

JIS

JAPANESE INDUSTRIAL STANDARD

Graphical Symbols for Electric Circuits of Welding Machines

JIS C 9309—1989

Translated and Published

by

Japanese Standards Association

Printed in Japan

In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

JAPANESE INDUSTRIAL STANDARD

J I S

Graphical Symbols for Electric Circuits of
Welding Machines

C 9309-1989

1. Scope

This Japanese Industrial Standard specifies graphical symbols which are used for electrical circuit diagrams of welding machines.

2. Graphical Symbols

The graphical symbols shall be as given in Table.

- Remarks 1. Sizes of graphical symbols may freely be changed, however, shapes shall be as homologous as possible. Such modification as discriminating the use by changing the thickness of line may, also, be applied.
2. If two or more graphical symbols are defined for a component having the same function, graphical symbols in the same series shall be used in the same circuit diagram.
- If two or more graphical symbols are defined for a component having the same function with (a) or (b) prefixed in the same series, there is no precedence, but the same graphical symbol shall be used in the same diagram.
3. As for graphical symbols of components including electrical contacts, the condition of the movable contact indicated in this standard denotes that under the following states:
- (1) The state that all electric supply and other energy supply to driving part of the contacts are cut off, for components driven by electrical energy or the like.
 - (2) The state that the operating parts are not touched by hand or foot, for components operated by hand or foot.
 - (3) The reset state or the state at which the contact normally lies under reset condition, for components whose contacts can take two different positions under the states described in (1) or (2), for example the states that,
 - (a) the pressure or liquid level does not reach the set value, for pressure switches, level switches, or the like,

Applicable Standards:

JIS C 0301-Graphic Symbols for Electrical Apparatus

JIS X 0122-Graphical Symbols for Binary Logic Elements

- (b) no water is running, for flow switches,
 - (c) the control object does not reach the set position, for limit switches, or
 - (d) the temperature does not increase (or decrease) to the set value, for temperature switches.
- (4) The arbitrary state, for such device as changeover switch used for changing over control system manual to automatic or vice versa in which the two different states described in (3) have almost similar significance and nothing interferes under the rest condition of the machine.
4. Graphical symbols including indication of make-break contacts should generally denote the condition of contacts under the states described in Remark 3., even if a circuit diagram is written as if the power supply (for example: batteries, generators) were connected, unless the symbol is otherwise specified in the circuit diagram.
5. In this Table, graphical symbol with IEC suffixed at upper right means that it is complying with the standard of IEC (International Electrical Commission) i.e. the international standard. However, IEC is not a part of the graphical symbol, therefore it is not necessary to suffix IEC for use in an electric circuit diagram.
- The example in the column of description with IEC suffixed means that such symbols are exemplified in IEC standard.
6. Graphical symbols may be applicable to a device having similar function, in this case, however, to clarify its performance by means of a mark or other appropriate means in needed.
7. If a component is not specified in this Standard, or the specification of this Standard is not enough, it is recommended to follow the standards stated below.
- (1) Components except logic elements shall be based on JIS C 0301.
 - (2) Logic elements of series 1 shall be based on JIS X 0122, and that of series 2 should be based on the old MIL standard MIL-STD-806 B (Graphic Symbols for Logic Diagrams) which is customarily used in general.
 - (3) If graphical symbols based on (1) and (2) is not enough, it is recommended to denote such a component by combination with fundamental graphical symbols or other symbols, or by addition of letters and/or marks.

Table

1. Current

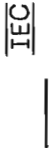
No.	Name	Graphical symbol	Description
1.1	Direct current		Example: D.C. ammeter D.C. generator  
1.2	Alternating current		Example: A.C. ammeter A.C. generator  
1.3	High frequency	(a)  (b) 	Use   for denoting audio frequency Use   for denoting power frequency Use  same as voice frequency for denoting a frequency higher than power frequency in an inverter system.

Table (Continued)

No.	Name	Graphical symbol	Description
1.4	Pulse		To clearly distinguish pulse from non-inductive resistance or heater the ratio $a : b$ shall be such that b is larger than 1.5 when a is assumed as 1.  However, if it is necessary to enter a special waveform in a circuit diagram, use the waveform.

