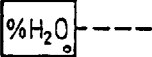
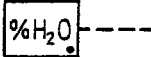
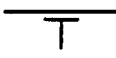
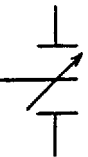
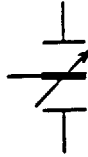
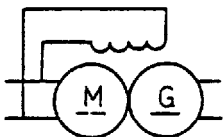
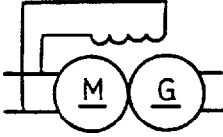
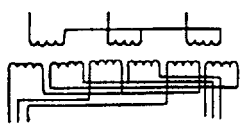
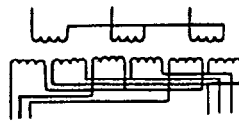
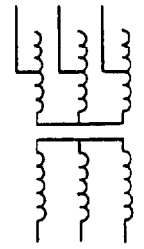
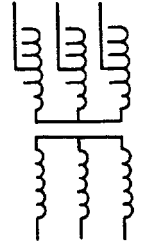
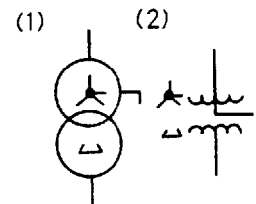
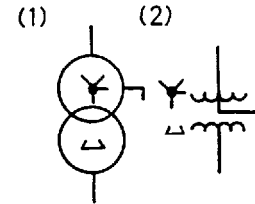
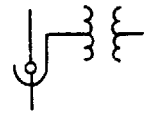
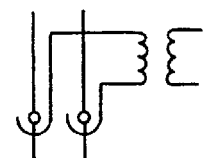
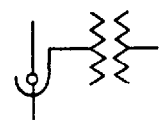
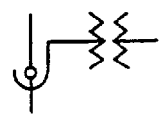
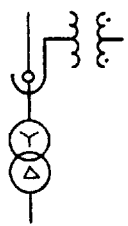
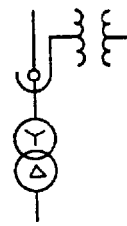
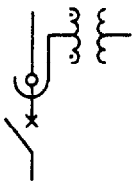
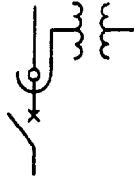
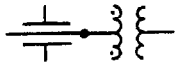
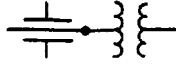
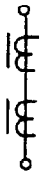
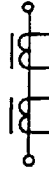
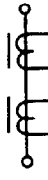
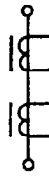
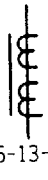
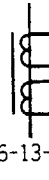
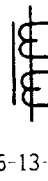
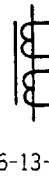
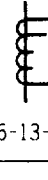
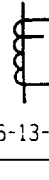
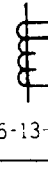
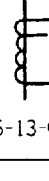


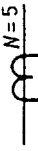
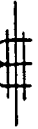
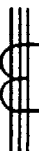
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ERRATA II
(in the figures)

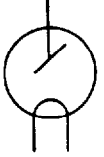
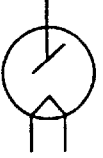
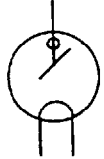
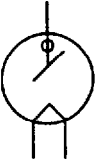
Position	Wrong	Correct
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I. 2.2.2 Description	 (IEC)	 (IEC)
I. 2.3.27 (a)	 04-02-03	 04-02-03
I. 2.3.30 Description 2 (a)	 04-02-13	 04-02-13
I. 2.5.4 (2)	 08-06-02	 08-06-02
II. 1.2.11	 06-02-12	 06-02-12
II. 2.2.7 Multi-line	 06-05-05	 06-05-05
II. 2.4.3 Single-line	 (06-08-03)	 (06-08-03)

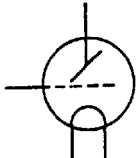
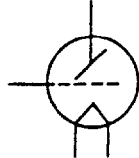
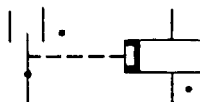
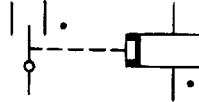
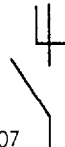
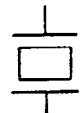
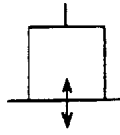
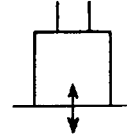
Position	Wrong	Correct
II. 3.1.7 Example 3 Multi- line	 (IEC)	 (IEC)
II. 3.1.7 Example 10 Multi- line	 06-10-10	 06-10-10
II. 3.2.7 Single- line (1), (2)	 (IEC) (IEC)	 (IEC) (IEC)
II. 3.2.15 Multi- line		
II. 3.2.15 Descrip- tion		
II. 3.2.16 Single- line (2)		

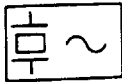
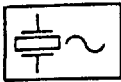
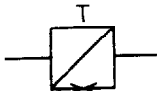
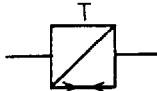
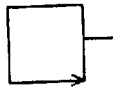
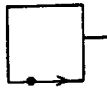
Position	Wrong	Correct
II. 3.2.17 Single-line (2)		
II. 3.2.18 Single-line (2)		
II. 3.3.2 Single-line (2)	 06-13-03	 06-13-03
II. 3.3.2 Multi-line	 06-13-03	 06-13-03
II. 3.3.3 Single-line (2)	 06-13-05	 06-13-05
II. 3.3.3 Multi-line	 06-13-05	 06-13-05
II. 3.3.4 Single-line (2)	 06-13-07	 06-13-07
II. 3.3.4 Multi-line	 06-13-07	 06-13-07

