INTERNATIONAL ELECTROTECHNICAL COMMISSION

Technical Committee No. 3 Documentation and graphical symbols

Data base model description for a Web-based library for graphical symbols

This document contains version 1.3 of the information model produced by the IEC TC3 Task Force for the specification of the information requirements for the graphical symbols data bases, as requested by the IEC TC3 at its meeting in New Delhi.

The described model is the basis for the implementation at the IEC Central Office.
Data base model description for a
Web based library for graphical symbols

Authors:
E. Selvik, SINTEF Energy Research,
N- 7034 Trondheim
F. Reuter, Siemens AG, Industrial Projects and Technical Services, Information Technology D-91050 Erlangen
Status: 1998-08-14
Version: 1.3

List of content

1. FOREWORD: ........................................................................................................................................... 2
2. DELIVERABLES ......................................................................................................................................... 2
3. INTRODUCTION: ..................................................................................................................................... 2
  3.1. COMMENTS ............................................................................................................................................. 2
4. LIMITATIONS OF THE MODEL .................................................................................................................. 3
  4.1. SUPPORT OF MULTIPLE LANGUAGES ................................................................................................. 3
  4.2. RESTRICTIONS ........................................................................................................................................ 3
5. ENTITY DESCRIPTIONS .............................................................................................................................. 4
  5.1. APPLICATION_NOTE ............................................................................................................................... 4
  5.2. ASSEMBLED_VARIANT ............................................................................................................................ 5
  5.3. ASSEMBLED_VARIANT_TO_SYMBOL_VARIANT_RELATIONSHIP ............................................................... 5
  5.4. CHANGE_REQUEST .................................................................................................................................. 6
  5.5. DET_DEFINITION .................................................................................................................................... 7
  5.6. FILE_PACKING .......................................................................................................................................... 8
  5.7. FILE_REFERENCE ..................................................................................................................................... 9
  5.8. ORGANIZATION ..................................................................................................................................... 10
  5.9. PAPER_PUBLICATION ............................................................................................................................ 12
  5.10. PUBLICATION_PART ............................................................................................................................... 12
  5.11. PUBLICATION_PART_RELATIONSHIP ................................................................................................. 13
  5.12. REMARK ................................................................................................................................................ 13
  5.13. (ABS)SYMBOL ...................................................................................................................................... 14
  5.14. SYMBOL_CLASS .................................................................................................................................... 15
  5.15. SYMBOL_DEFINITION ............................................................................................................................. 16
  5.16. SYMBOL_DEFINITION_TO_SYMBOL_FORM_RELATIONSHIP .................................................................. 17
  5.17. SYMBOL_EXAMPLE_RELATIONSHIP ....................................................................................................... 17
  5.18. SYMBOL_FORM ....................................................................................................................................... 18
  5.19. SYMBOL_GROUP ..................................................................................................................................... 18
  5.20. SYMBOL_HISTORY_RELATIONSHIP ....................................................................................................... 19
  5.21. SYMBOL_IN_PAPER_PUBLICATION ..................................................................................................... 19
  5.22. SYMBOL_NAME ...................................................................................................................................... 20
  5.23. SYMBOL_NOTE_RELATIONSHIP ............................................................................................................. 21
  5.24. SYMBOL_VARIANT ................................................................................................................................. 22
  5.25. SYSTEM_REFERENCE .............................................................................................................................. 22
  5.26. TERM ....................................................................................................................................................... 23
6. CONSTRAINTS ............................................................................................................................................. 24
7. EXPRESS-SOURCE ..................................................................................................................................... 25
1. Foreword:
During the last meeting of IEC TC 3 at its meeting in New Delhi in November 1997 it was decided to set up a task force for the specification of the information requirements for the graphical symbols data bases. For further information see 3(New Delhi/Secretariat)12.

2. Deliverables
This Task Force was entrusted to supply the following deliverables:
1. an information model on which the data base design can be founded;
2. at least one screen template allowing input of symbols with associated information;
3. instructions for how to enter information (e.g. which information in IEC 60617 shall be put where in the data base.

3. Introduction:
This document provides the deliverable as specified under clause 0.1.
The deliverable covers the requirements having been established during the first meeting of the IEC TC 3 Task force in Frankfort/Main, January 1998. It includes also further requirements originating from ISO TC 10 due to ISO/IEC 14617.
It was unclear whether IEC SC3C and ISO TC 145 would be willed to carry also the motion for a common data base structure. There was no commitment expressed to change in future from the existing data base within SC3C to a common structure.
Therefore the authors of the model focused primarily on the requirements for the use of symbols on diagrams taking into account the requirements established by IEC SC3C and ISO TC 145 for the use of symbols on equipment where appropriate.
Essential contributions were received also by phone from Mr. P.A. Svensson during the meeting in Trondheim, 11-13. March.
This version of the document is updated according to the decisions in the meeting of the task force in June 1998.
This document will be forwarded to the IEC Central Office in Geneva in order to set up the Web prototype.

3.1. Comments
Comments are kindly requested by email to the following addresses:
eirik.selvik@energy.sintef.no
fritz.reuter@erl9.siemens.de
4. Limitations of the model

4.1. Support of multiple languages

The model provides a multiple language support with respect to the entities symbol_name, application_note, symbol_example_relationship; remark symbol_history_relationship and remark. A group is here understood as a group of symbols within e.g. a part, a chapter or a section.

All other occurring strings in the model are single-language-bound, i.e. any other string value is based on defaults. Values occurring in the enumerations shape_class, iso_639(language code), symbol_type, symbol_status, function_class, request_status etc., are defined using the English language.

4.2. Restrictions

The model provides several references to source documents. As those references may differ according to the language the reference is made, the following agreement is made in order to avoid inconsistent referencing throughout the data base. References shall be made as shown below, and if needed, the year of edition should be added:

- source_reference: ISO 14617-21
5. Entity descriptions

5.1. application_note

The application_note is a collection of attributes assigning application oriented notes to either symbol_definition, symbol_group, symbol_form or symbol_variant. The entity is associated with the following attributes:

- application_note;
- note;
- source_reference and
- language_code.

EXPRESS description

ENTITY application_note;
    note             : STRING;
    source_reference : STRING;
    identification   : STRING;
    language_code    : iso_639;
    UNIQUE
    url1 : identification;
END_ENTITY;

5.1.1 identification

Identifies the occurrences of application notes.

5.1.2 note

Specifies an alphanumerical string containing human_interpretable text that gives further details about the referred graphical symbol.

5.1.3 source_reference

Identifies the origin of the referred application note.

5.1.4 language_code

Provides an enumeration of values encoding languages according to the 2-letter code as defined in ISO 639.

