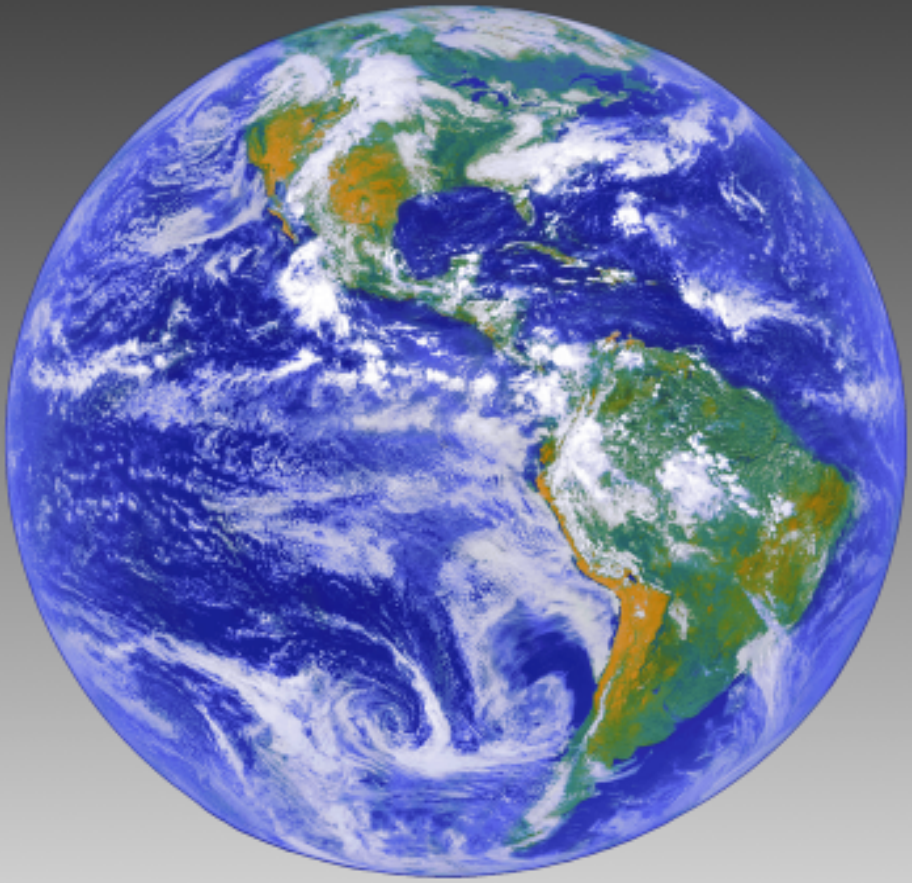
California Instruments

World Power Guide



Preface

There is a common misunderstanding that electrical power in North America is 115 V, 60 Hz and the rest of the world is 220 V, 50 Hz. In reality, power around the world varies from DC in parts of Argentina and India to over 480 volts AC in some countries. There are countries in the world where the frequency can vary by as much as ± 25 %. In Botswana, the voltage can vary by ± 100 % on a good day.

The characteristics of electric power – alternating or direct current, number of phases, frequency and voltage – found in major foreign countries are listed in this booklet. In addition, the stability of the frequency and the number of wires to a commercial or residential installation are given where available.

The current characteristics and other data furnished relate to domestic and commercial service only. It does not include special commercial installations involving relatively high voltage requirements, nor does it refer to any industrial installations.

Persons who are planning to use or export AC powered products abroad should acquaint themselves with the characteristics of the electric supply available in the area in which the product is to be used. California Instruments manufactures equipment for converting both the frequency and the voltage of commercial power to that used in the United States.

Some foreign hotels have a special circuit, providing approximately 120 volts, for the convenience of guests using electric shavers and other low-wattage appliances made in the U.S. Such circuits are usually labeled at the convenience outlet indicating the voltage. As a rule, these outlets provide no frequency conversion and should only be used to power products whose performance is not affected by AC frequencies other than the rated value.

Among the nominal voltages indicated in this publication, the lower voltages shown are used primarily for lighting and smaller appliances, while the higher voltages are used primarily for heating, ventilation, air conditioning (HVAC) and larger equipment.

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Introduction

This publication lists, for the information of manufacturers, exporters and people traveling abroad, the characteristics of electric power available in principal countries throughout the world.

The information in this publication was taken from a 1991 document entitled “Electric Current Abroad” prepared by the Trade Development unit in the International Trade Administration, U.S. Department of Commerce.

California Instruments has updated much of the information to agree with today’s world map. Since there are many changes occurring within the countries of the world, some of the information may be incorrect. California Instruments will welcome any current information that you may be able to provide to help us improve this document but cannot assume responsibility for incorrect data. If you have any comments or additions you would like to submit, please contact California Instruments’ marketing department via email using sales@calinst.com or fax at +1 858 677-0940.

Readers are reminded that the list of characteristics presented here were compiled over a long period using a large number of diverse sources. There is consequently the possibility of errors and omissions for which California Instruments cannot assume responsibility.

Readers are further reminded that the information presented here should not be taken as final in the case of industrial or highly specialized commercial installations. California Instruments regrets that it is impossible for it to maintain complete data on every foreign industrial installation. It is recommended that for special equipment required for commercial use, the characteristics of the electric power in the area of installation be obtained from the end user.

AC Power Products Guide

Today's products are likely to be used in areas of the world other than their point of manufacture. For electronic products operating from AC line power, this represents unique challenges for manufacturers who wish to ensure that their products will work predictably and reliably....no matter what the AC input power or local power environment.

California Instruments is no stranger to the needs of testing products for operation on international power and hostile power conditions. For over 35 years, we have been aggressively involved in the design and manufacture of precision test and measurement instrumentation products.

Our company has been a pioneer in developing solid state frequency inverters to simulate non-standard utility power and AC line disturbances. Our goal is to provide high quality, cost effective and reliable products for everyday use in product development and test applications.

More recently, new regulatory product requirements have been imposed on AC powered products that aim to reduce the emission of current harmonics and the generation of voltage flicker. Specifically, European IEC standards have to be met for CE marking of products destined for the European market. Other countries are expected to follow suit. California Instruments has been quick to respond by providing fully compliant test systems that allow independent test labs and manufacturers to verify compliance to such standards.

Our products are in use throughout the world. Contact your local California Instruments representative for product or application information or visit our site on the world wide web.

http://www.calinst.com

A brief summary of available product series is shown on the right.

P/RP Series Portable or rack mount programmable frequency converters. Ideal for basic AC power test applications of commercial, avionics and defense products requiring 50, 60 or 400 Hz and voltages up to 270 VRMS. Available power levels are 800 VA to 2000 VA.

iX Series Sophisticated programmable AC and DC power sources with output frequencies from DC to 500 Hz with arbitrary waveform generation, harmonic analysis, comprehensive metering and transient generation. Available power levels are 3kVA to 15KVA in single phase or 9 KVA to 30 KVA in three phase configurations.

L/Ls Series Programmable AC power up to 5000 Hz with metering and transient generation capabilities. Optional voltage ranges to 400 VRMS L-N. Available power levels are 750 VA to 18 kVA in single phase or 1500 VA to 24 kVA in three phase configurations.

Lx Series Sophisticated programmable AC power sources with output frequencies up to 5000 Hz with arbitrary waveform generation, harmonic analysis, comprehensive metering and transient generation. Available power levels are 3000 VA to 18000 VA in both single and three phase configurations.

FCS Series High power systems with output frequencies up to 1200 Hz for facility power applications. Available power levels are 18 kVA to 54 kVA in both single and three phase configurations.

