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Industrial Control Apparatus (Revised)



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Development of the Standards of the American Institute of Electrical Engineers

Recognizing the importance in the development of electrical engineering, of standardization in the electrical field, the A. I. E. E. in 1898 appointed a Committee on Standardization, consisting of seven members having qualifications and experience from designing, manufacturing and operating standpoints. The report of this Committee was accepted at a meeting of the Institute in June 1899.

Experience gained in applications of the standards and further developments in electrical apparatus and methods showed the necessity of revision, and a committee was appointed which after consultation with manufacturing and operating engineers presented the first revised report on Standardization Rules of the A. I. E. E. in June 1902.

The next revision was undertaken by a committee of ten, which presented its report in May 1906.

In September 1906, a Standards Committee of eleven members was appointed for further revision, and its report was presented in June 1907.

The appreciation of the importance and value of standardization resulted in the formation of a Standing Committee, with the title of Standards Committee of the A. I. E. E. This became effective in the Constitution of June 1907. The scope and amount of work necessitated increasing the number of members from time to time until in 1922 there were 37 members divided into a number of subcommittees specializing on various subjects.

A. I. E. E. Standards published in a single volume as each revision was adopted have been generally accepted as Standards of the electrical industry of the United States since the adoption of the first report in 1899. Subsequent reports on Standards were made and published, in some cases in several editions. The dates of adoption by the Board of Directors of such reports are as follows: June 20, 1902; June 21, 1907; June 27, 1912; July 10, 1914; June 30, 1915; June 28, 1916; November 8, 1918; October 8, 1920, and June 29, 1922.

On June 29, 1922, in view of the increasing complexity of the work, a reorganization of the Standards Committee was effected, and a working organization established which provided for an increase in standardization work and for the appointment on Working Committees of the Standards Committee of non-Institute members.

The present plan under which the Institute Standards are being issued involves the separation of the complete body of Standards into forty—or more—sections, each published as a separate pamphlet and dealing with a specific subject. Each section of the Standards has been formulated by a Working Committee of the Standards Committee which has been made as representative as possible for the work in hand. The division of the Standards into a number of separate publications simplifies the process of keeping the Standards revised to conform with the latest developments and enables those interested in a particular field to obtain in concise form the material relating to that field. In framing the Institute Standards the chief purpose has been to define terms and conditions which characterize the rating and behavior of electrical machinery and apparatus, with special reference to the conditions of acceptance tests.

The Standards Committee takes this occasion to draw attention to the value of suggestions based upon experience gained in the application of the Standards to general practise. Any suggestions looking toward improvement in the Standards will be welcomed for the guidance of the Committee in preparation of future editions, and should be communicated to the Secretary of the A. I. E. E. Standards Committee, 33 West 39th Street, New York.

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ACKNOWLEDGMENT

The Institute wishes to acknowledge its indebtedness to those who have so freely given their time and knowledge, and have conducted experimental work on which many of the A. I. E. E. Standards are based.

This Section of the A. I. E. E. Standards, "Industrial Control Apparatus," which is also an Apparatus Standard of the National Electrical Manufacturers Association, received approval as an American Standard in accordance with American Standards Association procedure and through presentation under joint sponsorship of the A. I. E. E. and the National Electrical Manufacturers Association.

The following organizations through their representatives on the sectional committee have given helpful cooperation in the development of this Standard.

The National Electrical Manufacturers Association

The National Electric Light Association

The Underwriters Laboratories

The United States Navy Department

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STANDARDS

OF THE

American Institute of Electrical Engineers

INDUSTRIAL CONTROL APPARATUS

(Adopted by Board of Directors December 5, 1924, Revised December 6, 1927)

SCOPE

The standards in this section cover the following types of control apparatus.

1. Industrial motor control.
2. Similar control used for industrial heating.
3. Rheostats including those for generator field.

Auto-transformers used with starters are included.

Standards for (1) Marine auxiliaries control apparatus, (2) Marine propulsion control apparatus, (3) Mine locomotive control apparatus, and (4) Railway control apparatus are not included.

SERVICE CONDITIONS

15-1 Temperature and Altitude.—Control apparatus conforming with these standards shall be suitable for carrying its rated load:

- (a) When and where the temperature of the cooling medium does not exceed 40 deg. cent.
- (b) Where the altitude does not exceed 1000 meters (3300 feet).

15-2 Unusual Service Conditions.—The use of apparatus in cooling mediums having temperatures higher than 40 deg. cent. or at altitudes greater than 1000 meters (3300 feet) should be considered as special applications.

There are further unusual conditions which, where they exist, should be subject to special consideration. Apparatus for use in such cases may require special construction or protection. Among such unusual conditions are:

- (a) Exposure to damaging fumes.
- (b) Operation in damp places.
- (c) Exposure to excessive dust.
- (d) Exposure to gritty or abrasive dust.
- (e) Exposure to steam.
- (f) Exposure to excessive oil vapor.
- (g) Exposure to salt air.
- (h) Exposure to vibration, shocks and tilting.
- (i) Exposure to explosive dust or gases.
- (j) Exposure to weather or dripping water.

DEFINITIONS

Definitions given herein apply specifically to the apparatus treated in this section. They are included with all other standard definitions in a separate section.

Classification of Controllers

15-50 Electric Controller.—An electric controller is a device, or group of devices, which serves to govern, in some predetermined manner the electric power delivered to the apparatus to which it is connected.

15-51 Full Magnetic Controller.—A full magnetic controller is one having all of its basic functions performed by electromagnets.

By "basic functions" is usually meant acceleration, retardation, line closing, reversing, etc.

15-52 Semi-Magnetic Controller.—A semi-magnetic controller is one having part of its basic functions performed by electromagnets and part by other means.

15-53 Manual Controller.—A manual controller is one having all of its basic functions performed by hand.

15-54 Drum Controller.—A drum controller is a controller that utilizes a drum switch as the main switching element.*

15-55 Starter.†—A starter is a controller designed for accelerating a motor to normal speed in one direction of rotation.

15-56 Automatic Starter.—An automatic starter is a starter designed to automatically control the acceleration of a motor.

15-57 Auto-Transformer Starter.—An auto - transformer starter is a starter having an auto-transformer to furnish a reduced voltage for starting. The device includes the necessary switching mechanism and is frequently called a compensator or auto-starter.

*A drum controller usually consists of a drum switch and a resistor.

†A device designed for starting a motor in either direction of rotation includes the additional function of reversing and should be designated a controller.