Pictorial Glossary

Click on a term to go directly to the definition

Click on a term to go directly to the definition

Chute Assembly

Circuit

Decimal

Bar

Plug

Proximity

Capacitive Reactance

Processor Unit (CPU)

Control

Curve Apparent Power

Splice Plates, Splice Arc

Bars Arc Fault

Starter Ratings Arc Fault

Stator Interrupter (AFCI)

Step-down Autotransformer

Transformer Binary-Coded

Step-up Transformer (BCD)

Surge Binary Number

Surge Protection Bit

Device (SPD) Bonding

Switchboard Branch Circuit

Switchgear Bus

Synchronous Speed Bus

Thermal-Magnetic Bus

Thermistor Busway

Thyristor Busway Hangers

Time-Current Curve Byte

Timing Relay Capacitance

Torque Capacitive

Totally Enclosed Switch

Fan Cooled (TEFC)

Totally Enclosed Capacitor

Non-ventilated Central

(TENV) Circuit Breaker

Transformer Closed-Loop

Transistor Conductor

Trim Contactor

Trip Unit Control Relay

True Power Coulomb

Sonar Proximity Coulomb’s

Law

Switch Counter EMF

Underwriters Crest Factor

Laboratories (UL) Current

Var DC Drive

Variable Frequency DC

Motor

Drive Dead Front

Variable Speed Delta

Drive Digital

Vector Control DIN Rail

Volt Diode

Voltage Direct Current (DC)

Voltmeter Disconnect

Switch

Volts power Hertz Discrete

I/O

(V/Hz) Operation

Distribution Section

Watt Duty Cycle

Word Effective Value

Wye

Pictorial Glossary

The pictorial glossary includes definitions and illustrations for many terms that are frequently used in the electrical industry. Terms that are underlined and italicized are included in the glossary as a separate definition.

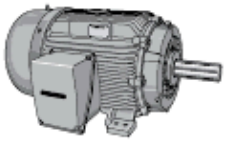
AC Drive

An electronic device used to control the speed of an *AC motor*. Also called a *variable frequency drive* and an *inverter*. The term *variable speed drive* applies to both *AC Drives* and *DC Drives*.

SINAMICS G110 AC Drives

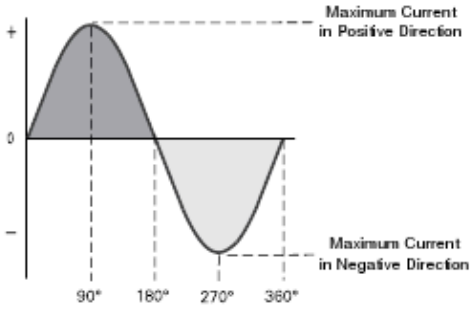
AC Motor

A *motor* that uses *alternating current* to convert electrical energy into mechanical energy. Many AC motors used in industrial applications are three-phase induction motors.



Alternating Current (AC)

Current that periodically reverses direction.



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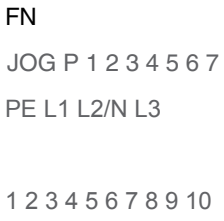

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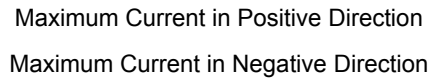


Ambient Temperature — The temperature of the medium (air, water, etc.) surrounding a device.

American National Standards Institute (ANSI) — A nongovernmental organization that promotes and coordinates the development of standards and accredits the procedures of other organizations that develop standards.

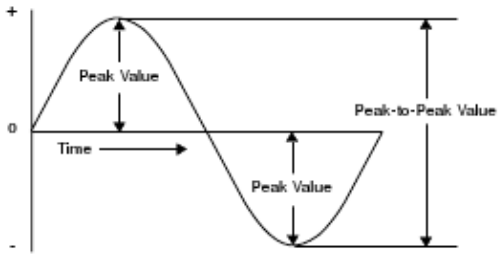
American Wire Gauge (AWG) — A common method of specifying wire size (cross-sectional area). Larger numbers represent smaller wires. After AWG No. 1, the largest sizes are AWG No. 0, AWG No. 00, AWG No. 000, and AWG 0000. AWG No. 0 is called one-aught, AWG No. 00 is called two-aught, etc.

Ammeter — A meter designed to measure *current*.

Ampacity — The continuous *current* rating in *amperes* for a conductor.