MX Series Very high power systems with output frequencies up to 819 Hz for complex power applications. Available power levels are 45 kVA to 135 kVA in both single and three phase configurations..

Key to Terms Used in This Publication

Type of Current	a.c. indicates alternating current and d.c. direct current.
Frequency	Shown in hertz (cycles per second). Even if voltages are similar, a 60-hertz U.S. motor will not function properly on 50-hertz current.
Number of phases	1 and 3 are the conventional phases which may be available
Nominal voltage	In voltages specified for direct current (d.c.) the lower voltage is always ½ of the higher voltage. In a direct current installation, the lower voltage requires two wires while the higher voltage requires three wires. Alternating current nominal voltage – Alternating current is normally distributed either through 3-phase wye (“star”) or delta (“triangle”), 4-wire, secondary distribution systems. In the wye distribution system, the nominal voltage examples are: 120/208, 127/220, 220/380, and 230/400. The higher voltage is 1.732 (the square root of 3) times the lower voltage. In a delta system, the 110/220 and 230/460 are examples of nominal voltages. The higher voltage is always double the lower voltage. The higher voltage may be single or 3-phase while the lower voltage is always single phase and used primarily for lighting and small appliances
Attachment Plugs	Attachment plugs used throughout the world come in various forms, dimensions and configurations too numerous to describe in this booklet. The basic and most commonly used types of plugs are listed by country however.

Number of wires	The number of wires which may be used by the consumer is shown. Normally, a single phase, 220/380 volt system or 127/220 system will have two wires if only the lower voltage is available (one phase wire and the neutral). It will have three wires if both the higher and lower voltages are available (two phase wires and the neutral) and, where three phase motors will be used, four wires will be available for the higher voltage (the three phase wires and the neutral wire).
Frequency stability	A “Yes” in the column indicates that the frequency stability is stable and service interruptions are rare.

Types of Electric Plugs by Country

COUNTRY	PLUG TYPE
Afghanistan	D
Albania	C
Algeria	C & F
American Samoa	A, B, F & I
Angola	C
Antigua	A & B
Argentina	C & I
Aruba	A, B & F
Australia	I
Austria	C, F
Azores	B, C & F
Bahamas	A & B
Bahrain	G
Balearic Islands	C & F
Bangladesh	A, C, D, G & K
Barbados	A, B, F & H
Belarus	C
Belgium	C & E
Belize	B, G & H
Benin	D
Bermuda	A & B
Bolivia	A & C
Botswana	D & G
Brazil	A, B, C & J
Brunei	G
Bulgaria	C & F
Burkina Faso	C & E
Burma	C, D & F
Burundi	C & E
Cambodia	No information
Cameroon	C, E, G & K
Canada	B
Canary Islands	C & F
Cape Verde, Rep. of	C & F
Cayman Islands	A & B
Central Africa Rep.	C & E
Chad	D, E, & F
Channel Islands	C & G
Chile	C & L

COUNTRY	PLUG TYPE
China, People's Rep. of	I
Colombia	A & B
Comoros	C & E
Congo, Peoples' Rep. of	C & E
Costa Rica	A & B
Cote d'Ivoire	C & E
Cyprus	C & G
Czech Republic	E
Denmark	C & K
Djibouti, Rep. of	C & E
Dominica	D & G
Dominican Rep.	A
Ecuador	A, B, C & D
Egypt (Arab Rep. of)	C
El Salvador	A through J & L
England	C & G
Equatorial Guinea	C & E
Ethiopia	C, D, J & L
Faeroe Islands	C & K
Fiji	I
Finland	C & F
France	C, E & F
French Guyana	C, D & E
Gabon	C
Gambia, The	G
Germany, Fed. Rep. of	F
Ghana	D & G
Gibraltar	C & G
Greece	C, D, E & F
Greenland	C & K
Grenada	G
Guadeloupe	C, D & E
Guam	A & B
Guatemala	A, B, G, H & I
Guinea	C, F & K
Guinea-Bissau	C
Guyana	A, B, D & G

COUNTRY	PLUG TYPE
Haiti	A, B & H
Honduras	A & B
Hong Kong	G
Hungary	C & F
Iceland	C & F
India	C & D
Indonesia	C, E & F
Iran	No information
Iraq	C, D & G
Ireland	G
Isle of Man	C & G
Israel	C & H
Italy	F & L
Ivory Coast	C, E
Jamaica	A & B
Japan	A, B & I
Jerusalem	D
Jordan	C, D, F, G & J
Kazakstan	C, G, H
Kenya	D & G
Korea	A, B, C, D, G, I & K
Kuwait	C & G
Laos	A, B, C, E & F
Lebanon	A, B, C, D & G
Lesotho	D
Liberia	A & G
Libya	D
Luxembourg	C & F
Macao	C & D
Macedonia	C, F
Madagascar	C, D, E, J & K
Madeira	C & F
Malawi	G
Malaysia	G
Maldives	A, D, G, J, K & L
Mali, Rep. of	C & E
Malta	G
Martinique	C, D & E
Mauritania	C
Mauritius	C & G
Mexico	A
Monaco	C, D, E & F
Montserrat	A & B
Morocco	C & E
Mozambique	C, D & F
Namibia	C
Nepal	C & D
Netherlands	C & F
Netherlands Antilles	A, B & F
New Caledonia	No information
New Zealand	I
Nicaragua	A
Niger	A through F
Nigeria	D & G
Northern Ireland	C & G
Norway	C & E
Okinawa	A, B & I
Oman	C & G
Pakistan	C & D
Palau	A, B
Panama	A, B & I
Papua New Guinea	I
Paraguay	C
Peru	A & C
Philippines	A, B, C, E, F & I
Poland	C & E
Portugal	C & F
Puerto Rico	A & B
Qatar	D & G
Romania	C & F
Russia (Soviet Union)	C
Rwanda	C & J

COUNTRY	PLUG TYPE
St. Kits-Nevis	D & G
St. Lucia	G
St. Vincent	A, C, E, G, J, I & K
Saudi Arabia	A, B & G
Scotland	C & G
Senegal	C, D, E & K
Serbia-Montenegro	F
Seychelles	G
Sierra Leone	D & G
Singapore	D & G
Slovak Republic	E
Somalia	C
South Africa	D & G
Soviet States, Confed. of Ind.	C
Spain	C & F
Sri Lanka	D
Sudan	C & D
Surinam	C & F
Swaziland	D
Sweden	C & F
Switzerland	C, E & J
Syria	C, E & L
Tajikistan	C, I
Tahiti	A
Taiwan	A, B & I
Tanzania	D & G
Thailand	C
Togo	C
Tonga	H
Trinidad & Tobago	B
Tunisia	C, E, F, K & L
Turkey	C & F

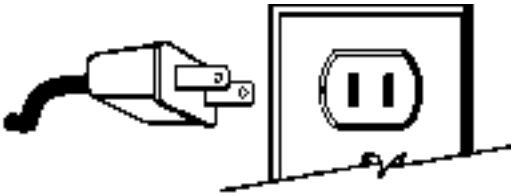
COUNTRY	PLUG TYPE
Uganda	G
Ukraine	C
United Arab Emirates	D & G
United States of America	A, B
Upper Volta	C & E
Uruguay	C, I & L
Uzbekistan	C, I
Venezuela	A, B & H
Virgin Islands (American)	A & B
Wales	C & G
Western Samoa	H
Yemen Arab Rep.	A, D & G
Yugoslavia	C, F & J
Zaire	C & D
Zambia	C, D & G
Zimbabwe	D & G

