



Irish Standard
I.S. EN ISO 6781-1:2023

Version 1.00

**Performance of buildings - Detection of heat, air and
moisture irregularities in buildings by infrared methods -
Part 1: General procedures (ISO 6781-1:2023)**

I.S. EN ISO 6781-1:2023 V1.00

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

NSAI/... xxx: A National adoption of a Technical Regulation (TR), Technical Specification (TS), CEN and/or CENELEC Workshop Agreement (CWA).

I.S. EN ISO 6781-1:2023 V1.00 was published under the authority of the NSAI and came into effect on: 2023-08-17

ICS number(s): 91.120.10

NSAI
1 Swift Square
Northwood, Santry
Dublin 9
D09 A0E4
+353 1 807 3800
standards@nsai.ie
[NSAI.ie](https://www.nsa.ie)

Sales
+353 1 857 6730
[Standards.ie](https://www.standards.ie)

Údarás um Chaighdeáin Náisiúnta na hÉireann

National Foreword

I.S. EN ISO 6781-1:2023 V1.00 is the version of the NSAI adopted European document EN ISO 6781-1:2023, *Performance of buildings - Detection of heat, air and moisture irregularities in buildings by infrared methods - Part 1: General procedures (ISO 6781-1:2023)*, including any Corrections, Amendments etc. to EN ISO 6781-1:2023.

This normative document by CEN/CENELEC the elaboration of which includes a public enquiry, followed by a Formal Vote of CEN/CENELEC national members and final ratification. This European Standard is published as an identical national standard and every conflicting national standard will be withdrawn. The content of a European Standard does not conflict with the content of any other EN (and HD for CENELEC).

This document does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

For relationships with other publications refer to the NSAI web store.

Conformance with this document does not of its self confer immunity from legal obligations.

In line with international standards practice the decimal point is shown as a comma (,) throughout this document.

I.S. EN ISO 6781-1:2023 V1.00

This page intentionally left blank

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 6781-1

August 2023

ICS 91.120.10

Supersedes EN 13187:1998

English Version

Performance of buildings - Detection of heat, air and
moisture irregularities in buildings by infrared methods -
Part 1: General procedures (ISO 6781-1:2023)

Performance des bâtiments - Détection d'irrégularités
de chaleur, air et humidité dans les bâtiments par des
méthodes infrarouges - Partie 1: Modes opératoires
généraux (ISO 6781-1:2023)

Verhalten von Gebäuden - Feststellung von wärme-,
luft- und feuchtebezogenen Unregelmäßigkeiten in
Gebäuden durch Infrarotverfahren - Teil 1: Allgemeine
Verfahren (ISO 6781-1:2023)

This European Standard was approved by CEN on 24 June 2023.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

I.S. EN ISO 6781-1:2023 V1.00

EN ISO 6781-1:2023 (E)

Contents

Page

European foreword.....	3
------------------------	---

European foreword

This document (EN ISO 6781-1:2023) has been prepared by Technical Committee ISO/TC 163/SC 1 "Test and measurement methods" in collaboration with Technical Committee CEN/TC 89 "Thermal performance of buildings and building components" the secretariat of which is held by SIS.

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 2024, and conflicting national standards shall be withdrawn at the latest by February 2024.

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.

This document supersedes EN 13187:1998.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association.

Any feedback and questions on this document should be directed to the users' national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

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

Endorsement notice

The text of ISO 6781-1:2023 has been approved by CEN as EN ISO 6781-1:2023 without any modification.

This page intentionally left blank

Contents

Page

Foreword	v
Introduction	vii
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
3.1 General terms	2
3.2 Thermography terms	4
4 Symbols and abbreviated terms	7
5 Example applications of use of thermography in building assessments	8
6 Customer preparation	8
7 Qualification of personnel	9
7.1 Personnel — General guidance	9
7.2 Application specific requirements	10
7.2.1 Residential buildings — Qualification requirements	10
7.2.2 Commercial buildings — Qualification requirements	10
7.2.3 Institutional / Industrial buildings — Qualification requirements	10
8 Equipment requirements for thermographic examination of residential, commercial and institutional buildings	11
8.1 Equipment — General requirements	11
8.2 Calibration and checking of equipment	12
9 Safety	12
10 Thermography techniques	12
10.1 General	12
10.2 Comparative thermography	12
10.2.1 General	12
10.2.2 Technique	13
10.3 Comparative qualitative thermography	13
10.4 Comparative quantitative thermography	14
10.4.1 General	14
10.4.2 Comparative quantitative thermography — Limitations	14
11 Non-contact infrared radiometry (spot radiometry) using infrared thermography cameras	15
12 Air leakage and mass transfer	15
12.1 Air leakage	15
12.2 Mass transfer — Moisture	15
13 Moisture detection	16
13.1 Conductivity test method — Moisture detection	16
13.2 Capacitance test method — Moisture detection	16
13.3 Phase change test method — Moisture detection	16
14 Baseline measurements for building maintenance and condition monitoring	17
15 Data collection	17
16 Field measurements of reflected temperature and emissivity, and attenuating media	18
17 Comparative assessment criteria — Severity	18
18 Diagnosis and prognosis	18
18.1 Survey intervals	18