The language_code may contain one of the following text strings:

en, fr, de, es

Note - The language code is for prototyping purposes limited to the above values.
5.2. assembled_variant

The entity assembled_variant provides the possibility to form assemblies containing symbol_variants. The following attribute is provided:
- contains S[2:?]

EXPRESS description

ENTITY assembled_variant
  SUBTYPE OF(symbol_variant);
  INVERSE
    contains : SET [2:?] OF
      assembled_variant_to_symbol_variant_relationship
      FOR is_a_part_of;
END_ENTITY;

5.2.1 contains S[2:?]

Provides the information on those symbol_variants which are included in the actual assembled_variant instance.

5.3. assembled_variant_to_symbol_variant_relationship

The entity dissolves the n:m relation between the entities symbol_variant and assembled_variant. The assembled_variant_to_symbol_variant_relationship provides the information about a symbol_variant which is a part of an assembled_variant (synonym: composite symbols), and the information about an assembled_variant containing symbol_variants. The following attributes are provided:
- is_a_part_of and
- contain.

EXPRESS description

ENTITY assembled_variant_to_symbol_variant_relationship;
  contain      : symbol_variant;
  is_a_part_of : assembled_variant;
END_ENTITY;

5.3.1 is_a_part_of

Specifies the assembled_variant of which the specified symbol_variant is a part.

5.3.2 contain

Specifies the symbol_variant which is included a part of the assembled_variant.
5.4. change_request

The change_request is a collection of attributes providing requests for modifications to either a symbol_definition, symbol_group, symbol_form or symbol_variant. The entity is associated with the following attributes:
- id;
- date_of_entry;
- proposal;
- reason;
- source_reference;
- category;
- status;
- date_of_evaluation;
- date_resolved;
- date_withdrawn and;
- refers_to.

**EXPRESS description**

ENTITY change_request;
  id         : INTEGER;
  date_of_entry : STRING;
  proposal    : STRING;
  reason      : STRING;
  source_reference : OPTIONAL STRING;
  status      : request_status;
  refers_to   : symbol;
  category    : request_category;
  date_of_evaluation : OPTIONAL STRING;
  date_resolved : OPTIONAL STRING;
  date_withdrawn : OPTIONAL STRING;
  UNIQUE
    ur1 : id;
END_ENTITY;

5.4.1 id
Identifies all change requests to the referred objects.

5.4.2 date_of_entry
Identifies the day of the change request originated (YYYY-MM-DD).

5.4.3 proposal
Specifies the intended modification of the referred object.

5.4.4 reason
Provides the information causing the requested change.
5.4.5 **source_reference**
Provides the possibility to refer to a document related to the requested change.

5.4.6 **category**
Classifies the different types of change requests.
The category may contain one of the following text strings:
editorial, techn_new, techn_mod

5.4.7 **status**
Provides information about the actual situation of the referred change request.
The status may contain one of the following strings:
submitted, accepted, rejected, resolved, withdrawn.

5.4.8 **date_of_evaluation**
Identifies the day of evaluation either resulting in a rejection or acceptance for further work (YYYY-MM-DD).

5.4.9 **date_resolved**
Identifies the day of closure of the referred change request (YYYY-MM-DD).

5.4.10 **date_withdrawn**
Identifies the day of withdrawal by the organization of the referred change request (YYYY-MM-DD).

5.4.11 **refers_to**
Identifies the (ABS)Symbol for which the change_request applies

5.5. **DET_definition**
The DET_definition is a collection of attributes assigning application-oriented DETs (data element types) to either a symbol_definition, symbol_group, symbol_form or symbol_variant. The entity is associated with the following attributes
- DET_code;
- DET_version;
- revision;
- preferred_name and
- source_reference

**EXPRESSION description**

ENTITY det_definition;
  det_code         : STRING;
  det_version      : STRING;
  revision         : STRING;
  preferred_name   : STRING;
  source_reference : STRING;
UNIQUE
  url1 : det_code, det_version;
END_ENTITY;

© IEC 1998 Taskforce IEC TC 3  - 7/34-
5.5.1 DET_code
Identifies a data element type within the defined source (see IEC 61360-1).

5.5.2 DET_version
Identifies the version of the data element type within the defined source (see IEC 61360-1).

5.5.3 revision
Identifies the revised version of the data element type referred to (see IEC 61360-1).

5.5.4 preferred_name
Provides the clear text name of the data element type within the defined source (see IEC 61360-1).

5.5.5 source_reference
Identifies the source document the data element type is selected from.

NOTE - In the context of this data base the only related source is IEC 61360-4. Each DET referred to in the data base needs to be made previously known in the IEC Reference collection of IEC 61360-4.

5.6. file_packing
The entity file_packing is a collection of attributes that describes the meta-data about the packing system applied for the packing of a file. The entity is provided with the following attributes:

- packing_system and
- packing_version

EXPRRESS description
ENTITY file_packing;
  packing_system  : STRING;
  packing_version : STRING;
UNIQUE
  url : packing_system, packing_version;
END_ENTITY;

5.6.1 packing_system
Specifies the computer system that is used for the packing of a file.

5.6.2 packing_version
Specifies the version of the computer system identified by the attribute packing_system used for the packing of a file.
5.7. file_reference

The file_reference is a collection of attributes providing the meta-data about a file available in a digital format.

The entity is associated with the following attributes
- file_name;
- syntactical_format;
- date_of_generation;
- module_size;
- scaling_factor;
- grid_present;
- created_by and
- packing.

Notes -
1. The file reference does not replace ISO/IEC 11714-2. The latter specifies how the file is structured.
2. It has been agreed that in the context of this data base the following three file types will be supported
   - the PDF-format;
   - the DXF-format and
   - the STEP physical file format (ISO 10303-21), based upon ISO 10303-212.
   At the time being the latter needs to cover the requirements established in ISO/IEC 11714-2.
3. That sequence will reflect also the priority of providing data into the database.
4. The following agreements have been taken:
   - the PDF-file will be provided including the grid presenting the used module size the symbol has been constructed within.
5. Neither the DXF nor the STEP-file will contain the presentation of a grid.

EXPRESSION description

ENTITY file_reference;
   file_name : STRING;
   syntactical_format : STRING;
   date_of_generation : STRING;
   created_by : system_reference;
   module_size : REAL;
   scaling_factor : REAL;
   packing : OPTIONAL file_packing;
   grid_present : BOOLEAN;
UNIQUE
   ur1 : file_name, syntactical_format;
END_ENTITY;
5.7.1 file_name
Specifies the information necessary to access the computer interpretable data.

5.7.2 syntactical_format
Specifies the syntax within the file.
Note - The syntactical format may be RTF, Word Perfect 4.2, C++, FORTRAN77, etc.

