SRI LANKA STANDARD 690 : PART 2 . 1985
UDC 003 . 62 : 621 . 3

GRAPHICAL SYMBOLS USED IN ELECTROTECHNOLOGY

PART 2 – KINDS OF CURRENT DISTRIBUTION SYSTEMS, METHODS OF CONNECTION AND CIRCUIT ELEMENTS

SRI LANKA STANDARDS INSTITUTION

GRAPHICAL SYMBOLS USED IN ELECTROTECHNOLOGY

PART 2 : KINDS OF CURRENT DISTRIBUTION SYSTEMS, METHODS OF CONNECTION AND CIRCUIT ELEMENTS

SLS 690:Part 2:1985

Gr. 8

SRI LANKA STANDARDS INSTITUTION
53, Dharmapala Mawatha,
Colombo 3,
Sri Lanka.

CONSTITUTION OF THE DRAFTING COMMITTEE

CHAIRMAN	*REPRESENTING*
Dr. J.R. Lucas	University of Moratuwa
MEMBERS	
Dr. D.M.G.T. Chulatunga	Ceylon Institute of Scientific and Industrial Research
Mr. Terrance Gunasekera	State Engineering Corporation of Sri Lanka
Mr. A. Sooriyarachchi	Sri Lanka Broadcasting Corporation
Mr. G.B. Wimalaratna	National Engineering Research & Development Centre of Sri Lanka

TECHNICAL SECRETARIAT

SRI LANKA STANDARDS INSTITUTION

Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This standard does not purport to include all the necessary provisions of a contract.

SRI LANKA STANDARD

GRAPHICAL SYMBOLS USED IN ELECTROTECHNOLOGY

PART 2 : KINDS OF CURRENT DISTRIBUTION SYSTEMS, METHODS OF CONNECTION AND CIRCUIT ELEMENTS

FOREWORD

This Sri Lanka Standard was authorized for adoption and publication by the Council of the Sri Lanka Standards Institution on 1985-04-24, after the draft, finalized by the Drafting Committee on Graphical Symbols, had been approved by the Electrical Engineering Divisional Committee.

This standard is one of the series of Sri Lanka Standards for Graphical Symbols used in electrotechnology. Separate standards for graphical symbols used in different departments of electrical engineering are being prepared. This standard is the second in the series; others, so far prepared are :

Part 1 : Architectural and installations diagrams

It is common in electrical engineering practice to employ graphical symbols to denote the various means and devices used when making diagrams of connections. The connecting devices and the points where they make contact with the apparatus may be indicated in the diagram. With the object of standardizing the symbols to meet the various needs of the electrical industry based as far as possible on symbols internationally agreed, a series of standards are being formulated.

In selecting and devising these symbols the object has been to ensure that symbols, as far as possible, are self explanatory and easy to draw in general use. It may be necessary in detailed diagrams to indicate the physical structure of the apparatus, the actual position of the terminals and so forth, but where possible, the principle of the standard symbols should be followed.

In the preparation of this standard the assistance derived from the publications of the International Electrotechnical Commission, the British Standards Institution and the Indian Standards Institution is gratefully acknowledged.

CHAPTER I : KINDS OF CURRENT, DISTRIBUTION SYSTEMS AND METHODS OF CONNECTION

1 SCOPE

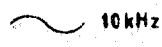
1.1 This standard covers graphical symbols concerning connections and circuit elements, systems distribution and methods of connection.

1.2 The symbols given in 2.1, 2.2 and 2.3 are on principle never used alone. They are shown at the side of other symbols for apparatus, machines or lines for stating precisely the kind of current, the kind of connection of a winding or the kind of distribution system.

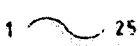
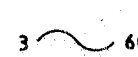
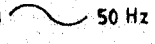
In addition, they are often used for the rating-plates if machines or apparatus.

2.1 Kinds of current

No.	Symbol	Description
2.1.1		Direct current
2.1.2		In the case where the symbol 2.1.1 is not suitable, the symbol 2.1.2 should be used.
2.1.3		Alternating current, general symbol. When it is necessary on a given drawing to distinguish between the different frequency bands, the following symbols may be used:
2.1.4		Power frequencies
2.1.5		Audio frequencies
2.1.6		Super audio, carrier and radio frequencies.

