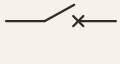
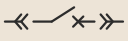
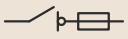
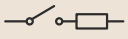
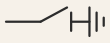
Single line diagram symbols

The IEC style and the North American style, side by side, with relay device numbers and abbreviations

Switching devices: breaker, disconnector, switch and fuse

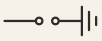
DEVICE	IEC DRAWING	NORTH AMERICAN DRAWING	HOW TO TELL
Circuit breaker			IEC puts a small cross on the fixed contact. North America draws a square for a medium-voltage breaker, often marked 52, and an arc for a low-voltage breaker.
Drawout breaker			Both families put chevrons on each side of the device. The chevrons mean the breaker can be pulled out of its cell.
Disconnector			IEC puts a short bar across the fixed contact. North America draws a plain blade and may write 89 beside it.
Switch-disconnector, also called a load break switch			IEC adds a small circle to the bar. North America draws the same plain blade as before and says "load break" in the label.
Fuse			IEC draws a rectangle with the line running through it. North America draws an S-shaped curve, or a small rectangle between two terminals.
Switch and fuse together			Both draw the switch first and the fuse after it. The fuse rating is written beside the fuse.
Earthing switch		A blade to the ground symbol, often marked with 89 and a letter for ground	The far side of the blade goes to earth and not to another circuit.

Transformers, current transformers and voltage transformers

DEVICE	IEC DRAWING	NORTH AMERICAN DRAWING	HOW TO TELL
Power transformer, two windings			IEC draws two overlapping circles. North America draws two scalloped coils that face each other.
Current transformer			IEC draws a ring around the line. North America draws a small scalloped coil beside the line.
Voltage transformer			Both tap it off the line. IEC draws two small circles, and North America draws two small coils and calls it a potential transformer, or PT.

Generators, motors, busbars and the parts around them

DEVICE	IEC DRAWING	NORTH AMERICAN DRAWING	HOW TO TELL
Busbar		The same	A heavy line with the circuits tapped off it. The current rating is written along the bar.
Generator		The same	A circle with the letter G. A wavy line inside means alternating current.
Motor		The same	A circle with the letter M.
Capacitor		The same	Two parallel plates. A bank of them corrects the power factor.
Earth, or ground		The same	Three bars that get shorter. IEC calls it earth and North America calls it ground.
Meter		The same	A circle with a letter: A for an ammeter and V for a voltmeter. Energy meters are usually a box marked kWh.

DEVICE	IEC DRAWING	NORTH AMERICAN DRAWING	HOW TO TELL
Surge arrester			IEC draws a rectangle with an arrow inside, connected to earth. North America draws a gap connected to ground and often calls it a lightning arrester.

Protection: device numbers and IEC markings

FUNCTION	IEC DRAWING	NORTH AMERICAN DRAWING	HOW TO TELL
Overcurrent protection			IEC writes the measured quantity in a box: the letter I with a greater-than sign. North America writes device numbers in a circle.

DEVICE NUMBER	WHAT IT DOES	IEC MARKING
21	Distance protection	Z<
25	Synchronism check before a breaker closes	Written out in words
27	Undervoltage	U<
32	Directional power, used against reverse power	P with an arrow
46	Phase unbalance in the current	I2>
47	Phase sequence of the voltage	Written out in words
49	Thermal overload of a machine or a transformer	The Greek letter theta with a greater-than sign
50	Instantaneous overcurrent	I>>
51	Time overcurrent	I>
50N and 51N, or 50G and 51G	The same two functions for an earth fault	Io> or IE>
52	AC circuit breaker	The breaker symbol itself
59	Overvoltage	U>
63	Pressure switch, such as the gas relay of an oil transformer	Written out in words
67	Directional overcurrent	I> with an arrow
79	Automatic reclosing	Written out in words
81	Frequency, under or over	f< or f>
86	Lockout relay, which keeps a breaker open after a trip	Written out in words
87	Differential protection	Id> or a delta with I
89	Line switch, meaning a disconnector	The disconnector symbol itself

