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ANSI/IEEE Std 315-1975)

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American National Standard
IEEE Standard

**Supplement to
Graphic Symbols for
Electrical and Electronics
Diagrams**

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**American National Standard
IEEE Standard**

**Supplement to
Graphic Symbols for
Electrical and Electronics Diagrams**

Sponsor
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Foreword

(This Foreword is not a part of ANSI/IEEE Std 315A-1986, Supplement to Graphic Symbols for Electrical and Electronics Diagrams.)

This standard supplements ANSI/IEEE Std 315-1975 by providing symbols approved by the International Electrotechnical Commission since 1975, or for which there is now a greater need in the United States arising from international commerce. It is believed that immediate issue of this supplement is preferable to the inevitable delay that would occur if a complete and proper revision of ANSI/IEEE Std 315-1975 were undertaken.

Besides adding new symbols, some updating of the information in ANSI/IEEE Std 315-1975 has been undertaken. The updating includes references to other standards, IEC labels on symbols where a change has occurred, and correction of errors.

This supplement is based on IEC Publication 617, Parts 2 through 11 and Part 13 as published in 1983. IEC Publication 617, Part 12 is included in full in ANSI/IEEE Std 91-1984, IEEE Standard Graphic Symbols for Logic Functions.

When this standard was approved SCC 11.1 had the following membership:

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American National Standard IEEE Standard

Supplement to Graphic Symbols for Electrical and Electronics Diagrams

AA1. Purpose

This supplement is intended to provide additional graphic symbols and information on internationally approved graphic symbols needed for use for electrical and electronics diagrams.

AA2. Scope

This supplement provides graphic symbols for use on all electrical or electronics diagrams except for those required for

(1) Logic circuit diagrams. See ANSI/IEEE Std 91-1984 [4]¹.

(2) Architectural plans. See ANSI Y32.9-1972 [2] and IEC Publication 617 (1983) [22] Part 11, ch IV.

(3) Street maps and building system layouts for cable TV application. See ANSI/IEEE Std 623-1976 [8] and IEC Publication 617 (1983) [22], Part 11, ch III.

AA3. Organization

This supplement places the IEC Publication 617 new material in a practical sequence with related material in ANSI/IEEE Std 315-1975 [7]. Except where the nature of the revisions dictate otherwise (for reasons of clarity) existing ANSI/IEEE Std 315-1975 [7] text is not repeated.

¹ Numbers in brackets correspond to those of the references listed in Section AA4.

AA4. References

This standard shall be used in conjunction with the following publications:

[1] ANSI Y1.1-1972 (R 1984), Abbreviations for Use On Drawings and In Text.²

[2] ANSI Y32.9-1972, American National Standard Graphic Symbols for Electrical Wiring and Layout Diagrams Used in Architecture and Building Construction.

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

[4] ANSI/IEEE Std 91-1984, IEEE Standard Graphic Symbols for Logic Functions.

[5] ANSI/IEEE Std 260-1978, IEEE Standard Letter Symbols for Units of Measurement.

[6] ANSI/IEEE Std 280-1985, IEEE Standard Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

[7] ANSI/IEEE Std 315-1975, Graphic Symbols for Electrical and Electronics Diagrams.

[8] ANSI/IEEE Std 623-1976, Graphic Symbols for Grid and Mapping Diagrams Used in Cable Television Systems.

² ANSI publications are available from the Sales Department, American National Standards Institute, 1430 Broadway, New York, NY 10018.

³ IEEE publications are available from IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854.

[9] IEC Publication 27-1 (1971) Part 1: General. Letter Symbols to be Used in Electrical Technology.⁴

[10] IEC Publication 417 (1973), Graphic Symbols for Use on Equipment.

[11] IEC Publication 445 (1973), Identification of Apparatus Terminals and General Rules for a Uniform System of Terminal Marking, Using an Alphanumeric Notation.

[12] IEC Publication 617-1 (1985) Part 1: General Information, General Index. Cross-Reference Tables.

[13] IEC Publication 617-2 (1983) Part 2: Symbol Elements, Qualifying Symbols and Other Symbols Having General Application.

[14] IEC Publication 617-3 (1983) Part 3: Conductors and Connecting Devices.

[15] IEC Publication 617-4 (1983) Part 4: Passive Components.

[16] IEC Publication 617-5 (1983) Part 5: Semiconductors and Electron Tubes.

[17] IEC Publication 617-6 (1983) Part 6: Production and Conversion of Electrical Energy.

[18] IEC Publication 617-7 (1983) Part 7: Switchgear, Controlgear, and Protective Devices.

[19] IEC Publication 617-8 (1983) Part 8: Measuring Instruments, Lamps, and Signaling Devices.

[20] IEC Publication 617-9 (1983) Part 9: Telecommunications: Switching and Peripheral Equipment.

[21] IEC Publication 617-10 (1983) Part 10: Telecommunications: Transmission.

