

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

**Systèmes d'automatisation dans l'industrie de transformation –
Essais d'acceptation en usine (FAT), essais d'acceptation sur site (SAT) et
essais d'intégration sur site (SIT)**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2024 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or request further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications providing graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications, symboles graphiques et le glossaire. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 500 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 25 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

**Systèmes d'automatisation dans l'industrie de transformation –
Essais d'acceptation en usine (FAT), essais d'acceptation sur site (SAT) et
essais d'intégration sur site (SIT)**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 25.040.40

ISBN 978-2-8322-9418-5

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
1.1 General applicability	9
1.2 Exclusions	9
1.2.1 Prior- and post-test activities	9
1.2.2 Regulated industries	9
1.2.3 Safety instrumented systems	9
1.2.4 Manufacturing execution systems	9
1.2.5 Advanced process control.....	9
1.2.6 Security for industrial automation and control systems.....	9
2 Normative references	10
3 Terms, definitions and abbreviated terms	10
3.1 Terms and definitions.....	10
3.2 Abbreviated terms.....	13
4 Overview of automation system testing.....	13
4.1 General.....	13
4.2 Methods of test performance.....	14
4.3 Project design changes.....	14
4.4 Adapted procedures in the event of modifications to existing systems.....	14
5 Factory acceptance test (FAT).....	15
5.1 General.....	15
5.2 Performance	15
5.3 Pre-FAT activities	15
5.3.1 General	15
5.3.2 Vendor tests	15
5.3.3 Documentation	15
5.3.4 Test plan	16
5.3.5 Test schedule	16
5.4 FAT punch list	17
5.4.1 General	17
5.4.2 Correction	17
5.4.3 Corrections after FAT	17
5.5 Documentation of FAT	18
5.5.1 General	18
5.5.2 FAT report.....	18
5.5.3 FAT final documentation.....	18
5.6 FAT completion.....	18
6 Factory integration test (FIT)	19
6.1 General.....	19
6.2 Performance	19
6.3 Pre-FIT activities.....	19
6.3.1 General	19
6.3.2 Test plan	19
6.3.3 Test schedule	19
6.4 FIT punch list.....	20

6.4.1	General	20
6.4.2	Correction.....	20
6.4.3	Correction after FIT	20
6.5	Documentation of FIT.....	21
6.5.1	General	21
6.5.2	FIT report	21
6.5.3	FIT final documentation	21
6.6	FIT completion.....	21
7	Site acceptance test (SAT).....	21
7.1	Performance	21
7.2	Pre-SAT activities	22
7.2.1	General	22
7.2.2	Test plan	22
7.2.3	Test schedule	23
7.3	SAT punch list	23
7.3.1	General	23
7.3.2	Correction.....	23
7.3.3	Correction after SAT	23
7.4	Documentation of SAT	24
7.4.1	General	24
7.4.2	SAT report.....	24
7.4.3	SAT final documentation.....	24
7.5	SAT completion	24
8	Site integration test (SIT).....	24
8.1	Performance	24
8.2	Pre-SIT activities	25
8.2.1	General	25
8.2.2	Test plan	25
8.2.3	Test schedule	25
8.3	SIT punch list.....	26
8.3.1	General	26
8.3.2	Correction.....	26
8.3.3	Correction after SIT	26
8.4	Documentation of SIT	27
8.4.1	General	27
8.4.2	SIT report.....	27
8.4.3	SIT final documentation	27
8.5	SIT completion.....	27
Annex (informative)	Factory acceptance testing checklist	28
A.1	General.....	28
A.2	Assemble documentation	28
A.2.1	General	28
A.2.2	User requirements specification.....	28
A.2.3	Functional requirements specification	28
A.2.4	Information to vendor.....	29
A.2.5	Vendor documentation.....	29
A.3	Develop a written test plan and specification.....	29
A.3.1	General	29
A.3.2	Documentation	29

A.3.3	Hardware/software inventory	30
A.3.4	Mechanical inspection	30
A.3.5	Wiring and termination inspection	30
A.3.6	Start-up, shut-down and re-start test and general system functions	30
A.3.7	System alarm test.....	31
A.3.8	Hardware redundancy and diagnostics (including fail and changeover of redundant units)	31
A.3.9	Operator interface	31
A.3.10	Engineering workstation functionality	31
A.3.11	User management	32
A.3.12	Network and system security	32
A.3.13	Test I/O to the operator display.....	32
A.3.14	Complete I/O tests.....	33
A.3.15	Bus interfaces.....	33
A.3.16	Intelligent field devices	33
A.3.17	FAT open item.....	33
A.3.18	Test of communication links to subsystems	34
A.3.19	Application programming	34
A.3.20	Check of other system functions	34
A.4	Develop a test schedule	35
A.5	FAT certificate	35
Annex B (informative)	Site acceptance testing checklist	36
B.1	General.....	36
B.2	Develop a written test plan and specification	36
B.2.1	General	36
B.2.2	Documentation	36
B.2.3	Hardware/software inventory	36
B.2.4	Mechanical inspection	36
B.2.5	Wiring and terminal identification.....	37
B.2.6	System energization	37
B.2.7	Hardware redundancy and diagnostics	37
B.2.8	Operator interface	37
B.2.9	Network and system security	37
B.2.10	I/O test	37
B.2.11	Bus interfaces.....	37
B.2.12	Intelligent field devices	37
B.2.13	Application programming	38
B.3	Develop a test schedule	38
B.4	SAT certificate	38
Annex C (informative)	Site integration testing checklist.....	39
C.1	General.....	39
C.2	Develop a written test plan and specification.....	39
C.2.1	General	39
C.2.2	Documentation	39
C.2.3	Visual inspection	39
C.2.4	Communications	39
C.2.5	Operator interface	39
C.2.6	Hardwired I/O	40
C.2.7	Functionality	40

C.3	Develop a test schedule	40
C.4	SIT certificate	40
	Bibliography	41
	Figure 1 – Project phases and E&I testing	14
	Table A.1 – Test schedule	35
	Table B.1 – Test schedule	38
	Table C.1 – Test schedule	40

Currently in preview, click buy full version

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

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. It is an International Standard.

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

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

- a) General re-organization of the standard;
- b) Current technology incorporated;
- c) Optional factory integration test (FIT) added;

- d) Replaced the forms in the annexes with detailed checklists of activities which can be used to develop project-specific test plans; and
- e) Provided additional references to other applicable standards.

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

Draft	Report on voting
65E/1080/FDIS	65E/1092/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.

INTRODUCTION

There is an increasing trend in the process industry to shorten the time period for project execution. At the same time, the complexity of automation systems is being increased due to the number of connected systems and the use of new technologies, for example, wired and wireless field sensor networks.

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

This document provides requirements and guidance on acceptance testing of control system installations, which can lead to a mutual understanding about the scope of activities of each party.

Currently in preview, click buy full version

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.

This document provides 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 specified 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-test 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 document.

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

The user can utilize this document to develop necessary testing for basic checks of a safety system, however, this document does not cover validation of a safety system. 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

Although this document includes a limited number of network checks, it does not cover complete network and system security. IEC 62443 provides requirements for automation and control systems cyber security.