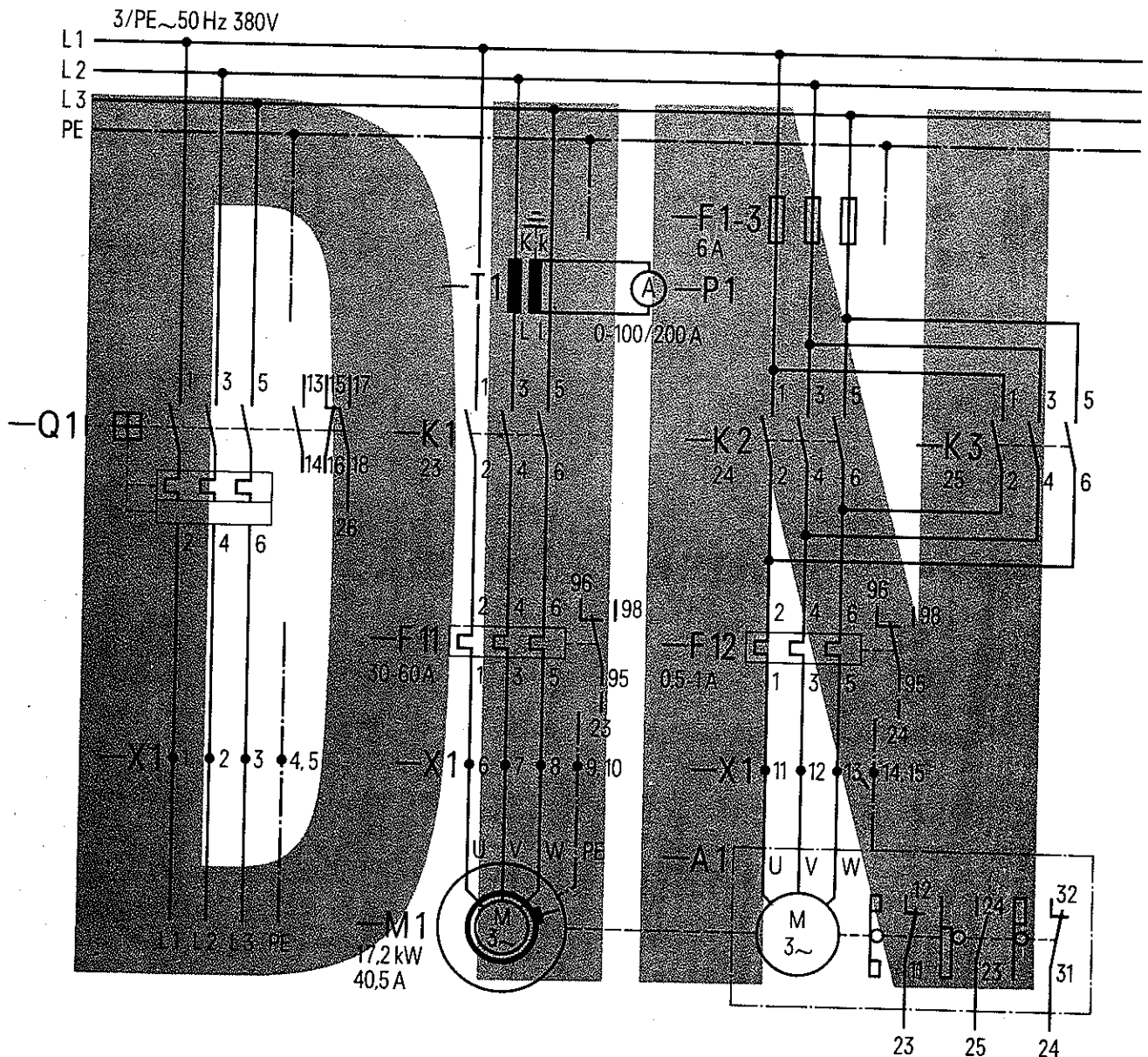


# SIEMENS

## How to Read German Schematic Diagrams of Industrial Equipment



# Preface to the Fifth Revised Edition

This edition is based on the standardization state of June 1979.

For various reasons, new standards are not always adopted in practice as soon as they are introduced. Thus, it is to be expected that at first the new and old symbols will be found side by side. Standardization is not yet complete and variations from the method of representation described below may still occur.

From the many graphical symbols available, only those have been selected that are used the most frequently in the circuit diagrams of electrical equipment for industrial plants. The graphical symbols were taken from the following standards:

DIN 40 700 to 40 717 (Federal Republic of Germany)  
BS 3939 (UK)  
ANS Y 32.2 (USA)  
NEMA ICS (USA)  
CSA Z 99 (Canada)  
EEMAC E 14-1 (Canada)  
IEC Publ. 117 (International Electrotechnical Commission)

## Contents

	Page
Preface to the Fifth Revised Edition	1
<b>1 The Schematic Diagram as a Means of Facilitating Maintenance and Repair</b>	<b>2</b>
<b>2 Method of Representation</b>	<b>2</b>
2.1 Circuit arrangements	2
2.1.1 Main circuits	2
2.1.2 Control, signalling and monitoring circuits	2
2.2 Electrical equipment	2
<b>3 Markings, Designations</b>	<b>2</b>
3.1 Plant identification code	3
3.2 Location identification code	6
3.3 Equipment identification code	7
3.3.1 Complete equipment identification code -- split representation	9
3.3.2 Marking of integrated components	10
3.4 Terminal identification code	10
3.4.1 Terminal markings of equipment and equipment combinations	12
3.5 Markings to indicate coil winding direction	12
3.6 Technical data and type designations	12
3.7 Crossings within groups of connecting lines	12
3.8 Method of wiring	13
<b>4 How to Locate Items in Schematic Diagrams</b>	<b>13</b>
4.1 Diagram section references marked at circuit symbols and connectors	13
4.2 Diagram section references for symbols identifying electronic equipment	14
<b>5 Explanatory Notes</b>	<b>16</b>
<b>6 Graphical Symbols</b>	<b>17</b>
<b>7 Schematic Diagrams (Figs. 33 to 36)</b>	<b>49</b>

Author: Rolf Neumüller

Nachdruck 10.86

# 1 The Schematic Diagram as a Means of Facilitating Maintenance and Repair

- A schematic diagram shows the following main features:
  - Main circuits;
  - Auxiliary circuits for control, signalling and monitoring;
  - Symbols identifying the electrical equipment, its component parts and connections;
  - Markings of the electrical equipment and its terminals;
  - References given at or near the equipment representations and circuit connectors as to where in the schematic diagram, i.e. in which section or square or possibly on which sheet, the corresponding part of the equipment or the continuation of the circuitry can be found.

These features are generally sufficient to explain the circuitry and its mode of operation, as well as to follow through the circuits when tracing a fault.

## 2 Method of Representation

### 2.1 Circuit Arrangements

The method of representing circuit arrangements in schematic diagrams is to break them down according to functional aspects. The actual location and mechanical relationship of the component parts of the electrical equipment are disregarded in most cases.

Depending on the extent of the circuitry, several functional units may be shown on the same sheet or one functional unit on one or more sheets.

All terminals and measuring or metering points are entered.

#### 2.1.1 Main Circuits

The main circuits are generally represented in multi-pole arrangement (Fig. 33 on the fold-out sheet).

#### 2.1.2 Control, Signalling and Monitoring Circuits

Control, signalling and monitoring circuits are shown in Fig. 34 on the fold-out sheet.

Circuits incorporating conventional switchgear are drawn from the top down between the horizontal potential lines representing the control and auxiliary supply (Fig. 34 a on the fold-out sheet).

On schematic diagrams showing electronic open-loop and closed-loop control systems, power supply circuits are mostly dispensed with. To compensate for this, the various potentials are marked immediately adjacent to the terminals of the equipment (Fig. 36 a on the fold-out sheet). The signal and information flow for open-loop control systems is generally from the top down and, for closed-loop systems, from left to right.

### 2.2 Electrical Equipment

Items of electrical equipment and their component parts are denoted by symbols and, where necessary, interlinked by lines representing connections.

Switchgear units and contacts are shown in the standard reference position, i.e. in the non-operated position with NO contacts open and NC contacts closed. Exceptions from this rule are specially marked, as shown by the vertical arrow next to the symbol in Fig. 1.

The complete equipment representations, with the exception of the electronic modules (see Section 4.2) are entered, complete with terminal designations, either in the main circuits (Fig. 33 a on the fold-out sheet) or below the lower supply bus for the control, signalling and monitoring circuits (Fig. 34 on the fold-out sheet), i.e. generally in the following manner:

- Electrically operated switchgear units (e.g. contactors) are shown
- Measuring instruments in the diagram section which includes their measuring systems
- Mechanically operated units (e.g. momentary-contact switches) in the diagram section which includes most of their contacts or the most important ones.

The assigned functional elements of electronic modules are listed in a table (see Section 4.2 and Fig. 36 b on the fold-out sheet).

Items requiring a complex representation - e.g. drum controllers - are generally shown next to the control and signalling circuits in the schematic diagram. Complete symbols representing items of equipment, e.g. motors (see Fig. 33 on fold-out sheet) are entered in the schematic diagram only once.

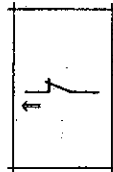


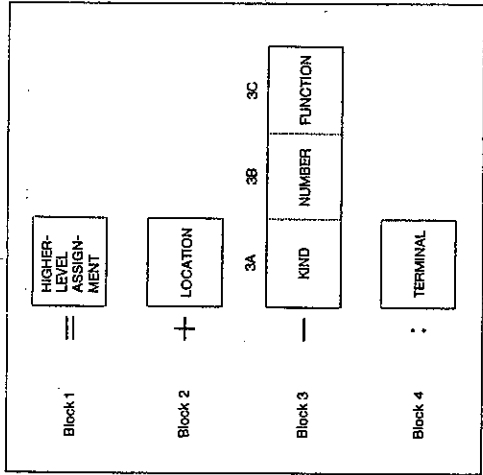
Fig. 1 NO contact (with automatic return) closed as shown in DIN 40713

## 3 Markings, Designations

The equipment markings are composed as follows:

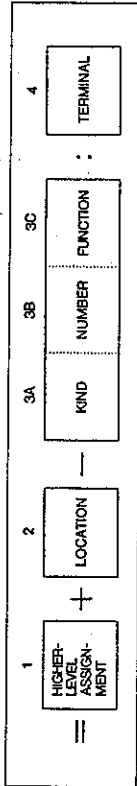
1. Higher-level assignment showing correlation with other parts of the equipment with regard to location and/or function
2. Location of item
3. Identification of item:
  - A = kind of item
  - B = number of item
  - C = function of item
4. Terminal and conductor markings.

