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**Water quality — Determination of phenol  
index by flow analysis (FIA and CFA)**

*Qualité de l'eau — Détermination de l'indice phénol par analyse en flux (FIA  
et CFA)*



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 14402 was prepared by Technical Committee ISO/TC 147, *Water quality*, Subcommittee SC 2, *Physical, chemical biochemical methods*.

Annex A of this International Standard is for information only.

## Introduction

Methods for determination of water quality using flow analysis and automatic wet chemical procedures are particularly suitable for the processing of large sample series at a high analysis frequency.

Differentiation is needed between flow injection analysis (FIA) [1, 2] and continuous flow analysis (CFA) [3]. Both methods include automatic dosage of the sample into a flow system (manifold) where the analytes in the sample react with the reagent solutions on their way through the manifold. The sample preparation may be integrated in the manifold. The reaction product is measured in a flow detector.

Phenol index is an analytical convention. It represents a group of aromatic compounds which under the specific reaction conditions form coloured condensation products. The analytical result is expressed in terms of phenol concentration.

This International Standard describes two methods: the determination of phenol index (without distillation) after extraction, and the determination of phenol index (without extraction) after distillation.

It should be investigated whether and to what extent particular problems will require the specification of additional marginal conditions.

# Water quality — Determination of phenol index by flow analysis (FIA and CFA)

## 1 Scope

This International Standard specifies two methods for the determination of the phenol index in waters of different origin (such as ground waters, surface waters, seep waters, and waste waters) in mass concentrations of 0,01 mg/l to 1 mg/l (in the undiluted sample). In particular cases, the range of application may be adapted by varying the operating conditions. Clause 3 describes the determination of phenol index (without distillation) after extraction, and in clause 4 the determination of phenol index (without extraction) after distillation is given.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods*.

ISO 5667-3:1994, *Water quality — Sampling — Part 3: Guidance on sample handling and preservation*.

ISO 6439:1990, *Water quality — Determination of phenol index — 4-Aminoantipyrine spectrometric methods after distillation*.

## 3 Determination of phenol index (without distillation) after extraction

### 3.1 Principle

The sample is fed into a continuously flowing carrier stream and mixed with also continuously flowing solutions of 4-aminoantipyrine and potassium peroxodisulfate. Phenolic compounds in the sample are oxidized by potassium peroxodisulfate, and the resulting quinones react with 4-aminoantipyrine, forming coloured condensation products. These are extracted in a flow extraction unit from the aqueous phase into chloroform. The chloroform phase is separated by a suitable phase separator (e.g. a hydrophobic semipermeable membrane), and the absorbance of the organic phase is measured spectrometrically in a flow spectrometer at 470 nm to 475 nm. More information on this analytical technique is given in the references [6 to 9].

It is absolutely essential that the test described in this International Standard be carried out by suitably qualified staff.

### 3.2 Interferences

#### 3.2.1 Chemical interferences

Under the prevailing reaction conditions, aromatic amines will also form condensation products with 4-aminoantipyrine, leading to positive bias.