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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 81346-12 was prepared by Technical Committee ISO/TC 10, *Technical product documentation*, Subcommittee SC 10, *Process plant documentation*.

Documents in the 80000 to 89999 range of reference numbers are developed by collaboration between ISO and IEC.

ISO 81346 consists of the following parts, under the general title *Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations*:

- *Part 3: Applications rules for a reference designation system* [Technical Specification]
- *Part 10: Power Plants*
- *Part 12: Buildings and building services*

IEC 81346 consists of the following parts, under the general title *Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations*:

- *Part 1: Basic Rules*
- *Part 2: Classification of objects and codes for classes*

Introduction

This standard considers and supports planning, erection, utilization, and operation of buildings and equipment of building services. The application of Reference Designation System RDS may lead to restructuring and reorientation of these activities, offers however chances and potentials of increasing efficiency and economization. Advantages of designation systems, which will be more and more important in the future, are:

- The reference designation system can be applied in several technical fields in the same way and is not designed only for one. So, technical, structural, and constructive objects, for example, can be treated in the same way – a basis for company-wide synergy effects.
- The reference designation system allows integrating any kind of systems and components without changing the once defined designations.
- The reference designation is not bound to a fixed structural pattern. Thus the designation system is vertically and horizontally expandable, which makes the interpretability in some cases quite complex. Therefore an exact and computer interpretable documentation and description is essential.
- The application of different aspects allows, for instance, the designation of functions independently from realizing products and their location.
- The different aspects in structuring and the possibility of creating relations between objects of these structures offer search and filter criteria and information correlations in a much greater variety than before.

The users of this standard have to decide more than without this designation system, what is the aim of an intended designation. Many advantages will appear visible and useable by innovative and consequent use of data processing systems, which in turn is prerequisite for their application.

Other well-known information structures besides the reference designation structures in this standard are:

- organization structures,
- utilization structures,
- costs structures,
- performance structures,
- Real estate structures.

These and other structures can be linked to each other, or to the reference designation based structures, so that requirements of flexibility and individuality can be fulfilled.

Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations — Part 12: Buildings and building services

1 Scope

This part of ISO 81346 applies to the function, product and location oriented designation of technical objects and their documentation in the field of buildings and building services.

This standard establishes rules for structuring and reference designation and determinates letter code tables for different designation blocks and breakdown levels. Additional stipulations for classification of objects and the corresponding letter codes as well as application information and examples are also included.

Buildings and the technical systems can be embedded, without changing the applied designations, in superior systems as far as they are structured and designated based on the rules of the ISO/IEC 81346 series.

NOTE Systems of higher order could be for example industrial sites, ships, drilling platforms, railway sites.

This part of ISO 81346 can be applied to systems in the sense of functional units of building objects.

This part of ISO 81346 is not applicable to manufacturer or system related designations of individuals (e.g. inventory number, serial number) or for the designation of object types and classes or products (e.g. article number or parts number).

For the forming of designations letter codes of the object classes given in IEC 81346-2 and the building related object classes, e.g. letter codes of the building services, will be applied.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60445, *Basic and safety principles for man-machine interface, marking and identification — Identification of equipment terminals, conductor terminations and conductors*

IEC 61175, *Industrial systems, installations and equipment and industrial products — Designation of signals*

IEC 61355-1:2008, *Classification and designation of documents for plants, systems and equipment — Part 1: Rules and classification tables*

IEC 61666, *Industrial systems, installations and equipment and industrial products — Identification of terminals within a system*

IEC 81346-1:2009, *Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations — Part 1: Basic rules*

IEC 81346-2:2009, *Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations — Part 2: Classification of objects and codes for classes*

ISO 4157 series, *Construction drawings — Designation systems*

ISO 6707-1:2004, *Building and civil engineering — Vocabulary — Part 1: General terms*

ISO 16484-2:2004, *Building automation and control systems (BACS) — Part 2: Hardware*

ISO/TS 81346-3, *Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations — Part 3: Applications rules for a reference designation system*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

aspect

specified way of viewing an object

[IEC 81346-1:2009, 3.3]

3.2

component

product manufactured as a distinct unit to serve a specific function or functions

[ISO 6707-1:2004, 6.1.3]

3.3

document kind

type of document defined with respect to its specified content of information and form of presentation

NOTE Sometimes the term document type is used for the same concept.

[IEC 61355-1:2008, 3.6]

3.4

equipment

aggregation of functional elements or assembly of components and modules that belong together in one physical unit of a plant or in a functional unit of a system

[ISO 16484-2:2004, 3.73]

3.5

object

entity treated in a process of development, implementation, usage and disposal.

NOTE 1 The object may refer to a physical or non-physical “thing”, i.e. anything that might exist, exists or did exist.

NOTE 2 The object has information associated to it.

[IEC 81346-1:2009,3.1]

3.6

plant

assembly of different systems on a specific site

[IEC 61355-1:2008, 3.10]

3.7**product**

intended or accomplished result of labour, or of a natural or artificial process

[IEC 81346-1:2009, 3.6]

NOTE 1 In the context of this standard the term refers to the industrial process (assembly, construction, installation, etc.) through which an object is realized.

NOTE 2 Here: Buildings and building services

3.8**structure**

<information technology> organization of relations among objects of a system describing constituency relations (consist-of / is-a-part-of)

[IEC 81346-1:2009, 3.9]

3.9**system**

set of interrelated objects considered in a defined context as a whole and separated from their environment

NOTE 1 A system is generally defined with the view of achieving a given objective, e.g. by performing a definite function.

NOTE 2 Elements of a system may be natural or man-made material objects, as well as modes of thinking and the results thereof (e.g. forms of organisation, mathematical methods, programming languages).

NOTE 3 The system is considered to be separated from the environment and from the other external systems by an imaginary surface, which cuts the links between them and the system.

NOTE 4 The term “system” should be qualified when it is not clear from the context to what it refers, e.g. control system, colorimetric system, system of units, transmission system.

NOTE 5 When a system is part of another system, it may be considered as an object as defined in this standard.
[IEV 151-11-27, modified]

[IEC 81346-1:2009, 3.2]

4 Structuring

4.1 General

In order for a system and for information about it, generated during its life cycle (e.g. basic data collection, planning, construction, operation, dismantling and disposal) to be administered, it is necessary to divide it in several units (objects) – that is to structure it. The structuring is usually carried out over several levels in top-down manner; a bottom-up method is also applicable. A hierarchical tree structure is the result.

The process of structuring is carried out according to several views, called aspects. The three most important types of aspects are:

- the function aspect, i.e. what does the object do?
- the product aspect, i.e. how is the object constructed?
- the location aspect, i.e. where is the object located?

Because of the different information contents and the different structure, a separate structure for each aspect is necessary – especially if the application of aspects should be consequent.

By building relations between the above named structures, characteristic information can be assembled and task-related conclusions on an object stated, such as information about the location of the object or a product that implements two different functions.

To differentiate between the different aspects each reference designation shall be indicated by a prefix. The following prefixes shall be used:

- „=” (Equal) when relating to the functions aspect;
- „–“ (Minus) when relating to the product aspect;
- „+“ (Plus) when relating to the location aspect.

4.2 Function-oriented structure

The main focus of the function-oriented consideration is in the project phases from the concept to the planning of the technical systems including the corresponding control systems. This function-oriented consideration is furthermore important for process control and optimization and also for locating failures of function during system operation.

The function-oriented structure is based on the purpose of a system and helps to understand, to structure and to describe a task systematically. The structure shows the partitioning of a system in single objects exclusively with regard to the function aspect without necessarily regarding the location of the function and/or the products implementing the function.

Document kinds in which the function-oriented aspect is shown are for example overview diagram, process diagram, function diagram, and circuit diagram, i.e. schematic and non-scaled documents composed of graphical symbols connected with lines.

4.3 Product-oriented structure

The product-oriented structure describes how a system is implemented and assembled by which parts. The structure shows the partitioning of a system into single objects with regard to the product aspect without necessarily regarding at where the product is located and which function the product fulfils.

In the context of the product aspect terms are used such as plant complex, plant, technical equipment, components, etc.

A product can realize one or more independent functions, for example a heat exchanger can heat or cool, several control functions can be implemented in one control system unit.

Also a product (alone or together with others) can be located at one or more locations, for example a measuring system with location of measuring unit and displaying unit or a duct system extended to several different locations.

With regard to the structuring and assessment of objects in planning and implementation as preparation of the operation phase the product-oriented aspect is important, because only products can be maintained, not functions.

Document kinds in which the product-oriented aspect is represented are for example product description, construction drawing, assembly drawing, explosion drawing, network part drawing, maintenance instruction, i.e. predominantly scaled drawings and descriptions related to a single physical object.

In the building industry a further distinction is made between construction products (e.g. ceilings, walls or columns) and products of the building services (e.g. filters, pumps, chillers, or boilers).

4.4 Location-oriented structure

The location-oriented structure is based on the topographical structure of a system and/or its environment where the system is located. The structure shows the partitioning of a system with regard to the product aspect. An object in a location-oriented structure can incorporate any number of products and functions.

An object of the location-oriented structure can be for example a site, a building complex, a building, a part of a building, a storey, or a room as well as an outside area, a green area, a park area, a parking area, a street, or a sidewalk. It can also be a product regarded as a location such as a row of cabinets, a cabinet, or a row inside a cabinet.

The location-oriented structure will be used in planning, erecting and managing of building, rooms, or areas as well as for locating objects to be assembled or maintained.

Document kinds in which the location-oriented-structure is represented are site plan, floor plan, sectional drawing, elevation drawing, ground plan, installation drawing, or assembling drawing, mainly scaled drawings.

5 Structure of Designations

5.1 General

A reference designation is structured in several levels, which are composed by letters and numbers. The letters represent the class of an object; the numbers are used for counting.

By means of classifying objects are assigned to a class of objects, but no properties are described or a detailed typecast is carried out – this is not the contents of a reference designation. Letter codes for object classes are listed in Tables A.1 to A.4. Application examples of several engineering areas are given in Annex B.

When applying a reference designation system on large, complex systems in a specific technical area it is recommended to establish fixed number of breakdown levels. The further structuring and designation is carried out variable in one or more breakdown levels and depends on the level of detail. The basis for the variable structure is ISO/TS 81346-3.

