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Industrial-process control systems - Methods of evaluating the performance of valve positioners with pneumatic outputs

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Industrial-process control systems - Methods of evaluating the performance of valve positioners with pneumatic outputs

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 61514:2000. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 61514 has been prepared by subcommittee 65B: Devices, of IEC technical committee 65: Industrial-process measurement and control. It is an International Standard.

This second edition cancels and replaces the first edition published in 2000. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) in 6.6.8 and Table 5, the magnetic field has been changed from 100 A/m to of 30 A/m (Mean Root Square);

b) 6.10.4 and Figure 9 have been modified for better understandability;

c) in 7.4, the reference to IEC 61187 has been deleted and replaced with a new Table 4: Document information.

The text of this International Standard is based on the following documents:

Draft	Report on voting
65B/1309/FDIS	65B/1321/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,

– withdrawn, or

– revised.

1 Scope ~~and object~~

This International Standard specifies tests designed to determine the static and dynamic performance of single-acting or double-acting analogue positioners. The tests ~~may be applied~~ apply to positioners which receive standard analogue input signals (as specified in IEC 60381-1, IEC 60381-2 and IEC 60382) and have a pneumatic output.

~~NOTE For~~ Positioners with pulsed or digital input signals, ~~equivalent criteria may be applied. The methods described may not fully apply to~~ positioners with digital controllers ~~or~~ and positioners with pulsed outputs are outside the scope of this document.

Testing ~~may be~~ is conducted either on a positioner alone, independently of an actuator, or on a positioner mounted and connected to a specific actuator, as a combined unit. The text makes clear where different approaches are required.

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

~~The closest liaison should be maintained between the evaluating body and the manufacturer. Note should 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.~~

The closest liaison between the evaluating body and the manufacturer is indispensable during the tests, including the possibility for the manufacturer to influence the test programme based on the manufacturer's specifications for the instrument and comment on both the test programme and the results.

This document is intended to provide definitions of positioner elements, actions, and characteristics, to specify uniform methods of measuring performance errors and effects of influence quantities on those characteristics, and to describe methods of reporting and evaluating the results of the measurement data obtained.

The test conditions described in this publication (for example range of ambient temperatures and power supply) relate to conditions which commonly arise in use. Consequently, the values specified ~~shall be~~ are used where no other values are specified by the manufacturer or user. If other values are used, they ~~should~~ will be stated. It is recognized that the manufacturer's specifications and instructions for installation and operation ~~should~~ apply during all steps.

The tests specified in this document are not necessarily sufficient for instruments specifically designed for unusually arduous conditions. Conversely, a reduced series of tests ~~may~~ can serve adequately for instruments designed to perform within a more limited range of conditions.

When a full evaluation, in accordance with this document, is not required or possible, ~~those~~ only the tests which are required ~~should be~~ are performed and the results reported in accordance with the relevant parts of this document. In such cases, the test report ~~should~~ will state that it does not cover the full number of tests specified herein.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

~~IEC 60050(161):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*~~

IEC 60050-311, *International electrotechnical vocabulary - Electrical and electronic measurements - Part 311: General terms relating to electrical measurements*

IEC 60050-351, *International electrotechnical vocabulary - Part 351: Control technology*

IEC 60068-2-1~~:1990~~, *Environmental testing - Part 2-1: Tests - Test A: Cold*

IEC 60068-2-2~~:1974~~, *Environmental testing - Part 2-2: Tests - Test B: Dry heat*

IEC 60068-2-6~~:1995~~, *Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)*

IEC 60068-2-31~~:1969~~, *Environmental testing - Part 2-31: Tests - Test Ec: ~~Drop and topple~~ Rough handling shocks, primarily for equipment-type specimens*

~~IEC 60068-2-56:1988, *Environmental testing – Part 2: Tests. Test Cb: Damp heat, steady state, primarily for equipment*~~

IEC 60068-2-78, *Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state*

IEC 60381-1~~:1982~~, *Analogue signals for process control systems - Part 1: Direct current signals*

IEC 60381-2, *Analogue signals for process control systems - Part 2: Direct voltage signals*

IEC 60382~~:1991~~, *Analogue pneumatic signal for process control systems*

IEC 60529~~:1989~~, *DegreeS of protection provided by enclosures (IP Code)*

IEC 60654 (all parts), *Industrial-process measurement and control equipment - Operating conditions*

IEC 60721-3 (all parts), *Classification of environmental conditions - Part 3 Classification of groups of environmental parameters and their severities*

~~IEC 60902:1987, *Industrial-process measurement and control – Terms and definitions*~~

~~IEC 61000-4-3:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 3: Radiated, radio-frequency electromagnetic field immunity test*~~

~~IEC 61000-4-4:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test*~~

~~IEC 61000-4-5:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 5: Surge immunity test*~~

~~IEC 61000-4-8:1993, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 8: Power frequency magnetic field immunity test*~~

IEC 61010-1~~:1990~~, *Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements*

IEC 61032~~:1997~~, *Protection of persons and equipment by enclosures - Probes for verification*

~~IEC 61187:1993, *Electrical and electronic measuring equipment – Documentation*~~

IEC 61298-4~~:1995~~, *Process measurement and control devices - General methods and procedures for evaluating performance - Part 4: Evaluation report content*

IEC 61326-1, *Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements*

3 Terms and definitions

~~For the purpose of this standard, the definitions given in IEC 60902 and IEC 60050(161) shall be applied, in addition to the following definitions.~~

For the purposes of this document, the terms and definitions given in IEC 60050-311 and IEC 60050- 351 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

– IEC Electropedia: available at https://www.electropedia.org/

– ISO Online browsing platform: available at https://www.iso.org/obp

3.1
positioner
position controller connected to the moving part of a final control element or its actuator; automatically adjusts its output signal Y to the actuator in order to maintain a desired travel signal X that bears a predetermined relationship to the input signal W

Note 1 to entry: In this document, only positioners with pneumatic output signals Y are considered. The input signal W may be an air pressure (pneumatic positioner), or an electric current or voltage (electro-pneumatic positioner~~, or a pulse or digital signal~~).

3.1.1
single-acting positioner
positioner having one output signal Y which acts on one side of the actuator

SEE: Figure 1 a).

Note 1 to entry: The returning force for the actuator is usually provided by springs.

3.1.2
double-acting positioner
positioner providing two output signals Y_D and Y_R connected to opposite sides of the actuator diaphragm or piston

SEE: Figure 1 b).