

Preparation of documents used in electrotechnology —

Part 2: Function-oriented diagrams

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British Standard

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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 61082-2:1994 *Preparation of documents used in electrotechnology — Part 2: Function-oriented diagrams*, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 1082-2:1993 published by the International Electrotechnical Commission (IEC).

This British Standard supersedes BS 5070-2:1988, which is withdrawn.

IEC 1082 consists of several Parts as follows:

IEC 1082-1:1991, *General requirements*.

IEC 1082-2:1993, *Function-oriented diagrams*.

IEC 1082-3:1993, *Connection diagrams, tables and lists*.

IEC 1082-4:1993, *Location and installation documents* (in preparation).

Other Parts under consideration are:

- Parts' lists
- Spare parts' lists
- Instructions

It is envisaged that all Parts of IEC 1082 will be adopted by CENELEC as Parts of EN 61082. British Standards identical in number and title will be published as further Parts of BS EN 61082 in due course.

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 78, 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.

English version

Preparation of documents used in electrotechnology Part 2: Function-oriented diagrams

(IEC 1082-2:1993)

Etablissement des documents utilisés en
électrotechnique
Partie 2: Schémas adaptés à la fonction
(CEI 1082-2:1993)

Erstellung von in der Elektrotechnik
verwendeten Dokumenten
Teil 2: Funktionsorientierte Schaltpläne
(IEC 1082-2:1993)

This European Standard was approved by CENELEC on 1993-07-06. 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

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Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 3B(CO)49, as prepared by Subcommittee 3B: Documentation, of IEC Technical Committee No. 3: Documentation and graphical symbols, was submitted to the IEC-CENELEC parallel vote in July 1992.

The reference document was approved by CENELEC as EN 61082-2 on 6 July 1993.

This European Standard replaces HD 246.7 S1:1984.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1994-12-01
- latest date of withdrawal of conflicting national standards (dow) 1994-12-01

Annexes designated “normative” are part of the body of the standard. Annexes designated “informative” are given only for information. In this standard, Annex A is informative and Annex ZA is normative.

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Section 1. General

1.1 Scope

This International Standard provides rules for function-oriented diagrams such as overview diagrams, function diagrams, and circuit diagrams.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 1082. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and the parties to agreements based on this part of IEC 1082 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 International Standards.

IEC 375:1972, *Conventions concerning electric and magnetic circuits*.

IEC 617-1:1985, *Graphical symbols for diagrams — Part 1: General information, general index. Cross-reference tables*.

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 617-4:1983, *Graphical symbols for diagrams — Part 4: Passive components*.

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

IEC 617-6:1983, *Graphical symbols for diagrams — Part 6: Production and conversion of electrical energy*.

IEC 617-7:1983, *Graphical symbols for diagrams — Part 7: Switchgear, controlgear and protective devices*.

IEC 617-8:1983, *Graphical symbols for diagrams — Part 8: Measuring instruments, lamps and signalling devices*.

IEC 617-9:1983, *Graphical symbols for diagrams — Part 9: Telecommunications: Switching and peripheral equipment*.

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

IEC 617-11:1983, *Graphical symbols for diagrams — Part 11: Architectural and topographical installation plans and diagram*.

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

IEC 617-13:1993, *Graphical symbols for diagrams — Part 13: Analogue elements*.

IEC 750:1983, *Item designation in electrotechnology*.

IEC 848:1988, *Preparation of function charts for control systems*.

IEC 1082-1:1991, *Preparation of documents used in electrotechnology — Part 1: General requirements*.

IEC 1175:1993, *Designations for signals and connections*.

ISO 3511-1:1977, *Process measurement control functions and instrumentation — Symbolic representation — Part 1: Basic requirements*.

ISO 3511-2:1984, *Process measurement control functions and instrumentation — Symbolic representation — Part 2: Extension of basic requirements*.

ISO 3511-4:1985, *Industrial process measurement control functions and instrumentation — Part 4: Basic symbols for process computer, interface, and shared display/control functions*.

Section 2. Common rules for function-oriented diagrams

2.1 General

Function-oriented diagrams shall be prepared in accordance with the rules in IEC 1082-1 and in accordance with the rules given in this part of IEC 1082.

2.2 Layout

Graphical symbols and circuits should be arranged to emphasize the process and/or signal flow and the functional relations according to 4.2 in IEC 1082-1. Topographical information may be added, if relevant, but should not govern the layout.

To emphasize the signal flow, the connecting lines of the circuits should be kept as straight as practicable. For certain fundamental circuits, the layouts referred to in 2.9 should be adopted.

To emphasize the functional relations, the symbols for functionally related items should be grouped close to one another. For example, see Figure 1.

The two requirements may in some cases lead to different results, and priority has to be given to one of them.

- Within functional groups, and for equipment of limited size and complexity, priority should be given to the signal flow.
- For systems and complex equipment, the overall function-oriented structure should be emphasized and priority given to the functional grouping. The signal flow between the functional groups may thus be more complicated than within the groups.

Parallel paths of equal importance should be symmetrically displaced with respect to the common path. For example, see Figure 2.

Similar items in parallel vertical [horizontal] paths should be aligned horizontally [vertically]. For example, see Figure 3.

2.3 Location reference systems

If it would otherwise be difficult to locate a symbol or an end of an interrupted connecting line in a diagram, the diagram shall incorporate a location reference system such as:

- 1) a grid reference system according to 4.8.2 in IEC 1082-1;
- 2) a circuit reference system, wherein the branches of a circuit are identified by numbers. For example, see Figure 3;

3) an item designation tabular reference system wherein, along one edge of the diagram, the item designations are repeated in line with the corresponding symbols. The item designations should be arranged in columns (or rows), one for each of the most frequently used types of parts (capacitors, resistors, relays, etc.), and one for all other types of parts. For example, see Figure 4.

2.4 Graphical symbols

2.4.1 General

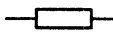
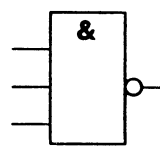
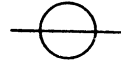
Symbols can represent functions, devices, or assemblies of functions or devices, and shall be chosen according to 4.3 in IEC 1082-1.

For some devices, there may be alternative ways of describing the function. For example, the same device might be represented either as an AND-element or as an OR-element. Another device might be represented as a multiplier or as a squarer (e.g., symbols 13-07-01 and 13-07-02 in IEC 617). The symbol chosen should depict the function actually performed by the device in the system.

2.4.2 Functions and real components or devices¹⁾

Many of the symbols in IEC 617 can represent functions as well as real components or devices capable of carrying out these functions.

EXAMPLES

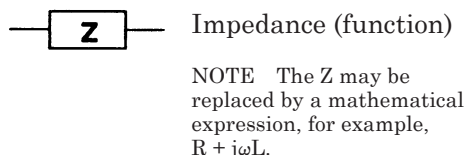
	(04-01-01) Resistance (function), resistor (component)
	(04-02-01) Capacitance (function), capacitor (component)
	(04-03-01) Inductance (function), inductor (component)
	(12-28-01) AND-element with negated output (function or component)
	(02-16-01) Current source (function or component)
	(02-16-02) Voltage source (function or component)

NOTE Regarding 02-16-01 and 02-16-02: For the indication of polarity and current reference direction, see IEC 375.

