

## ANSI Codes For Electrical Protection

American National Standards Institute (ANSI) codes are a means used by industry to establish and maintain a set of common standards. These codes range from industrial standards to geographic identification codes.

ANSI, the institution governing the creation of ANSI codes, was formed in 1916 as a joint effort by several engineering standards societies. It was designed as an impartial body dedicated to coordinating standards development.

ANSI produces codes governing a large number of subjects. ANSI accredits various governing organizations that are then tasked with creating the appropriate standards for their industry. These codes govern various areas, and provide dependable standards that ensure conformity of the standardized elements.

1. **Master Element** is the initiating device, such as a control switch, voltage relay, float 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.
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 switching sequence or protective relay system, except as specifically provided by service function 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 other or 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. **Anode Circuit Breaker** is a device used in the anode circuits of a power rectifier for the primary purpose of interrupting the rectifier circuit if an arc-back should occur.
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. **Reserved for Future Application** (USBR assigned - Control Power Transformer).
12. **Over-Speed Device** is usually a direct-connected speed switch which functions on machine over-speed.
13. **Synchronous-Speed Device** is a device such as a centrifugal switch, a slip-frequency relay, a voltage relay, and undercurrent relay , or any type of device that operates at approximately the synchronous speed of a machine.
14. **Under-Speed Device** is a device that functions when the speed of a machine fall below a pre -determined 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 (USBR assigned - Battery Charging Device).
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. **Valve** is one used in a vacuum, air, gas, oil, or similar line, when it is electrically operated or has electrical accessories such as auxiliary switches.
21. Distance Relay is a relay that functions when the circuit admittance, impedance, or reactance increases or decreases beyond predetermined limits.
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 function 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 as distinguished from a device that is used to provide automatic temperature regulation between close limits and would be designated as device function 90T.
24. **Reserved for future Application.** (USBR assigned - bus tie circuit breaker, contactor, or switch.)

25. **Synchronizing or Synchronism-Check Device** is a device that operates when two a-c circuits are within the desired limits of frequency, phase angle, or 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 shunt field or the amortisseur winding of a machine, or that of a load limiting or load shifting resistor or of a liquid or other medium, exceeds a predetermined value: or if the temperature of the protected apparatus, such as a power rectifier, or of any medium decrease below a predetermined value.
27. **Under voltage Relay** is a relay that functions on a given value of under-voltage.
28. **Flame Detector** is a device that monitors the presence of the pilot or main flame of 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 non-automatically reset device that gives a number of separate visual indications of the functions 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; or one that energizes the excitation and ignition circuits of a power rectifier.
32. **Directional Power Relay** is a device that functions on a desired value of power flow in a given direction or upon reverse power resulting from arc back in the anode or cathode circuits of a power rectifier.
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 multi-contact switch, or the equivalent, or programming device, such as a computer, that establishes or determines the operating sequence of the major devices in a equipment during starting and stopping or during other sequential switch operations.
35. **Brush-Operating or Slipping 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. **Under current or Under power Relay** is a relay that function when the current or power flow decreases below a predetermined value.
38. **Bearing Protective Device** is a device that functions on excessive bearing temperature, or on another abnormal mechanical conditions associated with the bearing, such as undue wear, which may eventually result in excessive bearing temperature.

39. **Mechanical Condition Monitor** is a device that functions upon the occurrence of an abnormal mechanical condition (except that associated with bearing as covered under device function 38), such as excessive vibration, eccentricity, expansion shock, tilting, or seal failure.
40. **Field Relay** is a relay that functions on a given or abnormally low value or failure of a machine field current, or on excessive value of the reactive component of armature current in an a-c machine indicating abnormally low field excitation.
41. **Field Circuit Breaker** is a device that functions to apply or remove the field excitation of a machine.
42. **Running Circuit Breaker** is a device whose principal function is to connect a machine to its source of running or operation voltage. This function may also be used for a device, such as a contactor, that is used in series with a circuit breaker or other field protecting means, primarily for frequent opening and closing of the breaker.
43. **Manual Transfer or Selector Device** is a manually operated device that transfers the control circuits in order to modify the plan of operation of the switching equipment or of some of the devices.
44. **Unit Sequence Starting Relay** is a relay that function to start the next available unit in a multiple-unit equipment upon the failure or non-availability of the normally preceding unit.
45. **Atmospheric Condition Monitor** is a device, that functions upon the occurrence of an abnormal atmospheric condition, such as damaging fumes, explosive mixtures, smoke or fire.
46. **Reverse Phase or Phase Balance Current Relay** is a relay that functions when the poly phase currents are of reverse-phase sequence, or when the poly phase currents are unbalanced or contain negative phase-sequence components above a given amount.
47. **Phase-Sequence Voltage Relay** is a relay that function upon a predetermined value of poly phase voltage in the desired phase sequence.
48. **Incomplete Sequence Relay** is a relay that generally returns the equipment to the normal, or off, position and locks it out if the normal starting, operating, or stopping sequence is not properly completed within a predetermined time. If the device is used for alarm purposes only, it should preferably be designated as 48A (alarm).
49. **Machine or Transformer Thermal Relay** is a relay that functions when the temperature of a machine armature or other load-carrying winding or element of a machine or the temperature of a power rectifier or power transformer (including a power rectifier transformer) exceeds a predetermined value.
50. **Instantaneous Over current or Rate -of-Rise Relay** is a relay that functions instantaneously on an excessive value of current or on an excessive rate of current rise, thus indicating a fault in the apparatus or circuit being protected.
51. **A-C Time Over current Relay** is a relay with either a definite or inverse time characteristic that functions when the current in an a-c circuit exceed a predetermined value.

