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C37.100-1981
(Revision of
ANSI C37.100-1972)**

An American National Standard
**IEEE Standard Definitions for
Power Switchgear**

Sponsor

**Switchgear Committee of the
IEEE Power Engineering Society**

Secretariat

**Institute of Electrical and Electronics Engineers
National Electrical Manufacturers Association**

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Foreword

(This Foreword is not a part of ANSI/IEEE C37.100-1981, IEEE Standard Definitions for Power Switchgear.)

This standard continues the compilation of terms and definitions relating to power switchgear and should be considered to reflect common and current usage of that industry. It is an update of the earlier standard with additions and changes.

It includes the definitions formerly contained in ANSI/IEEE C37.90-1978, IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus. The agreement to move these definitions from ANSI/IEEE C37.90-1978 to ANSI/IEEE C37.100-1981 was based on identifying the definitions for prime responsibility. Accordingly the code shown was adopted. Each of the eight participating entities of the Power System Relaying, Substations, and Switchgear Committees of the Technical Operations Department of the IEEE Power Engineering society identified definitions in which they had basic responsibility. This is shown immediately following the definition. The code indicates interest and consent required for any changes.

The size of this standard has been kept to a minimum by omitting all terms satisfactorily covered in readily available dictionaries. In many instances, terms and definitions of related products exhibiting minor variations have been combined for greater clarity.

International Electrotechnical Commission (IEC) definitions have been adopted wherever possible, without change, or with minor modifications.

Specifications and ratings have been excluded from definitions where possible. This information is included in standards covering the specific products.

The Standards Committee on Power Switchgear, C37, which reviewed and approved this standard, had the following personnel at the time of approval:

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John D. Hopkins, *Secretary*

J.E. Beehler, *Executive Vice-Chairman of High-Voltage Switchgear Standards*
W.E. Laubach, *Executive Vice-Chairman of Low-Voltage Switchgear Standards*
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Listed below are the codes for the committees responsible for each of the definitions in this standard. The first designation after a definition indicates the prime responsibility, subsequent designation(s) indicate interest and consent required for changes:

PSRC	Power System Relaying Committee, Relay Standards Subcommittee
SUB	Substation Committee
HVF, Swg	Switchgear Committee, High-Voltage Fuses Subcommittee
HVS, Swg	Switchgear Committee, High-Voltage Switches Subcommittee
LVSwgD	Switchgear Committee, Low-Voltage Switchgear Devices Subcommittee
PCB, Swg	Switchgear Committee, Power Circuit Breaker Subcommittee
R and S, Swg	Switchgear Committee, Reclosers and Sectionalizers Subcommittee
SwgA	Switchgear Committee, Switchgear Assemblies Subcommittee

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An American National Standard

IEEE Standard Definitions for Power Switchgear

1. Scope

The terms and definitions in the standard are intended to encompass the products within the scope of the C37 project which include power switchgear for switching, interrupting, metering, protection, and regulating purposes as used primarily in connection with generation, transmission, distribution, and conversion of electric power.

The definitions of terms and explanatory notes relating thereto contained in this standard not intended to embrace all possible meanings of terms. They are intended for the sole purpose of establishing only those meanings of terms used in switchgear standards. They do not purport to embrace other meanings that the terms may properly have when used in connection with other subjects.

In some instances, terms and definitions that are not identical to those in this standard have been developed by other branches of industry. Where this situation exists, the definitions in this standard shall be used for power switchgear within the C37 product scope.

2. General

In this standard, preferred terms are in some instances followed by less favored or alternate terms in parentheses. Also, since the terms are arranged alphabetically, application phrases have been parenthetically appended to many terms.

For definitions of terms of related component parts, accessories, etc, not covered in this standard, reference should be made to standards covering those products; for example, ANSI/IEEE C57.13-1978, [4]¹ and ANSI/IEEE Std 21-1976 [5].

¹The numbers in brackets correspond to the references listed in Section 3 of this standard.

3. References

When the following American National Standards and Guides referred to in this standard are superseded by a revision approved by the American National Standards Institute, the latest revision shall be used.

[1] ANSI C84.1-1977, Voltage Rating for Power Systems and Equipment (60 Hz)²

[2] ANSI/IEEE C37.09-1979, Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis

[3] ANSI/IEEE C37.2-1979, Standard Electrical Power System Device Function Numbers

[4] ANSI/IEEE C57.13-1978, Standard Requirements for Instrumentation Transformers

[5] ANSI/IEEE Std 21-1976, General Requirements and Test Procedure for Outdoor Apparatus Bushings

4. Definitions

a auxiliary switch. See auxiliary switch and *a* contact.

LVS_{wgD}, PCB, Swg

a contact (front contact). A contact that is open when the main device is in the standard reference position, and that is closed when the device is in the opposite position.

LVS_{wgD}, PSRC; PCB, Swg

NOTES: (1) *a* contact has general application. However, this meaning for front contact is restricted to relay parlance.

(2) For indication of the specific point of travel at which the contact changes position, an additional letter or percentage figure may be added to *a* as detailed in 9.4.4.1 and 9.4.4.2 of ANSI/IEEE C37.2-1979 [3].

(3) See standard reference position.

aa auxiliary switch. See auxiliary switch and *aa* contact.

LVS_{wgD}, PCB, Swg

aa contact. A contact that is open when the operating mechanism of the main device is in

²ANSI documents are available from the American National Standards Institute, 1430 Broadway, New York, N.Y. 10017.

the standard reference position and that is closed when the operating mechanism is in the opposite position.

LVS_{wgD}, PCB, Swg

NOTE: See standard reference position.

accelerating relay. A programming relay whose function is to control the acceleration of rotating electrical equipment.

PSRC

acceptance tests (see conformance tests).

NOTE: American National Standards should use the term **conformance test**, as directed by the Standards Council of ANSI, rather than the term **acceptance test**. Use of the term **conformance test** avoids the implication of contractual relations between buyer and seller.

accessories. Devices which perform a secondary or minor duty as an adjunct or refinement to the primary or major duty of a unit of equipment.

HVS, Swg, LVS_{wgD}

active power relay. A power relay that responds to active power.

PSRC

NOTE: See **power relay** and **reactive power relay**.

actual transient recovery voltage. The transient recovery voltage that actually occurs across the terminals of a pole of a circuit interrupting device on a particular interruption.

PCB, Swg

NOTE: This is the modified circuit transient recovery voltage with whatever distortion may be introduced by the circuit interrupting device.

actuating current (of an automatic line sectionalizer). The rms current which actuates a counting operation or an automatic operation.

R and S, Swg

air-blast circuit breaker. See NOTE under **circuit breaker**.

air circuit breaker. See NOTE under **circuit breaker**.

air switch. A switching device designed to close and open one or more electric circuits by means of guided separable contacts that separate in air.

HVS, Swg

alarm (signal) relay. A monitoring relay whose function is to operate an audible or visual signal to announce the occurrence of an operation or a condition needing personal attention, and which is usually provided with a signaling cancellation device.

PSRC

alarm switch (of a switching device). An auxiliary switch that actuates a signaling device upon the automatic opening of the switching device with which it is associated.

LVS_{wgD}

alternating-current component (of a total current). See **symmetrical component (of a total current)**.

ambient temperature. The temperature of the surrounding medium that comes in contact with the device or equipment.

LVS_{wgD}, HVF, Swg, HVS, Swg

ambient air temperature. The temperature of the surrounding air which comes in contact with equipment.

SwgA

NOTE: Ambient air temperature, as applied to enclosed switchgear assemblies, is the average temperature of the surrounding air that comes in contact with the enclosure.

amplitude factor (of transient recovery voltage). The ratio of the highest peak of the transient recovery voltage to the peak value of the normal-frequency recovery voltage.

PCB, Swg

NOTE: In tests made under one condition to simulate duty under another, as in single-phase tests made to simulate duty on three-phase ungrounded faults, the amplitude factor is expressed in terms of the duty being simulated.

analog telemetering. Telemetering in which some characteristic of the transmitter signal is proportional to the quantity being measured.

SUB

analog-to-digital converter (digitizer). A device or a group of devices that converts an analog quantity or analog position input signal into some type of numerical output signal or code. The input signal is either the measurand or a signal derived from it.

SUB

anode circuit breaker. A low-voltage power circuit breaker: (1) designed for connection in an anode of a mercury-arc power rectifier unit, (2) trips automatically only on reverse current and starts reduction of a current in a specified time when the arc-back occurs at the end of the forward current conduction, and (3) substantially interrupts the arc-back current within one cycle of the fundamental frequency after the beginning of the arc-back.

LVS_{wgD}

NOTE: The specified time in present practice is 0.008 second or less (at an ac frequency of 60 Hz).

antipump (pump-free) device. A device which prevents reclosing after an opening operation as long as the device initiating closing is maintained in the position for closing.

PCB, Swg, LVS_{wgD}

anti-single-phase tripping device. A device that operates to open all phases of a circuit by means of a polyphase switching device, in

response to the interruption of the current in one phase.

LVS_{SwgD}

NOTES: (1) This device prevents single phasing of connected equipment resulting from the interruption of any one phase of the circuit.

(2) This device may sense operation of a specific single-phase interrupting device or may sense loss of single phase potential.

applied-fault protection. A protective method in which, as a result of relay action, a fault is intentionally applied at one point in an electrical system in order to cause fuse blowing or further relay action at another point in the system.

PSRC

arc chute (of a switching device). A structure affording a confined space or passageway, usually lined with arc-resisting material, into or through which an arc is directed to extinction.

LVS_{SwgD}, PCB, Swg

arc-extinguishing medium (fuse filler) (of a fuse). Material included in the fuse to facilitate current interruption.

HVS, Swg

arc-shunting-resistor-current arcing time. The interval between the parting of the secondary arcing contacts and the extinction of the arc-shunting-resistor current.

PCB, Swg

arcing contacts. The contacts of a switching device on which the arc is drawn after the main (and intermediate, where used) contacts have parted.

HVS, Swg, LVS_{SwgD}, PCB, Swg

arcing horn. One of a pair of diverging electrodes on which an arc is extended to the point of extinction after the main contacts of the switching device have parted.

HVS, Swg

NOTE: Arcing horns are sometimes referred to as arcing runners.

arcing time (of a mechanical switching device). The interval of time between the instant of the first initiation of the arc and the instant of final arc extinction in all poles.

LVS_{SwgD}, PCB, Swg

NOTE: For switching devices that embody switching resistors, a distinction should be made between the arcing time up to the instant of the extinction of the main arc, and the arcing time up to the instant of the breaking of the resistance current.

arcing time (of a fuse). The time elapsing from the severance of the current-responsive element to the final interruption of the circuit.

HVF, Swg

armature (of a relay). The moving element of an electromechanical relay that contributes to the designed response of the relay and which

usually has associated with it a part of the relay contact assembly.

PSRC

articulated unit substation. A unit substation in which the incoming, transforming, and outgoing sections are manufactured as one or more subassemblies intended for connection in the field.

SwgA

asymmetrical current. See total (asymmetrical) current.

attachments. Accessories to be attached to switchgear apparatus, as distinguished from auxiliaries.

HVS, Swg, LVS_{SwgD}

automatic capacitor control equipment. An equipment that provides automatic control for functions related to capacitors, such as their connection to and disconnection from a circuit in response to predetermined conditions such as voltage, load, or time.

SUB, R and S, Swg

automatic circuit recloser. A self-controlled device for automatically interrupting and reclosing an alternating-current circuit, with a predetermined sequence of opening and reclosing followed by resetting, hold-closed, or lockout operation.

R and S, Swg

NOTE: When applicable it includes an assembly of control elements required to detect overcurrents and control the recloser operation.

automatic control. An arrangement of electrical controls that provides for switching or otherwise controlling or both in an automatic sequence and under predetermined conditions the necessary devices comprising an equipment. These devices thereupon maintain the required character of service and provide adequate protection against all unusual operating emergencies.

SUB

automatic control equipment. Equipment that provides automatic control for a specified type of power circuit or apparatus.

SUB

automatic line sectionalizer. A self-contained circuit-opening device that automatically opens the main electrical circuit through it after sensing and responding to a predetermined number of successive main current impulses equal to or greater than a predetermined magnitude. It opens while the main electrical circuit is de-energized. It may also have provision to be manually operated to interrupt loads.

R and S, Swg

NOTE: When applicable it includes an assembly of

control elements required to detect overcurrents and control the sectionalizer operation.

automatic machine control equipment. An equipment that provides automatic control for functions related to rotating machines or power rectifiers.

SUB

automatic opening (tripping). The opening of a switching device under predetermined conditions without the intervention of an attendant.
LVSwgD, PCB, Swg, R and S, Swg

automatic operation (of a switching device). The ability to complete an assigned sequence of operations by automatic control without the assistance of an attendant.

R and S, Swg

automatic reclosing equipment. An automatic equipment that provides for reclosing a switching device as desired after it has opened automatically under abnormal conditions.

SUB, R and S, Swg

NOTE: Automatic reclosing equipment may be actuated by conditions sensed on either or both sides of the switching device as designed.

automatic station. A station (usually unattended) that under predetermined conditions goes into operation by an automatic sequence; that thereupon by automatic means maintains the required character of service within its capability; that goes out of operation by automatic sequence under other predetermined conditions, and includes protection against the usual operating emergencies.

SUB

NOTE: An automatic station may go in and out of operation in response to predetermined voltage, load, time, or other conditions, or in response to supervisory control or to a remote or local manually operated control device.

automatic transfer (or throw-over) equipment. An equipment that automatically transfers a load to another source of power when the original source to which it has been connected fails, and that will automatically retransfer the load to the original source under desired conditions.

SUB

NOTES: (1) It may be of the nonpreferential, fixed-preferential, or selective-preferential type.

(2) Compare with transfer switch where transfer is accomplished without current interruption.

automatic transfer (or throw-over) equipment of the fixed-preferential type. Automatic transfer equipment in which the original source always serves as the preferred source and the other source as the emergency source. The automatic transfer equipment will retransfer

the load to the preferred source upon its reenergization.

SUB

NOTE: The restoration of the load to the preferred source from the emergency source upon the reenergization of the preferred source after an outage may be of the continuous-circuit restoration type or the interrupted-circuit restoration type.

automatic transfer (or throw-over) equipment of the nonpreferential type. Automatic transfer equipment that automatically retransfers the load to the original source only when the other source, to which it has been connected, fails.

SUB

automatic transfer (or throw-over) equipment of the selective-preferential type. Automatic transfer equipment in which either source may serve as the preferred or the emergency source of preselection as desired, and which will retransfer the load to the preferred source upon its reenergization.

SUB

NOTE: The restoration of the load to the preferred source from the emergency source upon the reenergization of the preferred source after an outage may be of the continuous-circuit restoration type or the interrupted-circuit restoration type.

automatic transformer control equipment. An equipment that provides automatic control for functions relating to transformers, such as their connection, disconnection or regulation in response to predetermined conditions such as system load, voltage or phase angle.

SUB

automatic tripping. See automatic opening.

automatically reset relay. See self-reset relay.

auxiliaries. Accessories to be used with switching apparatus.

HVS, Swg; R and S, Swg; LVSwgD

auxiliary relay. A relay whose function is to assist another relay or control device in performing a general function by supplying supplementary actions.

PSRC, PCB, Swg

NOTES: (1) Some of the specific functions of an auxiliary relay are:

(a) Reinforcing contact current-carrying capacity of another relay or device.

(b) Providing circuit seal-in functions.

(c) Increasing available number of independent contacts.

(d) Providing circuit-opening instead of circuit-closing contacts or vice-versa.

(e) Providing time delay in the completion of a function.

(f) Providing simple functions for interlocking or programming.

(2) The operating coil of the contacts of an auxiliary relay may be used in the control circuit of another relay or other control device. *Example:* An auxiliary relay may be applied to the auxiliary contact circuits

of a circuit breaker in order to coordinate closing and tripping control sequences.

(3) A relay which is auxiliary in its functions even though it may derive its driving energy from the power system current or voltage is a form of auxiliary relay. *Example:* A timing relay operating from current or potential transformers.

(4) Relays which, by direct response to power system input quantities, assist other relays to respond to such quantities with greater discrimination are NOT auxiliary relays. *Example:* Fault detector relay.

(5) Relays which are limited in function by a control circuit, but are actuated primarily by system input quantities, are NOT auxiliary relays. *Example:* Torque-controlled relays.

auxiliary relay driver. A circuit which supplies an input to an auxiliary relay.

PSRC

auxiliary switch. A switch mechanically operated by the main device for signaling, interlocking, or other purposes.

LVS_{Swg}D, PCB, Swg

NOTE: Auxiliary switch contacts are classed as: *a*, *b*, *aa*, *bb*, LC, etc, for the purpose of specifying definite contact positions with respect to the main device.

available (prospective) current (of a circuit with respect to a switching device situated therein). The current that would flow in that circuit if each pole of the switching device were to be replaced by a link of negligible impedance without any other change in the circuit or the supply.

LVS_{Swg}D

available (prospective) short-circuit current (at a given point in a circuit). The maximum current that the power system can deliver through a given circuit point to any negligible impedance short circuit applied at the given point, or at any other point that will cause the highest current to flow through the given point.

HVF, Swg, LVS_{Swg}D

NOTES: (1) This value can be in terms of either symmetrical or asymmetrical; peak or rms current, as specified.

(2) In some resonant circuits the maximum available short-circuit current may occur when the short circuit is placed at some other point than the given one where the available current is measured.

available (prospective) short-circuit test current (at the point of test). The maximum short-circuit current for any given setting of a test circuit that the test power source can deliver at the point of test, with the test circuit short-circuited by a link of negligible impedance at the line terminals of the device to be tested.

HVF, Swg, LVS_{Swg}D

NOTE: This value can be in terms of either symmetrical or asymmetrical; peak or rms current, as specified.

average inside air temperature (of enclosed switchgear). The average temperature of the surrounding cooling air which comes in contact with the heated parts of the apparatus within the enclosure.

SwgA

***b* auxiliary switch.** See auxiliary switch and *b* contact.

***b* contact (back contact).** A contact that is closed when the main device is in the standard reference position and that is open when the device is in the opposite position.

LVS_{Swg}D, PSRC, PCB, Swg

NOTES: (1) *b* contact has general application. However, this meaning for back contact is restricted to relay parlance.

(2) For indication of the specific point of travel at which the contact changes position, an additional letter or percentage figure may be added to *b* and detailed in 9.4.4.1 and 9.4.4.2 of ANSI/IEEE C37.2-1979 [3].

(3) See standard reference position.

back connected switch. A switch in which the current carrying conductors are connected to studs in back of the mounting base.

HVS, Swg

backup current limiting fuse. A fuse capable of interrupting all currents from the rated maximum interrupting current down to the rated minimum interrupting current.

HVF, Swg

backup protection (as applied to a relay system). A form of protection that operates independently of specified components in the primary protective system. It may duplicate the primary protection or may be intended to operate only if the primary protection fails or is temporarily out of service.

PSRC

balance beam (of a relay). A lever form of relay armature, one end of which is acted upon by one input and the other end restrained by a second input.

PSRC

balance relay. A relay which operates by comparing the magnitudes of two similar input quantities.

PSRC

NOTE: The balance may be effected by counteracting electromagnetic forces on a common armature, or by counteracting magnetomotive forces in a common magnetic circuit, or by similar means, such as springs, levers, etc.

barrier. A partition for the insulation or isolation of electric circuits or electric arcs.

HVF, Swg, HVS, Swg, PCB, Swg

base. (high-voltage fuse). The supporting member to which the insulator unit or units are attached.

HVF, Swg

basic device (of a supervisory system). See common device.

basic impulse insulation level (bil). A reference impulse insulation strength expressed in terms of the crest value of the withstand voltage of a standard full impulse voltage wave.

HVF, Swg

bb auxiliary switch. See auxiliary switch and bb contact.

LVSwgD, PCB, Swg

bb contact. A contact that is closed when the operating mechanism of the main device is in the standard reference position and that is open when the operating mechanism is in the opposite position.

LVSwgD, PCB, Swg

NOTE: See standard reference position.

bell crank. A lever with two arms placed at an angle diverging from a given point, thus changing the direction of motion of a mechanism.

HVS, Swg

bell crank hanger. A support for a bell crank.

HVS, Swg

benchboard. A combination of a control desk and a vertical switchboard in a common assembly.

SwgA

bifurcated feeder. A stub feeder that connects two loads in parallel to their only power source.

SUB

blade (disconnecting blade) (of a switching device). The moving contact member that enters or embraces the contact clips.

HVS, Swg, HVF, Swg

NOTE: In cutouts the blade may be a fuse carrier or fuseholder on which a nonfusible member has been mounted in place of a fuse link. When so used the nonfusible member alone is also called a blade in fuse parlance.

blade guide. (switch). An attachment to insure proper alignment of the blade and contact clip when closing the switch.

HVS, Swg

blade latch. A latch used on a stick-operated switch to hold the switch blade in the closed position.

HVS, Swg

blinder. A relay having a characteristic on an R-X diagram of one or more essentially straight lines, usually positioned at 75° to 90° from the R-axis and displaced from the origin.

PSRC

block (as applied to static relay design). An output signal of constant amplitude and specified polarity derived from an alternating input and with the duration controlled by the polarity of the input quantity.

PSRC

block-block element. A signal element in which

two blocks are compared as to coincidence or sequence.

PSRC

blocking. A relay function which prevents action that would otherwise be initiated by the relay system.

PSRC

blocking relay. A relay whose function is to render another relay or device ineffective under specified conditions.

PSRC

block-spike element. A signal element in which a block and a spike are compared as to coincidence.

PSRC

break distance (of a switching device). The minimum open-gap distance between the main-circuit contacts, or live parts connected thereto, when the contacts are in the open position.