Qualifying symbols are used to distinguish the blocks 1, 2, 3 and 4 of a complete designation. The different blocks with their qualifying symbols are shown below:



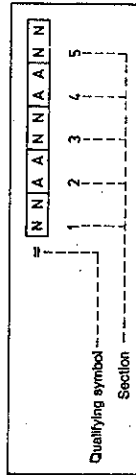
The qualifying symbol may be omitted if there is no ambiguity.

The following sequence of designation blocks is preferred:



The identification blocks 1 ("Plant") and 2 ("Location") are always entered in the block of the schematic diagram (see Figs. 33 b and 33 c on the fold-out sheet) but as a rule are only shown at the item of equipment if this is necessary for orientation purposes (see Fig. 34 b on the fold-out sheet).

This applies, for example, if the partial representation of the equipment should be shown - according to its function - at a different location and/or in connection with a different plant.



Inside the boxes, A stands for an identification letter and N for a numeral.

The individual sections can be recognized by an alternating arrangement of numerals and letters.

The identification block has a maximum of 10 alphanumeric data positions.

The number of data positions depends on the size of the plant or system. Data positions not needed may be left out provided that sections are not skipped altogether.

The alphabetical data positions are often allotted a specific meaning, which is laid down in tables.

The numerical data positions may just be numbers or have a certain other meaning.

The alphabetical data positions and, as a rule, the numerical ones as well correspond to the various steps of the functional breakdown of a plant or system.

One step generally comprises equivalent functions.

### 3.1 Plant Identification Code

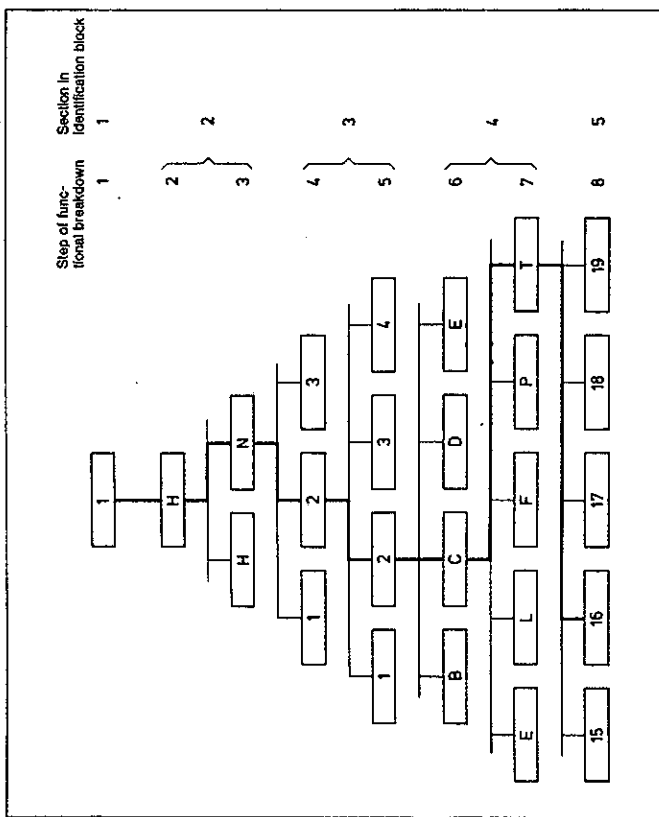
The "Plant" identification block is preceded by the equal sign (=), the identification being mainly in line with the functional structure, to which the breakdown of the schematic diagrams also corresponds.

If one circuit function is shown on several diagram sheets, these all bear the same plant identification code. The alphanumeric representation of this code generally reflects the method used for filling and locating the diagrams.

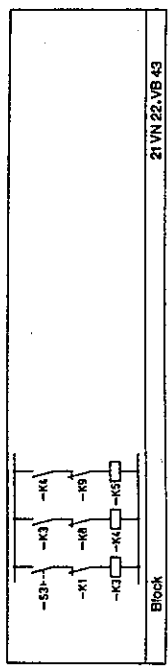
The plant identification code, which also identifies the schematic diagram (Fig. 33 b on the fold-out sheet and Fig. 2), is entered in the diagram block.

The identification block is subdivided into the following 5 sections:

**Example:**

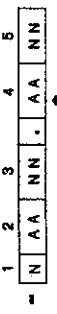


**Fig. 2 Plant identification code shown in the block of the schematic diagram.**



The meaning of the fixed alphabetical data positions is given in the table below.

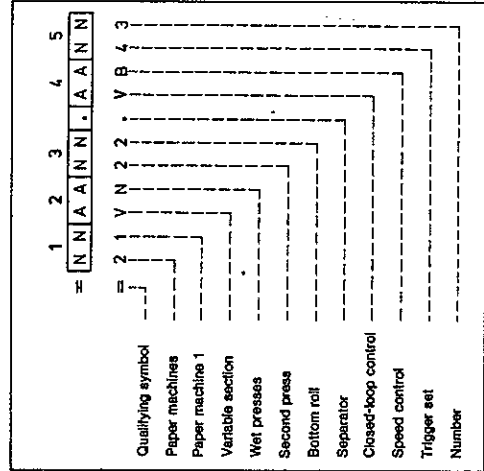
**Table 1** Meaning of the first letter code after the separator for identifying the functional group in the "Plant" identification block.



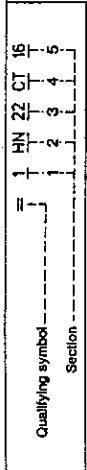
Letter code	Description	Examples from the power equipment sector
A	General	General, superordinated functions
B		
C	Power circuits operating at line frequency	Switching, transformation/conversion, transmission of electric power at high, medium or low voltage and line frequency A, C, drives, distribution systems
D		
E		
F		
G		A letter sequence in rising alphabetical order shall be used to indicate a decreasing voltage or power level
H	Power circuits not operating at line frequency	Switching, transformation/conversion, transmission of electric power at high, medium or low voltage and frequency other than the line frequency
J		D, C, drives, armature and field circuits
K		Static and other frequency converters, MF furnaces
L		A letter sequence in rising alphabetical order shall be used to indicate a decreasing voltage, power or frequency level
M		Switching, transformer/conversion, transmission of signals
N	Control Signalling	Monitoring, protection, storage, automation
P		Drive-oriented control systems (e.g. star-delta starting) and technology-oriented systems (e.g. preferential tripping)
Q		
R		
S	Measuring/metering	Measuring of electrical or other physical variables using analog or digital methods
T		Indicating, recording, counting
U		Closed-loop control of electrical and technological processes
V	Closed-loop control	Actual-value acquisition, setpoint initiation
W		Data processing, process computers
X		
Y	Other functions	
Z		

**Example of the power application:**  
The block complete with dot (.) as separator is used here.

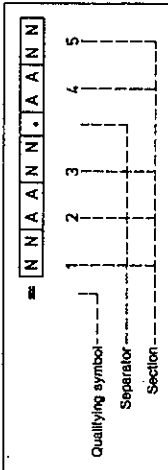
**Example:**



As already mentioned, the plant identification code also identifies the schematic diagram and is shown in the diagram block (Fig. 2).



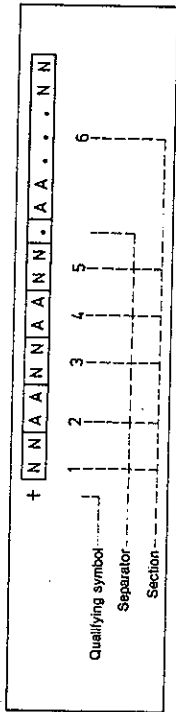
The identification block starts at the left with the largest functional unit and ends at the right with the smallest one. Where necessary, the breakdown chosen and the significance of the data positions are explained in the circuit documents. The identification block may be subdivided by a dot (.) between sections 3 and 4.



Inside the boxes, A stands for an identification letter and N for a numeral.  
Sections 1 to 3 (to the left of the separator) mainly contain details of the plant or system as a whole, which is made up of equipment assemblies, sets, functional groups etc.  
Sections 4 and 5 (to the right of the separator) generally give information on the individual equipment assemblies, sets, functional groups (power, measuring, metering and control circuits) or similar items.

### 3.2 Location Identification Code

The "Location" identification block is preceded by a plus sign (+). This identification code indicates the location of a piece of equipment, e.g. the building, room, cubicle, rack or mounting position. The identification block is subdivided as follows:



Inside the boxes, A stands for a code letter and N for a numeral.

The individual sections can be recognized by an alternating arrangement of letters and numerals. One section generally covers similar assemblies.

Inside the block, not more than 18 data positions are used. The number of data positions depends on the size of the plant or system. Data positions not in use may be left out provided that none of the sections are skipped.

The identification block is subdivided by a dot (.) as separator placed between sections 5 and 6.

Information regarding the location (building, room, row, etc.) of a construction unit (bay, cubicle, rack) is shown to the left of the separator (.)

