SLOVENSKI STANDARD
oSIST prEN IEC 62381:2023

01-oktober-2023

Avtomatizacijski sistemi v procesni industriji - Tovarniški prevzemni preskus (FAT), prevzemni preskus pri prevzemniku (SAT) in preskus integracije pri prevzemniku (SIT)

Automation systems in the process industry - Factory acceptance test (FAT), site acceptance test (SAT), and site integration test (SIT)

Systèmes d'automatisation pour les procédés industriels - Essais d'acceptation en usine (FAT), essais d'acceptation sur site (SAT) et essais d'intégration sur site (SIT)

Ta slovenski standard je istoveten z: prEN IEC 62381:2023

ICS:

25.040.40	Merjenje in krmiljenje industrijskih postopkov	Industrial process measurement and control

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IEC SC 65E : DEVICES AND INTEGRATION IN ENTERPRISE SYSTEMS

SECRETARIAT:	SECRETARY:
United States of America	Mr Donald (Bob) Lattimer

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

☒ SUBMITTED FOR CENELEC PARALLEL VOTING   ☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

Attention IEC-CENELEC parallel voting

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

TITLE:

Automation systems in the process industry - Factory acceptance test (FAT), site acceptance test (SAT), and site integration test (SIT)

PROPOSED STABILITY DATE: **2027**

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**AUTOMATION SYSTEMS IN THE PROCESS INDUSTRY –
FACTORY ACCEPTANCE TEST (FAT), SITE ACCEPTANCE TEST (SAT),
AND SITE INTEGRATION TEST (SIT)**

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International Standard IEC 62381 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

This third edition cancels and replaces the second edition published in 2012. This edition constitutes a technical revision.

The main changes with respect to the previous edition are listed below:

– General re-organization of the standard.

– Current technology incorporated

– Optional Factory Integration Test (FIT) added

– Replaced the forms in the annexes with detailed checklists of activities which can be used to develop project-specific test plans.

108 – Provided additional references to other applicable standards.
109
110 The text of this International Standard is based on the following documents:

FDIS	Report on voting
65E/XXX/FDIS	65E/XXX/RVD

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

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

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

118 The committee has decided that the contents of this publication will remain unchanged until the
119 stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to
120 the specific publication. At this date, the publication will be

121 • reconfirmed,
122 • withdrawn,
123 • replaced by a revised edition, or
124 • amended.

125

126

INTRODUCTION

127

128 There is an increasing trend in the process industry to shorten the time period for project
129 execution. At the same time, the complexity of automation systems is being increased due to
130 the number of connected systems and the use of new technologies, for example, fieldbus
131 systems.

132 Experience has shown that the owner, the buyer and the vendor have long and extensive
133 discussions to unambiguously establish the scope of activities and responsibilities in order to
134 achieve a timely delivery and acceptance of automation systems.

135 This standard is intended to provide requirements and guidance on acceptance testing of
136 control system installations, lead to an improvement and acceleration of the negotiation phase,
137 and lead to a mutual understanding about the scope of activities of each party.

138

139

AUTOMATION SYSTEMS IN THE PROCESS INDUSTRY –
FACTORY ACCEPTANCE TEST (FAT), SITE ACCEPTANCE TEST (SAT),
AND SITE INTEGRATION TEST (SIT)

1 Scope

1.1 General applicability

This international standard defines requirements and checklists for the Factory Acceptance Test (FAT), the Factory Integration Test (FIT), the Site Acceptance Test (SAT), and the Site Integration Test (SIT). These tests are carried out to demonstrate that the automation system meets the requirements of the applicable specification.

The intent of this document is to provide a means for all parties, including the owner, the buyer, and the vendor, to clearly establish and agree on the scope of activities and responsibilities involved in performing these tests in order to achieve a timely delivery and acceptance of the automation system. The activities described in this document can be used to develop test plans adapted to the specific requirements of the process/plant/equipment.

