SLOVENSKI STANDARD
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Neporušitveno preskušanje - Termografsko preskušanje - 3. del: Izrazi in definicije

Non-destructive testing - Thermographic testing - Part 3: Terms and definitions

Zerstörungsfreie Prüfung - Thermografische Prüfung - Teil 3: Begriffe

Essais non destructifs - Essais thermographiques - Partie 3: Termes et définitions

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EUROPEAN STANDARD

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English Version

Non-destructive testing - Thermographic testing - Part 3: Terms and definitions

Essais non destructifs - Analyses thermographiques - Partie 3: Termes et définitions

Zerstörungsfreie Prüfung - Thermografische Prüfung - Teil 3: Begriffe

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 16714-3:2016) has been prepared by Technical Committee CEN/TC 138 “Non-destructive testing”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2017, and conflicting national standards shall be withdrawn at the latest by February 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

EN 16714, *Non-destructive testing — Thermographic testing* consists of the following parts:

— *Part 1*: *General principles*

— *Part 2*: *Equipment*

— *Part 3*: *Terms and definitions*

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard establishes terms and definitions for thermographic testing.

2 Terms and definitions

2.1
absorptance
α
ratio of absorbed radiant power to the incident radiant power

Note 1 to entry: Absorptance may vary with wavelength, temperature and angle.

2.2
active thermography
thermographic procedure in which an artificial or natural source of energy is used to produce a non-stationary heat flux for the purpose of testing

2.3
anti-reflectance coating
coating of infrared or optical elements (lenses, protective windows) to increase the transmission of certain wavelength ranges by minimizing or suppressing reflections at interfaces

2.4
atmospheric temperature
T_{atm}
temperature of the atmosphere between camera and measured object

2.5
atmospheric attenuation
reduction of flux densities of electromagnetic radiation on the path through the atmosphere

Note 1 to entry: The atmosphere between object and camera attenuates IR radiation. Besides absorption of radiation by gases, e.g. water vapour (H_2O) and carbon dioxide (CO_2), radiation is attenuated by scattering (dust, fog, rain, snow, etc.).

2.6
comparative thermography
thermographic procedure that evaluates temperature differences or phase differences or differences of secondary parameters

2.7
chromatic aberration
wavelength dependent aberration of lens

Note 1 to entry: Due to dispersion (wavelength dependent index of refraction), different spectral parts are imaged in different image planes. This aberration is increasing with the spectral bandwidth of captured radiation.

2.8
close-up lens
additional lens which is placed in front of an existing IR lens to decrease the minimum distance between camera and object

Note 1 to entry: Close-up lenses are an inexpensive alternative to macro lenses to adapt the field of view of a camera or lens to visualize small objects.

2.9
data analysis
application of algorithms and calculations in order to increase the contrast of indications of recorded data

2.10
differential temperature
temperature difference between two temperature values recorded at different positions and/or at different times

Note 1 to entry: Temperature differences are used, e.g. for subtracting the temperature of an undisturbed area or for subtracting the zero image (thermogram before heating) from a data sequence.

2.11
diffraction limit
limit of spatial resolution due to diffraction of optical systems

Note 1 to entry: Diffraction at diaphragms, lens holders, etc. physically limits the spatial resolution of IR cameras. The limit can be estimated with the Rayleigh criterion. Diffraction depends on the wavelength of radiation as well as shape and dimension of beam-narrowing components.

2.12
emissivity
ε
ratio of the power radiated by real bodies to the power that is radiated by a black-body at the same temperature

Note 1 to entry: The emissivity can depend on the wavelength, the angle of emission, the body temperature and other factors. In this general case the ratio of the spectral radiance of a real body and a black-body is called spectral directional emissivity. In thermography practice, only the emissivity within the spectral sensitivity range of the IR camera is relevant. It is used for correcting temperature measurements carried out with the IR camera (settings of IR cameras for temperature measurements).

2.13
extension ring
ring that is placed between the camera and the lens to increase the distance between image plane and lens (increase of magnification)

2.14
external heating source
heating source which is used for external heating in active thermography for introducing a non-stationary heat transfer into the object under test

Note 1 to entry: As external heating source, e.g. flash lamps, halogen lamps, lasers, inductive coils, ultrasonic sonotrodes can be used.

2.15
field of view
FOV
image section that is captured by an IR camera

Note 1 to entry: The field of view depends amongst others on the focal length of the lens.

2.16
fill factor
ratio of the sum of all single detector areas to the total area of the detector array

Note 1 to entry: The fill factor is an important parameter to describe the properties of detector arrays. Arrays with high fill factors produce homogenous images. However, high fill factors are also prone to crosstalk of neighbouring detector elements.

2.17
fixed pattern noise
influence of different sensitivities of single detectors and readout circuit in FPA cameras

2.18
focal plane array
FPA
detector consisting of a one- or two-dimensional array of single detectors

2.19
frame rate
number of thermograms (frames) of a specific resolution per second, which are recorded with the IR camera

2.20
image averaging
averaging of consecutive images (thermograms, frames) to improve the thermal resolution of IR cameras

Note 1 to entry: Image averaging improves the signal-to-noise ratio (SNR). Image averaging improves the thermal resolution of IR cameras at the expense of temporal resolution. To avoid blurred images, image averaging should only be used for slowly moving cameras or slowly changing temperature distributions.

2.21
infrared (IR) camera
optical device including lens, filters, FPA and internal data processing for collecting and imaging the infrared radiation emitted by an object under test and which is measuring the radiation flux and/or the temperature

Note 1 to entry: Only the wavelength interval of infrared radiation transmitted by the lens and filters and where the FPA is sensitive is detected.

2.22
IR-imager
IR-viewer
infrared camera for visualizing infrared radiation without measurement functionalities

2.23
instantaneous field of view
IFOV
image section of a single detector element of IR camera

Note 1 to entry: The instantaneous field of view specifies the spatial resolution of IR cameras. It is strictly applicable only to scanning cameras with one single detector element. The spatial resolution for measurement of focal plane array can be determined by the slit response function (SRF).

2.24
integration time
time during which the incoming infrared radiation is accumulated (integrated) on the detectors of the FPA

Note 1 to entry: The longer the integration time, the more light is collected. A long integration time applied to objects with high temperature may saturate the detectors.

Note 2 to entry: The shortest integration time is usually limited by the speed of the detector.

2.25
long-wave infrared
LWIR
wavelength range between 8,0 µm and 14,0 µm

2.26
measurement field of view
MFOV
smallest target spot size on which an infrared camera can fulfil measurement, expressed in terms of angular subtense

Note 1 to entry: The slit response function (SRF) test and the hole response function (HRF) test are typical methods used to measure MFOV.

2.27
mid-wave infrared
MWIR
wavelength range between 2,0 µm and 5,0 µm

2.28
minimum resolvable temperature difference
MRTD
measure of the ability of an infrared imaging system and the human observer to recognize periodic bar targets on a display

2.29
modulation (of heat source)
procedure in which amplitude, phase and/or frequency of the periodic or impulse excitation function of a heat source is modified