Types of Electric Plugs in Domestic and Commercial Use

Type

A

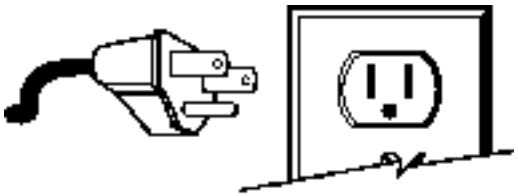
Flat blade
no ground



Type

B

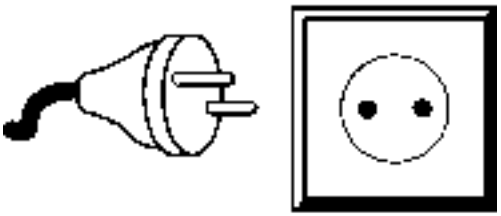
Flat blades with
round grounding pin



Type

C

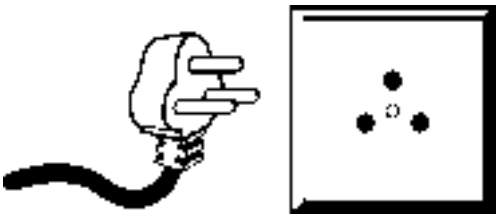
Round pins
no ground



Type

D

Round pins
with ground

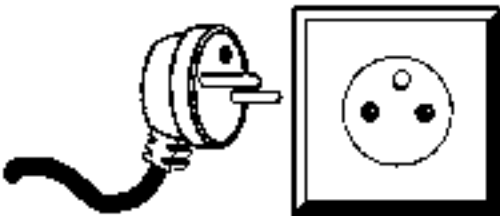


Types of Electric Plugs in Domestic and Commercial Use

Type

E

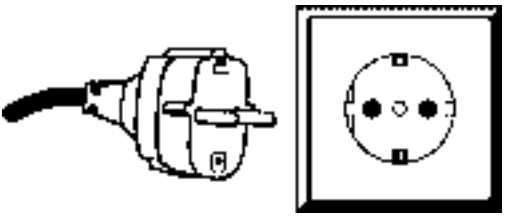
Round pins
with ground



Type

F

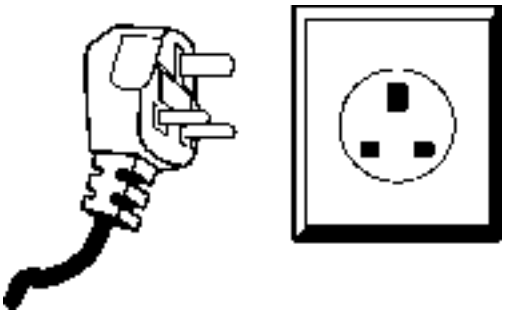
“Shuko” plug with
side grounding contacts



Type

G

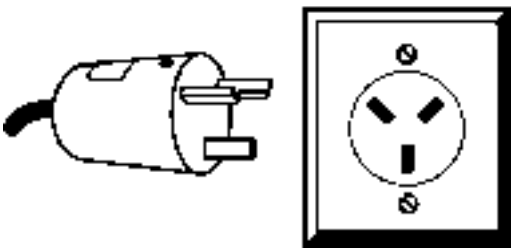
Rectangular blade
with ground



Type

H

Oblique flat blades
with ground

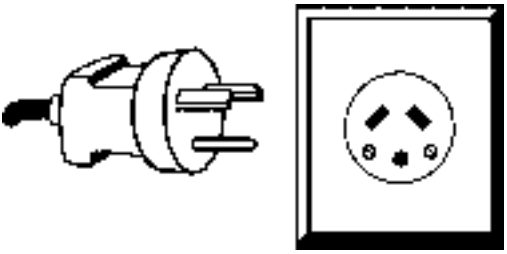


Types of Electric Plugs in Domestic and Commercial Use

Type

I

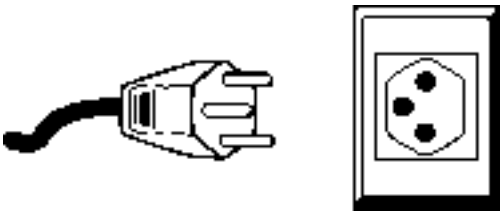
Oblique flat blades
with ground



Type

J

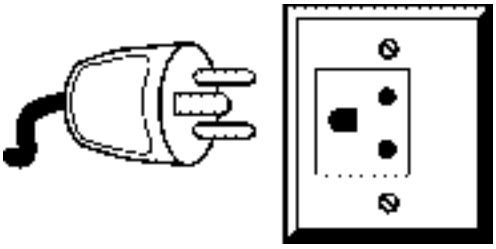
Round pins
with ground



Type

K

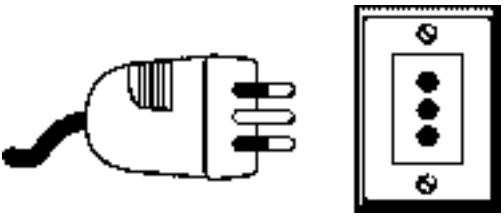
Round pins
with ground



Type

L

Round pins
with ground



Electric Current Abroad Characteristics

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
Afghanistan	a.c. 50	1,3	220/380	2,4	Yes
Charikar	a.c. 60	1,3	220/380	2,4	Yes
Albania	a.c. 50	1,3	220/380	2,4	No
Algeria	a.c. 50	1,3	127/220 220/380	2,4	Yes
American Somoa	a.c. 60	1,3	120/240 240/480	2,3,4	Yes
Angola[1,2,3]	a.c. 50	1,3	220/380	2,4	Yes
(Leeward Islands)					
Antigua[1]	a.c. 60	1,3	230/400	2,3,4	Yes
Argentina	a.c. 50	1,3	220/380	2,4	Yes
The following cities also have d.c.			220/440 2,3		
Buenos Aires					
Chivilcoy					
Corrientes					
Jujuy, Junin					
Mar del Plata					
Mendoza					
Necochea					
Parana, Posadas					
Resistencia					
Rio Cuarto					
Rosario					
Salta					
San Juan					
Santa Fe					
Tres Arroyos					
Aruba	a.c. 60	1,3	127/220	2,3,4	Yes
Lago colony	a.c. 60	1	115/230	2,3	Yes
Australia[1,8]	a.c. 50	1,3	240/415	2,3,4	Yes
Albany	a.c. 50	1,3	250/440	2,3,4	Yes
Kalgoorlie	a.c. 50	1,3	250/440	2,3,4	Yes
Perth	a.c. 50	1,3	250/440	2,3,4	Yes
Austria[1,8]	a.c. 50	1,3	230/400	3,5	Yes
Azores	a.c. 50	1,3	220/380	2,3,4	Yes
Ponta Delgada[4]	a.c. 50	1,3	220/380	2,3,4	Yes
	a.c. 50	1,3	110/190	2,3,4	Yes

