

Graphical symbols for diagrams —

Part 6: Production and conversion of electrical energy

The European Standard EN 60617-6:1996 has the status of a
British Standard

ICS 01.080.30; 29.020

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI
Documents

AVA

Document Sharing Hub

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee GEL/3, Documentation and graphical symbols, upon which the following bodies were represented:

- British Photographic Association
- Consumer Policy Committee of BSI
- Federation of the Electronics Industry
- GAMBICA (BEAMA Ltd.)
- Transmission and Distribution Association (BEAMA Ltd.)

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on 15 December 1996

© BSI 10-1998

The following BSI references relate to the work on this standard:
Committee reference GEL/3
Draft for comment 92/28836 DC

ISBN 0 580 26760 1

Amendments issued since publication

Amd. No.	Date	Comments

Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Foreword	2
Text of EN 60617-6:1996	3

National foreword

This British Standard has been prepared by Technical Committee GEL/3. It is the English language version of EN 60617-6:1996, *Graphical symbols for diagrams Part 6: Production and conversion of electrical energy* published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 617-6:1996 published by the International Electrotechnical Commission (IEC).

This British Standard replaces BS 3939-6:1985 which is withdrawn.

NOTE The French language version of the alphabetic index has not been included.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 41 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

ICS 01.080.30

Descriptors: Electric conversion, production of electrical energy, electric diagram, electrical symbol

English version

Graphical symbols for diagrams
Part 6: Production and conversion of electrical energy
(IEC 617-6:1996)

Symboles graphiques pour schémas
Partie 6: Production, transformation et
conversion de l'énergie électrique
(CEI 617-6:1996)

Graphische Symbole für Schaltpläne
Teil 6: Schaltzeichen für die Erzeugung und
Umwandlung elektrischer Energie
(IEC 617-6:1996)

This European Standard was approved by CENELEC on 1996-03-05. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

© 1996 Copyright reserved to CENELEC members

Foreword

The text of document 3A/384/FDIS, future edition 2 of IEC 617-6, prepared by SC 3A, Graphical symbols for diagrams, of IEC TC 3, Documentation and graphical symbols, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60617-6 on 1996-03-05.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-02-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-02-01

Contents

	Page
Introduction	3
Chapter I: Qualifying symbols for winding interconnections	
Section 1 Separate windings	4
Section 2 Internally connected windings	5
Chapter II: Machines	
Section 3 Elements of machines	7
Section 4 Types of machines	8
Section 5 Examples of direct current machines	9
Section 6 Examples of alternating current commutator machines	10
Section 7 Examples of synchronous machines	11
Section 8 Examples of induction type (asynchronous) machines	13
Chapter III: Transformers and reactors	
Section 9 General symbols for transformers and reactors	16
Section 10 Examples of transformers with separate windings	19
Section 11 Examples of auto-transformers	25
Section 12 Examples of induction regulators	26
Section 13 Examples of measuring transformers and pulse transformers	27
Chapter IV: Power converters	
Section 14 Block symbols for power converters	31
Chapter V: Primary and secondary cells and batteries	
Section 15 Primary and secondary cells	32
Chapter VI: Power generators	
Section 16 General symbol for non-rotary power generators	33
Section 17 Heat sources	33
Section 18 Examples of power generators	34
Section 19 Closed-loop controllers	36
Annex A (informative) Older symbols	37
Annex B (informative) English alphabetic index	38

Introduction

This part of IEC 617 forms an element of a series which deals with graphical symbols for diagrams.

The series consists of the following parts:

- *Part 1: General information, general index. Cross-reference tables;*
- *Part 2: Symbol elements, qualifying symbols and other symbols having general application;*
- *Part 3: Conductors and connecting devices;*
- *Part 4: Basic passive components;*
- *Part 5: Semiconductors and electron tubes;*
- *Part 6: Production and conversion of electrical energy;*
- *Part 7: Switchgear, controlgear and protective devices;*
- *Part 8: Measuring instruments, lamps and signalling devices;*
- *Part 9: Telecommunications: Switching and peripheral equipment;*
- *Part 10: Telecommunications: Transmission;*
- *Part 11: Architectural and topographical installation plans and diagrams;*
- *Part 12: Binary logic elements;*
- *Part 13: Analogue elements.*

The scope and the normative references for this series are given in IEC 617-1.

Symbols have been designed in accordance with requirements given in the future ISO 11714-1¹⁾. The module size $M = 2,5 \text{ mm}$ has been used. For better readability smaller symbols in this standard have been enlarged to double size and are marked “200 %” in the symbol column. To save space larger symbols have been reduced to half size and are marked “50 %” in the symbol column. In accordance with the future ISO 11714-1, clause 7, symbol dimensions (for instance height) may be modified in order to make space for a greater number of terminals or for other layout requirements. In all cases, whether the size is enlarged or reduced, or dimensions modified, the thickness of the original line should be maintained without scaling.

