

Electrochemical analyzers —

Part 1: Method for specifying performance common to all analyzers

[IEC title: Expression of performance of electrochemical
analyzers — Part 1: General]

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Electronic Equipment Standards Committee (EEL/-) to Technical Committee EEL/8 upon which the following bodies were represented:

- British Industrial Measuring and Control Apparatus Manufacturers' Association (BEAMA)
- British Telecommunications
- Department of Industry (British Calibration Service)
- Department of Industry (National Physical Laboratory)
- Electricity Supply Industry in England and Wales
- Electronic Engineering Association
- Institution of Electronic and Radio Engineers
- Scientific Instrument Manufacturers' Association (BEAMA)

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Engineering Equipment and Materials Users' Association
- Water Research Centre

This British Standard, having been prepared under the direction of the Electronic Equipment Standards Committee, was published under the authority of the Board of BSI and comes into effect on 31 December 1984

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National foreword

This Part of BS 6438 has been prepared under the direction of the Electronic Equipment Standards Committee. It is identical with IEC Publication 746-1:1982 “*Expression of performance of electrochemical analyzers — Part 1: General*”, published by the International Electrotechnical Commission (IEC).

This British Standard is divided into several Parts, of which this is Part 1. The other Parts will deal with certain aspects of a particular type of analyzer. Part 2, which deals with pH value, has been published, and other Parts, which will include electrical conductivity and dissolved oxygen content, are in preparation.

Terminology and conventions. The text of the International Standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

Cross-references

International Standards	Corresponding British Standards
IEC 278:1968	BS 4308:1979 <i>Specification for documentation to be supplied with electronic measuring apparatus</i>
IEC 278A:1974	(Identical)
IEC 348:1978	BS 4743:1979 <i>Specification for safety requirements for electronic measuring apparatus</i>
	(Identical)
IEC 359:1971	BS 4889:1973 <i>Method for specifying the performance of electronic measuring equipment</i>
	(Technically equivalent)
IEC 746-2:1982	BS 6438 <i>Electrochemical analyzers</i>
	Part 2:1984 <i>Method for specifying performance of pH value analyzers</i>
	(Identical)
ISO 31-0 to ISO 31-13	BS 5775: <i>Specification for quantities, units and symbols</i>
	Parts 0 to 13
	(Identical)
ISO 1000:1981	BS 5555:1981 <i>Specification for SI units and recommendations for the use of their multiples and of certain other units</i>
	(Identical)

The Technical Committee has reviewed the provisions of IEC 381-1 and IEC 382, to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard. A related standard to IEC 381-1 is BS 3586:1970 “*Analogue direct current signals for telemetry and control*”.

Typographical error. 4.1.5 is wrongly italicized; it forms part of 4.1 and is not a heading.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 14, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

1.1 This standard is applicable to electrochemical analyzers used for the determination of certain properties of (generally aqueous) solutions such as pH value, electrical conductivity, dissolved oxygen content, the concentration of specified ions and redox potential.

1.2 It includes the terminology, definitions, requirements for statements by manufacturers and tests that are common to all electrochemical analyzers. Other standards in this series describe those aspects that are specific to certain types, for example, IEC Publication 746-2: Expression of Performance of Electrochemical Analyzers, Part 2: pH value.

1.3 This standard is in accordance with the general principles set out in IEC Publication 359: Expression of the Functional Performance of Electronic Measuring Equipment.

1.4 It is applicable to analyzers specified for installation in any location and to such analyzers having either flow-through or immersible type sensors.

1.5 It is applicable to the complete analyzer when supplied by one manufacturer as an integral unit comprised of all mechanical, electrical and electronic portions. It also applies to sensor units alone and electronic units alone when supplied separately or by different manufacturers.

For the purposes of this standard, any regulator for mains-supplied power or any non-mains power supply, provided with the analyzer or specified by the manufacturer, is considered part of the analyzer whether it is integral with the analyzer or housed separately.

1.6 It does not apply to accessories such as recorders, analogue-to-digital converters or data acquisition systems, used in conjunction with the analyzers except that when two or more such analyzers are combined and sold as a sub-system and a single electronic unit is supplied to provide continuous measurement of several properties, that readout unit is considered to be part of the analyzer. Similarly, e.m.f.-to-current or e.m.f.-to-pressure converters that are an integral part of the analyzer are included.

1.7 Safety requirements are dealt with in IEC Publication 348: Safety Requirements for Electronic Measuring Apparatus.

1.8 Standard ranges of analogue d.c. current and pneumatic signals used in process control systems are dealt with in IEC Publication 381-1: Analogue Signals for Process Control Systems, Part 1: Direct Current Signals, and IEC Publication 382: Analogue Pneumatic Signal for Process Control Systems.

1.9 Requirements for documentation to be supplied with instruments are dealt with in IEC Publication 278: Documentation to be Supplied with Electronic Measuring Apparatus and 278A: First Supplement to Publication 278 (1968).

1.10 Requirements for general principles concerning quantities, units and symbols are dealt with in ISO Standard 1000. See also ISO Standard 31, Parts 0 to XIII.

2 Object

This standard is intended:

- to specify the terminology and definitions related to the functional performance of electrochemical analyzers used for the continuous determination of certain aspects of aqueous solutions;
- to specify the requirements for statements by manufacturers;
- to specify the tests necessary in order to determine the functional performance and how such tests should be carried out.

3 Definitions

The definitions contained in IEC Publication 359 and the following apply for the purposes of this standard.

3.1

electrochemical analyzer

an analytical instrument that consists of an electrochemical sensor unit and an appropriate electronic measuring equipment (hereinafter referred to as “sensor unit” and “electronic unit” respectively)

3.2

sensor unit

a transducer consisting of one or more components from which is derived an electrical output related to that property of the sample which is to be measured. Examples of electrochemical sensor units are: pH, ion-sensitive and redox potentiometric cells, dissolved oxygen sensor units, conductance cells

3.3

simulator

a device which provides well-defined electrical properties of the device being replaced, and which has errors that are negligible in comparison with the errors to be determined

3.4

calibration solution

an aqueous solution of known value of the property being measured, used for periodic calibration and for various performance tests

NOTE For the purposes of this standard, the values of these solutions represent the conventionally true values (see Sub-clause 3.9.2.1) against which the indicated values are compared. The values of the calibration solutions should be traceable to reference material according to international or national standards, or agreed upon by the manufacturer and the user, and the uncertainty of the conventionally true values shall be stated.

3.5

test solution

a solution of approximately known value of the property being measured, which is stable in value over an extended period of time

3.6

performance characteristic

one of the quantities assigned to an apparatus in order to define by values, tolerances, ranges, etc., the performance of the apparatus

3.7

influence quantity

any quantity, generally external to an apparatus, which may affect the performance of the apparatus

3.8 Values related to quantities

3.8.1

rated value

the value (or one of the values) of a quantity to be measured, observed, supplied or set, which the manufacturer has assigned to the apparatus

3.8.2

rated range

the range of the quantity to be measured, observed, supplied or set, which the manufacturer has assigned to the apparatus

3.8.3

effective range

that part of the rated range where measurements can be made or quantities be supplied within the stated limits of performance

3.8.4

span

the algebraic difference between the upper and lower values of the rated range