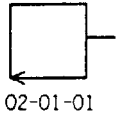
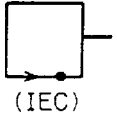
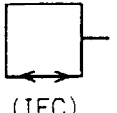
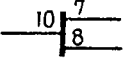
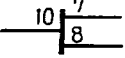
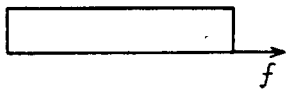
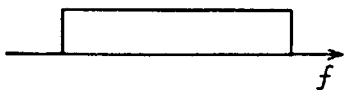
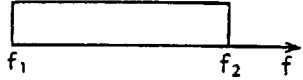
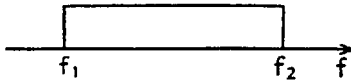
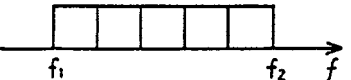
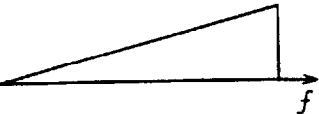
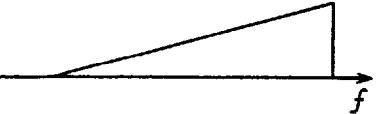
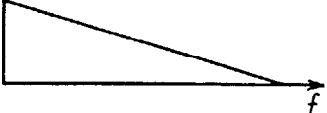
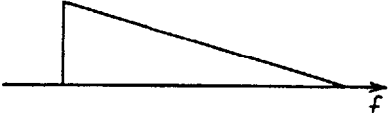
Position	Wrong	Correct
II. 3.3.5 Single- line (2)	 06-13-09	 06-13-09
II. 3.3.5 Multi- line	 06-13-09	 06-13-09
II. 3.3.6 Single- line (2)	 (IEC)	 (IEC)
II. 3.3.6 Multi- line	 (IEC)	 (IEC)
II. 3.3.1 to 3.3.4 Descrip- tion 2	 or 	 or 
II. 3.3.7 Single- line (2)	 (06-13-11)	 (06-13-11)
II. 3.3.7 Multi- line	 (06-13-11)	 (06-13-11)

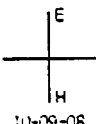
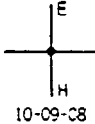
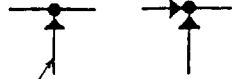
Position	Wrong	Correct
II. 3.3.8 Single-line (2)		
II. 3.3.8 Multi-line		
II. 3.3.9 Single-line (2)		
II. 3.3.9 Multi-line		
II. 3.3.10 Single-line (2)		
II. 3.3.10 Multi-line		
II. 6.2.4 a Series 2		

Position	Wrong	Correct
II. 6.2.4 b Series 2		
II. 6.2.7 Series 1	 07-02-04	 07-02-04
II. 7.3 Series 2 (b)		
II. 7.4 Series 2 (b)		
II. 11.1.2 Series 1	 07-16-12	 07-16-02
II. 11.1.9 Series 1	 (IEC)	 (IEC)
III. 1.1.8 (22)	 05-14-08	 (05-14-08)
III. 1.1.8 (22) Description		

Position	Wrong	Correct
III. 1.1.8 (23)	 (05-14-08)	 (05-14-08)
III. 1.3.9 Description (b)	 07-15-17	 07-15-17
III. 1.4.4 Series 1	 07-02-07	 07-02-07
III. 1.4.8 Series 1 (b)	 03-03-12	 03-03-12
III. 1.4.9 Series 1 (b)	 03-03-13	 (IEC)
III. 1.4.11 Series 1	 03-03-13	 03-03-13
III. 1.5.1.13	 04-07-01	 04-07-01
III. 1.5.1.15	 09-09-21	 09-09-21
III. 1.5.3.14 (2)		

Position	Wrong	Correct
III. 2.2.4		
III. 2.2.10 Description 1		 10-15-03
III. 4.3 (b)		
III. 4.11 (c)	 09-07-02	 09-07-02
III. 5.8	(a)  02-01-01 (b)  02-05-01	(a)  (IEC) (b)  (IEC)

Position	Wrong	Correct
III. 5.9	(a)  02-01-01 (b)  02-05-01	(a)  (IEC) (b)  02-05-05
III. 5.11 (a)	(a)  02-05-03	(a)  (IEC)
III. 6.2.16 Description 2 (b)		 (09-01-04;)
III. 7.7	 10-21-10	 10-21-10
III. 7.7 Description 1	 f ₁ f ₂ f	 (IEC)
III. 7.7 Description 2	 f ₁ f ₂ f 10-21-12	 f ₁ f ₂ f 10-21-12
III. 7.8	 10-21-13	 10-21-13
III. 7.9	 10-21-16	 10-21-16

Position	Wrong	Correct
III. 8.2.3.2 Description (a)	 10-09-08	 10-09-08
III. 9.2.2 to 9.2.4 Description (1)	 (03-03-05)	 10-24-04
IV. 1.12 In service	 11-02-06	 11-02-06
IV. 3.18 Multi-line	 03-04-05	 03-04-05
IV. 3.19 Description	 Side of on-off	 Side of on-off

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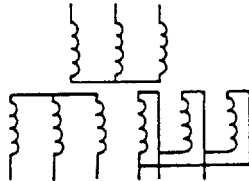
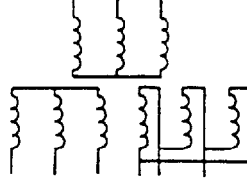
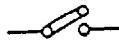
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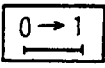
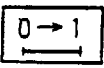
The English version of this Standard is available in the form of duplicate.

This errata is for correcting the duplicates purchased by January 25, 1995.

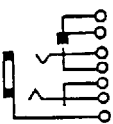
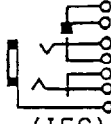
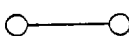
ERRATA I
(in the sentences)

Page	Position	Wrong	Correct
5	I. 1.1.1 Description Example 2.	2M-220/100V	2M-220/110V
8	I. 1.2.3 Description line 1	Information on control board ...	Information on controlled variable ...
	I. 1.2.4 Description line 1	Information on control board ...	Information on controlled variable ...
27	I. 2.3.7 Description (a)	This is a resistor with inherent non-linear variability, voltage dependent, and U may be replaced by V.	U may be replaced by V.
70	II. 3.2.5 Multi-line graphical symbol	 (IEC)	 (06-10-18)
95	II. 6.5.1 Description 2. (a)	After the "Flow" and mark, insert "The number starting from '27' shows the item number specified in IEC Pub. 27-1."	
109	II. 8.24 Series 1	 03-03-18	 03-03-19
113	(5) (e) line 1	The number starting from "27- 1"...	The number starting from "27" ...
	(5) (e) line 2	(Characteristic Quantity Symbols) is the	(Characteristics Quantity .. Symbols) is the item
	(5) (e) line 3	... in IEC publication 27.	... in IEC publication 27-1.

