

Industrial-process control systems — Instruments with analogue inputs and two- or multi-state outputs —

Part 1: Methods of evaluating the performance

The European Standard EN 61003-1:1993 has the status of a
British Standard

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Cooperating organizations

The European Committee for Electrotechnical Standardization (CENELEC), under whose supervision this European Standard was prepared, comprises the national committees of the following countries:

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Finland	Norway
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Germany	Spain
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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 61003-1:1993 *Industrial-process control systems — instruments with analogue inputs and two- or multi-state outputs — Part 1: Methods of evaluating the performance*, published by the European Committee for Electrotechnical Standardization (CENELEC).

It is identical with IEC 1003-1:1991 published by the International Electrotechnical Commission (IEC). In adopting IEC 1003-1:1991 as EN 61003-1:1993 CENELEC added normative Annex ZA.

No British Standard is superseded.

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, 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

Industrial-process control systems
Instruments with analogue inputs and two- or multi-state
outputs
Part 1: Methods of evaluating the performance

(IEC 1003-1:1991)

Processus industriels —
Instruments avec entrées analogiques et
sorties à deux ou plusieurs états
Partie 1: Méthodes d'évaluation des
performances
(CEI 1003-1:1991)

Systeme der industriellen Prozeßtechnik —
Geräte mit analogen Eingängen und Zwei- oder
Mehrpunktverhalten
Teil 1: Methoden der Beurteilung des
Betriebsverhaltens
(IEC 1003-1:1991)

This European Standard was approved by CENELEC on 1992-12-09. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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 1003-1:1991 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 61003-1 on 9 December 1992.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1993-12-01
- latest date of withdrawal of conflicting national standards (dow) 1993-12-01

For products which have complied with the relevant national standard before 1993-12-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1998-12-01.

Annexes designated “normative” are part of the body of the standard. In this standard, Annex A and Annex ZA are normative.

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Introduction

The methods of evaluation specified in this part of the standard are intended for use by manufacturers to determine the performance of their products and by users, or independent testing establishments, to verify the manufacturer's performance specifications.

The test conditions in this part of the standard, for example the range of ambient temperatures and power supply, represent those which commonly arise in use. Consequently, the values specified herein shall be used where no other values are specified by the manufacturer.

The tests specified in this part of the standard are not necessarily sufficient for instruments specifically designed for unusually arduous duties. Conversely, a restricted series of tests may be suitable for instruments designed to perform within a more limited range of conditions.

It will be appreciated that the closest communication should be maintained between the evaluating body and the manufacturer. Note shall be taken of the manufacturer's specifications for the instrument when the test programme is being decided, and the manufacturer should be invited to comment on both the test programme and the results.

His comments on the results should be included in any report produced by the testing organization.

1 Scope

This International Standard is applicable to pneumatic and electric industrial-process instruments using measured values that are continuous signals in accordance with current International Standards¹⁾. The other input value (i.e. the set point value) may be either a mechanical (position, force, etc.) or a standard signal.

It should be noted that while the tests specified herein cover instruments having such measured values, they can be applied in principle to instruments having other continuous measured values.

These instruments may be used as controllers or as switches for alarm and other similar purposes. The following wordings and letter symbols are in accordance with the use as controllers and can be easily adopted for switches.

Instruments with feedback are not covered by this standard.

Considerations other than the performance are listed in Annex A (normative).

This part of the standard is intended to specify uniform methods of tests for the evaluation of the performance of industrial-process instruments with analogue measured values and two- or multi-state outputs.

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.

IEC 68-2-1:1974, *Environmental testing. Part 2: Tests. Tests A: Cold.*

IEC 68-2-2:1974, *Environmental testing. Part 2: Tests. Tests B: Dry heat.*

IEC 68-2-3:1969, *Environmental testing. Part 2: Tests. Test Ca: Damp heat, steady state.*

IEC 68-2-6:1982, *Environmental testing. Part 2: Tests. Test Fc and guidance: Vibration (sinusoidal).*

IEC 68-2-14:1984, *Environmental testing. Part 2: Tests. Test N: Change of temperature.*

IEC 68-2-31:1969, *Environmental testing. Part 2: Tests. Test Ec: Drop and topple, primarily for equipment-type specimens.*

IEC 160:1963, *Standard atmospheric conditions for test purposes.*

IEC 278:1968, *Documentation to be supplied with electronic measuring apparatus.*

IEC 348:1978, *Safety requirements for electronic measuring apparatus.*

IEC 381, *Analogue signals for process control systems.*

¹⁾ IEC 381 and IEC 382.