The symbols in this standard are laid out in such a way that the distance between connecting lines is a multiple of a certain modulus. Modulus 2M has been chosen to provide enough space for the required terminal designation. The symbols have been drawn to a size convenient for comprehension, using consistently the same grid in the representation of all symbols.

All symbols are designed within a grid in a computer-aided draughting system. The grid which was used has been reproduced in the background of the symbols.

The older symbols which were included in appendix A of the first edition of IEC 617-6 for a transitional period, are no longer part of this second edition, as they will definitely be withdrawn from use.

The indexes in Annex B and C include an alphabetic list of symbol names and their corresponding number. The symbol names are based on the description of the symbols of this part. A general index including an alphabetic list of symbols of all parts is given in IEC 617-1.

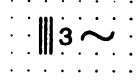
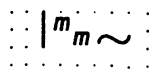
¹⁾ At present, at the stage of Draft International Standard (document 3/563/DIS).

Chapitre I: Symboles distinctifs pour l'interconnexion des enroulements

Section 1 — Enroulements séparés

Chapter I: Qualifying symbols for winding interconnections

Section 1 — Separate windings

No.	Symbole Symbol	Légende	Description
06-01-01		Un enroulement 1. Il convient d'indiquer le nombre d'enroulements séparés: — soit par le nombre de traits dessinés, — soit par un nombre inscrit à côté du symbole.	One winding 1. The number of separate windings should be indicated: — either by the number of strokes drawn, — or by adding a figure to the symbol.
06-01-02		EXEMPLES: Trois enroulements séparés	EXEMPLES: Three separate windings
06-01-03		Six enroulements séparés 2. Le symbole 06-01-01 peut aussi être utilisé pour représenter des enroulements à phases séparées permettant, par des moyens extérieurs, différents modes de connexion.	Six separate windings 2. Symbol 06-01-01 may also be used to represent windings which can be externally connected in various ways.
06-01-04		EXEMPLES: Enroulement triphasé, à phases séparées	EXEMPLES: Three-phase winding, phases not interconnected
06-01-05		Enroulement polyphasé, à m phases séparées	m -phase winding, phases not interconnected
06-01-06		Enroulement diphasé, quatre fils	Two-phase winding, four-wire

Section 2 — Enroulements connectés intérieurement

2.1 Le mode de connexion des enroulements de transformateurs peut également être indiqué par des codes. Voir la CEI 76: Transformateurs de puissance.

Section 2 — Internally connected windings

2.1 The method of connecting transformer windings may also be indicated by codes. See IEC Publication 76: Power Transformers.

No.	Symbole Symbol	Légende Description	Description
06-02-01		Enroulement diphasé	Two-phase winding
06-02-02		Enroulement triphasé partiel, en V (60°)	Three-phase winding, V (60°)
06-02-03		Enroulement tétraphasé, avec neutre sorti	Four-phase winding with neutral brought out
06-02-04		Enroulement triphasé, en T	Three-phase winding, T
06-02-05		Enroulement triphasé, en triangle Ce symbole peut aussi être utilisé pour représenter des enroulements multiphasés connectés en polygone, en précisant par un chiffre le nombre de phases.	Three-phase winding, delta This symbol may be used to symbolize a multiphase polygon connection of windings by adding a figure to denote the number of phases.
06-02-06		Enroulement triphasé, en triangle ouvert	Three-phase winding, open delta
06-02-07		Enroulement triphasé, en étoile Ce symbole peut aussi être utilisé pour représenter des enroulements multiphasés connectés en étoile, en précisant par un chiffre le nombre de phases.	Three-phase winding, star This symbol may be used to symbolize a multiphase star connection of windings by adding a figure to denote the number of phases.
06-02-08		Enroulement triphasé, en étoile, avec neutre sorti	Three-phase winding, star, with neutral brought out

No.	Symbole Symbol	Légende	Description
06-02-09		Enroulement triphasé, en zigzag	Three-phase winding, zigzag or interconnected star
06-02-10		Enroulement hexaphasé, en double triangle	Six-phase winding, double delta
06-02-11		Enroulement hexaphasé, en polygone	Six-phase winding, polygon
06-02-12		Enroulement hexaphasé, en étoile	Six-phase winding, star
06-02-13		Enroulement hexaphasé, en double zigzag, avec neutre sorti	Six-phase winding, fork with neutral brought out