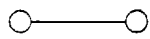
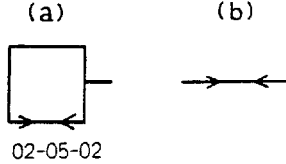
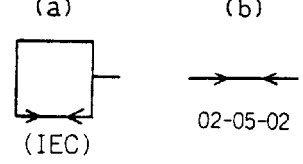
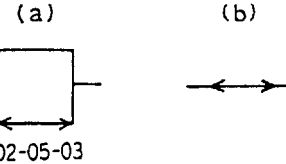
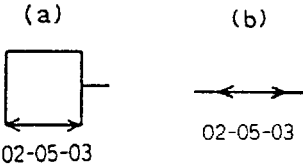
ERRATA I
(in the sentences)
(continued)

Page	Position	Wrong	Correct
114	II. 11.1.5 Series 1	I (27-67)	I 27-67
116	II. 11.1.16 Series 1	$P \leftarrow$	$P \leftarrow$ (IEC)
117	II. 11.1.27 Description line 2	in small letter.	in a small letter.
	II. 11.1.28 Series 1	n 27-104	n (IEC)
	II. 11.1.29 Description line 2	in small letter.	in a small letter.
123	II. 11.4.30 Description 2.	2. Symbols in series 2...	2. Symbols in series 1...
124	II. 11.4.35 II. 11.4.36 Description	(addition)	Rule a line between II. 11.4.35 and II. 11.4.36.
125	II. 11.4.43 Series 1	 07-187-02	 07-18-02
126	II. 11.4.52 Description line 2	written small letter.	written in a small letter.
128	II. 11.5.1 Description line 2	Setting range 5 to 80 V,	Setting range 50 to 80 V,
132	II. 12.1.13 Description	(addition)	Add "v is written in a small letter."
140	II. 14.1.5 Description line 13	Y Transducer	X Transducer
169	III. 1.2.3 (42) Name	Photo-conductive cell with symmetrical conductivity light dependent resistor	Light dependent resistor, photo- conductive cell with symmetri- cal conductivity

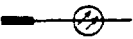
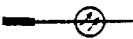
ERRATA I
(in the sentences)
(continued)

Page	Position	Wrong		Correct	
169	III. 1.2.3 (43) Name	Photodiode...		Photodiode,...	
181	III. 1.4.12 Series 1				
	III. 1.4.13 Description	1. Graphical symbols of (a) and (b) denote plugs and that of (c) and (d) jacks. 2. Use of graphical symbols (a) and (c) is recommended.		Graphical symbols of (a) and (b) denote plugs and that of (c) and (d) jacks.	
182	III. 1.4.14 Description	1. Use of graphical symbol (a) is recommended. 2. Multi-pole plug and ...		Multi-pole plug and ...	
190	III. 1.5.3.19 Name	Magnetic head for writing, reading (recording) and erasing (monophonic)		Magnetic head for writing (recording), reading and erasing (monophonic)	
201	III. 3.1.3 Name, Graphical symbol	Name	Graphical symbol	Name	Graphical symbol
		Circuits, transmission path (usage) Type of information transmission (according to Enforcement Regulation of Radio Law) No information Telegraph (for audio receiving)	(1) N A B C D E F W X (2) 	Circuits, transmission path (usage) Type of information transmission (according to Enforcement Regulation of Radio Law) No information Telegraph (for audio receiving)	(1) N A B C D E F W X
202		Telegraph (for automatic receiving) Facsimile Transmission of data Telephone (including broadcasting of music) Television (picture only) Combination of above systems Others		Telegraph (for automatic receiving) Facsimile Transmission of data Telephone (including broadcasting of music) Television (picture only) Combination of above systems Others	

ERRATA I
(in the sentences)
(continued)

Page	Position	Wrong	Correct	
202 (con- tinued)	III. 3.1.3 Name, Graphical symbol (continued)		Name	Graphical symbol
				(2) 
	III. 3.1.3 Description 4.	The use of abbreviation should be limited within ...	The use of abbreviation to express the usage in detail should be limited within ...	
206	III. 4.1 Description	(addition)	Add "T complies with 10-01-02 in IEC Pub. 617-10."	
211	III. 5.10 Name, Graphical symbol	Full duplex 	Propagation on both ways (simultaneous transmission and reception) 	
	III. 5.11 Name, Graphical symbol	Half duplex 	Propagation on both ways (alternate transmission and reception) 	
225	III. 8.1.16 Description	Normally indicated as. 	1. Normally indicated as.  2. Former graphical symbol is indicated in III. 8.1.32.	

ERRATA I
(in the sentences)
(continued)

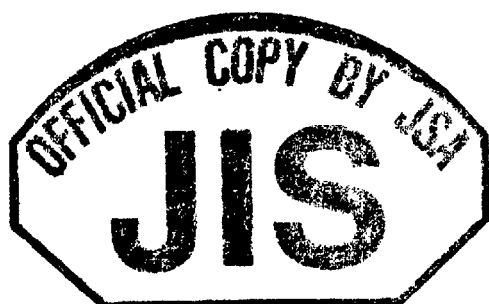
Page	Position	Wrong	Correct																				
242	III. 9.1.3 Description	Reflective index identifiers...	1. Reflective index identifiers ...																				
243	II. 9.1.5 Description	Supplementary information ... An optical fiber cable ... When a single line ...	2. Supplementary information ... 3. An optical fiber cable ... 4. When a single line ...																				
244	III. 9.2.2 Graphical symbol	(1)  (03-03-03)	(1)  (IEC)																				
252	IV. 3.9 Description	* denotes corrected position. Example: <table border="0" style="margin: auto;"> <tr> <td style="text-align: center;">Kind of wire</td> <td style="text-align: center;">Kind of pipe</td> <td style="text-align: center;">Inside diameter of pipe</td> <td style="text-align: center;">Number of pipes</td> </tr> <tr> <td style="text-align: center;">6 kV CVT</td> <td style="text-align: center;">22^a</td> <td style="text-align: center;">R</td> <td style="text-align: center">(100) x 6</td> </tr> <tr> <td colspan="4" style="text-align: center;">  </td> </tr> <tr> <td colspan="4" style="text-align: center;">CL 145.5</td> </tr> <tr> <td colspan="4" style="text-align: center;">Spacing between centers of manholes *</td> </tr> </table>		Kind of wire	Kind of pipe	Inside diameter of pipe	Number of pipes	6 kV CVT	22 ^a	R	(100) x 6					CL 145.5				Spacing between centers of manholes *			
Kind of wire	Kind of pipe	Inside diameter of pipe	Number of pipes																				
6 kV CVT	22 ^a	R	(100) x 6																				
																							
CL 145.5																							
Spacing between centers of manholes *																							
		Examples of kinds of pipe: SGP Steel pipe . . . MP Porcelain pipe	Examples of kinds of pipe: SGP Steel pipe . . . CP Porcelain pipe																				
261	V. 2.8 Description 2. (2) line 21	PEP Fiber reinforced...	PFP Fiber reinforced...																				