Abbreviations printed beside the symbols

WHAT IT MEANS	IEC DRAWINGS	NORTH AMERICAN DRAWINGS
Rated current of a device	In, as in In = 1600 A	The frame and trip sizes, as in 1600AF/1200AT
The current the trip unit is set to	Ir, as in Ir = 0.95 x In	The long-time pickup, or the trip plug size
Fault current a breaker can interrupt	Icu and Ics, in kA	The interrupting rating, written kAIC
Fault current a bar or a breaker can carry for a short time	Icw, as in 50 kA for 1 s	The short-time rating, or the bus bracing
Fault current available at a point	Ik or Ik", from IEC 60909	The available fault current, in kA sym
Rated voltage	Un or Ur	The voltage class, as in 15 kV class
Impulse voltage the insulation withstands	Uimp, or the lightning impulse level	BIL, as in 110 kV BIL
Trip functions of a breaker	L, S, I and G	LSIG, for long, short, instantaneous and ground
Number of poles	3P, 4P or 3P+N	3P or 4P, and 3 phase 4 wire for the system
Cable size	mm^2, as in 3x185 mm^2	AWG or kcmil, as in 3 x 500 kcmil
Normal position of a contact or a breaker	NO and NC	N.O. and N.C.
Medium voltage and low voltage	MV and LV, or the local words	MV and LV

The same labels in six languages

ENGLISH	GERMAN	FRENCH	SPANISH	ITALIAN	DANISH
Single line diagram	Einstrich-Netzschema	schéma unifilaire	esquema unifilar	schema unifilare	enstregsskema
Busbar	Sammelschiene	jeu de barres	juego de barras	sistema di sbarre	samleskinne
Circuit breaker	Leistungsschalter	disjoncteur	interruptor automático	interruttore	effektafbryder

ENGLISH	GERMAN	FRENCH	SPANISH	ITALIAN	DANISH
Disconnector	Trennschalter	sectionneur	seccionador	sezionatore	adskiller
Switch-disconnector	Lasttrennschalter	interrupteur-sectionneur	interruptor-seccionador	interruttore di manovra-sezionatore	lastadskiller
Earthing switch	Erdungsschalter	sectionneur de terre	seccionador de puesta a tierra	sezionatore di terra	jordslutter
Fuse	Sicherung	fusible	fusible	fusibile	sikring
Contactor	Schütz	contacteur	contactor	contattore	kontaktor
Power transformer	Transformator	transformateur de puissance	transformador de potencia	trasformatore	transformer
Current transformer	Stromwandler	transformateur de courant	transformador de intensidad	trasformatore di corrente	strømtransformer
Voltage transformer	Spannungswandler	transformateur de tension	transformador de tensión	trasformatore di tensione	spændingstransformer
Surge arrester	Überspannungsableiter	parafoudre	pararrayos	scaricatore	overspændingsafleder
Rectifier	Gleichrichter	redresseur	rectificador	raddrizzatore	ensretter
Withdrawable part	Einschub	partie débrochable	parte desenchufable	parte estraibile	No source found
Short-circuit current	Kurzschlussstrom	courant de court-circuit	corriente de cortocircuito	corrente di cortocircuito	kortslutningsstrøm
Overcurrent protection	Überstromschutz	protection à maximum de courant	protección de sobreintensidad	protezione di massima corrente	overstrømsbeskyttelse
Low, medium and high voltage	Niederspannung, Mittelspannung, Hochspannung	basse tension, moyenne tension, haute tension	baja tensión, media tensión, alta tensión	bassa tensione, media tensione, alta tensione	lavspænding, mellemspænding, højspænding

Drawings by Mavlon. Standards: IEC 60617, IEEE Std 315 (ANSI Y32.2) and IEEE C37.2. The full guide explains each row: mavlon.co/post/single-line-diagram-symbols. Found a mistake? Write to atishay@mavlon.co.