Table (Continued)

2. Conductor and Connection

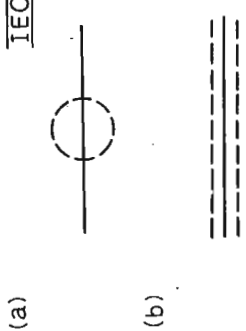
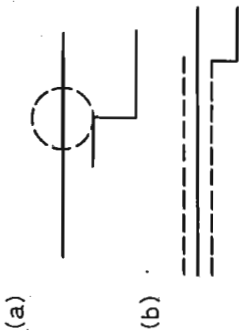
No.	Name	Graphical symbol	Description
2.1	Conductor		1. Use widely for wires, bus bars, etc. 2. Identify the wire by thickness if necessary. 3. Number of conductors, if desired, may be denoted as follows: (a) When two conductors $\text{---}\frac{\text{IEC}}{2}\text{---}$ (b) When three conductors $\text{---}\frac{\text{IEC}}{3}\text{---}$ (c) When n conductors $\text{---}\frac{\text{IEC}}{n}\text{---}$
2.2	Group of conductors		1. Oblique lines may be substituted by circular arcs. 2. Curve indicates wiring direction.
2.3	Shielded wire		If it is necessary to specify the side of shield to which earthing is done, indicate it as follows: 

Table (Continued)

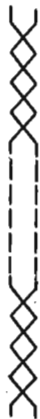
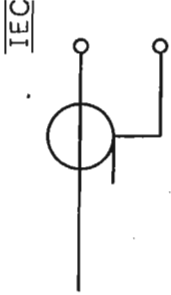
No.	Name	Graphical symbol	Description
2.4	Twisted wires	(a)  (b) 	1. Use this for denoting that two conductors are twisted. 2. If the wiring on diagram is long omission may be made as follows:   3. Denote shielded twisted wire as follows: 
2.5	Coaxial cable		To clearly indicate connection of external conductor, use the following symbol. 
2.6	Terminal	(a)  (b) 	If it is desired to indicate on which terminal a movable contact is hinged, hinged terminal may be shown by (a) and the other by (b).

Table (Continued)

No.	Name	Graphical symbol	Description
2.7	Junction of conductor	(a)  (b) 	
2.8	Crossing of conductors (connected)		This may be denoted as follows: 
2.9	Crossing of conductors (not connected)		
2.10	Earthing (for safety)		Use this symbol for earthing for safety.
2.11	Earthing (for signalling)		1. Oblique lines may be omitted if there is no ambiguity. 2. This symbol may be used with oblique lines omitted to identify the connection with a grounded line insulated from the power supply.

Table (Continued)

No.	Name	Graphical symbol	Description
2.12	Coupler		1. The left side denotes plug and the right side denotes plug receptacle. 2. Number of marks $\circ$ indicates number of terminals, and number or mark in $\circ$ indicates terminal mark. 3. Use (b) when number of terminals is large, and indicate terminal marks and wire number on separate table. 4. Use (c) to illustrate a coupler in the wiring of circuit diagram (number or mark in $\circ$ indicates terminal mark) and indicate number of terminals on separate table. 5. Symbols in 1 denote the case that plug and plug receptacle are mated and symbols in 2 denote that they are separated. 6. To identify male or female of connector, attach mark $\bullet$ to male one.
2.13	Terminal block		1. Symbol of terminal block for six terminations is shown. 2. Enter terminal mark or number in $\square$.

Table (Continued)

3. Linked Motion

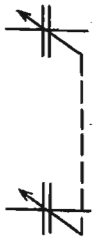
No.	Name	Graphical symbol	Description
3.1	General symbol for linked motion	(a)  (b)  	Examples: - Linked variable capacitance or variable capacitor  - Linked variable resistor  - Mechanical coupling  

Table (Continued)

4. General Components	No.	Name	Graphical symbol	Description
	4.1	Resistance or resistor	(a)  (b)  (c) 	- The number of ridges in (b) and (c) may be changed if especially necessary. - Use (c) to indicate non-inductive one.
	4.2	Variable resistance or variable resistor general		The following graphical symbol may be used for variable resistance or resistor. 
	4.3	Resistance or resistor continuously variable		If it is necessary to indicate the side to which moving contact is connected, the following graphical symbol may be used. 
	4.4	Resistance or resistor variable in step		To indicate continuously variable or variable in step in resistors with preset adjustment, the following graphical symbol may be used. 