Due to project or application system related circumstances it can be necessary to establish a fixed level of detail for the overall designation in order of limiting the designation length to a particular number of data digits.

Basically such stipulations are allowed according to IEC 81346-1, but by that concessions to the basic designation concepts have to be made and the intended flexibility and universality of the designation system get limited. Stipulations like that shall remain limited to special project or organization related applications. Further definitions can be taken from the standards ISO 4157 series.

5.2 Designation of functions

With the function-oriented designation functional units of building services are designated. Two kinds of function-oriented designations are differentiated:

- Functions and sub-functions of building services systems are designated by using the prefix „=“.
- If functional units of control systems are built, this sub-aspect can be represented by using the prefix „==“ (equal-equal).

The function-oriented designation is structured and built according to Figure 1. The letter codes for breakdown level 1 (BL1) are shown in Table A.2. The letter codes in Table A.4 according to the general letter codes of IEC 81346-2 have to be applied to the breakdown levels 2 to n.

Breakdown level BL		1		2		n		
Number / type of data position	= (=)	AA	NNN	.	AA	NN	AA	NN
Prefix											
Letter code of building services First letter "T" according to Table A.2											
Numbering or further substructure of building services											
Breakdown mark "Dot"											
Letter code of basic functions according to Table A.4											
Numbering or further subdivision of basic functions											

Figure 1 — Function-oriented designation block

5.3 Designation of products

5.3.1 Products of construction works

Products of construction works are construction units, by which a building is assembled, e.g. foundation, wall, column, ceiling, facade, door, window.

The structure of the product-oriented designation is shown in Figure 2. In breakdown level 1 (BL1) the letter „B“ classifies the products of construction works to differentiate between construction works and building services. Table A.1 contains the letter codes of BL1 for construction works. The letter codes to be used for the sub-breakdown levels are listed in Table A.4.

Breakdown level BL		1		2		n		
Number / type of data position	-	AA	NNN	.	AA	NN	AA	NN
Prefix											
Designation of construction works, first letter "B" according to Table A.1											
Numbering or further subdivision of construction works											
Breakdown mark "Dot"											
Letter code of object class according to Table A.4											
Numbering or further subdivision of object classes											

Figure 2 — Product-oriented designation block for construction works

5.3.2 Products of building services

Products of building services are units such as technical plants, plant sections, components, and other equipment used for realizing functions of building services.

The structure of the product-oriented designation is shown in Figure 3. In breakdown level 1 (BL1) the letter „T“ classifies the products of building services in order of differentiating between building services and construction services. Table A.2 contains the letter codes of BL1 for building services. The letter codes to be used for the sub-breakdown levels are listed in Table A.4 or IEC 81346-2:2009, Table 2.

Breakdown level BL		1		2			n				
Number / type of data position	-	AA	NNN	.	AA	NN	AA	NN
Prefix											
Designation of building services, first letter "T" according to Table A.2											
Numbering or further subdivision of building services											
Breakdown mark "Dot"											
Letter codes of object classes according to Table A.4											
Numbering or further subdivision of object classes											

Figure 3 — Product-oriented designation block for building services

5.4 Designation of locations

5.4.1 General

In the location-oriented designation two aspects are distinguished by different prefix:

- The aspect represented by the prefix „++“ means the placement locations for example site, property, building, storey, or room.
- The aspect represented by the prefix „+“ means the mounting location in objects of building area. Examples in the area of construction works are beams, mounting rails anchorages, sanitary objects, floor boxes and in the area of building services cabinets, mounting racks, operating panels or operator stations. The mounting location can be seen as a location of a product in a distribution cabinet, or as a location of a control or operating function in a product of an automation system.

NOTE The differentiation and application of both location-oriented aspects is here not done in the literal sense of IEC 81346-1 because one and the same object is not considered under these two different location-oriented aspects. In the present case on the one hand a placement location of building, on the other hand a mounting location in a product is structured and designated.

5.4.2 Placement location

The designation of sites, buildings and parts of buildings, stories, rooms and areas of rooms is done by using the placement designation represented by the prefix "++" (plus-plus).

Because of the various possibilities of building structuring and allocation of the different breakdown levels by letter codes and numbers neither fixed structure nor fixed designation structures are given here.

Figure 4 shows different possibilities of formation a location designation based on the structuring and designation rules of IEC 81346-1. This guideline includes no approach to create a room number, e.g. in relation to the construction grid or clockwise starting at a determined point.

Breakdown level	P	BL1	BL2	BL3	BL4	BL5	BL6
Location of placement		Site	Building	Part of building	Level	Room	Area
Example 1	++	NNN	A	A	NN	ANNN	A
	++	121	B		10	R231	B
Example 2	++		NN		ANN	ANNN	
	++		23		U01	R123	
Example 3	++		NN	A	NN	ANNN	
	++		15	C	10	R201	
Example 4	++	NN	N			NN	NN
	++	25	7			03	01

Key

BL Building

P Prefix

Figure 4 — Examples of placement location designations

When objects of respective breakdown levels such as building, storey or room should be structured, classified and designated this shall be defined in a project or for an organization. Due to possible conversion of location objects (e.g. conversion of a storage area to an office area) it is recommended to apply the classification as a part of the designation with caution because the designation of a room has to be changed consequently if the use of the room is changed. It is also advised against defining number intervals based on the type of rooms use.

Further regulations for the designation of buildings, levels, and rooms are specified in the ISO 4157 series.

5.4.3 Mounting location

Structure and composition of the plant-related location designation can be transferred from the product-oriented designation (see also 5.3). As a rule products (structural units) are treated and designated in a location-oriented aspect.

The designation of a mounting location (see ISO/TS 81346-3) has the prefix „+“ and the structure shown in Figure 5.

Breakdown level BL	1	2	n
Number / type of data position	AA	NNN	AA
Prefix	+	AA	NNN
Class of plant according to Table A.1 and Table A.2		AA	NN
Numbering or further subdivision of plant		AA
Breakdown mark “Dot”		..	NN
Letter code of object class according to Table A.4			
Numbering or further subdivision of object class			

Figure 5 — Designation block of mounting location

5.4.4 Extended designation of location

In various levels of location-oriented designations it is sometimes necessary to specify a concrete location more detailed. Generally this is done by using coordinates. Coordinates can be applied in the structure level site, building, storey, or rooms, and also in cabinets, control desks, or operating boards.

Because IEC 81346-1 offers thereto no specifications and possibilities the designation addendum „numbering part“ with the separator „/“ (slash) shall be used.

Hence the following designations of locations are possible for example:

++NNN/A...N Grid coordinates on a site

++NNN.ANN/A...N Coordinate in a level of a building

++NNN.ANN.NNN/A...N Coordinate inside a room or a fire zone

+AANN.NAANN/A...N Coordinate on a construction unit (e.g. cabinet, board)

6 Specific designations

6.1 General

Based on the three aspects function, location, and product specific designations can be built according to ISO/TS 81346-3, in fact the signal, terminal and document designations.

When composing these designations, other standards beside IEC 81346-1 have to be applied: the IEC 61175 for signals designation, IEC 61666 for terminals designation and IEC 61355-1 for documents designation.

In the following the requirements for buildings and building services are specified.

6.2 Designation of signals

The signal designations have to be defined together and coordinated with the structure of a data-point-name of a control system. The basis for defining a signal designation is the function-oriented structure of objects and the corresponding function designations with the prefix „=“ or „==“. The signal designation has a structure shown in Figure 6.

Object designation	Prefix	Type of signal	Number
A ... / ... N	;	A	NN

Figure 6 — Structure of the signal designation

Letter codes for types of signals are listed in Appendix A, Table A.5. The signal designation is a combination of an object reference designation and the signal designation part „; signal“ as determined in ISO/TS 81346-3, e.g. function-oriented designation „=“ or „==“ with designation block „signal“, e.g.

=ANN.NAANN.AANN;ANN

or

==ANN.NAANN.AANN;ANN.

If it is necessary to know at which location the signal is generated, the signal designation can be combined with a location-oriented designation, e.g.

++NNN.ANN=ANNN.AANN;ANN

This could be necessary if sites or buildings are managed and operated with a central control system.

6.3 Designation of terminals

The designation of terminals is a combination of a function-, location-, or product-oriented object reference designation and the terminal designation part.

The definition and application of terminal designation is described in IEC 61666. In this standard no general and fixed syntax for the digits of the terminal designation are stipulated.

Dependent on the application on products (e.g. sanitary equipment, vessels, electrical equipment) or on functions (e.g. function blocks of control systems) the syntax of the digits has to be defined and applied according to other standard of the respective technical area, e.g. IEC 60445 for electrical equipment, or specific stipulations for function block descriptions.

6.4 Designation of documents

Basis for creating the document designations are the function-, location-, and product-oriented reference designations of the objects. To these objects various document kinds with a Document kind Classification Code (DCC) are assigned. A document can consist of several sheets that are identified by an added counting part or sheet number.

The various documents are designated with a document designation according to IEC 61355-1 as shown in Figure 7.

Object designation	Prefix	Document kind classification code DCC		Number
A ... / ... N	&	(A)AA(NNN)	/	N(N ... N)

Figure 7 — Structure of a document designation

The designation block „Document kind classification code DCC“ and the definition of the single letter digits are stipulated in IEC 61355-1 and the respective letter code Tables in this standard. In the area of buildings the first digit is generally not necessary because the corresponding technical area and object to which the document is assigned is sufficiently defined by its reference designation with the corresponding prefix.

For a detailed differentiation of the various document kinds it could be necessary to increase the number of numeric digits in the designation block. These further digits are used for differentiating between the document kinds and shall not be used to differentiate and identify the single documents without a relation to an object.

Within the scope of a project process the document designation can be supplemented with process related information, e.g. codes for project phase, index, or technical area. It has to be considered that these additional codes do not divide the document designation in parts, i.e. these codes shall be added in front or at the end of the document designation.

