IEC 62337

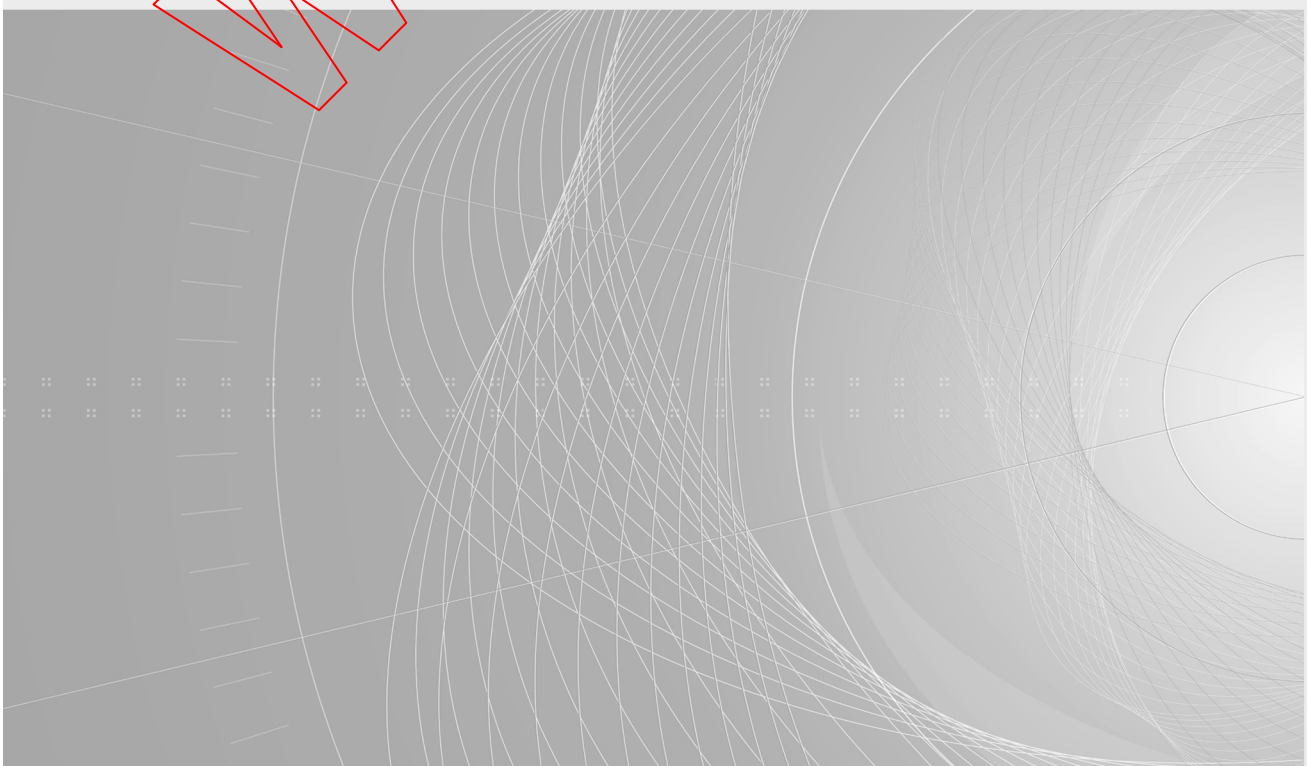
Edition 1.0 2006-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Commissioning of electrical, instrumentation and control systems in the process industry – Specific phases and milestones

Mise en service des systèmes électriques, de mesure et de commande dans l'industrie de transformation – Phases et jalons spécifiques



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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSIONING OF ELECTRICAL, INSTRUMENTATION AND CONTROL SYSTEMS IN THE PROCESS INDUSTRY – SPECIFIC PHASES AND MILESTONES

FOREWORD

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International Standard IEC 62337 has been prepared by IEC technical committee 65: Industrial-process measurement and control.

This standard cancels and replaces IEC/PAS 62337 published in 2002. This first edition constitutes a technical revision.