¹⁾ This sub-clause (2.4.2) is proposed to be transferred to IEC 617-1, but is included here until IEC 617 has been revised.

Another method of representing a function is to use a rectangle (symbol 02-01-02), supplemented with a qualifying symbol or legend inside. This method should only be used where no specific symbol in IEC 617 exists. If necessary, the symbol derived shall be explained in the diagram or in supporting documents.

EXAMPLE



2.4.3 Functions performed with the help of software

If it is necessary to indicate that functions are performed with the help of software, the hexagon symbol in ISO 3511-4 shall be used as a qualifying symbol. For example, see Figure 5.

2.4.4 Methods of the representation of components

2.4.4.1 General

Any or all of the six methods for the representation of components defined in 2.1.3.1 through 2.1.3.6 in IEC 1082-1 may be used in the same diagram. In simple cases, it may be satisfactory to use attached or grouped representation. In more complex circuits, the other methods may be necessary. Repeated, grouped and dispersed representations are useful, especially with integrated circuits.

IEC 617 shows the symbols in attached or grouped representation. For the other methods, the following rules apply.

2.4.4.2 Semi-attached representation

In semi-attached representation, linkages and connections among the functionally dependent parts that are internal to the device and not externally accessible shall be shown explicitly.

Semi-attached representation is traditionally applied to components having a mechanical functional linkage. However, the method may also be used for, for example, binary logic elements. This concept is illustrated in Figure 6.

Internal connections, for example, the one shown in Figure 6 between the AND-gate and the OR-gate, shall be shown as solid lines.

The internal connections shall be implied:

- by the absence of terminal designations at the ends of the internal connections if no ambiguity is likely, or
- by a notation, such as INT (INT = internal) at the usual location for terminal designations, or

— by special identifiers explained in the diagram or in a supporting document.

The connecting lines representing the internal connections may be interrupted, provided the requirements of 4.4.6 in IEC 1082-1 are met. For example, see Figure 7.

2.4.4.3 Detached representation

In detached representation, internal linkages and connections among the functionally dependent parts are only implied. Detached representation shall be used only if the internal linkages are substantially obvious, as in the case of an electromechanical relay coil and its corresponding contacts.

Each of the symbols representing a part of the component shall have an item designation that relates it to all other symbols representing the same component.

If necessary, location references from the actuating or affecting parts to the other parts and vice versa shall be shown in accordance with 2.3.

The referencing from the actuating or affecting parts to the other parts may be carried out as inset diagrams or inset tables, adjacent to the actuating or affecting part. If this location is not practical, they may be located elsewhere in the diagram or in a separate document. In the latter case a reference to that document shall be added to the symbol for the actuating or affecting part.

Examples: Figure 8 gives an example of the use of inset diagrams. In Figure 9 the inset diagrams are replaced with inset tables.

The symbols for individual characteristics of actuated or affected parts shall be shown with the symbols for these parts. Symbols showing the characteristics of the actuator or the affecting part, or common to the whole component should be shown with the symbol for the actuator or the affecting part. For examples, see Table 1. For manually operated devices, simplified repeated representation (see 2.4.4.4) may also be used. For example, see Figure 10.

2.4.4.4 Repeated representation

In repeated representation, each functionally independent part of a component is shown in attached representation in several places, partially connected in each place. As a consequence, the same terminal may appear more than once in a diagram. Each appearance shall be labelled with a terminal designation that relates it to all other appearances of the same terminal, but a connection to the repeated terminals need be shown in only one place. However, a connecting line or another indication of the connection may be present at all additional occurrences of the terminal, provided no confusion is likely. For simplification, see 4.6.4 in IEC 1082-1. See also Figure 10.

If it is necessary to identify repetitive information, this shall be done by placing the repeated terminal designation in parentheses or by a special identifier explained in the diagram.

2.4.4.5 Dispersed representation

If there are no connections²⁾ or linkages among the parts of a component, which means that these parts are functionally independent, the symbols for these parts may be shown in dispersed representation. Each of the symbols representing a part of the component shall have an item designation that relates it to all other symbols representing the same component.

2.4.4.6 Combination of the methods of representation

The alternative methods of representing functionally independent parts of a component (grouped or dispersed) may be combined with one of the alternative methods of representing functionally dependent parts (attached, semi-attached, detached, and repeated). For examples, see Table 2.

2.4.5 Representation of components with movable parts

2.4.5.1 Operational state

Components having a movable part, for example, a contact, shall be shown in a position or state as follows:

- a) Monostable manually operated or electromechanical components, e.g. relays, contactors, brakes, and clutches, in the non-actuated or de-energized state. However, in special cases the diagram can be better understood if these components are shown in the actuated or energized state. This shall be stated in the diagram³⁾.
- b) Circuit-breakers and disconnectors in the open (OFF) position. For other switching devices that can rest in any one of two or more positions or states, an explanation shall be given in the diagram, if necessary.
- c) Multi-stable manually operated control switches with a position designated OFF, in that position. Control switches without a position designated OFF, in a position specified in the diagram.
Manually operated control switches for emergency operation, stand-by, alarm, test, etc., should be shown in the position they occupy during normal service of the equipment, or in another specified position.
- d) Pilot switches operated by a cam, a variable such as position, level, speed, pressure, temperature, etc., in a position specified in the diagram.³⁾

2.4.5.2 Functional description

For manually operated control switches with a complex function, a graph shall be included in the diagram, if necessary to understand the function. See Figure 11 and IEC 617-7.

For pilot switches, the diagram shall contain a description of the operation, adjacent to the symbol. This description may consist of:

- a graph, prepared in accordance with the examples in Figure 12 and in the left-hand column of Table 3. In these examples, the indication “0” on the Y-axis stands for “contact open” and “1” for “contact closed”. If no confusion is likely, these indications may be omitted;

²⁾ The individual parts of a component may have a common power supply connection.

³⁾ This is not always possible because IEC 617 does not specify symbols for contacts in the actuated position and/or a method of specifying hysteresis in the operating device.

— a symbol for the actuating device. For cam-operated or similarly operated devices, the symbol shown in the third column of Table 3 may be used;

— a note, designation or table. For example, see Figure 13.

2.4.6 Representation of semi-conductor switches by contact symbols

Semi-conductor switches represented by symbol 07-26-01 for a make contact or 07-26-03 for a break contact shall be shown in the initial state, i.e. at the moment the auxiliary voltage supply has been switched on.