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
Bahamas	a.c. 60	1,3	120/240 120/208	2,3,4	Yes
Bahrain[1,3]	a.c. 50	1,3	230/400	2,3,4	Yes
Awali	a.c. 60	1 1,3	110/115 220/240	3	Yes
Balearic Islands[1,3]	a.c. 50	1,3	220/380	2,3,4,5	Yes
Bangladesh[1,3,5]	a.c. 50	1,3	220/440	3,4	No
Barbados[1]	a.c. 50	1,3	115/230 115/200	2,3,4	Yes
Belarus	a.c. 50	1,3	220/380	2,4	Yes
Belgium[1,7]	a.c. 50	1,3	230/400	2,3,4	Yes
Charleroi (incl. Gilly)	a.c. 50	1,3	230/400	2,3	Yes
Mons	a.c. 50	1,3	230/400	2,3	Yes
Turnhout	a.c. 50	1,3	230	2,3	Yes
Belize[1,6]	a.c. 60	1,3	110/220 220/440	2,3,4	Yes
Orange Walk	a.c. 60	1	110/220	2,3	No
San Ignacio	a.c. 60	1	110/220	2,3	No
Stann Creek	a.c. 60	1	110/220	2,3	No
San Pedro	a.c. 60	1	110/220	2,3	No
Benin	a.c. 50	1,3	220/380	2,4	Yes
Bermuda[1,3,5]	a.c. 60	1,3	120/240 120/208	2,3,4	Yes
Bolivia	a.c. 50	1,3	220/380	2,4	Yes
Cobija	a.c. 50	1,3	230/400	2,4	No
Guayaramerin	a.c. 50	1,3	230/400	2,4	No
La Paz	a.c. 50	1,3	115/230	2,3	Yes
Oruro	a.c. 50	1,3	115/230	2,3	Yes
Riberalta	a.c. 50	1,3	230/400	2,4	No
Trinidad	a.c. 50	1,3	230/400	2,4	No
Viacha	a.c. 50	1,3	115/230	2,3	Yes
Bosnia	a.c. 50	1,3	220/380	2,4	No
Botswana[9]	a.c. 50	1,3	231/400	2,4	Yes
Brazil[1]	a.c. 60	1,3	127/220	2,3,4	Yes
Anapolis	a.c. 60	1,3	220/380	2,3,4	Yes
Bage	a.c. 60	1,3	220/380	2,3,4	Yes
Blumenau	a.c. 60	,3	220/380	2,3,4	Yes
Brazilia, D.F.	a.c. 60	1,3	220/380	2,3,4	Yes

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
Caruaru	a.c. 60	1,3	220/380	2,3,4	Yes
Caxias do Sul	a.c. 60	1,3	220/380	2,3,4	Yes
Cel Fabriciano	a.c. 60	1,3	110/220	2,3	Yes
Citade Industrial	a.c. 60	1,3	127/220	2,3,4	Yes
Colatina	a.c. 60	1,3	127/220	2,3,4	Yes
Corumba	a.c. 60	1,3	127/220	2,3,4	Yes
Florianopolis	a.c. 60	1,3	220/380	2,3,4	Yes
Fortaleza	a.c. 60	1,3	220/380	2,3,4	Yes
Goiania	a.c. 60	1,3	220/380	2,3,4	Yes
Goias	a.c. 60	1,3	220/380	2,3,4	Yes
Itajai	a.c. 60	1,3	220/380	2,3	Yes
Jequie	a.c. 60	1,3	220/380	2,3,4	Yes
Joao Pessoa	a.c. 60	1,3	220/380	2,3,4	Yes
Joinville	a.c. 60	1,3	220/380	2,3,4	Yes
Juiz de For a	a.c. 60	1,3	120/240	2,3,4	Yes
Jundiai	a.c. 60	1,3	220	2,3	Yes
Livramento	a.c. 60	1,3	220/380	2,3,4	Yes
Maceio	a.c. 60	1,3	220/380	2,3,4	Yes
Manaus	a.c. 60	1,3	110/220	2,3	Yes
Mossoro	a.c. 60	1,3	220/380	2,3,4	Yes
Natal	a.c. 60	1,3	220/380	2,3,4	Yes
Novo Friburgo	a.c. 60	1,3	220/380	2,3	Yes
Olinda	a.c. 60	1,3	220/380	2,3,4	Yes
Parnaiba	a.c. 60	1,3	220/380	2,3	Yes
Pelotas	a.c. 60	1,3	220/380	2,3,4	Yes
Recife	a.c. 60	1,3	220/380	2,3,4	Yes
Santo Andre	a.c. 60	1,3	127/220	2,3	Yes
			220/380		Yes
Sao Bernardo	a.c. 60	1,3	220/380	2,3	Yes
do Campo Sao Caetano	a.c. 60	1,3	115/230	2,3	Yes
do Sul Sao Luiz	a.c. 60	1,3	110/220	2,3	Yes
Sao Paulo	a.c. 60	1,3	115/230	2,3	Yes
Teresina	a.c. 60	1,3	110/220	2,3	Yes
Volta Redonda			125/216	2,3,4	Yes
Brunei[1,3]	a.c. 50	1,3	240/415	2,4	Yes
Bulgaria[10]	a.c. 50	1,3	220/380	2,4	No
Burkino Faso	a.c. 50	1,3	220/380	2,4	No
Burma[1,3,6]	a.c. 50	1,3	230/400	2,4	No
Burundi[11]	a.c. 50	1,3	220/380	2,4	No
Cambodia	a.c. 50	1,3	120/208	2,4	No
Phnom-Penh	a.c. 50	1,3	220/380	2,3,4	No
Sihanoukville	a.c. 50	1,3	220/380	2,4	Yes

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
Cameroon	a.c. 50	1,3	127/220 220/380	2,4	No
Buea	a.c. 50	1,3	230/400	2,4	N.A.
Douala	a.c. 50	1,3	220/380	2,3,4	Yes
Dschang	a.c. 50	1,3	220/380	2,4	No
Ebolowa	a.c. 50	1,3	220/380	2,4	No
Edea	a.c. 50	1,3	220/380	2,3,4	Yes
Foumban	a.c. 50	1,3	220/380	2,4	No
Garoua	a.c. 50	1,3	220/380	2,3,4	No
Kribi	a.c. 50	1,3	220/380	2,4	No
Limbe	a.c. 50	1,3	230/400	2,4	N.A.
Canada[1,13]	a.c. 60	1,3	120/240	3,4	Yes
Canary Islands[1]	a.c. 50	1,3	220/380	2,3,4,5	Yes
Cape Verde, Rep. Of[3]	a.c. 50	1,3	220/380	2,3,4	No
Cayman Islands[1,14]	a.c. 60	1,3	120/240	2,3	Yes
Central African Rep.[3,15]	a.c. 50	1,3	220/380	2,4	Yes
Chad	a.c. 50	1,3	220/380	2,4	No
Channel Islands	a.c. 50	,3	240/415	2,4	Yes
Guernsey	a.c. 50	1,3	230/400	2,4	Yes
Chile	a.c. 50	1,3	220/380	2,3,4	Yes
China, People's Rep.	a.c. 50	1,3	220/380	3,4	No
Colombia	a.c. 60	1,3	110/220	2,3,4	No
Bogota[16]	a.c. 60	1,3	110/220 150/260	2,3,4	Yes
Duitama	a.c. 60	1,3	120/208	2,3,4	No
Honda	a.c. 60	1,3	120/208	2,3,4	No
Sogomosa	a.c. 60	1,3	120/240	2,3,4	No
Comoros	a.c. 50	1,3	220/380	2,4	N.A.
Congo, Rep. Of[1,3,17]	a.c. 50	1,3	220/380	2,4	No
Costa Rica	a.c. 60	1,3	120/240	2,3,4	Yes
Cote d'Ivoire (formerly Ivory Coast)	a.c. 50	1,3	220/380	3,4	Yes
Croatia	a.c. 50	1,3	220/380	2,4	No
Cyprus[1,3]	a.c. 50	1,3	240/415	2,4	Yes
Czech Republic	a.c. 50	1,3	220/380	2,3,4	Yes