This bilingual version (2013-05) 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
65/384/FDIS	65/390/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

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- withdrawn,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

INTRODUCTION

There is an increasing trend in the process industry to award the construction of whole plants to contractors on a lump-sum turnkey or similar commercial basis. Experience has shown that both the process industry (hereinafter called “the owner”) and the contractor have long and expensive discussions to lay down unambiguously the scope of activities to be taken by the contractor and the owner and their responsibilities to achieve the handover of the plant.

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.

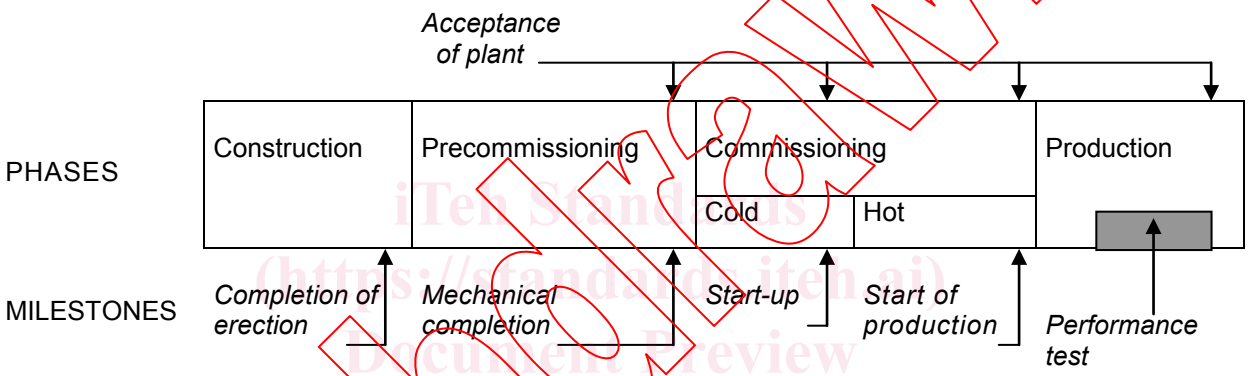
For application in the pharmaceutical or other highly specialized industries, additional guidelines (for example, Good Automated Manufacturing Practice (GAMP)), definitions and stipulations should apply in accordance with existing standards, for example, for GMP Compliance 21 CFR (FDA) and the Standard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

COMMISSIONING OF ELECTRICAL, INSTRUMENTATION AND CONTROL SYSTEMS IN THE PROCESS INDUSTRY – SPECIFIC PHASES AND MILESTONES

1 Scope

This International Standard defines specific phases and milestones (see Figure 1) in the commissioning of electrical, instrumentation and control systems in the process industry. By way of example, it describes activities following the "completion-of-erection" milestone of the project and prior to the "acceptance-of-the-plant" phase by the owner. Such activities need to be adapted for each type of process/plant concerned.

NOTE This standard assumes that the "acceptance-of-the-plant" milestone will occur after the performance test. If there is a reduced scope, this document should be adapted accordingly.



NOTE Construction and precommissioning activities could be overlapping.

Figure 1 – Definition of phases and milestones

2 Terms and definitions

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

2.1
precommissioning
phase during which the activities of non-operating adjustments, cold alignment checks, cleaning, and testing of machinery take place

NOTE Refer to Annex B for the detailed activities.

2.2
mechanical completion
milestone which is achieved when the plant, or any part thereof, has been erected and tested in accordance with drawings, specifications, instructions, and applicable codes and regulations to the extent necessary to permit cold commissioning

NOTE This includes completion of all necessary electrical and instrumentation work. This is a milestone marking the end of the precommissioning activities.

2.3
cold commissioning
phase during which the activities associated with the testing and operation of equipment or facilities using test media such as water or inert substances, prior to introducing any chemical in the system, take place

2.4
start-up
milestone marking the end of cold commissioning

NOTE At this stage, the operating range of every instrument loop should already be adjusted to reflect the actual working condition.