5.7.3 date_of_generation
Specifies the information about the date of generation of the computer interpretable data.

5.7.4 module_size
Specifies the size of the X/Y grid used in the design of the graphical symbol.
[ISO/IEC 81714-2]

5.7.5 scaling_factor
Specifies the relation by which the co-ordinates of all defined points of the graphical symbol will be enlarged or reduced in size in relation to the reference point of the symbol.
[ISO/IEC 81714-2]

5.7.6 grid_present
Specifies whether the symbol_variant kept in the file contains a grid or not.

5.7.7 created_by
Specifies the system_reference that is used to produce the file.

5.7.8 packing
Specifies the packing system used for the packing of the file.

5.8. organization

The organization is a collection of attributes providing information about the referred person and organization. The entity is associated with the following attributes
- organization_name;
- department;
- street;
- pob;
- postal_code;
- location;
- last_name;
- first_name;
- telephone;
- facsimile;
- electronic mail and
- requests S[1:?];
**EXPRESS description**

ENTITY organization;
  organization_name : STRING;
  last_name         : STRING;
  first_name        : STRING;
  street            : STRING;
  postal_code       : STRING;
  pob               : STRING;
  location          : STRING;
  telephone         : STRING;
  facsimile         : STRING;
  email             : STRING;
  requests          : SET [1:?] OF change_request;
  department        : STRING;
UNIQUE
  ur1 : organization_name, department, last_name, first_name;
END_ENTITY;

5.8.1 organization_name

Specifies the organization requesting the change_request.

5.8.2 department

Specifies the department within the organization_name.

5.8.3 street

Specifies the street within the location where the department of the organization is located.

5.8.4 pob

Specifies the post office box used by the referred organization department.

5.8.5 postal_code

Specifies the postal code used by the referred organization department.

5.8.6 location

Specifies the name of the location( town, village etc.) where the organization department resides.

5.8.7 last_name

Specifies the last name of the person within the organization responsible for originating the request.

5.8.8 first_name

Specifies the first name of the person within the organization responsible for originating the request.

5.8.9 telephone

Specifies the international telephone number under which the person within the organization can be contacted.

5.8.10 facsimile

Specifies the international fax number under which the person within the organization can be contacted.
5.8.11 electronic mail
Specifies the electronic mail number under which the person within the organization can be contacted.

5.8.12 requests S[1:?]
Specifies the change_requests which originates from the actual organization instance.

5.9. paper_publication
The paper_publication is a collection of attributes providing information about the International Standard the symbol is published in. The entity is associated with the following attributes
- publication and
- edition.

EXPRESS description
ENTITY paper_publication;
  publication : STRING;
  edition     : STRING;
UNIQUE
  url   : publication, edition;
END_ENTITY;

5.9.1 publication
Identifies the international standard which includes the referred symbol.

5.9.2 edition
Identifies month and year of the publication of the referred document (YYYY-MM).

5.10. publication_part
The entity publication_part is a collection of information about one part of a paper_publication. The following attributes are provided:
- part and
- publication.

EXPRESS description
ENTITY publication_part;
  publication : paper_publication;
  part        : STRING;
UNIQUE
  url         : part;
END_ENTITY;

5.10.1 part
Specifies the identification of the part of a paper_publication in which a (ABS)Symbol is published.
5.10.2 publication

Specifies the International Standard of which the publication_part is a part.

5.11. publication_part_relationship

The entity publication_part_relationship is a collection of attributes providing information about the relationship among parts of the same paper_publication. The entity is associated with the following attributes
- has_parts and
- is_subpart.

EXPRESS description

ENTITY publication_part_relationship;
  is_subpart : publication_part;
  has_parts  : publication_part;
END_ENTITY;

5.11.1 has_parts

Specifies the publication_part that consist other (sub) publication_part.

5.11.2 is_subpart

Specifies the publication_part that is a part of another publication_part.

5.12. remark

Provides the possibility assigning language dependent information to a symbol_definition, symbol_group, symbol_form or symbol_variant. The entity is associated with the following attributes
- description and
- language_code.

EXPRESS description

ENTITY remark;
  description   : STRING;
  language_code : iso_639;
END_ENTITY;

5.12.1 description

Specifies an alphanumerical string containing human_interpretable text that gives further details about the referred object.

5.12.2 language_code

Provides an enumeration of values encoding languages according to the 2-letter code as defined in ISO 639. See language_code.
5.13. (ABS)Symbol

The (ABS)Symbol is supertype of symbol_definition, symbol_group, symbol_form and symbol_variant. The (ABS)Symbol is a collection of attributes common to all of its subtypes. The entity is associated with the following attributes:

- identification
- status.
- date_of_entry
- date_of_evaluation
- date_released
- date_withdrawn
- has S[0:?]
- refers_to S[0:?] and
- is_a_part_of

EXPRESS description

ENTITY symbol
  ABSTRACT SUPERTYPE OF (ONEOF(symbol_group, symbol_definition, symbol_form, symbol_variant));
  status             : symbol_status;
  refers_to          : SET OF det_definition;
  is_a_part_of       : OPTIONAL symbol_group;
  identification     : STRING;
  date_of_entry      : STRING;
  date_of_evaluation : OPTIONAL STRING;
  date_released      : OPTIONAL STRING;
  date_withdrawn     : OPTIONAL STRING;
  has                : SET OF remark;
UNIQUE
  ur1 : identification;
END_ENTITY;

5.13.1 identification

Specifies the identifier of the symbol.

Note - This may be e.g. the registration number as in ISO/IEC 14617 or the symbol number as in IEC 60617.

5.13.2 status

Specifies the status of the (ABS)Symbol. The status may contain one of the following text strings:

proposed, accepted_for_work, rejected, released, withdrawn

5.13.3 date_of_entry

Identifies the day the symbol is originated (YYYY-MM-DD).

5.13.4 date_of_evaluation

Identifies the day of evaluation either resulting in a rejection or acceptance for further work (YYYY-MM-DD).

© IEC 1998 Taskforce IEC TC 3 - 14/34-
5.13.5 date_released
Identifies the day when the symbol was released (i.e. released for final publication) (YYYY-MM-DD).

5.13.6 date_withdrawn
Identifies the day of withdrawal of the symbol (YYYY-MM-DD).

5.13.7 has S[0:?]
Specifies a language-bound alphanumerical string containing human-interpretable text that is a remark about the data specified by the (ABS)Symbol.

5.13.8 refers_to S[0:?]
List the data-element types (DETs) which is relevant for the application of the

5.13.9 is_a_part_of
Specifies the symbol_group that the actual (ABS)Symbol instance eventually is a part of.