2.4.7 Orientation of contact symbols

Contact symbols should be oriented so that the imaginary direction of movement is consistent, for example, movement upwards with horizontal connecting lines or to the right with vertical connecting lines when the component is actuated. This is especially important if the symbol for the complete component contains symbols for a mechanical latch, blocking device, delay device, etc. However, when using detached representation in circuits with complicated contact arrangements but without mechanical latches etc., the contact symbol orientation may be changed if this results in a clearer layout of the diagram with a minimum of crossings.

2.5 Representation of supply circuits

Connections that satisfy power or voltage supply requirements of devices shall be indicated in circuit diagrams and may be indicated in other diagrams. The connections may be shown graphically, or may be specified in a table or a note. For example, see Figure 14.

The supply lines should be shown at opposite sides of the circuit branches, see Figure 15, or grouped together to one side of, above, or below, the circuit, see Figure 16. Supply lines may also be interrupted to aid the layout of the diagram, provided the requirements in 4.4.6 in IEC 1082-1 are met. For example, see Figure 17.

Supply lines to a block symbol may be drawn at right angles to the signal flow. For example, see Figure 18.

These methods may also be used inside a functional or constructional unit. For example, see Figure 17.

A component may be represented as two or more symbols, one of them showing only the supply connections. For example, see Figure 19.

2.6 Representation of combined electrical and non-electrical circuits

Relations between non-electrical and electrical functions shall be clearly indicated. For example, see Figure 20. The dot at one end of the arrows correlates the direction of rotation of the motor and the corresponding direction of motion of the sliding contact of the resistor.

2.7 Representation of binary logic circuits

2.7.1 General

General rules for binary logic elements and signals can be found in IEC 617-12.

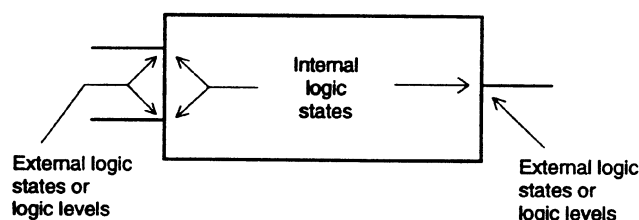
Rules for signal designations can be found in IEC 1175.

2.7.2 Logic conventions and logic polarity indication

When symbols for binary logic elements are used to represent hardware devices, it is necessary to establish the relationship between logic states and the nominal values (logic levels) of the physical quantities used to represent these states. There are two methods by which this may be done:

- 1) The use of the symbol for logic negation (symbols 12-07-01 and 12-07-02). This requires the adoption of a single logic convention, either positive or negative, for the whole diagram or for a portion of the diagram (see 2.7.2.1).
- 2) The use of direct logic polarity indication in which the presence or absence of the logic polarity symbol (symbols 12-07-03 through 12-07-06) indicates the required relationship between (external) logic level and internal logic state at each input and output of every binary logic element in the diagram (see 2.7.2.2).

The terms “states” and “levels” are explained in IEC 617-12, section 3, with the help of this figure:



2.7.2.1 Single logic convention

With this method the correspondence between a given external logic state and logic level is the same at all inputs and outputs.

The symbol for logic negation shall be used as required to define the relationship between the *external logic state* and the *internal logic state*. Specifically, the presence of the logic negation symbol at an input or output signifies that the internal and external states are the complements of one another for that terminal. The absence of the logic negation symbol signifies that the internal and external states are the same for that terminal. *The symbol for logic polarity shall not be used with this method.* See Figure 21 for an example of a diagram using a single logic convention (the positive logic convention).

The convention in use, either positive logic or negative logic, shall be clearly stated in the diagram or in referenced documentation. This statement may include a small waveform graph with indications of the logic states and, if necessary, of the nominal value of corresponding physical quantities.

NOTE Different logic conventions may be used for different portions of the same diagram; for example, on either side of an interface between contrasting technologies. The convention applying to each portion should be clearly shown, and the areas of the diagram to which each applies should be clearly delineated.

a) Positive logic convention:

For every logic connection, the more positive value of the physical quantity (H-level) corresponds to the external 1-state. The less positive value (L-level) corresponds to the external 0-state. This may be stated in a diagram thus:



See Figure 21 for an example of a diagram using positive logic convention.

b) Negative logic convention:

For every logic connection, the less positive value of the physical quantity (L-level) corresponds to the external 1-state. The more positive value (H-level) corresponds to the external 0-state. This may be stated in a diagram thus:



2.7.2.2 Direct logic polarity indication⁴⁾

With this method the relationship between the internal logic state and the (external) logic level of each input of every binary logic element is indicated directly by means of the presence or absence of the logic polarity symbol. Specifically, the presence of the logic polarity symbol at an input or output indicates that the (external) low level corresponds to the internal 1-state for that terminal. The absence of the logic polarity symbol signifies that the (external) high level corresponds to the internal 1-state for that terminal. No relationship between an external logic state and either an internal logic state or an (external) logic level is defined by the symbol. A relationship between the (external) logic level and a signal state is defined only by the signal designation (see IEC 1175). *In this system the symbol for logic negation shall not be used for external connections.* See Figure 22 for an example of a diagram using direct polarity indication.

For diagrams prepared with direct logic polarity indication, but showing no logic polarity symbols, a statement indicating that direct logic polarity is employed shall be placed in the diagram or in referenced documentation.

2.7.3 Use of alternative symbols with logic negation or polarity inversion

In a *function diagram*, the number of logic negations should be minimized to facilitate the understanding. For example, symbols for logic negation that would be shown at both the driving end and at the driven end of a connecting line (double negation) should be eliminated unless there are special requirements, such as if the function diagram is later to be converted to a circuit diagram. See Table 4.

In a *circuit diagram*, the symbols should be chosen so that the logic polarity or negation indication at an input is the same as that at the source of a signal feeding that input. If this is done, a reader of the diagram can directly apply the internal logic state of an output as the internal logic states of the inputs fed by that output. In the case of direct logic polarity indication, if the form of the signal name is chosen as described in IEC 1175 the signal designation, excluding the level indication, directly expresses the meaning of that internal logic state. See Figure 23.

⁴⁾ The term “direct logic polarity indication” is used to contrast the method with the single logic convention, where the logic level can be obtained from an internal logic state only indirectly through an external logic state.

Direct logic polarity indication has been called *mixed logic*, implying that both positive and negative logic are present in a diagram using that method. This is misleading since the fixed relationship between logic levels and external logic states inherent in a single logic convention does not exist with direct logic polarity indication. *Therefore, the term mixed logic is deprecated.*

However, it is not always possible to choose a set of symbols so that all the inputs and outputs that are connected by a signal carry the same polarity or negation indication. If there is a mismatch between the logic polarity or negation indication at the source of a signal and the indication at the destination, a reader of the diagram must invert the internal logic state of the source before using it as the internal logic state of the next input. Because these mismatches are a common source of errors in logic circuit design, it can be helpful to indicate clearly where such mismatches (and inversions) intentionally exist. If it is desired to highlight these mismatches, this should be done using a short perpendicular line (the mismatch symbol) across the connecting line. See Figure 24.