No.	Symbol	Description
2.1.7		As an alternative to 2.1.4, 2.1.5 and 2.1.6, 2.1.3 may be used with the numerical value of the frequency placed at the right hand side of the symbol. Example: Alternating current 10kHz.
2.1.8		Symbol for apparatus and machines suitable either for direct current or alternating current (universal).
2.1.9		Undulating or rectified current.

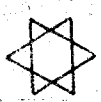
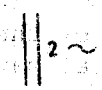
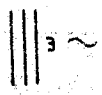
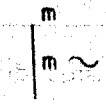
2.2 Distribution systems

No.	Symbol	Description
2.2.1		Alternating current of m phases and frequency f.
2.2.2		Example: Alternating current, single-phase 25Hz.
2.2.3		Example: Alternating current, three-phase 60 Hz.
2.2.4		The voltage may be indicated after the frequency (see also 2.2.7) Example: Alternating current, three-phase, 50Hz, 230V

No.	Symbol	Description
2.2.5	N	Neutral
2.2.6	3N ~ 50	Example: Alternating current, three-phase with neutral, 50 Hz. In certain cases, the following symbol may be used: 3 + N instead of : 3N
2.2.7	3N ~ 50 Hz 400 V	The line-to-line voltage shall be used when indicating the voltage of three-phase circuits Example: Alternating current, three-phase with neutral, 50Hz, 400V (230V between phase and neutral).
2.2.8	n ———	Direct current with n conductors. (Voltage may be indicated on right hand side of the symbol) Example: Direct current, 2 conductors, 110V Direct current, 3 conductors including neutral 220V (110V between outer conductors and neutral)
2.2.9	2 ——— 110 V	
2.2.10	2N ——— 220 V	
2.2.11	+	Positive polarity.
2.2.12	—	Negative polarity.

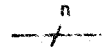
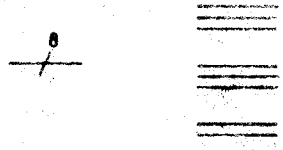
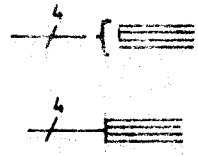
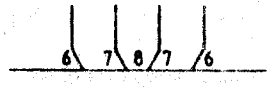
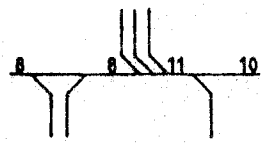
2.3 Methods of connecting windings

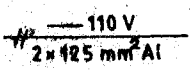
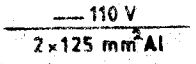
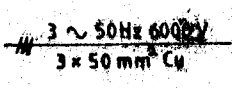
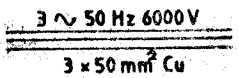
No.	Symbol	Description
2.3.1		One winding
2.3.2		Two separate windings
2.3.3		Three separate windings
2.3.4		m separate windings
2.3.5		2-phase winding
2.3.6		3-phase winding, two windings, V (60^{o})
2.3.7		4-phase winding with neutral brought out. The direction of the stroke representing the neutral can be arbitrarily chosen. (see also **2.3.12** and **2.3.17**).
2.3.8		3-phase winding, T-connected
2.3.9		3-phase winding, delta
2.3.10		3-phase winding, open delta
2.3.11		3-phase winding, star

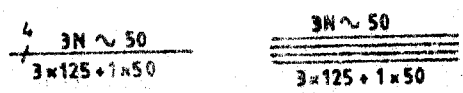
No.	Symbol	Description
2.3.12		3-phase winding, star, with neutral brought out (see 2.3.7).
2.3.13		3-phase winding, zig-zag or inter-connected star.
2.3.14		6-phase winding, double delta
2.3.15		6-phase winding, polygon
2.3.16		6-phase winding, star-connected
2.3.17		Winding 6-phase fork with neutral brought out.
2.3.18		m-phase winding, polygon
2.3.19		m-phase winding, star
2.3.20		2-phase windings, not interconnected
2.3.21		3-phase windings, not interconnected.
2.3.22		m-phase winding, not interconnected. The symbols 2.3.20, 2.3.21 and 2.3.22 used for windings which can be connected in various ways by external means.