HVF, Swg, HVS, Swg, LVSwgD, PCB, Swg

NOTE: In a multiple-break device, it is the sum of the breaks in series.

burden (of a relay). Load impedance imposed by a relay on an input circuit expressed in ohms and phase angle at specified conditions.

PSRC

NOTE: If burden is expressed in other terms such as volt-amperes, additional parameters such as voltage, current, and phase angle must be specified.

bus. A conductor, or group of conductors, that serve as a common connection for two or more circuits.

SwgA

bus structure. An assembly of bus conductors, with associated connection joints and insulating supports.

SwgA

bus support. An insulating support for a bus. It includes one or more insulator units with fittings for fastening to the mounting structure and for receiving the bus.

HVS, Swg

bushing. An insulating structure including a through conductor, or providing a passageway for such a conductor, with provision for mounting on a barrier, conducting or otherwise, for the purpose of insulating the conductor from the barrier and conducting current from one side of the barrier to the other.

PCB, Swg

cable charging current. Current supplied to an unloaded cable.

PCB, Swg

NOTE: Current is expressed in rms amperes.

calibration. The adjustment of a device to have the designed operating characteristics, and the subsequent marking of the positions of the adjusting means, or the making of adjustments

FOR POWER SWITCHGEAR

necessary to bring operating characteristics into substantial agreement with standardized scales or marking.

PSRC, LVSwgD

calibration error. In the operation of a device the departure, under specified conditions, of actual performance from performance indicated by scales, dials, or other markings on the device.

PSRC, LVSwgD

NOTE: The indicated performance may be by calibration markings in terms of input or performance quantities (amperes, ohms, seconds, etc.) or by reference to a specific performance data recorded elsewhere. See also **setting error**.

calibration scale. A set of graduations marked to indicate values of quantities, such as current, voltage, or time, at which an automatic device can be set to operate.

PSRC

capacitance-switching transient overvoltage ratio. The ratio of the peak value of voltage above ground, during the transient conditions resulting from the operation of the switch, to the peak value of the steady-state line-to-neutral voltage.

HVS, Swg, PCB, Swg,

NOTE: It is measured at either terminal of the switch whichever is higher, and is expressed in multiples of the peak values of the operating line-to-ground voltages at the switch with the capacitance connected.

capacitor switch. A switch capable of making and breaking capacitive currents of capacitor banks.

R and S, Swg, HVS, Swg; PCB, Swg

card extender. A device which provides access to components on a circuit card for testing purposes while maintaining all the electrical connections to the card.

PSRC

carrier, fuse. See **fuse carrier**.

carrier-pilot protection. A form of pilot protection in which the communication means between relays is a carrier current channel.

PSRC

cartridge fuse. A low-voltage fuse consisting of a current-responsive element inside a fuse tube with terminals on both ends.

LVSwgD

cartridge size (of a cartridge fuse). The range of voltage and ampere ratings assigned to a fuse cartridge with specific dimensions and shape.

LVSwgD

cascading (of switching devices). The application of switching devices in which the devices nearest the source of power have interrupting ratings equal to, or in excess of, the available short-circuit current, while devices in succeeding steps further from the source, have succes-

sively lower interrupting ratings.

LVSwgD, PCB, Swg

case (frame) ground protection. Overcurrent relay protection used to detect current flow in the ground or earth connection of the equipment or machine.

PSRC

Category A (pad-mounted automatic reclosers)³

center-break switching device. A mechanical switching device in which both contacts are movable and engage at a point substantially midway between their supports.

LVSwgD

check back. The retransmission from the receiving end to the initiating end of a coded signal or message to verify, at the initiating end, the initial message before proceeding with the transmitting of data or a command.

SUB

circuit breaker. A mechanical switching device, capable of making, carrying, and breaking currents under normal circuit conditions and also, making, carrying for a specified time and breaking currents under specified abnormal circuit conditions such as those of short circuit.

PCB, Swg, LVSwgD

NOTES: (1) A circuit breaker is usually intended to operate infrequently, although some types are suitable for frequent operation.

(2) The medium in which circuit interruption is performed may be designated by suitable prefix, that is, air-blast circuit breaker, air circuit breaker, compressed-air circuit breaker, gas circuit breaker, oil circuit breaker, vacuum circuit breaker, oilless circuit breaker, etc.

(3) Circuit breakers are classified according to their application or characteristics and these classifications are designated by the following modifying words or clauses delineating the several fields of application, or pertinent characteristics:

High-Voltage Power — Rated above 1000 volts ac

Molded-Case — See separate definition

Low-Voltage Power — Rated 1000 volts ac or below, or 3000 volts dc and below, but not including molded case circuit breakers.

Direct-current low-voltage power circuit breakers are subdivided according to their specified ability to limit fault current magnitude by being called General Purpose, High-Speed, Semi-High-Speed, or Anode. For specifications of these restrictions see latest revision of applicable American National Standard.

circuit transient recovery voltage. The transient recovery voltage characterizing the circuit and obtained with 100 percent normal-frequency recovery voltage, symmetrical current, and no modifying effect of the interrupting device.

PCB, Swg

NOTE: This voltage indicates the inherent severity of the circuit with respect to recovery voltage phenomena.

clearance. See **minimum clearance**.

³Not defined at this time.

clearing time.

(1) of a mechanical switching device. The interval between the time the actuating quantity in the main circuit reaches the value causing actuation of the release and the instant of final arc extinction on all poles of the primary arcing contacts.

R and S, Swg, LVSwgD, PCB, Swg

NOTE: Clearing time is numerically equal to the sum of contact parting time and arcing time.

(2) total clearing time of a fuse. The time elapsing from the beginning of a specified overcurrent to the final circuit interruption, at rated maximum voltage.

HVF, Swg

NOTE: The clearing time is equal to the sum of melting time and the arcing time.

clips. See contact clips, fuse clips.

closing operating time (of a switch). The interval during which the switch is being operated to move from the fully open position to the fully closed position.

HVS, Swg

close-open operation (of a switching device). A close operation followed immediately by an open operation without purposely delayed action.

LVSwgD, HVS, Swg, PCB, Swg

NOTE: The letters CO signify this operation: Close-Open.

close operation (of a switching device). The movement of the contacts from the normally open to the normally closed position.

LVSwgD, PCB, Swg

NOTE: The letter C signifies this operation: Close.

close-time delay-open operation (of a switching device). A close operation followed by an open operation after a purposely delayed action.

LVSwgD, PCB, Swg

NOTE: The letters CTO signify this operation: Close-Time Delay-Open.

closing coil (of a switching device). A coil used in the electromagnet that supplies power for closing the device.

LVSwgD, PCB, Swg

NOTE: In an air-operated, or other stored-energy-operated device, the closing coil may be the coil used to release the air or other stored energy which in turn closes the device.

closing relay. A form of auxiliary relay used with an electrically operated device to control the closing and opening of the closing circuit of the device so that the main closing current does not pass through the control switch or other initiating device.

LVSwgD, PSRC, PCB, Swg

closing time (of a mechanical switching device). The interval of time between the initiation of

the closing operation and the instant when metallic continuity is established in all poles.

HVS, Swg, LVSwgD, PCB, Swg

NOTES: (1) It includes the operating time of any auxiliary equipment necessary to close the switching device, and which form an integral part of the switching device.

(2) For switching devices that embody switching resistors, a distinction should be made between the closing time up to the instant of establishing a circuit at the secondary arcing contacts, and the closing time up to the establishment of a circuit at the main or primary arcing contacts, or both.

common (basic) device (of a supervisory system). A device in either the master or remote station that is required for the basic operation of the supervisory system and is not part of the equipment for the individual points.

SUB

comparer. A signal element which performs an AND logic function.

PSRC

compensator. (as applied to relaying). A transducer with an air gapped core that produces an output voltage proportional to input current. The voltage modifies (or *compensates*) the voltage applied to the relay.

PSRC

compressed-air circuit breaker. See note under circuit breaker.

condenser (of a fuse). See fuse condenser.

conductance relay. A mho relay for which the center of the operating characteristic on the R-X diagram is on the R-axis.

PSRC

NOTE: The equation which describes such a characteristic is $Z = K \cos \theta$ where K is a constant and θ is the phase angle by which the input voltage leads the input current. See Fig 1(b).

conducting element (fuse link) (of a fuse). The conducting means, including the current-responsive element, for completing the electric circuit between the terminals of a fuseholder or fuse unit.

HVF, Swg

conducting mechanical joint. The juncture of two or more conducting surfaces held together by mechanical means.

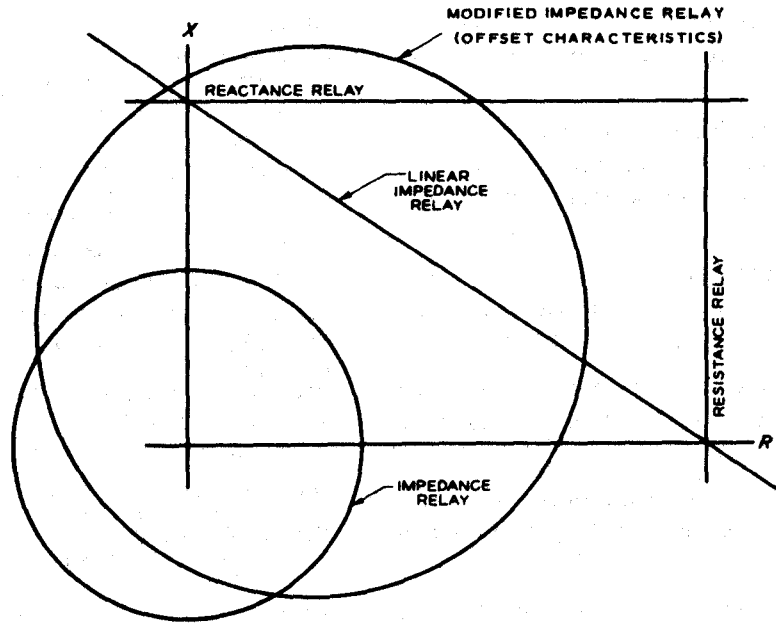
HVS, Swg, LVSwgD, PCB, Swg, SwgA

NOTE: Parts jointed by fusion processes, such as welding, brazing, or soldering, are excluded from this definition.

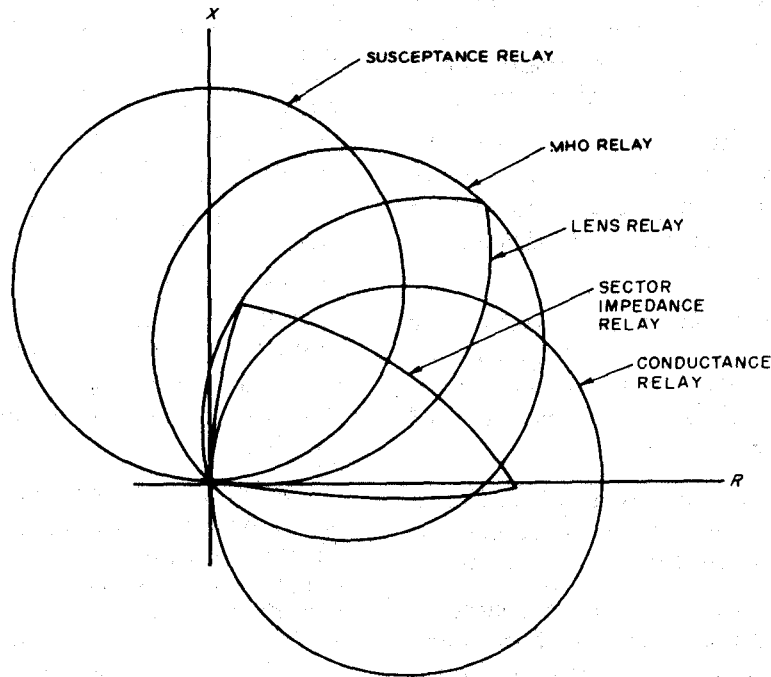
conformance tests. Those tests that are specifically made to demonstrate the conformity of switchgear or its component parts with applicable standards.

HVF, Swg, PCB, Swg, SwgA

connected position (of a switchgear-assembly removable element). That position of the re-



(a)
(PSRC)



(b)
(PSRC)

Fig 1
(a) Operating Characteristic of Distance Relays; (b) Operating Characteristics of Distance Relays that are Inherently Directional

movable element in which both primary and secondary disconnecting devices are in full contact.

SwgA
connecting rod or shaft. A component of a switch operating mechanism designed to transmit motion from an offset bearing or bell crank to a switch pole unit.

HVS, Swg
connection diagram. A diagram showing the relation and connections of devices and apparatus of a circuit or a group of circuits.

LVS_{wgD}
contact. A conducting part that co-acts with another conducting part to make or break a circuit.

HVS, Swg, LVS_{wgD}, PCB, Swg
contact. (of a relay). A conducting part that acts with another conducting part to make or break a circuit.

PSRC
contact clip (of a mechanical switching device). The clip that the blade enters or embraces.

HVS, Swg
contact converter. (as applied to relaying). A buffer element used to produce a prescribed output as the result of the opening or closing of a contact.

PSRC
contact current-carrying rating of a relay. The current that can be carried continuously or for stated periodic intervals without impairment of the contact structure or interrupting capability.

PSRC
contact current-closing rating of a relay. The current that the device can close successfully with prescribed operating duty and circuit conditions without significant impairment of the contact structure.

PSRC
contact interrupting rating of a relay. The current that the device can interrupt successfully with prescribed operating duty and circuit conditions without significant impairment of the contact structure.

PSRC
contact opening time (of a relay). The time a contact remains closed while in process of opening following a specified change of input.

PSRC
contact parting time (of a mechanical switching device). The interval between the time when the actuating quantity in, the release circuit reaches the value causing actuation of the release and the instant when the primary arcing contacts have parted in all poles.

R and S, Swg, PCB, Swg
NOTE: Contact parting time is the numerical sum of Release Delay and Opening Time.

contact surface. That surface of a contact

through which current is transferred to the co-acting contact.

HVS, Swg, LVS_{wgD}, PCB, Swg
contact-wear allowance. The total thickness of material which may be worn away before the co-acting contacts cease to perform adequately.

HVS, Swg, R and S, Swg
continuous-current tests. Tests made at rated current, until temperature rise ceases, to determine that the device or equipment can carry its rated continuous current without exceeding its allowable temperature rise.

PCB, Swg
control. A designation of how the equipment is governed, that is, by an attendant, by automatic means, or partially by automatic means and partially by an attendant.

SUB, LVS_{wgD}, PCB, Swg
NOTE: The word "control" is often used in a broad sense to include "indication" also.

control bus. A bus used to distribute power for operating electrically controlled devices.

PCB, Swg
control desk. A control switchboard consisting of one or more relatively short horizontal or inclined panels mounted on an assembly of such a height that the panel-mounted devices are within convenient reach of an attendant.

SwgA
control relay. An auxiliary relay whose function is to initiate or permit the next desired operation in a control sequence.

PSRC, PCB, Swg
control switch. A manually operated switching device for controlling power-operated devices.

PCB, Swg
NOTE: It may include signaling, interlocking, etc, as dependent functions.

control switchboard. A type of switchboard including control, instrumentation, metering, protective (relays) or regulating equipment for remotely controlling other equipment. Control switchboards do not include the primary power circuit-switching devices or their connections.

SwgA
control voltage. The voltage applied to the operating mechanism of a device to actuate it, usually measured at the control power terminals of the mechanism.

LVS_{wgD}, PCB, Swg
correct relay operation. An output response by the relay which agrees with the operating characteristic for the input quantities applied to the relay.

PSRC
NOTE: See also correct relaying-system performance.

correct relaying-system performance. The satisfactory operation of all equipment associated with the protective-relaying function in a pro-

protective-relaying system. It includes the satisfactory presentation of system input quantities to the relaying equipment, the correct operation of the relays in response to these input quantities, and the successful operation of the assigned switching device or devices.

PSRC

counting mechanism (of an automatic line sectionalizer or automatic circuit recloser). A device that counts the number of electrical impulses and, following a predetermined number of successive electrical impulses, actuates a releasing mechanism. It resets if the total predetermined number of successive impulses do not occur in a predetermined time.

R and S, Swg

counting operation (of an automatic line sectionalizer or automatic circuit recloser). Each advance of the counting mechanism towards an opening operation.

R and S, Swg

counting operation time (of an automatic line sectionalizer). The time between the cessation of a current above the minimum actuating current value and the completion of a counting operation.

LVSwgD

creepage distance. The shortest distance between two conducting parts measured along the surface or joints of the insulating material between them.

LVSwgD

critical impulse (of a relay). The maximum impulse in terms of duration and input magnitude which can be applied suddenly to a relay without causing pickup.

PSRC

critical impulse time (of a relay). The duration of a critical impulse under specified conditions.

PSRC

critical overtravel time (of a relay). The time following a critical impulse until movement of the responsive element ceases just short of pickup.

PSRC

critical travel (of a relay). The amount of movement of the responsive element of a relay during a critical impulse, but not subsequent to the impulse.

PSRC

current-balance relay. A balance relay that operates by comparing the magnitudes of two current inputs.

PSRC

current-carrying part. A conducting part intended to be connected in an electric circuit to a source of voltage.

HVF, Swg, HVS, Swg, LVSwgD, PCB, Swg

NOTE: Non-current-carrying parts are those not intended to be so connected.

current-limiting (peak let-through or cut-off) characteristic curve (of a current-limiting fuse).

A curve showing the relationship between the maximum peak current passed by a fuse and the correlated rms available current magnitudes under specified voltage and circuit impedance conditions.

HVF, Swg

NOTE: The rms available current may be symmetrical or asymmetrical.

current limiting fuse unit. A fuse unit that when it is melted by a current within its specified current limiting range, abruptly introduces a high resistance to reduce the current magnitude and duration.

HVF, Swg

NOTES: (1) There are two classes of current limiting fuse units - power and distribution. They are differentiated one from the other by current ratings and minimum melting time current characteristics.

(2) The values specified in standards for the threshold ratio, peak let-thru current, and I^2t characteristics are used as the measures of current limiting ability.

current-limiting range (of a current-limiting fuse). That specified range of currents between the threshold current and the rated interrupting current within which current limitation occurs.

HVF, Swg

current phase-balance protection. A method of protection in which an abnormal condition within the protected equipment is detected by the current unbalance between the phases of a normally balanced polyphase system.

PSRC

current rating of a relay. The limiting current at specified frequency that may be sustained by the relay for an unlimited period without causing any of the prescribed limitations to be exceeded.

PSRC

current relay. A relay which responds to current.

PSRC

current-responsive element (of a fuse). That part with predetermined characteristics, the melting and severance or severances of which initiate the interrupting function of the fuse.

HVF, Swg

NOTE: The current-response element may consist of one or more fusible elements combined with a strain element or other component(s), or both, which affect(s) the current-responsive characteristic.

current-type telemeter. A telemeter which employs the magnitude of a single current as the translating means.

SUB

cut-off characteristic (of a current-limiting

fuse). See **current-limiting characteristic curve**.

cutout. An assembly of a fuse support with either a fuseholder, fuse carrier, or disconnecting blade. The fuseholder or fuse carrier may include a conducting element (fuse link), or may act as a disconnecting blade by the inclusion of a nonfusible member.

HVF, Swg

NOTE: The term *cutout*, as defined here, is restricted in practice to equipment used on distribution systems. See **distribution and distribution cutout**. For fuses having similar components used on power systems see **power and power fuse**.

data logging. An arrangement for the alpha-numerical representation of selected quantities on log sheets; papers, magnetic tape, or the like, by means of an electric typewriter or other suitable devices.

SUB

dead-front mounting (of a switching device). A method of mounting in which a protective barrier is interposed between all live parts and the operator, and all exposed operating parts are insulated or grounded.

SwgA

NOTE: The barrier is usually grounded metal.

dead-front switchboard. One which has no exposed live parts on the front.

SwgA

NOTE: The switchboard panel is normally grounded metal and provides a barrier between the operator and all live parts.

dead tank switching device. A switching device in which a vessel (s) at ground potential surrounds and contains the interrupter (s) and the insulating medium.

PCB, Swg

dead time (of a circuit breaker on a reclosing operation). The interval between interruption in all poles on the opening stroke and reestablishment of the circuit on the reclosing stroke.

PCB, Swg

NOTES: (1) In breakers using arc-shunting resistors, the following intervals are recognized and the one referred to should be stated:

(a) Dead time from interruption on the primary arcing contacts to reestablishment through the primary arcing contacts.

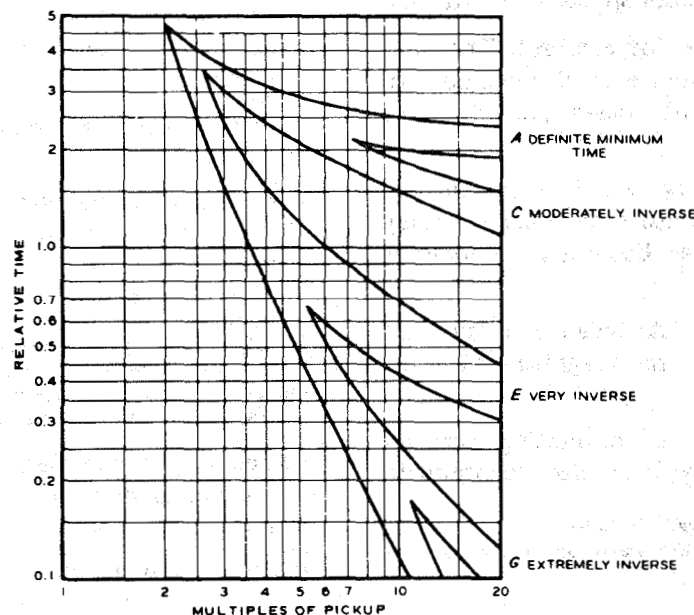
(b) Dead time from interruption on the primary arcing contacts to reestablishment through the secondary arcing contacts.