Annex A (normative)

Letter codes

A.1 Classes of construction works

Table A.1 — Classes of construction works

Letter code	Denomination
BB	Balcony
BC	Load carrying system
BD	Room delimiting outside construction (horizontal)
BE	Foundation, geotechnical system
BF	Room delimiting outside construction (vertical)
BG	External plant
BH	Traffic construction, traffic area
BJ	Hydraulic construction
BK	Construction for supply and disposal
BL	Interior fittings, built-in components
BR	Room delimiting inside construction (walls, suspended ceiling, framed floor)
BV	Connecting structure and buildings

A.2 Classes of building services

Table A.2 — Classes of building services

Class	Denomination
TA	Superior, combined system
TB	Safety and security system (if not in TF)
TC	Control system
TD	IT system
TE	Electrical supply system
TF	Communication system
TG	Fuel supply system
TH	Heat supply system
TJ	Conveying system
TK	Cooling supply system
TL	Air conditioning and ventilation system
TM	Operating supplies systems
TN	Utilization specific system
TP	Fire-extinguishing system
TQ	Kitchen systems
TS	Water supply systems
TT	Sewerage system
TU	Disposal system
TY	Other systems

A.3 Classes of basic functions and products

Table A.3 — Main classes of basic functions and products

Class	Denomination
A	Two or more purposes or tasks NOTE This class is only for objects for which no main intended purpose or task can be identified.
B	Converting an input variable (physical property, condition or event) into a signal for further processing
C	Storing of energy, information or material
E	Providing radiant or thermal energy
F	Direct protection (self-acting) of a flow of energy, signals, personnel or equipment from dangerous or unwanted conditions Including systems and equipment for protective purposes
G	Initiating a flow of energy or material Generating signals used as information carriers or reference source
H	Producing a new kind of material or product
K	Processing (receiving, treating and providing) signals or information (excluding objects for protective purposes, see Class F)
M	Providing mechanical energy (rotational or linear mechanical motion) for driving purposes
P	Presenting information
Q	Controlled switching or varying a flow of energy, of signals (for signals in control circuits, see Classes K and S) or of material
R	Restricting or stabilizing motion or a flow of energy, information or material
S	Converting a manual operation into a signal for further processing
T	Conversion of energy maintaining the kind of energy Conversion of an established signal maintaining the content of information Conversion of the form or shape of a material
U	Keeping objects in a defined position
V	Processing (treating) of material or products (including preparatory and post-treatment)
W	Guiding or transporting energy, signals, material or products from one place to another
X	Connecting objects

Table A.4 — Sub classes of basic functions and products

Letter Code	Denomination	Examples
AA	Simulation of electrical influences on plants, equipment and persons	
AF	Simulation of optical and acoustic influences on plants, equipment and persons	Operating-/monitoring station, touch screen
AL	Simulation of mechanical influences on plants, equipment and persons	
AZ	Combined tasks	
BA	Electrical potential	Voltage transformer, measuring shunt, measuring transformer (voltage)
BC	Electrical current	Measuring relay (current), current transformer
BD	Density	
BE	Other electrical and electromagnetic variable	Measuring shunt (resistance), measuring relay, measuring transformer
BF	Flow	Flow meter, gas meter, water meter
BG	Gauge, position, length (including distance, elongation, amplitude)	Motion sensor, movement detector, position switch, proximity switch, proximity sensor
BJ	Power	Watt meter
BK	Time	Clock, time counter
BL	Level	Level indication, fluid level measurement
BM	Moisture, humidity	Humidity meter (relative, absolute)
BP	Pressure, Vacuum	Pressure gauge, pressure sensor
BQ	Quality (composition, concentration, purity, material property)	Gas analyzer, smoke detector, CO meter
BR	Radiation	Photo cell, fire detector, flame detector
BS	Speed, frequency (including acceleration)	Accelerometer, speedometer, tachometer, vibration pickup
BT	Temperature	Temperature sensor
BU	Multi-variable	Energy counter
BV	Viscosity	
BW	Weight, force	Load cell, scales
BX	Other quantities	Microphone, video camera
BZ	Number of events, counts, combined tasks	Switching cycle detector
CA	Capacitive storing of electric energy	Capacitor
CB	Inductive storing of electric energy	Coil
CC	Chemical storing of electric energy	Buffer battery, accumulator, uninterruptible power supply UPS (static)

Table A.4 (continued)

Letter Code	Denomination	Examples
CF	Storing of information	CD, DVD, tape recorder, hard disk, EPROM, video recorder
CL	Open storage of material at fixed location (collection, housing)	Bunker, cistern, pool
CM	Closed storage of material at fixed location (collection, housing)	Expansion tank, barrel, boiler, buffer, container, depository, flash tank, gas holder, safe, silo, tank, water supply tank
CN	Moveable storage of material (collection, housing)	Container, drum, gas cylinder, shipping container
CP	Storing of thermal energy	Hot water accumulator, hybrid heat, storage, ice tank, steam storage, thermal energy storage, underground thermal energy storage
CQ	Storing of mechanical energy	Flywheel, uninterruptible power supply UPS (dynamic)
EA	Generation of electromagnetic radiation for lighting purposes using electrical energy	Lamp, lamp bulb, LED lamp, UV radiator
EB	Generation of heat by conversion of electrical energy	Electrical boiler, electrical furnace, electrical heater, electrical radiator, electrode steam boiler, heating rod, heating wire, infrared heating element
EC	Generation of cooling energy by conversion of electrical energy	Compression chiller, cooling unit, freezer, freezing unit, Peltier element, refrigerator, turbine-driven chiller
EF	Generation of electromagnetic radiation for signalling purposes	
EM	Generation of heat by conversion of chemical energy	Boiler, burner, combustion grate, furnace
EN	Generation of cooling energy by conversion of chemical energy	Cold pump, refrigerator
EP	Generation of heat by convection	Boiler, condenser, evaporator, economizer, heat exchanger, heat recovery steam generator, radiator, steam generator
EQ	Generation of cooling energy by convection	Cold pump, freezer, refrigerator, cooling tower, air cooling unit, evaporator, air cooler, cooling ceiling
EZ	Combined tasks	Air conditioning unit, induction unit
FA	Protection against overvoltage	Arrester, surge arrester
FB	Protection against residual current	Residual current device
FC	Protection against overcurrent	Fuse, fuse unit, miniature circuit-breaker, thermal overload release
FE	Protection against other electrical hazards	Enclosure for electromagnetic shielding, Faraday cage

Table A.4 (continued)

Letter Code	Denomination	Examples
FL	Protection against hazardous pressure condition	Automatic drains trap, rupture disc, safety valve,
FM	Protection against effects of fire	Fire damper, fire protection door, fire protection facility, lock
FN	Protection against dangerous operating condition or damage	Impact protection, protection device, protective shield, protective sleeve for thermocouple, safety clutch
FP	Protection against hazardous emission (e.g. radiation, chemical emissions, noise)	Noise protection, radiation protection
FQ	Protection against hazards or unwanted situations for person or animals (e.g. safeguarding)	barriers, contact protection, escape door, escape window, fence, gates, glare protection, guard, vision protection, railing
FR	Protection against wear (e.g. corrosion)	Cathodic protection anode
FS	Protection against environmental influences (e.g. weather conditions, geo-physical impact)	Avalanche protection device, geophysical protection device, weather protection device
FZ	Combined tasks	
GA	Initiation of an electrical energy flow by use of mechanical energy	Generator, dynamo, motor-generator set, emergency power generator
GB	Initiation of an electrical energy flow by chemical conversion	Battery, fuel cell, dry cell battery
GC	Initiation of an electrical energy flow using light	Solar cell
GF	Generation of signals as an information carrier	Signal generator, transducer
GL	Initiation of a continuous flow of solid matter	Belt, chain conveyor, distributor
GM	Initiation of a discontinuous flow of solid matter	Crane, elevators, forklift, lifting gear, manipulator, lifting device
GP	Initiation of a flow of liquid or flowable substances driven by an energy supply	Pump, screw conveyor
GQ	Initiation of a flow of gaseous substances by a mechanical driver	Blower, compressor, fan, vacuum pump, ventilator
GS	Initiation of a flow of liquid or gaseous substances by driving medium	Ejector, injector, jet
GT	Initiation of a flow of liquid or gaseous substances by gravity	Lubricator, oiler
GZ	Combined tasks	
HM	Separation of mixtures of substances by centrifugal force	Centrifuge, cyclone device
HN	Separation of mixtures of substances by gravity	Separator, settling tank
HP	Separation of mixtures of substances by thermal processes	Distillation column, drying (Munters air dryer),
HQ	Separation of mixtures of substances by filtering or classification	Fluid filter, gas filter, grate, rake, screen, moisture separator, waste separator,
HR	Separation of mixtures of substances by electrostatic or magnetic forces	Electrostatic precipitator, magnetic separator

Table A.4 (continued)

Letter Code	Denomination	Examples
HS	Separation of mixtures of substances by physical processes	Absorption washer, active charcoal absorber, ion exchanger, wet ash scrubber
HT	Generation of new gaseous substances	Gasifier
HW	Generation of new substances by mixing	Humidifier (steam), mixer
HZ	Combined tasks	
KF	Processing of electrical and electronic signals	Analogue integrated circuit, automatic paralleling device, binary integrated circuit, contactor relay, CPU, delay element, electronic valve, feedback controller, filter (a.c. or d.c.), input/output module, microprocessor, optocoupler, process computer, programmable controller, receiver, time relay, transistor, transmitter
KG	Processing of optical and acoustical signals	Mirror, controller, testing unit
KH	Processing of fluid and pneumatic signals	Control valve, fluid feedback controller
KJ	Processing of mechanical signals	Controller mechanical
KK	Processing of various input/output information carriers (e.g. electrical/pneumatic)	Electro-hydraulic converter, electric pilot valve, controller
KZ	Combined tasks	
MA	Driving by electromagnetic force	Electric motor, actuating drive
MB	Driving by magnetic force	Magnetic drive, actuator electro-magnetic
ML	Driving by mechanical force	Stored-energy spring actuator, mechanical actuator
MM	Driving by hydraulic or pneumatic force	Fluid actuator-motor, servo motor, hydraulic cylinder
MN	Driving by steam flow force	Steam turbine
MP	Driving by gas flow force	Gas turbine
MQ	Driving by wind force	Wind turbine
MR	Driving by fluid flow force	Water turbine
MS	Driving by force using chemical conversion means	Combustion engine
MZ	Combined tasks	
PF	Visible presentation of discrete states	LED, signal lamp
PG	Visible presentation of values of discrete variables	Ammeter, barometer, clock, counter, event counter, flow meter, frequency meter, Geiger counter, manometer, sight glass, synchronoscope, thermometer, voltmeter, watt-hour meter, wattmeter, weight display