Table (Continued)

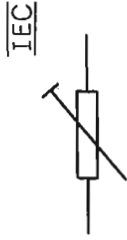
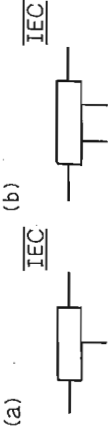
No.	Name	Graphical symbol	Description
4.5	Resistance or resistor with preset adjustment		 or 
4.6	Resistor with sliding contact and off position		4. To indicate continuously variable or variable in step in variable resistors, the following graphical symbol may be used.
4.7	Voltage divider with moving contact		 or 
4.8	Resistor with taps (preset adjustment)		

Table (Continued)

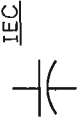
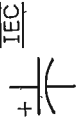
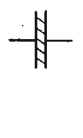
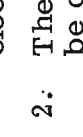
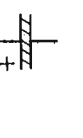
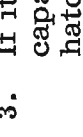
No.	Name	Graphical symbol	Description
4.9	Capacitance or capacitor	(a)  (b) 	1. Spacing between both poles shall be 1/5 to 1/3 of the length of pole. 2. In (b) the arc-form electrode indicates the side given in the following (1), (2) and (3) if the electrodes are classified. (1) External electrode for paper or ceramic capacitors (2) Variable electrode for variable capacitors (3) Low potential side for lead-through capacitors
4.10	Capacitor (polarized)	(a)  (b) 	To express electrolytic capacitor especially use 4.12.
4.11	Electrolytic capacitor (non-polarized)	(a)  (b)  (c) 	1. In (c), the hatching may be omitted if it is clear that the capacitor is electrolytic capacitor. 2. The mark + which indicates polarity may be omitted if there is no ambiguity. The following graphical symbol may be used. 
4.12	Electrolytic capacitor (polarized)	(a)  (b)  (c) 	3. If it is necessary to express electrolytic capacitor in, indication of (b), enter hatching between poles as illustrated in the above figure.

Table (Continued)

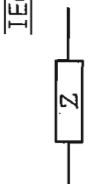
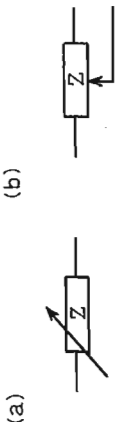
No.	Name	Graphical symbol	Description
4.13	Lead-through capacitor		
4.14	Variable capacitance or capacitor		If it is necessary to identify the rotor, the symbol shall be as follows: 
4.15	Capacitor with preset adjustment		
4.16	Impedance		
4.17	Variable impedance		

Table (Continued)

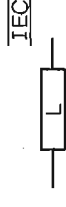
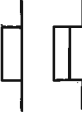
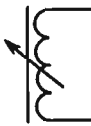
No.	Name	Graphical symbol	Description
4.18	Inductance (general) (Reactor)	(a)  (b)  (c) 	1. The number of ridges in (a) may be changed if especially needed. 2. Inductance with dust core may be denoted by the following graphical symbol if it is not confused with shield. 
4.19	Cored inductance (Reactor)		1. If especially necessary, the number of ridges may be changed. 2. If it is obvious that the inductance is cored one ——— may be omitted.
4.20	Variable inductance (Reactor)		The symbol shows inductance with core.
4.21	Inductance with continuous preset adjustment		The symbol shows inductance with core.

Table (Continued)

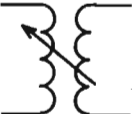
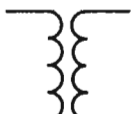
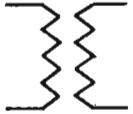
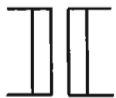
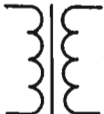
No.	Name	Graphical symbol	Description
4.22	Inductance with variable steps	 IEC	
4.23	Inductance with taps	 IEC	
4.24	Inductance variable mutually	 IEC	
4.25	Transformer (general)	 (a)  (b)  (c)	1. If especially needed the number of ridges may be changed. 2. If it is especially necessary to indicate that the transformer is a cored one, it shall be denoted by the following graphical symbol. 