Chapitre II: Machines

Section 3 — Éléments de machines

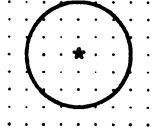
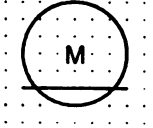
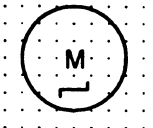
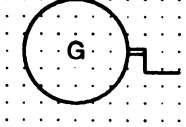
Chapter II: Machines

Section 3 — Elements of machines

No.	Symbole Symbol	Légende	Description
06-03-01		Distinction entre divers types d'enroulements ayant différentes fonctions: Enroulement de commutation ou de compensation	Differentiation between windings having different functions: Commutating or compensating winding
06-03-02		Enroulement série	Series winding
06-03-03		Enroulement d'excitation en dérivation ou séparé	Shunt winding or separate winding
06-03-04		Balai (sur bague ou sur collecteur à lames) Les balais sont représentés seulement si cela est nécessaire. Comme exemple d'application, voir le symbole 06-05-03.	Brush (on slip-ring or commutator) Brushes are shown only if necessary. For an example of application, see symbol 06-05-03.

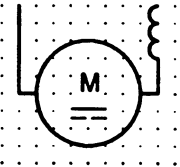
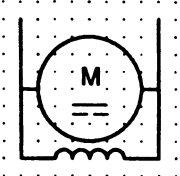
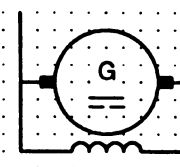
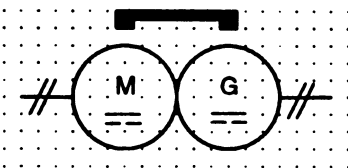
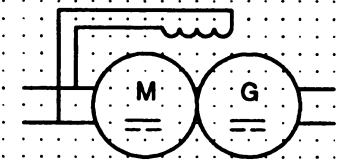
Section 4 — Types de machines

Section 4 — Types of machines

No.	Symbole Symbol	Légende	Description
06-04-01		Machine, symbole général L'astérisque, *, doit être remplacé par un des symboles littéraux suivants: C Commutatrice G Génératrice GS Alternateur synchrone M Moteur MG Machine pouvant servir comme génératrice ou comme moteur MS Moteur synchrone Les symboles 02-02-01 et 02-02-04 peuvent compléter le symbole comme indiqué dans les symboles des sections 5 à 8 Pour les générateurs de puissance non-rotatifs, voir section 16	Machine, general symbol The asterisk, *, shall be replaced by one of the following letter designations: C Rotary converter G Generator GS Synchronous generator M Motor MG Machine capable of use as a generator or motor MS Synchronous motor The symbols 02-02-01 and 02-02-04 may be added, as shown in Sections 5 to 8 For non-rotary power generators, see section 16
06-04-02		Moteur linéaire, symbole général	Linear motor, general symbol
06-04-03		Moteur pas à pas, symbole général	Stepping motor, general symbol
06-04-04		Générateur à commande manuelle (magnéto d'appel)	Hand-generator (magneto caller)

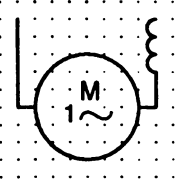
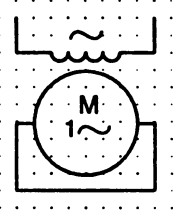
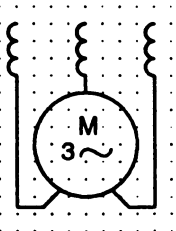
Section 5 — Exemples de machines à courant continu

Section 5 — Examples of direct current machines

No.	Symbole Symbol	Légende Description	Description
06-05-01		Moteur série, DC	Series motor, DC
06-05-02		Moteur shunt (à excitation en dérivation), DC	Shunt motor, DC
06-05-03		Génératrice DC à excitation composée à courte dérivation, représentée avec bomes et balais	Generator, DC, compound excited (short shunt), shown with terminals and brushes
06-05-04		Convertisseur rotatif, DC/DC avec excitation commune par aimant permanent	Rotary converter, DC/DC with common permanent magnet field
06-05-05		Convertisseur rotatif, DC/DC avec enroulement d'excitation commun	Rotary converter, DC/DC with common excitation winding

Section 6 — Exemples de machines à courant alternatif à collecteur

Section 6 — Examples of alternating current commutator machines

No.	Symbole Symbol	Légende	Description
06-06-01		Moteur série, monophasé	Series motor, single-phase
06-06-02		Moteur à répulsion, monophasé	Repulsion motor, single-phase
06-06-03		Moteur série, triphasé	Series motor, three-phase