Information regarding the location (row, column, etc.) of an item of equipment forming part of the construction unit is given to the right of the separator (.) In section 6, a maxi-

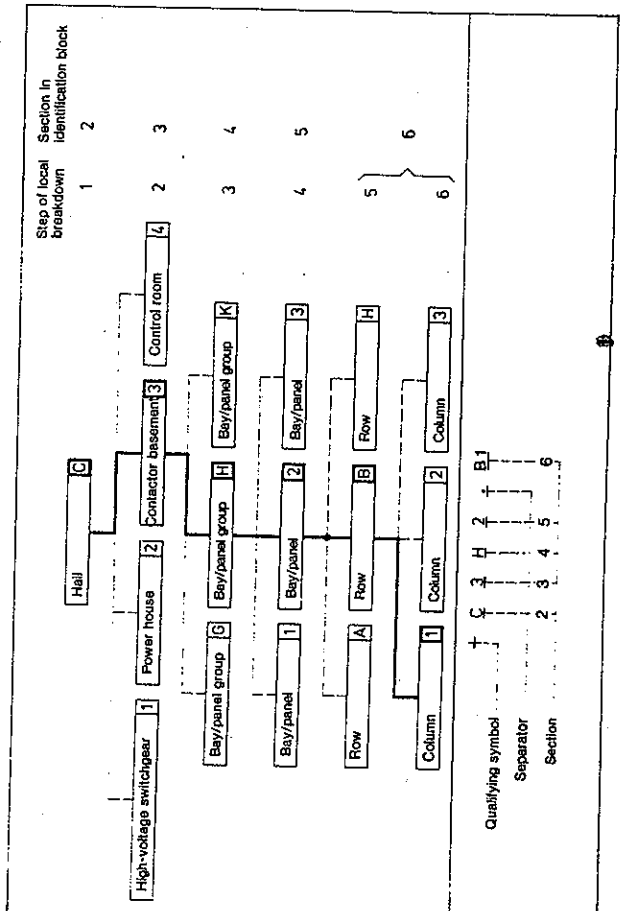
mum of 8 alphabetical and/or numerical symbols can be used in any desired order.

The following example shows the formation of the "Location" identification block, starting with section 2 and paying due regard to the construction features of a plant. The identification block starts at the left with the largest construction unit and ends at the right with the smallest unit. Where necessary, the breakdown and the significance of the data positions are explained in the circuit documents.

If the locations of mechanical equipment are included in this identification block as well, or if existing location markings have to be allowed for, sections 1 to 4 can each be extended to include 3 data positions but the total number of positions must not exceed 10.

Example:

Formation of the "Location" identification block.

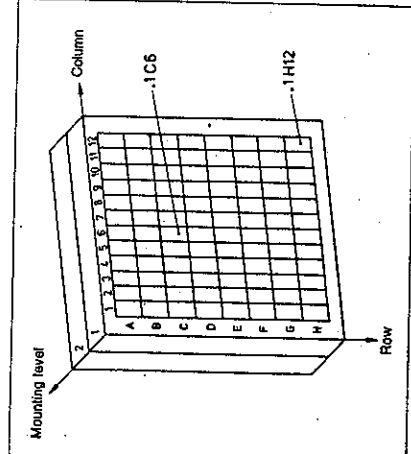


The meaning of the predetermined alphabetical data positions for power applications is given in the table below.

Letter code	Location	Examples of construction units
A	High voltage switchgear	Cubicles, cabinets, bays, boxes
B	Transformers, reactors, capacitors	Cubicles, rooms, mounting positions
C	Low voltage switchgear	Racks, boards, cubicles/cabinets
D	Low voltage switchgear	Boxes
E	Unassigned	Desks
F	Unassigned	Electrical equipment not covered by the letters A to R, e.g. on a machine ("locally")
G	Unassigned	Unassigned
H	Unassigned	
I	Unassigned	
J	Unassigned	
K	Unassigned	
L	Unassigned	
M	Unassigned	
N	Unassigned	
P	Unassigned	
R	Unassigned	
S	Unassigned	
T	Unassigned	
U	Unassigned	
V	Unassigned	
W	Unassigned	
X	Unassigned	
Y	Unassigned	
Z	Unassigned	

Table 2  
Letter code of the fourth data position to the left of the separator for identifying locations and construction units in the "Location" identification block.

Example:  
Location (section 6, to the right of the dot (.) as separator).



In the above example, section 6 (in the "Location" (+) identification block after the dot (.) starts with a numeral, but in Fig. 3 below with a letter. In the circuit diagram, the "Location" (+) identification block is shown below the "Plant" (-) identification block.

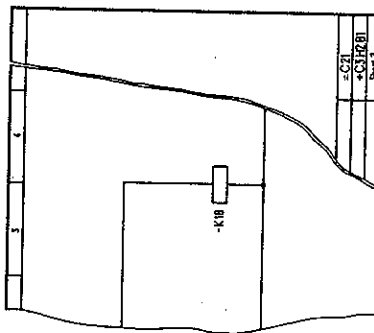
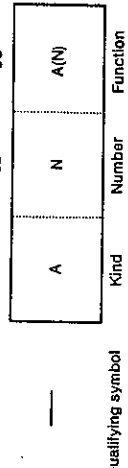


Fig. 3 Schematic diagram showing "Plant" (-) and "Location" (+) symbols in the block.

The location identification code is generally entered in the diagram block (Fig. 33c in the fold-out sheet) and at the item of equipment (Figs. 34 b and 35 a in the fold-out sheet) if necessary.

### 3.3 Equipment Identification Code

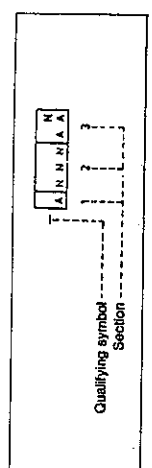
The "Equipment" identification block is preceded by a minus sign (-); it consists of the parts 3A, 3B and 3C.



Inside the boxes, A stands for a code letter and N for a numeral (see Fig. 35b on the fold-out sheet).

For equipment identification, part 3 B must be marked in the schematic diagram, whereas parts 3 A and 3 C may be added to part 3 B as supplements.

For the data positions in the above identification block, only the following letters and numerals are permissible, i.e. in the order shown:



Inside the boxes, A stands for a code letter and N for a numeral.

**Function**

The function of an item of equipment can be identified by one or two letters or by one letter and a numeral. The markings used are explained in the circuit document. In cases where general information on the function is

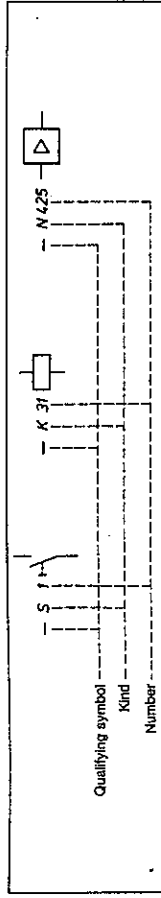
sufficient (e.g. power equipment and auxiliary devices), the letters shown in Table 4 below are used. This dispenses with further explanations in the circuit documents. The function identification may be left out if it is not needed but is never used by itself.

**Table 4**  
Letter codes and corresponding general functions  
(complying to block 3C)

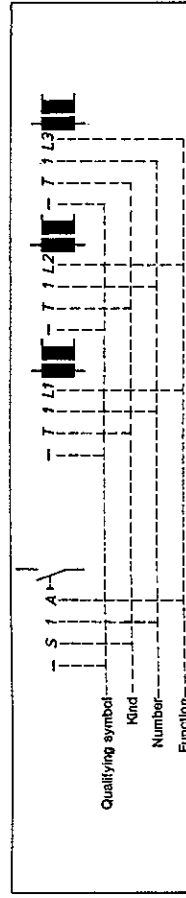
Letter code	General function
A	Auxiliary
B	Direction of movement (forward, backward, hoist, lower, clockwise, anti-clockwise)
C	Counting
D	Differentiating
E	Function "ON"
F	Protecting
G	Testing
H	Signalling
J	Integrating
K	Jogging
L	Conductor marking/identification
M	Main function
N	Measuring
P	Proportional
Q	State (start, stop, limit)
R	Reseating, erasing
S	Storing, recording
T	Timing, delaying
U	Speed (accelerating, braking)
V	Adding
W	Multiplying
X	Analog
Y	Digital
Z	

**Examples:**

Equipment identification codes consisting of a kind identifier and a number (see also Figs. 34c and 35b on the fold-out sheet).



Equipment identification codes consisting of a kind identifier, a number and a function identifier.



**Kind**

The kind of equipment is identified by only a single letter. This can be allotted to an individual item of equipment and also to a combination of various items, e.g. a starter with limit switch. The identification of the kind of equipment may be left out if it is not needed but is never used by itself.

**Number**

Each item of equipment shown in a circuit diagram is allotted a number having 1 to 3 digits. This number is always stated; it may have an additional meaning, which is then explained in a table.

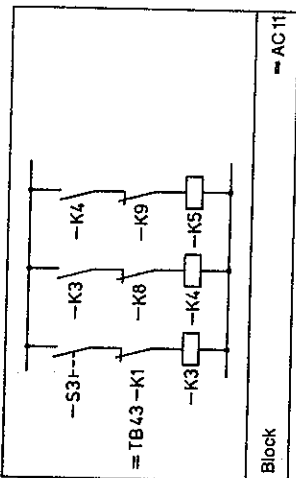
**3.3.1 Complete Equipment Identification Code — Split Representation**

Identification blocks (or parts thereof) which are the same for most of the items of equipment represented in a schematic diagram, e.g. the "Plant" identification block, are shown only once at a suitable place in the diagram, e.g. in the block (see Fig. 33b on the fold-out sheet). The complete code then comprises this common part and that which is marked next to the equipment symbol, items not covered by the common part are marked (at or near their symbol) with the complete code (see in the following example: contactor contact — TB43 — K1 in diagram — AC1). Marking at the equipment location can proceed in a similar manner.