[22] IEC Publication 617-11 (1983) Part 11: Architectural and Topographical Installation Plans and Diagrams.

[23] IEC Publication 617-12 (1983) Part 12: Binary Logic Elements.

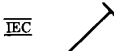
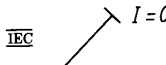
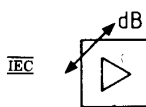
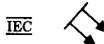
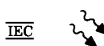
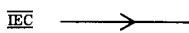
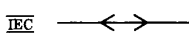
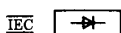
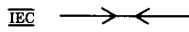
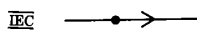
[24] IEC Publication 617-13 (1978) Part 13: Analog Elements.

[25] ISO 31, Parts 0-11 (1974-1980), Quantities, Units, Symbols, Conversion Factors, and Conversion Tables.⁵

⁴IEC Publications are available in the United States from the Sales Department, American National Standards Institute, 1430 Broadway, New York, NY 10018, USA. The IEC publications are also available from International Electrotechnical Commission, 3, rue de varembe, Case postale 131, CH 1211—Geneva 20, Switzerland.

⁵ISO publications are available in the United States from the Sales Department, American National Standards Institute, 1430 Broadway, New York, NY 10018, USA. ISO publications are also available from the International Organization for Standardization, 1, rue de Varembe, Case postale 56, CH 1211, Geneva 20, Switzerland.

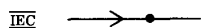
Qualifying Symbols

1.1.1.2 Preset, general  Add: Information on the conditions under which adjustment is permitted may be shown near the symbol. 1.1.1.2.1 Application: preset adjustment permitted only at zero current.  After 1.1.4.2 Add: 1.1.5 Automatic (inherent) control The controlled quantity may be indicated adjacent to the symbol.  1.1.5.1 Application: Amplifier with automatic gain control 	After 1.3.1 Add: 1.3.1.1 Coherent radiation, non-ionizing (for example coherent light)  1.3.2 Radiation, ionizing  Revise the NOTE to read as follows: NOTE 1.3.2A: If it is necessary to show the specific type of ionizing radiation, the symbol may be augmented by the addition of symbols or letters such as the following: <table><tr><td>Alpha particle</td><td>α</td></tr><tr><td>Beta particle</td><td>β</td></tr><tr><td>Gamma ray</td><td>γ</td></tr><tr><td>Deuteron</td><td>d</td></tr><tr><td>Proton</td><td>p</td></tr><tr><td>Neutron</td><td>n</td></tr><tr><td>Pion</td><td>π</td></tr><tr><td>K-meson</td><td>K</td></tr><tr><td>Muon</td><td>μ</td></tr><tr><td>X ray</td><td>X</td></tr></table> Add: IEC Designations α = alpha particle β = beta particle γ = gamma ray δ = deuteron ρ = proton η = neutron π = pion κ = K meson μ = muon X = X ray	Alpha particle	α	Beta particle	β	Gamma ray	γ	Deuteron	d	Proton	p	Neutron	n	Pion	π	K-meson	K	Muon	μ	X ray	X	1.7 Direction of Flow of Power, Signal, or Information Avoid conflict with symbols 9.5, 9.5.2, and 9.5.4 if used on the same diagram 1.7.1 One-way NOTE 1.7.1A: The lower symbol is used if it is necessary to conserve space. The arrowhead in the lower symbol shall be filled.  OR Add:  See NOTE 1.7.1A 1.7.2 Either way (but not simultaneously)  OR Add:  See NOTE 1.7.1A
Alpha particle	α																					
Beta particle	β																					
Gamma ray	γ																					
Deuteron	d																					
Proton	p																					
Neutron	n																					
Pion	π																					
K-meson	K																					
Muon	μ																					
X ray	X																					
1.2.1 Temperature dependence  Add: OR  After 1.2.5 Add: 1.2.6 Thermal effect  1.2.7 Electromagnetic effect  1.2.8 Magnetostrictive effect 	1.4.3 Solid  Add: OR  See NOTE 1.4A After 1.4.5 Add: 1.4.6 Material, semiconducting  1.4.7 Material, insulating 	1.7.3 Both ways, simultaneously  OR Add:  See NOTE 1.7.1A Avoid conflict with symbol 9.2 if used on the same diagram After 1.7.5 Add: 1.7.6 Transmission NOTE 1.7.6A: The dot may be omitted if the sense is unambiguously given by the arrowhead in combination with the symbol to which it is applied. 																				

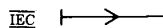
Qualifying Symbols

1.7.7 Reception

See NOTE 1.7.6A



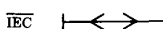
1.7.8 Energy flow from the busbars



1.7.9 Energy flow towards the busbars



1.7.10 Bidirectional energy flow



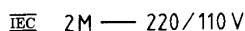
1.8.1

Add:

The voltage may be indicated at the right of the symbol and the type of system at the left.