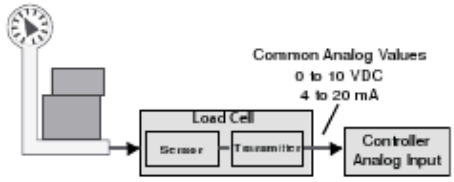
Ampere, Amp — The basic unit for *current*. An ampere, also called an amp, is equal to a current of 1 *Coulomb* per second. The symbol for ampere is "A."

Amplitude — The total variation of a waveform. Amplitude can be expressed as a peak value, peak-to-peak value, or *effective value*.



Analog — A value that is continuously variable. Also used to describe circuits that work with analog signals.

Analog Input — An input to a system that can continuously vary over a range of *current* or *voltage* such as 4 to 20 milliamps or 0 to 10 volts.



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Amplitude The total variation of a waveform. Amplitude can be expressed

as a peak value, peak-to-peak value, or effective value.

+

Peak Value

Time

Peak Value

-

Analog A value that is continuously variable. Also used to describe

circuits that work with analog signals.

Analog Input An input to a system that can continuously vary over a range of

current or voltage such as 4 to 0 milliamps or 0 to 0 volts.

Load Cell

Sensor Transmitter

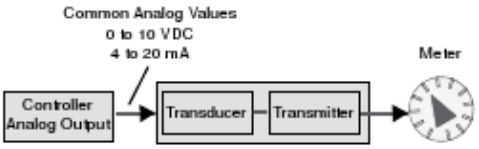
Peak-to-Peak Value 0

Common Analog Values 0 to 10 VDC 4 to 20 mA

Controller Analog Input

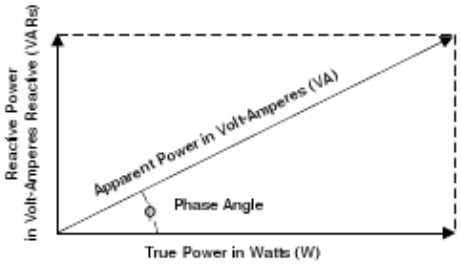
Analog Output

An output from a system that can continuously vary over a range of *current* or *voltage* such as 4 to 20 milliamps or 0 to 10 volts.



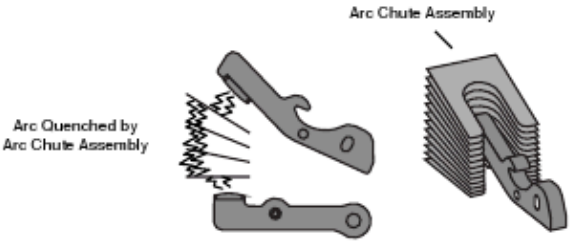
Apparent Power

The vector sum of *true power* and *reactive power*. Apparent power is calculated by multiplying *current* times *voltage*. The unit for apparent power is the volt-ampere, abbreviated "VA."



Arc Chute Assembly

An assembly of metal plates surrounding *circuit breaker* or *contactor* contacts. Arc chutes are used to reduce contact damage by quickly extinguishing the arc created when contacts open.



Arc Fault

An electrical arc which causes *current* to flow in unintended ways, but often not in sufficient amounts to cause a standard circuit breaker to trip. Arc faults result from worn or damaged insulation and are a common cause of fires.

Analog Output An output from a system that can continuously vary over a

range of current or voltage such as 4 to 0 milliamps or 0 to 0 volts.

Common Analog Values 0 to 10 VDC

4 to 20 mA Meter

Transducer Transmitter

Apparent Power The vector sum of true power and reactive power. Apparent

power is calculated by multiplying current times voltage. The unit for apparent power is the volt-ampere, abbreviated “VA.”

R

Controller Analog Output

)

Phase Angle

True Power in Watts (W)

Arc Chute Assembly An assembly of metal plates surrounding circuit breaker or contactor contacts. Arc chutes are used to reduce contact damage by quickly extinguishing the arc created when contacts open.

Arc Chute Assembly

Arc Quenched by Arc Chute Assembly

Arc Fault An electrical arc which causes current to flow in unintended

ways, but often not in sufficient amounts to cause a standard circuit breaker to trip. Arc faults result from worn or damaged insulation and are a common cause of fires.

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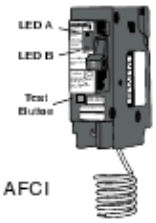
Arc Fault Circuit Interrupter (AFCI)

A *circuit breaker* designed to provide protection from the effects of an *arc fault* by recognizing the characteristics unique to arcing and de-energizing the circuit when an arc fault is detected. The most effective AFCI circuit breakers are combination AFCIs which provide protection against all three known types of arc faults.