Letter code	Kind of item	Examples
A	Assemblies, subassemblies	Amplifier with tubes or transistors, magnetic amplifier, laser, maser
B	Transducers, from non-electrical quantity to electrical quantity or vice-versa	Thermoelectric sensor, thermo cell, photoelectric cell, dynamometer, crystal transducer, microphone, pick-up, loudspeaker, synchros, resolvers
C	Capacitors	
D	Binary elements, delay devices, storage devices	Combinative elements, delay lines, bistable elements, monostable elements, core storage, register, magnetic tape recorder, disk recorder
E	Miscellaneous	Lighting devices, heating devices, devices not specified elsewhere in this table
F	Protective devices	Fuse, overvoltage discharge device, arrester
G	Generators, supplies	Rotating generator, rotating frequency converter, battery, supply device, oscillator, quartz-oscillator
H	Signalling devices	Optical and acoustic indicators
J		
K	Relays, contactors	
L	Inductors	Induction coil, line trap
M	Motors	
N	Amplifier, regulator	
P	Measuring equipment, testing equipment	Indicating, recording and integrating measuring devices, signal generator, clocks
Q	Mechanical switching devices for power circuits	Circuit-breaker, isolator
R	Resistors	Adjustable resistor, potentiometer, rheostat, shunt, thermistor
S	Switches, selectors	Control switch, pushbutton, limit switch, selector switch, selector, dial contact, connecting stage
T	Transformers	Voltage transformer, current transformer
U	Modulators, changers	Discriminator, demodulator, frequency changer, encoder, inverter, converter, telegraph translator
V	Tubes, semiconductors	Electronic tube, gas-discharge tube, diode, transistor, thyristor
W	Transmission paths, waveguides, aerials	Jumper wire, cable, busbar, waveguide, waveguide directional coupler, dipole, parabolic aerial
X	Terminals, plugs, sockets	Disconnecting plug and socket, test jack, terminal board, soldering terminal strip
Y	Electrically operated mechanical devices	Brake, clutch, pneumatic valve
Z	Terminations, hybrid transformers, filters, equalizers, limiters	Cable balancing network, compandor, crystal filter,

**Table 3** Letter codes and corresponding kinds of item (complying to block 3A)

Example:

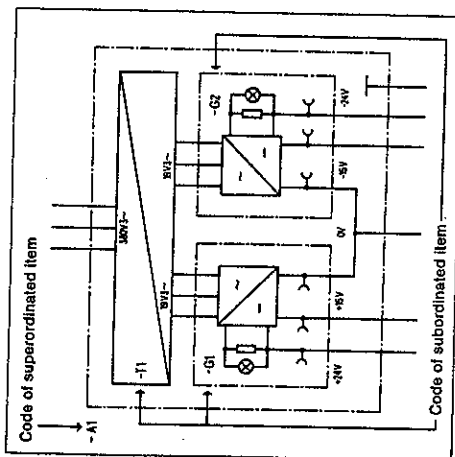


The complete identifying codes of all other symbols in the above example would read:

- AC11 -K3, -AC11 -K4, -AC11 -K5, -AC11 -K8, -AC11 -K9 and -AC11 -S3.

### 3.3.2 Marking of Integrated Components

With integrated components, one item of equipment forms part of another, each having its own markings, e.g. modular assembly - A1 (superordinated item) and the transformer - T1 (subordinated item).



To designate an item of equipment which forms part of a superordinated item, the two identification blocks are joined together (that of the superordinated item being on the left).

Example:

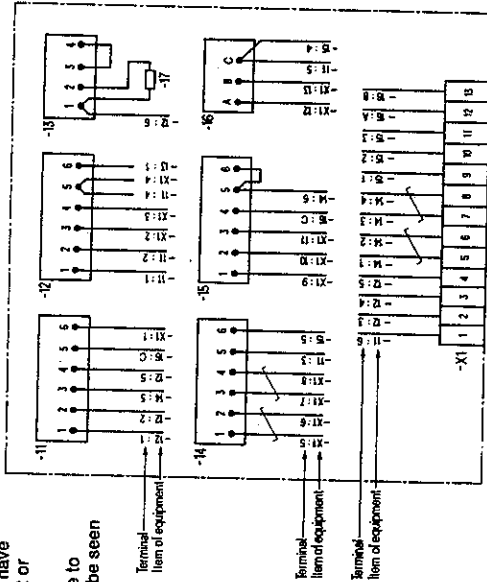
The complete identification code of a modular assembly consists of the "Plant" and "Kind, Number" blocks and reads -M3 -A1. The transformer built into this assembly is designated by the "Kind, Number" -T1 identification block (see Fig. 4).

The complete transformer identification code thus reads -M3 -A1 -T1.

The "Terminal" block is used when

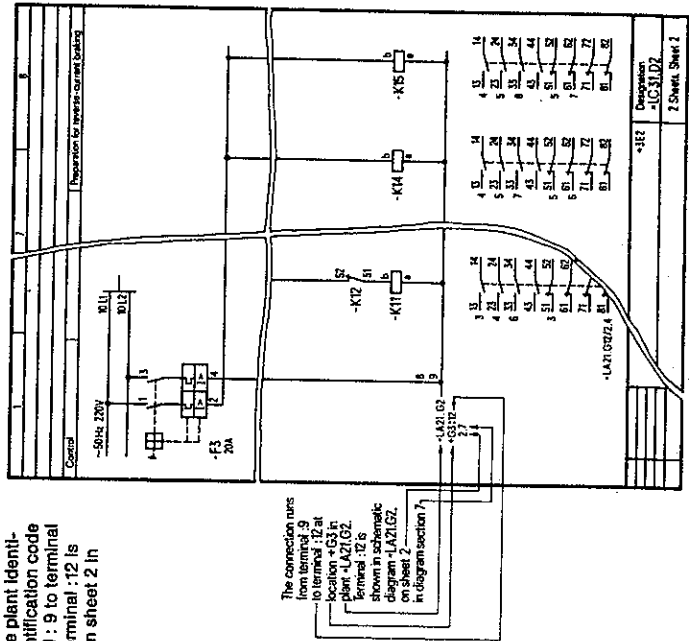
- the connections between items of equipment have been replaced by broken lines showing target or similar symbols, as illustrated in Fig. 5.
- terminals located in a plant other than the one to which the schematic diagram applies, as can be seen in Fig. 6.

Fig. 5 Typical "Terminal" identification block.



Terminal  
Item of equipment

Fig. 6 "Terminal" identification block in the schematic diagram



The schematic diagram in Fig. 6 bears the plant identification code -LC31.D2 and location identification code +3E2. The connection runs from terminal : 9 to terminal :12 at location +G3 in plant -LA21.G2. Terminal :12 is shown in schematic diagram -LA21.G2 on schematic diagram section 7.

The connection runs from terminal : 9 to terminal :12 at location +G3 in plant -LA21.G2. Terminal :12 is shown in schematic diagram -LA21.G2 on schematic diagram section 7.

- inside enclosures, or on immediately adjacent to the particular item,
- in the equipment or component list, complete with additional information,
- in the parts list complete with additional information that is generally required for reordering.

Fig. 4 Integrated item of equipment forming part of plant -M3. The modular power pack -A1 consists of transformer -T1 and the power supplies -G1 and -G2. The complete identification-codes read: -M3 -A1, -M3 -A1 -T1, -M3 -A1 -G1, -M3 -A1 -G2.

### 3.4 Terminal Identification Code

The "Terminal" identification block is preceded by a colon (:)



inside the box, A stands for the code letter and N for a numeral.

### 3.4.1 Terminal Markings of Equipment and Equipment Combinations

Terminals are marked immediately adjacent to the termination points of the equipment or equipment combinations; the colon (:) is generally not used here.

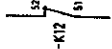


Fig. 7 NC contact with the terminals 51 and 52 of the contactor -K12 shown in the schematic diagram in the resolved state

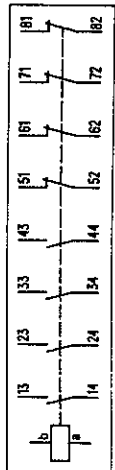


Fig. 8 Terminal markings shown at the complete equipment representation (contactor)

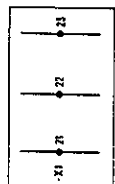


Fig. 9 Markings of 3 terminals on terminal block -X1

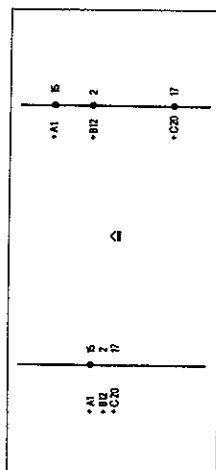


Fig. 10 Alternative representation of the markings of 3 terminals in a conductor run

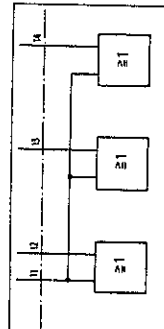


Fig. 11 Terminal markings at an equipment combination

### 3.5 Markings to Indicate Coil Winding Direction

The direction in which a coil is wound is marked by a dot (.) if necessary (see Figs. 12 and 13).

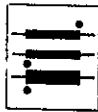


Fig. 12 Transductor reactor with 2 control windings (showing winding direction)

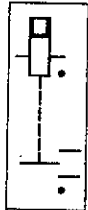


Fig. 13 Polarized relay with 3 switching positions and automatic reset when activation ceases. If a positive potential is applied to the terminal marked thus ●, the relay contact changes over to the corresponding side.

### 3.6 Technical Data and Type Designations

Technical data and type designations are marked below the equipment identification code in smaller print (see Figs. 14 to 17). Resistors may be marked "1K" instead of "1KQ".

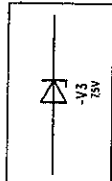


Fig. 14 Zenerdiode and its breakdown voltage

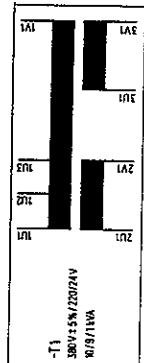


Fig. 15 Three-winding transformer, the rated voltages and the capacity of each winding being shown

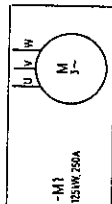


Fig. 16 Motor with its rated output and rated current

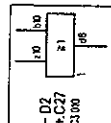


Fig. 17 SIMATIC module and its type designation C3010

### 3.7 Crossings Within Groups of Connecting Lines

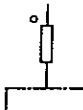
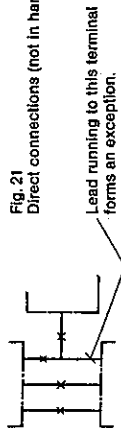
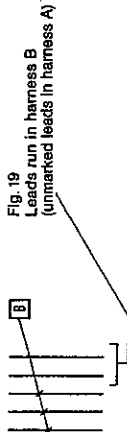
Grouped connecting lines reduced to single lines for the sake of convenience and then continued in crossed arrangement are marked as shown in Fig. 18.