The annexes of this document contain checklists which are available for consideration when preparing specific test procedures and documentation for a specific automation system.

1.2 Exclusions

1.2.1 Prior and post activities

Engineering and manufacturing activities prior to or after the FAT, FIT, SAT and SIT, such as loop checks and commissioning, are not covered by this standard.

1.2.2 Regulated industries

For applications in the pharmaceutical or other highly specialized industries, additional guidelines (for example, Good Automated Manufacturing Practice (GAMP)), definitions and stipulations apply in accordance with other applicable existing standards.

1.2.3 Safety Instrumented Systems

IEC 61511 provides requirements for checks and validation of Safety Instrumented Systems.

1.2.4 Manufacturing Execution Systems

Testing and verification of Manufacturing Execution Systems (MES) is not covered by this document.

1.2.5 Advanced Process Control

Testing and verification of Advanced Process Control (APC) is not covered by this document.

1.2.6 Security for industrial automation and control systems

IEC 62443 provides requirements for network and system security.

2   Normative References

The following documents are referred 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 61511 (all parts), *Functional Safety: Safety Instrumented Systems for the Process Industry Sector* series

IEC 62443 (all parts), *Industrial Communication Networks – Network and System Security*

IEC 62382, *Control systems in the process industry - Electrical and instrumentation loop check*

3   Terms, definitions, abbreviated terms and acronyms

3.1   Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

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

3.1.1

Advanced Process Control
APC
term comprising several tools and techniques whose common characteristic is taking process automation beyond the limits of single-loop control and includes model-based software that is used to direct the process operation and is commonly referred to as multivariable predictive control or model predictive control

3.1.2

automation system
term referring to the complete system for the monitoring and control of production facilities

Note 1 to entry: An automation system can include a BPCS and can also include an SIS and other sub-systems

3.1.3

Basic Process Control System
BPCS
system which responds to input signals from the process, its associated equipment, other programmable systems and/or operators and generates output signals causing the process and its associated equipment to operate in the desired manner but which does not perform any SIF

Note 1 to entry: A BPCS includes all of the devices necessary to ensure that the process operates in the desired manner.

Note 2 to entry: A BPCS typically can implement various functions such as process control functions, monitoring, and alarms.

[SOURCE: IEC61511:2016]

3.1.4

buyer

company purchasing the equipment or control system from the vendor

Note 1 to entry: Can be the owner or another company.

3.1.5

control system

system which responds to input signals from the process and/or from an operator and generates output signals causing the process to operate in the desired manner

Note 1 to entry: The control system includes sensors and final elements and can be either a BPCS or a SIS or a combination of the two.

[SOURCE: IEC61511:2016]

3.1.6

detailed design specification

separate document that shows how the system functions and meets the requirements established in the FRS

3.1.7

Factory Acceptance Test
FAT

activity, including inspection and testing, conducted at the vendor's facility to demonstrate that the automation system, subsystem, or component is in accordance with the specification and is typically conducted at the vendor's facility

3.1.8

Factory Integration Test
FIT

activity, including inspection and testing, conducted at the vendor's facility to demonstrate that the merging of some or all of the various subsystems and components into one overall automation system functions as specified

3.1.9

Functional Requirements Specification
FRS

a specification listing the detailed operational requirements for a control system (i.e. what the system does, not how it does it)

3.1.10

Manufacturing Execution System
MES

computerized systems used in manufacturing to track and document the transformation of raw materials to finished goods

3.1.11

owner

company that operates the production facilities where the automation system is or will be installed

3.1.12

process industry
industry that has a continuous or batch flow and uses chemical reactions, separations, or mixing techniques in order to create new products, modify existing products or treat waste and includes the following types of industries: chemical, petrochemical, water and wastewater treatment, paper, cement, microprocessor, etc.

Note 1 to entry: It does not include such industries as equipment/machine manufacturing or other similar industries. It does not include industries which are subject to regulations which have specialized validation requirements.

