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IEEE Standard Specifications for Maintenance and Test of Distributed Control Systems in Thermal Power Stations: General Requirements and Definitions

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Corporate Advisory Group
of the
IEEE Standards Association

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Abstract: The technical and managerial requirements for operational maintenance, repair, and tests of distributed control systems (DCSs) in power stations are specified. This standard is applicable to the operational maintenance, repair, and tests of DCSs in conventional thermal power stations after commencement of commercial operation.

Keywords: DCS, distributed control system, fault handling, I&C, IEEE 1865™, instrument and control, maintenance, operation service, repair, scheduled maintenance, technical management, test, thermal power plant

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Introduction

This introduction is not part of IEEE Std 1865™-2019, IEEE Standard Specifications for Maintenance and Test of Distributed Control Systems in Thermal Power Stations: General Requirements and Definitions.

Distributed control systems (DCSs) are in wide use today for monitoring and control of power generating units and their auxiliary systems. However, there are several factors—for example, quality of DCSs, the technical and managerial problems or potential risks involving design and configuration, factory acceptance test, installation and commissioning, operation, maintenance, and test process of DCSs—that may directly or indirectly affect the safe, reliable, and economical operation of power generating units.

The safe, reliable, and economical operation of the DCS are based on proper design and configuration, quality of installation and commissioning, and supported by effective maintenance and technical management. To assure long-term safe, stable, and reliable operation of DCS, it is necessary to exercise effective management and control throughout design and configuration, maintenance, test and routine service, and to exercise comprehensive management of safety related external equipment, and their storage and operating environment and conditions.

Therefore, standards were developed based on the summarization of experiences and expertise and lessons learned from the operational maintenance, repair, test, troubleshooting, and technical management to serve as an international technical and management standard. The related standards are:

IEEE Std 1865: General requirements and definitions

This standard specifies the basic requirements for operational maintenance, repair, and test of DCSs in power stations, and defines the applicable terms. It mainly covers:

- Overview, including maintenance and life cycle of DCS
- Basic requirements, including maintenance principle, planning, procedure and documentation, maintenance personnel, special tools and devices, and records
- Repair and test of control system, including general provisions for repair, requirements for basic repair, and overall repair of DCS, test purpose, determination of test items and cycle, classification of tests, basic requirements for tests, and relevant requirements for test acceptance
- Operation, maintenance, management, and assessment of control system, including basic requirements for operational maintenance, requirements for routine and periodic maintenance and shutdown of control system, basic requirements for control system management, requirements for setting management, performance management, safety management, fault and defect management, risk control, materials plan development management, spare parts management, technical data management, outsourcing management, assessment method, and handling of assessed problems

IEEE Std 1865.1™: Maintenance and testing

This standard specifies the basic principle of repair and testing, test performance indicators, and technical requirements for repair acceptance of DCSs. It mainly covers:

- Basic repair items and technical requirements
- Basic test items and technical requirements
- Technical requirements for functional repair and testing of monitoring systems

— Technical requirements for repair

— Testing of common systems and circuits, and repair and test acceptance

IEEE Std 1865.1 deals with the basic repair items and quality requirements that are intended to provide the basis for restoring and confirming the quality of control system and equipment, minimizing the omissions in repair and maintenance, and improving the reliability of the instrument and control (I&C) system.

IEEE Std 1865.1 also covers the technical criteria, test items, methods of the system, as well as the quality acceptance criteria and the post-repair acceptance items and criteria.

IEEE Std 1865.2™: Operation service and management

This standard specifies the basic principle of operation service, test performance indicators, and technical requirements of operation, maintenance, and test of DCSs. It mainly covers:

— Environment of DCS

— Operation and test of DCS

— Maintenance of DCS technical management of DCS

— Technical requirements and technical assessment of DCS

— The basic items, methods, and technical requirements of scheduled maintenance

The clauses about scheduled maintenance describe the basic items, methods, and technical requirements of periodic maintenance. The clauses about emergency handling and management of faults describe the development procedure and structure of emergency plans, general requirements, and basic principles to be followed for emergency handling of faults, and handling procedures in case of faults. Clauses about management requirements cover the technical requirements for repair and operation management, software/hardware and upgrade management, storage and management of spare parts, and software/hardware reliability management of control systems.

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IEEE Standard Specifications for Maintenance and Test of Distributed Control Systems in Thermal Power Stations: General Requirements and Definitions

1. Overview

1.1 Scope

This standard specifies the technical and managerial requirements for operational maintenance, repair, and tests of distributed control systems (DCSs) in power stations.

This standard is applicable to the operational maintenance, repair, and tests of DCSs in conventional thermal power stations after commencement of commercial operation.

IEEE Std 1865™ specifies the general requirements applicable to all standards in the IEEE 1865 series. IEEE Std 1865.1™ and IEEE Std 1865.2™ concentrate on more specific topics.

IEEE Std 1865.1 provides detailed requirements for the repair and test of DCSs, including items, methods, and procedures.

IEEE Std 1865.2 provides detailed requirements for the operational maintenance and management of DCSs, including items, methods, and procedures.

1.2 Purpose

This standard is intended to help maintain good conditions and reliable operation of DCS by providing technical and managerial requirements for the repair, test, and operational maintenance, based on proven engineering philosophy, methods, procedures, and field experiences with DCS of different brands. It aims to:

a) Specify requirements for inspection and maintenance of DCS hardware/software; checking and testing system performance, basic application functions, and monitoring and control functions; and their respective acceptance

b) Specify requirements for day-to-day management, periodic maintenance, and the procedures to deal with DCS hardware/software failure