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IEC
PAS 62382

Pre-Standard

First edition
2004-01

**Electrical and instrumentation
loop check**

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Reference number
IEC/PAS 62382:2004(E)

Publication numbering

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

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For price, see current catalogue

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL AND INSTRUMENTATION LOOP CHECK

FOREWORD

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A PAS is a technical specification not fulfilling the requirements for a standard but made available to the public.

IEC-PAS 62382 has been processed by IEC technical committee 65: Industrial-process measurement and control.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
65/310/PAS	65/323/RVD

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned will transform it into an International Standard.

INTRODUCTION

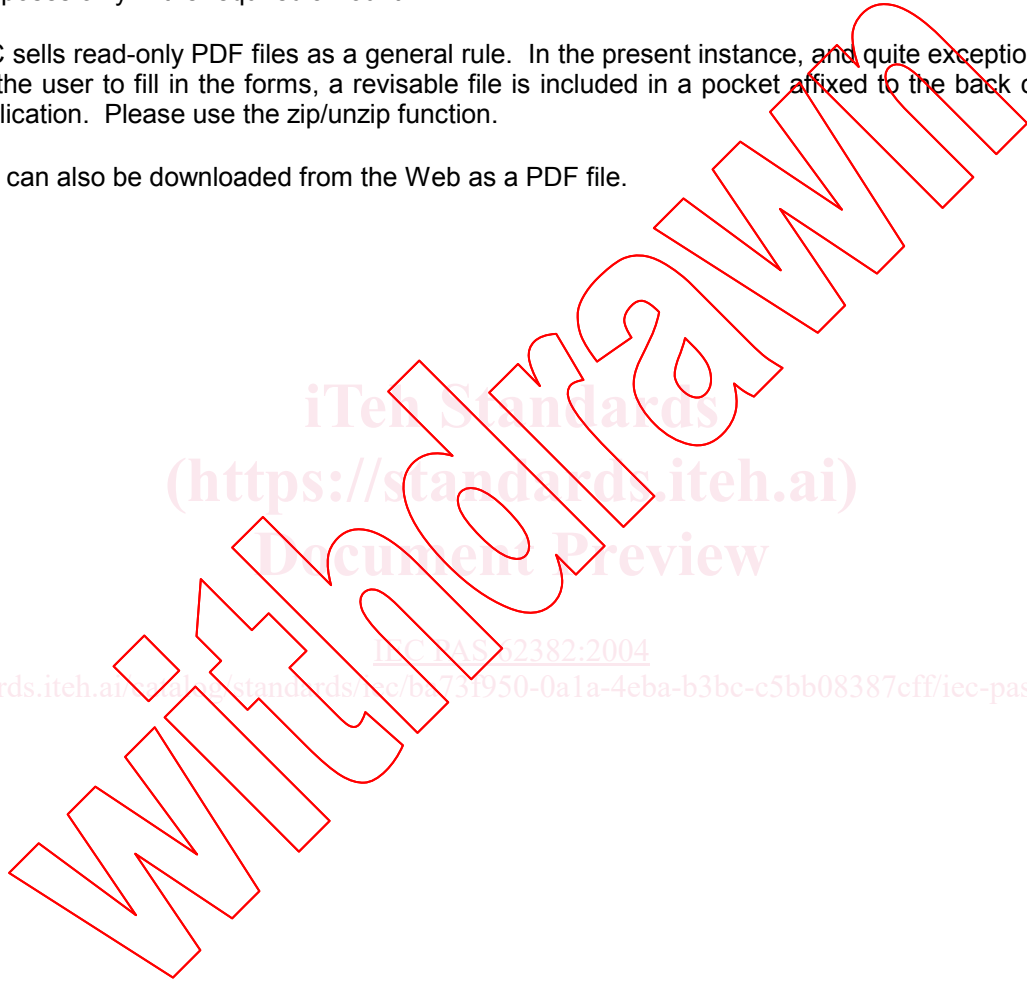
The inspection and verification of the individual measurements and controls in conjunction with the control systems used to monitor these devices (DCS, PLC, etc.) is referred to as the loop check. In industry, numerous methods and philosophies are used to check the instrumentation and controls after the mechanical installation within projects for modified or new facilities.

This document was created to provide a better understanding of what the loop check consists of and also to provide a standard methodology for executing the loop check.