This symbol divides the connection into two segments, each of which contains consistent logic polarity or negation indications. If the connecting line is branched, one or more symbols should be used to divide the connection tree into consistent branches. See Figure 25.

2.8 Current flow and magnetic flux directions; voltage polarity

The reference direction of the current in a branch, the indication of magnetic flux direction, the reference polarity of voltage, and the correspondence between the voltage polarities of coupled electric circuits, should be shown in accordance with IEC 375. An extract of this standard can be found in Annex A.

2.9 Layouts of commonly used fundamental circuits

Commonly used fundamental circuits should have a formalized pattern. Additional components should be arranged so that the basic pattern remains recognizable.

2.9.1 Terminations

Two-terminal passive networks should be represented with the terminals shown at the same end, see Figure 26.

Four-terminal passive networks, such as filters, smoothing circuits, attenuators, and phase-shift networks, should be represented with the terminals shown at the corners of an imaginary rectangle, see Figure 27.

2.9.2 Fundamental bridge circuits

Fundamental bridge circuits should be represented as in Figure 28.

2.9.3 RC-coupled amplifying stages

The symbols for the fundamental elements of RC-coupled amplifying stages should be arranged as shown in the following figures:

- a) Common base (two alternatives), see Figure 29
- b) Common emitter, see Figure 30
- c) Common collector (emitter follower), see Figure 31.

2.9.4 Fundamental bistable circuits

The symbols for the fundamental elements of elementary bistable circuits should be arranged as shown in Figure 32.

2.9.5 Motor circuit with star-delta starter

Motor circuits with a star-delta starter in principle should be drawn as shown in Figure 33. All terminals for the external connections should be shown in the same phase sequence, especially if the starter is represented by a terminal function diagram as in Figure 40.

2.10 Terminals connected to internal branches

General rules for the location and orientation of terminal designations are given in IEC 1082-1, 4.7.3.

For a terminal connected to internal branches, for example, a common terminal for several contacts of one component, the terminal designation shall be located outside the outermost junction point. See Figure 34, showing a control switch where terminal 13 is common to all the four contacts.

Figure 35 shows an example where terminal 1 serves alternatively as an input or an output.

2.11 Simplification techniques

General rules for simplification techniques are given in 4.6 in IEC 1082-1.

2.11.1 Multiple connections

Two or more identical branches of a circuit may be shown by representing one branch and using the symbol 03-02-09 in IEC 617. For examples, see Figure 36.

The techniques described in 4.4.7.2 and 4.6.3 in IEC 1082-1 may also be used as shown in Figure 37. The right-hand portion of eight circuits, identical except for the item designations, is shown simplified.

2.11.2 Multiple-function terminals

If all functions of a multiple-function input or output in a binary logic device require identical polarity and dynamic symbols and if no ambiguity is likely regarding which labels apply to the input and output functions, a single terminal may be shown and a solidus (/) used to separate the labels associated with the separate functions. See Figure 38, showing a different function from that in Figure 35.

To improve the layout of a diagram, a multiple-function terminal may also be depicted more than once at the symbol outline with the terminal designation repeated, provided the requirements in 2.4.4.4 are met. See Figure 39 showing the same function as in Figure 35.

2.11.3 Terminal-function diagrams

The internal function of a functional unit or group or constructional unit may be represented by a terminal-function diagram. A terminal-function diagram shall comprise an outline or boundary frame containing:

- a circuit diagram, simplified if applicable;
- a function diagram;
- a function or sequence chart; or
- text.

A terminal-function diagram shall be prepared in such a way that it is clear how the unit can be connected in an application and where any necessary measurements can be made.

The terminal-function diagram should be arranged with the same layout principles as other function-oriented diagrams, and should contain a reference to any detailed document(s) necessary to understand the full operation or implementation of the functional unit or group or constructional unit.

Figure 40 includes an example of a terminal function-diagram for a star-delta starter built in the form of a physical unit. The function is indicated by a simplified circuit diagram, and the graph in the lower left-hand corner of the terminal-function diagram.

Figures 19 and 20 in IEC 1082-1 are two other examples.

Figure 41 is a terminal-function diagram where the functions are depicted by means of a function chart.

2.11.4 Circuits represented by block symbols and terminal-function diagrams

A functional unit or group may be represented by a symbol, such as a block symbol, or a terminal-function diagram, to improve clarity and save space. In such a case, a reference shall be made to a diagram giving more detailed information on the functional unit or group. For examples, see Figure 40 and Figure 42.

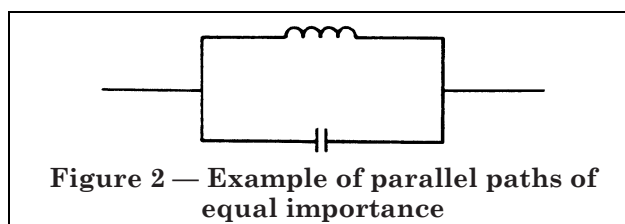
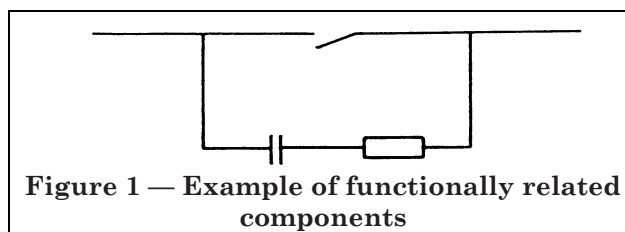
2.11.5 Repeated circuits