Fig. 18 Crossings within groups of connecting lines

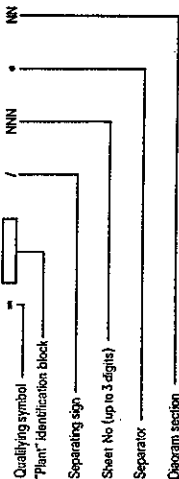
### 3.8 Method of Wiring

The particular wiring method used is marked as indicated in Figs. 19 to 22.



### 4.1 Diagram Section References Marked at Circuit Symbols and Connectors

To locate symbols, particularly when shown in the resolved state, reference codes are used which are made up as follows:



The following need not be shown:

- the "plant" identification block, if this is apparent from the equipment identification code,
- the sheet No., if the reference code refers to a diagram section or square on the same sheet.

In the case of contactor or relay contacts, reference is made to the representation of the coil if this is not shown on the same sheet (Fig. 25), and with partial representations of other items of equipment to their complete representation.

In the case of a complete representation of items of equipment, reference is made to all the partial representations (Fig. 24 and Fig. 34d on the fold-out sheet) and vice versa.

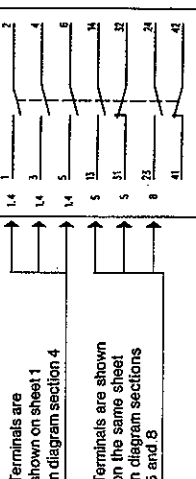


Fig. 24 References to diagram sections marked at or near the equipment representation (see also Fig. 34d on the fold-out sheet).

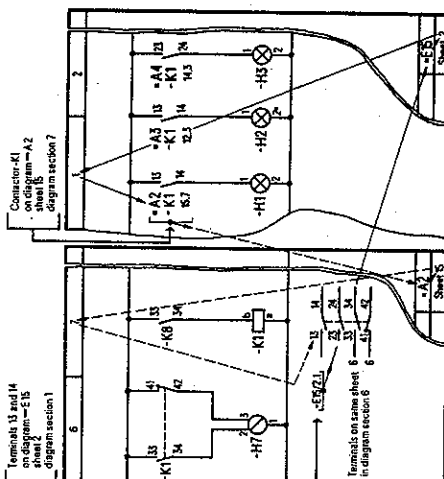


Fig. 25 Partial representations of an item of equipment in different diagrams

## 4 How to Locate Items in Schematic Diagrams

For convenient tracing of interrupted lines and items of equipment (as well as parts thereof shown elsewhere in the circuit), the schematic diagrams are subdivided into sections or squares (see Fig. 23 and Fig. 33e on the fold-out sheet).

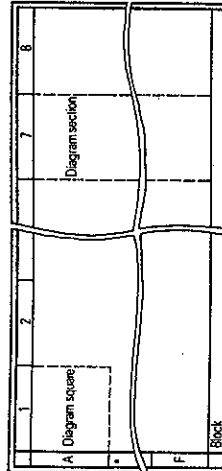


Fig. 23 Diagram sections are identified by a number, e.g. 7, and diagram squares by a numeral and a capital letter, e.g. 1A.



**Explanations to Fig. 25:**

The terminals 33, 34 and 41, 42 of contactor -K1 in diagram -A2, sheet 15 are shown in the same diagram, section 6, and terminals 13, 14 in diagram -E15, sheet 2, section 1. These terminals are marked to the effect that the complete representation of contactor -K1 is shown in diagram -A2, sheet 15, section 7.

Fig. 26 illustrates connectors, each end of which bears a note indicating where the continuation can be found. Both connector ends are located in the same plant -C21 (sheets 1 and 2 of the schematic diagram bear this plant identification code as well). The plant identification code need therefore not be marked at the connector ends, and the connector on sheet 1 only bears the reference "2.1.". This means that the continuation is found on sheet 2 in diagram section 1; and "1.4" is marked at the corresponding point on sheet 2, i.e. the continuation is shown on sheet 1 in diagram section 4.

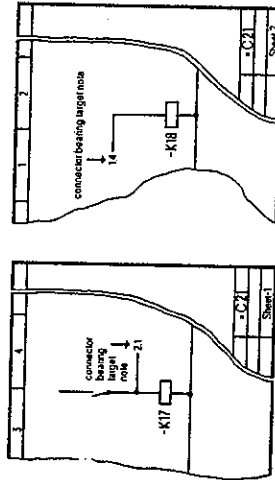


Fig. 26 Connectors marked to indicate the point of continuation

The target note, i.e. the note indicating the point of continuation (see Fig. 26) can be complemented by an "Identifier", which takes one of the following forms:

- a) Code to DIN 42 400, e.g. "L1", "L2", "PE", "N",
- b) Note indicating the mode of operation: "ACKNOWLEDGING", "EMERGENCY OFF",
- c) Alphanumeric characters.

Corresponding connector ends bear identical identifiers (see Fig. 27).

If only the target note is shown and there is a risk of its being confused with the identifier, it is put in brackets.

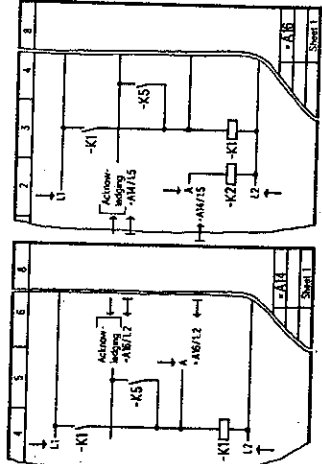


Fig. 27 Connectors with identifiers and target notes

Sections of two schematic diagrams are depicted in Fig. 27. The diagram blocks show the particular plant identification code (-A14 in the left-hand diagram and -A16 in the right-hand diagram) and the sheet No. underneath.

The target notes at the connector ends are made up as follows:

The separating sign (/) is preceded by the plant identification code (to indicate the diagram) and followed by the sheet No. of the particular diagram, this being followed - after the dot (.) - by the sheet No. of the diagram section.

**4.2 Diagram Section References for Symbols Identifying Electronic Equipment**

Electronic modules generally contain several functional elements. These are marked with consecutive numbers, e.g. from 1 to 15, as shown in Fig. 28.

In the schematic diagram - a section of such a diagram has been reproduced in Fig. 29 - the functional elements of an electronic module are shown in the particular circuits corresponding to their functions. They bear the equipment identification code of the electronic module (-D3 in the example), and their consecutive numbers have been entered with smaller figures at the bottom left (see also Fig. 35c on the fold-out sheet).

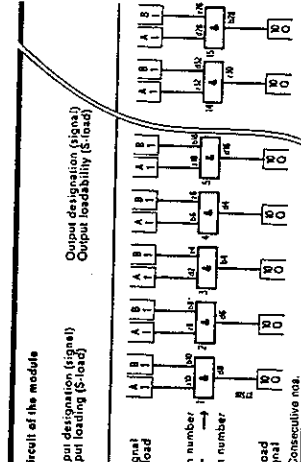


Fig. 28 Type 6EC3 000-0A module shown by equipment identification code -D3 in the schematic diagram.

The functional element numbers are marked at the left of the elements.

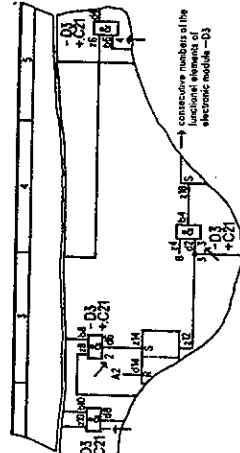


Fig. 29 Section of a schematic diagram which contains the functional elements 1 to 4 of the type 6EC3 000-0A module identified by the equipment code -D3

The note indicating the diagram section which contains the functional element is listed in a table. This forms part of the schematic diagram (Fig. 30).

The table heading in Fig. 30 contains from left to right:

- the equipment identification code,
- the type designation or abbreviated type designation,
- the numbers of the functional elements (from 1 to 14 in the example).

**Example:**

The electronic module with the equipment identification code -D3 and type designation 6EC3 000-0A has 15 functional elements (see Fig. 28), only 4 of which are connected up, however:

- Functional element 1 is in diagram section 2
- Functional element 2 is in diagram section 3
- Functional element 3 is in diagram section 4
- Functional element 4 is in diagram section 5

Elements 5 to 15 have not been assigned.

Electronic modules (of the plug-in type)	Diagram section (blank boxes still unassigned)															
	Code	Type designation or abbreviated designation	1	2	3	4	5	6	7	8	9	10	11	12	13	14
-D1	6EC3 000-0D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
-D2	000-0A	2	3	4	5	6	7	8	9	10	11	12	13	14		
-D3	000-0A	2	3	4	5	6	7	8	9	10	11	12	13	14		
-D4	000-0A	2	3	4	5	6	7	8	9	10	11	12	13	14		
-D5	000-0A	2	3	4	5	6	7	8	9	10	11	12	13	14		
-D6	101-0A	2	3	4	5	6	7	8	9	10	11	12	13	14		

Fig. 30 Table indicating the diagram sections (see also Fig. 36b on the fold-out sheet)

# 6 Graphical Symbols

The following reference list will facilitate tracing of the appropriate symbols:

General circuit elements	18
Operating mechanisms	21
Couplings, brakes	24
Releases	25
Switchgear	26
Valves (tubes), semiconductor elements	29
Transformers, reactors and transductors	30
Rotating machines	31
Measuring devices	36
Digital information processing	37
Acoustic and visual signalling devices	
Conductors	42
Conductor junctions	43
Voltage, current, frequency	44
AC systems and connections	45

**Note:**

- Indicates the fact that the foreign and German symbols are identical.
- Indicates the fact that no symbol exists.

# 5 Explanatory Notes

There are two ways of showing explanatory notes in schematic diagrams:

- either by entering them in one or several lines above the circuitry, as shown in Fig. 31,
- or by placing a number enclosed by a triangle, e.g. ▽, at a suitable point in the schematic diagram, in conjunction with a table shown at the right-hand side. This gives the No. and a note, e.g. "3 Lamp test" in Fig. 32.

