SLOVENSKI STANDARD
oSIST prEN IEC 61514-2:2024

01-september-2024

Sistemi za upravljanje industrijskih procesov - 2. del: Postopki za ocenjevanje lastnosti inteligentnih pozicionirnikov z ventili s pnevmatskimi izhodi, nameščenimi na sklop ventila aktuatorja

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

Systeme der industriellen Prozessleittechnik – Teil 2: Verfahren zur Bewertung des Betriebsverhaltens von intelligenten Ventilstellungsreglern mit pneumatischem Ausgang, die an Ventil-Stellantrieben montiert sind

Systèmes de commande des processus industriels - Partie 2: Méthodes d'évaluation des performances des positionneurs de vanne intelligents à sorties pneumatiques montés sur un ensemble actionneur/vanne

Ta slovenski standard je istoveten z: **prEN IEC 61514-2:2024**

ICS:

23.060.99	Drugi ventili	Other valves
25.040.40	Merjenje in krmiljenje industrijskih postopkov	Industrial process measurement and control

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65B/1257/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 61514-2 ED3**	
DATE OF CIRCULATION: **2024-07-05**	CLOSING DATE FOR VOTING: **2024-09-27**
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IEC SC 65B : MEASUREMENT AND CONTROL DEVICES

SECRETARIAT: United States of America	SECRETARY: Mr Wallie Zoller
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☒ QUALITY ASSURANCE ☐ SAFETY

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TITLE:

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

PROPOSED STABILITY DATE: 2027

NOTE FROM TC/SC OFFICERS:

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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 mounted on an actuator valve assembly

FOREWORD

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

This part of IEC 61514-2 is to be used in conjunction with IEC 61514:202X.

This second edition cancels and replaces the first edition published in 2004. This edition constitutes a technical revision.

The significant changes with respect to the previous edition are as follows:

– The standard has been optimized for usability.

– The test procedures have been reviewed regarding applicability for use in test facilities. Impractical test procedures were removed or modified.

The text of this standard is based on the following documents:

FDIS	Report on voting
65B/868/FDIS	65B/872/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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 publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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 standard 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.

INDUSTRIAL PROCESS CONTROL SYSTEMS –

Part 2: Methods of evaluating the performance of intelligent valve positioners with pneumatic outputs mounted on an actuator valve assembly

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 be applied to positioners which receive standard analogue electrical input signals (as specified in IEC 60381) 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 be equipped with additional sensors and additional functionality supporting the main function.

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

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

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

The standard is also applicable for non-intelligent microprocessor-based valve positioners without means for bi-directional communication. In that case an evaluation should be reduced to a limited programme of performance testing and a short 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, *International Electrotechnical Vocabulary (IEV):*

- *Part 311: Electrical and electronic measurements - General terms relating to electrical measurements*
- *Part 351: Control technology*

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests. Tests A: Cold*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests. Tests B: Dry heat*

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

IEC 60068-2-31, *Environmental testing – Part 2-31: Tests. Test Ec: Drop and topple, primarily for equipment-type specimens*

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

IEC 60079 (all parts), *Electrical apparatus for explosive gas 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, *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, *Classification of environmental conditions – Part 3 Classification of groups of environmental parameters and their severities*

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

IEC 61032, *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 61326-1:2020, *Electrical equipment for measurement, control and laboratory use – EMC requirements*

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

IEC 61508 Part 1 and 7, *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 61511-Part 1 and 3, *Functional safety - Safety instrumented systems for the process industry sector*

IEC 61514:202X, *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 62828-1:2017, *Reference conditions and procedures for testing industrial and process measurement transmitters – Part 1: General procedures for all types of transmitters*

3 Terms and definitions

For the purposes of this standard, the terms and definitions given in IEC 60050 and IEC 61514, as well as the following apply.

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

Note 2 to entry: In this standard, only positioners with pneumatic output signals are considered, as defined in 3.1 of IEC 61514:202X. 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

3.3
configurability
extent to which an intelligent positioner can be provided with functions to control various applications

3.4
calibration
process of adjusting the range of travel to the required value for acquiring a defined input-to-travel characteristic

Note 1 to entry: The adjusted travel can either be from stop to stop or to a value in between as defined by the valve manufacturer.

Note 2 to entry: Instruments may exist that are provided with an automatic procedure for travel range adjustment, which may then be addressed with the term auto-calibration.

[SOURCE: IEC 60050-311, 311-01-09, modified]

3.5
tuning
process of adjusting the various control parameters for a certain application

Note 1 to entry: The stem position tuning procedure can range from "trial and error" to an automatic proprietary procedure provided by the manufacturer and often addressed as auto-tuning.

3.6
set-up
process of configuring, calibrating and tuning a positioner for optimal controlling of a specific actuator/valve assembly

3.7
travel cut-off
point close to the extreme end (low or high) of the characteristic curve at which the positioner forces the valve to the corresponding mechanical stop (fully closed or fully open)

3.8
stroke time
time required to travel between two different positions under a defined set of conditions

3.9
dead band
finite range of values of the input variable within which a variation of the input variable does not produce any measurable change in the output variable

[SOURCE: IEC 60050-351, 351-45-15]

3.10
operating mode
selected method of operation of the positioner

[SOURCE: IEC 60050-351, 351-55-01, modified]

3.11
setpoint
input variable, which sets the desired value of the controlled variable (travel)

Note 1 to entry: The input variable may originate from an analogue source (mA or voltage) or from a digital source (fieldbus) or local keyboard).

3.12
balance pressure
average of the pressures on the opposite chambers of a double acting actuator in steady state condition

Note 1 to entry: The balance pressure shall be expressed as a percentage of the positioner supply pressure to evaluate the stiffness of the double acting system.

4 Design review

4.1 General

The observations of Clause 4 shall be based on open literature (manuals, instruction leaflets, etc.) provided to a user on delivery of the instruments and whatever the manufacturer is willing to disclose. They shall not contain confidential information.

The design review is meant to identify and make explicit the functionality and capabilities of the intelligent valve positioner under consideration in a structured way. As intelligent positioners appear in a great variety of designs a review has to show in a structured way the details of

– their physical structure;
– their functional structure.

Subclause 4.2 guides the evaluator in the process of describing the physical structure of intelligent positioners through identifying the hardware modules and the I/Os to the operational and environmental domains.

Thereafter the functional structure is described using the checklist of 4.3. The checklist gives a structured framework of the relevant issues, which have to be addressed by the evaluator through adequate qualitative and quantitative experiments.