Table A.4 (continued)

Letter Code	Denomination	Examples
PH	Visible presentation of information in drawing, pictorial and/or textual form	Analogue recorder, barcode printer, event recorder (mainly for presenting information), printer, recording voltmeter, text display, video screen,
PJ	Audible presentation of information	Bell, horn, loudspeaker, whistle
PK	Tactile presentation of information	Vibrator
PZ	Combined tasks	
QA	Switching and variation of electrical energy circuits	Circuit-breaker, contactor, motor starter, power transistor, thyristor
QB	Isolation of electrical energy circuits	Disconnecter, fuse switch, fuse-switch disconnector, isolating switch, load-break switch
QC	Earthing of electrical energy circuits	Earthing switch
QL	Braking	Brake
QM	Switching of flow of flowable substances in closed enclosures	Blank, blanking plate, damper, shutoff valve (including drain valve), solenoid valve
QN	Varying of flow of flowable substances in closed enclosure	Control damper, control valve, gas control path
QP	Switching or varying of flow of liquid substances in open enclosures	Dam plate, lock gate
QQ	Providing access to an area	Bar (lock), cover, door, gate, lock, turnstile
QR	Shut-off of flow of flowable substances (no valves)	Isolation device, rotary lock (open/close)
QW	Opening and Closing of access (Light, air) to an area	Window, glazing
QZ	Combined tasks	
RA	Limiting a flow of electrical energy	Limiter, resistor
RB	Stabilizing a flow of electrical energy	Uninterruptible power supply (UPS)
RF	Stabilizing a signal	Equalizer, Filter
RL	Restricting an unauthorized operation and/or movement (mechanical)	Blocking device, latch, lock, stop
RM	Restricting a return flow of gaseous, liquid and flowable substances	Non return valve, flap trap, Check valve
RN	Restricting a flow of liquid and gaseous substances	Flow restrictor, orifice plate, Venturi nozzle, water-proof seal air inlet, air outlet
RP	Restricting a sound propagation	Noise protection, sound absorber
RQ	Restricting a thermal flow	Insulation, jacket, lagging, lining, thermal insulation louver damper
RR	Restricting a mechanical effect	Brick lining, compensator, shock absorber, vibration absorption
RS	Restricting a chemical effect	Brick lining, explosion protection, fire-extinguisher, gas penetration protection, splash protection

Table A.4 (continued)

Letter Code	Denomination	Examples
RT	Restricting a light propagation	Blind, screen, shutter
RU	Restricting access to an area	Fence
RZ	Combined tasks	
SF	Providing an electrical signal	Control switch, discrepancy switch, keyboard, light pen, pushbutton switch, selector switch, set-point adjuster, switch
SG	Providing an electromagnetic, optical or acoustical signal	Light barrier, computer mouse
SH	Providing a mechanical signal	Hand wheel, selector switch
SJ	Providing a fluid or pneumatic signal	Push-button valve
SZ	Combined tasks	
TA	Converting electrical energy while retaining the energy type and energy form	AC/DC converter, frequency converter, power transformer, transformer
TB	Converting electrical energy while retaining the energy type and changing the energy form	Inverter, rectifier
TF	Converting signals (retention of information content)	Aerial, amplifier, electrical transducer, impulse amplifier, isolating converter, signal converter
TL	Converting speed of rotation, torque, force into the same kind	Automatic gear, control coupling, fluid amplifier, indexing gear, pressure amplifier, speed converter, torque converter
TR	Converting radiation energy while retaining energy form	Magnifying glass, parabolic mirror
TZ	Combined tasks	
UA	Holding and supporting electrical energy equipment	Insulator, supporting structure
UB	Holding and supporting electrical energy cables and conductors	Cable duct, cable rack, cable tray, cable trough, insulator, mast, portal, post insulator
UC	Enclosing and supporting electrical energy equipment	Cubicle, encapsulation, housing
UE	Holding and supporting of electrical and communication terminals	Floor tank, wall duct
UF	Holding and supporting instrumentation, control and communication equipment	Printed circuit board, sub-rack, transducer rack
UG	Holding and supporting instrumentation, control and communication cables and conductors	Cable rack, duct, shaft
UH	Enclosing and supporting instrumentation, control and communication equipment	Cabinet
UL	Holding and supporting machinery	Machine foundation
UM	Holding and supporting structural objects	Building foundation, duct (not cable duct, see UG), shaft, structural elements (e.g. column, joist, lintel, suspender beam)

Table A.4 (continued)

Letter Code	Denomination	Examples
UN	Holding and supporting piping objects	Bracket for pipes, pipe bridge, pipe hanger
UP	Holding and guiding of shafts and rotors	Ball bearing, roller bearing, sliding bearing
UR	Fastening and anchoring machinery	Anchor plate, bracket, carrier, erection frame, erection plate
US	Spatial objects, housing and supporting other objects	Corridor, duct, hall, passage, room, shaft, stairwell
UZ	Combined tasks	
VQ	Cleaning material, product or facility	Building cleaning equipment, vacuum cleaner, washing machine
WA	Distributing high voltage electrical energy (> 1 000 V a.c. or > 1 500 V d.c.)	Busbar, motor control centre, switchgear assembly
WB	Transporting high voltage electrical energy (> 1 000 V a.c. or > 1 500 V d.c.)	Bushing, cable, conductor
WC	Distributing low voltage electrical energy (\leq 1 000 V a.c. or \leq 1 500 V d.c.)	Busbar, motor control centre, switchgear assembly
WD	Transporting low voltage electrical energy (\leq 1 000 V a.c. or \leq 1 500 V d.c.)	Bushing, cable, conductor
WE	Conducting earth potential or reference potential	Bonding conductor, earthing busbar, earthing conductor, earth rod
WF	Distributing electrical or electronic signal	Data bus, field bus
WG	Transporting electrical or electronic signal	Control cable, data line, measuring cable
WH	Transporting and routing optical signal	Optical fibre, optical fibre cable, optical wave guide
WL	Transporting material or product (not driven)	Conductor, inclined plane, roller table
WM	Conducting or guiding flow of substance in open enclosure	Channel, downpipe, trough, floor drain
WN	Conducting or guiding flow of substance in flexible, closed enclosure	Hose, flexible pipe
WP	Conducting or guiding flow of substance in rigid, closed enclosure	Air duct, pipe, stack
WQ	Transporting mechanical energy	chain, linkage, rotor, shaft, V-belt
WR	Conducting or guiding track-bound transport equipment	Points, rails, railway
WS	Conducting or guiding persons (access equipment)	Catwalk, platform, stair
WT	Conducting or guiding mobile transport equipment	Path, road, shipping routes
WZ	Combined tasks	
XB	Connecting high voltage objects (> 1 000 V a.c. or > 1 500 V d.c.)	Terminal, junction box, socket
XD	Connecting low voltage objects (\leq 1 000 V a.c. or \leq 1 500 V d.c.)	Connector, junction box, plug connector, socket-outlet, terminal, terminal block, terminal strip

Table A.4 (continued)

Letter Code	Denomination	Examples
XE	Connecting to earth potential or reference potential	Bonding terminal, earthing terminal, shield connection terminal
XF	Connecting data network carriers	Hub, switch, patch panel
XG	Connecting electrical signal carriers	Connection element, plug connector, signal distributor
XH	Connecting optical signal carriers	Optical connection
XL	Connecting rigid enclosures for flows of substances	Piping fitting, piping flange, piping coupling
XM	Connecting flexible enclosures for flows of substances	Hose connection, hose coupling
XN	Connecting objects for transport of mechanical energy, non-detachable	Rigid coupling
XP	Connecting objects for transport of mechanical energy, detachable	Control coupling, disengaging coupling
XQ	Connecting objects irreversible	Bonded connection, soldered connection, welded connection
XR	Connecting objects reversible	Hook, lug
XZ	Combined tasks	

A.4 Classes of signals

Table A.5 — Classes of signals

Letter code	Denomination	Application area
A	Command (manual operation)	Operation and monitoring
B	Analog signal (Set value)	
D	Acting, Set value	
E	Command, Switching	
F	Feed back	
G	Alert signal (Status, Failure)	Control system
H	Limit signal, binary	
J	Combined signal, binary (Intermediary result)	
K	Combined signal, analog (Intermediary result)	
P	Command (manual operation on-site)	
Q	Feed back	
R	Alert signal (Status, Failure)	Process
S	Limit signal, binary	
T	Process signal, analog (measured variable)	
Z	Counted value	

Annex B (informative)

Examples of application

B.1 Construction works

B.1.1 Classes of construction works

The following Figures B.1 and B.2 exemplify the designation of construction works in breakdown level 1 of the product-oriented structure.