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
Denmark[18]	a.c. 50	1,3	230/400	2,3,4	Yes
Djibouti, Rep. Of	a.c. 50	1,3	220/380	2,4	Yes
Dominica[1,3,19] (Windward Islands)	a.c. 50	1,3	230/400	2,4	Yes
Dominican Republic	a.c. 60	1,3	110/220	2,3	Yes
Ecuador[1,20]	a.c. 60	1,3	120/208 127/220	2,3,4	Yes
Cuenca	a.c. 60	1,3	120/208	2,3,4	Yes
Esmeraldas	a.c. 60	1,3	120/208 120/240 127/220	2,3,4	Yes
Guaranda	a.c. 60	1,3	120/208 120/240 127/220	2,3,4	Yes
Guayaquil	a.c. 60	1,3	120/208 120/240 127/220	2,3,4	Yes
Ibarra	a.c. 60	1,3	127/220	2,3,4	Yes
Latacunga	a.c. 60	1,3	120/208	2,3,4	Yes
Loja	a.c. 60	1,3	127/220	2,3,4	Yes
Machala	a.c. 60	1,3	127/220	2,3,4	Yes
Morona	a.c. 60	1,3	127/208	2,3,4	Yes
Portoviejo	a.c. 60	1,3	127/220	2,3,4	Yes
Puyo	a.c. 60	1,3	127/220	2,3,4	Yes
Riobamba	a.c. 60	1,3	110/220 127/220	2,3,4	Yes
Tulcan	a.c. 60	1,3	121/210 127/220	2,3,4	Yes
Zamora	a.c. 60	1,3	121/210 127/220	2,3,4	Yes
Egypt	a.c. 50	1,3	220/380	2,3,4	No
El Salvador[1]	a.c. 60	1,3	115/230	2,3	Yes
England	see United Kingdom				
Equatorial Guinea[21]	a.c. 50	1	220	2	No
Eritrea	a.c. 50	1,3	220/380	2,4	Yes
Ethiopia	a.c. 50	1,3	220/380	2,4	Yes
Faeroe Islands	a.c. 50	1,3	220/380	2,3,4	Yes
Fiji [22]	a.c. 50	1,3	240/415	2,3,4	Yes
Finland[23]	a.c. 50	1,3	230/400	2,4,5	Yes

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
France[23]	a.c. 50	1,3	230/400	2,4	Yes
Briancon	a.c. 50	1,3	115/200	2,4	Yes
Caen	a.c. 50	1,3	127/220 230/400	2,4	Yes
Grenoble	a.c. 50	1,3	127/220	2,4	Yes
Lille	a.c. 50	1,3	110/220 230/400	2,4	Yes
Luxeuil-Bains	a.c. 50	1,3	127/220 230/400	2,4	Yes
Lyon	a.c. 50	1,3	110/220 127/220 230/400	2,4	Yes
Mulhouse	a.c. 50	1,3	230 230/400	2,4	Yes
Paris	a.c. 50	1,3	115/230 230/400	2,4	Yes
Royan	a.c. 50	1,3	127/220 230/400	2,4	Yes
Strasbourg	a.c. 50	1,3	125/220 230/400	2,4	Yes
Tourcoing	a.c. 50	1,3	110/220 230/400	2,4	Yes
French Guiana[1,3]	a.c. 50	1,3	220/380	2,3,4	No
Gabon[24,25]	a.c. 50	1,3	220/380	2,4	Yes
Gambia, The[3]	a.c. 50	1,3	220/380	2,4	No
Germany[1,3,23,26,27]	a.c. 50	1,3	230/400	2,4	Yes
Ghana	a.c. 50	1,3	230/400	2,3,4	No
Gibralter	a.c. 50	1,3	240/415	2,4	Yes
Greece	a.c. 50	1,3	230/400	2,4	Yes
Greenland	a.c. 50	1,3	220/380	2,3,4	Yes
Grenada[1,8,28] (Windward Islands)	a.c. 50	1,3	230/400	2,4	No
Guadeloupe	a.c. 50	1,3	220/380	2,3,4	Yes
Guam[1] 120/208	a.c. 60	1,3	110/220	3,4	Yes
Guatemala	a.c. 60	1,3	120/240	2,3,4	Yes
Guinea	a.c. 50	1,3	220/380	2,3,4	No
Guinea-Bissau	a.c. 50	1,3	220/380	2,3,4	No

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
Guyana[1,29,30]	a.c. 60	1,3	110/220	2,3,4	Yes
Georgetown	a.c. 50	1,3	110/220	2,3,4	Yes
Haiti	a.c. 60	1,3	110/220	2,3,4	Yes
Jacmel	a.c. 50	1,3	110/220	2,3,4	No
Honduras	a.c. 60	1,3	110/220	2,3	No
Hong Kong	a.c. 50	1,3	220/380	2,3,4	Yes
Hungary[3,17,31]	a.c. 50	1,3	220/380	2,3,4	Yes
Iceland	a.c. 50	1,3	220/380	2,3,4	Yes
India[31,32]	a.c. 50	1,3	230/400	2,4	Yes
Ajmer	d.c.		230/460	2,3	
Ambala	d.c.		220/440	2,3	
Ambala (City)	a.c. 50	1,3	230/400	2,4	Yes
Bombay City	a.c. 50	1,3	230/400	2,4	Yes
			230/460		
	d.c.		300/600	2,3	
Calcutta	a.c. 50	1,3	230/400	2,4	Yes
	d.c.		225/450	2,3	
Cuttack	a.c. 50	1,3	230/400	2,4	Yes
	d.c.		230/460	2,3	
Dehli, including	a.c. 50	1,3	230/400	2,4	Yes
New Dehli			230/415		
	d.c		250/500	2,3	
Gaya	a.c. 50	1,3	230/400	2,4	Yes
	d.c.		220/440	2,3	
Indore	a.c. 50	1,3	230/400	2,4	Yes
	d.c.		230/460	2,3	
Kanpur	a.c. 50	1,3	230/400	2,4	Yes
	d.c.		225/450	2,3	
Lucknow	a.c. 50	1,3	230/400	2,4	Yes
	d.c.		220/440	2,3	
Madras	a.c. 50	1,3	230/400	2,4	Yes
			250/440		
	d.c		225/450	2,3	
Mussoorie	a.c. 50	1,3	220/380	2,4	Yes
Naini Tal	a.c. 50	1,3	220/380	2,4	Yes
New Delhi (see Delhi)					
Patna	a.c. 50	1,3	220/380	2,4	Yes
			230/400		
	d.c.		220/440	2,3	
Rajkot	a.c. 50	1,3	230/400	2,4	Yes
	d.c.		230/460	2,3	
Simla	a.c. 50	1,3	220/380	2,4	Yes

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
Indonesia[1,33]	a.c. 50	1,3	220/380	2,4	Yes
Bandjarmasin	a.c. 50	1,3	127/220	2,4	No
Medan	a.c. 50	1,3	127/220	2,4	Yes
Padang	a.c. 50	1,3	127/220	2,4	No
Palembang	a.c. 50	1,3	127/220	2,4	Yes
Ujungpandang	a.c. 50	1,3	127/220	2,4	No
Iran	a.c. 50	1,3	220/380	2,3,4	Yes
Iraq[3,34]	a.c. 50	1,3	220/380	2,4	Yes
Ireland[1,3,35]	a.c. 50	1,3	220/380	2,4	Yes
Belfast	a.c. 50	1,3	220/380 230/400	2,4	Yes
Londonderry	a.c. 50	1,3	220/380 230/400	2,4	Yes
Isle of Man	a.c. 50	1,3	240/415	2,4	Yes
Israel[1,8]	a.c. 50	1,3	230/400	2,4	Yes
Italy[1,3,36]	a.c. 50	1,3	127/220 230/400	2,4	Yes
The following cities only have 220/380					
Bari					
Brindisi					
Cagliari					
Catania					
Florence					
La Spezia					
Leghorn					
Naples					
Palermo					
Ragusa					
Sassari					
Siena					
Siracusa					
Taranto					
Turin					
Ivory Coast see Cote d'Ivoire					
Jamaica[1,35]	a.c. 50	1,3	110/220	2,3,4	Yes
Japan[1]	a.c. 60	1,3	100/200	2,3	Yes
Chiba	a.c. 50	1,3	100/200	2,3	Yes
Hakodate	a.c. 50	1,3	100/200	2,3	Yes
Kawasaki	a.c. 50	1,3	100/200	2,3	Yes
Muroran	a.c. 50	1,3	100/200	2,3	Yes
Niigata	a.c. 50	1,3	100/200	2,3	Yes