JIS

JAPANESE INDUSTRIAL STANDARD

Graphical symbols for
electrical apparatus

JIS C 0301-1990



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Translation without guarantee
In the event of any doubt arising, the original
standard in Japanese is to be evidence

Translated

by

Japanese Standards Association

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Tokyo 107 Japan

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JAPANESE INDUSTRIAL STANDARD

J I S

Graphical symbols for electrical apparatus

C 0301-1990

1. Scope

This Japanese Industrial Standard specifies graphical symbols for use in diagrams of electrical circuits, apparatus, installation, diagrams which show the connection between them, and similar electrical diagrams.

Remark: International standards corresponding to this Standard are shown in Attached Table 1.

2. Ways of Looking and Using this Standard

- (1) In 1. Common application symbols, graphical symbols for use in electrical category and telecommunication category in common are arranged as described below.
 - (a) The elemental symbols of I.1 are symbols which serve as components of graphical symbols and are almost used in combination with another symbol though they are sometimes used independently.
 - (b) The characteristic quantity symbols (I.1.9 and II.11.1) and the auxiliary symbols (II.1.1, II.1.2, II.1.3, II.6.1, II.11.2, II.11.3, III.1.2.2 and III.1.6.2) are used in combination with a basic graphical symbol and supplement the meaning of the basic graphical symbol.
 - (c) The basic graphical symbols themselves are used generally.
 - (d) In the power equipment graphical symbols of II and the power installation graphical symbols of IV., symbols mainly used in electrical category are arranged, and in the telecommunication equipment graphical symbols of III. and the telecommunication installation graphical symbols of V., symbols mainly used in telecommunication category are arranged, for convenience of the users.

For equipment for which no symbol is specified in this Standard or for which this Standard is not enough, the equipment shall be denoted by the combination of the symbols specified in this Standard. It is recommended that such an equipment is denoted by combination of other graphical symbols, and addition of letters and marks if necessary.

- (2) In each graphical symbol, the relationship with IEC standard is expressed as follows:

- (a) When the symbol is completely complying with IEC standard.

The IEC No. is indicated below the graphical symbol ("IEC No." is not a part of graphical symbol).

- (b) When a part of graphical symbol is modified within permissible range of the IEC standard.

The IEC No. is indicated in parentheses below the graphic symbol ("IEC No." is not a part of graphical symbol).

- (c) When the graphical symbol is drawn by combining the element symbol and basic symbol of IEC standard.

The IEC is indicated below the graphical symbol ("IEC" is not a part of graphical symbol).

- (d) For symbols peculiar to this country not specified in IEC standard, only the graphical symbol is stated.

Figure 1 is the case when the symbol is completely complying with IEC standard and corresponds the above (a).

Figures 2, 3 and 4 show graphic symbols drawn by modifying Fig. 1 in the permissible range of IEC standard and correspond to the above (b).

Fig. 1

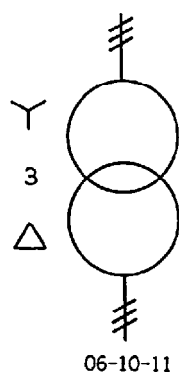


Fig. 2

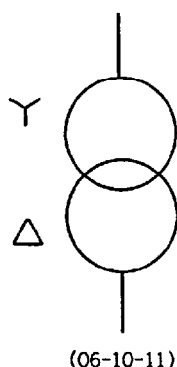


Fig. 3

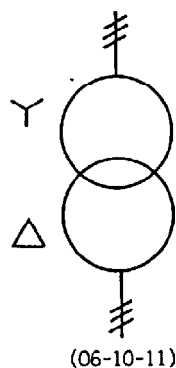


Fig. 4

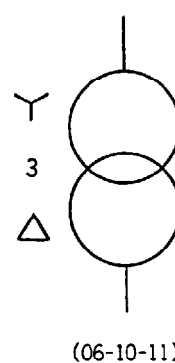


Fig. 5 shows the graphical symbol drawn by combining the IEC elemental graphic symbol 02-13-05 shown in Fig. 6. and the basic graphical symbol 07-02-03 shown in Fig. 7, and corresponds to the above (c).

Fig. 5

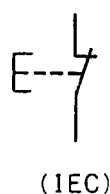


Fig. 6

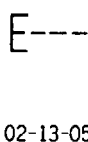


Fig. 7



- (3) Precedence of graphic symbols when two or more kinds are specified.

When stated (1) and (2) in the column of graphical symbol, (1) is recommended.

When stated (a) and (b), either may be used.

In a drawing, graphical symbols which denote the same function shall not be mixed.

- (4) When either of graphical symbol for single-line diagram or that for multi-line diagram is not specified, it is recommended that the specified one is used as practical for the need.
- (5) Graphical symbols of series 1 and series 2 are shown for contacts, control switches, power switching devices, control devices and protective relays, use of series 1 is recommended because series 1 is considered to meet IEC standard.
- (6) If the number of phases, number of lines, frequency, voltage, etc. of the given graphical symbol differ from those under actual operation, these parameters shall be modified as given below.

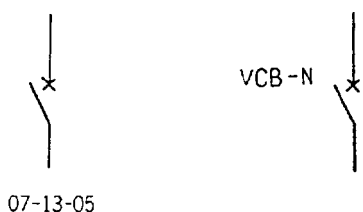
Example: When voltage and frequency are different

I.1.1.4 description (c)	Actual
3 N to 50 Hz 400/230 V	→ 3N to 60 Hz 6600/380 V
02-02-07	

- (7) It is free to change the size of graphical symbol, but dimensional similarity shall be maintained as far as possible. However, such modification that the thickness of line is changed for identification of usage may be made.
- (8) The graphical symbol may be used for the equipment of similar performance, in such a case the performances shall be clearly indicated by means of marks or by other adequate means.

Remark 1. If necessary, numbers or the like are described beside the graphical symbol and a correlated table is located separately for identification.

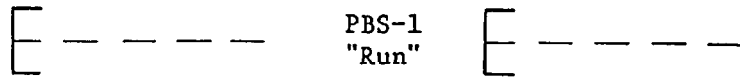
Example: For II. 7.20 a.c. circuit breaker; the usage of VCB-N is expressed as follows:



Abbreviation	Name of usage
VCB-1	No. 1 generator feeder
VCB-2	No. 2 generator feeder
VCB-3	Station power feeder

2. The abbreviation, usage, etc. may be written beside the graphical symbol, if it is necessary to facilitate understanding of control.