(c) Dead time from interruption on the secondary arcing contacts to reestablishment on the primary arcing contacts.

(d) Dead time from interruption on the secondary arcing contacts to reestablishment on the secondary arcing contacts.

(2) The dead time of an arcing fault on a reclosing operation is not necessarily the same as the dead time of the circuit breakers involved, since the dead time of the fault is the interval during which the faulted conductor is deenergized from all terminals.

Fig 2
Typical Operating Characteristic Curve Shapes of
Various Inverse-Time Relays
(PSRC)



definite-minimum-time relay. An inverse-time relay in which the operating time becomes substantially constant at high values of input. See Fig 2.

PSRC
definite-time delay. A qualifying term indicating that there is purposely introduced a delay in action, which delay remains substantially constant regardless of the magnitude of the quantity that causes the action.

LVS_{wgD}, PCB, Swg
definite-time relay. A relay in which the operating is substantially constant regardless of the magnitude of the input quantity.

PSRC
degree of asymmetry (of a current at any time). The ratio of the direct-current component to the peak value of the symmetrical component determined from the envelope of the current wave at that time.

LVS_{wgD}, PCB, Swg
NOTE: This value is 100 percent when the direct-current component equals the peak value of the symmetrical component.

delayed overcurrent trip. See **delayed release (trip)** and **overcurrent release (trip)**.

delayed release (trip). A release with intentional delay introduced between the instant when the activating quantity reaches the release setting and the instant when the release operates.

LVS_{wgD}
dependability (of a relay or relay system). The facet of reliability that relates to the degree of certainty that a relay or relay system will operate correctly.

PSRC
dependent manual operation. An operation solely by means of directly applied manual energy, such that the speed and force of the operation are dependent upon the action of the attendant.

LVS_{wgD}
dependent power operation. An operation by means of energy other than manual, where the completion of the operation is dependent upon the continuity of the power supply (to solenoids, electric or pneumatic motors, etc.)

LVS_{wgD}, HVF, Swg, PCB, Swg
design tests. Those tests made to determine the adequacy of a particular type, style, or model of equipment with its component parts to meet its assigned ratings and to operate satisfactorily under normal service conditions or under special conditions if specified.

LVS_{wgD}, PCB, Swg, HVF, Swg
NOTE: Design tests are made only on representative

apparatus to substantiate the ratings assigned to all other apparatus of basically the same design. These tests are not intended to be used as a part of normal production. The applicable portion of these design tests may also be used to evaluate modifications of a previous design and to assure that performance has not been adversely affected. Test data from previous similar designs may be used for current designs, where appropriate.

dielectric withstand-voltage tests. Tests made to determine the ability of insulating materials and spacings to withstand specified overvoltages for a specified time without flashover or puncture.

HVF, Swg, LVS_{wgD}, PCB, Swg, SwgA
differential capacitance voltage. The difference in magnitudes of the rms system normal frequency line-to-neutral voltage multiplied by the square root of two, with and without the capacitance connected.

HVS, Swg, PCB, Swg
NOTE: This can be calculated from the equations:

$$\Delta V = \sqrt{2} E_S \frac{X_L}{X_C - X_L} \quad \text{or}$$

$$\Delta V = \sqrt{2} E_S \frac{\text{kvar}}{\text{kVA}_{SC} - \text{kvar}}$$

where

ΔV = differential capacitance voltage in volts

E_S = system phase-to-neutral voltage in volts rms

X_L = source inductive reactance to point of application, in ohms per phase

X_C = capacitive reactance of bank being switched in ohms per phase

kvar = size of bank being switched (three phase)

kVA_{SC} = system short-circuit kVA at point of capacitor application (symmetrical three phase)

differential protection. A method of apparatus protection in which an internal fault is identified by comparing electrical conditions at all terminals of the apparatus.

PSRC
differential relay. A relay that by its design or application is intended to respond to the difference between incoming and outgoing electrical quantities associated with the protected apparatus.

PSRC
differentiator (relaying). A transducer whose output wave form is substantially the time derivative of its input wave form.

PSRC
digital converter (code translator). A device, or group of devices, that converts an input numerical signal or code of one type into an output numerical signal or code of another type.

SUB

digital readout clock. A clock that gives (usually with visual indication) a voltage or contact closure pattern of electrical circuitry for a readout of time. A digital readout calendar clock also includes a readout of day, month, and year, usually, also with indication.

SUB

digital telemeter indicating receiver. A device that receives the numerical signal transmitted from a digital telemeter transmitter and gives a visual numerical display of the quantity measured.

SUB

digital telemeter receiver. A device that receives the numerical signal transmitted by a digital telemeter transmitter and stores it or converts it to a usable form, or both, for such purposes as recording, indication, or control.

SUB

digital telemeter transmitter. A device that converts its input signal to a numerical form for transmission to a digital telemeter receiver over an interconnecting channel.

SUB

digital telemetering. Telemetering in which a numerical representation, as for example some form of pulse code, is generated and transmitted; the number being representative of the quantity being measured.

SUB

digital-to-analog converter. A device, or group of devices, that converts a numerical input signal or code into an output signal some characteristic of which is proportional to the input.

SUB

direct-acting machine voltage regulator. A machine voltage regulator having a voltage-sensitive element which acts directly without interposing power-operated means to control the excitation of an electric machine.

LVS_{wgD}

direct-acting overcurrent trip device. See **direct release (series trip)** indirect release (trip) and overcurrent release (trip).

direct-current component (of a total current). That portion of the total current which constitutes the asymmetry.

LVS_{wgD}, PCB, Swg

direct operation. Operation by means of a mechanism connected directly to the main operating shaft or an extension of the same.

HVS, Swg

direct release (series trip). A release directly energized by the current in the main circuit of a switching device.

LVS_{wgD}, PCB, Swg

directional-comparison protection. A form of

pilot protection in which the relative operating conditions of the directional units at the line terminals are compared to determine whether a fault is in the protected line section.

PSRC

directional control (as applied to a protective relay or relay scheme). A qualifying term that indicates a means of controlling the operating force in a nondirectional relay so that it will not operate until the two or more phasor quantities used to actuate the controlling means (directional relay) are in a predetermined band of phase relations with a reference input.

PSRC

directional-current tripping. See **directional-overcurrent protection** and **directional-overcurrent relay**.

directional-ground relay. A directional relay used primarily to detect single-phase-to-ground faults, but also sensitive to double-phase-to-ground faults.

PSRC

NOTE: This type of relay is usually operated from the zero-sequence components of voltage and current, but is sometimes operated from negative-sequence quantities.

directional-overcurrent protection. A method of protection in which an abnormal condition within the protected equipment is detected by the current being in excess of a predetermined amount and in a predetermined band of phase relations with a reference input.

PSRC

directional-overcurrent relay. A relay consisting of an overcurrent unit and a directional unit combined to operate jointly.

PSRC

directional-power relay. A relay that operates in conformance with the direction of power.

PSRC

directional-power tripping. See **directional-power relay**.

directional relay. A relay that responds to the relative phase position of a current with respect to another current or voltage reference.

PSRC

NOTE: The above definition which applies basically to a single phase directional relay may be extended to cover a polyphase directional relay.

discharge resistor. A resistor that, upon interruption of excitation source current, is connected across the field windings of a generator, motor, synchronous condenser, or an exciter to limit the transient voltage in the field circuit and to hasten the decay of field current of these machines.

LVS_{wgD}

FOR POWER SWITCHGEAR

disconnected position (of a switchgear-assembly removable element). That position in which the primary and secondary disconnecting devices of the removable element are separated by a safe distance from the stationary element contacts.

SwgA

NOTE: Safe distance, as used here, is a distance at which the equipment will meet its withstand ratings, both power frequency and impulse, between line and load stationary terminals and phase-to-phase and phase-to-ground on both line and load stationary terminals with the switching device in the closed position.

disconnecting blade. See blade (disconnecting blade) (of a switching device).

disconnecting cutout. A cutout having a disconnecting blade for use as a disconnecting or isolating switch.

HVF, Swg

disconnecting fuse. See fuse disconnecting switch.

disconnecting or isolating switch (disconnecter, isolator). A mechanical switching device used for changing the connections in a circuit, or for isolating a circuit or equipment from the source of power.

HVF, Swg; HVS, Swg

NOTE: It is required to carry normal load current continuously, and also abnormal or short-circuit currents for short intervals as specified. It is also required to open or close circuits either when negligible current is broken or made, or when no significant change in the voltage across the terminals of each of the switch poles occurs.

distance protection. A method of line protection in which an abnormal condition within a predetermined electrical distance of a line terminal on the protected circuit is detected by measurement of system conditions at that terminal.

PSRC

distance relay. A generic term covering those forms of protective relays in which the response to the input quantities is primarily a function of the electrical circuit distance between the relay location and the point of fault. See Figs 1(a) and 1(b).

PSRC

distribution (used as an adjective). A general term used, by reason of specific physical or electrical characteristics, to denote application or restriction of the modified term, or both, to that part of an electric system used for conveying energy to the point of utilization from a source or from one or more main receiving stations.

HVF, Swg

NOTES: (1) From the standpoint of a utility system, the area described is between the generating source, or intervening substations, and the customer's entrance equipment.

(2) From the standpoint of a customer's internal system, the area described is between a source or receiving station within the customer's plant and the points of utilization.

distribution cutout. A fuse or disconnecting device consisting of any one of the following assemblies:

(1) A fuse support and fuseholder which may or may not include the conducting element (or fuse link).

(2) A fuse support and disconnecting blade.

(3) A fuse support and fuse carrier which may or may not include the conducting element (fuse link) or disconnecting blade.

HVF, Swg

NOTE: In addition to the distribution cutout is identified by the following characteristics:

(1) Dielectric withstand (BIL) strengths at distribution levels.

(2) Application primarily on distribution feeders and circuits.

(3) Mechanical construction basically adapted to pole or crossarm mounting except for the distribution oil cutout.

(4) Operating voltage limits corresponding to distribution systems voltage.

distribution disconnecting cutout. See distribution cutout and disconnecting cutout.

distribution enclosed single-pole air switch (distribution enclosed air switches). A single-pole disconnecting switch in which the contacts and blade are mounted completely within an insulated enclosure. (Cannot be converted into a distribution cutout or disconnecting fuse.)

HVF, Swg

NOTE: The distribution enclosed air switch is identified by the following characteristics:

(1) Dielectric withstand (BIL) strengths at distribution level.

(2) Application primarily on distribution feeders and circuits.

(3) Mechanical construction basically adapted to crossarm mounting.

(4) Operating voltage limits correspond to distribution voltage.

(5) Unless incorporating load-break means, it has no interrupting (load-break current) rating. (Some load-break ability is inherent in the device. This ability can be best evaluated only by the user, based on experience under operating conditions.)

distribution fuse cutout. See **distribution cutout** and **fuse cutout**.

distribution oil cutout. See **distribution and oil cutout**.

distribution open cutout. See **distribution and open cutout**.

distribution open-link cutout. See **distribution and open-link cutout**.

distribution switchboard. A power switchboard used for the distribution of electric energy at the voltages common for such distribution within a building.

SwgA

NOTE: Knife switches, air circuit breakers, and fuses are generally used for circuit interruption on distribution switchboards, and voltages seldom exceed 600. However, such switchboards often include switchboard equipment for a high-tension incoming supply circuit and a step-down transformer.

double-break switch. One that opens a conductor of a circuit at two points.

HVS, Swg

double-throw (as applied to a mechanical switching device). A qualifying term indicating that the device can change the circuit connections by utilizing one or the other of its two operating positions.

LVSwgD

NOTE: A double-throw air switch changes circuit connections by moving the switchblade from one of two sets of contact clips into the other.

drawout-mounted device. One having disconnecting devices and in which the removable portion may be removed from the stationary portion without the necessity of unbolting connections or mounting supports.

LVSwgD, SwgA

NOTE: Compare with **stationary-mounted device**.

dropout (of a relay). A term for contact operation (opening or closing) as a relay just departs from pickup. Also identifies the maximum value of an input quantity which will allow the relay to depart from pickup.

PSRC

dropout fuse. A fuse in which the fuseholder or fuse unit automatically drops into an open position after the fuse has interrupted the circuit.

HVF, Swg

dropout ratio (of a relay). The ratio of dropout to pickup of an input quantity.

PSRC

NOTE: This term has been used mostly with relays for which reset is not differentiated from dropout. Hence a similar term, reset ratio, the ratio of reset to pickup, is not generally used, though technically correct.

dropout time (of a relay). The time interval to dropout following a specified change of input conditions.

PSRC

NOTE: When the change of input conditions is not specified it is intended to be a sudden change from pickup value of input to zero input.

dry vault. A ventilated, enclosed area not subject to flooding.

R and S, Swg

dual benchboard. A combination assembly of a benchboard and a vertical hinged panel switchboard placed back to back (no aisle) and enclosed with a top and ends.

SwgA

dual-element fuse. A fuse having current-responsive elements of two different fusing characteristics in series in a single fuse.

HVF, Swg

dual overcurrent trip. See **dual release (trip)** and **overcurrent release (trip)**.

dual release (trip). A release that combines the function of a delayed and an instantaneous release.

R and S Swg

dual switchboard. A control switchboard with front and rear panels separated a comparatively short distance and enclosed at both ends and top. The panels on at least one side are hinged for access to the panel wiring.

SwgA

duplex benchboard. A combination assembly of a benchboard and a vertical control switchboard placed back to back and enclosed with a top and ends (not grille). Access space with entry doors is provided between the benchboard and vertical control switchboard.

SwgA

duplex switchboard. A control switchboard consisting of panels placed back to back and enclosed with a top and ends (not grille). Access space with entry doors is provided between the rows of panels.

SwgA

earth-fault protection. See **ground protection**.

electric. Containing, producing, arising from, actuated by, or carrying electricity, or designed to carry electricity and capable of so doing.

SwgA

Examples: Electric eel, energy, motor, vehicle, wave.

electrical. Related to, pertaining to, or associated with electricity but not having its properties or characteristics.

SwgA

Examples: Electrical engineer, handbook, insulator, rating, school, unit.

electric telemeter. The measuring, transmitting,

and receiving apparatus, including the primary detector, intermediate means (excluding the channel) and end devices for electric telemetering.

SUB

NOTE: A telemeter that measures current is called a telemeter; voltage, a televoltmeter; power, a telewattmeter; one which measures angular or linear position, a position telemeter. The names of the various component parts making up the telemeter are, in general, self-defining; for example, the transmitter, receiver, indicator, etc.

electric telemetering (electric telemetry). Telemetering performed by an electrical translating means separate from the measurand.

SUB

electric center (of a power system out of synchronism). A point at which the voltage is zero when a machine is 180 degrees out of phase with the rest of the system.

PSRC

NOTE: There may be one or more electrical centers depending on the number of machines and the interconnections among them.

electrical interchangeability (of fuse links or fuse units). The characteristic which permits the designs of various manufacturers to be used interchangeably so as to provide a uniform degree of overcurrent protection and fuse coordination.

HVF, Swg

electrical operation. Power operation by electric energy.

LVSwgD, PCB, Swg

electrically release-free (trip-free) (as applied to an electrically operated switching device). A term indicating that the release can open the device even though the closing control circuit is energized.

PCB, Swg; LVSwgD; R and S, Swg

NOTE: Electrically release-free switching devices are usually arranged so that they are also anti-pump. With such an arrangement the closing mechanism will not reclose the switching device after opening until the closing control circuit is opened and again closed.

electrically reset relay. A relay that is so constructed that it remains in the picked-up condition even after the input quantity is removed; an independent electrical input is required to reset the relay.

PSRC

electrically trip-free. See electrically release-free.

electromagnetic relay. An electromechanical relay that operates principally by action of an electromagnetic element which is energized by the input quantity.

PSRC

electromechanical relay. A relay that operates

by physical movement of parts resulting from electromagnetic, electrostatic, or electrothermic forces created by the input quantities.

PSRC

element (of a relay). See relay element.

enclosed cutout. A cutout in which the fuse clips and fuseholder or disconnecting blade are mounted completely within an insulating enclosure.

HVF, Swg

enclosed switchboard. A dead-front switchboard that has an overall sheet metal enclosure (not grille) covering back and ends of the entire assembly.

HVF, Swg

NOTE: Access to the interior of the enclosure is usually provided by doors or removable covers. The top may or may not be covered.

enclosed switches, indoor or outdoor. Switches designed for service within a housing restricting heat transfer to the external medium.

HVS, Swg

enclosed switchgear assembly. One that is enclosed on all sides and top.

SwgA

enclosure. A surrounding case or housing used to protect the contain equipment and to prevent personnel from accidentally contacting live parts.

SwgA

NOTE: Material and finish shall conform to the standard for the switchgear enclosed.

end device (of a telemeter). The final system element that responds quantitatively to the measurand through the translating means and performs the final measurement operation.

SUB

NOTE: An end device performs the final conversion of measurement energy to an indication, record, or the initiation of control.

entrance terminal (distribution oil cutouts). A terminal with an electrical connection to the fuse contact and suitable insulation where the connection passes through the housing.

HVF, Swg

evolving fault. A change in the current during interruption whereby the magnitude of current increases to a fault current or to a higher value of fault current in one or more phases.

PCB, Swg

excitation current. The current supplied to unloaded transformers or similar equipment.

PCB, Swg

exciter ceiling voltage. The maximum voltage that may be attained by an exciter under specified conditions.

LVSwgD

expansion chamber (for an oil cutout). A

sealed chamber separately attachable to the vent opening to provide additional air space into which the gases developed during circuit interruption can expand and cool.

HVF, Swg

expendable cap (of an expendable-cap cutout). A replacement part or assembly for clamping the button head of a fuse link and closing one end of the fuseholder. It includes a pressure-responsive section which opens to relieve the pressure within the fuseholder, when a predetermined value is exceeded during circuit interruption.

HVF, Swg

expendable-cap cutout. An open cutout having a fuse support designed for and equipped with a fuseholder having an expendable cap.

HVF, Swg

explosionproof fuse. A fuse, so constructed or protected, that for all current interruptions within its rating shall not be damaged nor transmit flame to the outside of the fuse.

HVF, Swg

exponential-cosine (exponential minus cosine) (ex-cos) envelope (of a transient recovery voltage). A voltage-versus-time curve which represents the maximum at any time of the 1-cosine (1 minus cosine) envelope and the exponential envelope.

PCB, Swg

exponential (ex) envelope (of a transient recovery voltage). A voltage-versus-time curve of the general exponential form $e_1 E_1 [1 - \exp(-t/T)]$ in which e_1 represents the transient voltage across a switching device pole unit, reaching its crest E_1 at infinite time.

PCB, Swg

NOTE: In practice this envelope curve is derived from a circuit in which a voltage E_1 charges, by means of a switch, a circuit with inductance L in series with impedance Z and capacitance C in parallel. The voltage of e_1 is measured across Z .

E_1 represents the ac driving or ceiling voltage which is considered at its peak at the time of a current zero and remains practically constant during that portion of the transient defined by the first curve. Hence, it can be considered as dc source during this time. The voltage application is simulated by the closing of the switch.

e_1 represents the transient voltage across the circuit breaker pole unit.

L represents the equivalent effective inductance on the source side of the circuit breaker.

Z represents the equivalent surge impedance of associated transmission lines.

C represents the equivalent lumped capacitance on the source side of the breaker and modifies the exponential envelope by what may be considered as a slight initial time delay, T_1 .

R is the transient recovery voltage rate, corresponding to the initial slope of the exponential envelope.

expulsion fuse or fuse unit. A vented fuse or

fuse unit in which the expulsion effect of gases produced by the arc and lining of the fuseholder, either alone or aided by a spring, extinguishes the arc.

HVF, Swg

external insulation. Insulation that is designed for use outside of buildings and for exposure to the weather.

SwgA

factory renewable fuse unit. A fuse unit that after circuit interruption must be returned to the manufacturer to be restored for service.

HVF, Swg

failure to trip. In the performance of a relay or relay system, the lack of tripping which should have occurred considering the objectives of the relay system design.

PSRC

false tripping. In the performance of a relay or relay system, the tripping which should not have occurred considering the objectives of the relay system design.

PSRC

fault. See short circuit.

fault bus (fault ground bus). A bus connected to normally grounded parts of electric equipment, so insulated that all of the ground current passes to ground through fault detecting means.

SwgA, PSRC

fault bus protection (relaying). A method of ground fault protection which makes use of a fault bus.

SwgA, PSRC

fault-detector relay. A monitoring relay whose function is to limit the operation of associated protective relays to specific system conditions.

PSRC

fault incidence angle. The phase angle as measured between the instant of fault inception and a selected reference, such as the zero point on a current or voltage wave.

PSRC

fault-initiating switch. A mechanical switching device used in applied-fault protection to place a short circuit on an energized circuit and to carry the resulting current until the circuit has been denegitized by protective operation.

HVS, Swg

NOTES: (1) This switch is operated by a stored-energy mechanism capable of closing the switch within a specified rated closing time at its rated making current. The switch may be opened either manually or by a power-operated mechanism.

(2) The applied short circuit may be intentionally limited to avoid excessive system disturbance.

fault interrupter. A self controlled mechanical switching device capable of making, carrying and automatically interrupting an alternating current, but without automatic reclosing

capability. It includes an assembly of control elements to detect overcurrents and control the fault interrupter.

R and S, Swg

ferrule (of a cartridge fuse). A fuse terminal of cylindrical shape at the end of a cartridge fuse.

HVF, Swg, LVSwgD

field application relay. A relay that initiates the application of field excitation to a synchronous machine under specified conditions.

