
**Non-destructive testing — Infrared
thermography —**

Part 2:

**Test method for integrated
performance of system and equipment**

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Essais non destructifs — Thermographie infrarouge —

*Partie 2: Méthode d'essai relative aux performances intégrées du
système et de l'appareillage*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 135, *Non-destructive testing*, Subcommittee SC 8, *Thermographic testing*.

A list of all parts in the ISO 18251 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Industrial applications of infrared thermographic testing are getting wider along with remarkable improvement of thermographic technologies. The effectiveness of any application of infrared thermographic testing depends upon proper and correct usage of the system and equipment. The purpose of this document is to provide a test method for the integrated performance of the system and equipment for infrared thermography in the field of industrial non-destructive testing. The establishment of this document can solve the problem that there is no ISO standard for the performance test method of the infrared equipment and system. The main interested parties who can benefit from this document are manufacturers and users of the infrared testing equipment and system.

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Non-destructive testing — Infrared thermography —

Part 2:

Test method for integrated performance of system and equipment

1 Scope

This document specifies a test method for integrated performance parameters specified in ISO 18251-1 of an infrared (IR) imaging system and related equipment used in non-destructive testing (NDT). It also aims to assist the user in the selection of an appropriate system for a particular testing task.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10878, *Non-destructive testing — Infrared thermography — Vocabulary*

ISO 10880, *Non-destructive testing — Infrared thermographic testing — General principles*

ISO 18251-1, *Non-destructive testing — Infrared thermography — Part 1: Characteristics of system and equipment*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10878 and ISO 18251-1 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

4 General requirements

4.1 Environmental requirements

General environmental requirements shall be in accordance with ISO 10880 and the following.

The test for integrated performance shall be carried out in a stable indoor environment within the temperature range from 20 °C to 25 °C and with a relative humidity in the range from 40 % to 80 %. The IR imaging system and related equipment shall not be affected by shocks, vibrations, external electromagnetic fields or external radiation sources affecting the readings of measuring instruments.

4.2 Testing equipment and imaging methods requirements

4.2.1 General

Testing equipment shall include at least a blackbody simulator, target, optical table, positioning stage, computer system, constant temperature and humidity chamber, infrared radiometer. Sometimes a collimator is required. The basic requirements are given in [4.2.2](#) to [4.2.9](#).

The requirements and information of the imaging methods are described in ISO 10880.

4.2.2 Blackbody simulator

- a) Blackbody simulators are often used to provide a uniform temperature background when performing parametric tests.
- b) The blackbody simulator shall be a rectangular or circular planar cavity with a small hole to assure high emissivity.
- c) The temperature range shall cover the temperature measurement range of the IR imaging system.
- d) Temperature stability: $\leq \pm 0,1$ °C when blackbody temperature is less than or equal to 100 °C, $\leq \pm 0,1$ % blackbody temperature when it is greater than 100 °C.
- e) Temperature uniformity: $\leq \pm 0,15$ °C when blackbody temperature is less than or equal to 100 °C, $\leq \pm 0,15$ % blackbody temperature when it is greater than 100 °C.
- f) Emissivity: $\geq 0,95$.

4.2.3 Common target

- a) Common targets are used to test the parameters other than minimum resolvable temperature difference (MRTD) and minimum detectable temperature difference (MDTD).
- b) It shall be a rectangle with clear edges.
- c) Emissivity: $\geq 0,95$.
- d) Length: > 100 mm.
- e) Width: < 20 mm.

4.2.4 MRTD four-shot target

- a) The four-shot target is specifically used to test MRTD.
- b) It is comprised of four periodic rectangular slots with aspect ratio (width: height) 7:1, as shown in [Figure 1](#); $L = 7 \times D$.
- c) The distance between the rectangular slots is equal to the width of the slots, which is in accordance with the accuracy of the MRTD to be measured; $D = W$; $G = (1 \sim 2) \times W$. W is generally in the range of 5 mm to 15 mm.
- d) The target shall be made of metal such as copper or stainless steel with thickness above 0,5 mm, painted with black matt paint.
- e) Emissivity: $\geq 0,95$.