5.14. symbol_class
The symbol_class is a collection of attributes providing classifying information to a symbol_definition based on a given source. The entity is associated with the following attributes
- class_type
- class_code and
- source_reference.

EXPRESSION description
ENTITY symbol_class;
  class_type       : type_of_class;
  source_reference : STRING;
  class_code       : STRING;
END_ENTITY;

5.14.1 class_type
Identifies the classification area to which the related class_code belongs. The class_type shall contain one of the following codes:
- APPLICATION_AREA (IEC SC3C should provide the possible class_codes)
- FUNCTION_AREA (See clause Classification systems.)
- PRODUCT_AREA (ISO TC10 could provide the possible class_codes).

5.14.2 class_code
Classifies the referred object according to a given classification system within a given source.
5.14.3  source_reference

Identifies the document where the classification system used is given.

Note - IEC 750 in conjunction with IEC 204-2 provides a two letter classification system, providing about 25² class values, excluding the letters I and O. See clause 0.

5.15.  symbol_definition

The symbol_definition is a subtype of the (ABS)Symbol. The symbol_definition is a collection of attributes providing information about the related symbol. The entity is associated with the following attributes
- symbol_type;
- source_reference;
- associated_with S[1:];
- is_of S[1:?] and
- forms S[1:?].

EXRESS description

ENTITY symbol_definition
  SUBTYPE OF(symbol);
  source_reference : STRING;
  symbol_type : symbol_type;
  associated_with : SET [1:?] OF symbol_name;
  is_of : SET [1:?] OF symbol_class;
  INVERSE
  forms : SET [1:?] OF symbol_definition_to_symbol_form_relationship
   FOR symbol_definition;
END_ENTITY;

5.15.1  symbol_type

Classifies the different kind of symbols based on its possible use on drawings or in an a composition of symbols.

The symbol_type may contain one of the following text strings:
qualifying; basic; parametric.

5.15.2  source_reference

Identifies the origin of the referred symbol definition.

5.15.3  associated_with S[1:]

List the different symbol_names which is to be associated with the actual symbol_definition instance.

5.15.4  is_of S[1:?]

Specifies the class of the symbol. The classification of a symbol_definition could be based on different classification schemes (see symbol_class).
5.15.5 forms S[1:?]
Provides the information on those symbol_forms which applies for the actual symbol_definition instance.

5.16. symbol_definition_to_symbol_form_relationship
The entity dissolves the n:m relation between the entities symbol_definition and symbol_form. The symbol_definition_to_symbol_form_relationship provides the information that a symbol_definition may be associated with one or many symbol_forms, and the information that a symbol_form may be associated with symbol_definitions. The following attributes are provided:
- symbol_definition and
- symbol_form.

EXPRESS description
ENTITY symbol_definition_to_symbol_form_relationship;
symbol_definition : symbol_definition;
symbol_form       : symbol_form;
END_ENTITY;

5.16.1 symbol_definition
Specifies the symbol_definition which applies for the specified symbol_form.

5.16.2 symbol_form
Specifies the symbol_form for which the specified symbol_definition applies.

5.17. symbol_example_relationship
The symbol_example_relationship is a collection of attributes providing information about examples of and to symbol forms. The entity is associated with the following attributes
- has example;
- is example_of and
- description.

EXPRESS description
ENTITY symbol_example_relationship;
is_example_of : symbol_form;
has_example   : symbol_form;
description   : OPTIONAL remark;
END_ENTITY;

5.17.1 has example
Provides information about the set of symbol_forms being examples of the referred symbol_form.
5.17.2 is example_of
Provides information about the symbol_form, the referred symbol_form is an example from.

5.17.3 description
Specifies an alphanumerical string containing human-interpretable text that gives further details about the data specified by the symbol_example_relationship.

5.18. symbol_form
The symbol_form is a collection of attributes providing information about the different symbol forms of a symbol_definition. The entity is associated with the following attributes:
- shape;
- exists_in S[1:8] and
- definitions S[1:?].

EXPRESS description
ENTITY symbol_form
   SUBTYPE OF(symbol);
   shape      : shape_class;
   exists_in  : SET [1:8] OF symbol_variant;
   INVERSE
   definitions : SET [1:?] OF
                symbol_definition_to_symbol_form_relationship
                FOR symbol_form;
END_ENTITY;

5.18.1 shape
Classifies the symbol_form based on its shape. The shape may contain one of the following text strings:
Circle; Square; Rectangle; Ellipse; Parallelogram; Oval; Equilateral_triangle; right_angled_triangle; Trapezoid; Octagon; Hexagon;

5.18.2 exists_in S[1:8]
Specifies the symbol_variants that applies to the actual symbol_form instance.

5.18.3 definitions S[1:?]
Provides information on those symbol_definitions for which the actual symbol_form instance is valid.

5.19. symbol_group
The symbol_group is a subtype of the (ABS)Symbol. The symbol_group provides information about the symbols contained within a defined group. The entity is associated with the following attribute:
- consists_of S[1:?]

EXPRESS description
ENTITY symbol_group
   SUBTYPE OF(symbol);
   INVERSE
      consists_of : SET [1:?] OF symbol FOR is_a_part_of;
END_ENTITY;

5.19.1 consists_of S[1:?]
Specifies the (ABS)Symbols which are included in the actual symbol_group instance.

5.20. symbol_history_relationship
The entity symbol_history_relationship is a collection of attributes providing information about the preceding and following symbol_forms. The entity is associated with the following attributes
- replacing;
- replaced_by and
- description.

EXPRESS description
ENTITY symbol_history_relationship;
   replaced_by : symbol_form;
   replacing   : symbol_form;
   description : OPTIONAL remark;
END_ENTITY;

5.20.1 replacing
Provides information about the preceding symbol_form in relation to the referred symbol_form.

5.20.2 replaced_by
Provides information about the succeeding symbol_form in relation to the referred symbol_form.

5.20.3 description
Specifies an alphanumerical string containing human-interpretable text that gives further details about the data specified by the symbol_history_relationship.

5.21. symbol_in_paper_publication
The symbol_in_paper_publication is a collection of attributes providing information about the International Standard the symbol is published in. The entity is associated with the following attributes
- publication_reference;
- contains and
- published.

EXPRESS description
ENTITY symbol_in_paper_publication;
5.21.1 publication_reference
Provides the identification of the symbol within the referred edition of the publication.

5.21.2 contains
Specifies the (ABS)Symbol that is being published.

5.21.3 published
Specifies the publication_part in which the (ABS)Symbol is published.

5.22. symbol_name
The symbol_name is a collection of attributes providing language depending information to a symbol_definition. The entity is associated with the following attributes
- name;
- synonym S[0:?];
- keyword S[0:?];
- name_type; and
- language_code.