1.8.1.1 Application: Direct current, three conductors including midwire, 220 V (110 V between each outer conductor and midwire)

2M may be replaced by 2 + M



1.8.2 Alternating current



Add:

The numerical value of the frequency or the frequency range may be added at the right-hand side of the symbol.

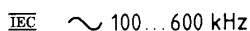
The voltage may also be indicated to the right of the symbol.

The number of phases and the presence of a neutral may be indicated at the left-hand side of the symbol.

1.8.2.1 Application: Alternating current of 60 Hz

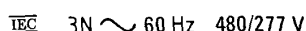


1.8.2.2 Application: Alternating current frequency range 100 kHz to 600 kHz



1.8.2.3 Application: Alternating current: three-phase with neutral, 60 Hz, 480 V (277 V between phase and neutral).

3N may be replaced by 3 + N



1.8.2.4 Neutral

This symbol for neutral is given in IEC Publication 445 (1973) [11].



1.8.2.5 Midwire

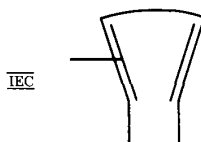
This symbol for midwire is given in IEC Publication 445 (1973) [11].



After 1.10.4

Add:

1.10.5 Conductive coating on internal surface of envelope



Add:

1.14 Operational Dependence On a Characteristic Quantity

1.14.1 Operating when the characteristic quantity is higher than the setting value



1.14.2 Operating when the characteristic quantity is lower than the setting value



1.14.3 Operating when the characteristic quantity is either higher than a given high setting or lower than a given low setting



1.14.4 Operating when value of the characteristic quantity becomes zero



1.14.5 Operating when the value of the characteristic quantity differs from zero by an amount which is very small compared with the normal value



1.15 Signal Identifiers

The symbol shall be used only when it is necessary to distinguish between analog and digital signals.

1.15.1 Identifier of analog signals



1.15.2 Identifier of digital signals



A time-sequence number (m) of bits may be denoted m #.

1.16 Signal Waveforms

Each symbol represents an idealized shape of the waveform.

1.16.1 Positive-going pulse



1.16.2 Negative-going pulse



1.16.3 Pulse of alternating current



1.16.4 Positive-going step function



1.16.5 Negative-going step function



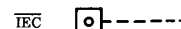
1.16.6 Sawtooth



1.17 Control by Nonelectrical Quantities

Letter symbols from ANSI/IEEE Std 280-1985 [6], may be used to denote other operating quantities than those shown below (for example pressure or speed). They should be enclosed in a rectangle if ambiguity could otherwise arise.

1.17.1 Control by fluid level

1.17.2 Control by number of events
Control by a counter

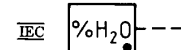
1.17.3 Control by flow

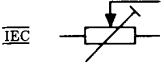
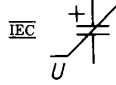
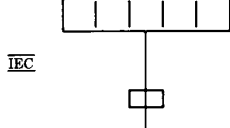
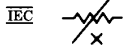
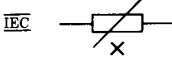
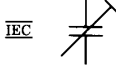
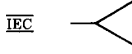
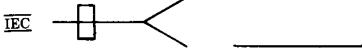
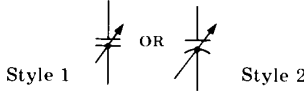
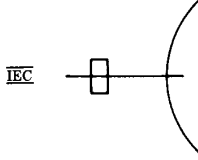
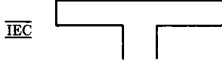
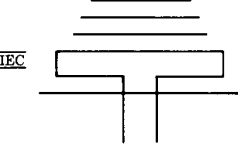
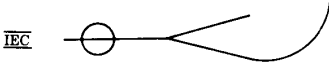
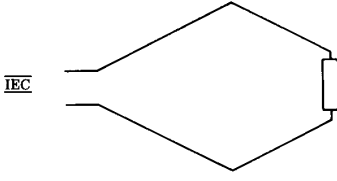
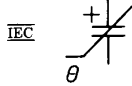