2.5
hot commissioning
phase during which the activities associated with the testing and operation of equipment or facilities using the actual process chemical, prior to making an actual production run, take place

2.6
start of production
milestone marking the end of hot commissioning

NOTE At this stage, the plant is ready for full and continuous operation.

2.7
performance test
milestone at which time the production plant runs to its design capacity

NOTE This test, carried out by the owner's personnel with the help and supervision of the contractor, serves to demonstrate the contractor's process performance and consumption guarantees as specified in the contract.

2.8
acceptance of plant
milestone in which the formal turnover of the plant from the contractor to the owner is carried out

NOTE At this stage, the contractor is relieved from any obligation, with the exception of defect liability and any other outstanding obligations which are part of the contract. The owner resumes full responsibility for running and maintaining the plant.

2.9
owner
company that hired a contractor to build a plant

2.10
contractor
company which is hired by the owner to design and build a plant

NOTE This company is responsible for all activities as described in a separate contract including, for example, the engineering design, procurement, erection of the plant as well as the implementation of all tests and acceptances that are necessary to deliver a serviceable plant. This company may also be responsible for training the owner's production as well as maintenance personnel on plant operation.

2.11
licenser
company or individual that has a process know-how which willingly provides the owner with the technology to be used in the construction, operation and maintenance of a plant, or part of the process in such a plant

2.12
vendor
manufacturer or distributor of a piece of equipment/instrument/package unit

NOTE The vendor is the expert for proper installation as well as operation of the equipment/ instrument/ package unit.

2.13
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

3 General preparations before acceptance of plant

The following items shall be completed in accordance with the responsibilities as defined within the contract.

a) Documents

The documents agreed upon according to Clause A.1 shall be issued by the contractor to the owner.

b) Manpower mobilization plan

The agreed amount of manpower required both from the owner and from the contractor, including their qualification and their availability, shall be available. The organization of personnel during precommissioning, commissioning and performance testing shall be established.

c) Equipment and tools

The agreed required tools and equipment to be supplied by the owner or the contractor shall be available.

d) Raw materials and utilities

For the agreed supply of raw materials and utilities, the contractor and the owner shall agree upon a detailed time schedule and the conditions for supply within a reasonable time before the completion of erection.

e) Catalysts and consumables

For the agreed supply of required catalysts, lubricants, chemicals and other consumables, the contractor and the owner shall agree upon a detailed time schedule and conditions within a reasonable time before the completion of erection.

4 Completion of erection

4.1 Mechanical checks and tests

After erection of the plant, of each piece of equipment, facility or discrete part of the plant, mechanical checks and tests shall be carried out by the contractor.

The mechanical checks and tests shall verify that

a) the plant is erected in accordance with the piping and instrument diagram, construction drawings and the vendor's drawings;

b) the equipment is installed and mechanically functions in accordance with the project specifications;

c) applicable codes, as listed in the project specifications, are followed for materials and workmanship.

Items such as painting, thermal insulation and final clean-up which would not affect the operation or safety of the plant could be excluded. All these items shall be listed and completed after precommissioning or commissioning within a mutually agreed schedule between the contractor and the owner but before the acceptance of the plant.

4.2 Procedure

The following shall apply.

a) The contractor shall prepare and maintain on-site test forms and records which shall include the following information:
   - description of the type of test or check;
   - date and time of test or check;
   - identification of equipment and facilities;
   - test pressure if applicable, test data and results, including remarks, if any;
   - signature of the owner's personnel witnessing the data recorded, if required.

b) Check, test and records thereof shall be carried out by the contractor's personnel.

   Wherever the owner's witness or attesting for the check or test is required, the owner's personnel shall attend such check and test. For this purpose, the contractor shall keep the owner informed of the day-to-day test-plan schedule. The test-plan schedule should be constantly revised to reflect the actual progress of the work and test.

c) Any items found incomplete or requiring repair or adjustment shall be marked as such on a separate punch list and reported by the contractor to the owner's and the contractor's personnel in charge of the relevant construction area. The test records for items in the punch list will be left blank until the problem has been corrected.

d) The contractor shall expedite and follow up the termination of all incomplete, repaired or adjusted work items in the punch list and shall keep these expediting records up to date.

e) Checking procedures shall be repeated until all the items on the checklist are cleared.

f) At the completion of each test, the owner shall certify on the test records that the test has been satisfactory; otherwise, the contractor shall repeat the tests. Upon satisfactory completion of the re-test, re-certification by the owner shall be made accordingly.

g) A complete set of test records shall be handed over to the owner on completion and, at this date, the completion of the erection shall be considered as achieved.