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
Otaru	a.c. 50	1,3	100/200	2,3	Yes
Sapporo	a.c. 50	1,3	100/200	2,3	Yes
Sendai	a.c. 50	1,3	100/200	2,3	Yes
Tokyo	a.c. 50	1,3	100/200	2,3	Yes
Yokohama	a.c. 50	1,3	100/200	2,3	Yes
Yokosuka	a.c. 50	1,3	100/200	2,3	Yes
Jerusalem[1,3,5]	a.c. 50	1,3	220/380	2,3,4	Yes
Jordan[1,3]	a.c. 50	1,3	220/380	2,3,4	Yes
Kazakstan	a.c. 50	1,3	220/380	2,3,4	Yes
Kenya[3,5]	a.c. 50	1,3	240/415	2,4	Yes
Korea[1,34,37,38]	a.c. 60	1	110	2	Yes
		1	110/220	3	Yes
		3	220/380	4	Yes
Kuwait[39]	a.c. 50	1,3	240/415	2,4	Yes
Laos	a.c. 50	1,3	220/380	2,4	No
Lebanon[1]	a.c. 50	1,3	220/380	2,4	No
The following cities also have 110/190					
Aley					
Beirut, Bhamdoun					
Brummana					
Tripoli, Tyre					
Lesotho[1,3,40]	a.c. 50	1,3	220/380	2,4	Yes
Liberia[1]	a.c. 60	1,3	120/240	2,3,4	No
			120/208		
Libya[41,42]	a.c. 50	1,3	127/220	2,4	No
Barce	a.c. 50	1,3	230/400	2,4	No
Benghazi	a.c. 50	1,3	230/400	2,4	No
Derna	a.c. 50	1,3	230/400	2,4	No
El Baida	a.c. 50	1,3	230	2,4	No
Sebha	a.c. 50	1,3	230	2,4	No
Tobruk	a.c. 50	1,3	230/400	2,4	No
Luxembourg[1,3]	a.c. 50	1,3	230/400	3,4,5	Yes
Macao	a.c. 50	1,3	200/346	2,3	Yes
Madagascar[1,4,43]	a.c. 50	1,3	127/220	2,4	Yes
			220/380		
Ambatolampy	a.c. 50	1,3	220/380	2,4	Yes
Ambatondrazaka	a.c. 50	1,3	220/380	2,4	Yes
Tulear	a.c. 50	1,3	220/380	2,4	Yes

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
Madeira[1,4]	a.c. 50 d.c.	1,3	220/380 220/440	2,3,4 2,3	Yes
Malawi[44]	a.c. 50	1,3	230/400	3,4	Yes
Malaysia[1,45,46]	a.c. 50	1,3	240/415	2,4	Yes
Penang	a.c. 50	1,3	230/400	2,4	Yes
Maldives	a.c. 50	1,3	230/400	2,4	Yes
Mali, Rep. Of[1,3]	a.c. 50	1,3	220/380	2,4	No
Malta[1,3]	a.c. 50	1,3	240/415	2,4	Yes
Martinique[1,3]	a.c. 50	1,3	220/380	2,3,4	Yes
Mauritania[1,3,47]	a.c. 50	1,3	220	2,3	No
Mauritius Island[3]	a.c. 50	1,3	230/400	2,4	Yes
Mexico[36]	a.c. 60	1,3	127/220	2,3,4	No
Monaco	a.c. 50	1,3	127/220 230/400	2,4	Yes
Montserrat (Leeward Islands)	a.c. 60	1,3	230/400	2,4	N.A.
Morocco[1,3]	a.c. 50	1,3	127/220	2,4	Yes
Agadir	a.c. 50	1,3	127/220 220/380	2,4	Yes
Beni-Mellal	a.c. 50	1,3	127/220 220/380	2,4	Yes
El-Hoceima	a.c. 50	1,3	220/380	2,4	Yes
Khemisset	a.c. 50	1,3	220/380	2,4	Yes
Khenifra	a.c. 50	1,3	220/380	2,4	Yes
Oud-Zem	a.c. 50	1,3	127/220 220/380	2,4	Yes
Sidi Kacem	a.c. 50	1,3	127/220 220/380	2,4	Yes
Sidi Slimane	a.c. 50	1,3	127/220 220/380	2,4	Yes
Souk-El-Arba Gharb	a.c. 50	1,3	127/220 220/380	2,4	Yes
Mozambique[3,48]	a.c. 50	1,3	220/380	2,3,4	Yes
Namibia[1,3]	a.c. 50	1,3	220/380	2,4	Yes
Keetmanshoop	a.c. 50	1,3	230/400	2,4	Yes
Nepal[1]	a.c. 50	1,3	220/440	2,4	No

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
Netherlands[1]	a.c. 50	1,3	230/400	2,3	Yes
Amsterdam	a.c. 50	1,3	230/400 230	2,3	Yes
Delft	a.c. 50	1,3	230/400 230	2,3	Yes
Netherlands Antilles[1,3]	a.c. 50	1,3	127/220	2,3,4	Yes
Curacao Emmastad	a.c. 50	1,3	220/380	2,3,4	Yes
St. Martin Philipsburg	a.c. 60	1,3	120/220	2,3,4	Yes
New Caledonia	a.c. 50	1,3	220/380	2,3,4	Yes
New Zealand[1,3]	a.c. 50	1,3	230/400	2,3,4	Yes
Newly Independent States of the former Soviet Union[19]	a.c. 50	1,3	220/380	N.A.	No
Nicaragua	a.c. 60	1,3	120/240	2,3,4	Yes
Bonanza	a.c. 60	1,3	120	2,3	Yes
Jalapa	a.c. 60	1,3	120	2,3	No
Matiguas	a.c. 60	1,3	120	2,3	No
Quilali	a.c. 60	1,3	120	2,3	No
Siuna	a.c. 60	1,3	120	2,3	Yes
Telpaneca	a.c. 60	1,3	120	2,3	No
Niger[49]	a.c. 50	1,3	220/380	2,3,4	No
Nigeria[1]	a.c. 50	1,3	230/415	2,4	Yes
Norway	a.c. 50	1,3	230	2,3	Yes
Okinawa Island[1]	a.c. 60	1	120/240	2,3	Yes
Military Facilities Non-Military Areas	a.c. 60	1	100/200	2,3	Yes
Oman[3,50]	a.c. 50	1,3	240/415	2,4	No
Pakistan[1,50]	a.c. 50	1,3	220/380	2,3,4	No
Palau	a.c. 60	1,3	120/240	4	No
Panama	a.c. 60	1,3	110/220	2,3	Yes
Colon	a.c. 60	1,3	115/230	2,3,4	Yes
Panama	a.c. 60	1,3	120/240	2,3,4	Yes
Puerto Armuelles	a.c. 60	1,3	120/240	2,3,4	Yes
Papua New Guinea[51]	a.c. 50	1,3	240/415	2,4	Yes
Paraguay	a.c. 50	1,3	220/380	2,4	Yes
Peru	a.c. 60	1,3	220	2,3	Yes
Arequipa	a.c. 50	1,3	110/220	2,3	Yes
Talara	a.c. 60	1,3	220	2,3	Yes