1.17.3.1 Application: Control by gas flow



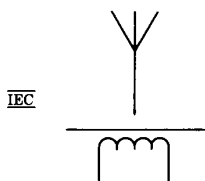
1.17.4 Control by relative humidity



<i>After 2.1.4</i> <i>Add:</i> 2.1.4.1 Application: preset adjustable resistor 	2.2.2.2 Voltage dependent polarized capacitor, where deliberate use is made of the voltage dependent characteristic, for example, semiconductor capacitor NOTE 2.2.2.2A: U may be replaced by V. 	<i>After 2.3.3</i> <i>Add:</i> 2.3.3.1 Slot antenna, shown with rectangular waveguide feeder 
2.1.7 Magnetoresistor (intrinsic) (linear type shown)  <i>Add:</i> OR 	<i>After 2.2.4</i> <i>Add:</i> 2.2.4A Capacitor with preset adjustment 	2.3.3.2 Horn antenna Horn feed  2.3.3.3 Cheese (box) reflector with horn feed, shown with rectangular waveguide feeder 
<i>After 2.1.9</i> <i>Add:</i> 2.1.9.1 Shunt Resistor with separate current and voltage terminals 	2.2.4.1 With moving element indicated <i>Revise NOTE 2.2.4.1A to read as follows:</i> NOTE 2.2.4.1A: If it is desired to indicate the moving element, the common intersection of the moving element with the symbol for variability and the connecting line is marked with a dot. See General Symbols 2.2.1 and NOTE 2.2B 	2.3.3.4 Paraboloidal antenna, shown with rectangular waveguide feeder 
2.1.13 Symmetrical photoconductive transducer (resistive)  <i>Add:</i> OR 	<i>After 2.3.2</i> <i>Add:</i> 2.3.2.1 Folded dipole  2.3.2.2 Folded dipole, shown with three directors and one reflector 	2.3.3.5 Horn-reflector antenna, shown with circular waveguide feeder  2.3.3.6 Rhombic antenna, shown terminated by a resistor 
<i>After 2.2.2</i> <i>Add:</i> 2.2.2.1 Temperature dependent polarized capacitor, where deliberate use is made of the temperature coefficient, for example, ceramic capacitor. NOTE 2.2.2.1A: θ may be replaced by t°. 		

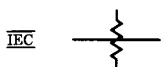
2.3.3.7 Magnetic rod antenna, for example ferrite.

If there is no risk of confusion, the general antenna symbol may be omitted.

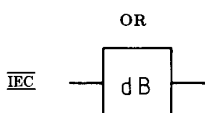


2.4 Attenuator

2.4.1 Fixed attenuator $\overline{F}$; pad (general)



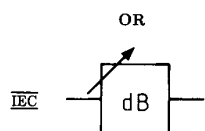
Add:



2.4.4 Variable attenuator $\overline{F}$ (general)



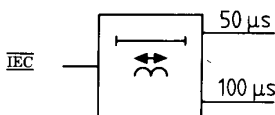
Add:



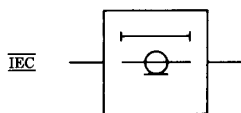
After 2.6.1

Add:

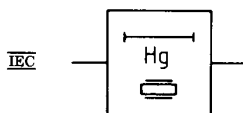
2.6.1.1 Magnetostrictive delay line shown with one input and two outputs giving delays of 50 μ s and 100 μ s



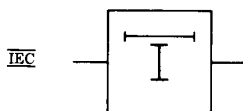
2.6.1.2 Coaxial delay line



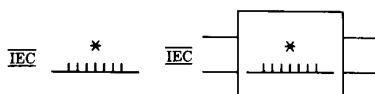
2.6.1.3 Mercury delay line with piezoelectric transducers



2.6.1.4 Delay line comprising an artificial line



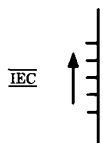
2.6.4 Slow-wave structure



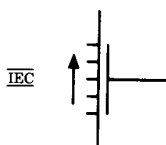
* See NOTE 2.6.1A

Add:

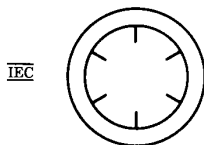
2.6.4.1 Open slow-wave structure (arrow indicates direction of energy flow)



2.6.4.2 Single electrode for electrostatic focusing along open slow-wave structure



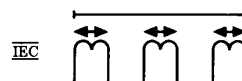
2.6.4.3 Closed slow-wave structure, shown with envelope



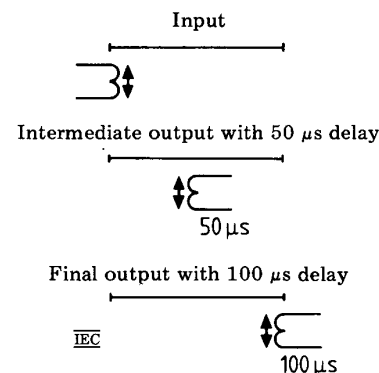
2.6.5 Delay Line Circuits

2.6.5.1 Magnetostrictive delay line with windings; three windings shown in assembled representation

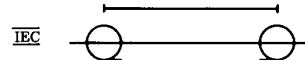
NOTE 2.6.5.1A: The winding symbols may be oriented as required



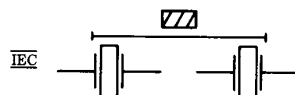
2.6.5.2 Magnetostrictive delay line with windings; one input and two outputs shown in detached representation



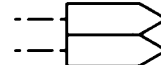
2.6.5.3 Coaxial delay line



2.6.5.4 Solid material delay line with piezoelectric transducers



2.9.6† Stereo

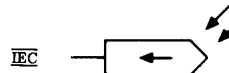


Add:

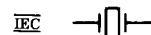
2.9.6.1 Stylus-operated stereophonic head