**EXPRESS description**

ENTITY symbol_name;
   description : OPTIONAL STRING;
   language_code : iso_639;
   name          : term;
   synonym       : SET OF term;
   keyword       : SET OF term;
   name_type     : type_of_name;
END_ENTITY;

5.22.1 name
Provides the human-readable name of the object.

5.22.2 synonym S[0:?]
Provides one or more human-readable synonym names for the object.

5.22.3 keyword S[0:?]
Provides a set of zero or many textual descriptors associated with the related object.

5.22.4 name_type
Specifies the domain of the information provided by the symbol_name. The name_type shall be one of the following codes:
- FUNCTION_ORIENTED_TERM;
- PRODUCT_ORIENTED_TERM.
5.22.5 language_code

Provides an enumeration of values encoding languages according to the 2-letter code as defined in ISO 639. See language_code.

5.23. symbol_note_relationship

The entity dissolves the n:m relation between the entities (ABS)Symbol and application_note. The symbol_note_relationship provides the information that a (ABS)Symbol may be associated with one or many application_notes, and the information that an application_note may be associated with one or many (ABS)Symbols.

- symbol and
- application_note.

EXPRESSION description

ENTITY symbol_note_relationship;
  symbol : symbol;
  application_note : application_note;
  note_no    : INTEGER;
END_ENTITY;

5.23.1 symbol

Specifies the (ABS)Symbol for which the specified application_note applies.

5.23.2 application_note

Specifies the application_note which applies for the specified (ABS)Symbol.
5.24. symbol_variant

The entity symbol_variant is a subtype of the (ABS)Symbol. The entity is associated with the following attributes:
- width;
- height;
- available as S[1:?] and
- used_as S[0:?].

EXPRESS description

ENTITY symbol_variant
  SUBTYPE OF(symbol);
  available_as : SET [1:?] OF file_reference;
  width        : OPTIONAL REAL;
  height       : OPTIONAL REAL;
  INVERSE
    used_as      : SET OF
      assembled_variant_to_symbol_variant_relationship
        FOR contain;
END_ENTITY;

5.24.1  width
Specifies the width of the symbol_variant in the relation to the module size.

5.24.2  height
Specifies the height of the symbol_variant in relation to the module size.

5.24.3  available as S[1:?]
Provides the information about the availability of the symbol_variant to the file_reference.

5.24.4  used_as S[0:?]
Provides the information about the use of the symbol_variant as an element of an assembled_variant.

5.25. system_reference

The entity system_reference is a collection of attributes providing the meta-data about the system producing the files. The entity is associated with the following attributes
- creating_system;
- creating_interface;
- operating_system and
- directory
**EXPRESS description**

ENTITY system_reference;
    creating_system : STRING;
    creating_interface : STRING;
    directory : STRING;
    operating_system : STRING;
    UNIQUE
    url : creating_system, creating_interface, directory;
END_ENTITY;

5.25.1 creating_system
Specifies the computer system that originated the computer interpretable data.

5.25.2 creating_interface
Specifies the interface of the computer system that originated the computer interpretable data.

5.25.3 operating_system
Specifies the operating system used by the program that originated the computer interpretable data.

5.25.4 directory
Specifies the path the computer interpretable data is located.

5.26. term
The entity term is the collection of attributes describing the terms used for the naming and keywording of a symbol. Terms should be taken from the IEV or other International standards. The entity is provided with the following attributes:

- term_id;
- source_reference;
- term_name and
- term_description

**EXPRESS description**

ENTITY term;
    term_id : STRING;
    term_name : OPTIONAL STRING;
    source_reference : STRING;
    term_description : OPTIONAL STRING;
END_ENTITY;
5.26.1 term_id
The unique identification of the term.
    Note - Here the identification code used in the IEV associated with the term may be used.

5.26.2 source_reference
Specifies the source (source document) for the definition of the term.

5.26.3 term_name
The name of the term. The name does not need to be unambiguous.

5.26.4 term_description
The full description or definition of the term.

6. Constraints
This document version does not yet provide explicit constraints.
For the prototype implementation of the data base, the following shall however be taken into account:

• the values of the attributes of a symbol_example_relationship instance shall not be the same, i.e. shall not point to the same symbol_form instance;

• the values of the attributes of a symbol_history_relationship instance shall not be the same, i.e. shall not point to the same symbol_form instance;

• for a symbol_definition instance associated with several symbol_name instances, the value of the language_code attribute of those symbol_name instances shall not be the same;

• for an (ABS)Symbol instance, the value of the following attributes shall be as indicated:
    attribute date_withdrawn > date_released > date_of_evaluation > date_of_entry;

• an (ABS)Symbol instance can not be part of a symbol_group instance that is the (ABS)Symbol instance itself;

• an assembled_variant_to_symbol_variant_relationship shall not point to a symbol_variant instance that is an assembled_variant.
7. EXPRESS-Source

This clause specifies the data model based on the EXPRESS Language specified by ISO 10303-21. An EXPRESS-G file is available also.

SCHEMA SYMBOL_LIBRARY

    TYPE iso_639 = ENUMERATION OF
        (EN,
         FR,
         DE,
         ES);
END_TYPE;

    TYPE request_category = ENUMERATION OF
        (EDITORIAL,
         TECH_NEW,
         TECH_MOD);
END_TYPE;

    TYPE request_status = ENUMERATION OF
        (SUBMITTED,
         ACCEPTED,
         REJECTED,
         RESOLVED,
         WITHDRAWN);
END_TYPE;

    TYPE shape_class = ENUMERATION OF
        (CIRCLE,
         ELLIPSIS,
         OVAL,
         TRIANGLE,
         EQUILATERAL_TRIANGLE,
         RIGHT_ANGLED_TRIANGLE,
         SQUARE,
         RECTANGLE,
         PARALLELOGRAM,
         HEXAGON,
         OCTAGON,
         TRAPEZOID);
END_TYPE;

    TYPE symbol_status = ENUMERATION OF
        (PROPOSED,
         ACCEPTED_FOR_WORK,
         REJECTED,
         RELEASED,
         WITHDRAWN);
END_TYPE;

    TYPE symbol_type = ENUMERATION OF
        (QUALIFYING,
         BASIC,
         PARAMETRIC);
END_TYPE;

    TYPE type_of_class = ENUMERATION OF
        (APPLICATION_AREA,
         FUNCTION_AREA,
         PRODUCT_AREA);
END_TYPE;
TYPE type_of_name = ENUMERATION OF
  (FUNCTION_ORIENTED_TERM,
   PRODUCT_ORIENTED_TERM);
END_TYPE;