18.2	Image interpretation.....	18
18.3	Fault identification process.....	19
19	Test report.....	19
19.1	General information.....	19
19.2	Building-specific information.....	20
19.3	Qualitative inspections.....	21
19.4	Quantitative inspections.....	21
19.5	Reporting of unsafe conditions.....	22
Annex A (normative)	Pro-forma safety rules and guidelines.....	23
Annex B (normative)	Field measurements of reflected apparent temperature and emissivity.....	24
Annex C (informative)	Examples of buildings heat, air and moisture faults, failures and anomalies detected by infrared thermography (IRT).....	28

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 whom 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 163, *Thermal performance and energy use in the built environment*, Subcommittee SC1, *Test and measurement methods*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 89, *Thermal performance of buildings and building components*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition cancels and replaces ISO 6781:1983, which has been technically revised.

The main changes are as follows:

- now comprises the first part of the ISO 6781 series, which addresses the general user of thermography and provides general requirements pertinent to thermography;

NOTE Further parts of the ISO 6781 series provide specific thermographic requirements pertinent to thermographic practitioners, and the technical requirement for thermography of specific types of buildings.

- covers general requirements concerning detection of air leakage and moisture anomalies, using thermographic methods, in addition to thermal anomalies;
- thoroughly updates the thermographic requirements resulting from the vast technological upgrades in thermography since ISO 6781:1983 was published;
- provides general information and specific constraints concerning qualitative thermography and quantitative thermography;
- provides general information and requirements regarding the qualification of thermographic operators and report writers.

A list of all parts in the ISO 6781 series can be found on the ISO website.

I.S. EN ISO 6781-1:2023 V1.00

ISO 6781-1:2023(E)

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

Infrared building thermography provides a tool to qualitatively identify the presence of energy-wasting defects and anomalies within building structures. These defects and anomalies can include, for example, thermal insulation defects, moisture content, and / or unwanted air movement or leakage within the building enclosure.

Building thermography is carried out by means of an infrared thermography camera, which produces an image based on the apparent radiance temperature of the target surface area. The thermal radiation (infrared radiation density) from the target area is converted by the infrared thermography camera to produce a thermal image (thermogram). This image (thermogram) represents the relative intensity of thermal radiation from different parts of the surface. The radiation intensity indicated by the image is related directly to

- a) the surface temperature distribution,
- b) the characteristics of the surface,
- c) the ambient conditions, and
- d) the sensor itself.

As a result, surface temperature distribution can be a key parameter for monitoring the performance of building components, building enclosure and the diagnostics of problems. In use, via analysis of surface temperature distributions, irregularities in the heat and moisture properties of building enclosures and components, and air movement within the building enclosure, can be indicated. These irregularities can be due to, for example, thermal insulation defects, moisture content, air leakage within components or through assemblies, or incorrect installation of components which comprise the construction of the building.

To realize its full utility as an initial qualitative screening technique, or an in-depth diagnostic technique, thermography must often be supported and/or validated by other methods. These methods include, but are not limited to, infrared photosensitive tracer gas methods, fan pressurization of the building enclosure, heat-flow metres, smoke diffusion, anemometry, moisture metres and relative humidity (RH) sensors.

Infrared building thermography inspection methodologies can be used for either new-construction quality control applications or in existing buildings as ongoing condition monitoring for periodic or specific building-condition reporting. The latter applications may be accompanied with visual fault symptoms, while the former may not necessarily present symptoms via visual faults.

Performance of buildings — Detection of heat, air and moisture irregularities in buildings by infrared methods —

Part 1: General procedures

1 Scope

This document specifies requirements and methodologies for infrared thermographic services for detection of heat, air and moisture irregularities in buildings that help users to specify and understand

- a) the extent of thermographic services required,
- b) the type and condition of equipment available for use,
- c) the qualifications of equipment operators, image analysts, and report authors and those making recommendations, and
- d) the reporting of results.

It provides guidance to understanding and utilizing the final results stemming from provision of the thermographic services.

This document is applicable to the general procedures for infrared thermographic methods as can be applied to residential, commercial, and institutional and special use buildings.

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 6781-3, *Performance of buildings — Detection of heat, air and moisture irregularities in buildings by infrared methods — Part 3: Qualifications of equipment operators, data analysts and report writers*

ISO 7345, *Thermal performance of buildings and building components — Physical quantities and definitions*

ISO 9288, *Thermal insulation — Heat transfer by radiation — Vocabulary*

ISO 9869-1, *Thermal insulation — Building elements — In-situ measurement of thermal resistance and thermal transmittance — Part 1: Heat flow meter method*

ISO 9972, *Thermal performance of buildings — Determination of air permeability of buildings — Fan pressurization method*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7345, ISO 9288, ISO 10878 and the following apply.

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

-
- Looking for additional Standards? Visit Intertek Inform Infostore
 - Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation
-