2.9.7 Light sensitive reproducing (reading, playback) head, monophonic

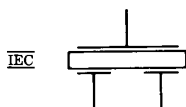


2.10 Piezoelectric Crystal Unit (including Crystal Unit, Quartz $\overline{F}$)

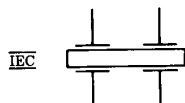


Add:

2.10.1 Piezoelectric crystal with three electrodes

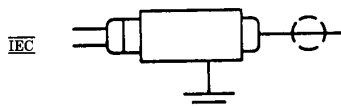


2.10.2 Piezoelectric crystal with two pairs of electrodes



Add:

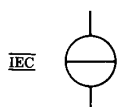
2.17.1 Ignition unit, high energy



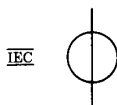
Add:

2.18 Ideal Circuit Elements

2.18.1 Ideal current source



2.18.2 Ideal voltage source



2.18.3 Ideal gyrator

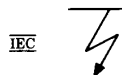


2.19 Faults

2.19.1 Fault
(indication of assumed fault location)



2.19.2 Flashover Breakthrough



After 3.1.2.3

Add:

3.1.2.4 Flexible conductor



3.1.6 Junction of paths or conductors

After 3.1.6.3

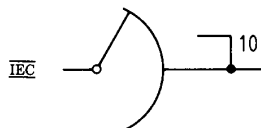
Add:

3.1.6.3A Connection common to a group of similar items



The total number of similar items may be indicated by a figure near the common connection symbol.

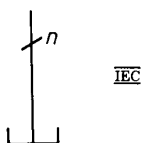
3.1.6.3A.1 EXAMPLE: Multiple uniselector banks shown for 10 banks



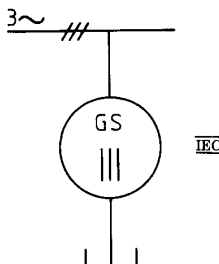
After 3.1.6.5

Add:

3.1.6.6 Neutral point in multiphase system, shown in single-line representation



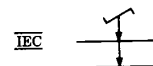
3.1.6.6.1 EXAMPLE: Synchronous generator, three-phase; both leads of each phase brought out, shown with external neutral point



3.1.7.2 Twisted (shown with two twisted conductors)

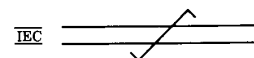
NOTE 3.1.7.2A: The asterisk is not part of the symbol. Always replace the asterisk by one of the following letters:

P = Pair
T = Triple



Add:

OR



OR



*See NOTE 3.1.7.2A

After 3.1.8.6

Add:

3.1.8.7

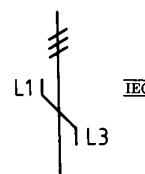
Interchange of conductors; change of phase sequence or inversion of polarity, shown for n conductors in single-line representation.

The interchanged conductors may be indicated.

For the identification of the conductors, IEC Publication 445 (1973) [11] applies.



3.1.8.7.1 EXAMPLE: Change of phase sequence



Graphic Symbols for Transmission Path

After 3.2.6.2

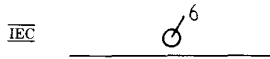
Add:

3.2.7 Duct or pipe

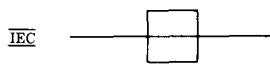


NOTE 3.2.7A: The number of ducts, the cross-section dimensions or other particulars, such as duct occupancy, may be shown above the line representing the duct route.

3.2.7.1 EXAMPLE: Line of six-way duct

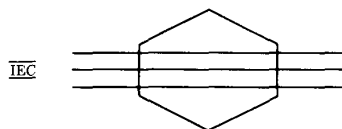


3.2.8 Line with manhole, giving access to jointing chamber

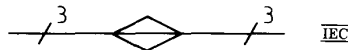


3.2.9 Straight-through joint box, shown with three conductors:

Multiline representation

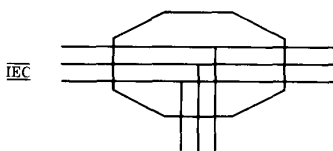


3.2.9.1 Single-line representation

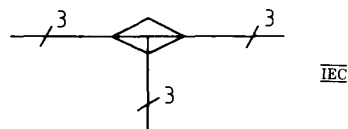


3.2.10 Junction box, shown with three conductors, with T-connections:

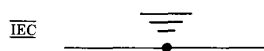
Multiline representation



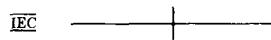
3.2.10.1 Single-line representation



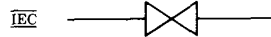
3.2.11 Line with buried jointing point



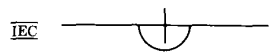
3.2.12 Line with gas or oil block



3.2.13 Line with gas or oil stop valve



3.2.14 Line with gas or oil block by-pass



3.2.15 Power feeding

3.2.15.1 Power feeding (ac) on telecommunication lines



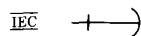
3.2.15.2 Power feeding (dc) on telecommunication lines



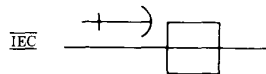
3.2.16 Anticreepage device

Anticreepage device for cable

NOTE 3.2.16A: The symbol should be shown on the creepout side of the manhole.