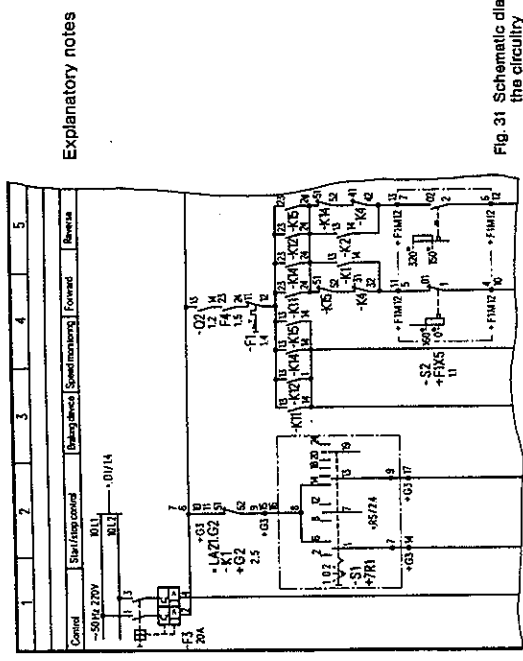


Fig. 31 Schematic diagram with explanatory notes shown above the circuitry

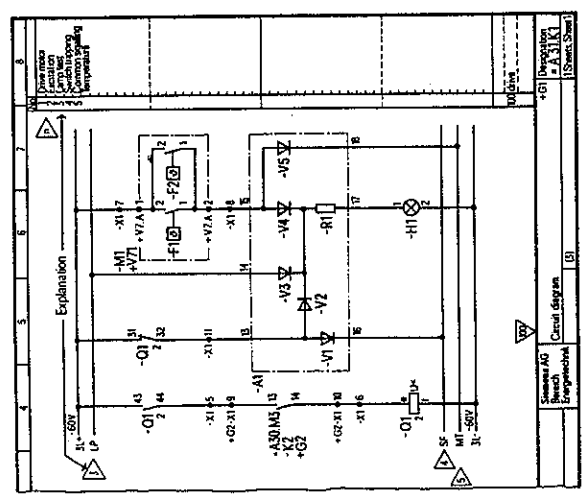


Fig. 32 Schematic diagram with the explanatory notes compiled in a table

# General circuit elements

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Resistor		$=$ or	$=$ or	$=$ or
with tappings		$=$	$=$	$=$
Winding, inductor				$=$ or
with tappings				$=$ or $=$
Capacitor				$=$ or
with tapping				$=$
Polarized capacitor			$=$	$=$
Polarized electrolytic capacitor			$=$ or	$=$ or
Permanent magnet		$=$	$=$ or	$=$
Accumulator cell, battery (long line = positive pole)			$=$	$=$
Earth (ground) connection		$=$	$=$	$=$
Frame or chassis connection				$\neq$
Electrical driven fan or blower			$=$	

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Variable in operation — continuously — stepwise		$=$	$=$	$=$
Variable for testing (pre-set adjustment)		$=$	$=$	$=$
Variable under the influence of a physical quantity		$=$	$=$	$=$
Spark gap				$\downarrow$ $\uparrow$
Surge diverter, general		$=$		$=$
Thermocouple				
Clock				
Converter, transmitter		$=$	$=$	$=$
Amplifier, general symbol		$=$ or		$=$ or
Single-phase bridge-connected rectifier				

# Operating mechanisms

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Hand operated mechanism		=	=	=
Foot operated mechanism		see page 28	see page 28	
Cam operated mechanism			=	
Pneumatic operating mechanism				=
Power operating mechanism (stored energy type)		=	=	=
Motor operated mechanism		=	= or	=
Valve, general symbol		=	=	=
Unidirectional latching device		=	=	=
Bidirectional latching device				
Notch			with annotation	=
Device for time delayed operation, following actuating force to right				=
Device for cyclic actuation			with annotation	=
Latching mechanism				

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Isolating fuse				
Fuse				
Isolating link				
Plug and socket device				
Filament lamp				
Discharge lamp				

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Operating element with automatic return on discontinuation of actuating force for contactors, relays, releases				
Operating coil energized (the arrow denotes the operating state, if this deviates from the standard representation)				
Relay with two coils acting unidirectionally				
Undervoltage relay				
Time-delay for electro-mechanic operating elements				
Coil of slow-releasing relay				
Coil of slow-operating relay				
Coil of a slow-operating and slow-releasing relay				

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Coil of a polarized relay with permanent magnet				
Coil of a remanent relay				
Coil of a mechanically-resonant relay				

# Couplings, brakes

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Mechanical coupling, hand operated, disengaged when operating means is non-operated				
engaged when operating means is non-operated				
Brake released when operating means (not shown) is energized				
Brake applied when operating means (not shown) is energized				

# Releases

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Thermal overload release				
Magnetic overcurrent release				
Undervoltage release				
Open-circuit shunt release				

# Switchgear

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Make contact (NO)				
Break contact (NC)				
Change-over contact				
Change-over contact make-before-break				
<b>Time-delayed contacts</b>				
Make contact, delayed make				
Break contact, delayed break				
Make contact, delayed break				
Break contact, delayed make				

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Contactor with thermal overload releases				
Triple-pole circuit breaker with latching mechanism, electro-magnetic release and 3 thermal overload relays				
Isolating circuit breaker				
Circuit breaker				
Triple-pole load-break switch				
Triple-pole fused isolator				
Triple-pole isolator				
Isolating link, change-over type				

# Valves (tubes), semiconductor elements

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Electronic valve, diode		=		=
Electronic valve, triode		=		=
Single anode rectifier vessel with mercury cathode (ignitron)		=	=	=
Semiconductor diode				
Limiting diode uni-bidirectional				
Transistor			=	=
Thyristor, general symbol				=
Photo-resistor bidirectional				=
Photoelectric cell				=
HALL generator				=
Junction field effect transistor with N-type channel		=		=

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Single-throw switch, manually operated				-
Spring-return switches, manually operated				=
with 1 NO contact				=
with 1 NC contact				
foot operated				
cam operated				
flow speed actuated				=
pressure actuated				=
temperature actuated				
liquid level actuated				
over/under normal flow speed	$v > / v <$			
over/under pressure	$p > / p <$			
over/under temperature	$\phi > / \phi <$			
over/under normal liquid level	$V > / V <$			
over/underspeed	$n > / n <$			
Examples: Spring-return switch opens at overspeed				
Spring-return switch closes at undertemperature				



## Transformers, reactors and transducers

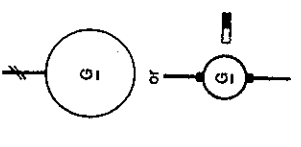
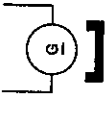
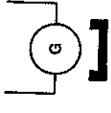

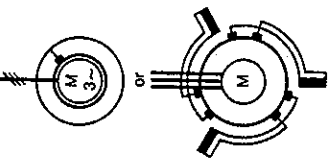
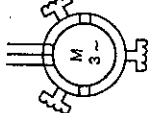
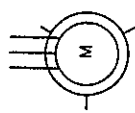
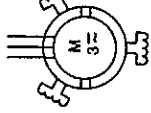
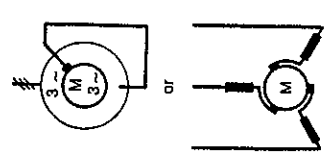
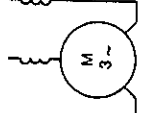
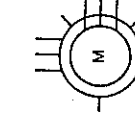
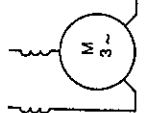
Description	German symbols	British symbols	US/Canadian symbols	International symbols
Transformer with two separate windings	or	or	or	or
Transformer with three separate windings	or	or	or	or
Auto-transformer	or	or	or	or
Reactor	or	or	or	or
Current transformer	or	or	or	or
Voltage (potential) transformer	or	or	or	or

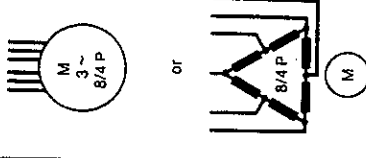
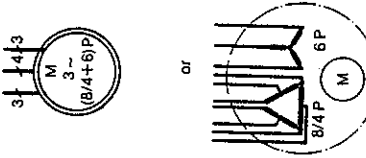
## Rotating machines

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Three-phase induction motor with slipring rotor	or	or	or	or
Three-phase induction motor with squirrel-cage rotor	or	or	or	or
Three-phase induction motor with squirrel-cage rotor, both ends of the windings brought out	or	or	or	or

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Single-phase induction motor with squirrel-cage rotor and starting winding in stator with capacitor				
Three-phase synchronous generator, star connected, neutral not brought out				
Three-phase synchronous generator with permanent magnet excitation				

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Single-phase synchronous generator with permanent magnet excitation				
D. C. shunt-wound generator, interpole windings arranged in symmetry with the armature				
D. C. series-wound motor, interpole windings arranged in symmetry with the armature				

Description	German symbols	British symbols	US/Canadian symbols	International symbols
D. C. generator with permanent magnet excitation				
Three-phase commutator motor with shunt characteristic, rotor fed				
Three-phase commutator motor with series characteristic				

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Change-pole squirrel-cage induction motor for changing from 3 to 4 poles according to Dahlander		-	-	-
Change-pole squirrel-cage induction motor with 2 separate windings for changing from 8 to 4 poles and 6 poles respectively		-	-	-

## Digital information processing

Description	German symbols	British symbols	US/Canadian symbols	International symbols
AND gate		=		=
OR gate		=		=
NOT gate, NEGATER		=		=
NAND gate, i. e. AND with negated output		=		=
NOR gate, i. e. OR with negated output		=		=
Exclusive OR gate		=		=
Delay element, general symbol		=		=
Delay element with specified delay times		=		=

## Measuring devices

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Ammeter		=	=	=
Voltmeter		=	=	=
Double voltmeter				
Single-phase A. C. watt-hour meter, form 1				
Single-phase A. C. watt-hour meter, form 2				
Single-phase recording A. C. wattmeter, form 2				
Instrument shunt				=
Synchro Rotor and stator three-phase		—		
Rotor single-phase stator three-phase		—		
Torque transmitter / receiver	* MG/ME	—	* TX/TR	* TX/TR
Torque differential transmitter/receiver	MDG/MDE	—	TDX/TDR	TDX/TDR
Control transformer/transformer	SG/SE	—	CX/CT	CX/CR
Control differential transmitter	SDG	—	CDX	CDX
Receiver transmitter/transformer	FG/FE	—	RS	RX/RR
Receiver differential transmitter	FDG	—	—	RDX
	(not standardized by DIN)			