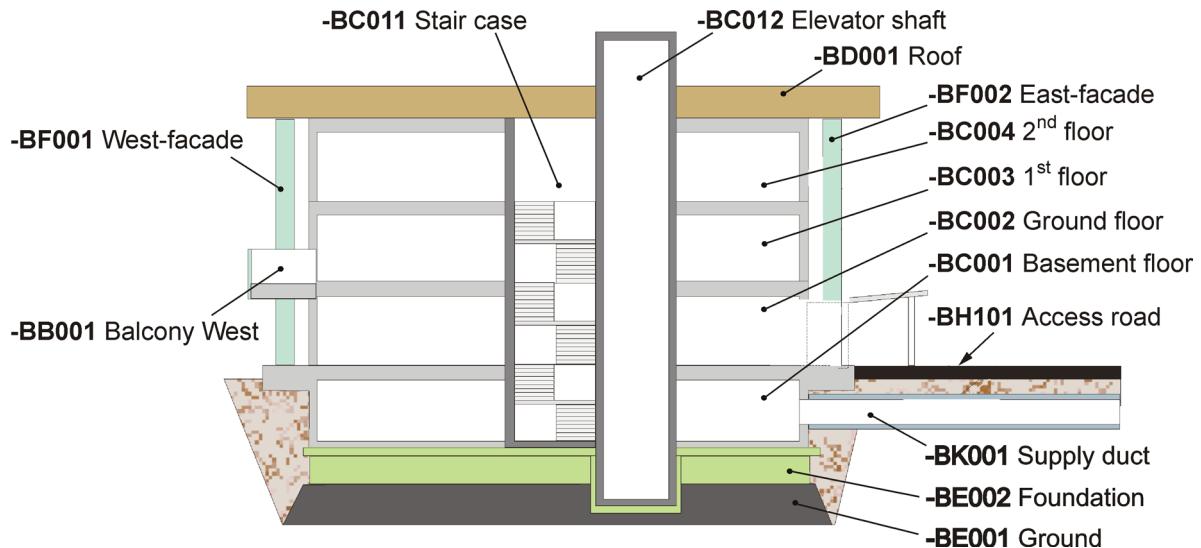


Figure B.1 — Graphical representation of construction works, example plant 1

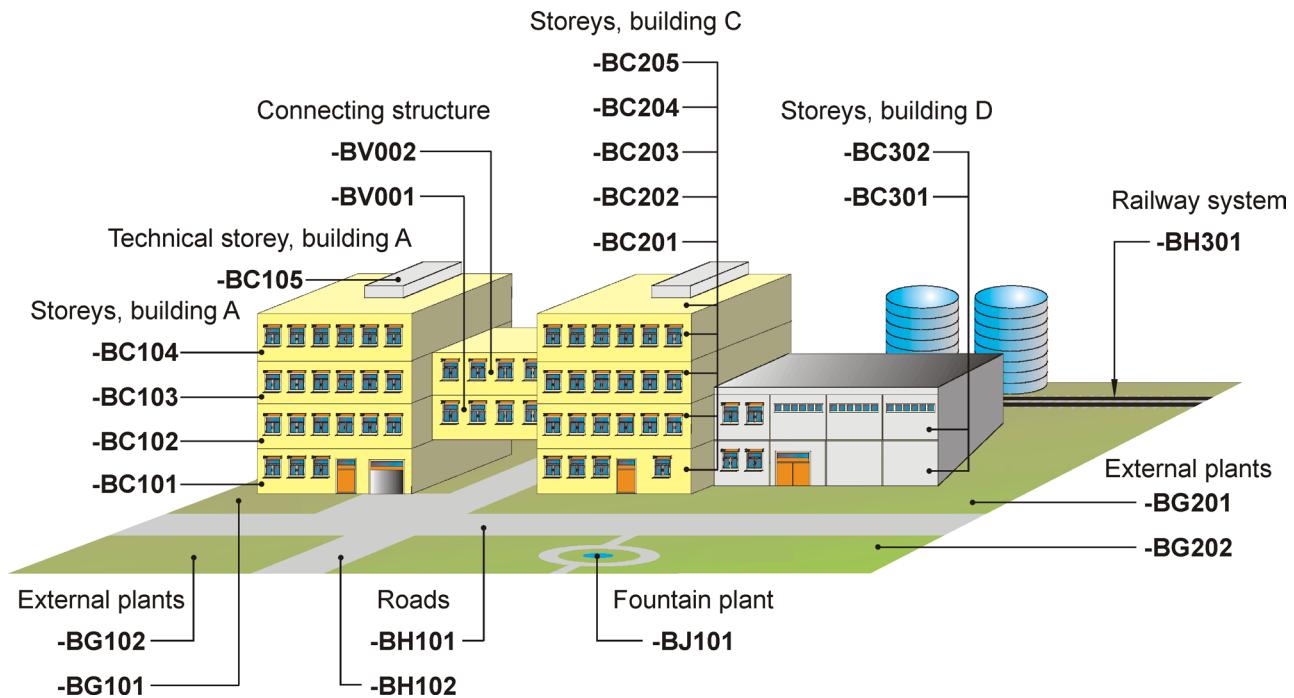


Figure B.2 — Graphical representation of construction works, example plant 2

B.1.2 Classes of components and sub-components of construction works

Figure B.3 shows the product-oriented structure and designation of components and sub-components of construction works.

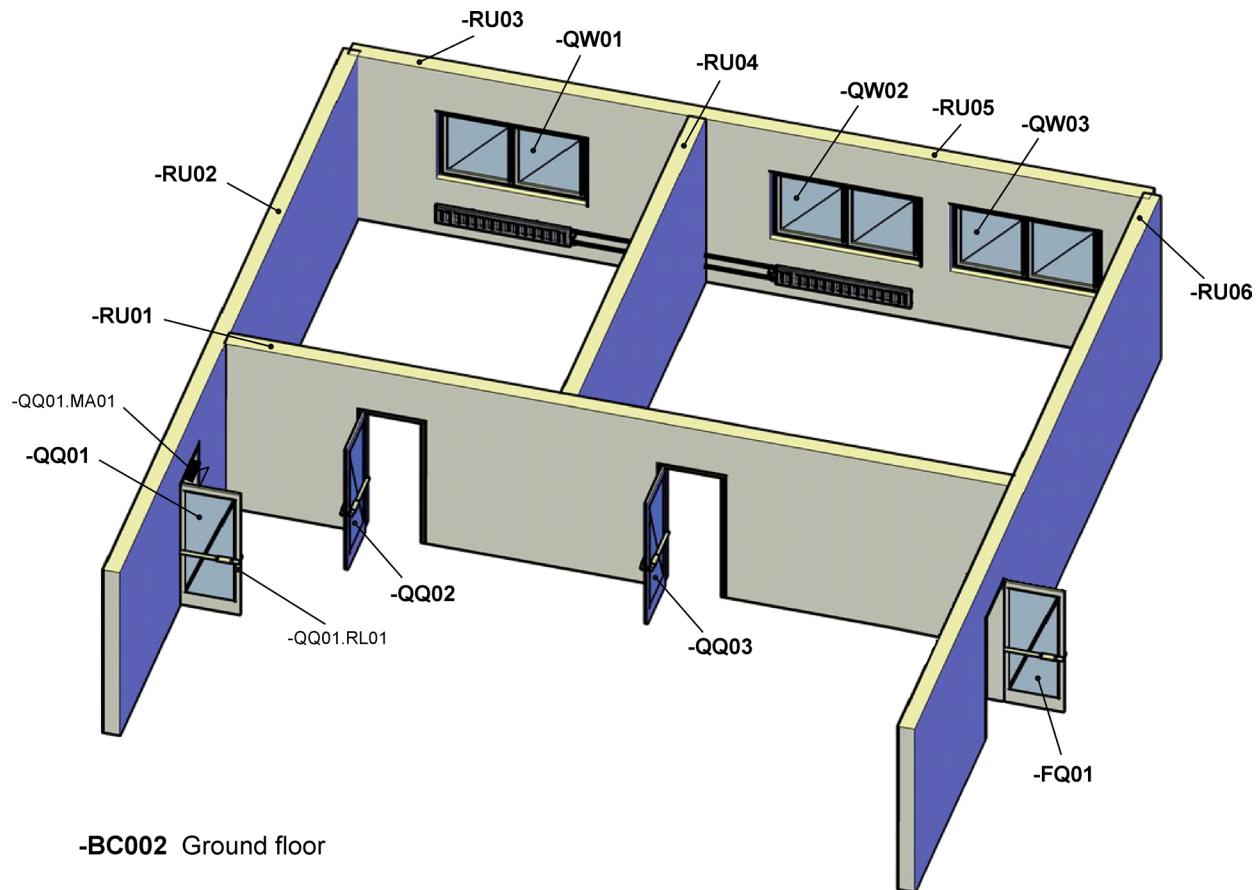


Figure B.3 — Graphical representation of components and sub-components of construction works, example plant 1

B.1.3 Product-oriented structure of construction works and components

Figure B.4 shows the product-oriented structure of construction works with their components and sub-components on example of plant 1, which is graphically represented in the Figures B.1 and B.3.

Plant 1	
-BB	Balcony
-BB001	Balcony West
-BC	Load carrying system
-BC001	Basement
-BC002	Ground floor
	.QQ01 Door 1
	.RL01 Lock cylinder
	.MA01 Lock motor drive
	.QQ02 Door 2
	.QQ03 Door 3
	.FQ01 Escape door 1
	.QW01 Window 1
	.QW02 Window 2
	.QW03 Window 3
	.RU01 Inside wall 1
	.RU02 Inside wall 2
	.RU03 Outside wall 1
	.RU04 Inside wall 3
	.RU05 Outside wall 2
	.RU06 Outside wall 3
-BC003	1 st Floor
-BC004	2 nd Floor
-BC011	Staircase
-BC012	Elevator shaft
-BD	Room delimiting outside construction (horizontal)
-BD001	Roof
-BE	Foundation, geotechnical system
-BE001	Grounding
-BE001	Foundation
-BF	Room delimiting outside construction (vertical)
-BF001	West-facade
-BF002	East-facade
-BH	Traffic construction, traffic area
-BH001	Access road
-BK	Construction for supply and disposal
-BK001	Supply

Figure B.4 — Product-oriented structure tree for construction works, components and sub-components, example plant 1

Figure 5 shows the product-oriented structure for construction works on example of plant 2, which is graphically represented in the Figure B.2.

Plant 2	
-BC	Load carrying system
-BC101	Storey 1, Building A
-BC102	Storey 2, Building A
-BC103	Storey 3, Building A
-BC104	Storey 4, Building A
-BC105	Technical storey, Building A
-BC201	Storey 1, Building C
-BC202	Storey 2, Building C
-BC203	Storey 3, Building C
-BC204	Storey 4, Building C
-BC205	Storey 5, Building C
-BC301	Storey 1, Building D
-BC302	Storey 2, Building D
-BG	External plant
-BG101	Green area, Building A
-BG102	Green area
-BG201	Green area, Buildings C and D
-BG202	Green area
-BH	Traffic construction, traffic area
-BH101	Road West – East
-BH102	Road North – South
-BH301	Railway system
-BJ	Hydraulic construction
-BJ101	Fountain plant
-BV	Connecting structure and building
-BV001	Connecting structure 1
-BV002	Connecting structure 2

Figure B.5 — Product-oriented structure tree for construction works, example plant 2

B.2 Building services

B.2.1 Heating, ventilation and air conditioning (HVAC)

Figure B.6 shows function-oriented designated objects of a HVAC-system. Figure B.7 shows product-oriented designated objects of an air handling unit. Figure B.8 shows a structure tree of the in Figure B.7 represented air handling unit.