IEC 382:1971, *Analogue pneumatic signal for process control systems*.

IEC 801-3:1984, *Electromagnetic compatibility for industrial-process measurement and control equipment. Part 3: Radiated electromagnetic field requirements*.

3 Basic relations and definitions

For the purpose of this International Standard, the following definitions apply.

3.1

two-state instrument

the action is illustrated in Figure 1

the two-state instrument having one pair of switching points x_1 and x_2 (x_2 greater than x_1) has the relationships

$$y = y_1 \text{ for } x < x_1$$

$$y = y_2 \text{ for } x > x_2$$

for $x_1 < x < x_2$, y may be either y_1 or y_2

it is y_1 if the last switching point crossed by x was x_1

it is y_2 if the last switching point crossed by x was x_2

3.2

multi-state instrument (see clause 9 and Figure 4)

a multi-state instrument has n possible output values and $n - 1$ pairs of switching points. Each pair of switching points may be investigated by the procedure given for the two-state instrument

3.3

switching point x_1, x_2

the measured Value (with the input moving either upscale or downscale) at which the output (y) changes from one state to another

3.4

switching differential X_{sd}

the difference between the switching point x_2 with the measured value moving upscale and the switching point x_1 with the measured value moving downscale

3.5

instrument with no switching differential

this is considered to be a special case where the switching differential approaches zero

3.6

mean switching point x_m

the mean of the values of upscale and downscale switching points

3.7

switching range X_{sr}

in a multi-state instrument the range of measured values corresponding to the extreme switching points

3.8

set point w (reference input variable)

the point (value) at which it is desired that switching (at x_2 or x_1 as specified) should occur

4 General

4.1 Environmental conditions

Test conditions specified in this standard are in accordance with IEC 160.

4.1.1 Recommended range of ambient conditions for test measurements

Temperature range	15 °C to 35 °C
Relative humidity	45 % to 75 %
Atmospheric pressure	86 kPa to 106 kPa (860 mbar to 1 060 mbar)
Electromagnetic field	value to be stated if relevant

The maximum rate of temperature change permissible during any test shall be 1 °C in 10 min. The conditions may be equivalent to normal operating conditions.

4.1.2 Standard reference atmosphere

Temperature	20 °C
Relative humidity	65 %
Atmospheric pressure	101,3 kPa (1 013 mbar)

This standard reference atmosphere is that atmosphere to which values measured under any other atmospheric conditions are corrected by calculation. It is recognized, however, that in many cases a correction factor for humidity is not possible. In such cases, the standard reference atmosphere takes account of temperature and pressure only.

This atmosphere is equivalent to the normal reference operating conditions usually identified by the manufacturer.

4.1.3 Standard atmosphere for referee measurements

When correction factors to adjust atmospheric-condition sensitive parameters to their standard reference atmosphere values are unknown, and measurements under the recommended range of ambient atmospheric conditions are unsatisfactory, repeated measurements under closely controlled atmospheric conditions may be conducted.

For the purpose of this standard, the following atmospheric conditions are given for referee measurements.

	<i>Nominal value</i>	<i>Tolerance</i>
Temperature	20 °C	± 2 °C
Relative humidity	65 %	± 5 %
Atmospheric pressure	86 kPa to 106 kPa (860 mbar to 1 060 mbar)	

This atmosphere is equivalent to the normal reference operating conditions usually identified by the manufacturer.

For tropical, sub-tropical or other special requirements, alternate referee atmospheres are given in IEC 160.

4.2 Supply conditions

4.2.1 Reference values

The values specified or agreed by the manufacturer.

4.2.2 Tolerances

The tolerances given below apply unless closer tolerances are agreed between user and manufacturer.

a) Electrical supply

— rated voltage	± 1 %
— rated frequency	± 1 %
— harmonic distortion	less than 5 % (a.c. supply)
— ripple content	less than 0,2 % (d.c. supply)

b) Pneumatic supply

— rated pressure	± 1 %
— supply air temperature	ambient temperature ± 2 °C
— supply air humidity	dew-point at least 10 °C below instrument temperature
— oil and dust free	

NOTE An oil content of not greater than one part per million and absence of dust particles greater than 3 µm are considered to be an "oil and dust free" supply.