The annexes of this document contain forms which may be used in the check procedures. They are attached to this publication in Excel format. Buyers of this publication may copy these forms for their own purposes only in the required amount.

The IEC sells read-only PDF files as a general rule. In the present instance, and quite exceptionally, to enable the user to fill in the forms, a revisable file is included in a pocket affixed to the back cover of this publication. Please use the zip/unzip function.

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ELECTRICAL AND INSTRUMENTATION LOOP CHECK

1 Scope

This document describes the recommended steps to complete a loop check which comprises the activities between the completion of loop construction (including installation and point-to-point checks) and the start-up of the cold commissioning. This document is applicable for the construction of new plants and for expansion/retrofits (i.e. revamping) of E&I installations in existing plants (including PLC, BAS, DCS, Panel-mounted and field instrumentation). It does not include a detailed checkout of power distribution systems except as they relate to the loops being checked (i. e. a motor starter or a power supply to a 4-wire transmitter).

2 Definitions

For the purposes of this document the following definitions apply.

2.1

precommissioning

phase, during which the activities of non-operating adjustments, cold alignment checks, cleaning, and testing of machinery take place (see annexes)

2.2

mechanical completion

milestone, which is achieved ("mechanically complete") 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. 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. At this stage the operating range of every instrument loop is 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 at which stage the plant is ready for full and continuous operation

2.7

performance test

milestone at which time the owner's personnel run the production plant, with the help and supervision of the contractor, to its design capacity. This test is to demonstrate the contractor's process performance 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

2.9

basic software

the software which, at a minimum, contains the graphic faceplates, base level alarms and switch points, basic interlocking and analogue control. In the case of safety loops, any safety switch point should be included if it is not in the basic database

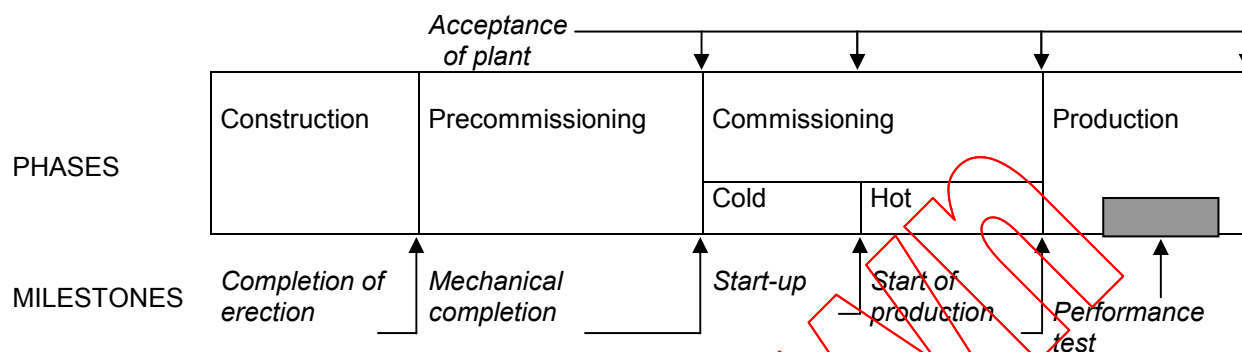
3 Abbreviations

BAS	Building automation systems
C&E	Cause and Effect Diagram
DCS	Distributed control system
E&I	Electrical & instrumentation
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 Order of loop check and cold commissioning in the project schedule

The loop checks will ideally occur in the "precommissioning" phase of the schedule depicted below.

However, normal occurrence is that the loop checks begin when any specific loop is completed and turned over to the checkout crew even when during the "construction" phase. The loop check could substantially overlap the "construction" phase.



NOTE Construction and precommissioning activities could be overlapping.

Figure 1 – Definition of phases and milestones

A loop check

- follows the E&I construction phase and FAT of the DCS in a project;
- is the last systematic check before mechanical completion to assure that
 - all E&I documents (loop sheets, etc.) are available and correspond to their latest revision;
 - all instrumentation and equipment is delivered according to the design specifications;
 - installation has occurred in accordance to engineering documents, applicable codes and local regulations;
 - loop functionality is correct.