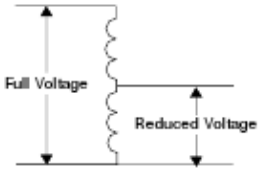
LED Indicator		Last Known Trip Condition
LED (A)	LED (B)	
OFF	OFF	Overcurrent
ON	OFF	Arc Fault
ON	ON	Arc Fault to Ground



Siemens Combination AFCI Circuit Breaker

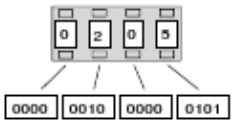
Autotransformer

A type of *transformer* in which the secondary coil is part of the primary coil. Often the secondary *voltage* is adjustable via a movable tap.



Binary-Coded Decimal (BCD)

Usually refers to the 8-4-2-1 code where four *bits* are used to represent decimal digits 0 through 9.



Decimal	BCD
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001

Binary Number

A number made up only of 1's and 0's that represent powers of two (2). *Digital* equipment uses binary numbers to represent numerical values and the on or off condition of devices.

10010010 in Binary = 146 in Decimal

Arc Fault Circuit A circuit breaker designed to provide protection from the Interrupter

(AFCI) effects of an arc fault by recognizing the characteristics

unique to arcing and de-energizing the circuit when an arc fault is detected. The most effective AFCI circuit breakers are combination AFCIs which provide protection against all three known types of arc faults.

Last Known LED Indicator

Trip Condition

LED A

TYPE QAFH

40 C

ARC FAULT GND LED (A) LED (B)

LED B

HACR

Circuit Breaker Combination Ty AFC OFF OFF Overcurrent

AFCI

ON OFF Arc Fault

Test Button

10707150001

ON ON

Siemens Combination AFCI Circuit Breaker

Autotransformer A type of transformer in which the secondary coil is part of the

primary coil. Often the secondary voltage is adjustable via a movable tap.

Full Voltage

Reduced Voltage

Binary-Coded Decimal Usually refers to the 8-4-- code where four bits are used to
(BCD) represent decimal digits 0 through 9.

0 2 0 5

0000 0010 0000 0101

SWD

15 O Interrupting Rating 22kA 120V Max. RMS Sym. 50/60 Hz

TEST Arc Fault to Ground

Decimal BCD

0 1 2 3 4 5 6 7 8 9

0000 0001 0010 0011 0100 0101 0110 0111 1000 1001

Binary Number A number made up only of ’s and 0’s that represent powers

of two (). Digital equipment uses binary numbers to represent numerical values and the

on or off condition of devices.

Most Significant Bit (MSB)

2

32 16

0

Least Significant Bit (LSB)

Power of 2

7

2

6

2

5

2

4

2

3

2

2

2

1

2

0

Decimal

128 64 8 4 2 1

Binary

1 0 1 0 0 1 0

10010010 in Binary = 146 in Decimal

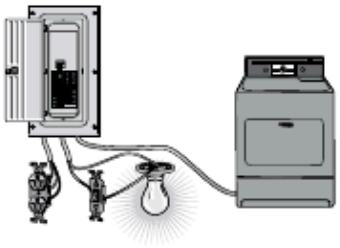
4

QUE QUE QUE

Bit A 1 or 0 representing one position in a *binary* number.

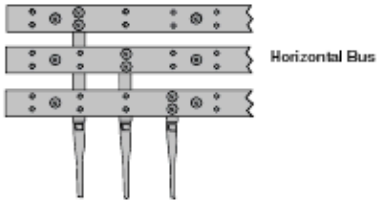
Bonding The permanent joining of metal parts to form an electrically conductive path.

Branch Circuit A part of a *power* distribution system extending beyond the final *overcurrent* protection device.

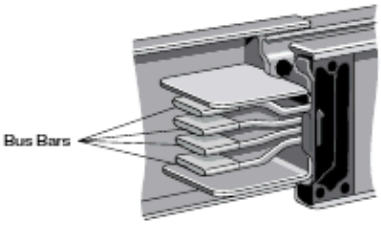


Branch Circuits

Bus A group of *conductors* used to supply *power*, data, or control signals.



Bus Bar A *conductor* that serves as a common connection for two or more circuits.



Bit A or 0 representing one position in a binary number.

Bonding The permanent joining of metal parts to form an electrically conductive path.

Branch Circuit A part of a power distribution system extending beyond the final overcurrent protection device.

Branch Circuits

Bus A group of conductors used to supply power, data, or control signals.

Horizontal Bus

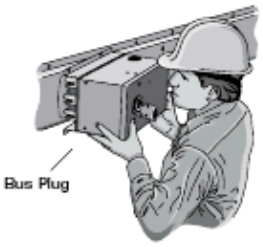
Vertical Bus

Bus Bar A conductor that serves as a common connection for two or more circuits.