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Bistable element, general symbol		=		=
Monostable element, single shot		=	= or	=
RS bistable element		=		=
T bistable element, binary divider, complementing element		=		=
Bidirectional shift register		=		=
Four-stage bidirectional counter with parallel loading and common reset		=		=

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Negation Negating input			=	=
Negating output			=	=
Polarity Input with polarity indicator The 1-state is the less positive level.		=	=	=
Output with polarity indicator			=	=
Static and dynamic inputs Static input		=	=	=
Dynamic input			=	=
Negated dynamic input			=	=

# Acoustic and visual signalling devices

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Horn				
Bell		=		=
Siren		=		=
Buzzer				
Pilot light, indicating light		=		=
Semaphore indicator		-		=
Drop annunciator Make contact actuated by the actuating system		-		-
Make contact actuated by the target				

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Inhibiting inputs Inhibiting input		=		=
Negated inhibiting input				=
Inputs and outputs not carrying logic information Input not carrying logic information		-		=
Output not carrying logic information		-		=
Extension input				=

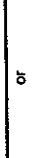
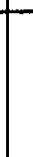


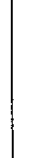



## Conductors

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Conductor, general		=	=	=
Flexible conductor			-	
Protective conductor				
Neutral		=	=	=
Two conductors twisted				
Coaxial pair				
Screened conductors		=	=	=
One conductor				
Of 7 conductors, 3 are within one screen				
Conductor with screen earthed				
Line marked to denote number of conductors		=	=	=
Grouping of conductors				
Random sequence				
Direction of conductors as marked				





















## Conductor junctions

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Junction of conductors		=	=	=
Junction		=	=	=
In general (or not separable)		=	=	=
Terminal strip		=		=




## Voltage, current, frequency

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Direct current	 or 	=	=	=
Alternating current		=	=	=
Direct or alternating current		=	=	=
Undulating or rectified current		=	=	=
Audio frequency		=	=	=
Super audio, carrier and radio frequencies		=	=	=
Square wave pulse, positive, negative		=	=	=
Single-phase a. c., e. g. 16 2/3 Hz	1 ~ 16 2/3 Hz	=	1 PH 16 2/3 c/s or 1 PH 16 2/3 c/s	= or 1 ~ 16 2/3 c/s
3-phase a. c.	3 ~ 50 Hz 380 V	=	380 V 3 PH 50 c/s or 380 V 3 Ø 50 ~	=
3-phase a. c. with neutral	3/N ~ 50 Hz 380 V	=	380 V 4 Ø 3 PH 50 c/s or 380 V 4 Ø 50 ~	3N ~ 50 Hz 380 V or 3N ~ 50 c/s 380 V
3-phase a. c. with neutral with protective function	3/PEN ~ 50 Hz 380 V	=	380 V 4 Ø 3 PH 50 c/s (neutral earthed) or 380 V 4 Ø 50 ~ (neutral earthed)	3 PEN ~ 50 Hz 380 V
3-phase a. c. with neutral and protective earth	3/N/PE ~ 50 Hz 380 V	=	380 V 5 Ø 3 PH 50 c/s (with neutral and protective earth) or 380 V 5 Ø 50 ~ (with neutral and protective earth)	3 NPE ~ 50 Hz 380 V
2-conductor d. c.	2-220 V	=	220 V DC 2 Ø	=
2-conductor d. c. with neutral	2/N-220 V	=	220 V DC 3 Ø	2N-220 V

## AC Systems and connections

Description	German symbols	British symbols	US/Canadian symbols	International symbols
Single-phase systems Single winding		—	—	=
Single winding with auxiliary phase		=	=	=
2-phase systems, generally 2 separate windings, especially open 2-phase connection	 or 	—	—	
2-phase winding L-connected		=	=	=
3-phase systems, generally 3 separate windings, especially open 3-phase connection	 or 	—	—	= or =
3-phase delta connection	 or 	= or =	= or =	= or =
3-phase star connection		=	=	=
3-phase star connection with neutral brought out		=		=
3-phase zig-zag connection		=	=	=
3-phase open delta connection		=	=	=
6-phase systems, generally 6 separate windings		—	—	=
6-phase double delta connection		=	=	=
6-phase hexagonal connection		=	=	=
6-phase star connection		=	=	=
Star-delta connection		—	—	—
Dahlander connection		—	—	—



Description	German symbols	British symbols	US/Canadian symbols	International symbols
m-phase systems generally n separate windings		—	—	=
m-dial connection (polygon connection)		—	—	=
m-fold star connection		—	—	=

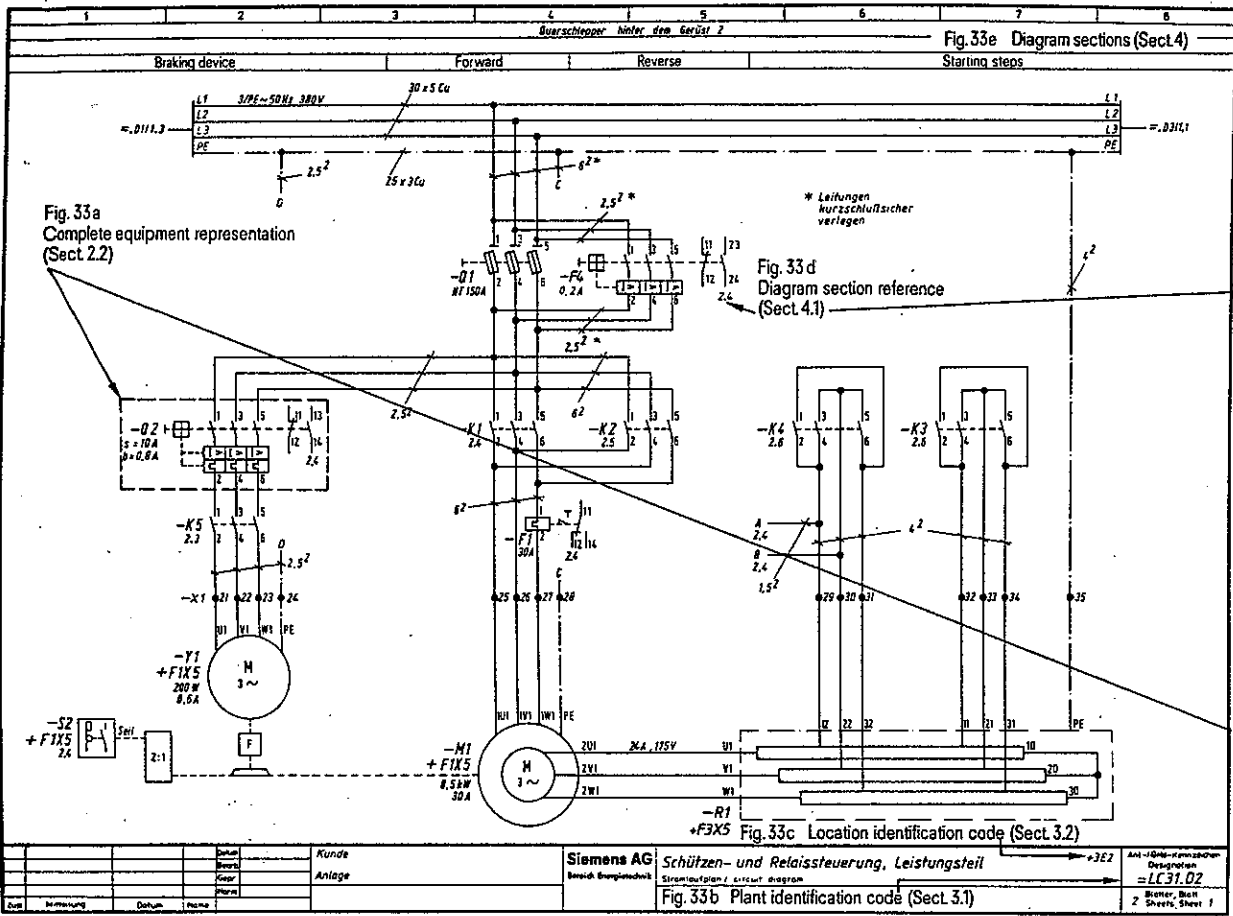


Fig. 33 Main circuits (Sect. 2.1.1)

