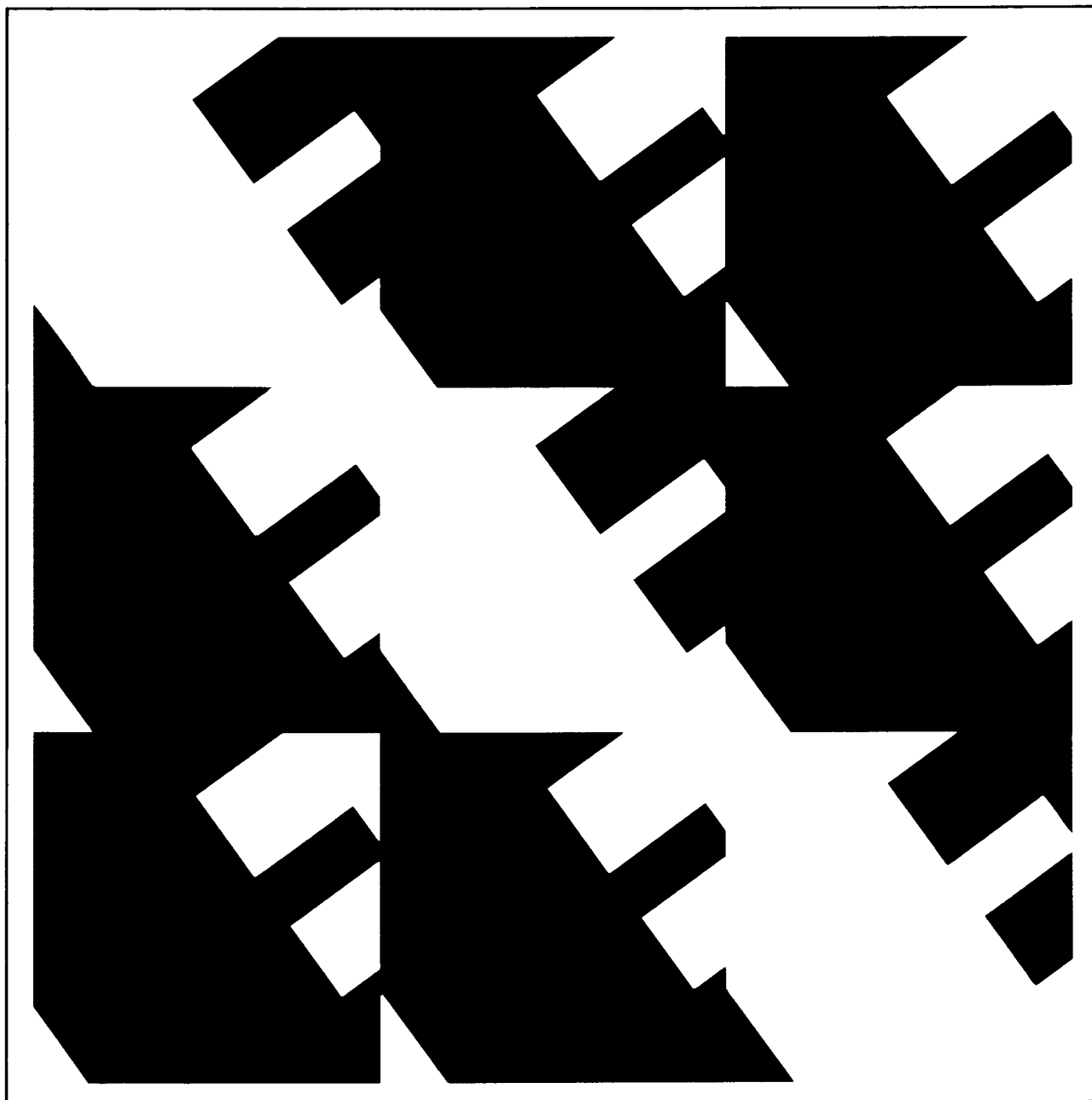


IEEE Standard Electrical Power System Device Function Numbers



IEEE C37.2-1987



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1. Scope and References

1.1 Scope. This standard applies to the definition and application of function numbers for devices used in electrical substations and generating plants and in installations of power utilization and conversion apparatus.

NOTE: Although the wording of this standard is directed specifically to equipment comprising conventional electro-mechanical devices, it also applies to equipment consisting totally, or in part, of electronic or solid-state devices.

1.2 References. When the American National Standards referred to in this standard are superseded by a revision approved by the American National Standards Institute, the revision shall apply.

