

# TECHNICAL SPECIFICATION



**Industrial process control systems – Guideline for evaluating process control systems –  
Part 1: Specifications**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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# INTERNATIONAL ELECTROTECHNICAL COMMISSION

## INDUSTRIAL PROCESS CONTROL SYSTEMS – GUIDELINE FOR EVALUATING PROCESS CONTROL SYSTEMS –

### Part 1: Specifications

#### FOREWORD

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- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62603-1, which is a technical specification, has been prepared by subcommittee 65B: Measurement and control devices, of IEC technical committee 65: Industrial-process measurement, control and automation.

The text of this technical specification is based on the following documents:

|               |                  |
|---------------|------------------|
| Enquiry draft | Report on voting |
| 65B/875/DTS   | 65B/905/RVC      |

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

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

A list of all parts in the IEC 62603 series, published under the general title *Industrial process control systems – Guideline for evaluating process control systems*, can be found on the IEC website.

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

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## INTRODUCTION

This International Technical Specification defines a procedure for verifying if a given Process Control System (PCS) satisfies the technical requirements specified by the end-user or by an engineering company for a specific application. The basic concept of this document is that “you can test what you have specified”. A testing procedure is meaningless if it does not include a procedure for specifying the technical requirements to be tested.

This Technical Specification was developed in the framework of the existing standards that define the general concepts of PCS design and testing, that is:

- IEC 61069     Industrial process measurement and control – Evaluation of system properties for the purpose of system assessment – Parts 1,2,3,4,5,6,7,8
- IEC 62381     Automation systems in the process industry – Factory acceptance test (FAT), site acceptance test (SAT), and site integration test (SIT)

The group of standards 61069 defines the general methodology, definitions, and procedures for assessing the functional characteristics of a PCS (Part 1 and 2) in terms of functionalities (Part 3), performances (Part 4), dependability (Part 5), operability (Part 6), safety (Part 7), and non-task-related properties (Part 8). IEC 62381 gives additional details about the general procedures for testing a PCS in factory, on site, and after the general integration of the complete system.

The IEC 62603 fully complies with these standards and gives a detailed guidance for specifying a PCS and for testing the specified functions. IEC 61069 and 62381 create a framework that is valid for any PCS as a system, while 62603, inside this framework, gives the users guidance for specifying the PCS he needs for carrying out the required functions.