ENTITY application_note;
  note              : STRING;
  source_reference  : STRING;
  identification    : STRING;
  language_code     : iso_639;
  UNIQUE
    url1 : identification;
END_ENTITY;

ENTITY assembled_variant
  SUBTYPE OF(symbol_variant);
  INVERSE
    contains : SET [2:?] OF
      assembled_variant_to_symbol_variant_relationship
      FOR is_a_part_of;
END_ENTITY;

ENTITY assembled_variant_to_symbol_variant_relationship;
  contain     : symbol_variant;
  is_a_part_of : assembled_variant;
END_ENTITY;

ENTITY change_request;
  id            : INTEGER;
  date_of_entry : STRING;
  proposal      : STRING;
  reason        : STRING;
  source_reference : OPTIONAL STRING;
  status        : request_status;
  refers_to     : symbol;
  category      : request_category;
  date_of_evaluation : OPTIONAL STRING;
  date_resolved : OPTIONAL STRING;
  date_withdrawn : OPTIONAL STRING;
  UNIQUE
    url1 : id;
END_ENTITY;

ENTITY det_definition;
  det_code        : STRING;
  det_version     : STRING;
  revision        : STRING;
  preferred_name  : STRING;
  source_reference : STRING;
  UNIQUE
    url1 : det_code, det_version;
END_ENTITY;

ENTITY file_packing;
  packing_system  : STRING;
  packing_version : STRING;
  UNIQUE
    url1 : packing_system, packing_version;
END_ENTITY;
ENTITY file_reference;
  file_name : STRING;
  syntactical_format : STRING;
  date_of_generation : STRING;
  created_by : system_reference;
  module_size : REAL;
  scaling_factor : REAL;
  packing : OPTIONAL file_packing;
  grid_present : BOOLEAN;
UNIQUE
  url1 : file_name, syntactical_format;
ENDENTITY;

ENTITY organization;
  organization_name : STRING;
  last_name : STRING;
  first_name : STRING;
  street : STRING;
  postal_code : STRING;
  pob : STRING;
  location : STRING;
  telephone : STRING;
  facsimile : STRING;
  email : STRING;
  requests : SET [1:?] OF change_request;
  department : STRING;
UNIQUE
  url1 : organization_name, department, last_name, first_name;
ENDENTITY;

ENTITY paper_publication;
  publication : STRING;
  edition : STRING;
UNIQUE
  url : publication, edition;
ENDENTITY;

ENTITY publication_part;
  publication : paper_publication;
  part : STRING;
UNIQUE
  url1 : part;
ENDENTITY;

ENTITY publication_part_relationship;
  is_subpart : publication_part;
  has_parts : publication_part;
ENDENTITY;

ENTITY remark;
  description : STRING;
  language_code : iso_639;
ENDENTITY;
ENTITY symbol
  ABSTRACT SUPERTYPE OF (ONEOF(symbol_group, symbol_definition,
                   symbol_form, symbol_variant));
  status             : symbol_status;
  refers_to          : SET OF det_definition;
  is_a_part_of       : OPTIONAL symbol_group;
  identification     : STRING;
  date_of_entry      : STRING;
  date_of_evaluation : OPTIONAL STRING;
  date_released      : OPTIONAL STRING;
  date_withdrawn     : OPTIONAL STRING;
  has                : SET OF remark;
  UNIQUE
    url : identification;
END_ENTITY;

ENTITY symbol_class;
  class_type       : type_of_class;
  source_reference : STRING;
  class_code       : STRING;
END_ENTITY;

ENTITY symbol_definition
  SUBTYPE OF(symbol);
  source_reference : STRING;
  symbol_type      : symbol_type;
  associated_with  : SET [1:?] OF symbol_name;
  is_of            : SET [1:?] OF symbol_class;
  INVERSE
    forms            : SET [1:?] OF
             symbol_definition_to_symbol_form_relationship
             FOR symbol_definition;
END_ENTITY;

ENTITY symbol_definition_to_symbol_form_relationship;
  symbol_definition : symbol_definition;
  symbol_form       : symbol_form;
END_ENTITY;

ENTITY symbol_example_relationship;
  is_example_of : symbol_form;
  has_example   : symbol_form;
  description   : OPTIONAL remark;
END_ENTITY;

ENTITY symbol_form
  SUBTYPE OF(symbol);
  shape      : shape_class;
  exists_in  : SET [1:8] OF symbol_variant;
  INVERSE
    definitions : SET [1:?] OF
             symbol_definition_to_symbol_form_relationship
             FOR symbol_form;
END_ENTITY;

ENTITY symbol_group
  SUBTYPE OF(symbol);
  INVERSE
    consists_of : SET [1:?] OF symbol FOR is_a_part_of;
END_ENTITY;
ENTITY symbol_history_relationship;
  replaced_by : symbol_form;
  replacing   : symbol_form;
  description : OPTIONAL remark;
END_ENTITY;

ENTITY symbol_in_paper_publication;
  contains              : symbol;
  publication_reference : STRING;
  published             : publication_part;
END_ENTITY;

ENTITY symbol_name;
  description   : OPTIONAL STRING;
  language_code : iso_639;
  name          : term;
  synonym       : SET OF term;
  keyword       : SET OF term;
  name_type     : type_of_name;
END_ENTITY;

ENTITY symbol_note_relationship;
  symbol           : symbol;
  application_note : application_note;
  note_no          : INTEGER;
END_ENTITY;

ENTITY symbol_variant
  SUBTYPE OF(symbol);
  available_as : SET [1:?] OF file_reference;
  width        : OPTIONAL REAL;
  height       : OPTIONAL REAL;
INVERSE
  used_as      : SET OF assembled_variant_to_symbol_variant_relationship
                  FOR contain;
END_ENTITY;

ENTITY system_reference;
  creating_system    : STRING;
  creating_interface : STRING;
  directory          : STRING;
  operating_system   : STRING;
UNIQUE
  ur1 : creating_system, creating_interface, directory;
END_ENTITY;

ENTITY term;
  term_id          : STRING;
  term_name        : OPTIONAL STRING;
  source_reference : OPTIONAL STRING;
  term_description : OPTIONAL STRING;
END_ENTITY;

END_SCHEMA;


## 8. Classification systems

The class codes are defined by the range of upper-case letters A, ..., Z excluding I and O.)