3 ELEMENTS OF ELECTRIC CIRCUITS

3.1 Conductors

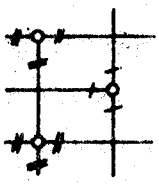
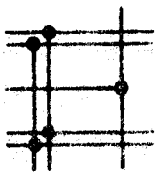
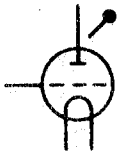
No.	Symbol	Description
3.1.1		One conductor or a group of several conductors (general symbol)
3.1.2		Flexible conductor
3.1.3		Two conductors or two groups of conductors
3.1.4		Three conductors or three groups of conductors
3.1.5		n conductors or n groups of conductors *NOTE - The stroke may be omitted if there is no risk of confusion.*
3.1.6		If the multi-line symbol is composed of more than 4 lines, it is recommended to group them from the top in bundles of 3, the spaces between lines. The bottom group may consist 1 or 2 lines. Example: Eight conductors.
3.1.7		Changing over from a single-line representation to a multi-line representation. Example: Four conductors.
3.1.8	 	Single-line representation of a varying number of conductors following the same path on a diagram. *NOTES* *1 The figure, if used indicates the number of conductors represented by the line at that point.* *2 The figures indicating the number of conductors shall be closer to the conductors referred to.*

No.	Symbol	Description
3.1.9	Indication of conductor particulars	If it is desired to indicate the system of distribution and particulars of the conductor, this should be done in accordance with the following method: a) The following particulars to be indicated above the line and in the following order: The kind of current or the system of distribution, the frequency and the voltage. b) The following particulars to be indicated below the line and in the following order: A numeral indicating the number of conductors of the circuit. A second, separated from the first by a multiplication sign, to indicate the cross-sectional area of each conductor in the usual units of each conductor. If the conductors forming the circuit differ in area, the different areas should be given separated by a plus sign. The material specified by its chemical symbol following the second number.
3.1.10	 	Example: Direct-current circuit, 110V, two conductors of 125mm^2 of aluminium.
3.1.11	 	Example: Three-phase circuit, 50 Hz, 6000V, three conductors of 50mm^2 of copper. The letter symbols of the units may be omitted, if there is no ambiguity.

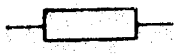
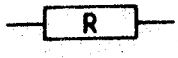
No.	Symbol	Description
3.1.12		Example: Direct-current circuit, 220V(110V between outer conductor and neutral), two conductors of 50mm^2 with neutral of 25 mm^2.
3.1.13		Example: Three-phase circuit, 50Hz three conductors of 125mm^2, with neutral of 50 mm^2.

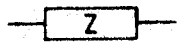
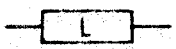
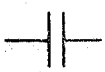
3.2 Terminals and connection of conductors

No.	Symbol	Description
3.2.1		Terminal, connection of conductors,
	or	*NOTE – If it is desired to indicate on which terminal a movable contact is hinged, this may be shown as follows: for the terminal with the hinged portion the symbol* **3.2.1** *for the other terminal the symbol* **3.2.2**.
3.2.2		
3.2.3		Junction of conductors
3.2.4		
3.2.5		The symbol of connection of conductors may be omitted for a simple junction; it must always be used for a double junction.
3.2.6		
3.2.7		
3.2.8		Double junction of conductors

No.	Symbol	Description
3.2.9		Crossing without electrical connection
3.2.10		Single-line representation Example: Crossing and connected conductors
3.2.11		Multi-line representation Example: Crossing and connected conductors
3.2.12		Test point indicator *NOTE - The symbol is used to indicate designated test points.* Example 1:  Example 2: 

3.3 Resistors, windings and capacitors

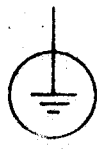
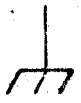
No.	Symbol		Description
	Preferred	Other forms	
3.3.1 3.3.2			Resistance, resistor (if it is not necessary to specify whether it is reactive or not).
3.3.3 3.3.4			Non reactive resistor.