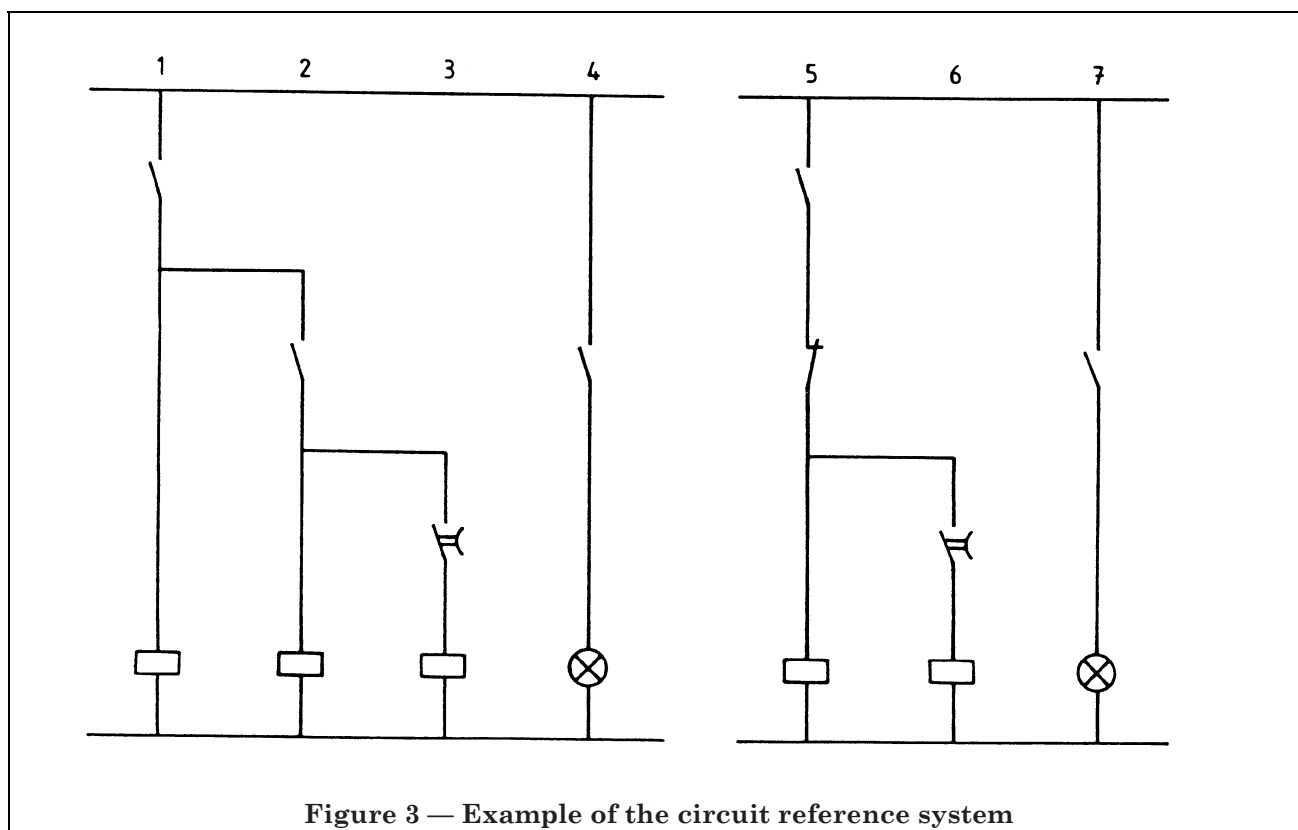
A repeated circuit arrangement may be shown in detail only once with an appropriate representation used for each repeated circuit; in that case, a reference to the detailed representation shall be shown with each simplified representation. For examples, see Figure 5 and Figure 43.

2.12 Supplementary information

Additional information such as external circuits and explanatory text may be added to the diagram to aid the understanding or application of the circuit. See Figure 40.

External or common circuits necessary to understand the circuit may be included in simplified form.





