

Graphical symbols for diagrams —

Part 13: Analogue elements

The European Standard EN 60617-13:1993 has the status of a
British Standard

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This British Standard, having been prepared under the direction of the General Electrotechnical Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 May 1993

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Contents

	Page
Cooperating organizations	Inside front cover
National foreword	ii
Foreword	2
Text of EN 60617-13	3
National annex NA (informative) Committees responsible	Inside back cover
National annex NB (informative) Cross-references	Inside back cover

National foreword

This British Standard has been prepared under the direction of the General Electrotechnical Standards Policy Committee and is the English language version of EN 60617-13 *Graphical symbols for diagrams — Part 13: Analogue elements*, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC Publication 617-13:1993, which has the same title as the European Standard. It supersedes BS 3939-13:1985 which is withdrawn.

References to page numbers in Annexes A to C are to IEC page numbers which are given in square brackets at the bottom of each page of the text of EN 60617. It is envisaged that all Parts of IEC 617 will be adopted by CENELEC as Parts of EN 60617. British Standards identical in number and title will be published as further Parts of BS EN 60617 in due course, superseding the equivalent Parts of BS 3939.

BS 3939 consists of the following Parts.

- *Part 1: General information, general index;*
- *Part 2: Symbol elements, qualifying symbols and other symbols having general application;*
- *Part 3: Conductors and connecting devices;*
- *Part 4: 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: Guide to binary logic elements.*

To take account of the development of computer draughting, the symbols have been designed to a grid. A transparent over-lay with this grid is included in BS 3939-1.

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.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 38, an inside back cover 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.

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Descriptors: Graphical symbols for diagrams, analogue quantities, analogue elements, mathematical operation

English version

Graphical symbols for diagrams Part 13: Analogue elements

(IEC 617-13:1993)

Symboles graphiques pour schémas
Partie 13: Opérateurs analogiques
(CEI 617-13:1993)

Schaltzeichen für Schaltungsunterlagen
Teil 13: Analoge Elemente
(IEC 617-13:1993)

This European Standard was approved by CENELEC on 1992-03-24. 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.

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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

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Foreword

The text of document 3A(CO)210, as prepared by IEC sub-committee 3A: Graphical symbols for diagrams, of IEC technical committee 3: Documentation and graphical symbols, was submitted to the IEC-CENELEC parallel vote in June 1991.

The reference document was approved by CENELEC as EN 60617-13 on 24 March 1992. The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1994-01-15
- latest date of withdrawal of conflicting national standards (dow) 1994-01-15

Annexes designated “normative” are part of the body of the standard. In this standard, Annex ZA is normative.

Contents

	Page
Foreword	2
Chapter I: General	
1 Scope	3
2 Normative references	3
3 General notes	3
Chapter II: Qualifying symbols associated with inputs, outputs and other connections	
4 Qualifying symbols indicating the type of signal	4
5 Qualifying symbols indicating the functions of inputs, outputs and other connections	5
Chapter III: Elements performing mathematical functions	
6 General	14
7 Examples of elements performing mathematical functions	15
8 Amplifiers	16
9 Examples of amplifiers	19
Chapter IV: Converters	
10 General	22
11 Examples of converters	24
Chapter V: Regulators, comparators	
12 Voltage regulators	26
13 Examples of voltage regulators	26
14 Comparators	28
15 Examples of comparators	28
Chapter VI: Miscellaneous	
16 Examples of complex function elements	29
17 Examples of electronic switches	30
18 Other devices	30
Annex A (informative) French alphabetical index	31
Annex B (informative) English alphabetical index	34
Annex C (informative) Index of devices for which symbols are shown	37
Annex ZA (normative) Other international publications quoted in this standard with the references of the relevant European publications	38

Chapter I: General

1 Scope

This part of IEC 617 contains graphical symbols that have been developed to represent functions operating on and/or producing analogue quantities. They are intended also to represent physical devices or combinations of physical devices capable of carrying out these functions.