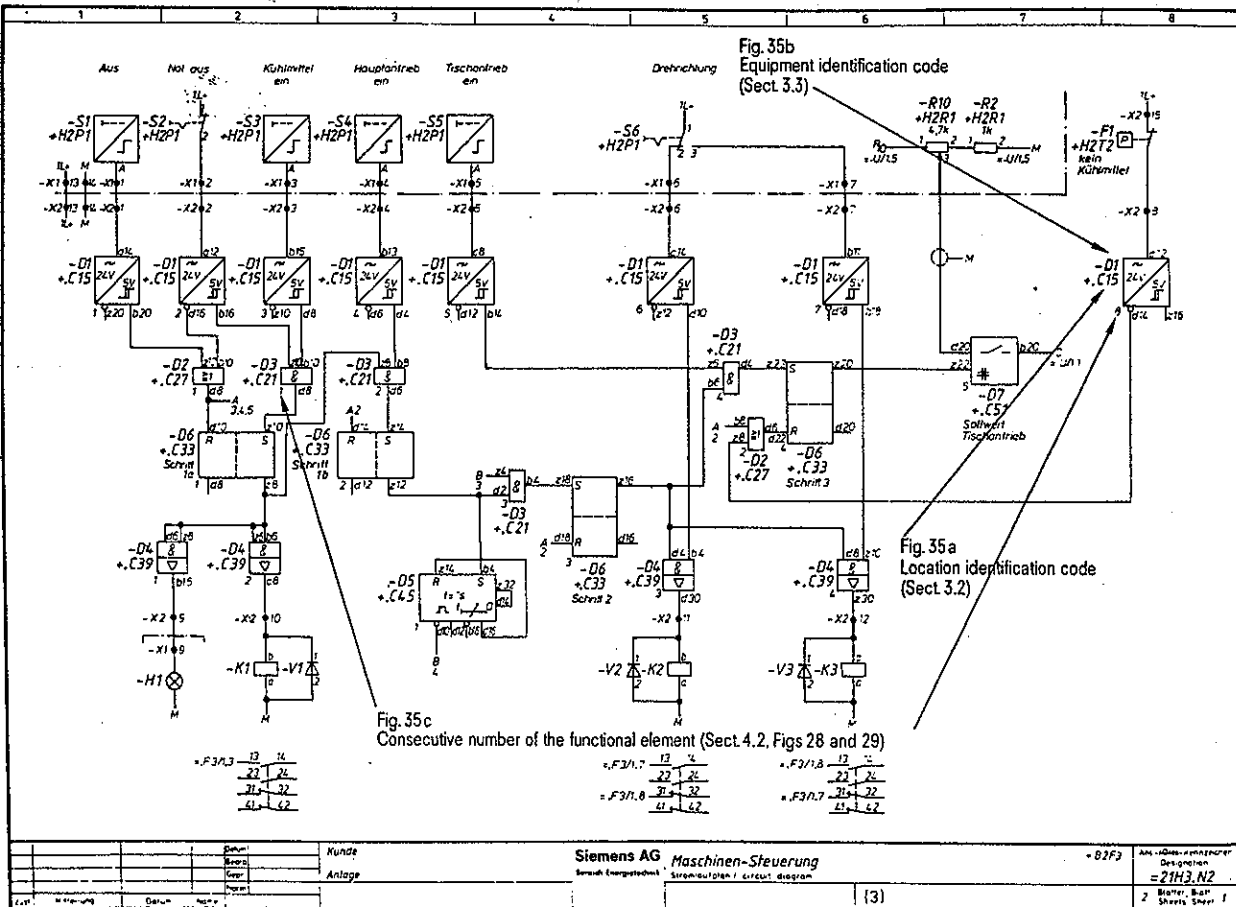


Fig. 35 Schematic diagram of an electronic control system

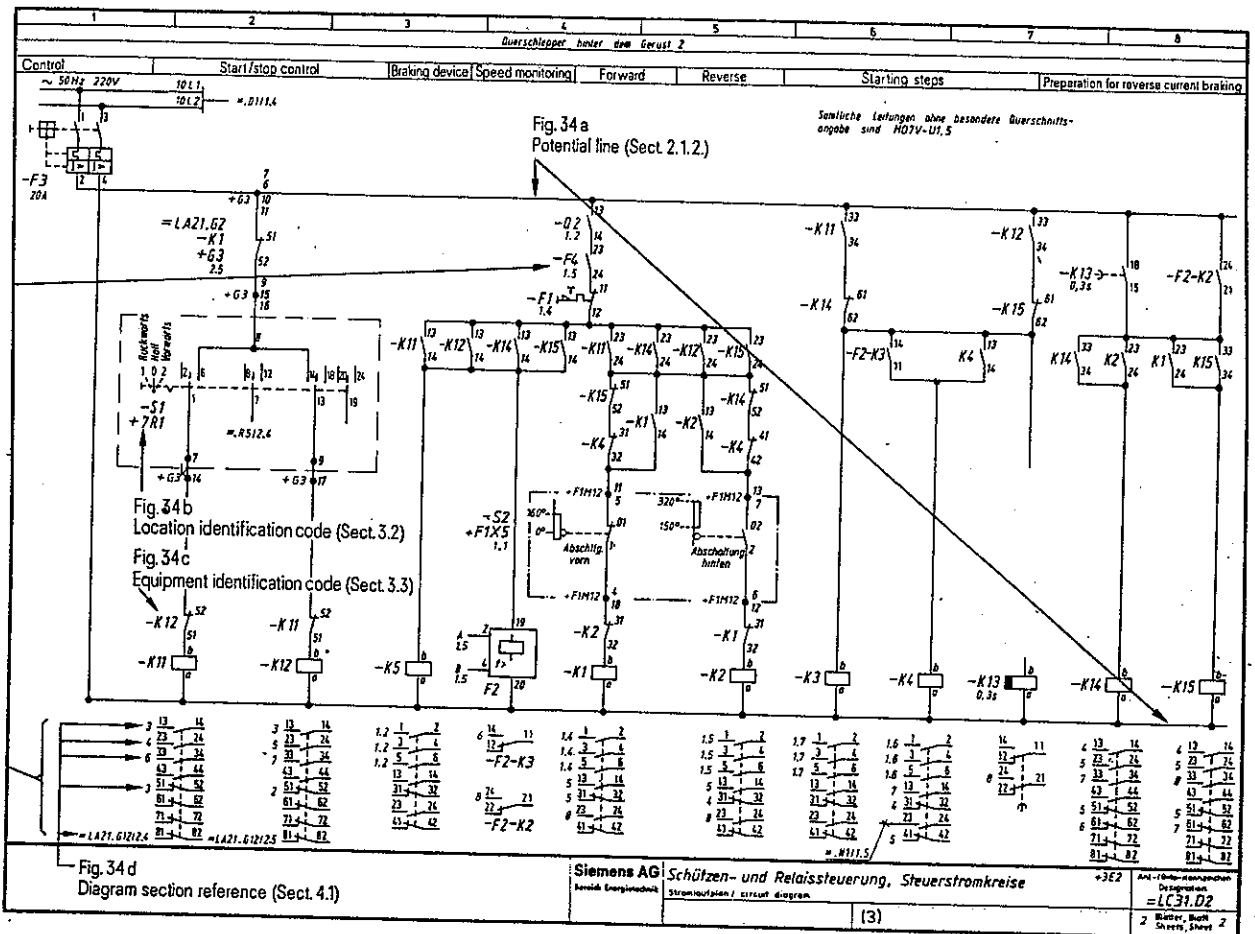


Fig. 34 Control, signalling and monitoring circuits (Sect. 2.1.2)

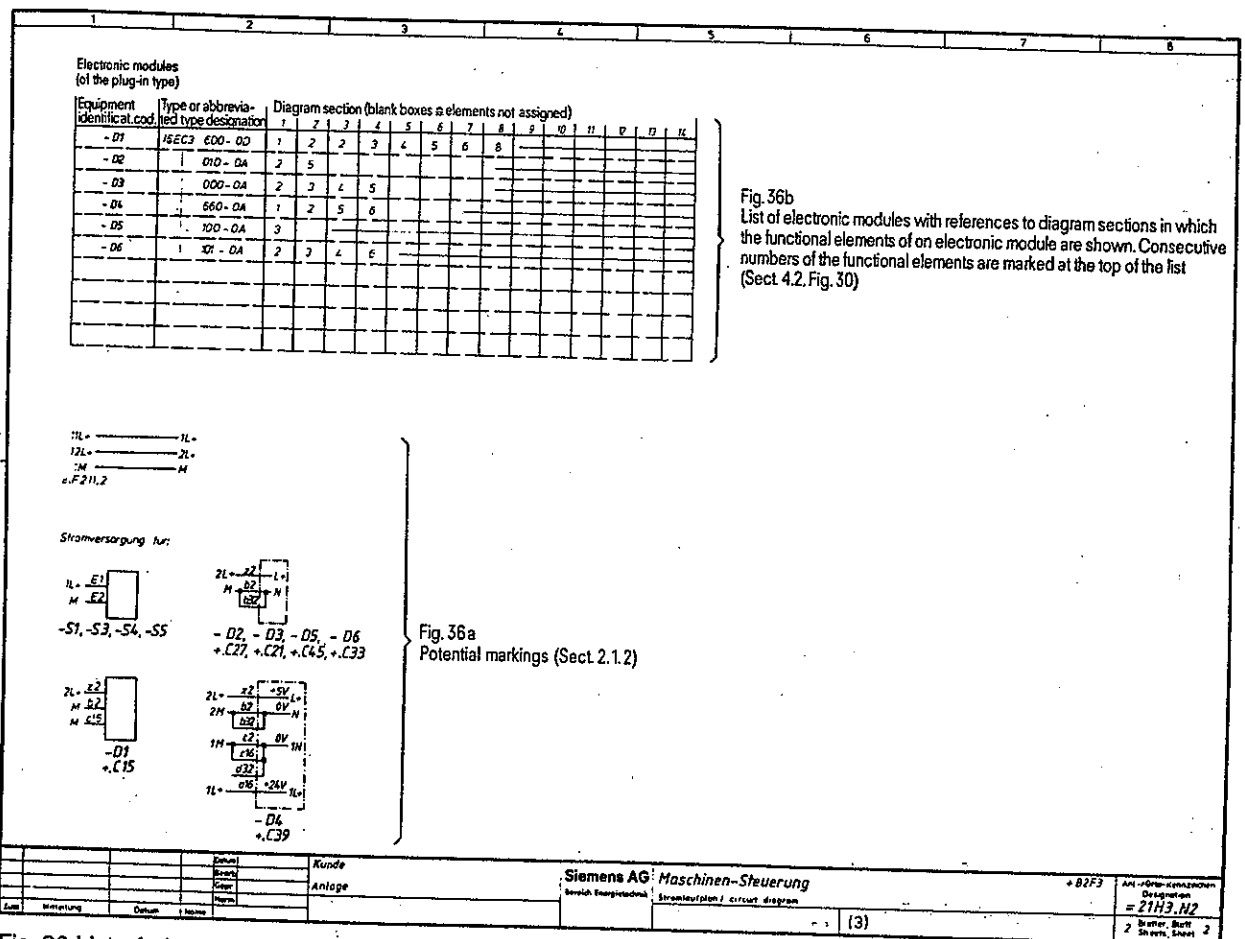


Fig. 36 List of electronic modules

Issued by: Power Engineering and Automation Group  
E59C-Advisory office for indirect exports and service

**SIEMENS AKTIENGESELLSCHAFT**

Subject to change without prior notice

Order No. A19100-E593-E004-X-7600  
Printed in the Fed. Rep. of Germany  
150056 PA