CAPACITORS	-C5			
RESISTORS	- R14	- R17	-R18	-R20
	-R15		-R19	
	-R16			
MISCELLANEOUS	- V18	-V6	-K1	
			-V7	

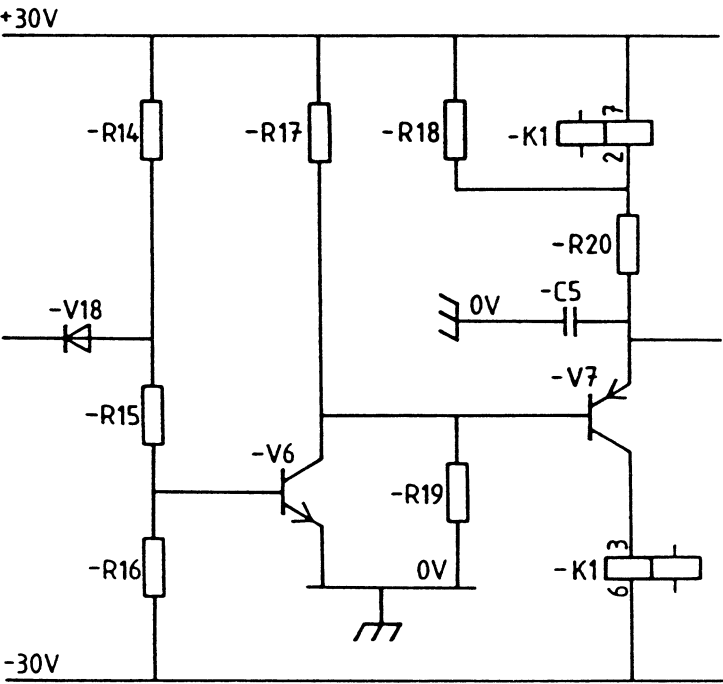


Figure 4 — Example of the tabular reference system

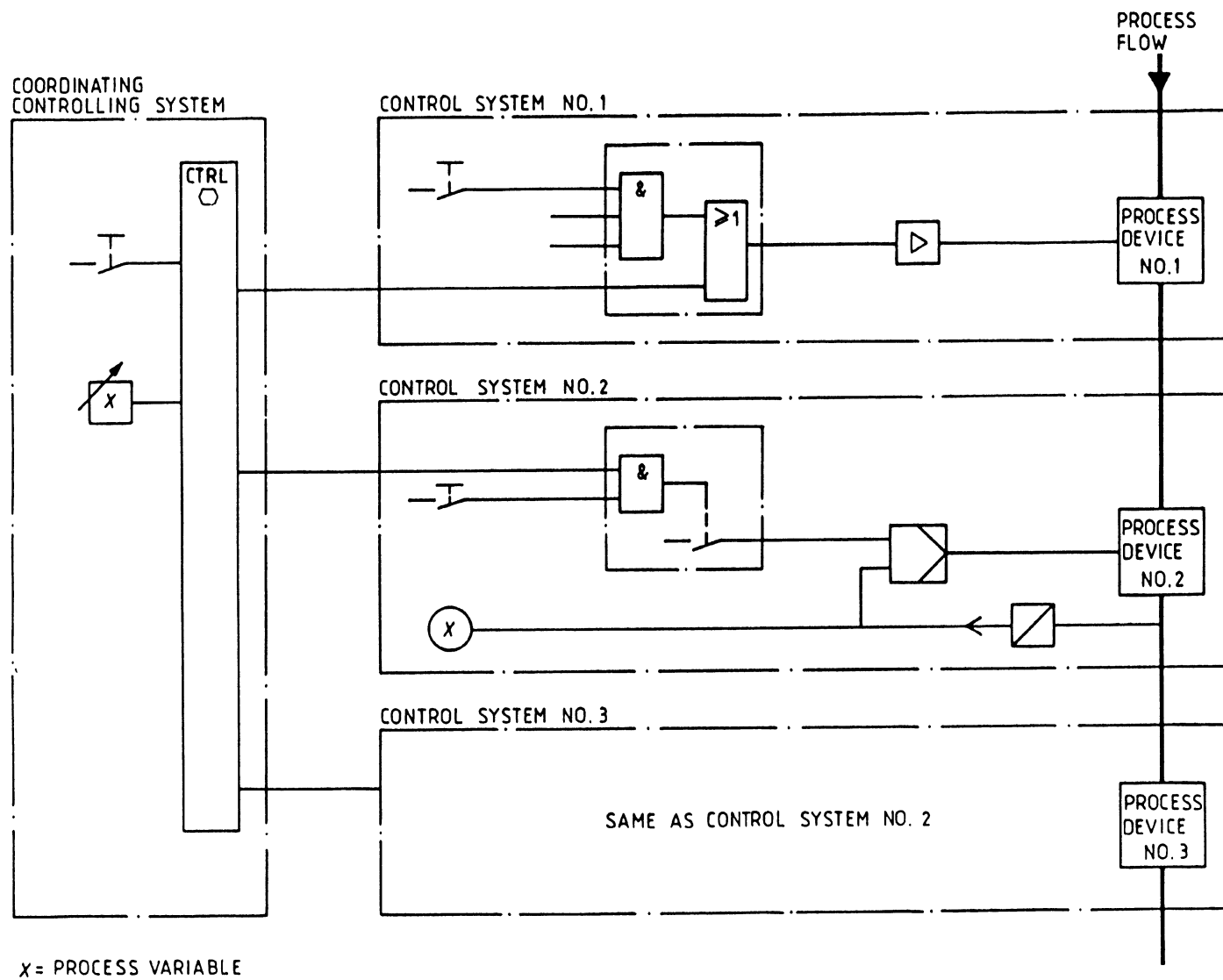
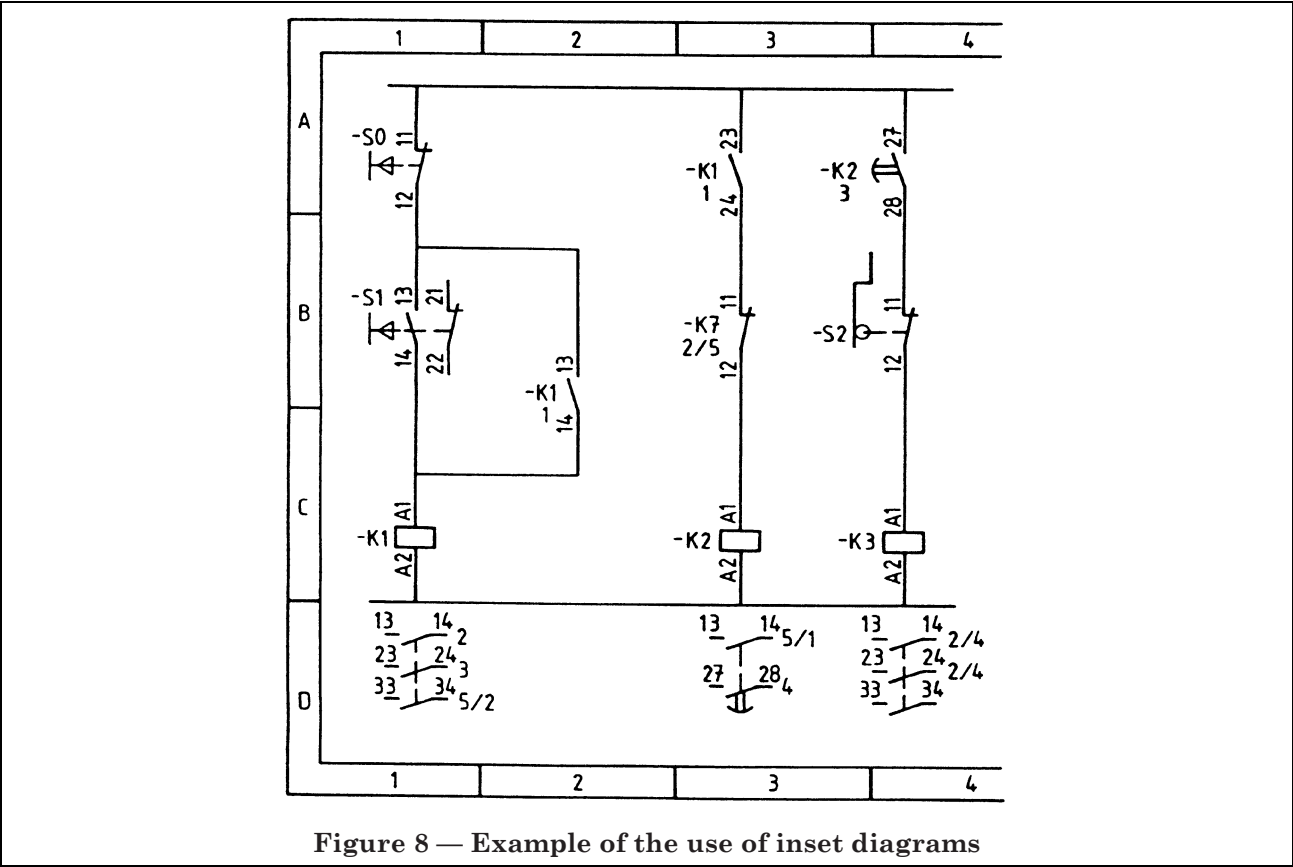
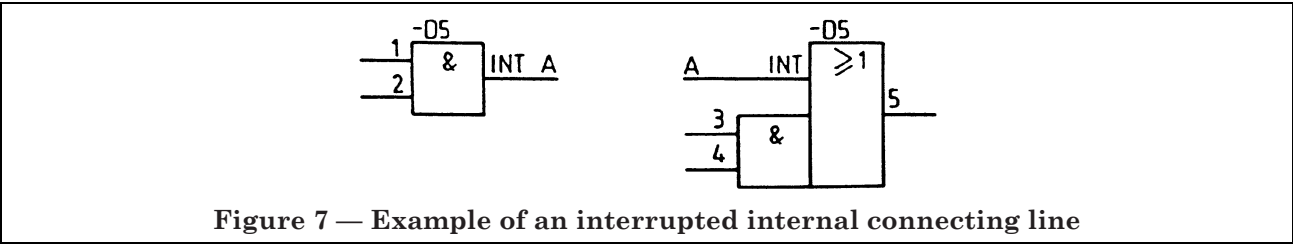
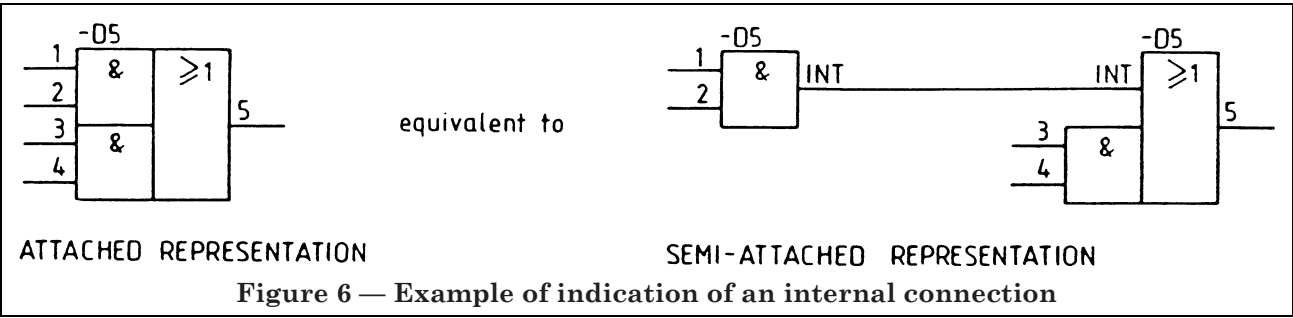