The symbols have been prepared with a view to electrical applications, but many can also be applied to non-electrical devices, for example pneumatic, hydraulic or mechanical.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 617. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 617 are encouraged to investigate the possibility of applying the most recent editions of the normative documents listed below. Members of IEC and ISO maintain registers of currently valid normative documents.

IEC 27-1:1992, *Letter symbols to be used in electrical technology — Part 1: General*.

IEC 617-2:1983, *Graphical symbols for diagrams — Part 2: Symbol elements, qualifying symbols and other symbols having general application*.

IEC 617-3:1983, *Graphical symbols for diagrams — Part 3: Conductors and connecting devices*.

IEC 617-5:1983, *Graphical symbols for diagrams — Part 5: Semiconductors and electron tubes*.

IEC 617-10:1983, *Graphical symbols for diagrams — Part 10: Telecommunications: Transmission*.

IEC 617-12:1991, *Graphical symbols for diagrams — Part 12: Binary logic elements*.

3 General notes

3.1 Construction and combination of outlines, labels and dependency notation should follow the applicable general rules of IEC 617-12 with the understanding that analogue connections carry a continuous range of signal levels rather than two logic states. Provided the direction of signal flow is clear or properly indicated, inputs may be shown on the right and outputs may be shown on the left if it aids layout of the diagram or better conveys the structure of the device.

3.2 In some figures, lower-case letters that are not part of the symbols have been shown outside the outline just to identify the inputs and outputs as referenced in the description.

3.3 Weighting factors applied to the input signals are each indicated by a sign indicator in combination with a numerical value placed inside the outline of the symbol adjacent to the relevant input.

In this International Standard $w_1, w_2, \dots, w_n$, which are understood to include the proper sign, are used to denote the values of the weighting factors. The symbols for sign indication are + and –. If the weighting factor is + 1 or – 1, such as where a simple non-inverting or inverting input is shown, the number 1 may be omitted.

3.4 In IEC 27, letter symbols for quantities are shown in italic (inclined) type. Upright lettering is allowed and normally used on diagrams. In this International Standard, upright letters are used for all lettering that is intended to be a final part of a symbol or a diagram.

3.5 In IEC 27, the letters V and v are recommended as reserve symbols for voltage; however, in the field of semiconductor devices and generally in the field of electronics, these symbols are so widely used that in graphical symbols prepared in accordance with this International Standard, V and v shall be considered equivalent to U and u including their use in qualifying symbols. In this International Standard, V and v and U and u are considered to be alternative chief symbols for voltage.

3.6 In symbols in this International Standard, the comma has been used for the decimal sign, as recommended in IEC 27-1.

3.7 In this International Standard, the “ φ ” has been used for phase (difference). The “ Φ ” is considered to be equivalent.

3.8 In many cases, examples are based on commercially available devices. Therefore, type numbers and terminal designations (for one unspecified package type) are shown for the assistance of the reader. Where the type number implies the product of a specific manufacturer, this is done to avoid uncertainties caused by functional variations that sometimes occur between devices that have the same generic portion of the type number but are made by different manufacturers.

3.9 Some symbols are shown in this International Standard with external connections or external networks. The function indicated by the symbol might be performed only when these external connections or external networks are present.

3.10 In cases where binary inputs or outputs are shown in this International Standard and the logic polarity indicator has not been used, positive logic convention is to be assumed.

3.11 Label grouping (see 54.6 of IEC 617-12) may be employed to group adjacent and associated connecting lines whose labels are partially alike.

Chapter II: Symboles distinctifs associés aux accès et aux autres connexions

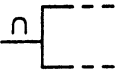
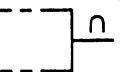
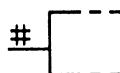
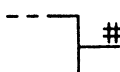
4 Symboles distinctifs indiquant le type de signal

Les symboles $\sqcap$ et # (symboles 02-17-08 et 02-17-09 de la CEI 617-2) doivent être utilisés s'il est nécessaire de distinguer entre eux des signaux analogiques et numériques. S'il y a possibilité de confusion sur la fonction ou le signal, on peut ajouter au symbole distinctif général adjacent les symboles 12-08-01, 12-08-05 et 12-08-06 de la CEI 617-12.