Example: When applied to I.1.7.5 (operated by pushing) of I.1.7 Apparatus and method of operation.



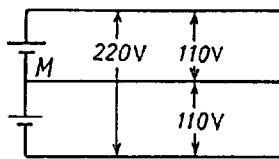
02-13-05

In the above figure, the number PBS-1 and name of operating switch are written.

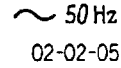
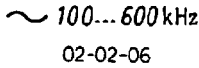
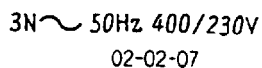
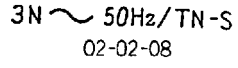
3. In graphical symbols including switching contacts, it shall be understood that the position of the movable part of the contact established in this standard shows one of the following positions:
- (1) In contacts operated electrically or by other energy, the position corresponding to the condition that the electric or other energy source is entirely cut off.
 - (2) In contacts operated manually, the position corresponding to the condition that the operating part is not touched with hand.
 - (3) If the contact can take two or more positions even under the condition of (1) or (2), the normal position at which the contact positions under reset or rest condition. For example, in a fault indicator, the reset condition and in a circuit-breaker with the main contact closed in operation, the open position of the main contact.
 - (4) If the two or more different positions prescribed in (3) have almost equal importance and the positioning of the contact on either side is permissible, for instance, a change-over contact which transfers the control system from automatic to manual operation, or vice versa, an arbitrary condition.
4. Unless the illustrated condition is particularly specified in a diagram, it shall generally be understood that the graphical symbol including the expression of switching contacts shows the condition given in the above 3., namely in accordance with the graphical symbol established in this standard, even if the power source (for example, battery, generator, etc.) is connected in the diagram.

Such device as the change-over contact prescribed in the above 3. (4) may be represented in an optional position, but any part of the same apparatus shall be indicated in the same position. In this case, it is recommended to show clearly the position wherein the parts are placed. Further, for limit switches, position switches, etc. the conditions under which these switches operate shall be clearly stated.

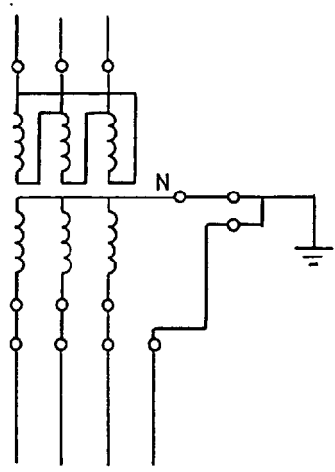
I. Common Graphical SymbolI.1. Elemental SymbolI.1.1 Current

No.	Name	Graphical symbol	Description
I.1.1.1	Direct current	 02-02-01	Example 1. D.C. ammeter D.C. generator  (IEC)  (IEC) Example 2. 2M-220/110 V 02-02-02 (a) The voltage is indicated on the right side of graphical symbol, and the distribution system is indicated on the left of graphical symbol.  The above example shows a d.c. three-wire system including mid-wire (M) and that the total voltage is 220 V and the voltage between each line and the mid-wire is 110 V. (b) The 2M may be indicated as 2+M. 1. The following graphical symbol may be used, if it is necessary to avoid confusion:  02-02-03
I.1.1.2	Positive polarity	 02-02-13	
I.1.1.3	Negative polarity	 02-02-14	

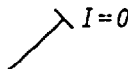
I.1.1 Current (Continued)

No.	Name	Graphical symbol	Description
I.1.1.4	Alternating current		Example 1. A.C. ammeter A.C. generator  (IEC)  (IEC) Example 2. The number of phases is indicated on the left side of graphical symbol and the frequency and voltage are indicated on the right side of graphical symbol, when such parameters are indicated. (a) Expression of 50 Hz is exemplified below.  02-02-05 (b) Expression of 100 kHz to 600 kHz is exemplified below.  02-02-06 (c) Expression of three-phase, 50 Hz with neutral line, line voltage 400 V, and phase voltage 230 V is exemplified below.  02-02-07 The 3N may be indicated as 3+N. (d) Expression of three-phase, 50 Hz with neutral line which is directly grounded is exemplified below.  02-02-08

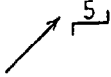
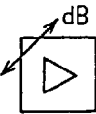
I.1.1.1 Current (Continued)

No.	Name	Graphical symbol	Description
			The 3N may be indicated as 3+N. An example of main circuit is given below.  ~ 50Hz
I.1.1.5	Frequency range	(a)  02-02-09 (b)  02-02-10 (c)  02-02-11	1. (a) is relatively low frequency Examples: Power frequencies Sub-audio frequencies Audio frequencies 2. (b) is medium frequencies Example: Audio frequencies 3. (c) is relatively high frequencies Examples: Radio frequencies Television frequencies
I.1.1.6	Neutral (line)	N 02-02-15	
I.1.1.7	Mid-wire	M 02-02-16	

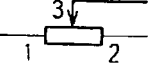
I.1.2 Variability

No.	Name	Graphical symbol	Description
I.1.2.1	Variability, non-inherent	 02-03-01	
I.1.2.2	Variability, non-inherent, non-linear	 02-03-02	
I.1.2.3	Variability, inherent	 02-03-03	Information on controlled variable is shown near the graphical symbol. Examples: Voltage, temperature
I.1.2.4	Variability, inherent, non-linear	 02-03-04	Information on controlled variable is shown near the graphical symbol. Examples: Voltage, temperature
I.1.2.5	Pre-set adjustment	 02-03-05	Information on the condition for adjustment is shown near the graphical symbol. Example: Adjustment permitted only at zero current  02-03-06
I.1.2.6	Continuous variability	 02-03-09	Example 1. Continuously variable  (IEC) Example 2: Pre-set adjustment, continuously variable  02-03-10

I.1.2 Variability (Continued)

No.	Name	Graphical symbol	Description
I.1.2.7	Variability in steps or stepping action	 02-03-07	Example: An example of expression of 5 steps is given below.  02-03-08
I.1.2.8	Automatic control	 02-03-11	Example: An example of amplifier with AGC is given below.  02-03-12 AGC is the abbreviation of automatic gain control.

