INTERNATIONAL STANDARD

ISO 78-2

Second edition
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Chemistry — Layouts for standards —

Part 2:
Methods of chemical analysis

Chimie — Plans de normes —

Partie 2: Méthodes d'analyse chimique

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 78-2 was prepared by Technical Committee ISO/TC 47, *Chemistry*, Subcommittee SC 1, *General methods*.

This second edition cancels and replaces the first edition (ISO 78-2:1982), which has been revised to reflect changes in Part 3 of the ISO/IEC Directives.

ISO 78 consists of the following parts, under the general title *Chemistry — Layouts for standards:*

— *Part 2: Methods of chemical analysis*

— *Part 3: Standard for molecular absorption spectrometry*

— *Part 4: Standard for atomic absorption spectrometric analysis*

NOTE Part 1 was planned but never published.

Annex A forms an integral part of this part of ISO 78. Annexes B and C are for information only.

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Introduction

It is recommended that standards for methods of chemical analysis are drawn up in accordance with Part 3 of the ISO/IEC Directives for the technical work of ISO, which gives general guidance, and using the layout of which details are given on the following pages.

It should always be remembered, in making use of this layout, that it is for guidance only. It should be adapted to suit any special requirements. There may be no need for all the subdivisions provided: those not required should be disregarded.

With the object of helping to solve problems of drafting and layout which arise in drawing up standards for methods of chemical analysis, ISO/TC 47 has established a series of standard layouts:

— layout for a standard method of chemical analysis, with notes on its application (ISO 78-2);

— standard layouts for instrumental analyses, with notes on their application (ISO 78-3 and ISO 78-4).

A standard for a chemical product should form a consistent whole. In addition to specifying the characteristics required of the product, it should state how to determine these characteristics. A standard method of chemical analysis (test method) may be incorporated in the text of a standard for a chemical product. Test methods may be presented as separate clauses, as annexes or as separate parts. However, a test method will normally be issued as a separate standard if it is likely to be referred to in a number of other standards. This will shorten the text of the standard for the chemical product; and, if a general method of chemical analysis applicable to the product exists, the standard for the product may merely refer to it.

The adoption of a standard form of layout and drafting ensures:

— that no important point is overlooked in the preparation of the standard;

— that the various items of information to be included in the standard are always given in the same order;

— that any desired clause may be found rapidly, whatever the origin or scope of the standard (this is particularly important if part of the text is being translated or two texts are being compared);

— simplification, rationalization and standardization of methods, reagents and equipment used in test laboratories;

— that each International Standard or other international document prepared in this field is drafted in terms which are as clear as possible.

Chemistry — Layouts for standards —

Part 2:
Methods of chemical analysis

1 Scope

This part of ISO 78 sets out a number of principles applicable to the layout and wording of methods of chemical analysis described in International Standards. It may also be useful for other test methods.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 78. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 78 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 31 (all parts), *Quantities and units*.

ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units*.

ISO 5725 (all parts), *Accuracy (trueness and precision) of measurement methods and results*.

3 Terms and definitions

For the purposes of this part of ISO 78, the following definitions apply:

3.1
laboratory sample
sample as prepared for sending to the laboratory and intended for inspection or testing

[Based on ISO 6206]

3.2
test sample
sample prepared from the laboratory sample and from which test portions will be taken

[Based on ISO 6206]

3.3
test portion
the quantity of material drawn from the test sample (or from the laboratory sample if both are the same) and on which the test or observation is actually carried out

[Based on ISO 6206]

3.4
standard volumetric solution
solution for titrimetric analysis, the concentration of which is known accurately

3.5
standard reference solution
solution used as a reference solution for calibrating other solutions

NOTE 1 It is either prepared from a primary standard or calibrated by some other means.

NOTE 2 Many standard reference solutions which can be used to prepare standard solutions are commercially available.

3.6
standard solution
solution of accurately known concentration of an element, an ion, a compound or a group derived from the substance used for its preparation

3.7
standard matching solution
solution of which the relevant characteristic is known or defined (for example colour, turbidity) and is used to assess the test solution in relation to that characteristic

NOTE 1 The English term standard matching solution is used solely as a generic term for these solutions, and each solution is normally defined more precisely by the appropriate adjective (for example, “standard colorimetric solution”, “standard turbidimetric solution”).