[1] ANSI Y1.1-1972 (R1984), Abbreviations for Use on Drawings and in Text.¹

[2] ANSI/IEEE Std 315-1975, Graphic Symbols for Electrical and Electronics Diagrams.²

[3] ANSI/IEEE C37.1-1987, IEEE Standard Definition, Specification, and Analysis of Systems Used for Supervisory Control, Data Acquisition, and Automatic Control.

[4] ANSI/IEEE C37.20.1-1987, IEEE Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear.

[5] ANSI/IEEE C37.20.2-1987, IEEE Standard for Metal-Clad and Station-Type Cubicle Switchgear.

¹ANSI publications are available from the American National Standards Institute, Sales Department, 1430 Broadway, New York, NY 10018.

²ANSI/IEEE publications are available from The Institute of Electrical and Electronics Engineers Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ, 08855-1331, or from The American National Standards Institute, Sales Department, 1430 Broadway, New York, NY 10018.

2. Purpose of Device Function Numbers

A device function number, with appropriate prefix and suffix where necessary, is used to identify the function of each device in all types of partial automatic and automatic switchgear and in many types of manual switchgear. These numbers are to be used on drawings, on elementary and connection diagrams, in instruction books, in publications, and in specifications. In addition, for automatic switchgear, the number may be placed on, or adjacent to, each device on the assembled equipment so that the device may be readily identified.

NOTE: These device function designations, which have been developed as a result of usage over many years, may define the actual function the device performs in an equipment, or they may refer to the electrical or other quantity to which the device is responsive. Hence, there may be in some instances a choice of the function number to be used for a given device. The preferable choice to be made in all cases should be the one which is recognized to have the narrowest interpretation so that it most specifically identifies the device in the minds of all individuals concerned with the design and operation of the equipment.

3. Standard Device Function Numbers

3.1 Standard Device Function Numbers. Each number with its corresponding function name and the general description of each function is listed below.

NOTE: When alternate names and descriptions are included under the function, only the name and description which applies to each specific case should be used. In general, only one name for each device, such as relay, contactor, circuit breaker, switch, monitor, or other device, is included in each function designation. However, when the function is not inherently restricted to any specific type of device and where the type of device itself is thus merely incidental, any one of the above listed alternative names, as applicable, may be substituted. For example, if for device function 6 a contactor is used for the purpose in place of a circuit breaker, the function name should be specified as starting contactor.

For every application of device function numbers, the originator should provide a brief definition for all device function numbers used in that application, including all combinations of prefixes, function numbers and suffixes. Typical definitions are illustrated in Fig 3a. These definitions should be included on the drawing where the device function number is used, or on a separate drawing or list to which the other drawings refer. All instruction books and other documents shall also include the device function number definitions.

Numbers from 95 to 99 should be assigned only for those functions in specific cases where none of the assigned standard device function numbers are applicable. Numbers which are "reserved for future application" should not be used.

1. master element is the initiating device, such as a control switch, etc, which serves either directly or through such permissive devices as protective and time-delay relays to place an equipment in or out of operation.

NOTE: This number is normally used for a hand-operated device, although it may also be used for an electrical or mechanical device for which no other function number is suitable.

2. time-delay starting or closing relay is a device that functions to give a desired amount of time delay before or after any point of operation in a switching sequence or protective relay system, except as specifically provided by device functions 48, 62, and 79.

3. checking or interlocking relay is a relay that operates in response to the position of a number of other devices (or to a number of predetermined conditions) in an equipment, to allow an operating sequence to proceed, or to stop, or to provide a check of the position of these devices or of these conditions for any purpose.

4. master contactor is a device, generally controlled by device function 1 or the equivalent and the required permissive and protective devices, that serves to make and break the necessary control circuits to place an equipment into operation under the desired conditions and to take it out of operation under abnormal conditions.

5. stopping device is a control device used primarily to shut down an equipment and hold it out of operation. (This device may be manually or electrically actuated, but excludes the function of electrical lockout (see device function 86) on abnormal conditions.)

6. starting circuit breaker is a device whose principal function is to connect a machine to its source of starting voltage.

7. Reserved for future application.

8. control power disconnecting device is a disconnecting device, such as a knife switch, circuit

breaker, or pull-out fuse block, used for the purpose of respectively connecting and disconnecting the source of control power to and from the control bus or equipment.

NOTE: Control power is considered to include auxiliary power which supplies such apparatus as small motors and heaters.

9. reversing device is a device that is used for the purpose of reversing a machine field or for performing any other reversing functions.

10. unit sequence switch is a switch that is used to change the sequence in which units may be placed in and out of service in multiple-unit equipments.