PSRC

NOTE: It is usually a polarized relay sensitive to the slip frequency of the induced field current. It may also remove excitation during an out-of-step condition.

field discharge (as applied to a switching device). A qualifying term indicating that the switching device has main contacts for energizing and deenergizing the field of a generator, motor, synchronous condenser or exciter; and has auxiliary contacts for short-circuiting the field through a discharge resistor at the instant preceding the opening of the main contacts. The auxiliary contacts also disconnect the field from the discharge resistor at the instant following the closing of the main contacts.

LVSwgD

NOTE: For dc generator operation the auxiliary contacts may open before the main contacts close.

field discharge circuit breaker. See **field discharge** and **circuit breaker**.

field renewable fuse or fuse unit. See **renewable fuse** or **fuse unit**.

field tests. Tests made on operating systems usually for the purpose of investigating the performance of switchgear or its component parts under conditions that cannot be duplicated in the factory.

PCB, Swg

NOTE: Field tests are usually supplementary to factory tests and therefore may not provide a complete investigation of capabilities.

field tests (switchgear). Tests made after the assembly has been installed at its place of utilization.

SwgA

fixed rack. An assembly enclosed at top and sides, either open or with door(s) for access, with a top to bottom front panel opening for equipment mounting (for example, nominal 19 inch wide chassis and subpanel assemblies).

PSRC

flame-retardant. So constructed or treated that it will not support flame.

SwgA

flow relay. A relay that responds to a rate of fluid flow.

PSRC

fluidly delayed overcurrent trip. See **fluidly delayed release (trip and overcurrent release (trip))**.

fluidly delayed release (trip). A release delayed by fluid displacement or adhesion.

LVSwgD

flush-mounted device. One in which the body of the device projects only a small specified distance in front of the mounting surface.

SwgA

frame size (as applied to a low-voltage circuit breaker). A term which denotes the maximum continuous current rating in amperes for all parts except the coils of the direct-acting trip device.

LVSwgD

frequency relay. A relay that responds to the frequency of an alternating electrical input quantity.

PSRC

frequency-type telemeter. A telemeter that employs the frequency of a periodically recurring electric signal as the translating means.

SUB

front contact. See **a** contact.

functional component. A device which performs a necessary function for the proper operation and application of a unit of equipment.

LVSwgD

fuse. An overcurrent protective device with a circuit-opening fusible part that is heated and severed by the passage of overcurrent through it.

HVF, Swg, PCB, Swg

NOTE: A fuse comprises all the parts that form a unit capable of performing the prescribed functions. It may or may not be the complete device necessary to connect it into an electric circuit.

fuse arcing time. See **arcing time (of a fuse)**.

fuse blade (of a cartridge fuse). A cartridge-fuse terminal having a substantially rectangular cross-section.

R and S, Swg

fuse carrier (of an oil cutout). An assembly of a cap which closes the top opening of an oil-cutout housing, an insulating member, and fuse contacts with means for making contact with the conducting element and for insertion into the fixed contacts of the fuse support.

HVF, Swg

NOTE: The fuse carrier does not include the conducting element (fuse link).

fuse clearing time. See **clearing time (total clearing time) (of a fuse)**.

fuse clips (contact clips or fuse contacts). The current carrying parts of a fuse support which engage the fuse carrier, fuse holder, fuse unit, or blade.

HVF, Swg

fuse condenser. A device that, added to a vented fuse, converts it to a nonvented fuse by providing a sealed chamber for condensation of the gases developed during circuit interruption.

HVF, Swg

fuse cutout. A cutout having a fuse link or fuse unit.

HVF, Swg

NOTE: A fuse cutout is a fuse disconnecting switch.

fuse contact. See **fuse terminal**.

fuse disconnecting switch (disconnecting fuse).

A disconnecting switch in which a fuse unit or fuseholder and fuse link forms all or a part of the blade.

HVF, Swg

fuse enclosure package (FEP). An enclosure supplied with one or more current limiting fuses as a package for which application data covering the specific fuse(s) and enclosure are supplied.

HVF, Swg

fuse filler. See **arc-extinguishing medium (of a fuse)**.

fuseholder (of a high-voltage fuse). An assembly of a fuse tube or tubes together with parts necessary to enclose the conducting element and provide means of making contact with the conducting element and the fuse clips. The fuseholder does not include the conducting element (fuse link or refill unit).

HVF, Swg

fuseholder (of a low-voltage fuse). An assembly of base, fuse clips, and necessary insulation for mounting and connecting into the circuit the current-responsive element, with its holding means if used for making a complete device.

LVSwgD

NOTES: (1) For low-voltage fuses the current-responsive element and holding means are called a fuse.

(2) For high-voltage fuses the general type of assembly defined above is called a fuse support or fuse mounting. The holding means (fuseholder) and the current-responsive or conducting element are called a fuse unit.

fuse hook. A hook provided with an insulating handle for opening and closing fuses or switches and for inserting the fuseholder, fuse unit, or disconnecting blade into and removing it from the fuse support.

HVF, Swg

fuse link. A replaceable part or assembly,

comprised entirely or principally of the conducting element, required to be replaced after each circuit interruption to restore the fuse to operating conditions.

HVF, Swg

fuse melting time. See **melting time (of a fuse)**.

fuse mounting. See **fuse support (of a high-voltage fuse)**.

fuse muffler. See **muffler (of a fuse)**.

fuse support (fuse mounting) (of a high-voltage fuse). An assembly of base, mounting support or oil-cutout housing, fuse clips, and necessary insulation for mounting and connecting into the circuit the current-responsive element with its holding means if such means are used for making a complete device.

HVF, Swg

NOTES: (1) For high-voltage fuses the holding means is called a fuse carrier or fuseholder, and in combination with the current-responsive or conducting element is called a fuse unit.

(2) For low-voltage fuses the general type of assembly defined above is called a fuseholder.

fuse terminal (fuse contact). The means for connecting the current-responsive element or its holding means, if such means is used for making a complete device, to the fuse clips.

HVF, Swg

fuse time-current characteristic. The correlated values of time and current that designate the performance of all or a stated portion of the functions of the fuse.

HVF, Swg

NOTE: The time-current characteristics of a fuse are usually shown as a curve.

fuse time-current tests. Tests that consist of the application of current to determine the relation between the rms alternating current or direct current and the time for the fuse to perform the whole or some specified part of its interrupting function.

HVF, Swg

fuse tongs. Tongs provided with an insulating handle and jaws. Fuse tongs are used to insert the fuseholder or fuse unit into the fuse support or to remove it from the support.

HVF, Swg

fuse tube. A tube of insulating material that surrounds the current-responsive element, the conducting element or the fuse link.

HVF, Swg

fuse unit. An assembly comprising a conducting element mounted in a fuseholder with parts and materials in the fuseholder essential to the operation of the fuse.

HVF, Swg

fusible element (of a fuse). That part, having

predetermined current-responsive melting characteristics, which may be all or part of the current-responsive element.

HVF, Swg

future point (for supervisory control or indication or telemeter selection). Provision for the future installation of equipment required for a point.

SUB

NOTE: A future point may be provided with 1) space only, 2) drilling, or other mounting provisions only or 3) drilling, or other mounting provisions, and wiring only.

gas-accumulator relay. A relay that is so constructed that it accumulates all or a fixed proportion of gas released by the protected equipment and operates by measuring the volume of gas so accumulated.

PSRC

gas-pressure relay. A relay so constructed that it operates by the gas pressure in the protected equipment.

PSRC

general purpose current limiting fuse. A fuse capable of interrupting all currents from the rated maximum interrupting current down to the current that causes melting of the fusible element in one hour.

HVF, Swg

general-purpose enclosure. An enclosure used for usual service applications where special types of enclosures are not required.

SwgA

general-purpose low-voltage dc power circuit breaker. A low-voltage dc power circuit breaker which, during interruption, does not usually prevent the fault current from rising to its E/R value.

LVS_{SwgD}

granular-filled fuse unit. A fuse unit in which the arc is drawn through powdered, granular, or fibrous material.

HVF, Swg

ground bus. A bus to which the grounds from individual pieces of equipment are connected, and that, in turn, is connected to ground at one or more points.

SwgA

ground contact (of a switchgear assembly). A self-coupling separable contact provided to connect and disconnect the ground connection between the removable element and the ground bus of the housing and so constructed that it remains in contact at all times except when the primary disconnecting devices are separated by a safe distance.

SwgA

NOTE: Safe distance, as used here, is a distance at which the equipment will meet its withstand-voltage ratings, both low-frequency and impulse, between line

and load terminals with the switching device in the closed position.

ground overcurrent. The net (phasor sum) current flowing in the phase and neutral conductors or the total current flowing in the normal neutral to ground connection which exceeds a predetermined value.

LVS_{SwgD}

ground protection. A method of protection in which faults to ground within the protected equipment are detected.

PSRC, LVS_{SwgD}

ground relay. A relay that by its design or application is intended to respond primarily to system ground faults.

PSRC

groundable parts. Those parts that may be connected to ground without affecting operation of the device.

HVF, Swg, LVS_{SwgD}

grounded parts. Parts that are intentionally connected to ground.

HVF, Swg, HVS, Swg, LVS_{SwgD}, PCB, Swg

grounding switch. A mechanical switching device by means of which a circuit or piece of apparatus may be electrically connected to ground.

HVS, Swg

group operation. The operation of all poles of a multipole switching device by one operating mechanism.

HVS, Swg, PCB, Swg

guard signal. A signal sent over a communication channel to make the system secure against false information by preventing or guarding against the relay operation of a circuit breaker or other relay action until the signal is removed and replaced by a tripping or permissive signal.

PSRC

hand-reset relay (mechanically reset relay). A relay that is so constructed that it remains in the picked-up condition even after the input quantity is removed; specific manual action is required to reset the relay.

PSRC

handling device (of metal-clad switchgear). That accessory that is used for the removal, replacement, or transportation of the removable element.

SwgA

harmonic-restraint relay. A restraint relay that is so constructed that its operation is restrained by harmonic components of one or more separate input quantities.

PSRC

high-pressure contact (as applied to high-voltage disconnecting switches). One in which the pressure is such that the stress in the material of either of the contact surfaces is near the

elastic limit of the material so that conduction is a function of pressure.

HVF, Swg

high-speed grounding switch. See fault-initiating switch.

high-speed low-voltage dc power circuit breaker. A low-voltage dc power circuit breaker which, during interruption, limits the magnitude of the fault current so that its crest is passed not later than a specified time after the beginning of the fault current transient, where the system fault current, determined without the circuit breaker in the circuit, falls between specified limits of current at a specified time.

LVS_{swgD}

NOTE: The specified time in present practice is 0.01 second.

high-speed relay. A relay that operates in less than a specified time.

PSRC

NOTE: The specified time in present practice is fifty milliseconds (three cycles on a 60 Hz basis).

high-speed short-circuiting switch. See fault-initiating switch.

hinge clip (of a switching device). The clip to which the blade is movably attached.

HVS, Swg

homogeneous series (of current limiting fuse units). A series of fuse units, deviating from each other only in such characteristics that, for a given test, the testing of one or a reduced number of particular fuse units of the series may be taken as representative of all the fuse units of the series.

HVF, Swg

hook operation. See stick (hook) operation.

hook ring (air switch). A ring provided on the switch blade for operation of the switch with a switch stick.

HVS, Swg

hook stick. See switch stick (switch hook).

horn-gap switch. A switch provided with arcing horns.

HVS, Swg

housing (body) (of an oil cutout). A part of the fuse support that contains the oil and provides means for mounting the fuse carrier, entrance terminals, and fixed contacts. The housing includes the means for mounting the cutout on a supporting structure and openings for attaching accessories such as a vent or an expansion chamber.

HVF, Swg

hydraulic operation. Power operation by movement of a liquid under pressure.

PCB, Swg

hydraulically release-free (trip-free) (as applied to a hydraulically operated switching device). A term indicating that by hydraulic control the switching device is free to open at any position in the closing stroke if the release is energized.

PCB, Swg

NOTE: This release-free feature is operative even though the closing control switch is held closed.

I^2t characteristic (of a fuse). The amount of ampere-squared seconds passed by the fuse during a specified period and under specified conditions.

HVF, Swg

NOTES: (1) The specified period may be the melting, arcing, or total clearing time. The sum of melting and arcing I^2t is the clearing I^2t .

(2) The melting characteristic is related to a specified current wave shape, and the arcing I^2t to specified voltage and circuit-impedance conditions.

ice proof. So constructed or protected that ice of a specified composition and thickness will not interfere with successful operation.

HVS, Swg

impedance relay. A distance relay in which the threshold value of operation depends only on the magnitude of the ratio of voltage to current applied to the relay, and is substantially independent of the phase angle of the impedance. See Fig 1(a).

PSRC

impulse (time) margin. In the operation of a relay the difference between characteristic operating times and critical impulse times. See Fig 3.

PSRC

impulse withstand voltage. The crest voltage of an impulse that, under specified conditions, can be applied without causing flashover or puncture.

HVF, Swg

incorrect relay operation. Any output response or lack of output response by the relay that, for the applied input quantities, is not correct.

PSRC

incorrect relaying-system performance. Any operation or lack of operation of the relays or associated equipment that, under existing conditions, does not conform to correct relaying-systems performance.

PSRC

independent manual operation (of a switching device). A stored-energy operation where manual energy is stored and released, such that the speed and force of this operation are independent of the action of the attendant.

LVS_{swgD}

independent pole tripping. The application of multipole circuit breakers in such a manner that a malfunction of one or more poles or asso-

ciated control circuits will not prevent successful tripping of the remaining pole(s).

PCB, Swg

NOTES: (1) Circuit breakers used for independent pole tripping must inherently be capable of individual pole opening.

(2) Independent pole tripping is applied on ac power systems to enhance system stability by maximizing the probability of clearing at least some phases of a multi-phase fault.

independent power operation. An operation by means of energy other than manual where the completion of the operation is independent of the continuity of the power supply.

LVSwgD

indicating control switch. One that indicates its last control operation.

SwgA

indicating fuse. A fuse that automatically indicates that the fuse has interrupted the circuit.

HVF, Swg

indirect-acting machine voltage regulator. A machine voltage regulator having a voltage-sensitive element that acts indirectly, through the medium of an interposing device such as contactors or a motor, to control the excitation of an electric machine.

LVSwgD

NOTE: A regulator is called a generator voltage regulator when it acts in the field circuit of a generator and is called an exciter voltage regulator when it acts in the field circuit of the main exciter.

indirect manual operation (of a switching device). Operation by hand through an operating handle mounted at a distance from, and connected to the switching device by, mechanical linkage.

LVSwgD

indirect operation (of a switching device). Operating by means of an operating mechanism connected to the main operating shaft or an extension of it, through offset linkages and bearings.

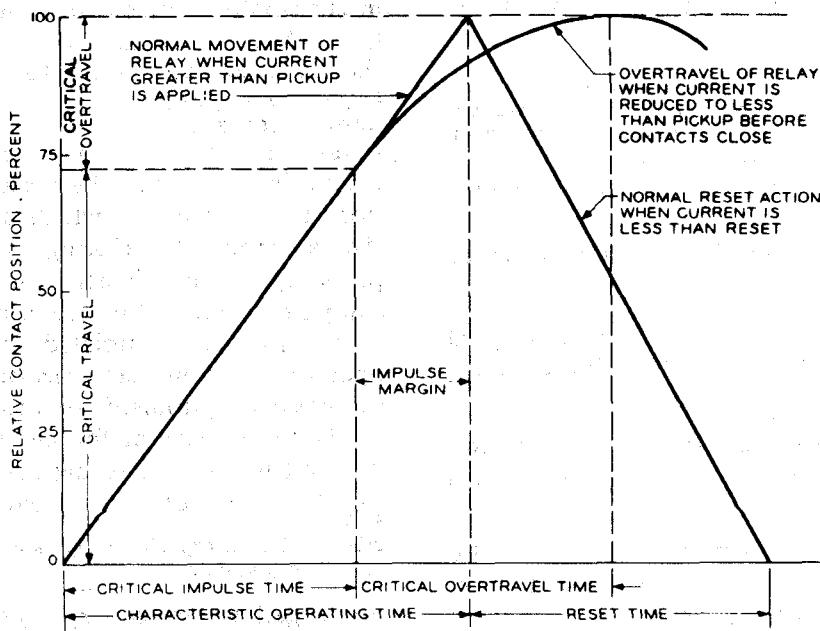
HVS, Swg

indirect release (trip) (of a switching device). A release energized by the current in the main circuit through a current transformer, shunt, or other transducing device.

LVSwgD

individual pole operation. (of a multipole circuit breaker or switching device). A descriptive term indicating that any pole(s) of the device can be caused to change state (open or close) without changing the state of the remaining pole(s). Devices may have capability

Fig 3
Relationship of Relay Operating Time for
Electromechanical Relays
(PSRC)



for individual pole opening, individual pole closing, or both.

PCB, Swg

indoor. Designed for use only inside buildings, or weatherresistant enclosures.

HVF, Swg, HVS, Swg, PCB, Swg

induction cup (of a relay). A form of relay armature in the shape of a cylinder with a closed end that develops operating torque by its location within the fields of electromagnets that are excited by the input quantities.

PSRC

induction cylinder (of a relay). A form of relay armature in the shape of an open-ended cylinder that develops operating torque by its location within the fields of electromagnets that are excited by the input quantities.

PSRC

induction disc (of a relay). A form of relay armature in the shape of a disc that usually serves the combined function of providing an operating torque by its location within the fields of an electromagnet excited by the input quantities and a restraining force by motion within the field of a permanent magnet.

PSRC

induction loop (of a relay). A form of relay armature consisting of a single turn or loop that develops operating torque by its location within the fields of electromagnets that are excited by the input quantities.

PSRC

initiating relay. A programming relay whose function is to constrain the action of dependent relays until after it has operated.

PSRC

input (to a relay). A physical quantity or quantities to which the relay is designed to respond.

PSRC

NOTES: (1) A physical quantity that is not directly related to the prescribed response of a relay, (though necessary, to or in some way affecting the relay operation,) is not considered part of input.

(2) Time is not considered a relay input, but it is a factor in performance.

inside air temperature. See average inside air temperature.

instantaneous. A qualifying term indicating that no delay is purposely introduced in the action of the device.

PSRC, LVSwgD, PCB, Swg

instantaneous phase or ground trip element. See instantaneous and direct-acting overcurrent trip device.

instrument switch. One used to connect or disconnect an instrument, or to transfer it from one circuit or phase to another.

SwgA

Examples: Ammeter switch, voltmeter switch.

insulator unit. An insulator assembled with such metal parts as may be necessary for attaching it to other insulating units or device parts.

HVF, Swg, HVS, Swg

integral unit substation. A unit substation in which the incoming, transforming, and outgoing sections are manufactured as a single compact unit.

SwgA

integrator (as applied to relaying). A transducer whose output wave form is substantially the time integral of its input wave form.

PSRC

interconnecting channel (of a supervisory system). The transmission link, such as the direct wire, carrier, or microwave channel (including the direct current, tones, etc) by which supervisory control or indication signals or selected telemeter readings are transmitted between the master station and the remote station or stations, in a single supervisory system.

SUB

interlock. A device actuated by the operation of some other device with which it is directly associated, to govern succeeding operations of the same or allied devices.

HVS, Swg, LVSwgD, PCB, Swg

NOTE: An interlock system is a series of interlocks applied to associated equipment in such a manner as to prevent or allow operation of the equipment only in a prearranged sequence. Interlocks are classified into three main divisions: mechanical interlocks, electrical interlocks, and key interlocks, based on the type of interconnection between the associated devices.

intermediate contacts (of a switching device). Contacts in the main circuit which part after the main contacts and before the arcing contacts have parted.

LVSwgD, PCB, Swg

interposing relay (of a supervisory system). An auxiliary relay at the master or remote station, the contacts of which serve: 1) to energize a circuit (for closing, opening, or other purpose) of an element of remote station equipment when the selection of a desired point has been completed and when suitable operating signals are received through the supervisory equipment from the master station; or 2) to connect in the circuit the telemeter transmitting and receiving equipments, respectively, at the remote and master stations.

SUB

NOTE: The interposing relays are considered part of a supervisory system.

interrogative supervisory system. A system

whereby the master station controls all operations of the system, and whereby all indications are obtained on a master station request or interrogation basis.

SUB

NOTE: The normal state is usually one of continuous interrogation or polling of the remote stations for changes in status.

interrupter. An element designed to interrupt specified currents under specified conditions.

HVS, Swg, LVSwgD, PCB, Swg

interrupter switch. An air switch, equipped with an interrupter, for making or breaking specified currents, or both.

HVS, Swg

NOTE: The nature of the current made or broken, or both, may be indicated by suitable prefix: that is, load interrupter switch, fault interrupter switch, capacitor current interrupter switch, etc.

interrupter blade (of an interrupter switch). A blade used in the interrupter for breaking the circuit.

HVS, Swg

interrupting (breaking) current. The current in a pole of a switching device at the instant of the initiation of the arc.

PCB, Swg

interrupting tests. Tests that are made to determine or check the interrupting performance of a switching device.

HVF, Swg, LVSwgD, PCB, Swg

interrupting (total break) time (of a mechanical switching device). The interval between the time when the actuating quantity of the release circuit reaches the operating value, the switching device being in a closed position, and the instant of arc extinction on the primary arcing contacts.

LVSwgD, PCB, Swg

NOTES: (1) Interrupting time is numerically equal to the sum of opening time and arcing time.

(2) In multipole devices interrupting time may be measured for each pole or for the device as a whole, in which latter case the interval is measured to the instant of arc extinction in the last pole to clear.

interruption to service. The isolation of an electrical load from the system supplying that load, resulting from an abnormality in the system.