Bus Bars

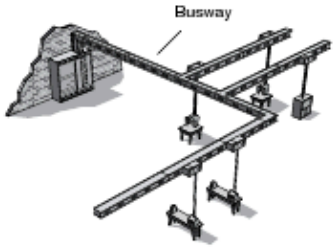
Bus Plug

A device used with *plug-in busway* to provide *power* connections close to the intended load.



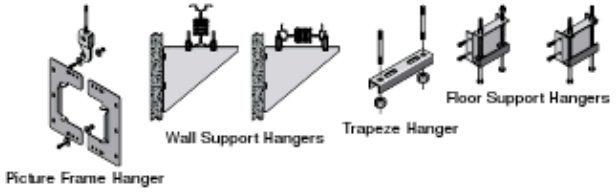
Busway

A prefabricated electrical distribution system that uses *bus bars* in a protective *enclosure*.



Busway Hangers

Devices used to suspend *busway* from a ceiling or mount it to a wall.



Byte

Eight consecutive *bits*.

Capacitance

The property of a circuit or device that allows it to store an electrical charge. The symbol for capacitance is "C." The unit for capacitance is the *farad*.

Bus Plug A device used with plug-in busway to provide power

connections close to the intended load.

Bus Plug

Busway A prefabricated electrical distribution system that uses bus bars in a protective enclosure.

Busway

Busway Hangers Devices used to suspend busway from a ceiling or mount it to a wall.

Wall Support Hangers

Picture Frame Hanger

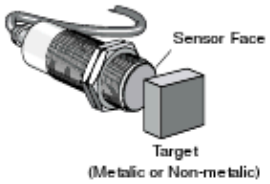
Floor Support Hangers

Byte Eight consecutive bits.

Capacitance The property of a circuit or device that allows it to store an electrical charge. The symbol for capacitance is “C.” The unit for capacitance is the farad.

Trapeze Hanger

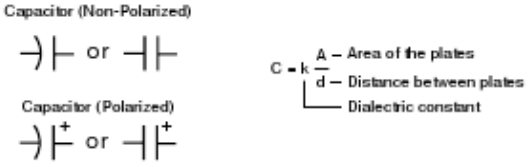
Capacitive Proximity Switch A type of *sensing switch* that produces an electrostatic field to detect the presence of an object without touching the object.



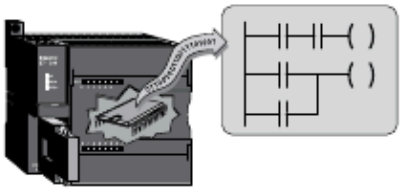
Capacitive Reactance The opposition to *alternating current* resulting from circuit *capacitance*. Capacitive reactance is inversely proportional to *frequency* (f) and capacitance (C). The symbol for capacitive reactance is "X_C." The unit for capacitive reactance is the *ohm*.

$$X_C = \frac{1}{2\pi fc}$$

Capacitor A device manufactured to have a specific *capacitance*.



Central Processor Unit (CPU) The decision-making part of a computer. May also be used to describe the processing circuits together with memory and other circuits needed for processing information.



Capacitive Proximity Switch A type of sensing switch that produces an electrostatic field

to

detect the presence of an object without touching the object.

Sensor Face

Target (Metalic or Non-metalic)

Capacitive Reactance The opposition to alternating current resulting from circuit

capacitance. Capacitive reactance is inversely proportional to frequency (f) and capacitance (C). The symbol for capacitive reactance is “X

C

.” The unit for capacitive reactance is the ohm.

Xc

=

2πfc 1

Capacitor A device manufactured to have a specific capacitance.

Capacitor (Non-Polarized)

or

C = k

A d Area of the plates

Distance between plates Capacitor + or

(Polarized) +

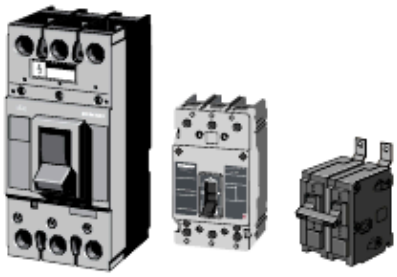
Dialectric constant

Central Processor Unit (CPU) The decision-making part of a computer. May also be used to

describe the processing circuits together with memory and other circuits needed for processing information.

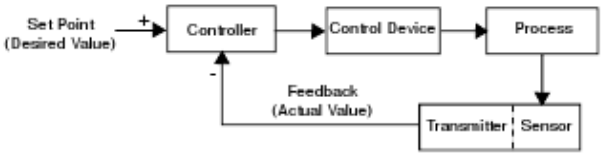
Circuit Breaker

A device that can be used to open or close a circuit manually and also opens a circuit automatically when it senses an *overcurrent*.