11. multifunction device is a device that performs three or more comparatively important functions which could only be designated by combining several of these device function numbers. All of the functions performed by device 11 shall be defined in the drawing legend or device function definition list.

NOTE: If only two relatively important functions are performed by the device, it is preferred that both function numbers be used, as described in 3.6.

12. overspeed device is usually a direct-connected speed switch which functions on machine overspeed.

13. synchronous-speed device is a device such as a centrifugal-speed switch, a slip-frequency relay, a voltage relay, an undercurrent relay, or any type of device that operates at approximately the synchronous speed of a machine.

14. underspeed device is a device that functions when the speed of a machine falls below a predetermined value.

15. speed or frequency matching device is a device that functions to match and hold the speed or frequency of a machine or of a system equal to, or approximately equal to, that of another machine, source or system.

16. Reserved for future application.

17. shunting or discharge switch is a switch that serves to open or to close a shunting circuit around any piece of apparatus (except a resistor), such as a machine field, a machine armature, a capacitor, or a reactor.

NOTE: This excludes devices that perform such shunting operations as may be necessary in the process of starting a machine by devices 6 or 42, or their equivalent, and also excludes device function 73 that serves for the switching of resistors.

18. accelerating or decelerating device is a device that is used to close or to cause the closing of circuits which are used to increase or decrease the speed of a machine.

19. starting-to-running transition contactor is a device that operates to initiate or cause the automatic transfer of a machine from the starting to the running power connection.

20. electrically operated valve is an electrically operated, controlled or monitored valve used in a fluid, air, gas, or vacuum line.

NOTE: The function of the valve may be more completely indicated by the use of suffixes as discussed in 3.2.

21. distance relay is a relay that functions when the circuit admittance, impedance, or reactance increases or decreases beyond a predetermined value.

22. equalizer circuit breaker is a breaker that serves to control or to make and break the equalizer or the current-balancing connections for a machine field, or for regulating equipment, in a multiple-unit installation.

23. temperature control device is a device that functions to raise or lower the temperature of a machine or other apparatus, or of any medium, when its temperature falls below, or rises above, a predetermined value.

NOTE: An example is a thermostat that switches on a space heater in a switchgear assembly when the temperature falls to a desired value. This should be distinguished from a device that is used to provide automatic temperature regulation between close limits and would be designated as device function 90T.

24. volts per hertz relay is a relay that functions when the ratio of voltage to frequency exceeds a preset value. The relay may have an instantaneous or a time characteristic.

25. synchronizing or synchronism-check device is a device that operates when two ac circuits are within the desired limits of frequency, phase angle, and voltage, to permit or to cause the paralleling of these two circuits.

26. apparatus thermal device is a device that functions when the temperature of the protected apparatus (other than the load-carrying windings of machines and transformers as covered by device function number 49), or of a liquid or other medium exceeds a predetermined value; or when the temperature of the protected apparatus or of any medium decreases below a predetermined value.

27. undervoltage relay is a relay which operates when its input voltage is less than a predetermined value.

28. flame detector is a device that monitors the presence of the pilot or main flame in such apparatus as a gas turbine or a steam boiler.

29. isolating contactor is a device that is used expressly for disconnecting one circuit from another for the purposes of emergency operation, maintenance, or test.

30. annunciator relay is a nonautomatically reset device that gives a number of separate visual indications upon the functioning of protective devices, and which may also be arranged to perform a lockout function.

31. separate excitation device is a device that connects a circuit, such as the shunt field of a synchronous converter, to a source of separate excitation during the starting sequence.

32. directional power relay is a relay which operates on a predetermined value of power flow in a given direction, or upon reverse power flow such as that resulting from the motoring of a generator upon loss of its prime mover.

33. position switch is a switch that makes or breaks contact when the main device or piece of apparatus which has no device function number reaches a given position.

34. master sequence device is a device such as a motor-operated multicontact switch, or the equivalent, or a programming device, such as a computer, that establishes or determines the operating sequence of the major devices in an equipment during starting and stopping or during other sequential switching operations.

35. brush-operating or slip-ring short-circuiting device is a device for raising, lowering, or shifting the brushes of a machine, or for short-circuiting its slip rings, or for engaging or disengaging the contacts of a mechanical rectifier.

36. polarity or polarizing voltage device is a device that operates, or permits the operation of, another device on a predetermined polarity only, or verifies the presence of a polarizing voltage in an equipment.

37. undercurrent or underpower relay is a relay that functions when the current or power flow decreases below a predetermined value.