Chapter II: Qualifying symbols associated with inputs, outputs and other connections

4 Qualifying symbols indicating the type of signal

The symbols $\sqcap$ and # (symbols 02-17-08 and 02-17-09 of IEC 617-2) shall be used when it is necessary to distinguish between analogue and digital signals. They may also be added to a general qualifying symbol or placed adjacent to symbols 12-08-01, 12-08-05, and 12-08-06 of IEC 617-12 if confusion is likely regarding whether the function or signal is digital or analogue.

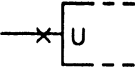
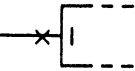
No.	Symbole Symbol	Légende	Description
13-04-01		Entrée analogique	Analogue input
13-04-02		Sortie analogique	Analogue output
13-04-03		Entrée numérique ou binaire	Digital input
13-04-04		Sortie numérique ou binaire	Digital output
13-04-05	Utiliser le symbole 12-10-01 de la CEI 617-12 Use symbol 12-10-01 of IEC 617-12	Connexion auxiliaire Accès d'alimentation du dispositif ou une connexion dont la connaissance n'est pas importante pour comprendre le fonctionnement de l'élément et du circuit (par exemple la connexion de la résistance ou du condensateur supplémentaire).	Subsidiary connection An input supplying power to the device or a connection the knowledge of whose level is not important to understand the function of the element and the circuit (e.g., a connection to an external supplementary resistor or capacitor).

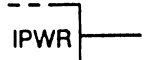
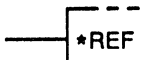
5 Symboles distinctifs indiquant les fonctions des accès et autres connexions

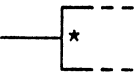
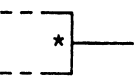
5.1 Une information supplémentaire peut être ajoutée comme suffixe aux symboles distinctifs de cette section, pourvu qu'il n'en résulte aucune confusion.

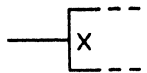
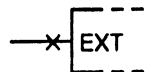
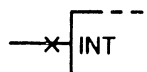
5 Qualifying symbols indicating the functions of inputs, outputs and other connections

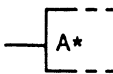
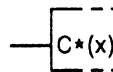
5.1 Any necessary supplementary information may be added to the symbols in this section, provided no confusion is likely.

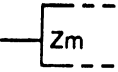
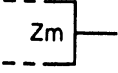
No.	Symbole Symbol	Légende	Description
13-05-01		Accès de tension d'alimentation, figuré côté gauche	Supply-voltage terminal, shown on the left-hand side
13-05-02		Accès d'alimentation en courant, figuré côté gauche Accès connecté à une source de puissance. U [I] peut être suivi par le signe de polarité ou peut être remplacé par — la valeur nominale avec le signe de polarité (par exemple +5 V, 10 mA), ou par — une indication mnémonique, (par exemple VCC, GND). NOTE Les accès d'alimentation ne sont pas toujours représentés.	Supply-current terminal, shown on the left-hand side A terminal to be connected to a source of power. U [I] may be followed by the polarity sign or may be replaced by — the nominal signed value (e.g., +5 V, 10 mA) or by — a suitable mnemonic (e.g., VCC, GND). NOTE Supply terminals are not always shown.