52. **A-C Circuit Breaker** is a device that is used to close and interrupt an a-c power circuit under normal conditions or to interrupt this circuit under fault of emergency conditions.
53. **Exciter or D-C Generator Relay** is a relay that forces the d-c machine field excitation to build up during starting or which functions when the machine voltage has been built up to a given value.
54. **High-Speed D-C Circuit Breaker** is a circuit breaker which starts to reduce the current in the main circuit in 0.01 second or less, after the occurrence of the d-c over current or the excessive rate of current rise.
55. **Power Factor Relay** is a relay that operates when the power factor in an a-c circuit rises above or falls below a predetermined value.
56. **Field Application Relay** is a relay that automatically controls the application of the field excitation to an a-c motor at some predetermined point in the slip cycle.
57. **Short-Circuiting or Grounding Device** is a primary circuit switching device that functions to short-circuit or to ground a circuit in response to automatic or manual means.
58. **Rectification Failure Relay** is a device that functions if one or more anodes of a power rectifier fail to fire, or to detect and arc-back or on failure of a diode to conduct or lock properly.
59. **Overvoltage Relay** is a relay that functions on a given value of over-voltage.
60. **Voltage or Current Balance Relay** is a relay that operates on a given difference in voltage, or current input or output, or two circuits.
61. **Reserved for Future Application.**
62. **Time-Delay Stopping or Opening Relay** is a time-delay relay that serves in conjunction with the device that initiates the shutdown, stopping, or opening operation in an automatic sequence or protective relay system.
63. **Liquid or Gas Pressure or Vacuum Relay** is a relay that operates on given values of liquid or gas pressure or on given rates of change of these values.
64. **Ground Protective Relay** is a relay that functions on failure of the insulation of a machine, transformer, or of other apparatus to ground, or on flashover of a d-c machine to ground.  
Note: This function is assigned only to a relay that detects the flow of current from the frame of a machine or enclosing case or structure of piece of apparatus to ground, or detects a ground on a normally ungrounded winding or circuit. It is not applied to a device connected in the secondary circuit of current transformer, in the secondary neutral of current transformers, connected in the power circuit of a normally grounded system.
65. **Governor** is the assembly of fluid, electrical, or mechanical control equipment used for regulating the flow of water, steam, or other medium to the prime mover for such purposes a starting, holding speed or load, or stopping.
66. **Notching or Jogging Device** is a device that functions to allow only a specified number of operations of a given device or equipment, or a specified number of successive operations within a given time of each other. It is also a device that functions to energize

a circuit periodically or for fractions of specified time intervals, or that is used to permit intermittent acceleration or jogging of a machine at low speeds for mechanical positioning.

67. **A-C Directional Over current Relay** is a relay that functions on a desired value of a-c over-current flowing in a predetermined direction.
68. **Blocking Relay** is a relay that initiates a pilot signal for blocking of tripping on external faults in a transmission line or in other apparatus under predetermined condition, or cooperates with other devices to block tripping or to block re-closing on an out-of-step condition or on power savings.
69. **Permissive Control Device** is generally a two-position, manually-operated switch that, in one position, permits the closing of a circuit breaker, or the placing of an equipment into operation, and in the other position prevents the circuit breaker or the equipment from being operated.
70. **Rheostat** is a variable resistance device used in an electric circuit, which is electrically operated or has other electrical accessories, such as auxiliary, position, or limit switches.
71. **Liquid or Gas-Level Relay** is a relay that operates on given values of liquid or gas level or on given rates of change of these values.
72. **D-C Circuit Breaker** is a circuit breaker that is used to close and interrupt a d-c power circuit under normal conditions or to interrupt this circuit under fault or emergency conditions.
73. **Load-Resistor Contactor** is a contactor that is used to shunt or insert a step of load limiting, shifting, or indicating resistance in a power circuit, or to switch a space heater in circuit, or to switch a light or regenerative load resistor, a power rectifier, or other machine in and out of circuit.
74. **Alarm Relay** is a relay other than an Annunciator, as covered under device function 30, that is used to operate, or to operate in connection with, a visual or audible alarm.
75. **Position Changing Mechanism** is a mechanism that is used for moving a main device from one position to another in an equipment: as for example, shifting a removable circuit breaker unit to and from the connected, disconnected, and test positions.
76. **D-C Over current Relay** is a relay that functions when the current in a d-c circuit exceeds a given value.
77. **Pulse Transmitter** is used to generate and transmit pulses over a telemetering or pilot-wire circuit to the remote indicating or receiving device.
78. **Phase-Angle Measuring or Out-Of-Step Protective Relay** is a relay that functions at a pre-determined phase angle between two voltages or between two currents or between a voltage and current.
79. **A-C Reclosing Relay** is a relay that controls the automatic reclosing and locking out of an a-c circuit interrupter.
80. **Liquid or Gas Flow Relay** is a relay that operates on given values of liquid or gas flow or on given rates of change of these values.