5 Precommissioning (mechanical completion)

5.1 General

After completion of the erection, the precommissioning activities listed in the procedure defined in Annex B and the final steps listed in 5.2 shall be carried out in accordance with the contract to make the plant mechanically complete and ready for commissioning.

The documents to be utilized are listed in Annex A.

5.2 Procedure

a) The contractor's personnel responsible for the checks, tests and recording of results on the completion of erection shall be responsible for the completion of any remaining work, adjustments and repairs of the equipment marked on the test records during precommissioning and for the maintenance of appropriate records.

b) The contractor's personnel appointed for commissioning should also participate in the precommissioning work to verify the satisfactory performance of the plant.

c) During the checks and tests, the contractor's personnel are responsible for training the owner's personnel on the operation of the plant, as defined within the contract.

d) The owner or the contractor shall furnish operating and maintenance personnel, according to the manpower mobilization plan, to perform those parts of the precommissioning work, which are agreed to be the owner's responsibility in accordance with Annex D.

e) The contractor shall ensure that his personnel work in close conjunction with the owner's personnel by providing supervision and advice where necessary.

f) The contractor shall prepare detailed procedures for each precommissioning activity listed in Annex B. Procedures shall be updated or added by the contractor as necessary to support any additional work.

g) Mechanical completion shall be confirmed on each part/section/unit/facility of the plant individually.

h) A detailed schedule for the precommissioning of each part/section/unit/facility shall be submitted by the contractor to the owner before completion of the erection.

i) Upon completion of the precommissioning activities of each part/section/unit/facility of the plant, the contractor shall submit to the owner a written notice of mechanical completion, which shall include

   – identity of a part/section/unit/facility of the plant considered mechanically complete;
   – a copy of all relevant completed test reports;
   – the date on which the completion of the tests was achieved;
   – a checklist;
   – a request for acceptance of a mechanical completion certificate in respect of that part/section/unit/facility.

j) Within an agreed period from the date of receipt of the contractor's written notice, the owner shall

   – in the case of acceptance:

     sign the issued mechanical completion certificate similar to the form given in Annex C;

     or

   – in the case of objection:

     submit a rejection statement listing the remaining items to be completed or defects or deficiencies to be corrected before the mechanical completion status can be accepted.

k) When the owner rejects the contractor's notice, the contractor shall take any necessary action to complete or correct the items marked and give the owner a subsequent notice of mechanical completion.

l) The owner shall sign either a completion certificate or shall issue a rejection statement within an agreed period after the date of any subsequent notice of mechanical completion.

m) Upon acceptance of the mechanical completion certificate of the last part/section/ unit/facility of the plant by the owner, the owner shall, within an agreed period, accept the relevant issued mechanical completion certificate for the plant similar to the form given in Annex C.

6 Commissioning

6.1 General

After the owner has issued a mechanical completion certificate for a part/section/ unit/facility of the plant, the commissioning activities listed in 6.2 shall be carried out as far as possible to enable the start-up and/or start of production.

The documents to be used are listed in Annex A.