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
Philippines[1,52,53]	a.c. 60	1,3	110/220	2,3	Yes
Manila	a.c. 60	1,3	115/230 110/220	2,3,4	Yes
Poland	a.c. 50	1,3	230/400	2,4	No
Katawice	a.c. 50	1,3	230/400	2,3,4	No
Portugal[1]	a.c. 50	1,3	230/400	2,3,4	No
Puerto Rico	a.c. 60	1,3	120/240	2,3,4	Yes
Qatar	a.c. 50	1,3	240/415	2,3,4	Yes
Romania[54]	a.c. 50	1,3	220/380	2,4	No
Russia see Newly Independent States					
Rwanda	a.c. 50	1,3	220/380	2,4	Yes
St. Kitts and Nevis (Leeward Islands)	a.c. 60	1,3	230/400	2,4	Yes
St. Lucia[1,3,56] (Windward Islands)	a.c. 50	1,3	240/416	2,4	Yes
St. Vincent[1,3,28] (Windward Islands)	a.c. 50	1,3	230/400	2,4	Yes
Saudi Arabia[57,58]	a.c. 60	1,3	127/220	2,4	No
Scotland see United Kingdom					
Senegal[1,57,59]	a.c. 50	1,3	127/220	2,3,4	No
Serbia-Montenegro	a.c. 50	1,3	220/380	3,4,5	Yes
Seychelles	a.c. 50	1,3	240	2,3	Yes
Sierra Leone	a.c. 50	1,3	230/400	2,4	No
Singapore[3]	a.c. 50	1,3	230/400	2,4	Yes
Slovak Republic[1]	a.c. 50	1,3	220/380	2,4	No
Slovenia	a.c. 50	1,3	220/380	2,3,4	Yes
Somalia	a.c. 50	1,3	220	2,3	No
Berbera	a.c. 50	1,3	230	2,3	Yes
Brava	a.c. 50	1,3	220/440	2,4	Yes
Merca	a.c. 50	1,3	110/220	2,4	No
Mogadishu	a.c. 50	1,3	220/380	2,4	No
South Africa[1,3,60]	a.c. 50	1,3	220/380	2,3,4	Yes
Beaufort West	a.c. 50	1,3	230/400	2,4	Yes
Benoni	a.c. 50	1,3	230/400	2,4	Yes
Boksburg	a.c. 50	1,3	230/400	2,4	Yes

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
Cradock	a.c. 50	1,3	230/400	2,4	N.A.
Germiston	a.c. 50	1,3	230/400	2,3,4	Yes
Grahamstad	a.c. 50	1,3	250/430	2,4	Yes
Johannesburg	a.c. 50	1,3	220/380	2,3,4	Yes
	d.c.		230/460	2,3	
King Williams	a.c. 50	1,3	220/380	2,3,4	Yes
			250/433		
Klerksdorp	a.c. 50	1,3	230/400	2,3,4	Yes
Kroonstad	a.c. 50	1,3	230/400	2,3,4	Yes
Paarl	a.c. 50	1,3	230/400	2,4	Yes
Port Elizabeth	a.c. 50	1,3	250/433	2,4	Yes
Pretoria	a.c. 50	1,3	240/415	2,3,4	Yes
Roodeport	a.c. 50	1,3	230/400	2,4	Yes
Somerset West	a.c. 50	1,3	230/400	2,4	Yes
Springs	a.c. 50	1,3	220/380	2,3,4	Yes
			230/400		
Umtata	a.c. 50	1,3	230/400	2,3,4	Yes
Upington	a.c. 50	1,3	230/400	2,4	Yes
Virginia	a.c. 50	1,3	230/400	2,4	Yes
Vryheid	a.c. 50	1,3	230/400	2,3,4	Yes
Walvis Bay	a.c. 50	1,3	230/400	2,3,4	Yes
Wellington	a.c. 50	1,3	230/400	2,4	Yes
Worcester	a.c. 50	1,3	230/400	2,4	Yes
Spain[30,61]	a.c. 50	1,3	220/380	2,3,4,5	Yes
Sri Lanka[1,3,14]	a.c. 50	1,3	230/400	2,4	Yes
Sudan[1]	a.c. 50	1,3	240/415	2,4	Yes
Wau	a.c. 50	1	240	2	Yes
Suriname	a.c. 60	1,3	127/220	2,3,4	Yes
Swaziland	a.c. 50	1,3	230/400	2,4	Yes
Sweden[1,3]	a.c. 50	1,3	230/400	2,3,4,5	Yes
Switzerland[1,3]	a.c. 50	1,3	230/400	2,3,4	Yes
Syria[2]	a.c. 50	1,3	220/380	2,3	No
Tahiti	a.c. 60	1,3	127/220	2,3,4	No
Taiwan[1]	a.c. 60	1,3	110/220	2,3,4	Yes
Tajikistan	a.c. 50	1,3	220/380	2,3	No
Tanzania[1,2,3]	a.c. 50	1,3	230/400	2,3,4	Yes
Thailand[62]	a.c. 50	1,3	220/380	2,3,4	Yes
Togo	a.c. 50	1,3	220/380	2,4	Yes
			127/220		

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
Tonga	a.c. 50	1,3	240/415	2,3,4	N.A.
Trinidad and Tobago[5]	a.c. 60	1,3	115/230 230/400	2,3,4	Yes
Tunisia[1,61,62]	a.c. 50	1,3	127/220 220/380	2,4	Yes
Bardo	a.c. 50	1,3	220/380	2,4	Yes
Beja	a.c. 50	1,3	220/380	2,4	Yes
Carthage	a.c. 50	1,3	220/380	2,4	Yes
Djemmal	a.c. 50	1,3	220/380	2,4	Yes
Gabes	a.c. 50	1,3	220/380	2,4	Yes
Gafsa	a.c. 50	1,3	220/380	2,4	Yes
Hammam-Lif	a.c. 50	1,3	127/220	2,4	Yes
Kalaa-Kebira	a.c. 50	1,3	220/380	2,4	Yes
Ksar Hellal	a.c. 50	1,3	220/380	2,4	Yes
Ksour Essaf	a.c. 50	1,3	220/380	2,4	Yes
La Goulette	a.c. 50	1,3	127/220	2,4	Yes
La Manouba	a.c. 50	1,3	127/220	2,4	Yes
Le Kef	a.c. 50	1,3	220/380	2,4	Yes
Mahdia	a.c. 50	1,3	220/380	2,4	Yes
Maxula-Rades	a.c. 50	1,3	220/380	2,4	Yes
Menzel Temime	a.c. 50	1,3	220/380	2,4	Yes
Moknine	a.c. 50	1,3	220/380	2,4	Yes
Monastir	a.c. 50	1,3	220/380	2,4	Yes
M'saken	a.c. 50	1,3	220/380	2,4	Yes
Nabeul	a.c. 50	1,3	220/380	2,4	Yes
Nefta	a.c. 50	1,3	220/380	2,4	Yes
Ras Djebel	a.c. 50	1,3	220/380	2,4	Yes
Tozeur	a.c. 50	1,3	220/380	2,4	Yes
Zarsis	a.c. 50	1,3	220/380	2,4	Yes
Turkey[1]	a.c. 50	1,3	220/380	2,3,4	Yes
Turkmenistan	a.c. 50	1,3	220/380	2,3	Yes
Uganda[1,4,50]	a.c. 50	1,3	240/415	2,4	Yes
United Arab Emirates	a.c. 50	1,3	220/380	2,3,4	Yes
Abu Dhabi	a.c. 50	1,3	220/415	2,3,4	Yes
Ajman	a.c. 50	1,3	230/400	2,3,4	Yes
Sharjah	a.c. 50	1,3	230/415	2,3,4	Yes
United Kingdom:					
England[1,5,8]	a.c. 50	1,3	240/480	2,3	Yes
		3	240/415	4	Yes
Scotland[1,5,8]	a.c. 50	1,3	240/415	2,4	Yes
Wales[1,5,8]	a.c. 50	1,3	240/415	2,4	Yes