PSRC

inverse-time delay. A qualifying term indicating that there is purposely introduced a delaying action, the delay decreasing as the operating force increases.

LVSwgD, PCB, Swg

inverse-time relay. A relay in which the input quantity and operating time are inversely related throughout at least a substantial portion of the performance range. See Fig 2.

PSRC

NOTE: Types of inverse-time relays are frequently identified by such modifying adjectives as "definite minimum time," "moderately," "very," and "extremely" to identify relative degree of inverseness of the operating characteristics of a given manufacturer's line of such relays.

isolated-phase bus. One in which each phase conductor is enclosed by an individual metal housing separated from adjacent conductor housings by an air space.

SwgA

NOTE: The bus may be self-cooled or may be forced-cooled by means of circulating a gas or liquid.

isolator. See disconnecting or isolating switch.

isolating time (of a sectionalizer). The time between the cessation of a current above the minimum actuating current value which caused the final counting and opening operation and the maximum separation of the contacts.

R and S, Swg

knife switch. A form of switch in which the moving element, usually a hinged blade, enters or embraces the stationary contact clips.

LVSwgD

NOTE: In some cases, however, the blade is not hinged and is removable.

latch. An attachment used to hold a fuse or switch in the closed position.

HVF, Swg

latching current (of a switching device). The making current during a closing operation in which the device latches or the equivalent.

PCB, Swg

latching relay. A relay that is so constructed that it maintains a given position by means of a mechanical latch until released mechanically or electrically.

PSRC

LC auxiliary switch. See auxiliary switch and LC contact.

LC contact. A latch-checking contact that is closed which the operating mechanism linkage is relatched after an opening operation of the switching device.

PCB, Swg

leakage distance of external insulation. See creepage distance.

lens distance relay. A distance relay that has an operating characteristic comprising the common area of two intersecting circular relay characteristics. See Fig 1(b).

PSRC

level detector (as applied to relaying). A device that produces a change in output at a prescribed input level.

PSRC

lifting eye (fuse holder, fuse unit, or disconnecting blade). An eye provided for receiving a

fuse hook or switch hook for inserting the fuse or disconnecting blade into and for removing it from the fuse support.

HVF, Swg
lifting-insulator switch. One in which one or more insulators remain attached to the blade, move with it, and lift it to the open position.

HVS, Swg
line-closing switching-surge factor. The ratio of the line-closing switching-surge maximum voltage to the crest of the normal-frequency line-to-ground voltage at the source side of the closing switching device immediately prior to closing.

PCB, Swg
line-closing switching-surge maximum voltage. The maximum transient crest voltage to ground measured on a transmission line during a switching surge which results from energizing that line.

PCB, Swg
line tap (in respect to system protection). A connection to a line with equipment that does not feed energy into a fault on the line in sufficient magnitude to require consideration in the relay plan.

PSRC
line terminal (in respect to system protection). A connection to a line with equipment that can feed energy into a fault on the line in sufficient magnitude to require consideration in the relay plan and which has means for automatic disconnection.

PSRC
linear-impedance relay. A distance relay for which the operating characteristic on an $R-X$ diagram is a straight line.

PSRC
NOTE: It may be described by the equation $Z = K/\cos(\theta - \alpha)$ where K and α are constants and θ is the phase angle by which the input voltage leads the input current. See Fig 1(a).

link-break cutout. A load-break fuse cutout that is operated by breaking the fuse link to interrupt the load current.

HVF, Swg
liquid-filled fuse unit. A fuse unit in which the act is drawn through a liquid.

HVF, Swg
live-front switchboard. One having exposed live parts on the front.

SwgA
live parts. Those parts which are designed to operate at voltage different from that of the earth.

HVF, Swg, HVS, Swg, PCB, Swg, SwgA
live tank switching device. A switching device in which the vessel(s) housing the interrupter(s) is at a potential above ground.

PCB, Swg

load. The true or apparent power consumed by power utilization equipment performing its normal function.

PCB, Swg
load-break cutout. A cutout with mean for interrupting load currents.

HVF, Swg
load-indicating automatic reclosing equipment. An automatic reclosing equipment that provides for reclosing the circuit interrupter automatically in response to sensing of predetermined conditions of the load circuit.

SUB
NOTE: This type of automatic reclosing equipment is generally used for direct-current load circuits.

load-indicating resistor. A resistor used, in conjunction with suitable relays or instruments, in an electric circuit, for the purpose of determining or indicating the magnitude of the connected load.

SUB
load-interrupter switch. An interrupter switch designed to interrupt currents not in excess of the continuous-current rating of the switch.

R and S, Swg
NOTES: (1) It may be designed to close and carry abnormal or short-circuit currents as specified.

(2) In international (IEC) practice a device with such performance characteristics is called a switch.

load restoration. The process of scheduled load restoration when the abnormality causing load shedding has been corrected.

PSRC
load shedding. The process of deliberately removing preselected loads from a power system in response to an abnormal condition in order to maintain the integrity of the system.

PSRC
load-shifting resistor. One used in an electric circuit to shift load from one circuit to another.

LVSwgD
local backup. A form of backup protection in which the backup protective relays are at the same station as the primary protective relays.

PSRC
lockout-free (as applied to a recloser or sectionalizer). A general term denoting that the lockout mechanism can operate even though the manual operating level is held in the closed position.

R and S, Swg
NOTE: When used as an adjective modifying a device, the device has this operating capability.

lockout mechanism (of an automatic circuit recloser). A device that locks the contacts in the open position following the completion of a predetermined sequence of operations.

R and S, Swg

lockout operation (of a recloser). An opening operation followed by the number of closing and opening operations that the mechanism will permit before locking the contacts in the open position.

R and S, Swg

lockout relay. An electrically reset or hand-reset auxiliary relay whose function is to hold associated devices inoperative until it is reset.

PSRC

long-time-delay phase trip element. A direct-acting trip device element that functions with a purposely delayed action (seconds).

LVS_{wgD}

loop-service (ring) feeder. A feeder that supplies a number of separate loads distributed along its length and that terminates at the same bus from which it originated.

SUB

loss-of-excitation relay. A relay that compares the alternating voltages and currents at the terminal of a synchronous machine and operates to produce an output if the relationship between these quantities indicates that the machine has substantially lost its field excitation.

PSRC

low-pressure contact (area contact). One in which the pressure is such that stress in the material is well below the elastic limit of both contact surface materials, such that conduction is a function of area.

HVF, Swg

low-voltage ac power circuit breaker. See note under circuit breaker.

low-voltage integrally fused power circuit breaker. An assembly of a general-purpose ac low-voltage power circuit breaker and integrally mounted current-limiting fuses which together function as a coordinated protective device.

LVS_{wgD}

low-voltage protection. See undervoltage protection.

lumped capacitive load. A lumped capacitance which is switched as a unit.

PCB, Swg

magnetic (as applied to a switching device). A term indicating that interruption of the circuit takes place between contacts separable in an intense magnetic field.

PCB, Swg, LVS_{wgD}

NOTE: With respect to contactors, this term indicates the means of operation.

magnetic air circuit breaker. See magnetic and air circuit breaker.

main contacts (of a switching device). Contacts

which carry all or most of the current of the main current.

HVS, Swg, LVS_{wgD}, PCB, Swg

main protection. See primary protection.

main (primary) switchgear connections. Those that electrically connect together devices in the main circuit, or connect them to the bus, or both.

LVS_{wgD}, SwgA

maintenance operation device. A removable device for use with power operated circuit breakers which is used for manual operation of a deenergized circuit breaker during maintenance only.

LVS_{wgD}, PCB, Swg

NOTE: This device is not to be used for closing the circuit breaker on an energized circuit.

making current (of a switching device). The value of the available current at the time the device closes.

HVS, Swg, LVS_{wgD}, PCB, Swg

NOTES: (1) Its rms value is measured from the envelope of the current wave at the time of the first major current peak.

(2) The making current may also be expressed in terms of instantaneous value of current in which case it is measured at the first major peak of the current wave. This is designated peak making current.

manual control. Control in which the main devices under control, whether manually or power operated are controlled by an attendant.

SUB, PCB, Swg

manual lockout device. A device that holds the associated device inoperative unless a predetermined manual function is performed to release the locking feature.

LVS_{wgD}, PCB, Swg

manual operation. Operation by hand without using any other source of power.

HVS, Swg, LVS_{wgD}, PCB, Swg, R and S, Swg

manual trip device. A device which is connected to the tripping linkage and which can be operated manually to trip a switching device.

PCB, Swg, LVS_{wgD}

manually release- (trip-) free. See mechanically release- (trip-) free for a manually operated switching device.

master station (of a supervisory system). The station from which remotely located units of switchgear or other equipment are controlled by supervisory control or which receives supervisory indications or selected telemeter readings.

SUB

maximum design voltage

(1) of a device. The highest voltage at which the device is designed to operate

PCB, Swg

(2) of a relay. The highest root mean square

or direct voltage at which a relay is designed to be energized continuously

PSRC

master station supervisory equipment. That part of a (single) supervisory system that includes all necessary supervisory control relays, keys, lamps, and associated devices located at the master station for selection, control, indication, and other functions to be performed.

SUB

measurand. A physical or electrical quantity, property or condition that is to be measured.

SUB

mechanical interchangeability (of fuse links). The characteristic that permits the designs of various manufacturers to be interchanged physically so they fit into and withstand the tensile stresses imposed by various types of prescribed cutouts made by different manufacturers.

HVF, Swg

mechanical operation (of a switch). Operation by means of an operating mechanism connected to the switch by mechanical linkage.

HVS, Swg

NOTE: Mechanically operated switches may be actuated either by manual, electrical, or other suitable means.

mechanical switching device. A switching device designed to close and open one or more electric circuits by means of guided separable contacts.

LVS_{SwgD}

NOTE: The medium in which the contacts separate may be designated by suitable prefix; that is, air, gas, oil, etc.

mechanically delayed overcurrent trip. See **mechanically delayed release (trip)** and **overcurrent release (trip)**.

mechanically delayed release (trip). A release delayed by a mechanical device.

LVS_{SwgD}

mechanically reset relay. See **hand-reset relay**.

mechanically release-free (trip-free) (as applied to a switching device). A term indicating that the release can open the device even though 1) in a manually operated switching device the operating lever is being moved toward the closed position; or 2) in a power-operated switching device, such as solenoid- or spring-actuated types, the operating mechanism is being moved toward the closed position either by continued application of closing power or by means of a maintenance closing lever.

LVS_{SwgD}, PCB, Swg

mechanism (of a switching device). The complete assembly of levers and other parts that actuates the moving contacts of a switching device.

LVS_{SwgD}, PCB, Swg

melting-speed ratio (of a fuse). A ratio of the current magnitudes required to melt the current responsive element at two specified melting times.

HVF, Swg

NOTES: (1) Specification of the current wave shape is required for time less than one-tenth of a second.

(2) The lower melting time in present use is 0.1 second, and the higher minimum melting current times are 100 seconds for low-voltage fuses and 300 or 600 seconds, whichever specified, for high-voltage fuses.

melting time (of a fuse). The time required for overcurrent to sever the current-responsive element.

HVF, Swg

memory action (of a relay). A method of retaining an effect of an input after the input ceases or is greatly reduced, so that this input can still be used in producing the typical response of the relay.

PSRC

NOTE: For example, memory action in a high-speed directional relay permits correct response for a brief period after the source of voltage input necessary to such response is short-circuited.

metal-clad switchgear. Metal-enclosed power switchgear characterized by the following necessary features:

(1) The main switching and interrupting device is of the removable type arranged with a mechanism for moving it physically between connected and disconnected positions and equipped with self-aligning and self-coupling primary and secondary disconnecting devices.

(2) Major parts of the primary circuit, that is, the circuit switching or interrupting devices, buses, voltage transformers, and control power transformers are completely enclosed by grounded metal barriers which have no intentional openings between compartments. Specifically included is a metal barrier in front of or a part of the circuit interrupting device to insure that, when in the connected position, no primary circuit components are exposed by the opening of a door.

(3) All live parts are enclosed within grounded metal compartments. Automatic shutters prevent exposure of primary circuit elements when the removable element is in the disconnected, test, or removed position.

(4) Primary bus conductors and connections are covered with insulating material throughout.

(5) Mechanical interlocks are provided to ensure a proper and safe operating sequence.

(6) Instruments, meters, relays, secondary control devices and their wiring are isolated by grounded metal barriers from all primary circuit elements with the exception of short lengths of wire such as at instrument transformer terminals.

(7) The door through which the circuit-interrupting device is inserted into the housing may serve as an instrument or relay panel and may also provide access to a secondary or control compartment within the housing.

SwgA

NOTES: (1) Auxiliary vertical sections may be required for mounting devices or for use as bus transition.

(2) The term metal-clad (as applied to switchgear assemblies) is correctly used only in connection with switchgear conforming fully to the definition above. Metal-clad switchgear is metal-enclosed but not all metal-enclosed switchgear can be correctly designated as metal-clad.

metal-enclosed (as applied to a switchgear assembly or components thereof). Surrounded by a metal case or housing, usually grounded.

SwgA

metal-enclosed bus. An assembly of conductors with associated connections, joints, and insulating supports within a grounded metal enclosure. The conductors may be either rigid or flexible.

SwgA

NOTE: In general, three-basic types of construction are used: nonsegregated-phase, segregated-phase, and isolated-phase.

metal-enclosed interrupter switchgear. Metal-enclosed power switchgear including the following equipment as required: 1) interrupter switches, 2) power fuses, 3) bare bus and connections, 4) instrument transformers, and 5) control wiring and accessory devices. The interrupter switches and power fuses may be stationary or removable type. When removable type, mechanical interlocks are provided to insure a proper and safe operating sequence.

SwgA

metal-enclosed low-voltage power circuit breaker switchgear. Metal-enclosed power switchgear of multiple or individual enclosure including the following equipment as required: (1) low-voltage power circuit breaker (fused or unfused), (2) bare bus and connections, (3) instrument and control power transformers, (4)

instruments, meters, and relays, and (5) control wiring and accessory devices. The low-voltage power circuit breakers are contained in individual grounded metal compartments and controlled either remotely or from the front of the panels. The circuit breakers may be stationary or removable type. When removable type, mechanical interlocks are provided to insure a proper and safe operating sequence.

SwgA

metal-enclosed power switchgear. A switchgear assembly completely enclosed on all sides and top with sheet metal (except for ventilating openings and inspection windows) containing primary power circuit switching or interrupting devices, or both, with buses and connections and may include control and auxiliary devices. Access to the interior of the enclosure is provided by doors or removable covers.

SwgA

NOTE: Metal-clad switchgear, station-type cubicle switchgear, metal-enclosed interrupter switchgear, and low-voltage power circuit breaker switchgear are specific types of metal-enclosed power switchgear.

mho relay. A distance relay for which the inherent operating characteristic on an $R-X$ diagram is a circle which passes through the origin.

PSRC

NOTE: The operating characteristic may be described by the equation $Z = K \cos(\theta - \alpha)$ where K and α are constants and θ is the phase angle by which the input voltage leads the input current. See Fig 1(b).

microwave-pilot protection. A form of pilot protection in which the communication means between relays is a beamed microwave radio channel.

PSRC

mimic bus. A single-line diagram of the main connections of a system constructed on the face of a switchgear or control panel, or assembly.

SwgA

minimum clearance between poles (phases). The shortest distance between any live parts of adjacent poles (phases).

HVF, Swg, HVS, Swg, LVSwgD

NOTE: Cautionary differentiation should be made between clearance and spacing or center-to-center distance.

minimum clearance to ground. The shortest distance between any live part and adjacent grounded parts.

HVF, Swg, HVS, Swg, LVSwgD

minimum melting current (of a fuse). The smallest current at which a current-responsive fuse element will melt.

HVF, Swg

mobile unit substation. A unit substation mounted and readily movable as a unit on a transportable device.

SwgA

modified circuit transient recovery voltage. The circuit transient recovery voltage modified in accordance with the normal-frequency recovery voltage and the asymmetry of the current wave obtained on a particular interruption.

PCB, Swg

NOTE: This voltage indicates the severity of the particular interruption with respect to recovery-voltage phenomena.

modified impedance relay. An impedance form of distance relay for which the operating characteristic of the distance unit on an *R-X* diagram is a circle having its center displaced from the origin.

PSRC

NOTE: It may be described by the equation

$$Z^2 = 2K_1 Z \cos(\theta - \alpha) = K_2^2 - K_1^2$$

where K_1 , K_2 and α are constants and θ is the phase angle by which the input voltage leads the input current. See Fig 1(a).

moisture-resistant. Not readily injured by exposure to a moist atmosphere.

HVS, Swg, SwgA

molded-case circuit breaker. One that is assembled as an integral unit in a supporting and enclosing housing of molded insulating material.

LVS_{SwgD}

momentary current. The current flowing in a device, an assembly, or a bus at the major peak of the maximum cycle as determined from the envelope of the current wave.

HVS, Swg, PCB, Swg

NOTE: The current is expressed as the rms value, including the direct-current component, and may be determined by the method shown in American National Standard Methods for Determining the Values of a Sinusoidal Current Wave and Normal-Frequency Recovery Voltage for AC High-Voltage Circuit Breakers, ANSI/IEEE C37.09-1979 [2].

monitoring relay. A relay which has as its function to verify that system or control-circuit conditions conform to prescribed limits.

PSRC

mounting position (of a switch or fuse support). The position determined by and corresponding to the position of the base of the device.

HVF, Swg, HVS, Swg

NOTE: The usual positions are: 1) horizontal upright, 2) horizontal underhung, 3) vertical, and 4) angle.

moving contact. A conducting part which bears a contact surface arranged for movement to and from the stationary contact.

HVS, Swg, PCB, Swg

muffler (of a fuse). An attachment for the vent of a fuse, or a vented fuse, that confines the arc and substantially reduces the venting from the fuse.

HVF, Swg

multiple feeder. One that is connected to a common load in multiple with one or more feeders from independent sources.

SUB

multipole fuse. See second note under pole (pole unit) (of a switching device or fuse).

multipole operation. (of a circuit breaker or switching device). A descriptive term indicating that all poles of the device are linked mechanically, electrically, or by other means such that they change state (open or close) substantially simultaneously. Devices may have capability for multipole opening, multipole closing, or both.

PCB, Swg

multirestraint relay. A restraint relay that is so constructed that its operation may be restrained by more than one input quantity.

PSRC

negative-phase-sequence relay. A relay that responds to the negative-phase-sequence component of a polyphase input quantity.

PSRC

network limiter. An enclosed fuse for disconnecting a faulted cable from a low-voltage network distribution system and for protecting the unfaulted portions of that cable against serious thermal damage.

LVS_{Swg, D}

network master relay. A relay that functions as a protective relay by opening a network protector when power is back-fed into the supply system and as a programming relay by closing the protector in conjunction with the network phasing relay when polyphase voltage phasors are within prescribed limits.

PSRC, LVS_{SwgD}

network phasing relay. A monitoring relay which has as its function to limit the operation of a network master relay so that the network protector may close only when the voltages on the two sides of the protector are in a predetermined phasor relationship.

PSRC, LVS_{SwgD}

network protector. An assembly comprising a circuit breaker and its complete control equipment for automatically disconnecting a transformer from a secondary network in response to predetermined electrical conditions on the primary feeder or transformer, and for connecting a transformer to a secondary network either through manual control or automatic control responsive to predetermined electrical

conditions on the feeder and the secondary network.

LVS_{wgD}

NOTE: The network protector is usually arranged to connect automatically its associated transformer to the network when conditions are such that the transformer, when connected, will supply power to the network and to automatically disconnect the transformer from the network when power flows from the network to the transformer.

network restraint mechanism. A device that prevents opening of a network protector on transient power reversals which either do not exceed a predetermined value or persist for a predetermined time.

LVS_{wgD}

network tripping and reclosing (networking) equipment. An equipment that automatically connects its associated power transformer to an ac network when conditions are such that the transformer, when connected, will supply power to the network and that automatically disconnects the transformer from the network when power flows from the network to the transformer.

SUB, LVS_{wgD}

neutral relay. A relay that responds to quantities in the neutral of a power circuit.

PSRC

nominal system voltage. A nominal value assigned to designate a system of a given voltage class.

LVS_{wgD}, PCB, Swg

NOTE: See ANSI C84.1-1977 [1].

nonautomatic opening (nonautomatic tripping). The opening of a switching device only in response to an act of an attendant.

LVS_{wgD}, PCB, Swg, SwgA

nonautomatic operation. Operation controlled by an attendant.

LVS_{wgD}

nondisconnecting fuse. An assembly consisting of a fuse unit or fuseholder and a fuse support having clips for directly receiving the associated fuse unit or fuseholder, which has no provision for guided operation as a disconnecting switch.

HVF, Swg

nonenclosed switches, indoor or outdoor. Switches designed for service without a housing restricting heat transfer to the external medium.

HVS, Swg

nonmechanical switching device. A switching device designed to close or open, or both, one or more electric circuits by means other than by separable mechanical contacts.

LVS_{wgD}

nonrenewable (one-time) fuse or fuse unit. A

fuse or fuse unit not intended to be restored for service after circuit interruption.

HVF, Swg

nonsegregated-phase bus. One in which all phase conductors are in a common metal enclosure without barriers between the phases.

SwgA

NOTE: When associated with metal-clad switchgear, the primary bus conductors and connections are covered with insulating material throughout.

nonvented fuse. A fuse without intentional provision for the escape of arc gases, liquids, or solid particles to the atmosphere during circuit interruption.

HVF, Swg

nonventilated enclosure. An enclosure so constructed as to provide no intentional circulation of external air through the enclosure.