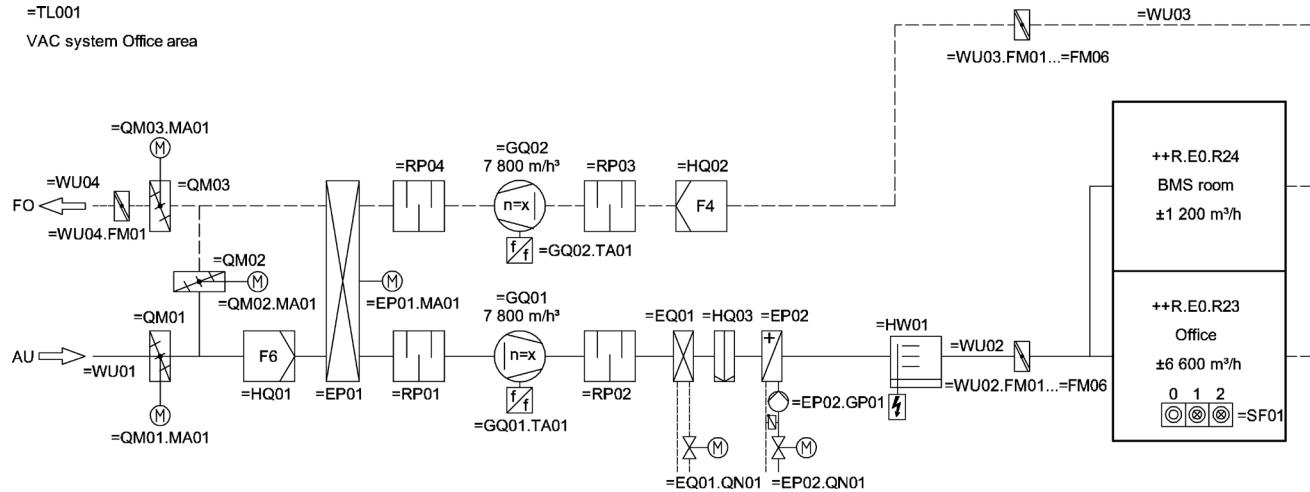


Figure B.6 — Graphical representation of function-oriented designated objects of an air conditioning system

-TL002.AZ01 VAC Air Handling Unit
++B.U01.25 Central ventilation room

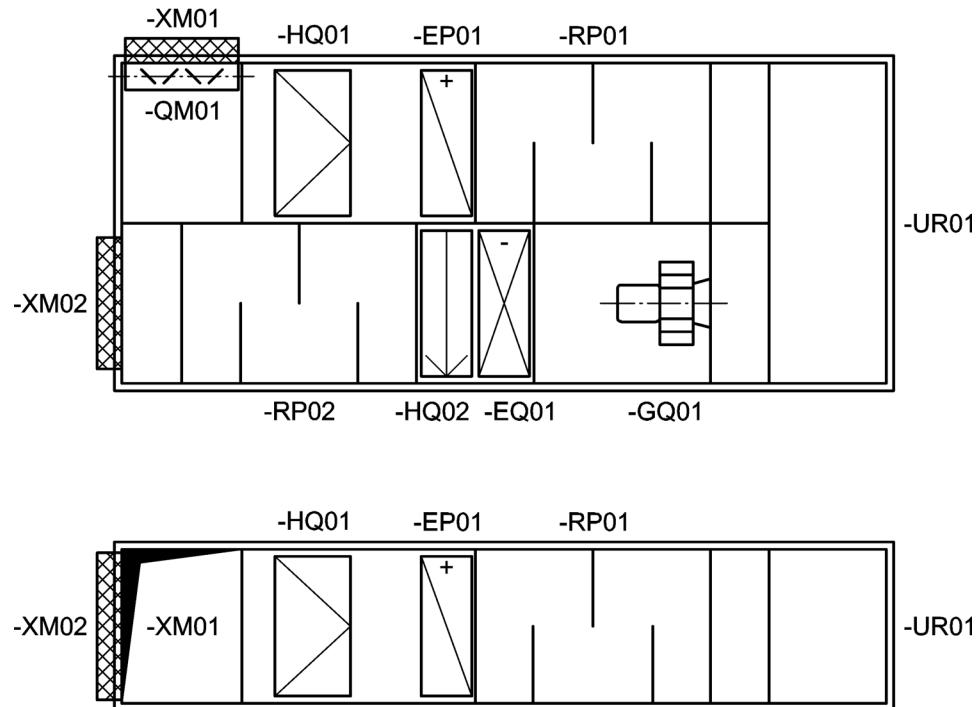


Figure B.7 — Graphical representation of product-oriented objects of an air handling unit

-TL 002.AZ01 VAC Air Handling Unit

.UR01	Construction frame
.XM01	Connection Outdo Air Duct
.XM02	Connection Supply Air Duct
.QM01	Outdoor Air Flap
.HQ01	Outdoor Air Filter
.EP01	Air heater
.RP01	Exhaust Air Silencer
.WU01	Duct 1
.WU02	Duct 1
.GQ01	Supply Air Fan
.EQ01	Air Cooler
.HQ02	Droplet catcher
.RP02	Supply Air Silencer

Figure B.8 — Structure tree of air handling unit which is represented in Figure B.7

B.2.2 Automation system

Figure B.9 shows function-oriented designated objects of an area control system. In Figure B.10 different aspects of this area control system are represented as structure tree.

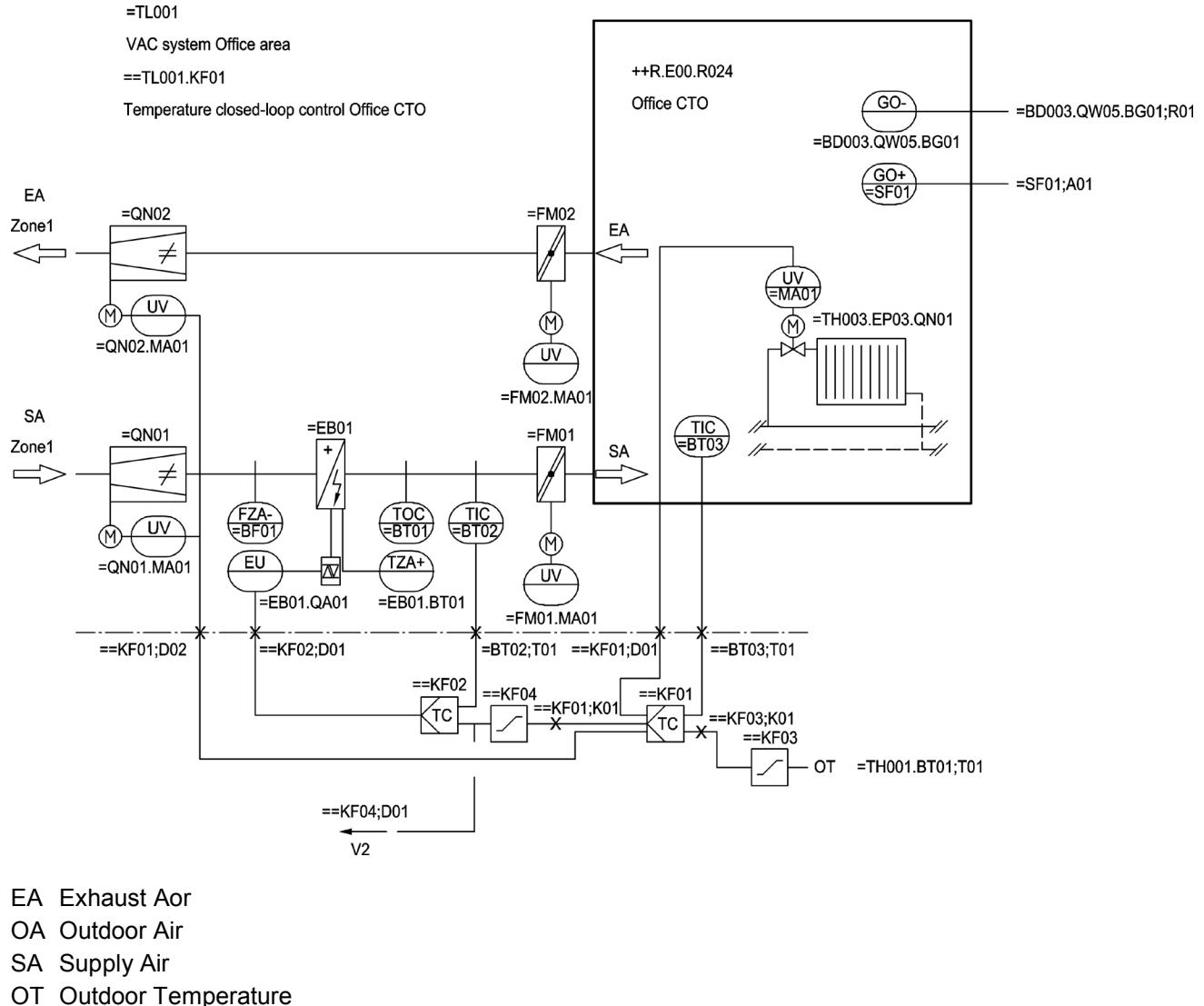


Figure B.9 — Graphical representation of function-oriented designated objects of an area control system

== TL001.KF01
Temperature closed-loop control Office CTO

-KF01	Room temperature closed-loop control
-KF02	Supply air temperature closed-loop control
-KF03	Outdoor air dependant Room temperature - set-point calculation
-KF04	Supply air temperature set-point calculation

Examples for signals

== TL001.KF01.KF03;K01	Set-point room temperature
== TL001.KF01.KF01;D01	Manipulated value for radiator control valve
== TL001.KF01.KF01;D02	Manipulated value for air flow control valve
== TL001.KF01.KF04;D01	Set-point Supply air temperature
== TL001.KF01.KF02;D01	Manipulated value for air heater
=TH001.BT01;T01	Outside air temperature
=TL001.BT03;T01	Supply air temperature measured value
=TL001.BT04;T01	Room temperature BMS room
=TL001.SF01;A01	Presence ON
=BC003.QW05.BG01;R01	Outside construction, Window position OPEN

Figure B.10 — Structure tree of air conditioning system for office area, building services, and construction services which are represented in Figure B.9 and lists of signals

B.2.3 Cooling system

Figure B.11 shows the function-oriented designated objects of a cooling supply system.