Figure 5 — Example of the recommended layout principle. No item designations are shown as the figure is intended to show the layout principle only



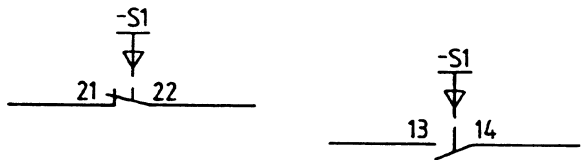
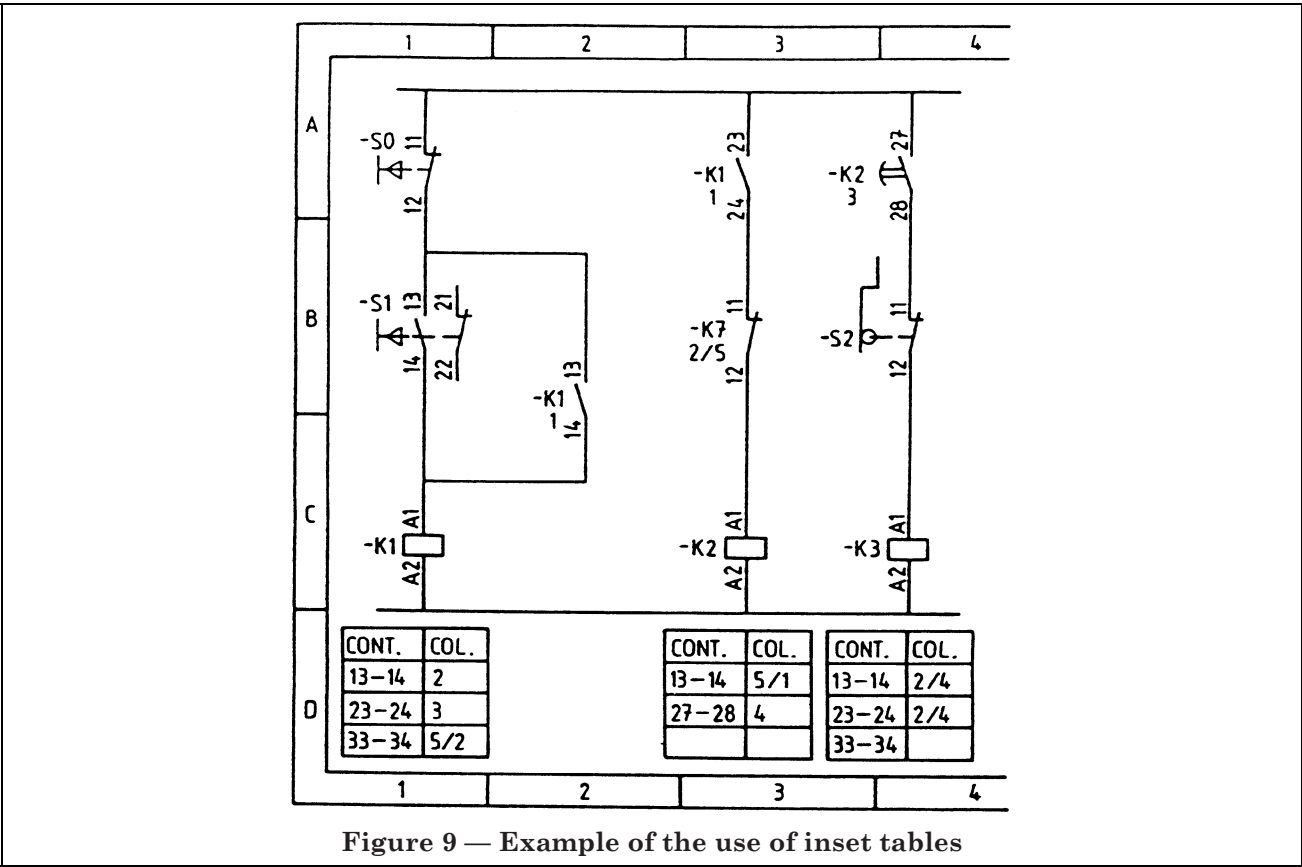


Figure 10 — Example of a manually operated switch shown in simplified repeated representation

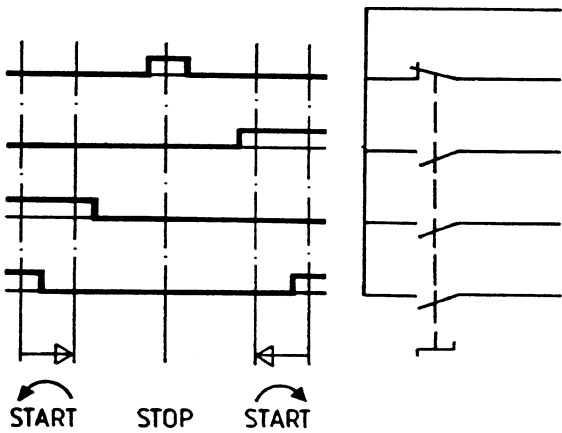


Figure 11 — Example of a graph for describing the functions of a manually operated control switch

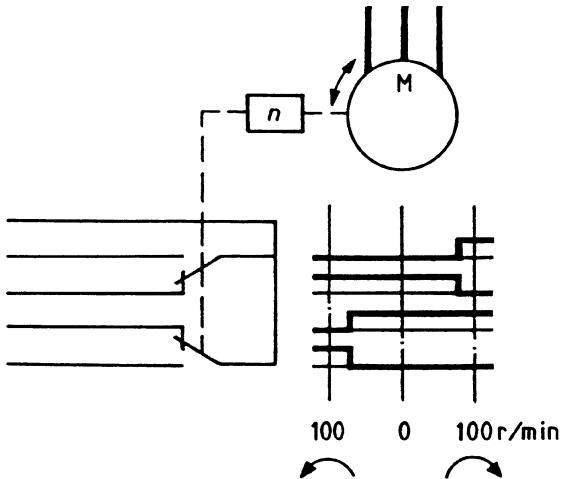


Figure 12 — Example of a graph for describing the functions of a pilot switch for speed monitoring

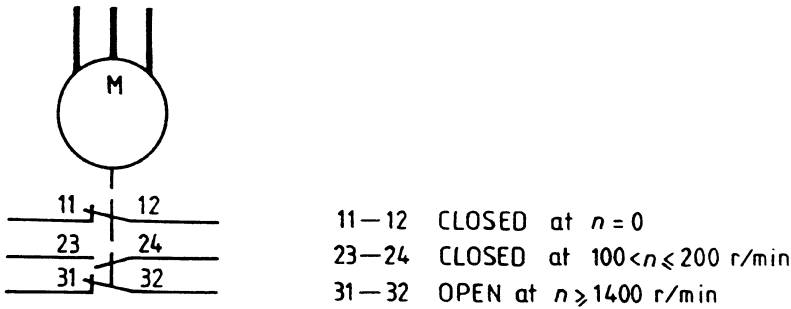


Figure 13 — Example of a note for describing the functions of a pilot switch for speed monitoring