Table (Continued)

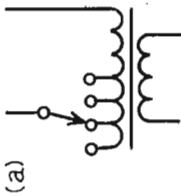
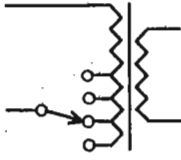
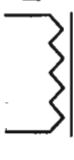
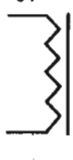
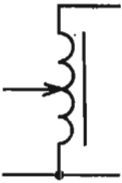
No.	Name	Graphical symbol	Description
4.25	(Cont'd)		3. If it is especially necessary to indicate shield, it shall be denoted by the following graphical symbol. 
4.26	Transformer with dial switch	(a)  (b) 	
4.27	One side of iron cored transformer	(a)  (b)  (a)  (b) 	P indicates primary winding and S indicates secondary winding.
4.28	Autotransformer	(a)  (b) 	Express the movable contact by arrow mark when variable one is denoted. Example: 

Table (Continued)

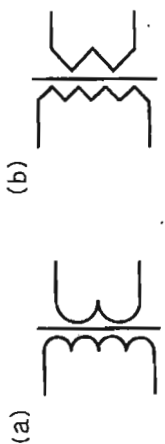
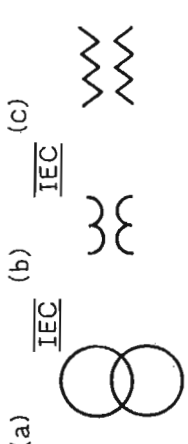
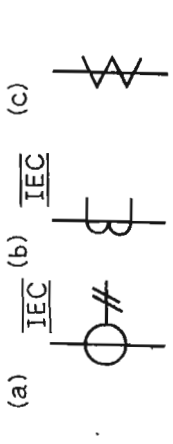
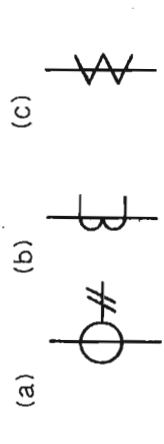
No.	Name	Graphical symbol	Description
4.29	Resistance welding transformer		
4.30	Potential transformer		Write with thinner line than that for main transformer, and enter PT near by.
4.31	Current transformer		Write with thinner line than that for main transformer, and enter CT near by.
4.32	Toroidal coil		Use the same graphical symbols as those of current transformer of 4.31 and enter TC near by.

Table (Continued)

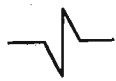
No.	Name	Graphical symbol	Description
4.33	Saturable reactor	(a)  (b) 	
4.34	Electromagnetic coil	(a)  (b) 	1. Applicable to electromagnetic coil used for electromagnetic valve or the like. 2. If graphical symbol of terminal (see 2.6) is especially necessary, mark ○ may be entered. Example:  3. The oblique line shall be right side upwards.
4.35	Thermal overcurrent relay	(a)  (b) 	If graphical symbol of terminal (see 2.6) is especially necessary in (b), mark ○ may be entered. Example: 

Table (Continued)

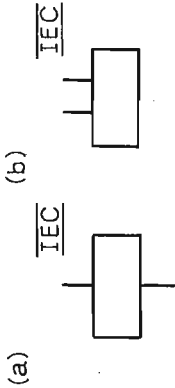
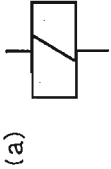
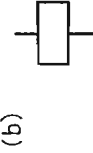
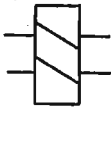
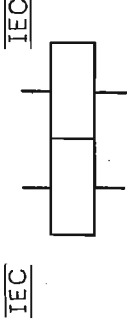
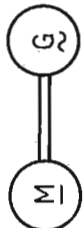
No.	Name	Graphical symbol	Description
4.36	Relay coil (general)		1. If it is necessary to indicate that the coil consists of one winding.   2. If it is necessary to indicate that the coil consists of two windings.   3. The following graphical symbol may be used if there is no ambiguity.  Such symbol as CR or a number may be entered in ○.

Table (Continued)

No.	Name	Graphical symbol	Description
4.37	Cell or d.c. power supply		1. The long line represents positive pole, the short line negative pole. 2. If ambiguous, it may be denoted as follows.  3. When several cells are connected, such a case may be denoted as follows. (a)  (for three) (b)  4. Battery with taps shall be denoted by the following graphical symbol.  5. If the voltage is variable, it shall be denoted by the following graphical symbol. 
4.38	A.C. power supply		

Table (Continued)

No.	Name	Graphical symbol	Description
4.39	Generator		1. If identification of a.c. or d.c. is necessary, it shall be denoted as follows: A.C.  D.C. 
4.40	Motor		2. Machine capable of use as generator or motor shall be denoted as follows: 
4.41	Motor-generator		This graphical symbol represents a machine consisting of d.c. motor and a.c. generator.