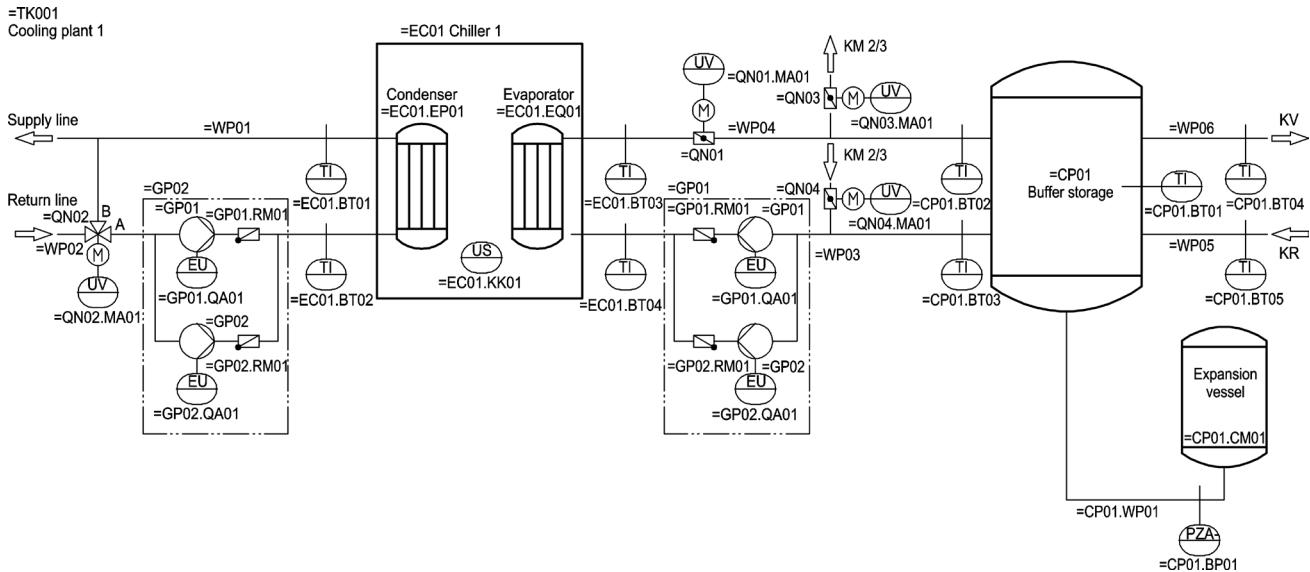


Figure B.11 — Graphical representation of functional objects of a cooling supply system

B.2.4 Heating system

Figure B.12 shows the possibility, to view and designate one and the same object according to different aspects. In the Figure B.13 structure tree of the heating system is shown.

=TH003

Heating Secundary rooms

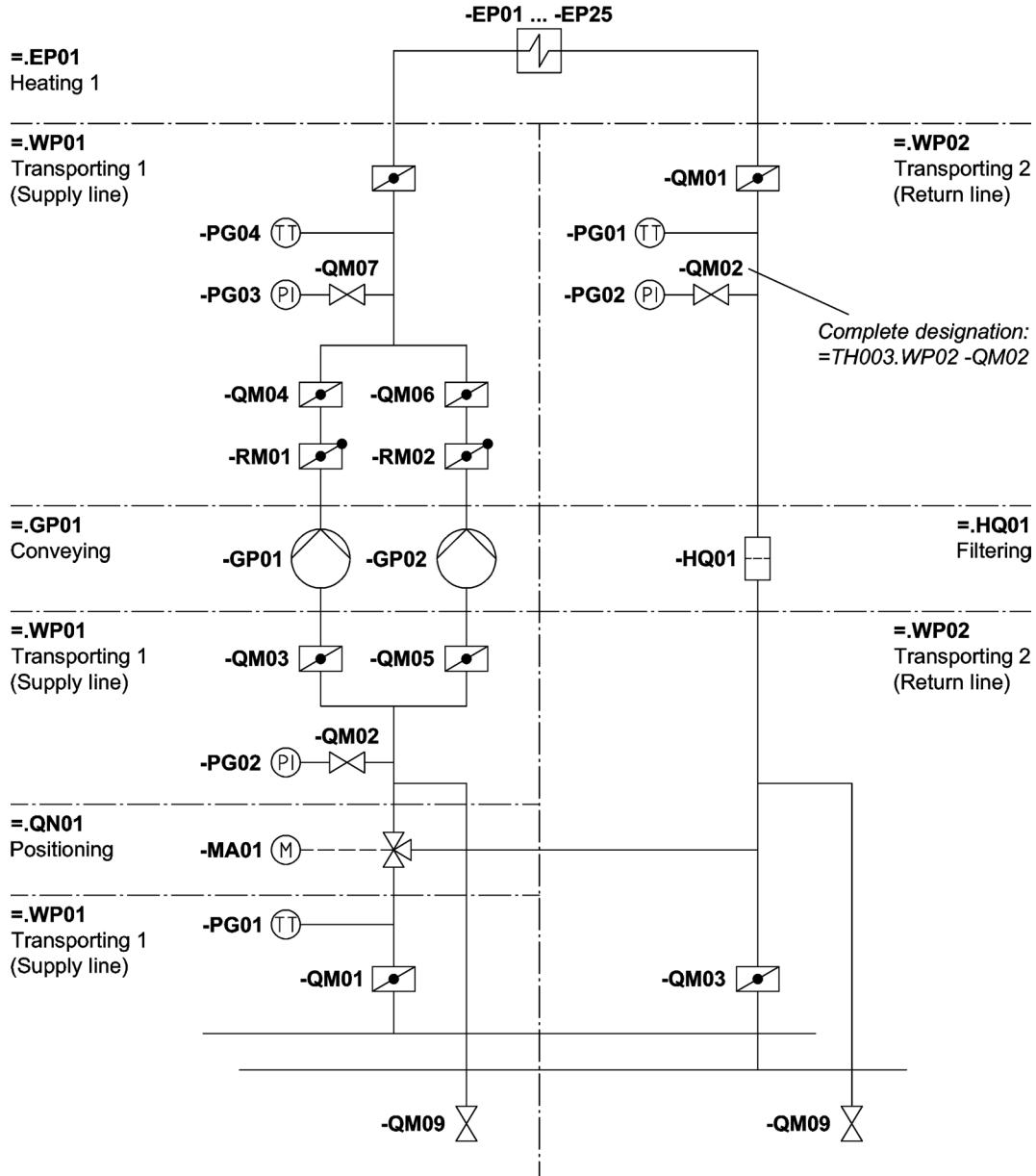


Figure B.12 — Graphical representation of basic functions and product classes of a heating supply system

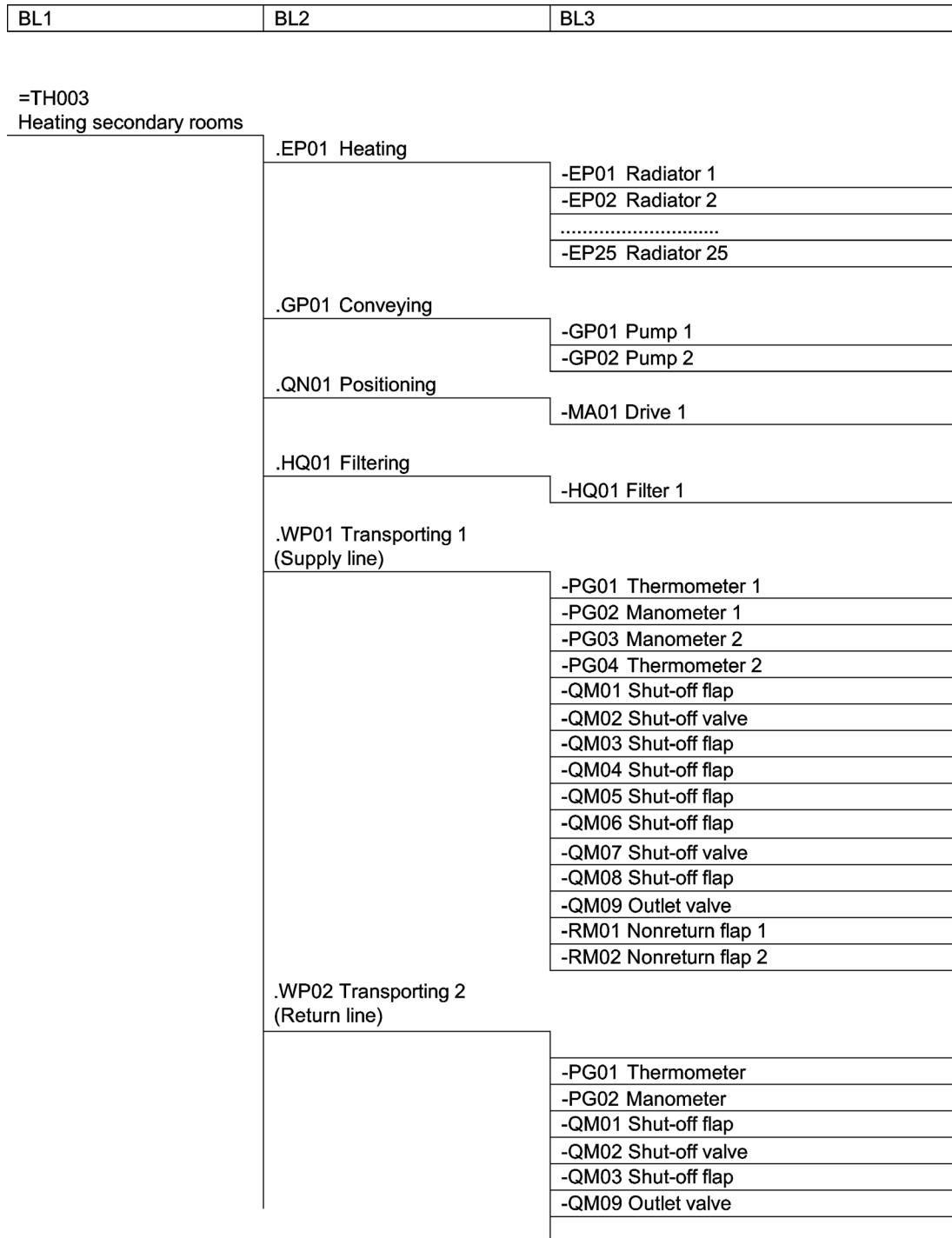


Figure B.13 — Structure tree of basic functions and product classes of a heating supply system according to Figure B.12

B.2.5 Electrical supply system

Figure B.14 shows function-oriented designated objects of a low voltage main distribution in an overview diagram. Figure B.15 shows some parts of this distribution system as a tree structure.

