

DEVICE FUNCTION NUMBERS For Electric Power System ACCORDING TO ANSI STANDARD C 37.2

Device Number	Function and Description
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 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 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.

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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.
12	Over-Speed 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	Under - Speed 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 the 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.

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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 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.

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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.

25 Synchronizing of 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 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 decreases below a predetermined value.

27 Undervoltage Relay is a relay that functions on a given value of undervoltage.

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.

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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 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.
38	Bearing Protective Device is a device that functions on excessive bearing temperature, or on other abnormal mechanical conditions associated with the bearing, such as undue wear, which may eventually result in excessive bearing temperature or failure.

Device Number	Function and Description
39	Mechanical Condition Monitor is a device that functions upon the occurrence of an abnormal mechanical condition (except that associated with bearings 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 machine field current, or on an 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 operating 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 fault protecting means, primarily for frequent opening and closing of the circuit.
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 functions to start the next available unit in a multiple-unit equipment upon the failure or nonavailability 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 polyphase currents are of reverse-phase sequence, or when the polyphase currents are unbalanced or contain negative phase-sequence components above a given amount.

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47	Phase-Sequence Voltage Relay is a relay that functions upon a predetermined value of polyphase 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 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 Overcurrent 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 Overcurrent Relay is a relay with either a definite or inverse time characteristic that functions when the current in an a-c circuit exceeds 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 or 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	Reserved for Future Application.

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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 an arc-back or on failure of a diode to conduct or block properly.
59	Overvoltage Relay is a relay that functions on a given value of overvoltage.
60	Voltage or Current Balance Relay is a relay that operates on a given difference in voltage, or current input or output, of 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.

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	<p>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 a 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 a current transformer, or in the secondary neutral of current transformers, connected in the power circuit of a normally grounded system.</p>
65	<p>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 as starting, holding speed or load, or stopping.</p>
66	<p>Notching or Jogging Device is a device that functions to allow only a specified number of perations 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.</p>
67	<p>A-C Directional Overcurrent Relay is a relay that functions on a desired value of a-c overcurrent flowing in a predetermined direction.</p>
68	<p>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 conditions, or cooperates with other devices to block tripping or to block reclosing on an out-of-step condition or on power savings.</p>
69	<p>Permissive Control Devic 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.</p>

Device Number	Function and Description
70	<p>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.</p>
71	<p>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.</p>
72	<p>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.</p>
73	<p>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 of a power rectifier or other machine in and out of circuit.</p>
74	<p>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.</p>
75	<p>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.</p>
76	<p>D-C Overcurrent Relay is a relay that functions when the current in a d-c circuit exceeds a given value.</p>
77	<p>Pulse Transmitter is used to generate and transmit pulses over a telemetering or pilot-wire circuit to the remote indicating or receiving device.</p>
78	<p>Phase-Angle Measuring or Out-of-Step Protective Relay is a relay that functions at a predetermined phase angle between two voltages or between two currents or between voltage and current.</p>

Device Number	Function and Description
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 reclosing 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 an 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 tapchanger, 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 shut down 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.

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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 relay that 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 exceeds 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 functions to trip a circuit breaker, contactor, or equipment, or to permit immediate tripping by other devices; or to prevent immediate reclosure of a circuit interrupter if it should open automatically even though its closing circuit is maintained closed.

Device Number	Function and Description
95*	
96*	
97*	
98*	
99*	

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

Supervisory Control and Indication.

A similar series of numbers, prefixed by the letters RE (for "remote") shall be used for the interposing relays performing functions that are controlled directly from the supervisory system. Typical examples of such device functions are: RE1, RE5, and RE94.

Note : The use of the "RE" prefix for this purpose in place of the former 200 series of numbers now makes it possible to obtain increased flexibility of the device function numbering system. For example, in pipeline pump stations, the numbers 1 through 99 are applied to device functions that are associated with the over-all station operation. A similar series of numbers, starting with 101 instead of 1, are used for those device functions that are associated with unit 1; a similar series starting with 201 for device functions that are associated with unit 2; and so on, for each unit in these installations.

SUFFIX LETTERS

Suffix Letters may be used with device function numbers for various purposes. These permit multiplication of available function designations for the large number and variety of devices used in many types of systems. These also denote individual or specific parts or auxiliary contacts of these devices or certain distinguishing features, characteristics, or conditions which describe the use of the device or its contacts in the system. Letter suffixes should be used only when these accomplish a useful purpose. In order to prevent any possible conflict or confusion, each suffix should preferably have only one meaning in an individual system. The meaning of each suffix used with a device function number should be designated.

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 Relay
L	Lowering Relay
O	Opening Relay or Contactor
OP	Auxiliary Relay, Open (energized when main device is in open position)
PB	Push Button
R	Raising Relay
U	"Up" Position Switch Relay
X	} Auxiliary Relay
Y	
Z	

Note : In the control of a circuit breaker with a so-called 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.