# **INDUSTRIAL PROCESS CONTROL SYSTEMS – GUIDELINE FOR EVALUATING PROCESS CONTROL SYSTEMS –**

## **Part 1: Specifications**

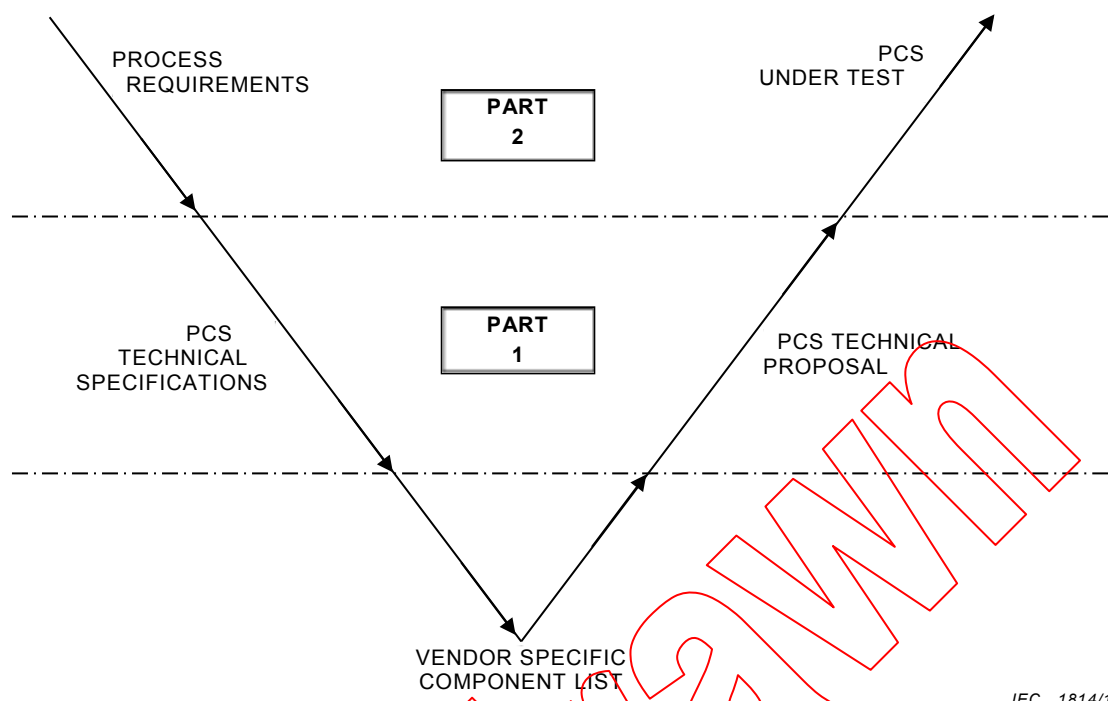
### **1 Scope**

This International Technical Specification describes methods and provides guidance for the evaluation of Process Control Systems (PCS) during the phase of selection between different proposals.

The methods of evaluation proposed in this technical specification are intended for use mainly by users, engineering companies, or independent test laboratories, to verify manufacturers' proposals during the tender (as described in IEC 62603-1) or the provided Process Control System during the FAT procedure.

The specification and test procedures specified in this technical specification apply to a large variety of automation systems, both based on conventional technology (e.g. 4 mA to 20 mA field devices) and based on Intelligent Field Devices (IFD) with serial communication of any kind. For this reason, the tests specified in this technical specification are not necessarily sufficient for automation systems specifically designed for special duties. In such cases, user and manufacturer should define additional tests for assessing specific functions or performances.

The procedure for specifying the PCS technical requirements, evaluating the different offers, and carrying out the tests on the chosen PCS differs from one company to another and from one project to another, but some common steps exist, as Figure 1 shows. The IEC 62603 considers this process divided into two steps: definition of the PCS technical requirements (in the scope of IEC 62603-1) and test of the chosen PCS.



