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

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NATIONAL FOREWORD

See Eesti standard EVS-EN 61514-2:2013 sisaldab Euroopa standardi EN 61514-2:2013 ingliskeelset teksti.	This Estonian standard EVS-EN 61514-2:2013 consists of the English text of the European standard EN 61514-2:2013.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 06.09.2013.	Date of Availability of the European standard is 06.09.2013.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 23.060, 25.040.40

EUROPEAN STANDARD

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English version

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

(IEC 61514-2:2013)

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
(CEI 61514-2:2013)

Systeme der industriellen Prozessleittechnik – Teil 2: Verfahren zur Bewertung des Betriebsverhaltens von intelligenten Ventilstellungsreglern mit pneumatischem Ausgang, die an Ventil-Stellantrieben montiert sind
(IEC 61514-2:2013)

CENELEC

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B - 1000 Brussels

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Foreword

The text of document 65B/868/FDIS, future edition 2 of IEC 61514-2, prepared by SC 65B, “Devices & process analysis”, of IEC TC 65, “Industrial-process measurement, control and automation” was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61514-2:2013.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2014-05-01
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2016-08-01

This document supersedes EN 61514-2:2004.

EN 61514-2:2013 includes the following significant technical changes with respect to EN 61514-2:2004:

– 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.

EN 61514-2:2013 is to be used in conjunction with EN 61514:2002.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 61514-2:2013 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60050	Series	International Electrotechnical Vocabulary (IEV)	-	-
IEC 60068-2-1	1990	Environmental testing - Part 2: Tests - Tests A: Cold	EN 60068-2-1 [1)]	1993
IEC 60068-2-2	1974	Environmental testing - Part 2: Tests - Tests B: Dry heat	EN 60068-2-2 [2) 3)]	1993
IEC 60068-2-6	1995	Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6 [4)]	1995
IEC 60068-2-31	1969	Environmental testing. Part 2: Tests. Test Ec: Drop and topple, primarily for equipment-type specimens	EN 60068-2-31 [5) 6)]	1993
IEC 60068-2-78	2001	Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state	EN 60068-2-78 [7)]	2001
EN 60079	Series	Electrical apparatus for explosive gas atmospheres	-	-
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May	1991 1993
IEC 60534-1	-	Industrial-process control valves - Part 1: Control valve terminology and general considerations	EN 60534-1	-
IEC 60654	Series	Industrial-process measurement and control equipment - Operating conditions	EN 60654	Series
IEC 60721-3	-	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities	EN 60721-3	-
IEC 61000-4-11	-	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests	EN 61000-4-11	-

[1)] EN 60068-2-1 is superseded by EN 60068-2-1:2007, which is based on IEC 60068-2-1:2007.

[2)] EN 60068-2-2 includes supplement(s) A to IEC 60068-2-2.

[3)] EN 60068-2-2 is superseded by EN 60068-2-2:2007, which is based on IEC 60068-2-2:2007.

[4)] EN 60068-2-6 is superseded by EN 60068-2-6:2008, which is based on IEC 60068-2-6:2007.

[5)] EN 60068-2-31 includes A1 to IEC 60068-2-31.

[6)] EN 60068-2-31 is superseded by EN 60068-2-31:2008, which is based on IEC 60068-2-31:2008.

[7)] EN 60068-2-78 is superseded by EN 60068-2-78:2013, which is based on IEC 60068-2-78:2012.

Publication	Year	Title	EN/HD	Year
IEC 61010-1 + corr. May + corr. April	2001 2001 2003	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	EN 61010-1 - + corr. June [9)]	2001 2002
IEC 61032 + corr. January	1997 2003	Protection of persons and equipment by enclosures - Probes for verification	EN 61032	1998
EN 61069	Series	Industrial-process measurement and control - Evaluation of system properties for the purpose of system assessment	-	-
IEC 61158	Series	Industrial communication networks - Fieldbus specifications	EN 61158	Series
IEC 61298	Series	Process measurement and control devices - General methods and procedures for evaluating performance	EN 61298	Series
IEC 61298-1	2008	Process measurement and control devices - General methods and procedures for evaluating performance - Part 1: General considerations	EN 61298-1	2008
IEC 61298-2	2008	Process measurement and control devices - General methods and procedures for evaluating performance - Part 2: Tests under reference conditions	EN 61298-2	2008
IEC 61298-3	2008	Process measurement and control devices - General methods and procedures for evaluating performance - Part 3: Tests for the effects of influence quantitites	EN 61298-3	2008
IEC 61298-4	2008	Process measurement and control devices - General methods and procedures for evaluating performance - Part 4: Evaluation report content	EN 61298-4	2008
IEC 61326-1 + corr. February + corr. February	2005 2010 2008	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements	EN 61326-1 [11)]	2006
IEC/PAS 61499	Series	Function blocks for industrial-process measurement and control systems	-	-
IEC 61514 (mod)	2000	Industrial-process control systems - Methods of evaluating the performance of valve positioners with pneumatic outputs	EN 61514	2002
IEC/TS 62098	-	Evaluation methods for microprocessor-based instruments	-	-
CISPR 11	-	Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement	EN 55011	-

[9)] EN 61010-1 is superseded by EN 61010-1:2010, which is based on IEC 61010-1:2010.

[11)] EN 61326-1 is superseded by EN 61326-1:2013, which is based on IEC 61326-1:2012.

CONTENTS

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

IEC 60068-2-1:1990, *Environmental testing – Part 2: Tests. Tests A: Cold*

IEC 60068-2-2:1974, *Environmental testing – Part 2: Tests. Tests B: Dry heat*

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

IEC 60068-2-31:1969, *Environmental testing – Part 2: Tests. Test Ec: Drop and topple, 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 atmospheres*

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, *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, *Electrical equipment for measurement, control and laboratory use – EMC requirements*

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

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

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

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 61514:2000 and IEC 60050-351, 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 1 to 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 61514:2000. 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.

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