These letters indicate the **condition or electrical** quantity to which the device responds, or the medium in which it is located such as :

A	Air or Amperes
C	Current
E	Electrolyte
F	Frequency or Flow or Fault
L	Level or Liquid
P	Power or Pressure
PF	Power Factor
Q	Oil
S	Speed
T	Temperature
V	Voltage or Volts or Vacuum
VAR	Reactive Power
VB	Vibration
W	Water or Watts

These letters denote the **location of the main device in the circuit**, or the type of circuit in which the device is used, or the type of circuit or apparatus with which it is associated, when this is necessary, such as :

A	Alarm or Auxiliary Power
AC	Alternating Current
AN	Anode
B	Battery or Blower or Bus
BK	Brake
BP	Bypass
BT	Bus Tie
C	Capacitor or Condenser or Compensator or Carrier Current
CA	Cathode
D	Discharge
DC	Direct Current
E	Exciter
F	Feeder or Field or Filament
G	Generator or Ground*
H	Heater or Housing
L	Line or Logic
M	Motor or Metering
N	Network or Neutral*
P	Pump or Phase Comparison
R	Reactor or Rectifier

S	Synchronizing or Secondary
T	Transformer or Thyatron
TH	Transformer (High-voltage Side)
TL	Transformer (Low-voltage Side)
TM	Telemeter
U	Unit

***Note :** Suffix "N" is generally used in preference to "G" for devices connected in the secondary neutral of current transformers, or in the secondary of a current transformer whose primary winding is located in the neutral of a machine or power transformer, except in the case of transmission line relaying, where the suffix "G" is more commonly used for those relays that operate on ground faults.

These letters denote **parts of the main device**, divided into the two following categories :

(1) All parts, such as the following, except auxiliary contacts, position switches, limit switches, and torque limit switches which are covered separately :

BK	Brake
C	Coil or Condenser or Capacitor
CC	Closing Coil
HC	Holding Coil
M	Operating Motor
MF	Fly-ball Motor
ML	Load-limit Motor
MS	Speed Adjusting or Synchronizing Motor
S	Solenoid
SI	Seal-in
TC	Trip Coil
V	Valve

(2) All auxiliary contacts and position and limit switches for such devices and equipment as circuit breakers, contactors, valves and rheostats and contacts of relays.

a Contact that is open when the main device is in the standard reference position commonly referred to as the nonoperated or de-energized position, and that closes when the device assumes the opposite position.

- b Contact that is closed when the main device is in the standard reference position, commonly referred to as the nonoperated or de-energized position, and that opens when the device assumes the opposite position.

Note : The simple designation “a” or “b” is used in all cases where there is no need to adjust the contacts to change position at any particular point in the travel of the main device or where the part of the travel where the contacts change position is of no significance in the control or operating scheme. Hence the “a” and “b” designations usually are sufficient for circuit breaker auxiliary switches.

Auxiliary Switches for Circuit Breaker Operating Mechanisms for the mechanically trip-free mechanism of a circuit breaker :

- aa Contact that is open when the operating mechanism of the main device is in the nonoperated position and that closes when the operating mechanism assumes the opposite position.
- bb Contact that is closed when the operating mechanism of the main device is in the nonoperated position and that opens when the operating mechanism assumes the opposite position.

The part of the stroke at which the auxiliary switch changes position should, if necessary, be specified in the description. “LC” is used to designate the latch-checking switch of such a mechanism, which is closed when the mechanism linkage is relatched after an opening operation of the circuit breaker.

“LS” designates a **limit switch**. This is a position switch that is actuated by a main device, such as a rheostat or valve, at or near its extreme end of travel. Its usual function is to open the circuit of the operating motor at the end of travel of the main device, but it may also serve to give an indication that the main device has reached an extreme position of travel.

Torque Limit Switch is used to open an operating motor circuit at a desired torque limit at the extreme end of travel of a main device, such as a valve. It should be designated as follows :

- tqc Torque limits switch, opened by torque-responsive mechanism, to stop valve closing.
- tqo Torque limit switch, opened by torque-responsive mechanism, to stop valve opening.

If several similar **auxiliary, position, and limit switches** are present on the same main device, they should be designated with supplementary numerical suffixes as 1, 2, 3, etc., when necessary.

The following letters cover all **other distinguishing features or characteristics or conditions**, not specifically described previously, which serve to describe the use of the device or its contacts in the equipment, such as :

A	Accelerating or Automatic
B	Blocking or Backup
C	Close or Cold
D	Decelerating or Detonate or Down or Disengaged
E	Emergency or Engaged
F	Failure or Forward
H	Hot or High
HR	Hand Reset
HS	High Speed
L	Left or Local or Low or Lower or Leading
M	Manual
O	Open
OFF	OFF
ON	ON
P	Polarizing
R	Right or Raise or Reclosing or Receiving or Remote or Reverse
S	Sending or Swing
T	Test or Trip or Trailing
TDC	Time-delay Closing
TDO	Time-delay Opening
U	Up

SUFFIX NUMBERS

If two or more devices with the same function number and suffix letter are present, these may be distinguished by numbered suffixes, as for example, 4X-1, 4X-2, and 4X-3 when necessary.

DEVICES PERFORMING MORE THAN ONE FUNCTION

If one device performs two relatively important functions in an equipment so that it is desirable to identify both of these functions, a double function number and name, such as 50/51 Instantaneous and Time Overcurrent Relay, may be used.