Closed-Loop Control

A control technique that compares a *feedback* signal representative of an actual value with a desired value and responds to minimize the error.

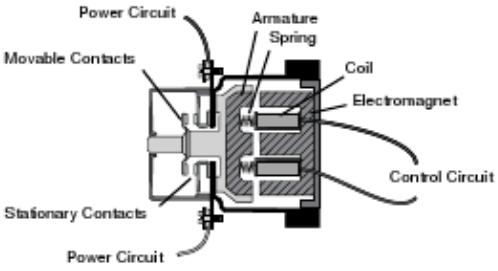


Conductor

A material that permits electrons to easily move through it. Copper, silver, and aluminum are examples of materials that are good conductors. Also used generically to refer to a wire, cable, or *bus bar* that is made from a conducting material.

Contactor

Usually refers to a device with large contacts that close when current is applied to its electromagnet; however, solid state contactors are also available. Contactors are used to control the power applied to motors, lights, or heating components.



Circuit Breaker A device that can be used to open or close a circuit manually

and also opens a circuit automatically when it senses an overcurrent.

Closed-Loop Control A control technique that compares a feedback signal

representative of an actual value with a desired value and responds to minimize the error.

Set Point (Desired Value)

+

Controller

Control Device Process

-

Feedback (Actual Value)

Transmitter Sensor

Conductor A material that permits electrons to easily move through it.

Copper, silver, and aluminum are examples of materials that are good conductors. Also used generically to refer to a wire, cable, or bus bar that is made from a conducting material.

Insulator

Conductor

Contactor Usually refers to a device with large contacts that close when

current is applied to its electromagnet; however, solid state contactors are also available. Contactors are used to control the power applied to motors, lights, or heating components.

Power Circuit

Armature Spring Movable Contacts

Coil

Electromagnet

Control Circuit

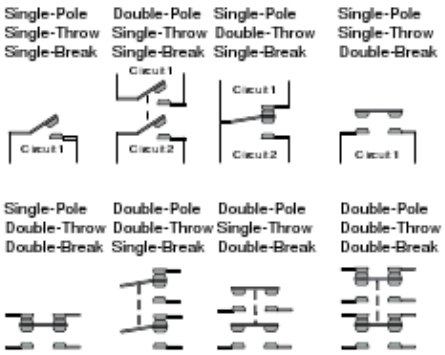
Stationary Contacts

Power Circuit

8

Control Relay

Usually refers to a device with contacts that open and close electromagnetically, but solid state control relays are also available. Control relays typically handle smaller currents than contactors, but are capable of switching more rapidly.



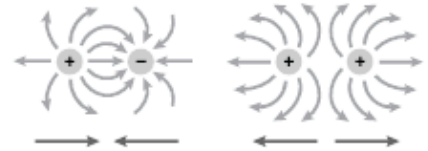
Control Relay Contact Types

Coulomb

A unit of electrical charge moved in 1 second by a current of 1 ampere. This is equal to approximately 6.24×10^{18} electrons.

Coulomb's Law

A law that states that charged objects attract or repel each other with a force that is directly proportional to the product of their charges and inversely proportional to the square of the distance between them.



Counter EMF

A *voltage* created in an inductive circuit that opposes a change in *current* flow. EMF stands for electromotive force.

Control Relay Usually refers to a device with contacts that open and close

electromagnetically, but solid state control relays are also available. Control relays typically handle smaller currents than contactors, but are capable of switching more rapidly.

Single-Pole Single-Throw Single-Break

Circuit 1

Double-Pole Single-Throw Single-Break

Circuit 2

Single-Pole Double-Throw Single-Break

Single-Pole Single-Throw Double-Break

Circuit 1

Single-Pole Double-Throw Double-Break

Circuit 1

Circuit 1

Circuit 2

Double-Pole Double-Throw Single-Break

Double-Pole Single-Throw Double-Break

Double-Pole Double-Throw Double-Break

Control Relay Contact Types

Coulomb A unit of electrical charge moved in second by a current of

ampere. This is equal to approximately .4 x 0

8

electrons.

Coulomb's Law A law that states that charged objects attract or repel each

other with a force that is directly proportional to the product of their charges and inversely proportional to the square of the distance between them.

Unlike Charges Attract Like Charges Repel

Counter EMF A voltage created in an inductive circuit that opposes a change

in current flow. EMF stands for electromotive force.