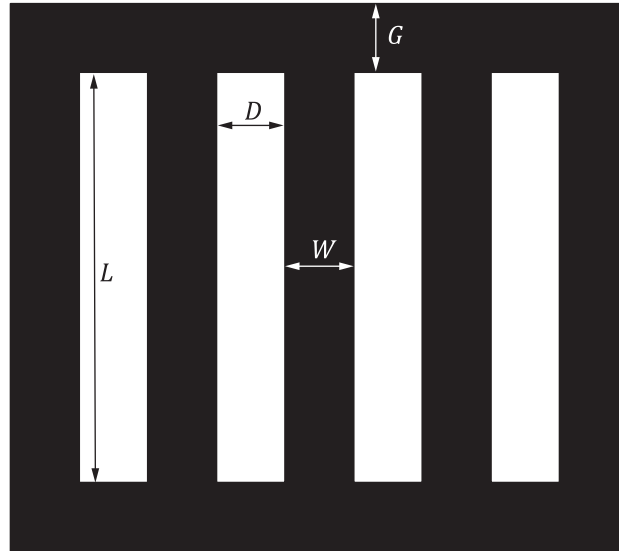


Figure 1 — Four-shot target

4.2.5 MDTD disk target

- a) The disk target is specifically used to test MDTD.
- b) [Figure 2](#) shows the layout of MDTD target. The MDTD target is generally round with the diameter D generally in the range of 100 mm to 300 mm and it can cover the whole field of view (FOV) of the infrared camera. There is a circular target hole which the diameter d is generally in the range of 20 mm to 40 mm. The distance L from the target hole centre to the MDTD target centre is generally in the range of 25 mm to 60 mm;
- c) The target shall be metal (e.g. copper) with thickness above 0,5 mm, painted with black matt paint.
- d) Emissivity: $\geq 0,95$.

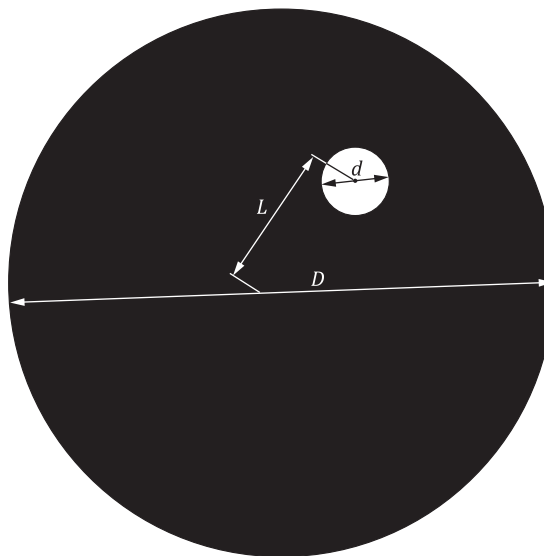


Figure 2 — MDTD target

4.2.6 Optical table

Optical table is used to test infrared system and equipment parameters. Its flatness shall be less than 0,05 mm/m².

4.2.7 Positioning stage

- a) Positioning stage is used to move and rotate the infrared camera.
- b) The positioning stage shall be able to carry the infrared camera in a steady speed and manageable manner.
- c) The infrared camera shall be able to move up and down in z direction, move on horizontal plane in one dimension and rotate on the horizontal plane. Its range and accuracy shall meet the test requirements of the IR imaging system.

4.2.8 Infrared radiometer

- a) The infrared radiometer is used to calibrate target temperature.
- b) Measuring range: -20 °C to 500 °C.
- c) Measurement accuracy: ±1 °C or ±1 % (using the higher).

4.2.9 Collimator

- a) The collimator is used to turn the target's infrared beam into parallel light. Its use is optional.
- b) The focal length shall be at least 3 times the focal length of the infrared camera being measured.
- c) The optical aperture shall be greater than the receiving aperture of the infrared camera being measured.

4.3 Document requirements

4.3.1 Testing specification

A written testing specification shall be formulated, with following items at least:

- a) version number;
- b) scope of application;
- c) basis of standards, regulations or other technical documents;
- d) a reference to this document, i.e. ISO 18251-2:2023;
- e) environment requirements;
- f) requirements of personnel;
- g) testing equipment requirements;
- h) information of tested equipment and pre-test preparation requirements;
- i) test methods and test procedures;
- j) requirements of test records;
- k) test results and reporting requirements;
- l) signature and date.