

# INTERNATIONAL STANDARD

**ISO**  
**9397**

First edition  
1989-03-15

---

---

## Plastics — Phenolic resins — Determination of free formaldehyde content

*Plastiques — Résines phénoliques — Dosage du formaldéhyde libre*  
**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO 9397:1989

<https://standards.iteh.ai/catalog/standards/sist/11169fdd-544b-4705-8b91-1be5f65df313/iso-9397-1989>



Reference number  
ISO 9397 : 1989 (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 approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 9397 was prepared by Technical Committee ISO/TC 61, *Plastics*.

[ISO 9397:1989](https://standards.iteh.ai/catalog/standards/sist/11169fdd-544b-4705-8b91-1be5f65d313/iso-9397-1989)

<https://standards.iteh.ai/catalog/standards/sist/11169fdd-544b-4705-8b91-1be5f65d313/iso-9397-1989>

© ISO 1989

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Organization for Standardization  
Case postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

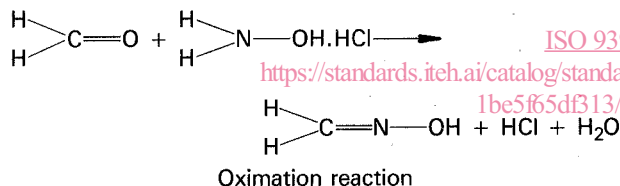
# Plastics — Phenolic resins — Determination of free formaldehyde content

## 1 Scope

This International Standard specifies a method of chemically determining free formaldehyde in phenolic resins by potentiometric titration, in aqueous or organic solution. The method is applicable to resins with free formaldehyde contents up to and including 15 % (m/m). For free formaldehyde contents between 15 % (m/m) and 30 % (m/m), it may be necessary to adjust the concentrations of the standard volumetric solutions used accordingly.

## 2 Principle

Oximation of formaldehyde with hydroxylamine hydrochloride. Back-titration by potentiometry of the hydrochloric acid formed during this reaction, using sodium hydroxide solution.



## 3 Reagents

During the analysis, use only reagents of recognized analytical grade and only distilled water or water of equivalent purity.

**3.1 Hydroxylamine hydrochloride**, 10 % (m/m) solution the pH of which has been adjusted to 3,5 by the addition of sodium hydroxide solution.

**3.2 Sodium hydroxide**, standard volumetric solutions,  $c(\text{NaOH}) = 1 \text{ mol/l}$  and  $c(\text{NaOH}) = 0,1 \text{ mol/l}$ .

**3.3 Hydrochloric acid**, standard volumetric solutions,  $c(\text{HCl}) = 1 \text{ mol/l}$  and  $c(\text{HCl}) = 0,1 \text{ mol/l}$ .

**3.4 Methanol**, free of aldehydes and ketones.

**3.5 Propan-2-ol**, free of aldehydes and ketones.

## 4 Apparatus

Ordinary laboratory apparatus and

**4.1 Balance**, accurate to 0,1 mg.

**4.2 pH-meter**, sensitive to 0,1 pH units, equipped with a glass indicating electrode and a standard calomel reference electrode.

**4.3 Magnetic stirrer**.

**4.4 Graduated burettes**, of capacity 10 ml and 25 ml, the latter being for use if the formaldehyde content is likely to be greater than 5 % (m/m).

## 5 Procedure

### 5.1 Test temperature

Conduct the test at  $23 \text{ }^\circ\text{C} \pm 1 \text{ }^\circ\text{C}$ .

### 5.2 Test portion

Weigh, to the nearest 0,1 mg, into a 250 ml beaker, a test portion (from 1 g to 5 g, depending on the assumed formaldehyde content) chosen from the following table.

Table 1

Assumed formaldehyde content % (m/m)	Mass of test portion g
< 2	5,0 ± 0,2
2 to 4	3,0 ± 0,2
> 4	1 to 2

### 5.3 Determination

Add 50 ml of the methanol (3.4), or 50 ml of a mixture of 3 volumes of the propan-2-ol (3.5) and 1 volume of water, to the contents of the beaker, switch on the magnetic stirrer (4.3) and stir until the resin has dissolved and the temperature has stabilized at  $23 \text{ }^\circ\text{C} \pm 1 \text{ }^\circ\text{C}$ .

Introduce the electrodes of the pH-meter (4.2) into the solution and, using the 0,1 mol/l solution of hydrochloric acid (for neutralized resins) or the 1 mol/l solution (for highly alkaline resins) (3.3), adjust the pH to 3,5.

Pipette into the solution approximately 25 ml of the hydroxylamine hydrochloride solution (3.1) at  $23\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ .

Stir for  $10\text{ min} \pm 1\text{ min}$ .

Titrate rapidly using the 1 mol/l solution of sodium hydroxide (or the 0,1 mol/l solution for low formaldehyde contents) (3.2) contained in a suitable-capacity burette (4.4), until the pH is 3,5.

#### 5.4 Blank test

Conduct a blank test in parallel with the determination, by the same procedure, using the same reagents as in the determination, but omitting the test portion.

### 6 Expression of results

#### 6.1 Method of calculation

The free formaldehyde content, expressed as a percentage by mass, is given by the formula

$$\frac{3c(V_1 - V_0)}{m}$$

where

$c$  is the actual concentration, in moles per litre, of the solution of sodium hydroxide (3.2) utilized;

$V_0$  is the volume, in millilitres, of the solution of sodium hydroxide (3.2) utilized for the blank test (5.4);

$V_1$  is the volume, in millilitres, of the solution of sodium hydroxide (3.2) utilized for the determination (5.3);

$m$  is the mass, in grams, of the test portion (5.2).

#### 6.2 Precision

Repeatability: 0,2 % ( $m/m$ ) formaldehyde

Reproducibility: 0,4 % ( $m/m$ ) formaldehyde

### 7 Test report

The test report shall contain the following information:

- a) a reference to this International Standard;
- b) an identification of the resin tested;
- c) the result of the test, as specified in 6.1;
- d) the date of the test.

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

ISO 9397:1989

<https://standards.iteh.ai/catalog/standards/sist/11169ffd-544b-4705-8b91-1be5f65df313/iso-9397-1989>

---

---

UDC 678.632 : 543.2 : 547.281.1

Descriptors : plastics, resins, phenoplasts, chemical analysis, determination of content, formaldehyde.

Price based on 2 pages

---

---