<table>
<thead>
<tr>
<th>IEC 750 letter code</th>
<th>Value range</th>
<th>Description</th>
<th>Erklärung</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td></td>
<td>assemblies, subassemblies</td>
<td>Baugruppen, Teilbaugruppen</td>
</tr>
<tr>
<td>AD</td>
<td></td>
<td>transistor amplifier</td>
<td>Transistorverstärker</td>
</tr>
<tr>
<td>AJ</td>
<td></td>
<td>IC amplifier</td>
<td>IC-Verstärker</td>
</tr>
<tr>
<td>AM</td>
<td></td>
<td>magnetic amplifier</td>
<td>Magnetverstärker</td>
</tr>
<tr>
<td>AV</td>
<td></td>
<td>tube amplifier</td>
<td>Röhrenverstärker</td>
</tr>
<tr>
<td>AP</td>
<td></td>
<td>printed circuit board</td>
<td>Leiterplatte</td>
</tr>
<tr>
<td>AT</td>
<td></td>
<td>drawer unit</td>
<td>Einschub</td>
</tr>
<tr>
<td>AR</td>
<td></td>
<td>drawer unit rack</td>
<td>Einschubgestell</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td></td>
<td>transducers from non-electrical to electrical quantity or vice versa</td>
<td>Umsetzer von nicht elektrischen auf elektrische Größen oder umgekehrt</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>photoelectric element, dynamometer, piezoelectric pick up, microphone, audio pick up, loudspeaker, synchro generator</td>
<td>Photoelektrische Zelle Dynamometer, Kristallwandler, Mikrofon, Tonabnehmer, Lautsprecher, Drehmelder</td>
</tr>
<tr>
<td>BP</td>
<td></td>
<td>pressure sensor</td>
<td>Druckgeber</td>
</tr>
<tr>
<td>BQ</td>
<td></td>
<td>locator, position encoder</td>
<td>Positionsgeber/Weggeber</td>
</tr>
<tr>
<td>BR</td>
<td></td>
<td>tacho generator</td>
<td>Drehzahlgeber</td>
</tr>
<tr>
<td>BT</td>
<td></td>
<td>temperature sensor</td>
<td>Temperaturgeber</td>
</tr>
<tr>
<td>BV</td>
<td></td>
<td>velocity pick up</td>
<td>Geschwindigkeitsgeber</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td></td>
<td>capacitors</td>
<td>Kondensatoren</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td></td>
<td>binary elements, delay devices, storage devices</td>
<td>Binäre Elemente, Verzögerungseinrichtungen, Speichereinrichtungen</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>digital integrated circuits and devices: delay line, bistable element, monostable element, register, magnetic core, magnetic tape recorder or disk storage</td>
<td>Integrierte digitale Schaltkreise und Geräte: Verzögerungsleitung, bistabiles Element, monostabiles Element, Register, Kernspeicher, Magnetbandgerät oder Plattenspeicher</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>miscellaneous</td>
<td>Verschiedenes</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>items / devices which are not listed otherwise</td>
<td>Einrichtungen/Geräte, die an anderer Stelle dieser Tabelle nicht aufgeführt sind.</td>
<td></td>
</tr>
<tr>
<td>EH</td>
<td>heating device</td>
<td>Heizeinrichtung</td>
<td></td>
</tr>
<tr>
<td>EL</td>
<td>lighting device</td>
<td>Beleuchtungseinrichtung</td>
<td></td>
</tr>
<tr>
<td>EV</td>
<td>fan</td>
<td>Lüfter</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>protective devices</td>
<td>Schutzeinrichtungen</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>over voltage discharge device, surge voltage protector</td>
<td>Überspannungsentladevorrichtung, Überspannungsableiter</td>
<td></td>
</tr>
<tr>
<td>FA</td>
<td>overcurrent protective device, instantaneous</td>
<td>Überstromschutzeinrichtung, unverzögert</td>
<td></td>
</tr>
<tr>
<td>FR</td>
<td>overcurrent protective device, time delayed</td>
<td>Überstromschutzeinrichtung, zeitverzögert</td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>overcurrent protective device, instantaneous and time delayed characteristic</td>
<td>Überstromschutzeinrichtung mit unverzögterer und zeitverzögerter Wirkung</td>
<td></td>
</tr>
<tr>
<td>FU</td>
<td>fuse</td>
<td>Sicherung</td>
<td></td>
</tr>
<tr>
<td>FV</td>
<td>voltage monitor</td>
<td>Spannungswächter</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>generators, power supplies</td>
<td>Generatoren, Stromversorgungen</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>rotating generators, (quartz)oscillator</td>
<td>rotierende Generatoren, (Quarz)oscillator</td>
<td></td>
</tr>
<tr>
<td>GB</td>
<td>battery</td>
<td>Batterie</td>
<td></td>
</tr>
<tr>
<td>GF</td>
<td>rotating or static frequency converter</td>
<td>rotierender oder statischer Frequenzwandler</td>
<td></td>
</tr>
<tr>
<td>GS</td>
<td>power supply unit</td>
<td>Stromversorgungseinrichtung</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>signalling devices</td>
<td>Meldeeinrichtungen</td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td>audible signal device</td>
<td>Akustisches Meldegerät</td>
<td></td>
</tr>
<tr>
<td>HL</td>
<td>optical signal device, indicator light</td>
<td>Optisches Meldegerät, Leuchtmelder</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>relay, contactors</td>
<td>Relais, Schütze</td>
<td></td>
</tr>
<tr>
<td>KA</td>
<td>instantaneous all-or-nothing relay, instantaneous contactor relay</td>
<td>unverzögertes Schaltrelais oder unverzögertes Hilfsschütz</td>
<td></td>
</tr>
<tr>
<td>KL</td>
<td>bistable contactor relay with mechanical latching or permanent magnet etc.</td>
<td>bistabiles Hilfsschütz mit mechanischer Verklinkung oder Permanentmagnet usw.</td>
<td></td>
</tr>
<tr>
<td>KM</td>
<td>contactor</td>
<td>Schütz</td>
<td></td>
</tr>
<tr>
<td>KP</td>
<td>polarized relay</td>
<td>polarisiertes Relais</td>
<td></td>
</tr>
<tr>
<td>KR</td>
<td>reed relay</td>
<td>Reed-Relais</td>
<td></td>
</tr>
<tr>
<td>KT</td>
<td>time-delay relay</td>
<td>Zeitrelais</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>inductors, reactors</td>
<td>Induktivitäten</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>induction coil, wave trap, reactor (shunt or series winding)</td>