No.	Symbole Symbol	Légende	Description
13-05-03		Sortie de tension d'alimentation	Supply-voltage output
13-05-04		Sortie d'alimentation en courant Sortie d'une source d'alimentation. U [I] peut être suivi par le signe de polarité ou peut être remplacé par — la valeur nominale avec le signe de polarité (par exemple, +5 V PWR, 1 A PWR), ou par — une indication mnémonique, (par exemple VCCPWR, GNDPWR). S'il n'est pas nécessaire de préciser qu'il s'agit d'une sortie de puissance, utiliser le symbole 13-05-08.	Supply-current output An output that is a source of power. U [I] may be followed by the polarity sign or may be replaced by — the nominal signed value (e.g., resulting in +5 V PWR, 1 A PWR), or by — a suitable mnemonic (e.g., resulting in VCCPWR, GNDPWR). If it is not necessary to emphasize the fact that it is a power output, use symbol 13-05-08.
13-05-05		Entrée de référence Entrée connectée à une source de référence.	Reference input An input to be connected to a reference source.
13-05-06		Sortie de référence Sortie utilisée comme source de référence. L'astérisque doit être remplacé par la symbole de la grandeur physique de référence (par exemple U, I, f, φ). Le symbole de grandeur physique peut être suivi par le signe de polarité ou peut être remplacé par — la valeur nominale avec le signe de polarité (par exemple +5 V REF, 10 mA REF), ou par — une indication mnémonique (par exemple VCCREF, GNDREF).	Reference output An output that is a reference source. The asterisk shall be replaced by the symbol for the reference quantity (e.g., U, I, f, φ). The quantity symbol may be followed by the polarity sign or may be replaced by — the nominal signed value (e.g., resulting in +5 V REF, 10 mA REF), or by — a suitable mnemonic (e.g., resulting in VCCREF, GNDREF).

No.	Symbole Symbol	Légende	Description
		S'il n'est pas nécessaire de préciser qu'il s'agit d'une entrée [sortie] de référence, utiliser le symbole 13-05-07 [13-05-08].	If it is not necessary to emphasize the fact that it is a reference input [output] use symbol 13-05-07 [13-05-08].
13-05-07		Entrée de la grandeur physique	Quantity-sensing input
13-05-08		Sortie de la grandeur physique	Quantity output
		Entrée [sortie] pour laquelle la grandeur physique indiquée représente l'information. L'astérisque doit être remplacé par le symbole de la grandeur représentant l'information (par exemple U, I, f, φ). Le symbole de grandeur physique peut être suivi par le signe de polarité ou peut être remplacé par une des indications suivantes de la gamme ou de la valeur fixée: — une ou des valeurs nominales avec le signe de polarité (par exemple +5 V, 0 mA ... 20 mA, 440 Hz) ou — une indication mnémonique (par exemple VCC, GND, A[#]). Si le signe de polarité n'est pas indiqué, U peut être omis si aucune confusion n'est possible. Si ce symbole est combiné avec d'autres symboles (par exemple 13-05-09), il convient de le faire suivre des autres symboles, encadrés, si nécessaire, par des crochets.	Input [output] for which the indicated quantity represents the information. The asterisk shall be replaced by the symbol for the quantity representing the information (e.g., U, I, f, φ). The quantity symbol may be followed by the polarity sign or may be replaced by one of the following indications of the range or fixed value: — a nominal signed value or values (e.g., +5 V, 0 mA ... 20 mA, 440 Hz) or — a suitable mnemonic (e.g., VCC, GND, A[#]). If the polarity sign is not shown, U should be omitted unless confusion is likely. If this symbol is combined with other symbols (e.g., 13-05-09) it should follow those other symbols, enclosed, if necessary, in square brackets.