SwgA

NOTE: Doors or removable covers are usually gasketed and humidity control may be provided by filtered breathers.

normal frequency. The frequency at which a device or system is designed to operate.

LVS_{wgD}, PCB, Swg

normal-frequency (low-frequency) dew withstand voltage. The normal-frequency withstand voltage applied to insulation completely covered with condensed moisture.

HVF, Swg, PCB, Swg

NOTE: See normal-frequency withstand voltage.

normal-frequency (low-frequency) dry withstand voltage. The normal-frequency withstand voltage applied to dry insulation.

PCB, Swg

NOTE: See normal-frequency withstand voltage.

normal-frequency line-to-line recovery voltage. The normal-frequency recovery voltage, stated on a line-to-line basis, that occurs on the source side of a three-phase circuit-interrupting device after interruption is complete in all three poles.

PCB, Swg

normal-frequency pole-unit recovery voltage. The normal-frequency recovery voltage that occurs across a pole unit of a circuit-interrupting device upon circuit interruption.

PCB, Swg

normal-frequency recovery voltage. The normal-frequency rms voltage that occurs across the terminals of an ac circuit-interrupting device after the interruption of the current and after the high-frequency transients have subsided.

HVF, Swg, LVS_{wgD}, PCB, Swg

NOTE: For determination of the normal-frequency recovery voltage, see ANSI/IEEE C37.09-1979 [2].

normal-frequency (low-frequency) wet withstand voltage. The normal-frequency withstand voltage applied to wetted insulation.

HVF, Swg

NOTE: See normal-frequency withstand voltage.

normal-frequency (low-frequency) withstand voltage. The normal-frequency voltage that can be applied to insulation under specified conditions for a specified time without causing flashover or puncture.

HVF, Swg, LVSwgD

NOTES: (1) This value is usually expressed as a root-mean-square (rms) value.

(2) See also normal-frequency dew withstand voltage, normal-frequency dry withstand voltage, and normal-frequency wet withstand voltage.

notching relay. A programming relay in which the response is dependent upon successive impulses of the input quantity.

PSRC

offset (outboard) bearing (air switch). A component of a switch operating mechanism designed to provide support for a torsional operating member and a crank which provides reciprocating motion for switch operation.

HVS, Swg

offset (as applied to a distance relay). The displacement of the operating characteristic on an *R-X* diagram from the position inherent to the basic performance class of the relay. See Fig 1a.

PSRC

NOTE: A relay with this characteristic is called an offset relay. See Fig 2a.

oil cutout (oil-filled cutout). A cutout in which all or part of the fuse support and its fuse link or disconnecting blade are mounted in oil with complete immersion of the contacts and the fusible portion of the conducting element (fuse link), so that arc interruption by severing of the fuse link or by opening of the contacts will occur under oil.

HVF, Swg

oil immersible current limiting fuse. A current limiting fuse unit suitable for application requiring total or partial immersion directly in oil or other dielectric liquid of a transformer or switchgear.

HVF, Swg

oilless circuit breaker. See NOTE under circuit breaker.

oil switch. See note under mechanical switching device.

1 minus cosine ($1 - \cos$) envelope (of a transient recovery voltage). A voltage-versus-time curve of the general form $e_2 E_2 (1 - \cos Kt)$ in which e_2 represents the transient voltage across a switching device pole unit, reaching its crest E_2 at a time T_2 .

PCB, Swg

open cutout. A cutout in which the fuse clips and fuseholder, fuse unit, or disconnecting blade are exposed.

HVF, Swg

open line wire charging current. Current supplied to an unloaded open-wire line.

R and S, Swg

NOTE: Current is expressed in rms amperes.

open-link cutout. A cutout that does not employ a fuseholder and in which the fuse support directly receives an open-link fuse link or a disconnecting blade.

HVF, Swg

open-link fuse link. A replaceable part or assembly comprised of the conducting element and fuse tube, together with the parts necessary to confine and aid in extinguishing the arc and to connect it directly into the fuse clip of the open-link fuse support.

HVF, Swg

open-link fuse support. An assembly of base or mounting support, insulators or insulator unit and fuse clips for directly mounting an open-link fuse link and for connecting it into the circuit.

HVF, Swg

open operation (of a switching device). The movement of the contacts from the normally closed to the normally open position.

LVSwgD, PCB, Swg

NOTE: The letter O signifies this operation: Open.

open-phase protection. A form of protection that operates to disconnect the protected equipment on the loss of current in one phase conductor of a polyphase circuit, or to prevent the application of power to the protected equipment on the absence of one or more phase voltages of a polyphase system.

PSRC

open-phase relay. A polyphase relay designed to operate when one or more input phases of a polyphase circuit are open.

PSRC

open switchgear assembly. One that does not have enclosures as part of the structure.

SwgA

opening operation (of a switching device). See open operation (of a switching device).

opening operating time (of a switch). The interval during which a switch is being operated to move from the fully closed to the fully open position.

HVS, Swg

opening time (of a mechanical switching device). The time interval between the time when the actuating quantity of the release circuit reaches the operating value, and the instant when the primary arcing contacts have parted. Any time delay device forming an integral part of the switching device is adjusted to its min-

imum setting or, if possible, is cut out entirely for the determination of opening time.

LVS_{Swg}, PCB, Swg

NOTE: The opening time includes the operating time of an auxiliary relay in the release circuit when such a relay is required and supplied as part of the switching device.

opening time (of a sectionalizer). See **isolating time (of a sectionalizer).**

operating characteristic (of a relay). The response of the relay to the input quantities which result in relay operation.

PSRC

operating duty (of a switching device). A specified number and kind of operations at stated intervals.

PCB, Swg

operating mechanism (of a switching device). That part of the mechanism that actuates all the main-circuit contacts of the switching device either directly or by the use of pole-unit mechanisms.

LVS_{SwgD}, HVF, Swg, PCB, Swg

operating time (of a relay). The time interval from occurrence of specified input conditions to a specified operation.

PSRC

operating voltage. The voltage of the system on which a device is operated.

PCB, Swg

NOTE: This voltage, if alternating, is usually expressed as a rms value.

operation (of a switching device). Action of the parts of the device to perform its normal function.

HVS, Swg, LVS_{SwgD}

operation indicator (of a relay). See **target (of a relay).**

outdoor. Designed for use outside buildings.

HVF, Swg, HVS, Swg, PCB, Swg, SwgA

outdoor enclosure. An enclosure for outdoor application designed to protect against weather hazards such as rain, snow, or sleet.

SwgA, PCB, Swg

NOTE: Condensation is minimized by use of space heaters.

out-of-step. A system condition in which two or more synchronous machines have lost synchronism with respect to one another and are operating at different average frequencies.

PSRC

out-of-step protection. A form of protection that separates the appropriate parts of a power system, or prevents separation that might otherwise occur, in the event of loss of synchronism.

PSRC

outrigger (of a switching-device terminal). An attachment that is fastened to or adjacent to

the terminal pad of a switching device to maintain electrical clearance between the conductor and other parts or, when fastened adjacent, to relieve mechanical strain on the terminal, or both.

HVS, Swg

overcurrent protections. A form of protection that operates when current exceeds a predetermined value.

PSRC

overcurrent relay. A relay that operates when its input current exceeds a predetermined value.

PSRC

overcurrent release (trip). A release that operates when the current in the main circuit is equal to or exceeds the release setting.

LVS_{SwgD}

overcurrent trip device, direct-acting. See **direct-acting overcurrent trip device.**

overhead line charging current. Current supplied to an unloaded overhead line.

HVS, Swg

NOTE: Current is expressed in rms amperes.

overreach (of a relay). The extension of the zone of protection beyond that indicated by the relay setting.

PSRC

overreaching protection. A form of protection in which the relays at one terminal operate for faults beyond the next terminal. They may be constrained from tripping until an incoming signal from a remote terminal has indicated whether the fault is beyond the protected line section.

PSRC

overspeed protection. A form of protection that operates when the speed of rotation exceeds a predetermined value.

PSRC

overtravel (of a relay). The amount of continued movement of the responsive element after the input is changed to a value below pickup. See Fig 3.

PSRC

overvoltage relay. A relay that operates when its input voltage exceeds a predetermined value.

PSRC

overvoltage release (trip). A release that operates when the voltage of the main circuit is equal to or exceeds the release setting.

LVS_{SwgD}

pad-mounted. A general term describing equipment positioned on a surface mounted pad located outdoors. The equipment is usually enclosed with all exposed surfaces at ground potential.

R and S, Swg

panel. A unit of one or more sections of flat material suitable for mounting electric devices.
SwgA

panel-frame mounting (of a switching device). Mounting on a panel frame in the rear of a panel with the operating mechanism on the front of the panel.
LVSwgD

parallel-connected capacitance (as applied to interrupter switches). Capacitances are defined to be parallel-connected when the crest value of inrush current to the capacitance being switched exceeds the switch inrush current capability for single capacitance.
R and S, Swg, HVS, Swg

parallel feeder. One that operates in parallel with one or more feeders of the same type from the same source.
SUB

NOTE: These feeders may be of the stub-, multiple-, or tie-feeder type.

partial-automatic station. A station that includes protection against the usual operating emergencies, but in which some or all of the steps in the normal starting or stopping sequence, or in the maintenance of the required character of service, must be performed by a station attendant or by supervisory control.
SUB

partial-automatic transfer (or throwover) equipment. An equipment that automatically transfers load to another (emergency) source of power when the original (preferred) source to which it has been connected fails, but that will not automatically retransfer the load to the original source under any conditions.
SUB

NOTE: The restoration of the load to the preferred source from the emergency source upon the reenergization of the preferred source after an outage may be of the continuous-circuit restoration type or the interrupted-circuit restoration type.

partial discharge. A localized electric discharge resulting from ionization in an insulation system when the voltage stress exceeds the critical value. This discharge partially bridges the insulation between electrodes.
R and S, Swg

peak let-through characteristic curve (of a current-limiting fuse). See **current-limiting characteristic curve (of a current-limiting fuse).**

peak let-through cut-off current (of a current-limiting fuse). The highest instantaneous current passed by the fuse during the interruption of the circuit.
HVF, Swg

peak overvoltages (for current-limiting fuses). The peak value of the voltage that can exist across a current limiting fuse during its arcing interval.
HVF, Swg

percentage differential relay. A differential relay in which the designed response to the phasor difference between incoming and outgoing electrical quantities is modified by a restraining action of one or more of the input quantities.
PSRC

NOTE: The relay operates when the magnitude of the phasor difference exceeds the specified percentage of one or more of the input quantities.

performance characteristic (of a device). An operating characteristic, the limit or limits of which are given in the design test specifications.
HVF, Swg, PCB, Swg

periodic-automatic-reclosing equipment. An equipment that provides for automatically reclosing a circuit-switching device a specified number of times at specified intervals between reclosures.
SUB, R and S, Swg

NOTE: This type of automatic reclosing equipment is generally used for alternating-current circuits.

permissive (as applied to a relay system). A general term indicating that functional cooperation of two or more relays is required before control action can become effective.
PSRC

phase-balance relay. A relay that responds to differences between quantities of the same nature associated with different phases of a normally balanced polyphase circuit.
PSRC

phase-comparison protection. A form of pilot protection that compares the relative phase-angle position of specified currents at the terminals of a circuit.
PSRC

phase delay (as applied to relaying). An equal delay of both the leading and trailing edges of a locally generated block.
PSRC

phase-failure protection. See **open-phase protection** and **phase-undervoltage protection.**

phase relay. A relay that by its design or application is intended to respond primarily to phase conditions of the power system.
PSRC

phase-reversals relay. See **negative-phase-sequence relay.**

phase-selector relay. A programming relay whose function is to select the faulted phase or

phases thereby controlling the operation of other relays or control devices.

PSRC

phase-sequence relay. A relay that responds to the order in which the phase voltages or currents successively reach their maximum positive values.

PSRC

phase-sequence reversal protection. A form of protection that prevents energization of the protected equipment on the reversal of the phase sequence in a polyphase circuit.

PSRC

phase spacing (of a fuse or switching device). The distance between center-lines of the current-carrying parts of the adjacent poles of the switching device.

HVF, Swg

phase-undervoltage protection. A form of protection that disconnects or inhibits connection of the protected equipment on deficient voltage in one or more phases of a polyphase circuit.

PSRC

phase-undervoltage relay. A relay that operates when one or more phase voltages in a normally balanced polyphase circuit is less than a predetermined value.

PSRC

phasing voltage (of a network protector). The voltage across the open contacts of a selected phase.

LVS_{wgD}

NOTE: This voltage is equal to the phasor difference between the transformer voltage and the corresponding network voltage.

pickup (of a relay). The action of a relay as it makes designated response to progressive increase of input. As a qualifying term, the state of a relay when all response to progressive increase of input has been completed. Also used to identify the minimum value of an input quantity reached by progressive increases which will cause the relay to reach the pickup state from reset.

PSRC, LVS_{wgD}

NOTE: In describing the performance of relays having multiple inputs, pickup has been used to denote contact operation, in which case pickup value of any input is meaningful only when related to all other inputs.

pilot protection. A form of line protection that uses a communication channel as a means to compare electrical conditions at the terminals of a line.

PSRC

pilot wire protection. Pilot protection in which a metallic circuit is used for the communicating means between relays at the circuit terminals.

PSRC

pneumatic operation. Power operation by means of compressed gas.

PCB, Swg

pneumatically release-free (trip-free) (as applied to a pneumatically operated switching device). A term indicating that by pneumatic control the switching device is free to open at any position in the closing stroke if the release is energized.

PCB, Swg

NOTE: This release-free feature is operative even though the closing control switch is held closed.

point (for supervisory control or indication or telemeter selection). All of the supervisory control or indication devices, in a system, exclusive of the common devices, in the master station and in the remote station that are necessary for:

(1) Energizing the closing, opening, or other circuits of a unit, or set of units of switchgear or other equipment being controlled, or

(2) Automatic indication of the closed or open or other positions of a unit, or set of units of switchgear or other equipment for which indications are being obtained, or

(3) Connecting a telemeter transmitting equipment into the circuit to be measured and to transmit the telemeter reading over a channel to a telemeter receiving equipment.

SUB

NOTE: A point may serve for any two or all three of the purposes described above; for example, when a supervisory system is used for the combined control and indication of remotely operated equipment, point (for supervisory control) and point (for supervisory indication) are combined into a single control and indication point.

polarization (as applied to a relay). A term identifying the input that provides a reference for establishing the direction of system phenomena such as direction of power or reactive flow, or direction to a fault or other disturbance on a power system.

PSRC

pole (pole unit) (of a switching device or fuse). That portion of the device associated exclusively with one electrically separated conducting path of the main circuit of the device.

LVS_{wgD}, PCB, Swg

NOTES: (1) Those portions which provide a means for mounting and operating all poles together are excluded from the definition of a pole.

(2) A switching device or fuse is called single-pole if it has only one pole. If it has more than one pole, it may be called multi-pole (two-pole, three-pole, etc) and provided, in the case of a switching device, that the poles are or can be coupled in such a manner as to operate together.

pole-unit mechanism (of a switching device). That part of the mechanism that actuates the moving contacts of one pole.

LVS_{wgD}, HVS, Swg, PCB, Swg

polyphase (as applied to a relay). A descriptive term indicating that the relay is responsive to polyphase alternating electrical input quantities.

PSRC

NOTE: A multiple-unit relay with individual units responsive to single-phase electrical inputs is not a polyphase relay even though the several single-phase units constitute a polyphase set.

positive-phase-sequence relay. A relay that responds to the positive-phase-sequence component of a polyphase input quantity.

PSRC

power (used as an adjective). A general term, used, by reason of specific physical or electrical characteristics, to denote application or restriction or both, to generating stations, switching stations or substations. The term may also denote use or application to energy purposes as contrasted with use for control purposes.

HVF, Swg, LVS_{wgD}, PCB, Swg

power circuit protector. An assembly consisting of a modified low-voltage power circuit breaker, which has no direct-acting tripping devices, with a current limiting fuse in series with the load terminals of each pole.

LVS_{wgD}

power fuse. A fuse consisting of an assembly of a fuse support and a fuse unit or fuseholder which may or may not include the refill unit or fuse link.

HVS, Swg

NOTE: The power fuse is identified by the following characteristics:

(1) Dielectric withstand (BIL) strengths at power levels.

(2) Application primarily in stations and substations.

(3) Mechanical construction basically adapted to station and substation mountings.

power operation. Operation by other than hand power.

HVF, Swg, LVS_{wgD}, PCB, Swg

power relay. A relay that responds to a suitable product of voltage and current in an electric circuit. (See Active Power Relay and Reactive Power Relay).

PSRC

power service protector. An assembly consisting of a modified low-voltage power circuit breaker, which has no direct-acting tripping devices, with a current-limiting fuse connected in series with the load terminals of each pole.

LVS_{wgD}

power switchboard. A type of switchboard including primary power-circuit switching and interrupting devices together with their interconnections.

SwgA

NOTE: Knife switches, fuses, and air circuit breakers are the commonly used switching and interrupting devices.

pressure relay. A relay that responds to liquid or gas pressure.

PSRC

primary (used as an adjective).

(1) First to operate; for example, primary arcing contacts, primary detector.

(2) First in preference; for example, primary protection.

(3) Referring to the main circuit as contrasted to auxiliary or control circuits; for example, primary disconnecting devices.

(4) Referring to the energy input side of transformers, or the conditions (voltages) usually encountered at this location; for example, primary unit substation.

LVS_{wgD}, PCB, Swg

primary arcing contacts (of a switching device).

The contacts on which the initial arc is drawn and the final current, except for the arc-shunting-resistor current, is interrupted after the main contacts have parted.

LVS_{wgD}, PCB, Swg

primary detector (or sensing element or initial element). The first system element or group of elements that responds quantitatively to the measurand and performs the initial measurement operation. A primary detector performs the initial conversion or control of measurement energy and does not include transformers, amplifiers, shunts, resistors, etc. when these are used as auxiliary means.

SUB

primary disconnecting devices (of a switchgear assembly). Self-coupling separable contacts provided to connect and disconnect the main circuits between the removable element and the housing.

SwgA, LVS_{wgD}

primary protection (as applied to a relay system). First-choice relay protection in contrast with backup relay protection.

PSRC

primary switchgear connections. See main switchgear connections.

primary unit substation. See note under unit substation.

product relay. A relay that operates in response to a suitable product of two alternating electrical input quantities.

PSRC

production tests (for switchgear). Those tests made to check the quality and uniformity of the workmanship and materials used in the manufacture of switchgear or its components.

HVF, Swg, LVS_{wgD}, PCB, Swg

programmer. An arrangement of operating elements or devices that initiates, and often controls, one or a series of operations in a given sequence.

SUB

programming relay. A relay whose function is to establish or detect electrical sequences.

PSRC

prospective current of a circuit (with respect to a switching device situated therein). See available (prospective) current (of a circuit with respect to a switching device situated therein).

LVS_{SwgD}

prospective short-circuit current (at a given point in a circuit). See available (prospective) short-circuit current (at a given point in a circuit).

prospective short-circuit test current (at the point of test). See available (prospective) short-circuit test current (at the point of test).

protective gap. A gap placed between live parts and ground to limit the maximum over-voltage that may occur.

HVS, Swg

protective relay. A relay whose function is to detect defective lines or apparatus or other power system conditions of an abnormal or dangerous nature and to initiate appropriate control circuit action.

PSRC

NOTE: A protective relay may be classified according to its input quantities, operating principal, or performance characteristics.

pulse (relaying). A brief excursion of a quantity from its initial level.

PSRC

pulse accumulator (or register) (of a telemeter system). A device that accepts and stores pulses and makes them available for readout on demand.

SUB

pulse-type telemeter. A telemeter that employs characteristics of intermittent electric signals other than their frequency, as the translating means.

SUB

NOTE: These pulses may be utilized in any desired manner to obtain the final indications, such as periodically counting the total number of pulses; or measuring their "on" time, their "off" time, or both.

pump-free control. See antipump (pump-free) device.

quick-break. A term used to describe a device which has a high contact opening speed independent of the operator.

HVS, Swg

quick-make. A term used to describe a device

which has a high contact closing speed independent of the operator.

HVS, Swg

quiescent supervisory system. A supervisory system that is normally alert but inactive, and transmits information or control signals only when a change in status occurs at the remote station or when a demand operation is initiated at the master station.

SUB

radio-influence tests. Tests that consist of the application of voltage and the measurement of the corresponding radio-influence voltage produced by the device being tested.

HVF, Swg, PCB, Swg

rated. A qualifying term that, applied to an operating characteristic, indicates the designated limit or limits of the characteristic for application under specified conditions.

LVS_{SwgD}, PCB, Swg

NOTE: The specific limit or limits applicable to a given device is specified in the standard for that device, and included in the title of the rated characteristic, that is, rated *maximum* voltage, rated frequency *range*, etc.

rate-of-change protection. A form of protection in which an abnormal condition causes disconnection or inhibits connection of the protected equipment in accordance with the rate of change of current, voltage, power, frequency, pressure, etc.

PSRC

rate-of-change relay. A relay that responds to the rate of change of current, voltage, power, frequency, pressure, etc.

PSRC

rate-of-rise current tripping. See rate-of-rise release (trip).

rate-of-rise release (trip). A release that operates when the rate of rise of the actuating quantity in the main circuit exceeds the release setting.

LVS_{SwgD}

rating. The designated limit(s) of the rated operating characteristic(s) of a device.

PSRC, HVF, Swg, LVS_{SwgD}

NOTE: Such operating characteristics as current, voltage frequency, etc, may be given in the rating.

ratio-type (position-type) telemeter. A telemeter that employs the relative phase position between, or the magnitude relation between, two or more electrical quantities as the translating means.