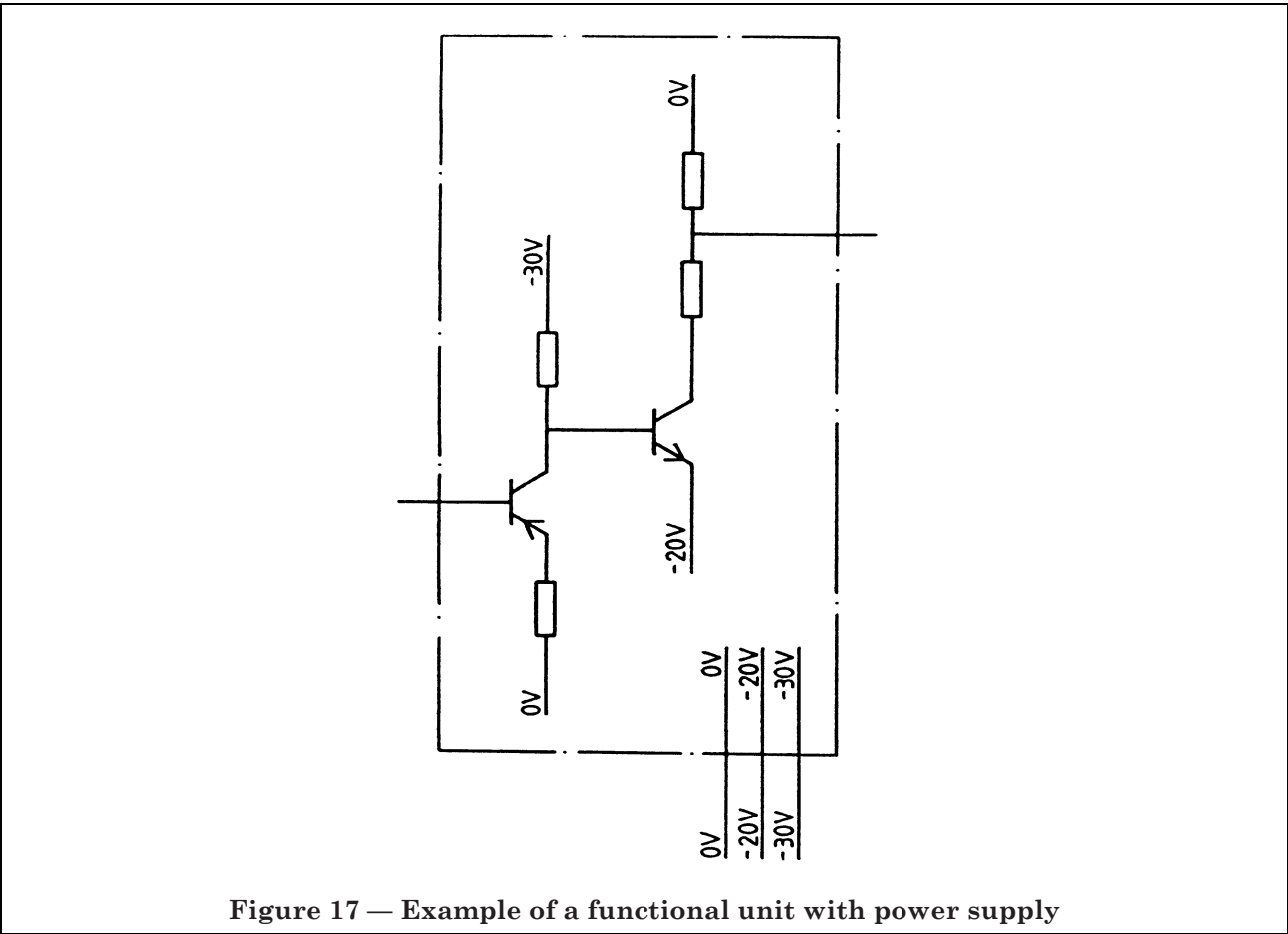


Figure 17 — Example of a functional unit with power supply

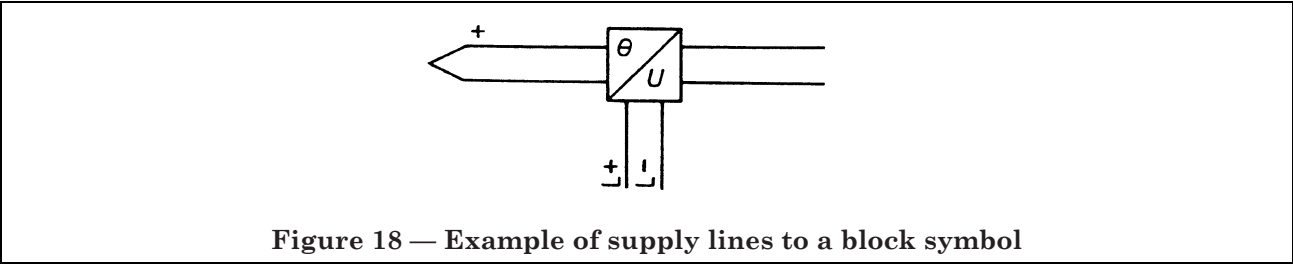


Figure 18 — Example of supply lines to a block symbol

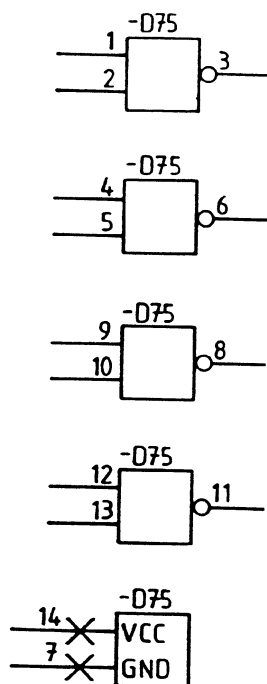


Figure 19 — Example of a component with one part for the supply

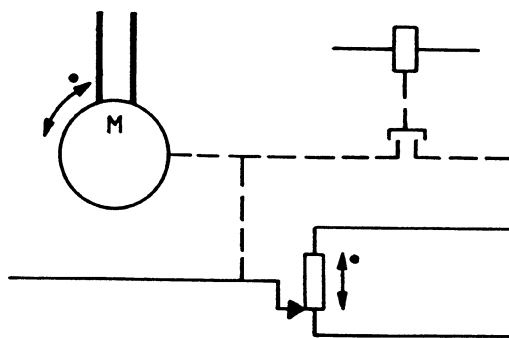


Figure 20 — Example of mechanical functions related to electrical functions