NOTE 2 It may be prepared from solutions mentioned above or other solutions having the required characteristic.

NOTE 3 The method of preparation of standard matching solutions is normally given in the subclause “Calibration” (see A.13.7).

3.8
precision
the closeness of agreement between independent test results obtained under stipulated conditions

[Based on ISO 5725-1]

3.9
accuracy
closeness of agreement between a test result and an accepted reference value

NOTE The term accuracy, when applied to a set of test results, involves a combination of random components and a common systematic error or bias component.

[Based on ISO 5725-1]

3.10
repeatability
precision under repeatability conditions

[Based on ISO 5725-1]

3.11
repeatability conditions
conditions where independent test results are obtained with the same method on identical test items in the same laboratory by the same operator using the same equipment within short intervals of time

[Based on ISO 5725-1]

3.12
repeatability limit
value less than or equal to which the absolute difference between two test results obtained under repeatability conditions may be expected to be with a probability of 95 %

NOTE The symbol used is r.

[Based on ISO 5725-1]

3.13
reproducibility
precision under reproducibility conditions

[Based on ISO 5725-1]

3.14
reproducibility conditions
conditions where test results are obtained with the same method on identical test items in different laboratories with different operators using different equipment

[Based on ISO 5725-1]

3.15
reproducibility limit
the value less than or equal to which the absolute difference between two test results obtained under reproducibility conditions may be expected to be with a probability of 95 %

NOTE The symbol used is R.

[Based on ISO 5725-1]

4 Quantities, units and symbols

4.1 General

The quantities, units, mathematical signs and symbols for quantities laid down in ISO 31 (all parts) and ISO 1000 shall be used wherever possible.

The symbols for units of measurement shall be used if they are preceded by a number expressed in figures. In other cases, these units should preferably be written out in full, except where used in drawings, graphs and in column headings in tables.

NOTE In some countries, the symbol °/₀₀ (“per mill” or “per thousand”) is used for the number 0,001. This symbol should preferably be avoided.

Since per cent and per mill are numbers, it is in principle meaningless to speak about percentage by mass or percentage by volume. Additional information, such as % (*m/m*) or % (*V/V*) should preferably not be attached to the unit symbol therefore. The preferred way of expressing a mass or volume fraction is: “the mass (or volume) fraction is 0,75” or “the mass (or volume) fraction is 75 %”. Mass and volume fractions can also be expressed in the form 5 µg/g and 4,2 ml/m^3 respectively. Abbreviations such as ppm, pphm and ppb shall not be used.

4.2 Choice of test methods

As far as possible, the same test methods for a given property or characteristic of related chemical products shall be adopted in all ISO documents, and their wording shall be as similar as possible. This does not apply to certain industries if, in a particular industry, this rule would be contrary to justified and well established practice which it is desirable to retain.

4.3 Chemical nomenclature

The recommendations prepared by the International Union of Pure and Applied Chemistry (IUPAC) on the nomenclature of chemicals of high purity and the way of spelling and printing their names should preferably be applied, e.g. the IUPAC nomenclature for organic compounds. If they exist, Chemical Abstract Registry Service Numbers (CAS numbers) should be given (see clause A.10). It is advisable to put the trivial name of the reagent in parentheses after the IUPAC name when it first occurs. In the remainder of the text, either the IUPAC name or the trivial name may be used, but the same name shall be used consistently throughout the remainder of the text.

The use of trade/proprietary names shall be avoided as far as possible, even if they are in common use.

For commercial chemicals (basic chemicals for industrial use), the trivial name should be given in the title of the standard and in the “Scope” clause of the standard; the corresponding IUPAC name for the pure product should be given in parentheses after the trivial name, but thereafter only the trivial name need be used.

The use of symbols for chemical products shall be restricted to chemical formulae and to symbols used to indicate quantities, e.g. $c(H_2SO_4)$. In running text, the full names shall be used.

4.4 Numerical values and tolerances

Whenever a quantity, for example a temperature or a period of time, is expressed, a tolerance on its value shall be specified where it is critical.

