

# 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 pour les procédés industriels – Essais d'acceptation en usine (FAT), essais d'acceptation sur site (SAT) et essais d'intégration sur site (SIT)**

IEC 62381:2006

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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 IEC technical committee 65: Industrial-process measurement and control.

This standard cancels and replaces IEC/PAS 62381 published in 2004. This first edition constitutes a technical revision.

This bilingual version (2013-04) corresponds to the monolingual English version, published in 2006-11.

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

FDIS	Report on voting
65/385/FDIS	65/394/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.

The French version of this standard has not been voted upon.

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

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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

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## 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, fieldbus systems.

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

This standard should lead to an improvement and acceleration of the negotiation phase and to a mutual understanding about the scope of activities of each party

The annexes of this standard contain forms which may be used in the test procedures. Buyers of this standard may copy these forms for their own purposes only in the required amount.

For application in the pharmaceutical or other highly specialized industries, additional guidelines (for example, Good Automated Manufacturing Practice (GAMP)) definitions and stipulations should apply in accordance with existing standards, for example, for GMP Compliance 21 CFR (FDA) and the Standard Operating Procedure of the European Medicines Agency (SOP/INSP/2003).

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

## **1 Scope**

This International Standard defines procedures and specifications for the Factory Acceptance Test (FAT), the Site Acceptance Test (SAT), and the Site Integration Test (SIT). These tests are carried out to prove that the automation system is in accordance with the specification.

Engineering and manufacturing activities prior to these tests are not covered by this standard.

The description of activities described in this standard can be taken as a guideline and adapted to the specific requirements of the process/plant/equipment. A typical sequence of activities and events is shown in Figure 1, their relationship in Figures 2 and 3.

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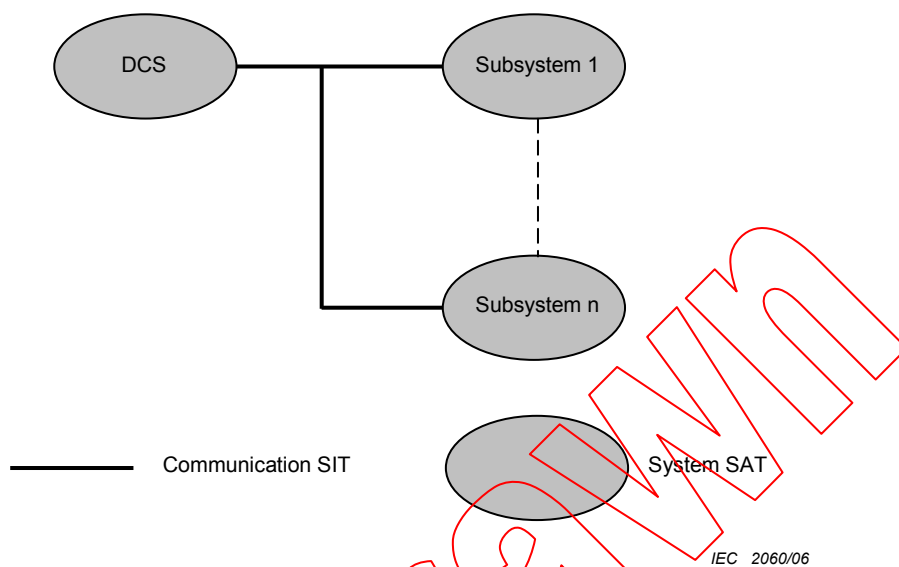
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IEC 2059/06

**Figure 1 – Diagram depicting typical sequence of events for FAT, SAT and SIT with respect to the project milestones**



**Figure 2 – Diagram depicting the relationship for the SAT and SIT between the DCS and subsystems**

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WILSON



**Figure 3 – Diagram depicting the relationship between the FAT, SAT and SIT with the relevant plant levels**

## 2 Terms and definitions

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

### 2.1 automation system

DCS- or PLC-based system for the monitoring and controlling of production facilities in the process industry, including control systems based on fieldbus technologies

### 2.2 tag

unambiguous alphanumeric descriptor which identifies a sensor or actuator

### 2.3 factory acceptance test

activity to demonstrate that the vendor system and additionally supplied systems are in accordance with the specification

### 2.4 site acceptance test

activity to demonstrate that the installation of the various vendor systems are in accordance with the applicable specifications and installation instructions

## 2.5

### **site integration test**

activity to demonstrate that the merging of the various systems to one overall system is completed and that all components work together as specified

## 2.6

### **buyer**

company which is functionally responsible for the automation system purchased from vendor, i.e. either the owner or the contractor

## 2.7

### **owner**

company that hired a contractor to build a chemical plant, petrochemical plant, etc.