81. **Frequency Relay** is a relay that functions on a predetermined value of frequency (either under or over or on normal system frequency) or rate of change of frequency.
82. **D-C Reclosing Relay** is a relay that controls the automatic closing and re-closing of a d-c circuit interrupter, generally in response to load circuit conditions.
83. **Automatic Selective Control or Transfer Relay** is a relay that operates to select automatically between certain sources or conditions in a equipment, or performs a transfer operation automatically.
84. **Operating Mechanism** is the complete electrical mechanism or servomechanism, including the operating motor, solenoids, position switches, etc., for a tap changer, induction regulator, or any similar piece of apparatus which otherwise has no device function number.
85. **Carrier or Pilot-Wire Receiver Relay** is a relay that is operated or restrained by a signal used in connection with carrier-current or d-c pilot-wire fault directional relaying.
86. **Locking-Out Relay** is an electrically operated hand, or electrically reset relay or device that functions to shutdown or hold an equipment out of service, or both, upon the occurrence of abnormal conditions.
87. **Differential Protective Relay** is a protective relay that functions on a percentage or phase angle or other quantitative difference of two currents or of some other electrical quantities.
88. **Auxiliary Motor or Motor Generator** is one used for operating auxiliary equipment, such as pumps, blowers, exciters, rotating magnetic amplifiers, etc.
89. **Line Switch** is a switch used as a disconnecting, load-interrupter, or isolating switch in an a-c or d-c power circuit, when this device is electrically operated or has electrical accessories, such as an auxiliary switch, magnetic lock, etc.
90. **Regulating Device** is a device that functions to regulate a quantity, or quantities, such as voltage, current power, speed, frequency, temperature, and load at a certain value or between certain (generally close) limits for machines, tie lines, or other apparatus.
91. **Voltage Directional Relay** is a device which operates when the voltage across an open circuit breaker or contactor exceeds a given value in a given direction.
92. **Voltage and Power Directional Relay** is a relay that permits or causes the connection of two circuits when the voltage difference between them exceed a given value in a predetermined direction and causes these two circuits to be disconnected from each other when the power flowing between them exceeds a given value in the opposite direction.
93. **Field-Changing Contactor** is a contactor that functions to increase or decrease, in one step, the value of field excitation on a machine.
94. **Tripping or Trip-Free Relay** is a relay that function to trip a circuit breaker, contactor or equipment, or to permit immediate tripping by other devices; or to prevent immediate re - closure of a circuit interrupter if it should open automatically even though its closing circuit is maintained closed.

- 95. 95\*) (USBR assigned - Closing Relay or Contactor)
- 96. 96\*)
- 97. 97\*)
- 98. 98\*) (USBR assigned - Loss of Excitation Relay)
- 99. 99\*) (USBR assigned - Arc Detector)

\* Used only for specific applications in individual installations where none of the assigned numbered functions from 1 to 94 are suitable.

### **Auxiliary Devices**

These letters denote separate auxiliary devices, such as:

- C** Closing Relay or Contactor
- CL** Auxiliary Relay, Closed (energized when main device is in closed position).
- CS** Control Switch
- D** "Down" Position Switch or Relay
- L** Lowering Relay
- 1.** Opening Relay
- OP** Auxiliary Relay, Open (energized when main device is in open position).
- PB** Push Button
- R** Raising Relay
- U** "Up" Position Switch or Relay
- X** Auxiliary Relay
- Y** Auxiliary Relay
- Z** Auxiliary Relay

**Note:** In the control of a circuit breaker with an X-Y Relay Control Scheme, the X relay is the device whose main contacts are used to energize the closing coil or the device which in some other manner, such as by the release of stored energy, causes the breaker to close. The contacts of the Y relay provide the anti-pump feature for the circuit breaker.