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Industrial process control systems -
~~Part 2:~~ Methods of evaluating the performance of ~~intelligent~~ valve positioners with pneumatic outputs -
Part 2: Test Methods for intelligent positioners mounted on an actuator valve assembly

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Industrial process control systems - ~~Part 2:~~ Methods of evaluating the performance of ~~intelligent~~ valve positioners with pneumatic outputs - Part 2: Test Methods for intelligent positioners mounted on an actuator valve assembly

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 61514-2:2013. 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 61514-2 has been prepared by subcommittee 65B: Measurement and control devices, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This third edition cancels and replaces the second edition published in 2013. This edition constitutes a technical revision.

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

a) in 5.5.2, the standard for the measurements of influence quantities has been changed to IEC 62828-1:2026;
b) all references to IEC 61514 have been updated to IEC 61514:2026;
c) the aspect of cyber-security has been added in 4.2.7 and 4.2.9.

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

Draft	Report on voting
65B/1315/FDIS	65B/1332/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.

This document is to be used in conjunction with IEC 61514:2026.

A list of all parts of the IEC 61514 series, published under the general title *Industrial process control systems*, can be found on the IEC website.

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.

INTRODUCTION

New instruments for process control and measurement including valve positioners are mainly equipped with microprocessors, thereby utilising digital data processing and communication methods and/or artificial intelligence, making them more complex and giving them a considerable added value.

Modern intelligent valve positioners are no longer only controlling the valve position, but they are in many cases also equipped with various facilities for self-testing, actuator/valve condition monitoring and alarming. The variety of added functionalities is large. They can no longer be compared with the single function "cam-type" positioners. Therefore, accuracy related performance testing, although still very important, is no longer sufficient to demonstrate their flexibility, capabilities and other features with respect to engineering, installation, maintainability, reliability and operability.

In this document, the evaluation considers performance testing and a design review of both hardware and software. The layout of this document follows to some extent the framework of IEC TS 62098. A number of performance tests described in IEC 61514 are still valid for intelligent valve positioners. ~~Further reading of IEC 61069 is recommended.~~

1 Scope

This part of IEC 61514 specifies design reviews and tests intended to measure and determine the static and dynamic performance, the degree of intelligence and the communication capabilities of single-acting or double-acting intelligent valve positioners. The tests ~~may~~ can be applied to positioners which receive standard analogue electrical input signals (as specified in IEC 60381-1 or IEC 60381-2) and/or digital signals via a data communication link (for example Fieldbus) and have a pneumatic output. An intelligent valve positioner as defined in Clause 3 is an instrument that uses for performing its functions digital techniques for data processing, decision-making and bi-directional communication. It ~~may~~ can be equipped with additional sensors and additional functionality supporting the main function.

The performance testing of an intelligent valve positioner ~~needs to be~~ is conducted with the positioner mounted on and connected to the actuator/valve assembly the positioner is used on. The specific characteristic parameters of ~~these combinations~~ the actuator/valve combination such as size, stroke, friction ~~(hysteresis)~~, type of packing, spring package and supply pressure for the pneumatic part~~, should be carefully chosen and reported, since the~~ has significant impact on the performance of a positioner ~~is greatly dependent on the used actuator~~.

The methods of evaluation given in this document are intended for testing laboratories to verify equipment performance specifications. The manufacturers of intelligent positioners are urged to apply this document at an early stage of development.

This document is intended to provide guidance for designing evaluations of intelligent valve positioners by providing:

– a checklist for reviewing their hardware and software design in a structured way;

– test methods for measuring and qualifying their performance under various environmental and operational conditions;

– methods for reporting the data obtained.

When a full evaluation, in accordance with this document, is not required or possible, the tests which are required ~~should be~~ are performed and the results ~~should be~~ reported in accordance with the relevant clauses of this document. In such cases, the test report ~~should~~ will state that it does not cover the full number of tests specified herein. Furthermore, the items omitted ~~should be~~ are mentioned, to give the reader of the report a clear overview.

This document is also applicable for non-intelligent microprocessor-based valve positioners without means for bi-directional communication. In that case an evaluation ~~should~~ will be reduced to a limited programme of performance testing and a review of the construction.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

~~IEC 60050 (all parts), *International Electrotechnical Vocabulary (IEV)* (available at http://www.electropedia.org)~~

IEC 60050-300, *International electrotechnical vocabulary (IEV) - International Electrotechnical Vocabulary Electrical and electronic measurements and measuring instruments - Part 311: General terms relating to measurements - Part 312: General terms relating to electrical measurements - Part 313: Types of electrical measuring instruments - Part 314: Specific terms according to the type of instrument*

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

IEC 60068-2-1~~:1990~~, *Environmental testing - Part 2-1: Tests - Tests 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 60068-2-78~~:2001~~, *Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state*

IEC 60079 (all parts), ~~*Electrical apparatus for explosive gas*~~ *Explosive atmospheres*

IEC 60381-1, *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 60529~~:1989~~, *Degrees of protection provided by enclosures (IP Code)*

IEC 60534-1, *Industrial-process control valves - Part 1: Control valve terminology and general considerations*

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

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

~~IEC 61000-4-11, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*~~

IEC 61010-1~~:2001~~, *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 61069 (all parts), *Industrial-process measurement and control – Evaluation of system properties for the purpose of system assessment*~~

~~IEC 61158 (all parts), *Digital data communications for measurement and control – Fieldbus for use in industrial control systems*~~

~~IEC 61298 (all parts), *Process measurement and control devices – General methods and procedures for evaluating performance*~~

~~IEC 61298-1:2008, *Process measurement and control devices – General methods and procedures for evaluating performance – Part 1: General considerations*~~

~~IEC 61298-2:2008, *Process measurement and control devices – General methods and procedures for evaluating performance – Part 2: Tests under reference conditions*~~

~~IEC 61298-3:2008, *Process measurement and control devices – General methods and procedures for evaluating performance – Part 3: Tests for the effects of influence quantities*~~

~~IEC 61298-4:2008, *Process measurement and control devices – General methods and procedures for evaluating performance – Part 4: Evaluation report content*~~

IEC 61326-1:~~2005~~2020, *Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements*

~~IEC/PAS 61499 (all parts), *Function blocks for industrial-process measurement and control systems*~~

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 61511 (all parts), *Functional safety - Safety instrumented systems for the process industry sector*

IEC 61514:~~2000~~2026, *Industrial-process control systems –- Methods of evaluating the performance of valve positioners with pneumatic outputs*

IEC 62061, *Safety of machinery - Functional safety of safety-related control systems*

~~IEC/TS 62098, *Evaluation methods for microprocessor-based instruments*~~

IEC 62828-1:2026, *Reference conditions and procedures for testing industrial and process measurement transmitters - Part 1: General procedures for all types of transmitters*

~~CISPR 11, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*~~

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-311, IEC 60050-351 and IEC 61514 as well as 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
intelligent valve positioner
position controller based on microprocessor technology, and utilising digital techniques for data processing, decision-making and bi-directional communication

Note 1 to entry: It may be equipped with additional sensors and additional functionality supporting the main function.

Note 2 to entry: In this document, only positioners with pneumatic output signals are considered, as defined in 3.1 of IEC 61514:~~2000~~2026. The input signal may be an electric current or voltage, or a digital signal via a fieldbus.

Note 3 to entry: For non-intelligent microprocessor-based position controllers without bi-directional communication, an evaluation is reduced to a limited amount of performance testing and an abridged design review of the construction.

3.2
configuring
process of implementing the functionality required for a certain application