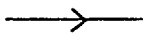
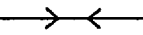
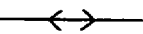
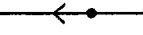
I.1.3 Direction of Force or Motion

No.	Name	Graphical symbol	Description
I.1.3.1	Unidirectional motion or force	 02-04-01	Rectilinear force or motion in the direction of the arrow
I.1.3.2	Bidirectional motion or force	 02-04-02	Example: The example given below shows that the frequency is increased when the brush 3 is moved towards 2, and decreased when the brush is moved towards terminal 1. Frequency Increase ← → Decrease 
I.1.3.3	Unidirectional rotation	 02-04-03	Clockwise rotation is shown.

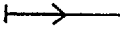
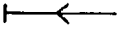
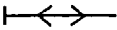
I.1.3 Direction of Force or Motion (Continued)

No.	Name	Graphical symbol	Description
I.1.3.4	Bidirectional rotation	 02-04-04	
I.1.3.5	Bidirectional rotation (limited in both directions)	 02-04-05	
I.1.3.6	Reciprocating motion	 02-04-06	

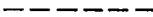
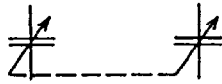
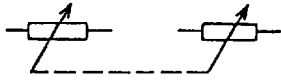
I.1.4 Direction of Flow

No.	Name	Graphical symbol	Description
I.1.4.1	One way flow	 02-05-01	One way flow of energy, signal, etc.
I.1.4.2	Propagation, both ways, simultaneously, Simultaneous transmission and reception	 02-05-02	
I.1.4.3	Propagation, both ways, not simultaneously, Alternate transmission and reception	 02-05-03	
I.1.4.4	Transmission	 02-05-04	

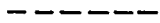
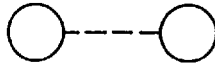
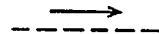
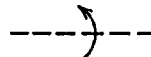
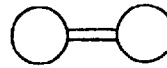
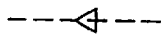
I.1.4 Direction of Flow (Continued)

No.	Name	Graphical symbol	Description
I.1.4.5	Reception	 02-05-05	
I.1.4.6	Energy flow from busbar	 02-05-06	
I.1.4.7	Energy flow toward busbar	 02-05-07	
I.1.4.8	Bidirectional energy flow	 02-05-08	

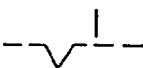
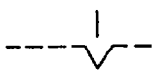
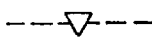
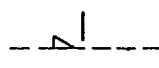
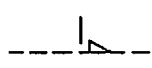
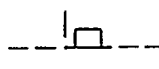
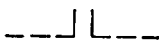
I.1.5 Link

No.	Name	Graphical symbol	Description
I.1.5.1	Link	 02-12-01	Example 1. Linked variable capacitance or capacitor  (IEC) Example 2. Linked variable resistor  (IEC)

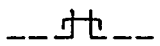
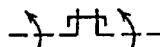
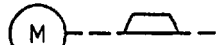
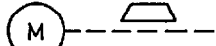
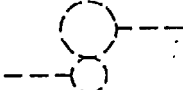
I.1.6 Mechanical Controls

No.	Name	Graphical symbol	Description
I.1.6.1	Link	 02-12-01	1. Mechanical connection Example  (IEC)
			2. Pneumatic connection 3. Hydraulic connection 4. (a) Direction of force or motion is indicated by arrow.  02-12-02
			(b) Direction of rotation, if necessary, is indicated as follows:  02-12-03
			5. The following symbol may be used if the space is limited.  02-12-04
			Example  (IEC)
I.1.6.2	Delayed action	 02-12-05	Delayed action in the direction of movement from the arc towards its center.
		 02-12-06	
I.1.6.3	Automatic return	 02-12-07	△ shows the direction of return.

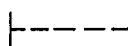
I.1.6 Mechanical Controls (Continued)

No.	Name	Graphical symbol	Description
I.1.6.4	Detent	 02-12-08	1. Non-automatic return. 2. Device for maintaining a given position.
I.1.6.5	Detent (dis-engaged)	 02-12-09	
I.1.6.6	Detent (engaged)	 02-12-10	
I.1.6.7	Mechanical interlock	 02-12-11	Mechanical interlock between two devices.
I.1.6.8	Latching device (dis-engaged)	 02-12-12	
I.1.6.9	Latching device (engaged)	 02-12-13	
I.1.6.10	Blocking device	 02-12-14	
I.1.6.11	Blocking device (engaged)	 02-12-15	Movement to the left is blocked.
I.1.6.12	Clutch mechanical coupling	 02-12-16	

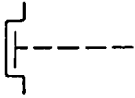
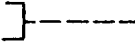
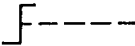
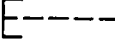
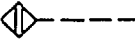
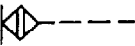
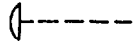
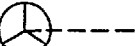
I.1.6 Mechanical Controls (Continued)

No.	Name	Graphical symbol	Description
I.1.6.13	Mechanical coupling (dis-engaged)	 02-12-17	
I.1.6.14	Mechanical coupling (engaged)	 02-12-18	Example 1. Flywheel Example 2. Unidirectional coupling device for rotation is indicated as follows:  02-12-19
I.1.6.15	Brake (General)	 02-12-20	Example 1. The following symbol is used to denote electric motor with brake applied.  02-12-21 Example 2. The following symbol is used to denote electric motor with brake released.  02-12-22
I.1.6.16	Gearing	 02-12-23	

I.1.7 Operating Device and Method

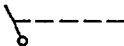
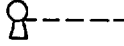
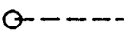
No.	Name	Graphical symbol	Description
I.1.7.1	Manually operated control (general)	 02-13-01	

I.1.7 Operating Device and Method (Continued)

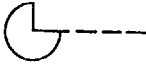
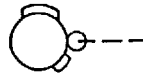
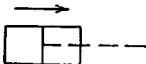
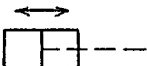
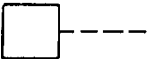
No.	Name	Graphical symbol	Description
I.1.7.2	Manually operated control (restricted access)	 02-13-02	
I.1.7.3	Operated by pulling	 02-13-03	
I.1.7.4	Operated by turning	 02-13-04	Change-over switch operated by turning with locking is exemplified below.  07-07-04
I.1.7.5	Operated by pushing	 02-13-05	
I.1.7.6	Operated by proximity effect	 02-13-06	
I.1.7.7	Operated by touching	 02-13-07	
I.1.7.8	Emergency switch	 02-13-08	
I.1.7.9	Operated by handwheel	 02-13-09	