**Figure 1 – Procedure for specifying and testing a PCS**

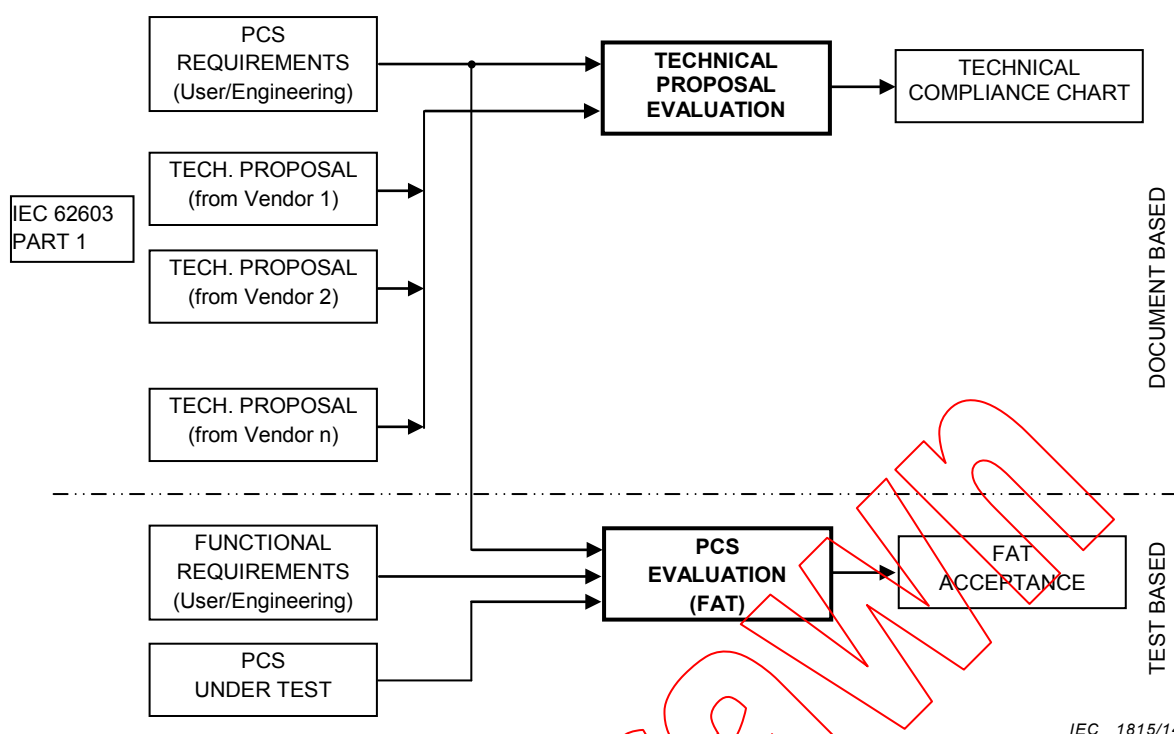
The first step of the specification of a PCS is to define the process requirements, in terms of required performances to achieve a satisfactory control of the process. Normally these requirements are defined with a joint effort of process engineers, automation, and instrumentation experts. From the process requirements, the automation engineers derive the PCS technical requirements, that is the functionalities the PCS should offer to achieve the required goals. Based on the process requirements and the PCS technical requirements, suppliers prepare their technical offers, and the evaluation procedure starts. IEC 62603-1 suggests a possible procedure for assessing the fitness of a proposed PCS to the specifications, based on a simple algorithm that considers the weight (importance) of each single required function.

After the selection of the PCS maker, the implementation stage starts. When the PCS is ready, prior to shipping the PCS on site and sometimes even during the implementation stage, the user/engineer may perform a set of Factory Acceptance Tests.

The technical evaluation of the tenders (IEC 62603-1) is mostly based on the evaluation of documents and data-sheets, and it may require simple calculations, e.g. for performance calculation. These verifications are based on general data of the proposed automation systems, not dedicated to any specific piece of hardware or software.

On the contrary, the FAT is mostly based on testing activities in laboratories or factories on a specific PCS including both the physical devices and the application software.

Figure 2 shows the typical process of PCS evaluation in an automation project.



IEC 1815/14

**Figure 2 – The process of PCS evaluation**

The first evaluation is needed to select one supplier from a number of proposals. The reference document is the PCS technical requirements provided by the user or by a delegated engineering company. Scope of the evaluation at this stage is to verify if the proposed systems support the specified functions and performances. Evaluation is mostly based on the documents supplied by the supplier, such as technical data-sheets, manuals, conformity declarations, and so on. The PCS technical requirements should include the description of the required FAT procedure.

After the supplier's selection, the detailed engineering stage starts, and the user (or the delegated engineering company) produces a document that describes the software requirements in details. The PCS supplier assembles the PCS and implements the logic. After the completion of in-house tests, the Factory Acceptance Tests starts.

Several aspects of process control systems are in the scope of existing IEC standards that are to be considered together with the present document. This technical specification reports abstracts of the cited IEC standards based on the revisions available at the date of submission. Users should consult the most recent versions of the referenced standards for the actual requirements.