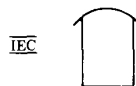


3.2.16.1 EXAMPLE: Manhole equipped with anticreepage device for cable (Creepage to the left is prevented)

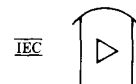


3.2.17 Overground, weatherproof enclosure, general symbol

NOTE 3.2.17A: Qualifying symbols or designations may be used to indicate the apparatus contained in the enclosure.



3.2.17.1 EXAMPLE: Amplifying point in a weatherproof enclosure



3.2.18 Crossconnection point

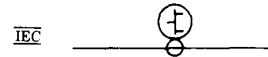
NOTE 3.2.18A: Inlets and outlets may be oriented as required.



3.2.19 Line concentrator Automatic line connector

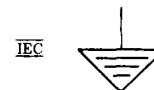


3.2.19.1 EXAMPLE: Line concentrator on a pole

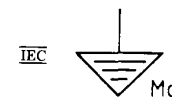


3.2.20 Protective anode

NOTE 3.2.20A: The type of anode material may be indicated by adding its chemical letter symbol.



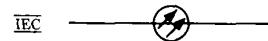
3.2.20.1 EXAMPLE: Magnesium protective anode



After 3.6.7

Add:

3.6.8 Optical fiber

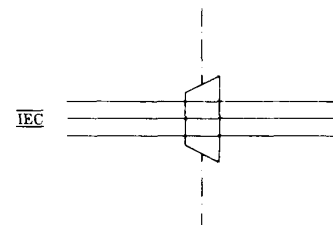


After 3.10

Add:

3.10.1 Pressure-tight bulkhead cable gland; shown with three cables

NOTE 3.10.1A: The high-pressure side is the longer side of the trapezoid thus retaining gland in bulkhead.



4.1 Switching Function

NOTE 4.1A: Switching function symbols are suitable for use on *detached contact* diagrams, but may be used in other applications.

Add:

4.1A Qualifying Symbols for Contacts (IEC Publication 617-7 (1983) [18])

4.1A.1 Contactor function



4.1A.2 Circuit-breaker function



4.1A.3 Disconnecter (isolator) function



4.1A.4 Switch-disconnector (isolating-switch) function



4.1A.5 Automatic release function



4.1A.6 Position switch function Limit switch function

NOTE 4.1A.6A: This qualifying symbol can be applied to simple contact symbols to indicate position or limit switches if there is no need to show the means of operating the contact. In complicated cases, where it is desirable to show the means of operation, symbols 14.4.16 to 14.4.16.3 should be used instead.

NOTE 4.1A.6B: This symbol is placed on both sides of the contact symbol when the contact is mechanically operated in both directions.



4.1A.7 Spring return function

NOTE 4.1A.7A: This symbol may be used to indicate spring return function. When this convention is invoked its use should be appropriately referenced.

NOTE 4.1A.7B: This symbol should not be used together with qualifying symbols 4.1A.1, 4.1A.2, 4.1A.3, and 4.1A.4. In many cases, symbol 14.5.1 may be used.



4.1A.8 Nonspring return (stay put) function

NOTE 4.1A.8A: This symbol may be used to indicate nonspring return function. When this convention is invoked, its use should be appropriately referenced.

NOTE 4.1A.8B: This symbol should not be used together with qualifying symbols 4.1A.1, 4.1A.2, 4.1A.3, and 4.1A.4. In many cases, symbol 14.5.2 may be used.



4.3 Basic Contact Assemblies

The standard method of showing a contact is by a symbol indicating the circuit condition it produces when the actuating device is in the de-energized or nonoperated position. The actuating device may be of a mechanical, electrical, or other nature, and a clarifying note may be necessary with the symbol to explain the proper point at which the contact functions; for example, the point where a contact closes or opens as a function of changing pressure, level, flow, voltage, current, etc. In cases where it is desirable to show contacts in the energized or operated condition and where confusion may result, a clarifying note shall be added to the drawing.

For designations of auxiliary switches or contacts for circuit breakers, etc, see ANSI/IEEE C37.2-1979 [3].

Add:

4.3A IEC Publication 617-7 (1983) [18] Coordinated System

This section provides preferred symbols for contact units and switchgear. Each symbol depicts the function of a contact or a switching device, without necessarily being related to the construction of the device it represents.

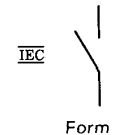
A small circle, open or filled in, representing the hinge-point may be added to most of the symbols for contacts, switches, and controlgear. See for example 4.3A.1.1.1.

For clarity this symbol must be shown on some symbols, see for example 4.3A.1.4.