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C 0301-1990

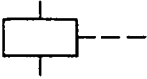
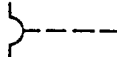
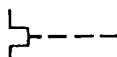
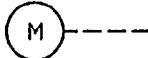
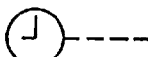
I.1.7 Operating Device and Method (Continued)

No.	Name	Graphical symbol	Description
I.1.7.10	Operated by pedal	 02-13-10	
I.1.7.11	Operated by lever	 02-13-11	
I.1.7.12	Operated by remote handle	 02-13-12	
I.1.7.13	Operated by key	 02-13-13	
I.1.7.14	Operated by crank	 02-13-14	
I.1.7.15	Operated by roller	 02-13-15	

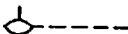
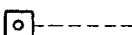
I.1.7 Operating Device and Method (Continued)

No.	Name	Graphical symbol	Description
I.1.7.16	Operated by cam	 02-13-16	1. If desired, more details of the cam may be shown. 2. Example (a) Cam profile drawing may be expressed as follows:  02-13-17 (b) The above (a) may be expressed as follows:  02-13-18 (c) If it is necessary to show the relationship between cam and roller, it may be expressed as follows:  02-13-19
I.1.7.17	Operated by pneumatic or hydraulic control (single acting)	 02-13-21	
I.1.7.18	Operated by pneumatic or hydraulic control (double acting)	 02-13-22	
I.1.7.19	Operated by other system	 02-13-20	Operated by stored mechanical energy

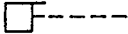
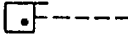
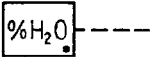
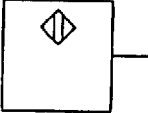
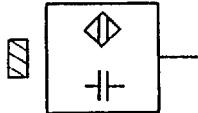
I.1.7 Operating Device and Method (Continued)

No.	Name	Graphical symbol	Description
I.1.7.20	Operated by electro-magnetic actuator	 02-13-23	
I.1.7.21	Operated by electro-magnetic over-current protection	 02-13-24	
I.1.7.22	Operated by thermal over-current protection	 02-13-25	
I.1.7.23	Operated by electric motor	 02-13-26	
I.1.7.24	Operated by electric clock	 02-13-27	

I.1.8 Control by Non-Electrical Quantities

No.	Name	Graphical symbol	Description
I.1.8.1	Control by fluid level	 02-14-01	
I.1.8.2	Control by counter	 02-14-02	

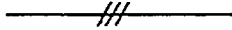
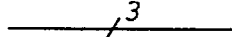
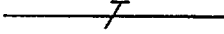
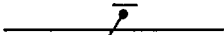
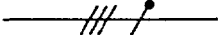
I.1.8 Control by Non-Electrical Quantities (Continued)

No.	Name	Graphical symbol	Description
I.1.8.3	Control by flow	 02-14-03	Control by gas flow is exemplified below.  02-14-04
I.1.8.4	Control by relative humidity	 02-14-05	
I.1.8.5	Proximity sensor	 07-19-01	
I.1.8.6	Proximity sensing device	 07-19-02	Operating method shall be indicated. Example: Capacitive proximity detector operating on the approach of solid material is exemplified below.  07-19-03
I.1.8.7	Touch sensor	 07-19-04	

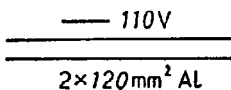
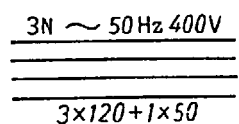
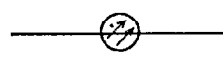
I.1.9 Characteristic Quantity Symbol

No.	Name	Graphical symbol	Description
I.1.9.1	Larger	$>$ 02-06-01	When the characteristic quantity is higher than the setting value.
I.1.9.2	Smaller	$<$ 02-06-02	When the characteristic quantity is lower than the setting value.
I.1.9.3	Larger or smaller	$\geq$ 02-06-03	When the characteristic quantity is either higher than a given high setting or lower than a given low setting.
I.1.9.4	Equal, Zero character- istic quantity	$= 0$ 02-06-04	When the characteristic values are equal. When the characteristic value becomes zero.
I.1.9.5	Deviation	≈ 0 02-06-05	When the value of characteristic quantity differs from zero by a very small amount.

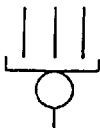
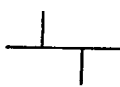
I.2. Basic Graphical SymbolsI.2.1 Conductors and Connections

No.	Name	Graphical symbol	Description
I.2.1.1	Conductor (Cable)	 03-01-01	1. This is widely used for wires, buses, etc. 2. The thickness is changed as needed. 3. If it is desired to show the number of conductors in a single-line diagram, it may be expressed as follows: (a) When 3 conductors  03-01-02 (b) When n conductors, 3 in this figure.  03-01-03 4. If identification of specific conductors is desired in a single-line diagram, it may be expressed as follows: (a) Neutral conductor  11-11-01 (b) Protective conductor  11-11-02 (c) Combined protective and neutral conductor  11-11-03 (d) Three-phase wiring with neutral conductor and protective conductor is exemplified below.  (IEC)

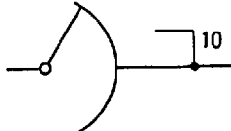
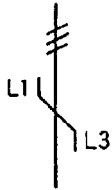
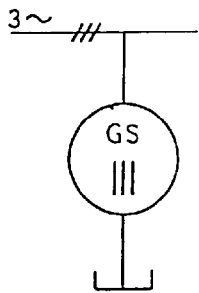
I.2.1 Conductors and Connections (Continued)

No.	Name	Graphical symbol	Description
I.2.1.1	Conductor (Cable)		5. Additional information may be indicated as follows: (a) The distribution system, voltage and frequency are indicated above the graphical symbol, and the size and kind of conductor are indicated below the graphical symbol. (b) D.C. circuit, 110 V, two aluminum conductors of 120 mm² is exemplified below. The kind of conductor shall be indicated by the chemical symbol.  03-01-04 D.C. circuit of 110 V may be indicated as follows:  (c) Three-phase circuit, 50 Hz, 400 V, three conductors of 120 mm² with a neutral conductor of 50 mm², is exemplified below.  03-01-05 6. Optical fiber cable is indicated as given below.  10-23-01

