

Expression of performance of sample handling systems for process analyzers

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National foreword

This British Standard has been prepared under the direction of the Industrial-Process Measurement and Control Standards Policy Committee and is the English language version of EN 61115:1993 *Expression of performance of sample handling systems for process analyzers*, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 1115:1992 published by the International Electrotechnical Commission (IEC).

The following print types are used in this standard:

- requirements proper: in roman type;
- *test specifications: in italic type*;
- notes: in smaller roman type.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 22, 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.

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English version

Expression of performance of sample handling systems for process analyzers

(IEC 1115:1992)

Expression des qualités de fonctionnement des
systèmes de manipulation d'échantillon pour
analyseurs de processus
(CEI 1115:1992)

Angabe zum Betriebsverhalten von
Probenhandhabungssystemen für
Prozeßanalysengeräte
(IEC 1115:1992)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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 CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The CENELEC questionnaire procedure, performed for finding out whether or not the International Standard IEC 1115:1992 could be accepted without textual changes, has shown that no common modifications were necessary for the acceptance as European Standard.

The reference document was submitted to the CENELEC members for formal vote and was approved by CENELEC as EN 61115 on 22 September 1993.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1994-10-01
- latest date of withdrawal of conflicting national standards (dow) 1994-10-01

Annexes designated “normative” are part of the body of the standard. Annexes designated “informative” are given only for information. In this standard, Annex A, Annex B, Annex C and Annex ZA are normative and Annex D and Annex E are informative.

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Introduction

Most process or environmental analyzers are designed to work within specified limits of the properties of the sample fluid (e.g. pressure, dew-point) at the sample inlet as well as the outlet [1,2]. Moreover, process analyzers may need auxiliary fluids or other utilities for their correct function.

It is the purpose of a sample handling system to connect one or more process analyzers with one or more source fluids and the environment, so that the requirements of the analyzer are met, and so that it is possible for the analyzer to work properly over an acceptable period of time with an economically justified amount of maintenance work.

(See Annex A for the description of the purpose, functions and properties of sample handling systems.)

Sample handling systems may fulfill the following functions [1]:

- sample extraction;
- sample transport;
- sample conditioning;
- exhaust stream disposal;
- supply of utilities;
- sample stream switching;
- performance monitoring and control.

Some of the functions can be completely or partly fulfilled by components which are integral parts of an analyzer or which are external to the sample handling system. For the purpose of this standard these components are not considered part of the sample handling system.

The design of a sample handling system depends on the properties of the source fluid, the process analyzer, and the disposal points. Furthermore, the design depends on the properties required for the complete measuring device. Testing a sample handling system is very important. Due to the variety of system configurations and requirements for a system, many different test procedures are applied in practice, but in this standard only the test procedures which are used in most cases are specified. User and manufacturer may agree on additional test procedures, but these are not covered in this standard.

1 Scope and object

1.1 Scope

This International Standard specifies the tests which should be carried out to determine the functional performance of sample handling systems. In addition it specifies the information to be provided by the manufacturers and users of such systems.

It is applicable to:

- a) systems handling gaseous or liquid samples for process analyzers used for any ultimate purpose, e.g. process control, emission, ambient air monitoring, etc.;
- b) complete systems and system components;
- c) power supplies and instrumentation for providing and controlling other utilities necessary for process analyzers or sample handling system components, only in so far as they are a functional part of the system;
- d) facilities for maintaining system performance;
- e) facilities for maintaining the performance of the process analyzer if these are part of the sample handling system and not the analyzer.

NOTE 1 This standard has been prepared in accordance with the general principles set out in IEC 359.

NOTE 2 Requirements for general principles concerning quantities, units and symbols are given in ISO 1000 and recommendations for the use of their multiples and of certain other units in ISO 31.

1.1.1 Aspects excluded from scope

This standard does not cover:

- general aspects of process analyzers (see IEC 746 for electrochemical analyzers);

NOTE An IEC standard is in preparation for gas analyzers.

- electric safety requirements (see IEC 348);
- safety aspects concerning explosive or toxic hazards;
- aspects concerning applications where regulations or legal metrology are involved, such as atmospheric pollution. For such aspects more elaborate work going on inside ISO such as ISO 6712 applies;
- requirements for output signals (see IEC 381-1 and IEC 381-2);
- influence of environmental conditions (see IEC 68).

1.1.2 Equipment excluded from scope

This standard does not apply to:

- systems for handling solid samples;
- equipment intended for use in explosive gas atmospheres (see IEC 79-0 to IEC 79-12).