## 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 60038:2009, *IEC standard voltages*

IEC 60050 (all parts), *International Electrotechnical Vocabulary* (available at <<http://www.electropedia.org>>)

IEC 60079-10, *Electrical apparatus for explosive gas atmospheres – Part 10: Classification of hazardous areas*<sup>1</sup>

IEC 60079-10-1, *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*

IEC 60079-10-2, *Explosive atmospheres – Part 10-2: Classification of areas – Combustible dust atmospheres*

IEC 60079-11, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"*

IEC 60079-14, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*

IEC 60300-3-4, *Dependability management – Part 3-4: Application guide – Guide to the specification of dependability requirements*

IEC 60654-1, *Industrial-process measurement and control equipment – Operating conditions – Part 1: Climatic conditions*

IEC 60654-2, *Operating conditions for industrial-process measurement and control equipment – Part 2: Power*

IEC 60654-3, *Operating conditions for industrial-process measurement and control equipment – Part 3: Mechanical influences*

IEC 60654-4, *Operating conditions for industrial-process measurement and control equipment – Part 4: Corrosive and erosive influences*

IEC 60721-3-1, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 1: Storage*

IEC 60721-3-2, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 2: Transportation*

IEC 60721-3-3, *Classification of environmental conditions – Part 3-3: Classification of groups of environmental parameters and their severities – Stationary use at weatherprotected locations*

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<sup>1</sup> Withdrawn.

IEC 60721-3-4, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 4: Stationary use at non-weatherprotected locations*

IEC 60848, *GRAFCET specification language for sequential function charts*

IEC 60870-4, *Telecontrol equipment and systems – Part 4: Performance requirements*

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61000-4-9, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 9: Pulse magnetic field immunity test. Basic EMC Publication*

IEC 61000-4-10, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 10: Damped oscillatory magnetic field immunity test. Basic EMC Publication*

IEC 61000-4-11, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

IEC 61025, *Fault tree analysis (FTA)*

IEC 61069-1, *Industrial-process measurement and control – Evaluation of system properties for the purpose of system assessment – Part 1: General considerations and methodology*

IEC 61069-4, *Industrial-process measurement and control – Evaluation of system properties for the purpose of system assessment – Part 4: Assessment of system performance*

IEC 61069-5, *Industrial-process measurement and control – Evaluation of system properties for the purpose of system assessment – Part 5: Assessment of system dependability*

IEC 61069-6, *Industrial-process measurement and control – Evaluation of system properties for the purpose of system assessment – Part 6: Assessment of system operability*

IEC 61069-7, *Industrial-process measurement and control – Evaluation of system properties for the purpose of system assessment – Part 7: Assessment of system safety*

IEC 61069-8, *Industrial-process measurement and control – Evaluation of system properties for the purpose of system assessment – Part 8: Assessment of non-task-related system properties*

IEC 61078, *Analysis techniques for dependability – Reliability block diagram and boolean methods*

IEC 61131-2, *Programmable controllers – Part 2: Equipment requirements and tests*

IEC 61131-3, *Programmable controllers – Part 3: Programming languages*

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61158 (all parts), *Industrial communication networks – Fieldbus specifications*

IEC 61158-2, *Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition*

IEC 61326-1, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 61511 (all parts), *Functional safety – Safety instrumented systems for the process industry sector*

IEC 61512 (all parts), *Batch control*

IEC 61784 (all parts), *Industrial communication networks – Profiles*

IEC 62305-1, *Protection against lightning – Part 1: General principles*

IEC TR 62380, *Reliability data handbook – Universal model for reliability prediction of electronics components, PCBs and equipment*

IEC 62381, *Automation systems in the process industry – Factory acceptance test (FAT), site acceptance test (SAT), site integration test (SIT)*

IEC 62347, *Guidance on system dependability specifications*

IEC 62443-2-1, *Industrial communication networks – Network and system security – Part 2-1: Establishing an industrial automation and control system security program*

IEC 62443-3-3, *Industrial communication networks – Network and system security – Part 3-3: System security requirements and security levels*

ISO/IEC 14764:2006, *Software Engineering – Software Life Cycle Processes – Maintenance*

IEEE 802 (all parts), *IEEE Standards for Local and Metropolitan Area Networks*

ISA 18.1-1979 (R1992), *Annunciator sequences and specifications*

ISA 18.2-2009, *Management of alarm systems for the process industries*

ISA 37.1-1975 (R1982), *Electrical transducer nomenclature and terminology*

ISA S88 (all parts), *Batch Control*

Withdrawn