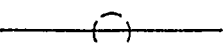
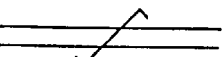
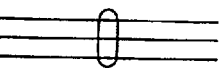
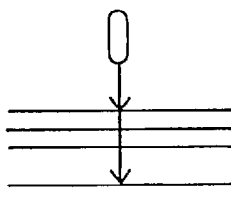
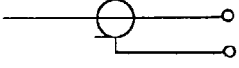
I.2.1 Conductors and Connections (Continued)

No.	Name	Graphical symbol	Description
I.2.1.2	Grouped conductors		1. The oblique line may be replaced by arc line. 2. The curve indicates wiring direction.
I.2.1.3	Joint wires		1. Reference number of conductor is written in ○ . 2. If reference number is unnecessary, ○ may be omitted.
I.2.1.4	Terminal	 03-02-02	
I.2.1.5	Connection of conductors	 03-02-01	
I.2.1.6	Junction of conductors	(1)  03-02-04	(2)  03-02-05
I.2.1.7	Double junction of conductors	(1)  03-02-06	(2)  03-02-07
I.2.1.8	Crossing of conductors (without connection)		

I.2.1 Conductors and Connections (Continued)

No.	Name	Graphical symbol	Description
I.2.1.9	Connection common to a group of similar circuits	 03-02-09	The total number of similar circuits is indicated near the common connection symbol. Example: Multiplied selector switch of 10 banks is given below.  03-02-10
I.2.1.10	Inter-change of conductor, change of phase sequence or inversion of polarity	 03-02-11	This indicates that n conductors are interchanged. This is mainly used in single-line diagrams. Example: Change of phase sequence is given below.  03-02-12
I.2.1.11	Neutral point in multi-phase system	 03-02-13	The n indicates the number of conductors. This is mainly used in single-line diagrams. Example: Synchronous generator, three-phase, each phase brought out and connected at external neutral point, is given below.  03-02-14

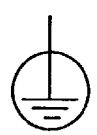
I.2.1 Conductors and Connections (Continued)

No.	Name	Graphical symbol	Description
I.2.1.12	Flexible cable (Cable with flexibility)	 03-01-06	
I.2.1.13	Screened cable	 03-01-07	
I.2.1.14	Twisted cable	 03-01-08	
I.2.1.15	Conductors in a cable	 03-01-09	1. Three-conductor cable is shown. 2. Five-conductor cable with two kinds of conductor is exemplified below.  03-01-10
I.2.1.16	Coaxial cable	 03-01-11	1. Coaxial cable connected to terminal is given below.  03-01-12 2. Coaxial cable with screen is given below.  03-01-13

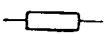
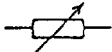
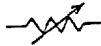
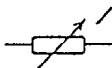
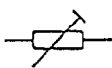
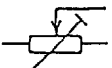
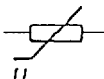
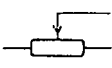
I.2.1 Conductors and Connections (Continued)

No.	Name	Graphical symbol	Description
I.2.1.17	Cable not connected at one end	 03-01-14	
I.2.1.18	Cable not connected at one end (Insulated in a space)	 03-01-15	

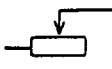
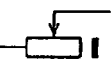
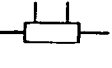
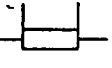
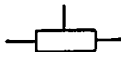
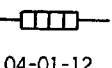
I.2.2 Grounding

No.	Name	Graphical symbol	Description
I.2.2.1	Ground (General)	 02-15-01	
I.2.2.2	Connection to frame	 02-15-04	The hatching may be omitted if there is no ambiguity. The line representing the frame or chassis shall be thicker.  (IEC)
I.2.2.3	Noiseless ground	 02-15-02	
I.2.2.4	Protective ground	 02-15-03	This is used to indicate protection against electric shock in case of a fault.
I.2.2.5	Equipotentiality	 02-15-05	

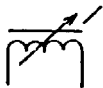
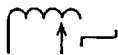
I.2.3 Resistors, Inductors and Capacitors

No.	Name	Graphical symbol	Description
I.2.3.1	Resistor (or re- sistance) general	(a)  04-01-01 (b)  04-01-02	1. In (b), the number of ridges may be changed if especially necessary. 2. The following symbol is used to indicate non-inductive resistor. 
I.2.3.2	Variable resistor, general	 04-01-03	 The above symbol may be used.
I.2.3.3	Continuously variable resistor	 (IEC)	
I.2.3.4	Resistor, pre-set	 (IEC)	
I.2.3.5	Potentiometer, pre-set	 04-01-08	
I.2.3.6	Variable resistor in steps	 (IEC)	
I.2.3.7	Voltage dependent resistor or varistor	(a)  04-01-04 (b) 	(a) U may be replaced by V. (b) This may be expressed as 
I.2.3.8	Potentiometer with sliding contact	 04-01-07	

I.2.3 Resistors, Inductors and Capacitors (Continued)

No.	Name	Graphical symbol	Description
I.2.3.9	Resistor with sliding contact	 04-01-05	
I.2.3.10	Resistor with sliding contact and off position	 04-01-06	
I.2.3.11	Resistor with fixed taps	 04-01-09	
I.2.3.12	Shunt	 04-01-10	In single-line diagrams, this may be indicated as given below.  (IEC)
I.2.3.13	Carbon-pile resistor (resistor composed of carbon disks)	 04-01-11	
I.2.3.14	Heating element	 04-01-12	
I.2.3.15	Winding or coil	(a)  04-03-01 (b)  04-03-02	1. In (a) the number of ridges may be changed, if especially necessary.

I.2.3 Resistors, Inductors and Capacitors (Continued)

No.	Name	Graphical symbol	Description
I.2.3.16	Inductor or reactor	(a)  04-03-01 (b)  04-03-02	1. In (a) the number of ridges may be changed, if especially necessary. 2. If it is especially necessary to show that the inductor has magnetic core it is expressed as follows:  04-03-03
I.2.3.17	Variable inductor	 (IEC)	
I.2.3.18	Continuously variable inductor	 04-03-05	
I.2.3.19	Pre-set inductor	 (IEC)	
I.2.3.20	Continuously variable pre-set inductor	 (IEC)	
I.2.3.21	Inductor, variable in steps	 04-03-07	
I.2.3.22	Inductor with fixed tapplings	 04-03-06	The case of two taps is shown.

1. In (a) the number of ridges may be changed, if especially necessary.

2. If it is especially necessary to show that the inductor has magnetic core it is expressed as follows:



04-03-03