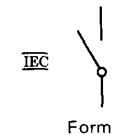
4.3A.1 Contacts with two or three positions

4.3A.1.1 Make contact

NOTE 4.3A.1.1A: This symbol is also used as the general symbol for a switch.



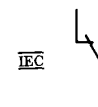
4.3A.1.1.1



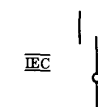
4.3A.1.2 Break contact



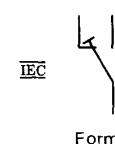
4.3A.1.3 Change-over break before make contact



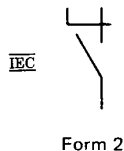
4.3A.1.4 Two-way contact with center-off position



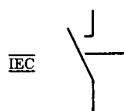
4.3A.1.5 Changeover make before break contact (bridging)



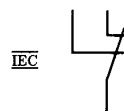
4.3A.1.5.1



4.3A.1.6 Contact with two makes

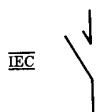


4.3A.1.7 Contact with two breaks

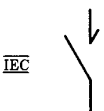


4.3A.2 Passing contacts with two positions

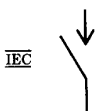
4.3A.2.1 Passing make contact closing momentarily when its operating device is actuated



4.3A.2.2 Passing make contact closing momentarily when its operating device is released

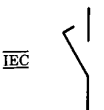


4.3A.2.3 Passing make contact closing momentarily when its operating device is actuated or released

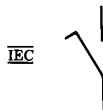


4.3A.3 Early and late operating contacts

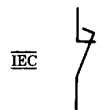
4.3A.3.1 Make contact (of a multiple contact assembly) which is early to close relative to the other contacts of the assembly



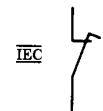
4.3A.3.2 Make contact (of a multiple contact assembly) which is late to close relative to the other contacts of the assembly



4.3A.3.3 Break contact (of a multiple contact assembly) which is late to open relative to the other contacts of the assembly

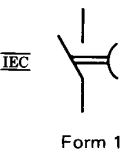


4.3A.3.4 Break contact (of a multiple contact assembly) which is early to open relative to the other contacts of the assembly

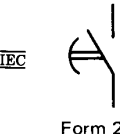


4.3A.4 Examples of contacts with intentional delay

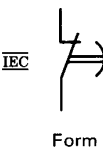
4.3A.4.1 Make contact delayed when closing (operating device actuated)



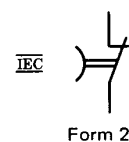
4.3A.4.2



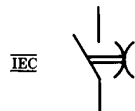
4.3A.4.3 Break contact delayed when reclosing (operating device released)



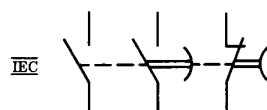
4.3A.4.4



4.3A.4.5 Make contact delayed when closing and opening

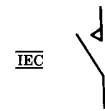


4.3A.4.6 Contact assembly with one make contact not delayed, one make contact delayed when reopening and one break contact delayed when opening

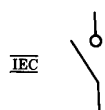


4.3A.5 Examples of spring return and nonspring return (stay put) contacts

4.3A.5.1 Make contact with spring return



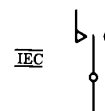
4.3A.5.2 Make contact without spring return (stay put)

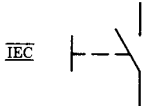
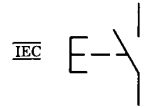
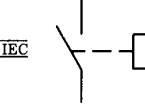
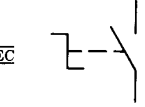


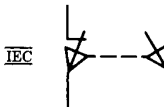
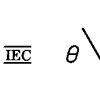
4.3A.5.3 Break contact with spring return

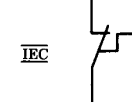
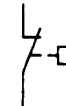
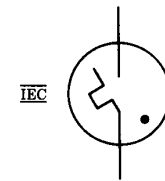
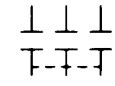


4.3A.5.4 Two-way contact with center-off position with spring return from the left-hand position but not from the right-hand one (stay put)



<i>Add:</i> 4.3B ANSI/IEEE Std 315-1975 [7] System 4.3.1 Closed contact (break) ⋮ ⋮ No change in existing symbols but IEC approval will be withdrawn in the future. 4.3.8.3	
<i>Add:</i> 4.6.3 Indication of operating method Former 4.6.3 is now 4.6.3.5 Devices with <i>push</i> or <i>pull</i> operation normally have spring return. It is therefore not necessary to show the automatic return symbol (14.5.1). On the other hand, a detent symbol (14.5.2) should be shown in the exceptional cases where locking exists. Devices operated by turning do not usually have automatic return. It is therefore not necessary for the detent symbol (14.5.2) to be shown. On the other hand, the automatic return symbol (14.5.1) should be shown in those cases where an automatic return exists. 4.6.3.1 Manually operated switch; general symbol  4.6.3.2 Push-button switch (non-locking)  4.6.3.3 Pull-switch (nonlocking)  4.6.3.4 Turn-switch (locking)  4.6.3.5 Knife switch $\overline{\text{F}}$, general 	

