



**NSAI**  
Standards

Irish Standard  
I.S. EN ISO 11409:1998

Plastics - Phenolic resins - Determination of heats and temperatures of reaction by differential scanning calorimetry (ISO 11409:1993)

**I.S. EN ISO 11409:1998**

*Incorporating amendments/corrigenda/National Annexes issued since publication:*

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NSAI  
1 Swift Square,  
Northwood, Santry  
Dublin 9

T +353 1 807 3800  
F +353 1 807 3838  
E standards@nsai.ie  
W NSAI.ie

Sales:  
T +353 1 857 6730  
F +353 1 857 6729  
W standards.ie

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## National Foreword

I.S. EN ISO 11409:1998 is the adopted Irish version of the European Document EN ISO 11409:1998, Plastics - Phenolic resins - Determination of heats and temperatures of reaction by differential scanning calorimetry (ISO 11409:1993)

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EUROPEAN STANDARD

EN ISO 11409

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 1998

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Descriptors: see ISO document

English version

Plastics - Phenolic resins - Determination of heats and  
temperatures of reaction by differential scanning calorimetry  
(ISO 11409:1993)

Plastiques - Résines phénoliques - Détermination des  
chaleurs et températures de réaction par calorimétrie  
différentielle à balayage (ISO 11409:1993)

Kunststoffe - Phenolharze - Bestimmung der  
Reaktionswärmen und -temperaturen durch dynamische  
Differenzkalorimetrie (ISO 11409:1993)

This European Standard was approved by CEN on 13 June 1998.

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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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



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Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Page 2

EN ISO 11409:1998

### **Foreword**

The text of the International Standard from Technical Committee ISO/TC 61 "Plastics" of the International Organization for Standardization (ISO) has been taken over as an European Standard by Technical Committee CEN/TC 249 "Plastics", the secretariat of which is held by IBN.

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 1999, and conflicting national standards shall be withdrawn at the latest by February 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

### **Endorsement notice**

The text of the International Standard ISO 11409:1993 has been approved by CEN as a European Standard without any modification.

NOTE: Normative references to International Standards are listed in annex ZA (normative).

**Annex ZA** (normative)**Normative references to international publications  
with their relevant European publications**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN</u>	<u>Year</u>
ISO 10082	1991	Plastics - Phenolic resins - Definitions and test methods	EN ISO 10082	1995

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INTERNATIONAL  
STANDARD

**ISO**  
**11409**

First edition  
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**Plastics — Phenolic resins —  
Determination of heats and temperatures  
of reaction by differential scanning  
calorimetry**

*Plastiques — Résines phénoliques — Détermination des chaleurs et  
températures de réaction par calorimétrie différentielle à balayage*



Reference number  
ISO 11409:1993(E)

## ISO 11409:1993(E)

### 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11409 was prepared by Technical Committee ISO/TC 61, *Plastics*, Sub-Committee SC 12, *Thermosetting materials*.

Later, this International Standard will become part of a general standard concerning differential scanning calorimetry.

Annex A of this International Standard is for information only.

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International Organization for Standardization  
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# Plastics — Phenolic resins — Determination of heats and temperatures of reaction by differential scanning calorimetry

## 1 Scope

**1.1** This International Standard specifies a method for the determination of heats and temperatures of reaction of phenolic resins by differential scanning calorimetry.

**1.2** The method is applicable to phenolic resins with exothermic behaviour, such as resols or mixtures of novolaks with hexamethylenetetramine or other curing agents.

**1.3** The method is useful for the characterization of products and for research.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 472:1988, *Plastics — Vocabulary*.

ISO 5725:1986, *Precision of test methods — Determination of repeatability and reproducibility for a standard test method by inter-laboratory tests*.

ISO 10082:1991, *Plastics — Phenolic resins — Definitions and test methods*.

## 3 Definitions

For the purposes of this International Standard, the following definitions apply.

**3.1 differential scanning calorimetry (DSC):** A technique whereby the difference in energy absorbed or released by a polymer and by a reference material is measured as a function of temperature and/or time while the polymer and the reference are subjected to the same temperature schedule.

**3.2 phenolic resin:** Generally, a class of resins made by polycondensation of phenol, its homologues and/or derivatives, with aldehydes or ketones. [ISO 472]

**3.3 novolaks:** Non-self-curing, soluble, fusible phenolic resins that remain stable when stored, the phenol nuclei of which are linked primarily by methylene bridges. Novolaks can be made to react further and crosslink by the addition of hardeners; heating is also usually necessary. [ISO 10082]

See also *novolak* in ISO 472.

**3.4 resols:** Soluble, fusible phenolic resins which, in contrast to novolaks, contain methylol groups and methylene-ether and sometimes also methylene-amine bridges. Resols are self-curing; they crosslink into insoluble products when heated and/or mixed with catalysts, without addition of further reaction components. Resols are perishable and can be stored for a limited time only. [ISO 10082]

See also *resol* in ISO 472.

NOTE 1 In this document, the term "heat" and "heat of reaction" used throughout the text are equivalent to the terms "enthalpy" and "enthalpy of reaction".

## 4 Test method

### 4.1 Principle

The heat flux (power) supplied to a test sample is measured as a function of time or temperature, while

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