<td>Induktionsspule, Wellensperre, Drosselspule (Nebenschluß oder Reihenschluß)</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>M</td>
<td>motors</td>
<td>Motoren</td>
</tr>
<tr>
<td>N</td>
<td>N</td>
<td>analogue elements</td>
<td>Analoge Elemente</td>
</tr>
<tr>
<td>P</td>
<td>measuring equipment, testing equipment</td>
<td>Meßgeräte, Prüfeinrichtungen</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>displaying, writing and counting measuring equipment; signal generator</td>
<td>anzeigende, schreibende und zählende Meßeinrichtungen; Signalgenerator</td>
<td></td>
</tr>
<tr>
<td>PA</td>
<td>ammeter</td>
<td>Amperemeter / Strommesser</td>
<td></td>
</tr>
<tr>
<td>PC</td>
<td>pulse counter</td>
<td>Impulszähler</td>
<td></td>
</tr>
<tr>
<td>PJ</td>
<td>watthour meter</td>
<td>Wattstundenzähler</td>
<td></td>
</tr>
<tr>
<td>PS</td>
<td>recording instrument</td>
<td>schreibendes Meßgerät</td>
<td></td>
</tr>
<tr>
<td>PT</td>
<td>clock, elapsed-hour meter</td>
<td>Uhr, Betriebsstundenzähler</td>
<td></td>
</tr>
<tr>
<td>PV</td>
<td>voltmeter</td>
<td>Voltmeter / Spannungsmesser</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>switching devices for power circuits</td>
<td>Starkstrom-Schaltgeräte</td>
<td></td>
</tr>
<tr>
<td>QF</td>
<td>circuit breaker</td>
<td>Leistungsschalter</td>
<td></td>
</tr>
<tr>
<td>QM</td>
<td>motor circuit-breaker</td>
<td>Motorschutzschalter</td>
<td></td>
</tr>
<tr>
<td>QS</td>
<td>disconnector</td>
<td>Trennschalter</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>resistors</td>
<td>Widerstände</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>fixed or trimming resistor</td>
<td>fester oder einstellbarer Widerstand</td>
<td></td>
</tr>
<tr>
<td>RP</td>
<td>potentiometer</td>
<td>Potentiometer</td>
<td></td>
</tr>
<tr>
<td>RS</td>
<td>shunt resistor</td>
<td>Nebenwiderstand</td>
<td></td>
</tr>
<tr>
<td>RT</td>
<td>thermistor (NTC, PTC)</td>
<td>temperaturabhängiger Widerstand (Heiß-, Kaltleiter)</td>
<td></td>
</tr>
<tr>
<td>RV</td>
<td>voltage dependant resistor (VDR)</td>
<td>spannungsabhängiger Widerstand (Varistor)</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>switching devices for control circuits, selectors</td>
<td>Schalter, Wähler</td>
<td></td>
</tr>
<tr>
<td>SA</td>
<td>selector switch or control switch</td>
<td>Wahl- oder Steuerschalter</td>
<td></td>
</tr>
<tr>
<td>SB</td>
<td>push button</td>
<td>Drucktaster (einschl. elektronische berührungslos wirkende Befehlgeräte)</td>
<td></td>
</tr>
<tr>
<td>SL</td>
<td>detecting element</td>
<td>Meßfühler (einstufige Digitalfühler) für mechanische und eletronische Erfassung: Flüssigkeits-Füllstandsfühler</td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>pressure sensor</td>
<td>Druckfühler</td>
<td></td>
</tr>
<tr>
<td>SQ</td>
<td>position sensor, displacement sensor, proximity switch</td>
<td>Wegfühler (Positionsschalter) einschl. Näherungsschalter</td>
<td></td>
</tr>
<tr>
<td>SR</td>
<td>speed monitor</td>
<td>Drehzahlwächter</td>
<td></td>
</tr>
<tr>
<td>ST</td>
<td>temperature detector</td>
<td>Temperaturfühler</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>transformers</td>
<td>Transformatoren</td>
<td></td>
</tr>
<tr>
<td>TA</td>
<td>current transformer</td>
<td>Stromwandler</td>
<td></td>
</tr>
<tr>
<td>TC</td>
<td>control power transformer</td>
<td>Steuertransformator</td>
<td></td>
</tr>
<tr>
<td>TM</td>
<td>power transformer</td>
<td>Leistungstransformator</td>
<td></td>
</tr>
<tr>
<td>TS</td>
<td>magnetic voltage stabilizer</td>
<td>magnetischer Spannungskonstanthalter</td>
<td></td>
</tr>
<tr>
<td>TV</td>
<td>voltage transformer</td>
<td>Spannungswandler</td>
<td></td>
</tr>
<tr>
<td>U</td>
<td>U</td>
<td>modulators, changers</td>
<td>Modulatoren, Umsetzer von elektrischen in andere elektrische Größen</td>
</tr>
<tr>
<td>V</td>
<td>tubes, semiconductors</td>
<td>Röhren, Halbleiter</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>----------------------</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>electron-beam tube, gaseous discharge tube, diode, transistor, thyristor</td>
<td>Elektronenröhre, Gasentladungsrohre, Diode, Transistor, Thyristor</td>
<td></td>
</tr>
<tr>
<td>VC</td>
<td>rectifier for control circuits</td>
<td>Gleichrichter für Steuerstromkreise</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>transmission paths, waveguides, aerials</td>
<td>Übertragungswege, Hohlleiter, Antennen</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>terminals, plugs, sockets</td>
<td>Klemmen, Stecker, Steckdosen</td>
<td></td>
</tr>
<tr>
<td>XB</td>
<td>disconnecting link</td>
<td>Trennlasche (Brücke)</td>
<td></td>
</tr>
<tr>
<td>XJ</td>
<td>test socket</td>
<td>Prüfbuchse</td>
<td></td>
</tr>
<tr>
<td>XP</td>
<td>plug</td>
<td>Stecker</td>
<td></td>
</tr>
<tr>
<td>XS</td>
<td>socket</td>
<td>Steckdose</td>
<td></td>
</tr>
<tr>
<td>XT</td>
<td>terminal strip</td>
<td>Klemmleiste</td>
<td></td>
</tr>
<tr>
<td>XX</td>
<td>terminal plug</td>
<td>Klemmstecker</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>electrically operated mechanical devices</td>
<td>elektrisch betätigte mechanische Einrichtungen</td>
<td></td>
</tr>
<tr>
<td>YA</td>
<td>electromagnet</td>
<td>Elektromagnet</td>
<td></td>
</tr>
<tr>
<td>YB</td>
<td>brake</td>
<td>Bremse</td>
<td></td>
</tr>
<tr>
<td>YC</td>
<td>coupling</td>
<td>Kupplung</td>
<td></td>
</tr>
<tr>
<td>YH</td>
<td>magnetic clamping device</td>
<td>magnetische Spannvorrichtung oder Spanndorn</td>
<td></td>
</tr>
<tr>
<td>YV</td>
<td>solenoid valve</td>
<td>Magnetventil</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>terminations, hybrid transformers, filters, equalizers, limiters</td>
<td>Abschlüsse, Gabelübertrager, Filter, Entzerrer, Begrenzer</td>
<td></td>
</tr>
</tbody>
</table>