## 2.8

### **contractor**

company which is hired by the owner to design and build a chemical plant, petrochemical plant, etc.

NOTE The function of contractor can be fulfilled by the owner.

## 2.9

### **vendor**

manufacturer or distributor of the automation system.

## 2.10

### **process industry**

industry that 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, waste treatment, paper, cement, etc. It does not include such industries as equipment/machine manufacturing or other similar industries. Industries which are subject to special requirements and or validation, etc. are also not included

## 2.11

### **project design specification**

#### **PDS**

document that defines detailed information needed to implement the functionality described in the PFS

## 2.12

### **project functional specification**

#### **PFS**

document that contains the vendor's response to the requirements the buyer stipulated prior to starting the project with the vendor

## 3 Abbreviations

C&E	Cause and effect diagram
DCS	Distributed control system
ESD	Emergency shut-down system
FAT	Factory acceptance testing
FBD	Functional block diagram
FUP	Function plan
HMI	Human machine interface
HW	Hardware

MC	Mechanical completion
PDS	Project design specifications
PFS	Project functional specification
PLC	Programmable logic controller
SAT	Site acceptance test
SIT	Site integration test
SW	Software

#### 4 General preparation before conducting the FAT

Prior to commencing the FAT, the vendor shall complete full in-house testing. Test reports shall be available for inspection.

All relevant documents shall be prepared for use during the FAT. The following list shows documents typically used. The list should be adapted to be specific project.

##### 4.1 Documents typically prepared by OWNER/CONTRACTOR

- Specifications
- Preceding agreement(s)
- Function plans
- Cause and effect diagrams
- Sequential functional charts
- Sketches of operator displays and relevant text
- Control narratives
- Instrument index, for example, TAG – service text – I/O type – scaling – units
- Alarm message list, for example, TAG – type of alarm – sorting criteria (priority, plant area)
- Setpoint, control, effect and safety directions
- Interlock list, for example, interlocks assigned to each sensor/actuator, software (DCS) and hardware (ESD)

##### 4.2 Documents typically prepared by vendor

- System documentation
- Manuals, system data sheets, certificates
- System layout
- Hardware layout
- Description of interfaces
- I/O list and tag name conventions
- Graphic printouts
- Configuration printout
- In-house test reports
- Loop typicals (hardware and software) list of deliveries (hardware, software, application and licenses)
- Test plan

## 5 Factory acceptance test

### 5.1 General

The FAT shall be performed by the vendor. The buyer should witness the test activities. There may be buyers who want to carry out some parts of the FAT themselves. This has to be laid down on a project-related basis.

The FAT shall comprise the following areas:

- project-relevant scope of supply;
- application-related functions of the automation system from signal source;
- system-related functions;
- adequate infrastructure shall be provided by vendor.

The FAT shall be conducted using the checklists given in Annex A.

With respect to the specification, any incomplete work or nonconformances detected during the FAT shall be recorded on a punch list (Annex H).

Punch items will be categorized as follows:

- to be cleared on the spot, FAT to continue after rectification;
- on-going rectification during FAT;
- FAT to be repeated;
- modifications to be made after FAT, before the system is shipped to the site;
- remaining work to be rectified, i.e. at site.

The FAT shall be considered complete when the vendor has successfully proven all necessary functions according to the FAT procedures and specifications, with the exception of the mutually agreed remaining punch-list items.

Upon successful completion of the FAT, authorized representatives of the buyer and the vendor shall sign the FAT certificate (for an example, see Annex D).

### 5.2 FAT test schedule

A test schedule (activities and time-schedule) shall be mutually agreed upon between the buyer and the vendor. The schedule shall include, but is not limited to, the following activities:

Item	Description
1	Start-up meeting (document review, schedule, etc.)
2	Vendor documentation (including in-house test reports) check
3	HW and SW inventory check
4	Mechanical inspection
5	Wiring and termination inspection
6	Start-up test
7	General system functions including hardware redundancy and diagnostic check
8	Visualization/operation
9	Test of functionality against all documents mentioned in Clause 4
10	Complex functionality and operation modes (for example, batch, sequence control)