

ISO/FDIS 24087:20222023(E)

ISO/TC 45/SC 2/WG 5

Secretariat:—JISC

Style Definition: Normal; Font: (Default) Cambria, 11 pt, (Asian) Japanese, (Other) English (United Kingdom), Space After: 12 pt, Line spacing: At least 12 pt

Formatted: English (United Kingdom)

Formatted: English (United Kingdom)

Formatted: English (United Kingdom)

Formatted: Font: Not Bold

First edition

2023-02-23

Formatted: Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

Formatted: Font: Bold

Rubber, vulcanized — Determination of the glass transition temperature and enthalpy by differential scanning calorimetry

Caoutchouc brut — Détermination de la température de transition vitreuse et de l'enthalpie par analyse calorimétrique différentielle

Formatted: French (Switzerland)

Formatted: Right, Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

First edition

2022-07-05

Formatted: Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

Formatted: Font: Bold

ISO/FDIS 24087

<https://standards.iteh.ai/catalog/standards/sist/c70261f4-590b-4f7c-a616-f33ed1449244/iso-fdis-24087>

Document type: **Error! Reference source not found.**

Document subtype: **Error! Reference source not found.**

Document stage: **Error! Reference source not found.**

Document language: **Error! Reference source not found.**

Error! Reference source not found.

Edited DIS - MUST BE USED FOR FINAL DRAFT

iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO/FDIS 24087

<https://standards.iteh.ai/catalog/standards/sist/c70261f4-590b-4f7c-a616-f33ed1449244/iso-fdis-24087>

Document type: **Error! Reference source not found.**

Document subtype: **Error! Reference source not found.**

Document stage: **Error! Reference source not found.**

Document language: **Error! Reference source not found.**

Error! Reference source not found.

Edited DIS - MUST BE USED FOR FINAL DRAFT

© ISO 2022-2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO Copyright Office

CP 401 • CH-1214 Vernier, Geneva

Phone: + 41 22 749 01 11

Email: copyright@iso.org

Website: www.iso.org

Published in Switzerland.

Formatted: Font: 11 pt, Font color: Blue

Formatted: Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

Formatted: Font: 11 pt, Font color: Blue

Formatted: Font: 11 pt, Font color: Blue

Formatted: Font: 11 pt, Font color: Blue

Formatted: Font: 11 pt, Font color: Blue

Formatted: Font: 11 pt, Font color: Blue

Formatted: English (United States)

Formatted: Font: 11 pt, Font color: Blue

Formatted: English (United States)

Formatted: Font: 11 pt, Font color: Blue

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/FDIS 24087

<https://standards.iteh.ai/catalog/standards/sist/c70261f4-590b-4f7c-a616-f33ed1449244/iso-fdis-24087>

Contents	Page
Foreword	7
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols	2
5 Principle	5
6 Apparatus and materials	6
7 Calibration	7
7.1 General.....	7
7.2 Temperature calibration.....	7
7.3 Heat calibration.....	7
8 Test portion	8
9 Conditioning	8
10 Procedure	8
10.1 General.....	8
10.2 Determination of the glass transition temperature, T_g	9
10.3 Determination of the transition temperature and enthalpy of other thermal phenomena.....	10
11 Precision	10
12 Test report	10
Annex A (informative) Recommended calibration materials	12
Annex B (informative) Precision	14
Foreword	7
1 Scope	1
2 Normative references	1

ISO/FDIS 24087:20222023(E)

3	Terms and definitions	1
4	Symbols	2
5	Principle	5
6	Apparatus and materials	6
7	Calibration	7
8	Test portion	8
9	Conditioning	8
10	Procedure	8
11	Precision	10
12	Test report	10
	Annex A (informative) Recommended calibration materials	12
	Annex B (informative) Precision	14

ITeH STANDARD PREVIEW
(standards.iteh.ai)

ISO/FDIS 24087

<https://standards.iteh.ai/catalog/standards/sist/c70261f4-590b-4f7c-a616-f33ed1449244/iso-fdis-24087>

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).

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 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analysis*.

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.

Formatted: Line spacing: At least 15.5 pt, Tab stops: Not at 20 pt

Formatted: English (United States)

Formatted: Adjust space between Latin and Asian text, Adjust space between Asian text and numbers

Formatted: English (United States)

Formatted: English (United States)

Formatted: English (United States)

Formatted: English (United States)

Formatted: English (United States)

Formatted: English (United States)

Formatted: English (United States)

Formatted: English (United States)

Formatted: English (United States)

Formatted: English (United States)

Formatted: Adjust space between Latin and Asian text, Adjust space between Asian text and numbers

Formatted: English (United States)

Formatted: English (United States)

Rubber, vulcanized — Determination of the glass transition temperature and enthalpy by differential scanning calorimetry

WARNING — Persons using this document should be familiar with normal laboratory practice, if applicable. This document does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any regulatory requirements.

1 Scope

This document specifies a method of thermal analysis of vulcanized rubber by differential scanning calorimetry (DSC). This method is intended for the observation and measurement of various properties and phenomena associated, such as physical transitions (glass transition, melting and crystallization, polymorphic transitions, etc.).