6.2 Procedure

a) Commissioning shall be carried out in the following sequence:

   – warming up or cooling down;
   – initial running using test media such as water or other inert substances;

- operability adjustment;
- feeding in;
- stable operation;
- loading up to the design capacity;
- final adjustment.

b) At all stages of the commissioning sequence, the plant shall be operated at optimum and in safe plant conditions. To ensure this, the contractor may make adjustments to the condition indicated in the operating manual and process flow diagrams as necessary.

c) The contractor shall specify for each discrete part of the plant the operational data to be recorded and the manner in which the data is to be taken.

d) All the operating data shall be recorded by the owner on the predefined forms to be mutually agreed upon. A copy of the operating log and analytical data from the initial operation through to the completion of the performance test shall be made available by the owner to the contractor for evaluation.

e) When any part of the plant is pressurized or placed in hot alignment, regular checking on thermal expansion, vibration, noise and the like shall be performed by the contractor.

f) The detailed methods and procedures for each of the commissioning tests and operations shall be specified by the contractor in the operating manual or issued to the owner as additional work procedures.

g) The contractor shall arrange for the presence of the vendor's and the licenser's representatives at the site to assist the contractor's personnel, wherever necessary.

h) The contractor's construction personnel appointed for precommissioning should remain on site to carry out any necessary adjustment and remedial work.

i) All changes and modifications applied during commissioning shall be documented.

7 Performance test and acceptance of plant

7.1 General

After the initial operation of the plant, a performance test shall be carried out to demonstrate the contractor's process performance and consumption guarantees specified in the contract.

a) Detailed test procedure

The contractor shall propose detailed performance test procedures within an agreed period of time and the contractor and the owner shall agree upon the test procedures prior to starting the performance test based on the test procedure specified in the contract.

b) Type of operation

Unless otherwise specified in the contract, the performance test will be limited to one type of operation, raw material and one operation mode.

c) Measurement

The instrument, apparatus and method of measuring of the quantity and quality of individual media, consumption, etc. should be specified and used to measure such streams in relation to the process performance and consumption guarantees based on the measurement specifications described in the contract.

The measurement tolerances, loss corrections, performance for sampling methods and analytical procedures shall be specified on a project-related basis.

d) Performance test schedule

The performance test schedule shall be determined with due regard to the actual progress of the work and the condition of the plant.

7.2 Conditions for commencement of performance test

The performance test will be commenced when the following conditions are satisfied from the viewpoint of the process design requirements.

a) Plant operation

The plant shall be operated at the normal operating conditions shown on the applicable flow diagrams and in the operating manual.

Minor variations from the conditions indicated on the flow diagrams and in the operating manual to obtain optimum process performance shall be agreed upon by the owner.

b) Instruments

Verify that all plant instruments and analytical apparatus perform as expected.

c) Supply of raw materials and utilities by the owner or the contractor

The plant is supplied with adequate and uninterrupted supplies of raw materials and utilities by the owner as required at the battery limit conditions to permit a successful performance test to be completed.

d) Supply of catalysts, lubricants and chemicals by the contractor or the owner

The plant is supplied with adequate and timely supplies of catalysts, lubricants, chemicals and other consumables to permit a successful performance test to be completed.

e) Transfer of products and waste

The owner shall be responsible for the safe transfer of the plant products and waste from the battery limit of the plant.

h) Other conditions

Any other conditions necessary for the commencement of the performance test as agreed between the owner and the contractor shall be satisfied.

7.3 Execution of performance test

a) Notice of readiness to carry out performance test

When the contractor considers that the plant is ready for the performance test and that all of the conditions stated in 7.2 have been fulfilled, he shall then give the owner a notice of readiness to carry out the performance test.

Within a predefined period of the receipt of such notice, the owner shall

– acknowledge that the plant is ready for the performance test to be conducted;

or

– submit to the contractor a written statement setting forth in which respects the plant is not ready for such a test.

If the owner considers that the plant is not ready, then he shall specify in writing the conditions preventing the start of the performance test. The party responsible for such conditions shall rectify the problem.

The performance test shall be commenced as soon as the above conditions are corrected.

b) Performance test run

The performance test shall extend continuously over a period specified in the contract.

c) Two or more units

Where the plant includes two or more individual process units for which separate process performance and consumption guarantees are to be demonstrated, a performance test or tests may be carried out individually on each of the units or simultaneously with any other unit or units.

d) Operating data

Operating and analytical data recorded during the performance test shall be documented by the owner and made available to the contractor for evaluation as stated in 7.4.