SUB

NOTE: Examples of ratio-type telemeters include ac or dc position matching systems.

reach (of a relay). The extent of the protection afforded by a relay in terms of the impedance

or circuit length as measured from the relay location.

PSRC

NOTE: The measurement is usually to a point of fault, but excessive loading or system swings may also come within reach or operating range of the relay.

reactance relay. A linear-impedance form of distance relay for which the operating characteristic of the distance unit on an R - X diagram is a straight line of constant reactance.

PSRC

NOTE: The operating characteristic may be described by either equation $X = K$, or $Z \sin \theta = K$, where K is a constant, and θ is the angle by which the input voltage leads the input current. See Fig 1a.

reactive power relay. A power relay that responds to reactive power.

PSRC

receiver relay. An auxiliary relay whose function is to respond to the output of a communications set such as an audio, carrier, radio, or microwave receiver.

PSRC

reclosing fuse. A combination of two or more fuseholders, fuse units, or fuse links mounted on a fuse support or supports, mechanically or electrically interlocked, so that one fuse can be connected into the circuit at a time and the functioning of that fuse automatically connects the next fuse into the circuit, with or without intentionally-added time delay, thereby permitting one or more service restorations without replacement of fuse links, refill units, or fuse units.

HVF, Swg

reclosing interval (of an automatic circuit recloser). The open-circuit time between an automatic opening and the succeeding automatic reclosure. See also clearing time.

R and S, Swg

reclosing relay. A programming relay whose function is to initiate the automatic reclosing of a circuit breaker.

PSRC

reclosing time (of a circuit breaker). The interval between the time when the actuating quantity of the release (trip) circuit reaches the operating value (the breaker being in the closed position) and the reestablishment of the circuit on the primary arcing contacts on the reclosing stroke.

PCB, Swg, LVSwgD

recovery voltage. The voltage that occurs across the terminals of a pole of a circuit interrupting device upon interruption of the current.

HVF, Swg

refill unit (of a high-voltage fuse unit). An assembly comprised of a conducting element, the complete arc-extinguishing medium, and

parts normally required to be replaced after each circuit interruption to restore the fuse unit to its original operating condition.

HVF, Swg

regulating relay. A relay whose function is to detect a departure from specified system operating conditions and to restore normal conditions by acting through supplementary equipment.

PSRC

reignition. A resumption of current between the contacts of a switching device during an opening operation after an interval of zero current of less than $\frac{1}{4}$ cycle at normal frequency.

HVS, Swg, PCB, Swg

relay. An electrical device designed to respond to input conditions in a prescribed manner and after specified conditions are met to cause contact operation or similar abrupt change in associated electric control circuits.

PSRC, PCB, Swg

NOTES: (1) Inputs are usually electrical, but may be mechanical, thermal, or other quantities or a combination of quantities. Limit switches are similar simple devices are not relays.

(2) A relay may consist of several relay units, each responsive to specified inputs with the combination providing the desired overall performance characteristic of the relay.

relay backup. That part of the backup protection that operates in the event of failure of the primary relays.

PSRC

relay unit. A subassembly of parts.

PSRC

NOTE: The combination of several relay elements constitutes a relay unit.

relay unit. An assembly of relay elements that in itself can perform a relay function.

PSRC

NOTE: One or more relay units constitutes a relay.

release (tripping mechanism) (of a mechanical switching device). A device, mechanically connected to a mechanical switching device, which releases the holding means and permits the opening or closing of the switching device.

LVSwgD, PCB, Swg

release (trip) coil (of a mechanical switching device). A coil used in the electromagnet which initiates the action of a release (trip).

LVSwgD, PCB, Swg

release (tripping) delay (of a mechanical switching device). Intentional time-delay introduced into contact parting time in addition to opening time.

LVSwgD, PCB, Swg

NOTE: In devices employing a shunt release, release delay includes the operating time of protective and

auxiliary relays external to the device. In devices employing direct or indirect release, release delay consists of intentional delay introduced into the function of the release.

release-delay (trip-delay) setting. A calibrated setting of the time interval between the time when the actuating value reaches the release setting and the time when the release operates.

LVS_{wgD}

release (trip) setting. A calibrated point at which the release is set to operate.

LVS_{wgD}

release-free (trip-free) (as applied to a mechanical switching device). A descriptive term that indicates that the opening operation can prevail over the closing operation during specified parts of the closing operation.

LVS_{wgD}, PCB, Swg

release-free (trip-free) in any position. A descriptive term indicating that a switching device is release-free at any part of the closing operation.

LVS_{wgD}, PCB, Swg

NOTE: If the release circuit is completed through an auxiliary switch, electrical release will not take place until such auxiliary switch is closed.

release-free relay. See **trip-free (release-free) relay.**

reliability (of a relay or relay system). A measure of the degree of certainty that the relay, or relay system, will perform correctly.

PSRC

NOTE: Reliability denotes certainty of correct operation together with assurance against incorrect operation from all extraneous causes. See also **dependability** and **security.**

remote backup. A form of backup protection in which the protection is at a station or stations other than that which has the primary protection.

PSRC

remote control. Control of a device from a distant point.

SUB

NOTE: Remote control may be over 1) direct wire, or over 2) other types of interconnecting channels such as carrier-current or microwave, or by 3) supervisory control or by 4) mechanical means.

remote data logging. An arrangement for the numerical representation of selected telemetered quantities on log sheets or paper or magnetic tape, or the like, by means of an electric typewriter, teletype, or other suitable devices.

SUB

remote indication. indication of the position or condition of remotely located devices.

SUB

NOTE: Remote indication may be over 1) direct wire, or over 2) other types of interconnecting channels such

as carrier-current or microwave, or by 3) supervisory indication or by 4) mechanical means.

remote manual operation. See **indirect manual operation.**

remote operation. See **remotely controlled operation.**

remote release. See **remote trip (remote release).**

remote station (of a supervisory system). A remotely located station wherein units of switchgear or other equipment are controlled by supervisory control or from which supervisory indications or selected telemeter readings are obtained.

SUB

remote-station supervisory equipment. That part of a (single) supervisory system that includes all supervisory control relays and associated devices located at the remote station for selection, control, indication, and other functions to be performed.

SUB

remote trip (remote release). A general term applied to a relay installation to indicate that the switching device is located physically at a point remote from the initiating protective relay, device, or source of release power or all these.

PSRC

NOTE: This installation is commonly called transfer trip when a communication channel is used to transmit the signal for remote tripping.

remotely controlled operation. Operation of a device by remote control.

HVS, Swg, PCB, Swg

removable element (of a switchgear assembly). That portion that normally carries the circuit-switching and circuit-interrupting devices and the removable part of the primary and secondary disconnecting devices.

LVS_{wgD}, SwgA

renewable (field-renewable) fuse or fuse unit. A fuse or fuse unit that, after circuit interruption, may be restored readily for service by the replacement of the renewal element, fuse link, or refill unit.

HVF, Swg

renewal element (of a low-voltage fuse). That part of a renewable fuse that is replaced after each interruption to restore the fuse to operating condition.

LVS_{wgD}

renewal parts. Those parts which it is necessary to replace during maintenance as a result of wear.

LVS_{wgD}, PCB, Swg

replica temperature relay. A thermal relay

whose internal temperature rise is proportional to that of the protected apparatus or conductor, over a range of values and durations of overloads.

PSRC

reset (of a relay). The action of a relay as it makes designated response to decreases in input. Reset as a qualifying term denotes the state of a relay when all response to decrease of input has been completed. Reset is also used to identify the maximum value of an input quantity reached by progressive decreases that will permit the relay to reach the state of complete reset from pickup.

PSRC

NOTE: In defining the designated performance of relays having multiple inputs, reset describes the state when all inputs are zero and also when some input circuits are energized, if the resulting state is not altered from the zero-input condition.

reset interval (of an automatic circuit recloser or automatic line sectionalizer). The time required, after a counting operation, for the counting mechanism to return to the starting position of that counting operation.

R and S, Swg

reset time (of an automatic circuit recloser or automatic line sectionalizer). The time required, after one or more counting operations, for the counting mechanism to return to the starting position.

R and S, Swg

reset time (of a relay). The time interval from occurrence of specified conditions to reset.

PSRC

NOTE: When the conditions are not specified it is intended to apply to a picked-up relay and to be a sudden change from pickup value of input to zero input.

residual relay. A relay that is so applied that its input, derived from external connections of instrument transformers, is proportional to the zero-phase-sequence component of a polyphase quantity.

PSRC

resistance relay. A linear-impedance form of distance relay for which the operating characteristic on an *R-X* diagram is a straight line of constant resistance.

PSRC

NOTE: The operating characteristic may be described by the equation $R = K$ or $Z \cos \theta = K$, where K is a constant, and θ is the angle by which the input voltage leads the input current. See Fig 1(a).

resistant (used as a suffix). So constructed, protected, or treated that damage will not occur readily when the device is subjected to the specified material or condition.

HVF, Swg, HVS, Swg

response (of a device or system). A quantitative expression of the output as a function of the input under conditions that must be explicitly stated.

PSRC

NOTE: The response characteristic, often presented graphically, gives the response as a function of some independent variable such as frequency or time.

restraint relay. A relay so constructed that its operation in response to one input is restrained or controlled by a second input.

PSRC

restrike. A resumption of current between the contacts of a switching device during an opening operation after an interval of zero current of $\frac{1}{4}$ cycle at normal frequency or longer.

HVS, Swg, PCB, Swg

reverse-current relay. A relay that operates on a current flow in a direct-current circuit in a direction opposite to a predetermined reference direction.

PSRC

reverse-current release (trip). A release that operates upon reversal of the direct current in the main circuit from a predetermined direction.

R and S, Swg

reverse-current tripping.

reverse-power tripping. See reverse-current release (trip).

rotating-insulator switch. One in which the opening and closing travel of the blade is accomplished by the rotation of one or more of insulators supporting the conducting parts of the switch.

HVS, Swg

routine tests (for switchgear). See production tests (for switchgear).

***R-X* diagram.** A graphic presentation of the characteristics of a relay unit in terms of the ratio of voltage to current and the phase angle between them.

PSRC

NOTE: For example, if a relay just operates with ten volts and ten amperes in phase, one point on the operating curve of the relay would be plotted as one ohm on the *R* axis (i.e., $R = 1$, $X = 0$ where *R* is the abscissa and *X* is the ordinate.) See Fig 1a and 1b.

seal-in relay. An auxiliary relay that remains picked up through one of its own contacts which bypasses the initiating circuit until de-energized by some other device.

PSRC, PCB, Swg

secondary (used as an adjective).

(1) Operates after the primary device; for example, secondary arcing contacts.

(2) Second in preference.

(3) Referring to auxiliary or control circuits as contrasted with the main circuit; for example, secondary disconnecting devices, secondary and control wiring.

(4) Referring to the energy output side of transformers or the conditions (voltages) usually encountered at this location; for example, secondary fuse, secondary unit substation.

LVS_{SwgD}

secondary and control wiring (small wiring).

Wire used with switchgear assemblies for control circuits and for connections between instrument transformers secondaries, instruments, meters, relays, or other equipment.

LVS_{SwgD}

secondary arcing contacts (of a switching device). The contacts on which the arc of the arc-shunting-resistor current is drawn and interrupted.

LVS_{SwgD}, SwgA

secondary disconnecting devices (of a switchgear assembly). Self-coupling separable contacts provided to connect and disconnect the auxiliary and control circuits between the removable element and the housing.

LVS_{SwgD}, SwgA

secondary fuse. A fuse used on the secondary-side circuits of transformers.

HVF, Swg

NOTE: In high-voltage fuse parlance such a fuse is restricted for use on a low-voltage secondary distribution system that connects the secondaries of distribution transformers to consumers' services.

secondary unit substation. See note under **unit substation**.

sectionalizer. See **automatic line sectionalizer**.

sector impedance relay. A form of distance relay that by application and design has its operating characteristic limited to a sector of its operating circle on the *R-X* diagram. See Fig 1(b).

PSRC

security (of a relay or relay system). That facet of reliability that relates to the degree of certainty that a relay or relay system will not operate incorrectly.

PSRC

segregated-phase bus. One in which all phase conductors are in a common metal enclosure, but are segregated by metal barriers between phases.

SwgA

selective opening (tripping). The application of switching devices in series such that (of the devices carrying fault current) only the device nearest the fault will open and the devices closer to the source will remain closed and carry the remaining load.

LVS_{SwgD}, R and S, Swg

selective overcurrent trip. See **selective release (trip)** and **overcurrent release (trip)**.

selective overcurrent tripping. See **selective opening (tripping)** and **overcurrent release (trip)**.

selective pole switching. The practice of tripping and reclosing one or more poles of a multipole circuit breaker without changing the state of the remaining pole(s) with tripping being initiated by protective relays which respond selectively to the faulted phases.

PCB, Swg

NOTE: Circuit breakers applied for selective pole switching must inherently be capable of individual pole opening.

selective release (trip). A delayed release with selective settings that will automatically reset if the actuating quantity falls and remains below the release setting for a specified time.

LVS_{SwgD}

selectivity (of a protective system). A general term describing the interrelated performance of relays and breakers, and other protective devices; complete selectivity being obtained when a minimum amount of equipment is removed from service for isolation of a fault or other abnormality.

PSRC

selector switch. One arranged to permit connecting a conductor to any one of a number of other conductors.

HVS, Swg

self-rest relay (automatically reset relay). A relay that is so constructed that it returns to its reset position following an operation after the input quantity is removed.

PSRC

semiflush-mounted device. One in which the body of the device projects in front of the mounting surface a specified distance between the distance specified for flush-mounted and surface-mounted devices.

SwgA

semi-high-speed low-voltage dc power circuit breaker. A low-voltage dc power circuit breaker which, during interruption, limits the magnitude of the fault current so that its crest is passed not later than a specified time after the beginning of the fault current transient, where the system fault current, determined without the circuit breaker in the circuit, falls between specified limits of current at a specified time.

LVS_{SwgD}

NOTE: The specified time in present practice is 0.03 second.

sequence filter. (See **sequence network**).

sequence network. An electrical circuit that produces an output proportional to one or more of the sequence components of a poly-phase system of voltages or currents, e.g. positive-sequence network, negative sequence network, or zero-sequence network.

PSRC
series coil sectionalizer. A sectionalizer in which main circuit current impulses above a specified value, flowing through a solenoid or operating coil, provide the energy required to operate the counting mechanism.

R and S, Swg
series overcurrent tripping. See **direct (series) release (trip)** and **overcurrent release (trip)**.

series-trip recloser. A recloser in which main-circuit current above a specified value, flowing through a solenoid or operating coil, provides the energy necessary to open the main contacts.

R and S, Swg
series undercurrent tripping. See **direct (series) release (trip)** and **undercurrent release (trip)**.

set (used as a verb). To position the various adjusting devices so as to secure the desired operating characteristic.

PSRC, LVSwgD
NOTE: Typical adjustment devices are taps, dials, levers, and scales suitably marked, rheostats that may be adjusted during tests, and switches with numbered positions that refer to recorded operating characteristics.

setting (used as a noun). The desired characteristic, obtained as a result of having set a device, stated in terms of calibration markings or of actual performance bench marks such as pick-up current and operating time at a giving value of input.

PSRC, LVSwgD
NOTE: When the setting is made by adjusting the device to operate, as desired in terms of a measured input quantity, the procedure may be the same as in calibration. However, since it is for the purpose of finding one particular position of an adjusting device, which in the general case may have several marked positions that are not being calibrated, the word setting is to be preferred over the word calibration.

setting error. The departure of the actual performance from the desired performance resulting from errors in adjustment or from limitations in testing or measuring techniques.

PSRC, LVSwgD
setting limitation. The departure of the actual performance from the desired performance resulting from limitations of adjusting devices.

PSRC, LVSwgD
short circuit. An abnormal connection (in-

cluding an arc) of relatively low impedance, whether made accidentally or intentionally, between two points of different potential.

LVSwgD, PCB, Swg
NOTE: The term fault or short-circuit fault is used to describe a short circuit.

short-line-fault transient recovery voltage. The transient recovery voltage obtained when a circuit switching device interrupts a nearby fault on the line.

PCB, Swg
NOTE: It differs from terminal fault conditions in that the length of line adds a high-frequency sawtooth component to the transient recovery voltage. As the distance to the fault becomes greater, the amplitude of the saw-tooth component increases, the rate of rise of the saw-tooth component decreases and the fault current decreases.

The increased amplitude adversely affects the interrupting capability of the circuit switching device while the decrease in rate of rise and the decrease in current makes interruption easier. The effects are not proportional and a distance is reached where interruption is most severe even though the current is less than for a terminal fault. The critical value varies considerably with the type of circuit switching device (oil, air-blast, gas-blast, etc), and with the particular design. The critical distance may be in the order of a mile at the higher voltages. The critical distance is less as lower voltages are considered.

short-time current. The current carried by a device, an assembly, or a bus for a specified short time interval.

HVS, Swg, LVSwgD, PCB, Swg
short-time delay phase or ground trip element. A direct-acting trip device element that functions with a purposely delayed action (milliseconds).

LVSwgD
short-time rating of a relay. The highest value of current or voltage or their product that the relay can stand, without injury, for specified short-time intervals (for alternating-current circuits, root-mean-square total value including the direct-current component shall be used). The rating shall recognize the limitations imposed by both the thermal and electromagnetic effects.

PSRC
shunt (air switch). A flexible electrical conductor comprised of braid, cable, or flat laminations designed to conduct current around the mechanical joint between two conductors.

R and S, Swg
shunt capacitor bank current. Current, including harmonics, supplied to a shunt capacitor bank.

PCB, Swg
NOTE: Current is expressed in rms amperes.

shunt release (trip). A release energized by a source of voltage.

LVS_{SwgD}

NOTE: The voltage may be derived either from the main circuit or from an independent source.

shunt-trip recloser. A recloser in which the tripping mechanism, by releasing the holding means, permits the main contacts to open, with both the tripping mechanism and the contact opening mechanism deriving operating energy from other than the main circuit.

R and S, Swg

shutter (of a switchgear assembly). A device that is automatically operated to completely cover the stationary portion of the primary disconnecting devices when the removable element is either in the disconnected position, test position, or has been removed.

SwgA

side-break switch. One in which the travel of the blade is in a plane parallel to the base of the switch.

HVS, Swg

signal relay. See alarm relay.

silver-surfaced or equivalent. The term indicates metallic materials having satisfactory long-term performance and which operate within the temperature rise limits established for silver-surfaced electrical contact parts and conducting mechanical joints.

LVS_{SwgD}; PCB, Swg; SwgA

single-break switch. One that opens each conductor of a circuit at one point only.

LVS_{SwgD}

single capacitance (as applied to interrupter switches). A capacitance is defined to be a single capacitance when the crest of its inrush current does not exceed the switch inrush current capability for single capacitance.

HVS, Swg

single-element fuse. A fuse having a current-responsive element comprising one or more parts with a single fusing characteristic.

HVF, Swg

single pole switching. The practice of tripping and reclosing one pole of a multipole circuit breaker without changing the state of the remaining poles, with tripping being initiated by protective relays which respond selectively to the faulted phase.

PCB, Swg

NOTES: (1) Circuit breakers used for single pole switching must inherently be capable of individual pole opening.

(2) In most single pole switching schemes it is the practice to trip all poles for any fault involving more than one phase.

single throw (switching device). A qualifying term used to indicate that the device has an open and a closed circuit position only.

LVS_{SwgD}

sleet hood (of a switch). A cover for the contacts to prevent sleet from interfering with successful operation of the switch.

HVS, Swg

small wiring. See secondary and control wiring.

solid-material fuse unit. A fuse unit in which the arc is drawn through a hole in solid material.

HVF, Swg

solid-state relay (or relay unit). A static relay or relay unit constructed exclusively of solid-state components.

PSRC

spare point (for supervisory control or indication or telemeter selection). A point that is not being utilized but is fully equipped with all of the necessary devices for a point.

SUB

speed ratio (of a fuse). See melting-speed ratio (of a fuse).

spike (as applied to relaying). An output signal of short duration and limited crest derived from an alternating input of specified polarity.

PSRC

NOTE: The duration of a spike usually does not exceed one millisecond.

split-winding protection. A form of differential protection in which the current in all or part of the winding is compared to the normally proportional current in another part of the winding.

PSRC

spring operation. Stored-energy operation by means of spring-stored energy.

LVS_{SwgD}, PCB, Swg

squaring amplifier (as applied to relaying). A circuit which produces a block.

PSRC

snatch circuit. A circuit for preventing production of an unwanted output in the absence of a signal having predetermined characteristics.

PSRC

standard operating duty. See operating duty.

standard reference position (of a contact). The nonoperated or deenergized position of the associated main device to which the contact position is referred.

LVS_{SwgD}

NOTE: Standard reference positions of typical devices are listed in 9.44 of ANSI/IEEE C37.2-1979 [3];

Device	Standard Reference Position
Circuit breaker	Main contacts open
Disconnecting switch	Main contacts open
Relay	Deenergized position
Contactors	Deenergized position
Valve	Closed position

startup (of a relay). The action of a relay as it just departs from complete reset. Startup as a qualifying term is also used to identify the minimum value of the input quantity which will permit this condition.

PSRC

static relay (or relay unit). A relay or relay unit in which the designed response is developed by electronic, solid-state, magnetic or other components without mechanical motion.

PSRC

NOTE: A relay which is composed of both static and electromechanical units in which the designed response is accomplished by static units may be referred to as a static relay.

station-type cubicle switchgear. Metal-enclosed power switchgear composed of the following equipment: 1) primary power equipment for each phase segregated and enclosed by metal, 2) stationary-mounted power circuit breakers, 3) group-operated switches, interlocked with the circuit breakers, for isolating the circuit breakers, 4) bare bus and connections, 5) instrument transformers, 6) control wiring and accessory devices.