This provides

- in a project, the quality check for E&I engineering, procurement and installation;
- the base for the commissioning phase which consists of
 - cold commissioning: phase during which functional testing of equipment and facilities, using test media such as water or inert substances, takes place;
 - hot commissioning (chemical start-up): phase during which activities associated with testing and operation of equipment using the actual process chemicals (initial start up of process) are performed;

The main activities in the cold and hot commissioning phases are system verification, tuning of loops and instruments and control schemes.

5 Loop Check Content

5.1 Included activities

A loop check includes the following elements of a "single loop" (sensor and/or actuator).

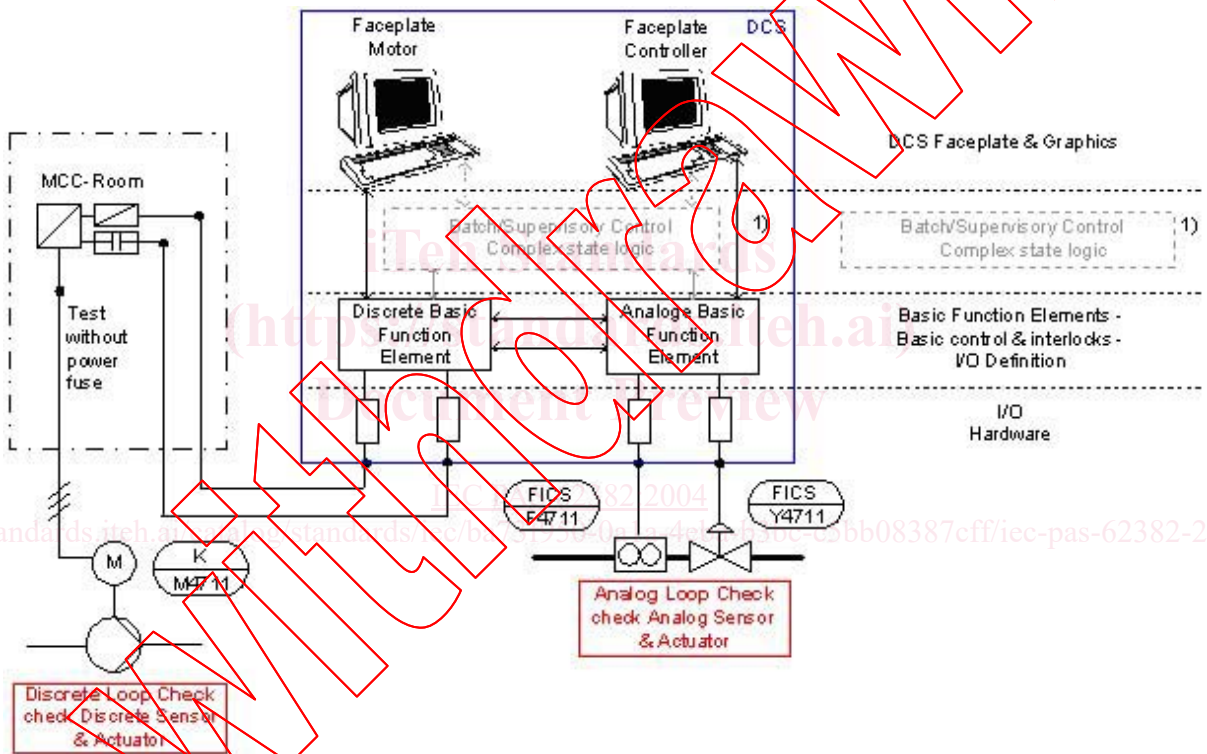
- Hardware components:
 - the installed instruments or components in the field;
 - the equipment in E&I rooms;
 - hard wired functionality between sensor and actuator loops.
 - the input/output cards of process control systems.

- The basic software components (including the graphic faceplates, base level alarms and switch points, basic interlocking and basic analogue control) to test the field elements. The loop check uses the basic graphics/faceplates of the control system (see Figure 2)

In the case of safety loops, all safety switch points should be included if they are not in the basic database.

The actual loop check involves three phases:

- Documentation checkout**
Check for the completeness and consistency of loop documents, including any documents from the installation or FAT.
- Visual inspection** of loop devices for correct installation and labelling.
- Function check** using a testing device to exercise all components of the loop (including hardware, wiring and software) to check that all the components function correctly and that the DCS or panel readouts are accurate.



¹⁾ The check of Operational configuration is completed during cold commissioning or hot commissioning.

Figure 2 – Loop Check