No.	Symbole Symbol	Légende	Description																
13-05-09		Entrée opérande analogique (entrée X figurée) Cette entrée représente un opérande sur lequel une ou plusieurs opérations analogiques sont effectuées. Pour les opérandes analogiques il convient d'utiliser les letters X et Y. Quand plus de deux opérandes sont impliqués, des caractères additionnels peuvent être utilisés, ou des suffixes peuvent être ajoutés, s'il n'y a pas de confusion possible.	Analogue operand input (X-input shown) This input represents an operand on which one or more analogue functions are performed. For analogue operands, the letters X and Y should be used. If more than two operands are involved, other characters may be used or suffixes may be added, providing no confusion is likely.																
13-05-10		Accès, figuré côté gauche, d'un élément de circuit auxiliaire connecté extérieurement Il convient de remplacer EXT par une autre désignation, par exemple <table><tr><td>RX</td><td>résistance</td></tr><tr><td>CX</td><td>capacité</td></tr><tr><td>RCX</td><td>résistance et capacité</td></tr><tr><td>XTAL</td><td>cristal piézoélectrique</td></tr></table> NOTE 1 Ce symbole peut être figuré sans le symbole de connexion auxiliaire (symbole 13-04-05) s'il n'y a pas de confusion possible. NOTE 2 Ce symbole peut être suivi d'un + ou –, lorsqu'il faut indiquer une polarité.	RX	résistance	CX	capacité	RCX	résistance et capacité	XTAL	cristal piézoélectrique	Terminal, shown on the left-hand side, to be externally connected to a subsidiary circuit or circuit element EXT should be replaced by another designation, e.g., <table><tr><td>RX</td><td>resistance</td></tr><tr><td>CX</td><td>capacitance</td></tr><tr><td>RCX</td><td>resistance and capacitance</td></tr><tr><td>XTAL</td><td>crystal</td></tr></table> NOTE 1 This symbol may be shown without the symbol for subsidiary connection (symbol 13-04-05) if no confusion is likely. NOTE 2 If an indication of the polarity is necessary, a + or a – may be added as a suffix to the symbol.	RX	resistance	CX	capacitance	RCX	resistance and capacitance	XTAL	crystal
RX	résistance																		
CX	capacité																		
RCX	résistance et capacité																		
XTAL	cristal piézoélectrique																		
RX	resistance																		
CX	capacitance																		
RCX	resistance and capacitance																		
XTAL	crystal																		
13-05-11		Accès, figuré côté gauche, d'un circuit interne auxiliaire ou d'un composant du circuit Il convient de remplacer INT par une autre désignation, par exemple <table><tr><td>RINT</td><td>résistance</td></tr><tr><td>CINT</td><td>capacité</td></tr><tr><td>RCINT</td><td>résistance et capacité</td></tr><tr><td>XTALINT</td><td>cristal piézoélectrique</td></tr></table> Les notes du symbole 13-05-10 sont applicables.	RINT	résistance	CINT	capacité	RCINT	résistance et capacité	XTALINT	cristal piézoélectrique	Terminal, shown on the left-hand side, of a subsidiary internal circuit or circuit component INT should be replaced by another designation, e.g., <table><tr><td>RINT</td><td>resistance</td></tr><tr><td>CINT</td><td>capacitance</td></tr><tr><td>RCINT</td><td>resistance and capacitance</td></tr><tr><td>XTALINT</td><td>crystal</td></tr></table> The notes with symbol 13-05-10 apply.	RINT	resistance	CINT	capacitance	RCINT	resistance and capacitance	XTALINT	crystal
RINT	résistance																		
CINT	capacité																		
RCINT	résistance et capacité																		
XTALINT	cristal piézoélectrique																		
RINT	resistance																		
CINT	capacitance																		
RCINT	resistance and capacitance																		
XTALINT	crystal																		