No.	Symbol		Description
	Preferred	Other forms	
3.3.5			Impedance
3.3.6			
3.3.7			Inductance Inductor
3.3.8			
3.3.9			Winding
3.3.10			
3.3.11			Capacitance - Capacitor *NOTE - The distance between the plates shall be not greater than one fifth of the length of the plate.*
3.3.12			

Symbols* **3.3.2 *and* **3.3.9** *are not to be used with two meanings on the same diagram.*

3.4 Other elements

No.	Symbol	Description
3.4.1		Earth (ground) *NOTE - Supplementary information may be given to define the state.* Example: Amend the description: Noiseless (clean) earth (ground)

No.	Symbol	Description
3.4.2		Protective earth (ground) *NOTE - This symbol may be used in place of symbol 53.0 to indicate an earth connection having a specified protective function.* *for example: for protection against electrical shock in case of a fault.*
3.4.3		Frame or chassis
3.4.4		Equipotentiality *NOTE - The symbol may be used on conductors having the same potential but which are not shown directly connected to the same conductor.* *Supplementary information should be placed inside or adjacent to the symbol to indicate the type of equipotential level (for example: common potential level for all conductor symbols having the same reference).*
3.4.5		Example: Frame or chassis earth connection.
3.4.6		Fault *NOTE - The same symbol is used on a plate or piece of apparatus to indicate a "Dangerous voltage" and is shown on a drawing, if desired as represented hereby.*
3.4.7		
3.4.8		Example: Position of fault to frame.
3.4.9		Variability, general symbol *NOTE - The arrow shall be drawn at about 45° to the body of the symbol.*
3.4.10		Variability by steps.

SRI LANKA STANDARDS INSTITUTION

The Sri Lanka Standards Institution (SLSI) is the National Standards Organization of Sri Lanka established under the Sri Lanka Standards Institution Act No. 6 of 1984 which repealed and replaced the Bureau of Ceylon Standards Act No. 38 of 1964. The Institution functions under the Ministry of Science & Technology.

The principal objects of the Institution as set out in the Act are to prepare standards and promote their adoption, to provide facilities for examination and testing of products, to operate a Certification Marks Scheme, to certify the quality of products meant for local consumption or exports and to promote standardization and quality control by educational, consultancy and research activity.

The Institution is financed by Government grants, and by the income from the sale of its publications and other services offered for Industry and Business Sector. Financial and administrative control is vested in a Council appointed in accordance with the provisions of the Act.

The development and formulation of National Standards is carried out by Technical Experts and representatives of other interest groups, assisted by the permanent officers of the Institution. These Technical Committees are appointed under the purview of the Sectoral Committees which in turn are appointed by the Council. The Sectoral Committees give the final Technical approval for the Draft National Standards prior to the approval by the Council of the SLSI.

All members of the Technical and Sectoral Committees render their services in an honorary capacity. In this process the Institution endeavours to ensure adequate representation of all view points.

In the International field the Institution represents Sri Lanka in the International Organization for Standardization (ISO), and participates in such fields of standardization as are of special interest to Sri Lanka.

Printed at the Sri Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.

SLS CERTIFICATION MARK

The Sri Lanka Standards Institution is the owner of the registered certification mark shown below. Beneath the mark, the number of the Sri Lanka Standard relevant to the product is indicated. This mark may be used only by those who have obtained permits under the SLS certification marks scheme. The presence of this mark on or in relation to a product conveys the assurance that they have been produced to comply with the requirements of the relevant Sri Lanka Standard under a well designed system of quality control inspection and testing operated by the manufacturer and supervised by the SLSI *which includes surveillance inspection of the factory, testing of both factory and market samples.*

Further particulars of the terms and conditions of the permit may be obtained from the Sri *Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.*

Printed at SLSI (Printing Unit)