Country with city variances	Type and frequency of current	Number of phases	Nominal voltage	Number of wires	Frequency stability stable enough for electric clocks
Northern Ireland[1,5,8]	a.c. 50	1,3	220/380 230/400	2,4	Yes
United States of America	a.c. 60	1,3	120/240	2,3,4	Yes
Uruguay[3,63]	a.c. 50	1,3	220/380	2,4	Yes
Uzbekistan	a.c. 50	1,3	220/380	2,4	Yes
Venezuela	a.c. 60	1,3	120/240	2,3,4	Yes
Vietnam[1,64]	a.c. 50	1,3	220/380	2,4	No
Can Tho	a.c. 50	1,3	127/220 220/380	2,4	No
Dalat	a.c. 50	1,3	120/208 220/380	2,4	No
Da Nang	a.c. 50	1,3	127/220	2,4	No
Hanoi	a.c. 50	1,3	127/220 220/380	2,4	No
Hue	a.c. 50	1,3	127/220	2,4	No
Khanh Hung (Soc Trang)	a.c. 50	1,3	127/220	2,4	No
Nha Trang	a.c. 50	1,3	127/220	2,4	No
Saigon-Cholon	a.c. 50	1,3	120/208 220/380	2,4	No
Virgin Islands (American)	a.c. 60	1,3	120/240	2,3,4	Yes
Wales see United Kingdom					
Western Samoa	a.c. 50	1,3	230/400	2,3,4	Yes
Yemen Arab Rep.	a.c. 50	1,3	230/400	2,4	Yes
Hodeida	a.c. 50	1,3	220/400	2,4	No
Sanaa	a.c. 50	1,3	220/400	2,4	No
Taiz	a.c. 50	1,3	220/400	2,4	No
Yugoslavia[11]	a.c. 50	1,3	220/380	2,4	No
Zaire Rep. Of[1,3]	a.c. 50	1,3	220/380	2,3,4	No
Zambia[1,3,65]	a.c. 50	1,3	220/380	2,4	Yes
Zimbabwe[34]	a.c. 50	1,3	220/380	2,3,4	Yes

Country Specific Notes

1. The neutral wire of the secondary distribution system is grounded.
2. The nominal voltage varies by ± 5 %.
3. A grounding conductor is required in the electrical cord attached to appliances.
4. The nominal voltage is being standardized and converted to 220/380.
5. Voltage tolerance ± 6 %.
6. Frequency tolerance ± 5 Hz, voltage tolerance ± 10 %.
7. A grounding conductor is required in the electrical cord attached to appliances except for class 2 appliances.
8. A grounding conductor is required in the electrical cord attached to appliances that are not double insulated.
9. Voltage tolerance ± 100 %.
10. Electric clocks lose about 6 minutes during 24 hours.
11. Voltage tolerance ± 5 to 10 %.
12. Current is being changed from 127/220 to 220/380, whereas the former 127/220 installations now in some residences and offices are being systematically changed.
13. Three phase, 4-wire systems such as 120/208 volts are available. Also, 347/600 volts is available for commercial establishments.
14. Frequency tolerance ± 1 %, voltage tolerance ± 5 %.
15. Frequency tolerance up to 5 Hz, voltage tolerance ± 5 %.
16. Seventy-five percent of the city uses 110/220 volts. Mostly older sector uses 150/260 volts.
17. Frequency and voltage tolerances ± 5 %.
18. Copenhagen includes Frederiksberg and Gentofte.
19. Frequency tolerance ± 1 %, voltage tolerance + 4 % to - 8 %.
20. 120/240 volts is used in rural areas.
21. Voltage generally varies between 150 and 175. Frequent power outages.
22. Frequency tolerance ± 2 %, voltage tolerance ± 6 %.
23. Nominal voltage being changed to 230/400 volts.
24. The neutral wire of the secondary distribution system is grounded at the generator.
25. A grounding conductor is required in the electrical cord attached to appliances using 10 amps and above. It is suggested but not required for appliances using less than 10 amps.
26. Most residences are served by 4 wires (the 3-phase wires and the neutral wire).
27. Voltage tolerance + 6 % to - 10 %.
28. Frequency tolerance ± 3 %, voltage tolerance + 4 to - 8 %.
29. Guyana plans to standardize domestic power at 115/230, 60Hz, 2 & 3 wire single phase and its industrial power at 480 volts, 3-phase, 3-wire.
30. A grounding conductor is required for any 220/380 volt appliance.
31. Separate ground and neutral wires.

32. Frequency and voltage tolerances ± 25 %.
33. Conversion to 220/380 completed in Jakarta and other principal cities in Java. Other parts of the country are in process.
34. Voltage tolerance ± 10 %.
35. Frequency tolerance ± 5 %, voltage tolerance ± 6 %.
36. Frequency tolerance ± 2 %, voltage tolerance ± 10 %.
37. A grounding conductor is required in the electrical cord attached to appliances designed for 150 volts or more.
38. All household appliances must be designed to operate at 220 volts without addition of transformers or any other modification.
39. Frequency tolerance ± 4 %, voltage tolerance ± 6 %.
40. Voltage fluctuations are common.
41. Electric current is now continuous in most of the cities and large towns.
42. The neutral wire of the secondary distribution system is grounded except in the case of Sebha.
43. Frequency tolerance ± 2 %, voltage tolerance ± 7 %.
44. Frequency tolerance ± 2.5 %, voltage tolerance ± 6 %.
45. Frequency tolerance ± 1 %.
46. A grounding insulated conductor is required in the electrical cord attached to appliances.
47. Voltage tolerance ± 20 to 30 %.
48. Electric ranges must not exceed 11 kilowatts.
49. Frequency and voltage tolerances ± 15 %.
50. Voltage variations sufficient to damage electrical appliances are not uncommon.
51. Frequency tolerance ± 4 %, voltage tolerance ± 5 %.
52. A grounding conductor is required in the electrical cord attached to air conditioning appliances and electrical ranges above 8kw rating.
53. Commercial establishments use 230/460 volts.
54. Voltage tolerance ± 7 %, frequencies as low as 41 Hz have occasionally been experienced.
55. Frequency tolerance ± 1 %, voltage tolerance ± 6 %.
56. Frequency tolerance 0.5 Hz , voltage tolerance ± 4 to 8 %.
57. 380 volts is available in industrial areas.
58. Frequency and voltage tolerances ± 10 %.
59. Frequency tolerance ± 5 %, voltage tolerance ± 10 %.
60. Frequency tolerance ± 2.5 %, voltage tolerance ± 5 %.
61. Nominal voltage of 220 volts is used in commercial establishments and is gradually becoming common in private residences.
62. Frequency and voltage tolerances ± 2.5 to 5 %.
63. Voltage tolerance + 4.5 to - 20.5 %.
64. The electric utility system of Vietnam is to be standardized at 220/380, 3-phase, 4-wire wye. It may be several years before all of the system will be changed over to this voltage.
65. Frequency tolerance ± 2.5 %, voltage tolerance ± 10 %.

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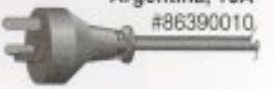

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