No.	Symbole Symbol	Légende	Description																																																								
13-05-12		Accès de réglage, figuré côté gauche A* doit être remplacé par ADJ, ou bien seul l'astérisque doit être remplacé par une indication sur la propriété ou grandeur à ajuster. Il convient d'utiliser les indications suivantes pour les propriétés et quantités énumérées ciaprès: <table><tr><td>B</td><td>polarisation</td></tr><tr><td>CL</td><td>limitation de courant</td></tr><tr><td>f</td><td>fréquence</td></tr><tr><td>H</td><td>hystérésis</td></tr><tr><td>m</td><td>gain</td></tr><tr><td>OFS</td><td>décalage</td></tr><tr><td>P</td><td>puissance</td></tr><tr><td>SR</td><td>pente</td></tr><tr><td>SYM</td><td>symétrie</td></tr><tr><td>T</td><td>température</td></tr><tr><td>U ou V</td><td>tension</td></tr><tr><td>WF</td><td>forme de l'onde</td></tr><tr><td>Z</td><td>impédance</td></tr><tr><td>φ ou Φ</td><td>phase</td></tr></table>	B	polarisation	CL	limitation de courant	f	fréquence	H	hystérésis	m	gain	OFS	décalage	P	puissance	SR	pente	SYM	symétrie	T	température	U ou V	tension	WF	forme de l'onde	Z	impédance	φ ou Φ	phase	Adjustment terminal, shown on the left-hand side The A* shall be replaced by ADJ, or only the asterisk shall be replaced by an indication of the property or quantity to be adjusted. The following indications should be used for the properties or quantities listed: <table><tr><td>B</td><td>bias</td></tr><tr><td>CL</td><td>current limit</td></tr><tr><td>f</td><td>frequency</td></tr><tr><td>H</td><td>hysteresis</td></tr><tr><td>m</td><td>amplification</td></tr><tr><td>OFS</td><td>offset</td></tr><tr><td>P</td><td>power</td></tr><tr><td>SR</td><td>slew rate</td></tr><tr><td>SYM</td><td>symmetry</td></tr><tr><td>T</td><td>temperature</td></tr><tr><td>U or V</td><td>voltage</td></tr><tr><td>WF</td><td>waveform</td></tr><tr><td>Z</td><td>impedance</td></tr><tr><td>φ ou Φ</td><td>phase</td></tr></table>	B	bias	CL	current limit	f	frequency	H	hysteresis	m	amplification	OFS	offset	P	power	SR	slew rate	SYM	symmetry	T	temperature	U or V	voltage	WF	waveform	Z	impedance	φ ou Φ	phase
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13-05-13		Accès de compensation, figuré côté gauche C* doit être remplacé par CPN, ou bien seul l'astérisque doit être remplacé par une indication sur la propriété ou la quantité à ajuster. x doit être remplacé par une indication sur la propriété ou la quantité nécessitant l'ajustage ou la compensation. Il convient d'utiliser les mêmes indications que celles du symboles 13-05-12, pour remplacer l'astérisque et/ou le x. NOTE Comme exemples d'application, voir les symboles 13-09-03, 13-09-05 et 13-09-09.	Compensation terminal, shown on the left-hand side The C* shall be replaced by CPN, or only the asterisk shall be replaced by an indication of the property or quantity to be adjusted. The x shall be replaced by an indication of the property or quantity that causes the adjustment or compensation to be necessary. The indications listed with symbol 13-05-12, should be used in replacing the asterisk and/or the x. NOTE For examples of use, see symbols 13-09-03, 13-09-05 and 13-09-09.																																																								

No.	Symbole Symbol	Légende	Description
13-05-14		Entrée Zm	Zm-input
13-05-15		Sortie Zm	Zm-output
		Les accès analogiques, entrées Zm ou sorties Zm, influençants et les accès analogiques qui en dépendent ont le même niveau de signal. NOTE 1 Ces symboles impliquent l'application de la notation de dépendance incluant le remplacement du «m» par le numéro d'identification pertinent. Pour une explication des techniques concernées, voir CEI 617-12.11, CEI 617-12.12 et CEI 617-12.25. NOTE 2 Pour les accès numériques influençant Zm, voir la section 17 de CEI 617-12.	Affecting analogue Zm-inputs or Zm-outputs impose their signal levels on the analogue inputs and outputs affected by them. NOTE 1 These symbols imply the application of dependency notation including the replacement of “m” by the relevant indentifying number. For an explanation of the techniques involved, see IEC 617-12, IEC 617-12.11, IEC 617-12.12 and IEC 617-12.25. NOTE 2 For affecting digital Zm-inputs and Zm-outputs, see IEC 617-12, IEC 617-12.17.