user company, with the indication "not inspected" for those items which could not be checked, as well as the reason.

With respect to the equipment and installations for which no anomaly will have been noted during the inspection, the indication "Nothing to report" will be noted on the list opposite the equipment concerned.

During the following visit, this list will include the result(s) of control run used to verify whether the previously noted anomaly has been eliminated by corrective action on the part of the user company.

### **7.3 Non- Conformity Sheets**

With respect to the equipment and installations for which an anomaly will have been noted during the inspection, the report will include a specific sheet with those indications listed in Appendix 3 (location and data concerning the equipment, analyses and recommendations), accompanied by a clear photo (with an arrow designating the hot spot, or some other means of identification) and a thermogram.

Additional analyses may be recommended if the operator deems them advisable (for example: harmonics, transformer chromatography, area-specific air analysis, ultrasonic detection, etc.).

Some recommendations may be formulated to improve safety, depending upon the observations made during the inspection (dust removal, cowling, insulation, equipment protection, etc.).



Note: Special attention must be paid to information about risks associated with the inspected installation's, and/or equipment's, environment.

#### **7.4 Inspections Reports Conclusions**

The report's conclusions must propose that an analysis be carried out of the anomalies' possible causes and suggest a suitable treatment plan by ranking, in order of priority, the recommended measures defined in the following table.

The number of anomalies per priority ranking has to be shown in the inspection report.

Priority Level    Recommended Measures

Priority 1	Immediate action (note on anomaly sheet if the action was taken during the inspection);
Priority 2	Action should be taken within 2 months of receipt of the report;
Priority 3	Equipment or installation to be monitored (tracking anomaly changes).

Note: These conclusions must also appear on each of the specific data sheets.

## **8 Traceability**

### **8.1 Storing the thermogramas and inspection report**

The thermogramas of hot spots classified as anomalies will be subject to data storage in computer file format (computerization of the thermogram), on the premises of the company involved. These computer files must be kept for a minimum duration of two inspection periods.

### **8.2 Inspections Reports**

All inspection reports must be kept by the inspections company for each inspected electrical equipment involved and by the user company for a minimal duration of two inspection periods.

This guideline sets out the requirements that must be satisfied in order that a dwelling may be categorised as a Fire Safe Home. The intention is that this guideline should be applicable to all types of dwellings, from single family houses to flats in multi-storey buildings.

The guideline describe both a base package which CFPA Europe considers reasonable in a dwelling, and also a number of optional measures that can be selected to further improve fire protection.

The concept of Fire Safe Homes is based on insight, knowledge and motivation and on the applicability at all times of the requirements set out in this document. Through being aware of the



fire risks that may arise in the home, and by maintaining and checking the appliances and equipment provided for fire protection, the residents will be well prepared should a fire nevertheless occur.

We welcome the involvement of all who want to help us promote our vision of a Europe with greater fire safety in our homes, and where the number of fire deaths will steadily decrease.

## **9 European guidelines**

- Guideline No 1:2002 F - Internal fire protection control
- Guideline No 2:2007 F - Panic & emergency exit devices
- Guideline No 3:2011 F - Certification of thermographers
- Guideline No 4:2010 F - Introduction to qualitative fire risk assessment
- Guideline No 5:2003 F - Guidance signs, emergency lighting and general lighting
- Guideline No 6:2004 F - Fire safety in residential homes for the elderly
- Guideline No 7:2011 F - Safety distance between waste containers and buildings
- Guideline No 8:2004 F - Preventing arson – information to young people
- Guideline No 9:2005 F - Fire safety in restaurants
- Guideline No 10:2008 F - Smoke alarms in the home
- Guideline No 11:2005 F - Recommended numbers of fire protection trained staff
- Guideline No 12:2006 F - Fire safety basics for hot work operatives
- Guideline No 13:2006 F - Fire protection documentation
- Guideline No 14:2007 F - Fire protection in information technology facilities
- Guideline No 15:2010 F - Fire safety in guest harbours and marinas
- Guideline No 16:2008 F - Fire protection in offices
- Guideline No 17:2008 F - Fire safety in farm buildings
- Guideline No 18:2008 F - Fire protection on chemical manufacturing sites
- Guideline No 19:2009 F - Fire safety engineering concerning evacuation from buildings
- Guideline No 20:2009 F - Fire safety in camping sites
- Guideline No 21:2009 F - Fire prevention on construction sites
- Guideline No 22:2010 F - Wind turbines – Fire protection guideline
- Guideline No 23:2010 F - Securing the operational readiness of fire control system
- Guideline No 24:2010 F - Fire safe homes
- Guideline No 25:2010 F - Emergency plan
- Guideline No 26:2010 F - Fire protection of temporary buildings on construction sites