5 Clause titles and clause order

The preferred titles of the clauses (and other elements) in methods of chemical analysis, and the preferred order of the clauses, are given below.

Any clause or subclause which is unnecessary in a particular case may be omitted, and others, if required, may be added in the most appropriate places. The clauses and subclauses shall be numbered consecutively from the beginning to the end of each document, using arabic numerals. Clear distinction shall be made between normative and informative parts of the standard, such as annexes.

For further details, see the relevant clause in annex A.

	For comments see
Foreword	A.1
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Annex A
(normative)

Notes on the application of the layout for a standard method of chemical analysis

A.1 Foreword

Where applicable, the main changes compared with the previous edition and the titles of all the parts of a multipart standard shall be given in addition to the standard text.

A.2 Introduction

The introduction is an optional element used, if necessary, to present additional information, such as comments concerning the technical content of the standard or the reasons for its preparation.

If background information on the method is required, it should preferably be included in this clause.

A.3 Title

The title of the standard shall express concisely and without ambiguity the products to which the test method applies, the constituent or the characteristic to be determined and the nature of the determination. It should be limited, wherever possible, to a maximum of three elements.

EXAMPLE 1 Light olefins for industrial use — Determination of traces of chloride — Wickbold combustion method

EXAMPLE 2 Liquid chemical products for industrial use — Determination of density at 20 °C

A.4 Warnings

If the product being analysed or the reagents or the procedure are dangerous, either to health or to the environment, it is essential to draw attention to the hazards and to describe the precautions necessary to avoid them. This information shall be printed in bold type and placed

— immediately after the title of the standard if the danger is of a general nature or is due to the product being analysed;

— after the name of the reagent or material if the danger is due to a particular reagent or material;

— at the beginning of the “Procedure” clause if the danger is inherent in the procedure (see also A.13.1).

EXAMPLE

WARNING — Persons using this International Standard should be familiar with normal laboratory practice. This standard does not purport to address all of the safety problems, 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 national regulatory conditions.

A.5 Scope

This clause of the standard shall state succinctly the method of chemical analysis and specifically the products to which it applies. If applicable, it shall state the detection limit and/or the limit beyond which the method can no longer be assumed to be quantitative.

It shall contain any additional, useful, information which could not be included in the title.

It shall also contain sufficient information to enable the user to judge quickly whether the standard is applicable to the products being considered, or whether limitations exist. These limitations shall take into account the presence of other components of the product or products in question and of their limiting contents.

Relevant information regarding possible interference applicable to the method, wherever such data are available, shall also be included in this clause. If it is necessary to provide modifications to the basic method, for instance to ensure the elimination of certain interfering factors, these modifications should preferably be treated as special cases. These special cases shall be indicated in the “Scope” clause and the corresponding modifications shall be described in the “Special cases” clause (see clause A.17).

It is sometimes necessary to provide several methods for the determination of a given entity, depending, for example, on the composition of the product or on its differing contents for that entity, or the accuracy required, each method having its own particular scope. A clear distinction shall be drawn between the individual scopes of the methods laid down if the standard includes several methods.

The “Scope” clause should preferably be written in such a way that it is suitable for use as a summary for indexing or information purposes.

A.6 Normative references

This clause shall give a list of those documents which are necessary for the application of the International Standard.

Documents which have merely served as references in the preparation of the standard shall be indicated in a bibliography at the end of the document.

A.7 Definitions

This clause shall give any definitions of terms used in the text that may be necessary for its complete understanding. It is recommended that reference be made to already existing definitions and/or terminology standards wherever possible.

A.8 Principle

This optional clause indicates the essential steps in the method used, the basic principles and the properties of which use is made and, if appropriate, the reasons justifying the choice of certain procedures.

A.9 Reactions

This clause shall indicate the essential reactions, if they are considered necessary for the comprehension of the text or the calculations. These reactions shall, if appropriate, be expressed in ionic form.

The reactions are given for guidance only and are not intended to settle any controversial questions. They justify the calculations made from the data obtained in the determinations and may lead to a better understanding of the method, especially if several successive changes occur in the state of oxidation of the element being determined.