4.14.5.3 Normally closed  <i>Add:</i> OR  <i>After 4.14.5.4</i> <i>Add:</i> 4.14.5.5 Position or limit switch mechanically operated in both directions with two separate circuits 	
4.21.1 Closes on rising temperature  See NOTE 4.21A <i>Add:</i> OR 	
4.21.2 Opens on rising temperature  See NOTE 4.21A <i>Add:</i> OR 	

4.22 Flasher Self-Interrupting Switch  OR  <i>Add:</i> 4.22.1 Self-operating thermal switch, break contact  NOTE 4.22.1A: It is important to distinguish between a contact as shown and a contact of a thermal relay, which in detached representation may be shown as follows:  4.22.2 Gas discharge tube with thermal element Starter for fluorescent lamp 	
<i>Revise 4.29.1 to read as follows:</i> 4.29.1 Manually operated 3-pole contactor 	

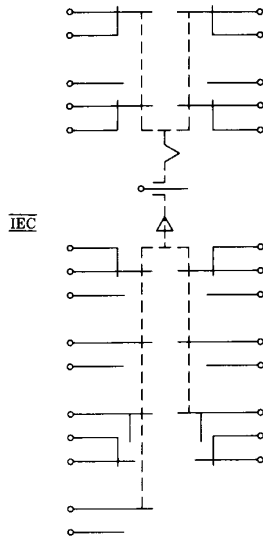
Graphic Symbols for Contacts, Switches, Contactors, and Relays

After 4.33
Add:

4.34 Multipole and Multiposition Switches (IEC Publication 617-7 (1983) [18])

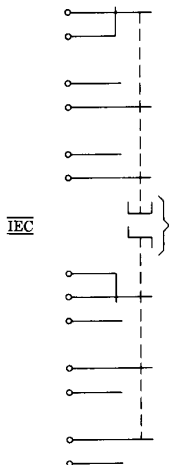
4.34.1 Key operated lever or turn switches (compare with 4.12 items)

4.34.1.1 Three position lever-operated switch, locking in the upper position and with spring return from the lower position to the middle one, shown with terminals

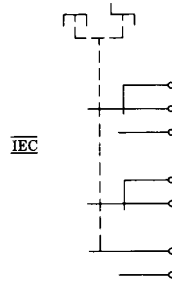


4.34.1.2 Button-operated switch in which one set of contacts is operated by pushing the button (nonlocking) and another set by turning it (locking), shown with terminals

The bracket indicates that there is only one actuator

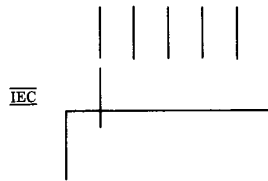


4.34.1.3 Button-operated switch in which the same set of contacts may be operated in two different ways; either by turning (with locking) or pushing (with spring return), shown with terminals

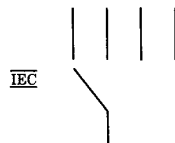


4.34.2 Multiposition Switches

4.34.2.1 Single-pole n-position switch, shown for $n = 6$

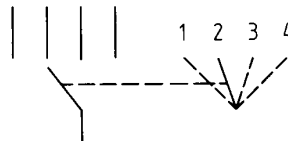


4.34.2.2 Single-pole n-position switch, alternative for use when n is small, shown for $n = 4$

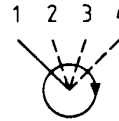


4.34.2.3 Example with position diagram

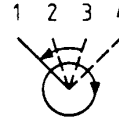
NOTE 4.34.2.3A: It is sometimes convenient to indicate the purpose of each switch position by adding text to the position diagram. It is also possible to indicate limitations of movement of the operating device as in the examples which follow:



The operating device (for example handwheel) can be turned only from positions 1 to 4 and back.

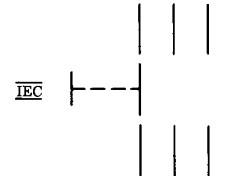


The operating device can be turned in the clockwise direction only.

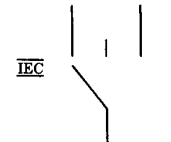


The operating device can be turned in the clockwise direction without limitation and may be turned in the counter-clockwise direction only between positions 3 and 1.

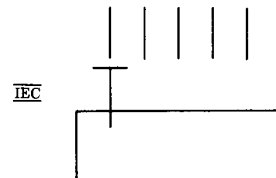
4.34.2.4 Four-position switch, manually operated, having four independent circuits



4.34.2.5 Single-pole, four-position switch in which position 2 cannot be connected



4.34.2.6 Single-pole, six-position switch with a wiper that bridges only while passing from one position to the next



4.34.2.7 Single-pole multiposition switch with a wiper that bridges three consecutive terminals in each switch position