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 11357-1, Plastics — Differential scanning calorimetry (DSC) — Part 1: General principles

ISO 23529, Rubber — General procedures for preparing and conditioning test pieces for physical test methods

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11357-1 and the following 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/>

3.1

glass transition temperature

T_g
temperature of change from a glassy or hard condition to a rubbery or viscous condition

3.2

melting

Formatted: Default Paragraph Font

Formatted: Default Paragraph Font

Formatted: Default Paragraph Font

Formatted: Default Paragraph Font

Formatted: Default Paragraph Font

Formatted: Default Paragraph Font

Formatted: Default Paragraph Font

Formatted: Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

Formatted: Default Paragraph Font

Formatted: Default Paragraph Font

Formatted: Default Paragraph Font

Formatted: Font: Cambria, 11 pt

Formatted: Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers, Tab stops: 19.85 pt, Left + 39.7 pt, Left + 59.55 pt, Left + 79.4 pt, Left + 99.25 pt, Left + 119.05 pt, Left + 138.9 pt, Left + 158.75 pt, Left + 178.6 pt, Left + 198.45 pt, Left

Formatted: English (United States)

Formatted: English (United States)

Formatted: Font: Cambria

Formatted: Font: Bold

ISO/FDIS 24087:2023(E)

Formatted: German (Germany)

Formatted: Left, Space After: 34 pt

transition stage between a fully crystalline or partially crystalline solid state and an amorphous liquid of variable viscosity

Note 1 to entry: The transition, also referred to as "fusion", is characterized by an endothermic peak in the DSC curve (see Figure 1).

Formatted: Default Paragraph Font

3.3 crystallization

transition stage between an amorphous liquid state and a fully crystalline or partially crystalline solid state

Note 1 to entry: The transition is characterized by an exothermic peak in the DSC curve (see Figure 1).

Formatted: Default Paragraph Font

3.4 enthalpy of fusion

heat required to melt a material at constant pressure

Note 1 to entry: It is expressed in kilojoules per kilogram (kJ/kg) or joules per gram (J/g).

3.5 enthalpy of crystallization

heat released by the *crystallization* (3.3) of a material at constant pressure

Note 1 to entry: It is expressed in kilojoules per kilogram (kJ/kg) or joules per gram (J/g).

3.6 reference crucible

crucible used on the reference side of the symmetrical crucible holder assembly

Note 1 to entry: Normally, the reference crucible is empty.

Note 2 to entry: This reference material should be thermally inactive over the temperature and time range of interest.

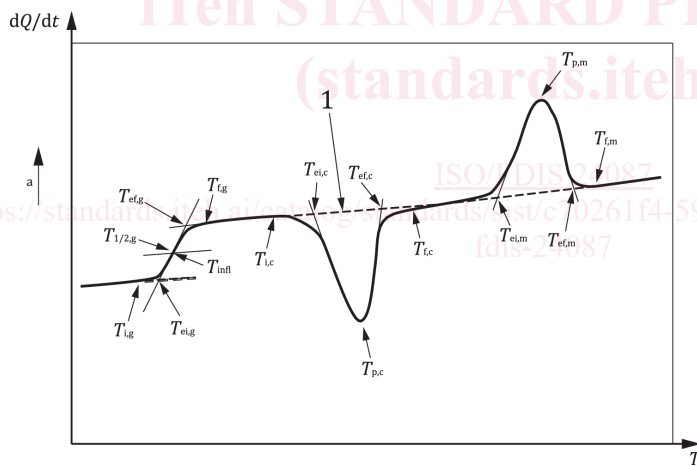
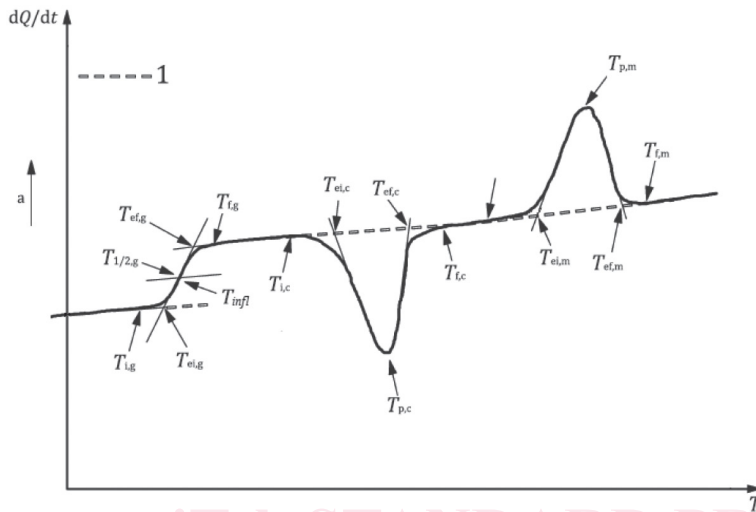
4 Symbols

A typical DSC curve, with conventional temperatures, is shown in Figure 1 and are explained in Table 1.

Formatted: Default Paragraph Font

Formatted: Default Paragraph Font

Formatted: Default Paragraph Font



Key

- dQ/dt heat flow rate
- T temperature
- T_i onset temperature
- T_{ei} extrapolated onset temperature
- $T_{1/2g}$ midpoint temperature
- T_{infl} point of inflection temperature
- T_p peak temperature
- T_{ef} extrapolated end temperature
- T_f end temperature