SwgA

stationary contact member. A conducting part having a contact surface which remains substantially stationary.

HVS, Swg, LVSwgD, PCB, Swg

stationary-mounted device. One that cannot be removed except by the unbolting of connections and mounting supports.

LVSwgD, SwgA

NOTE: Compare with drawout-mounted device.

stick (hook) operation. Manual operation of a switching device by means of a switch stick.

HVS, Swg

stored energy indicator. An indicator which visibly shows that the stored energy mechanism is in the charged or discharged position.

LVSwgD, PCB, Swg

stored-energy operation. Operation by means of energy stored in the mechanism itself prior to the completion of the operation and sufficient to complete it under predetermined conditions.

LVSwgD, PCB, Swg

NOTE: This kind of operation may be subdivided according to: 1) how the energy is stored (spring, weight, etc), 2) how the energy originates (manual, electric, etc), 3) how the energy is released (manual, electric, etc).

strain element (strain wire) (of a fuse). That part of the current-responsive element, connected in parallel with the fusible element in order to relieve it of tensile strain.

HVF, Swg

NOTE: The fusible element melts and severs first and then the strain element melts during circuit interruption.

striking distance. The shortest distance, measured through air, between parts of different polarities.

PCB, Swg

stub (radial) feeder. A feeder that connects a load to its only source of power.

SUB

stub-multiple feeder. A feeder that operates as either a stub or a multiple feeder.

SUB

stud (of a switching device). A rigid conductor between a terminal and a contact.

LVSwgD, PCB, Swg

submersible. So constructed as to be successfully operable when submerged in water under specified conditions of pressure and time.

HVS, Swg, SwgA

submersible entrance terminals (cableheads) (of distribution oil cutouts). A hermetically sealable entrance terminal for the connection of cable having a submersible sheathing or jacket.

HVS, Swg

submersible fuse (subway oil cutout). See submersible and fuse.

sudden-pressure relay. A relay that operates by the rate of rise in pressure of a liquid or gas.

PSRC

supervisory control. A form of remote control comprising an arrangement for the selective control of remotely located units by electrical means over one or more common interconnecting channels.

SUB

supervisory indication. A form of remote indication comprising an arrangement for the automatic indication of the position or condition of remotely located units by electrical means over one or more common interconnecting channels.

SUB

supervisory station check. The automatic selection in a definite order, by means of a single initiation of the master station, of all of the supervisory points associated with one remote station of a system; and the transmission to the master station of indications of positions or conditions of the individual equipment or device associated with each point.

SUB

supervisory system. All supervisory control, indicating, and telemeter selection devices in

the master station and all of the complementary devices in the remote station, or stations, which utilize a single common interconnecting channel for the transmission of the control or indication signals between these stations.

SUB

supervisory system check. The automatic selection in a definite order, by means of a single initiation at the master station, of all supervisory points associated with all of the remote stations in a system; and the transmission to the master station of indications of positions or conditions of the individual equipment or device associated with each point.

SUB

supervisory telemeter selection. A form of remote telemeter selection comprising an arrangement for the selective connection of telemeter transmitting equipment to an appropriate telemeter receiving equipment over one or more common interconnecting channels.

SUB

surface-mounted device. A device, the entire body of which projects in front of the mounting surface.

SwgA

susceptance relay. A mho-type distance relay for which the center of the operating characteristic on the R - X diagram is on the X axis.

PSRC

NOTE: The equation that describes such a characteristic is $Z = K \sin \theta$ where K is a constant and θ is the phase angle by which the input voltage leads the input current. See Fig 1b.

swing rack cabinet. An assembly enclosed at the top, side and rear with front hinged door for front access having a swing open frame for equipment mounting (e.g. nominal 19 inch wide chassis and subpanel assemblies).

PSRC, SwgA

switch. See switching device.

switch inrush current capability for single capacitance (as applied to interrupter switches). This capability is a function of the rated switching current, for single capacitance, the rated differential capacitance voltage (minimum) and the maximum design voltage of the switch.

HVS, Swg

NOTE: This can be calculated from the equation:
Capability, in Peak Amperes =

$$\sqrt{2} I_C \sqrt{1 + \frac{0.816 E_m}{\Delta V_{\min}}}$$

where

I_C = rated switching current for single capacitance

ΔV_{\min} = rated differential capacitance voltage, minimum

E_m = switch rated maximum voltage, in volts, rms

switch stick (switch hook). A device with an insulated handle and a hook or other means for performing stock operation of a switching device.

HVS, Swg

switchboard. A type of switchgear assembly that consists of one or more panels with electric devices mounted thereon, and associated framework.

SwgA

NOTE: Switchboards may be classified by function; that is, power switchboards or control switchboards. Both power and control switchboards, may be further classified by construction as defined.

switchgear. A general term covering switching and interrupting devices and their combination with associated control, metering, protective and regulating devices, also assemblies of these devices with associated interconnections, accessories, enclosures and supporting structures, used primarily in connection with the generation, transmission, distribution and conversion of electric power.

SwgA

switchgear assembly. An assembled equipment (indoor or outdoor) including, but not limited to, one or more of the following: switching, interrupting, control, metering, protective and regulating devices, together with their supporting structures, enclosures, conductors, electric interconnections, and accessories.

SwgA

switching current. The value of current expressed in rms symmetrical amperes which the power circuit breaker element of the circuit protector interrupts at the rated maximum voltage and rated frequency under the prescribed test conditions.

LVS_{SwgD}

switching device (switch). A device designed to close or open, or both, one or more electric circuits.

HVF, Swg, HVS, Swg, PCB, Swg

NOTES: (1) The term switch in International (IEC) practice refers to a mechanical switching device capable of opening and closing rated continuous load current.

(2) See mechanical switching device and nonmechanical switching device.

switching structure. An open framework supporting the main switching and associated equipment, such as instrument transformers, buses, fuses, and connections. It may be designed for indoor or outdoor use and may be

assembled with or without switchboard panels carrying the control equipment.

SwgA
symmetrical component (alternating-current component) (of a total current). That portion of the total current that constitutes the symmetry.

LVSwgD, PCB, Swg
synchronism-check relay. A verification relay whose function is to operate when two input voltage phasors are within predetermined limits.

PSRC
synchronizing relay. A programming relay whose function is to initiate the closing of a circuit breaker between two ac sources when the voltages of these two sources have a predetermined relationship of magnitude, phase angle, and frequency.

PSRC
synchronous operation (opening or closing). Operation of a switching device in such a manner that the contacts are closed or opened at a predetermined point on a reference voltage or current wave.

PCB, Swg
NOTE: Synchronous operation applied on multiphase circuits may require that closing or opening of the contacts of each pole be responsive to a different reference.

target (operation indicator) (of a relay). A supplementary device operated either mechanically or electrically, to indicate visibly that the relay has operated or completed its function.

PSRC
NOTES: (1) A mechanically operated target indicates the physical operation of the relay.

(2) An electrically operated target when not further described is actuated by the current in the control circuit associated with the relay and hence indicates not only that the relay has operated but also that it has completed its function by causing current to flow in the associated control circuit.

(3) A shunt-energized target only indicates operation of the relay contact and does not necessarily show that current has actually flowed in the associated control circuit.

telemetry (or remote metering). Measurement with the aid of intermediate means that permit the measurement to be interpreted at a distance from the primary detector.

SUB
NOTE: The distinctive feature of telemetry is the nature of the translating means which includes the provision for converting the measurand into a representative quantity of another kind that can be transmitted conveniently for measurement at a distance. The actual distance is irrelevant.

telephone-type relay. A type of electromechanical relay in which the significant structural

feature is a hinged armature mechanically separate from the contact assembly. This assembly usually consists of a multiplicity of stacked leaf-spring contacts.

PSRC
temperature relay. A relay whose operation is caused by specified external temperature.

PSRC
NOTE: Compare with thermal relay.

temperature-rise tests. Tests to determine the temperature rise, above ambient, of various parts of the tested device when subjected to specified test quantities.

HVF, Swg, LVSwgD
NOTE: The test quantities may be current, load, etc.

terminal (terminal connector). A connector for attaching a conductor to electrical apparatus.

HVF, Swg, LVSwgD, PCB, Swg, SwgA
terminal block (terminal board). An insulating base equipped with terminals for connecting secondary and control wiring.

PCB, Swg, SwgA
terminal chamber. A metal enclosed container which includes all necessary mechanical and electrical items to complete the connections to other equipment.

SwgA
terminal connector. See terminal.

terminal pad. A usually flat conducting part of a device to which a terminal connector is fastened.

HVF, Swg, HVS, Swg, PCB, Swg
test cabinet (for a switchgear assembly). An assembly of a cabinet containing permanent electric connections, with cable connections to a contact box arranged to make connection to the secondary contacts on an electrically operated removable element, permitting operation and testing of the removable element when removed from the housing. It includes the necessary control switch and closing relay, if required.

SwgA
test enclosure (for low-voltage ac power circuit breakers). A single unit enclosure used for test purposes for a specific frame-size circuit breaker and which conforms to the manufacturer's recommendation for minimum volume, minimum electrical clearances, effective areas and locations of ventilation openings, and configuration of connections to terminals.

LVSwgD
test position (of a switchgear assembly removable element). That position in which the primary disconnecting devices of the removable element are separated by a safe distance from those in the housing and some or all of the

secondary disconnecting devices are in operating contact.

LVS_{SwgD}, SwgA

NOTES: (1) A set of test jumpers or mechanical movement of secondary disconnecting devices may be used to complete all secondary connections for test in the test position. This may correspond with the disconnected position.

(2) Safe distance, as used here, is a distance at which the equipment will meet its withstand ratings, both power frequency and impulse, between line and load stationary terminals and phase-to-phase and phase-to-ground on both line and load stationary terminals with the switching device in the closed position.

test switch (test block). A combination of connection studs, jacks, plugs, or switch parts arranged conveniently to connect the necessary devices for testing instruments, meters, relays, etc.

SwgA

thermal relay. A relay whose operation is caused by heat developed within the relay as a result of specified external conditions.

PSRC

NOTE: Compare with temperature relay.

thermally delayed overcurrent trip. See thermally delayed release and overcurrent release.

thermally delayed release (trip). A release delayed by a thermal device.

LVS_{SwgD}

threshold current (of a current-limiting fuse). A current magnitude of specified wave shape at which the melting of the current-responsive element occurs at the first instantaneous peak current for that wave shape.

HVF, Swg

NOTE: The current magnitude is usually expressed in rms amperes.

threshold ratio (of a current-limiting fuse). The ratio of the threshold current to the fuse current rating.

HVF, Swg

tie feeder. A feeder that connects together two or more independent sources of power and has no tapped load between the terminals.

SUB

NOTE: If a feeder has any tapped load between the two sources, it is designated as a multiple feeder.

tight (used as a suffix). So constructed that the specific material is excluded under specified conditions.

PSRC, HVF, Swg, HVS, Swg, SwgA

tilting-insulator switch. One in which the opening and closing travel of the blade is accomplished by a tilting movement of one or more of the insulators supporting the conducting parts of the switch.

HVS, Swg

time-current characteristic (of a fuse). See fuse time-current characteristic.

time-current tests (of a fuse). See fuse time-current tests.

time dial (time lever) (of a relay). An adjustable, graduated element of a relay by which, under fixed input conditions, the prescribed relay operating time can be varied.

PSRC

time-overcurrent relay. An overcurrent relay in which the input current and operating time are inversely related throughout a substantial portion of the performance range.

PSRC

time-undervoltage protection. A form of undervoltage protection that disconnects the protected equipment upon a deficiency of voltage after a predetermined time interval.

PSRC

timing relay (or relay unit). An auxiliary relay or relay unit whose function is to introduce one or more time delays in the completion of an associated function.

PSRC

torque control (of a relay). A method of constraining the pickup of a relay by preventing the torque-producing element from developing operating torque until another associated relay unit operates.

PSRC

total clearing time (of a fuse). See clearing time (of a fuse).

total (asymmetrical) current. The combination of the symmetrical component and the direct current component of the current.

LVS_{SwgD}, PCB, Swg

transactor. A magnetic device with an air-gapped core having an input winding which is energized with an alternating current and having an output winding which produces a voltage that is a function of the input current.

PSRC

NOTE: The term transactor is a contraction of the words transformer and reactor.

transfer switch (a high-voltage switch). A switch arranged to permit transferring a conductor connection from one circuit to another without interrupting the current.

(1) A tandem transfer switch is a switch with two blades, each of which can be moved into or out of only one contact.

(2) A double-blade double-throw transfer switch is a switch with two blades, each of which can be moved into or out of either of two contacts.

HVS, Swg

NOTE: In contrast to high-voltage switches, many low-voltage, control and instrument transfer switches interrupt current during transfer. Compare with selector switch. Also compare with automatic transfer (or throw-over) equipment that connects a load to an alternate source after failure of an original source.

transfer trip. A form of remote trip in which a communication channel is used to transmit a trip signal from the relay location to a remote location.

PSRC

transformer overcurrent tripping. See indirect release and overcurrent release.

transformer undercurrent tripping. See indirect release and undercurrent release.

transformer voltage (of a network protector). The voltage between phases or between phase and neutral on the transformer side of a network protector.

LVS_{wgD}

transient blocking. A circuit function which blocks tripping during the interval in which an external fault is being cleared.

PSRC

transient inrush current. Current which results when a switching device is closed to energize a capacitance or an inductive circuit.

PCB, Swg

NOTE: Current is expressed by the highest peak value in amperes and frequency in hertz.

transient overvoltage. The peak voltage during the transient conditions resulting from the operation of a switching device.

PCB, Swg

NOTE: The location and units of measurement are specified in apparatus standards. Compare with transient overvoltage ratio (factor).

transient overvoltage ratio (factor). The ratio of the transient overvoltage to the closed-switching-device operating line-to-neutral peak voltage with the load connected.

PCB, Swg

NOTE: The location of measurement is specified in the apparatus standards.

transient recovery voltage. The voltage transient that occurs across the terminals of a pole of a circuit switching device upon interruption of the current.

HVF, Swg, PCB, Swg

NOTES: (1) It is the difference between the transient voltages to ground occurring on the terminals. It may be a circuit transient recovery voltage, a modified circuit transient recovery voltage, or an actual transient recovery voltage.

(2) In a multipole circuit breaker, the term is usually applied to the voltage across the first pole to interrupt. For circuit breakers having several interrupting units in series, the term may be applied to the voltage across units or groups of units.

transient response (of a relay). The manner in which a relay, relay unit or relay system responds to a sudden change in the input.

PSRC

transient recovery voltage rate. The rate at which the voltage rises across the terminals of a pole of a circuit switching device upon interruption of the current.

PCB, Swg

NOTE: It is usually determined by dividing the voltage at one of the crests of the transient recovery voltage by the time from current zero to that crest. In case no definite crest exists, the rate may be taken to some stated value usually arbitrarily selected as a certain percentage of the crest value of the normal-frequency recovery voltage. In case the transient is an exponential function the rate may also be taken at the point of zero voltage. It is the rate of rise of the algebraic difference between the transient voltages occurring on the terminals of the switching device upon interruption of the current. The transient recovery voltage rate may be a circuit transient recovery voltage rate or a modified circuit transient recovery voltage rate, or an actual transient recovery voltage rate according to the type of transient from which it is obtained. When giving actual transient recovery voltage rates, the points between which the rate is measured should be definitely stated.

travel (of a relay). The amount of movement in either direction (towards pickup or reset) of a responsive element.

PSRC

NOTE: Travel may be specified in linear, angular, or other measure.

trip (used as a verb)⁴

(1) To release in order to initiate either an opening or a closing operation or other specified action.

(2) To release in order to initiate an opening operation only.

(3) To initiate and complete an opening operation.

PSRC

trip (used as a noun)⁴

(1) A release that initiates either an opening or a closing operation or other specified action.

(2) A release that initiates an opening operation only.

(3) A complete opening operation.

(4) The action associated with the opening of a circuit breaker or other interrupting device.

PSRC

trip or tripping (used as an adjective)⁴

(1) Pertaining to a release that initiates either an opening or a closing operation or other specified action.

⁴ All terms employing *trip*, *tripping*, or their derivatives are referred to the term that expresses the intent of the usage.

FOR POWER SWITCHGEAR

(2) Pertaining to a release that initiates an opening operation only.

(3) Pertaining to a complete opening operation.⁴

LVS, Swg, PCB, Swg

trip coil. See release (trip) coil (of a mechanical switching device).

trip delay setting. See release (trip) delay setting.

trip-free. See release-free (trip-free) (as applied to a mechanical switching device).

trip-free in any position. See release-free (trip-free) in any position.

trip-free relay (release-free relay). An auxiliary relay whose function is to open the closing circuit of an electrically operated switching device so that the opening operation can prevail over the closing operation.

PSRC, PCB, Swg

trip setting. See release (trip) setting.

tripping delay. See release (tripping) delay (of a mechanical switching device).

tripping mechanism. See release (tripping mechanism) (of a mechanical switching device).

trussed blade (of a switching device). A blade that is reinforced by truss construction to provide stiffness.

HVS, Swg

tube (of a fuse). See fuse tube.

undercurrent relay. A relay that operates when the current is less than a predetermined value.

PSRC

undercurrent release (trip). A release that operates when the current in the main circuit is equal to or less than the release setting.

R and S, Swg

undercurrent tripping. See undercurrent release (trip).

underreaching protection. A form of protection in which the relays at a given terminal do not operate for faults at remote locations on the protected equipment, the given terminal being cleared either by other relays with different performance characteristics or by a transferred trip signal from a remote terminal similarly equipped with underreaching relays.

PSRC

undervoltage protection (low-voltage protection). A form of protection that operates when voltage is less than a predetermined value.

PSRC, LVSwgD

undervoltage relays. A relay that operates when its voltage is less than a predetermined value.

PSRC

undervoltage release (trip). A release that operates when the voltage of the main circuit is equal to less than the release setting.

LVSwgD, PCB, Swg

undervoltage tripping. See undervoltage release (trip).

unit (of a relay). See relay unit.

unit operation (CO) (of a circuit breaker). See close-open operation (of a switching device).

unit operation (of a recloser). An interrupting operation followed by a closing operation. The final interruption is also considered one unit operation.

R and S, Swg

unit substation. A substation consisting primarily of one or more transformers mechanically and electrically connected and coordinated in design with one or more switchgear or motor control assemblies or combination thereof.

PCB, Swg

NOTE: A unit substation may be described as *primary* or *secondary* depending on the voltage rating of the low-voltage section: *primary*, more than 1000 volts; *secondary*, 1000 volts and below.

universal fuse links. Fuse links that, for each rating, provide mechanical and electrical interchangeability within prescribed limits over the specified time-current range.

HVF, Swg

vaportight. So enclosed that vapor will not enter the enclosure.

HVF, Swg

vent (of a fuse). The means provided for the escape of the gases developed during circuit interruption.

HVF, Swg

NOTE: In distribution oil cutouts, the vent may be an opening in the housing or an accessory attachable to a vent opening in the housing with suitable means to prevent loss of oil.

vented fuse (or fuse unit). A fuse with provision for the escape of arc gases, liquids, or solid particles to the surrounding atmosphere during circuit interruption.

HVF, Swg

ventilated enclosure. An enclosure provided with means to permit circulation of sufficient air to remove an excess of heat, fumes, or vapors.

SwgA

NOTE: For outdoor applications ventilating openings or louvres are usually filtered, screened, or restricted to limit the entrance of dust, dirt or other foreign objects.

verification relay. A monitoring relay restricted to functions pertaining to power-system conditions and not involving opening circuit breakers during fault condition.

PSRC

NOTE: Such a relay is sometimes referred to as a check or checking relay.

vertical-break switch. One in which the travel of the blade is in a plane perpendicular to the plane of the mounting base. The blade in the closed position is parallel to the mounting base.

HVS, Swg

vertical section. That portion of the switchgear assembly between two successive vertical delineations. It may contain one or more units.

SwgA

vertical switchboard. A control switchboard composed only of vertical panels.

SwgA

NOTE: This type of switchboard may be enclosed or have an open rear. An enclosed vertical switchboard has an overall sheet-metal enclosure (not grille) covering back and ends of the entire assembly, access to which is usually provided by doors or removable covers.

vibrating-contact machine regulator. A regulator that varies the excitation of an electric machine by changing the average time of engagement of vibrating contacts in the field circuit.

LVSwgD

vibration relay. A relay that responds to the magnitude and frequency of a mechanical vibration.

PSRC

voltage balance relay. A balance relay which operates by comparing the magnitudes of two voltage inputs.

PSRC

voltage-phase-balance protection. A form of protection that disconnects or prevents the connection of the protected equipment when

the voltage unbalance of the phases of a normally balanced polyphase system exceed a predetermined amount.

PSRC

voltage rating of a relay. The voltage at a specified frequency, that may be sustained by the relay for an unlimited period, without causing any of the prescribed limitations to be exceeded.

PSRC

voltage relay. A relay that responds to voltage.

PSRC

voltage restraint. A method of restraining the operation of a relay by means of a voltage input which opposes the typical response of the relay to other inputs.

PSRC, R and S, Swg

voltage-type telemeter. A telemeter that employs the magnitude of a single voltage as the translating means.

SUB

volts per hertz relay. A relay whose pickup is a function of the ratio of voltage to frequency.

PSRC

withstand voltage. The specified voltage that, under specified conditions, can be applied to insulation without causing flashover or puncture.

LVSwgD

zero-phase-sequence relay. A relay that responds to the zero-phase-sequence component of a polyphase input quantity.

PSRC

zone (of a relay). See reach (of a relay).

zone of protection (for relays). That segment of the power system in which the occurrence of assigned abnormal conditions should cause the protective relay system to operate.

PSRC