1.2 Object

This standard is intended

- to specify and to unify the general aspects in the terminology and definitions related to the functional performance of sample handling systems for process analyzers;
- to specify the tests which, in most cases, should be performed to determine the functional performance of sample handling systems;
- to specify what information should be available for the manufacturer of sample handling systems. This information may be provided by the user or the manufacturer of process analyzers or by the manufacturer of sample handling system components;
- to specify what information should be available for the user of sample handling systems.

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.

2.1 IEC standards

IEC 359:1987, *Expression of the performance of electrical and electronic measuring equipment*.

2.2 ISO standards

ISO 31, *Quantities and units — Parts 0 to 13*.

ISO 1000:1981, *SI units and recommendations for the use of their multiples and certain other units*.

NOTE See Annex E for informative references of ISO and IEC standards.

3 Definitions

3.1 General definitions

(See Annex A and Figure A.1 and Figure A.2 for a description of sample handling systems.)

3.1.1

process analyzer

an analytical instrument connected to a source fluid that automatically provides output signals giving information in relation to a quantity of one or more components present in a fluid mixture or in relation to physical or chemical properties of a fluid which depend on its composition

NOTE For on-line or extractive process analyzers a sample stream is extracted from the source fluid and transported to the analyzer. With an in-line or *in situ* analyzer the measurement is performed within the source fluid.

3.1.2

sample handling system

a system which connects one or more process analyzers with the source fluid, disposal points and utilities

NOTE 1 A sample handling system may extract the required sample stream from one or more source fluids and condition it in order to meet all the input requirements of the process analyzer so that an accurate measurement of the properties under investigation is possible. The system may also ensure the appropriate disposal of exhaust streams and the supply of utilities as necessary. Instrumentation for ensuring the proper function of a sample handling system component or for facilitating maintenance work is considered part of the sample handling system if it is a functional part of it.

NOTE 2 See Annex A and Figure A.1 and Figure A.2 for a description of sample handling systems.

NOTE 3 Figure 1 gives a schematic example for the use of terms describing the functions of sample transport and exhaust stream disposal.

3.1.3 Sample extraction

The function of those parts of a sample handling system which extract the required sample stream from the source fluid.

NOTE The sample stream should be extracted in such a way that it is truly representative of the source fluid.

3.1.3.1

source fluid

the source fluid (gas or liquid) from which the sample stream is extracted and of which the composition or properties are to be measured

NOTE 1 The source fluid may flow through a process line or fill a volume. Ambient air may also be the source fluid.

NOTE 2 The source fluid and the sample fluid in the sample line may consist of a combination of the following components:

- components to be measured;
- irrelevant components;
- obstructive components;
- interfering components.

3.1.3.2

component to be measured

the component or group of components of which a quantity (e.g. concentration) is to be measured by the process analyzer

3.1.3.3

property to be measured

the physical or chemical property which is to be measured by the analyzer and which depends on the composition of the source fluid

3.1.3.4**irrelevant components**

the components which are not to be measured and which do not affect the performance of the analyzer or of the sample handling system

3.1.3.5**obstructive components**

the components which adversely affect the performance of the analyzer or of sample handling system components

the effect may be:

- physical (e.g. by dirtying windows in optical analyzers), or
- chemical (e.g. by corrosion), or
- by causing unacceptable errors (e.g. bubbles in a liquid sample stream for a photometer).

obstructive components can be solid, liquid or gaseous

3.1.3.6**interfering components**

the components which give rise to interference errors in the analyzer

3.1.3.7**sampling point**

the point where the sample stream is extracted from the source fluid

NOTE It may be necessary to have a combination of sampling points at the inlet of a sample handling system. The sample streams from different sampling points can be mixed or measured separately.

3.1.4 Sample transport

The function of those parts of a sample handling system which transfer the sample fluid from the sampling point to the inlet of the process analyzer.

3.1.4.1**sample line**

the connection from the sampling point(s) to the analyzer inlet in which a stream is allowed to flow

NOTE Filters, coolers, pumps, flowmeters, etc. may be part of the sample line (see Annex A, Figure A.2).

3.1.4.2**sample stream**

the fluid stream in the sample line

NOTE 1 Other streams may be branched off the sample stream (e.g. bypass streams) or be injected into it (e.g. dilution streams).

NOTE 2 The composition and the physical state of the fluid in the sample line shall be allowed to change only in a predictable way.

NOTE 3 The properties of the conditioned sample stream at the inlet of an analyzer have to meet the requirements of the analyzer.

3.1.4.3**bypass stream**

a fluid stream which is branched off the sample stream

NOTE 1 It is frequently the purpose of bypass streams to reduce the delay time of the sample handling system.

NOTE 2 The term “bypass stream” is also used for process lines. So the sample stream may be extracted from a bypass stream of a process stream.