3.1.13

punch list
list of all problems found, the corrective action to be taken, party responsible and date completed

Note 1 to entry: Other information categories can be added as required.

3.1.14

Safety Instrumented Function
SIF
safety function with a specified safety integrity level which is necessary to achieve functional safety and which can be either a safety instrumented protection function or a safety instrumented control function

3.1.15

Safety Instrumented System
SIS
instrumented system used to implement one or more SIF's

Note 1 to entry: A SIS is composed of any combination of sensor(s), logic solver(s), and final element(s) (e.g., see Figure 6 in IEC 61511). It also includes communication and ancillary equipment (e.g., cables, tubing, power supply, impulse lines, heat tracing).

Note 2 to entry: A SIS can include software.

Note 3 to entry: A SIS can include human action as part of a SIF.

[SOURCE: IEC61511:2016]

3.1.16

Safety Integrity Level
SIL
discrete level (one out of four) allocated to the SIF for specifying the safety integrity requirements to be achieved by the SIS

[SOURCE: IEC61511:2016]

3.1.17

Site Acceptance Test
SAT
activity, including inspection and testing, conducted at the site of the installation, to demonstrate that the installation of the automation system, any subsystem, or any component is in accordance with the applicable standards, codes, specifications, and installation instructions

3.1.18

Site Integration Test
SIT
activity, including inspection and testing, conducted at the site of the installation, to demonstrate that the merging of the various subsystems and components into one overall automation system is completed and that all components work together as specified

304 **3.1.19**

305 **tag**

306 unique identifier assigned to a process measurement, calculation, or device within the
307 automation system

308 **3.1.20**

309 **User Requirements Specification**
310 **URS**

311 document that defines the user's (owner's) general requirements for the automation system

312 **3.1.21**

313 **vendor**

314 manufacturer, distributor, or systems integrator of the automation system, subsystem, or
315 component

316 **3.2　Abbreviated terms**

317 DCS　　　　Distributed Control System

318 HMI　　　　Human Machine Interface

319 P&ID　　　　Piping (or Process) and Instrumentation Diagram

320 PLC　　　　Programmable Logic Controller

321 UPS　　　　Uninterruptible Power Supply

322 **4　Overview of automation system testing**

323 **4.1　General**

324 An automation system is to be tested at various stages in its development and
325 implementation. Each new automation system shall be subjected to three tests to demonstrate
326 proper operation in accordance with project-specific requirements: Factory Acceptance Test
327 (FAT), Site Acceptance Test (SAT) and Site Integration Test (SIT). After the SAT, loop tests
328 shall be performed in accordance with IEC 62382. All these tests shall be completed, with any
329 open items documented and agreed upon, prior to the system being placed in operation. An
330 optional fourth test, Factory Integration Test (FIT) can also be performed on all or part of the
331 system while at the vendor's factory.

332 Note: Refer to IEC 62337 for the typical sequence of project phases noted in this document.

333 The typical order of execution of these tests is:

334 • The Factory Acceptance Test (FAT) is performed on the automation system, sub-system
335 or component before it leaves the vendor's factory to demonstrate that it functions in
336 accordance with the project specific requirements.

337 • The Factory Integration Test (FIT) is a fourth, optional testing point to demonstrate that
338 the merging of some or all of the various subsystems and components function as
339 specified. This test is performed after or in conjunction with the FAT, before the
340 automation system, sub-system or component leaves the vendor's factory.

341 • The Site Acceptance Test (SAT) is performed after installation on site to demonstrate the
342 automation system, subsystem, or component is in accordance with the applicable
343 standards, codes, specifications, and installation instructions. This test is performed after
344 each sub-system is installed.

345 • The Site Integration Test (SIT) is performed after the SAT to demonstrate that the merging
346 of the various subsystems and components into one overall automation system is
347 complete and that all sub-systems and components work together as specified. This test