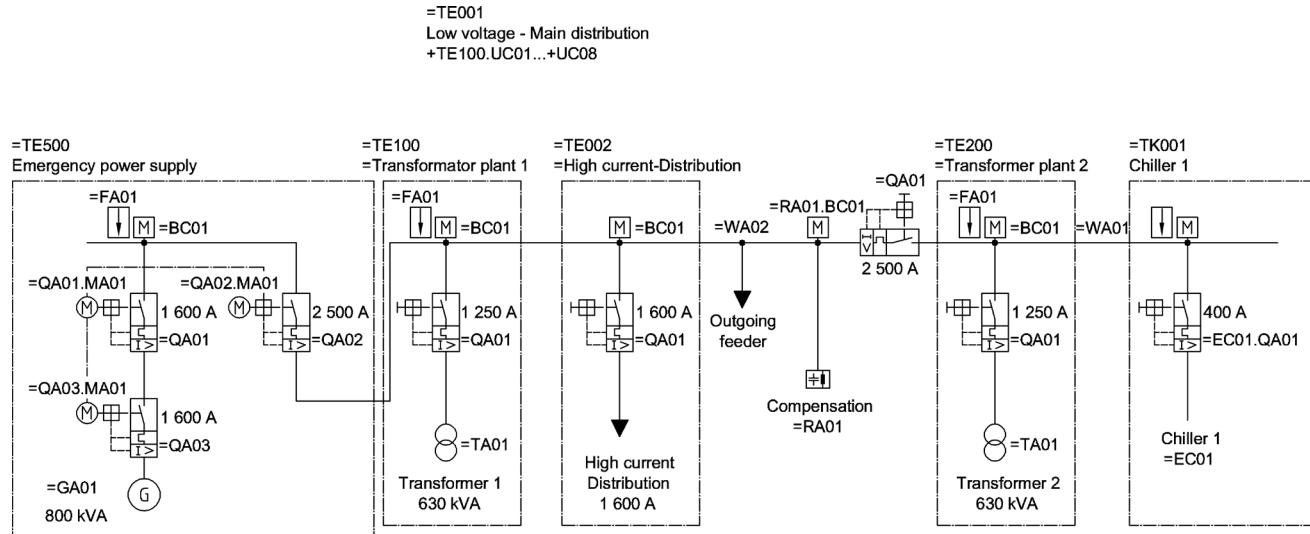


Figure B.14 — Graphical representation of a low voltage distribution system

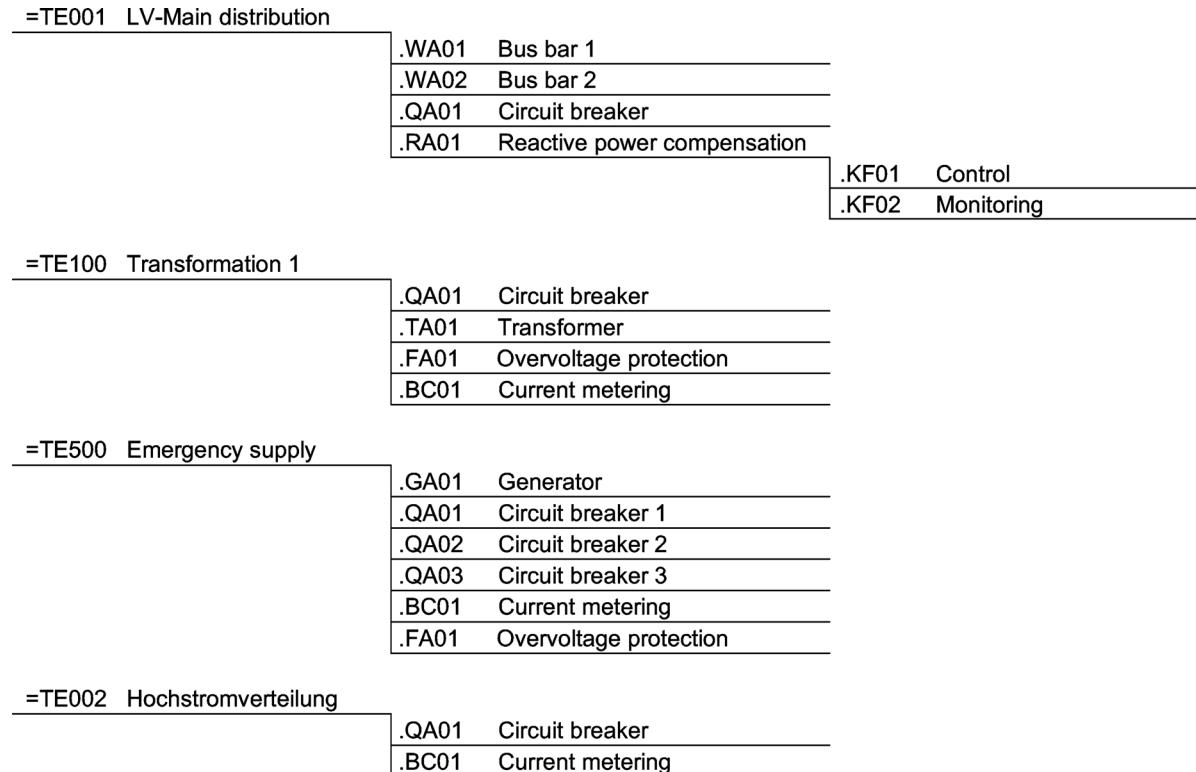


Figure B.15 — Structure tree of the low voltage distribution system according to Figure B.14

B.2.6 Lighting system

Figure B.16 shows the functional objects of a lighting system with their function-oriented designation and the corresponding equipment designated with product-oriented designation based on the location-oriented designation of the cabinet where they are assembled in. Figure B.17 shows the corresponding tree structures.

=TE100 Lighting storage building
+TE100.UC01 Lighting plant - Switchboard section 1

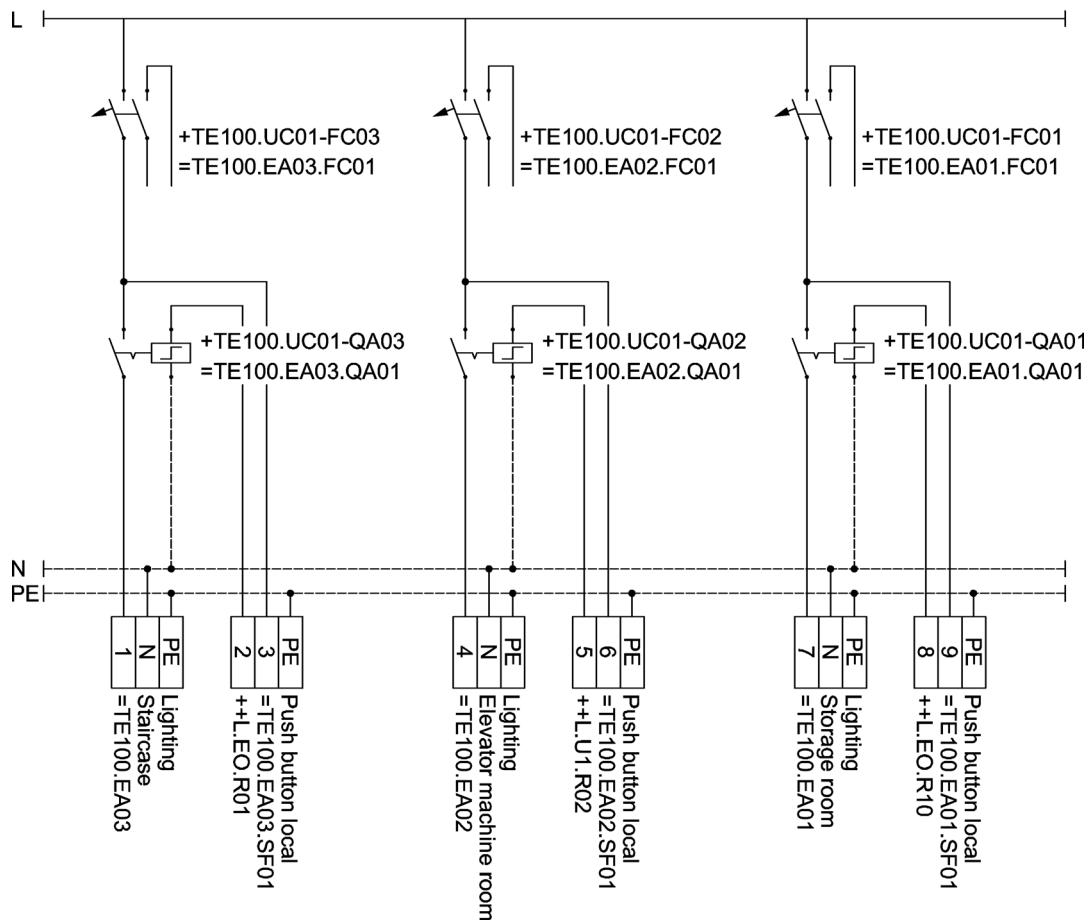
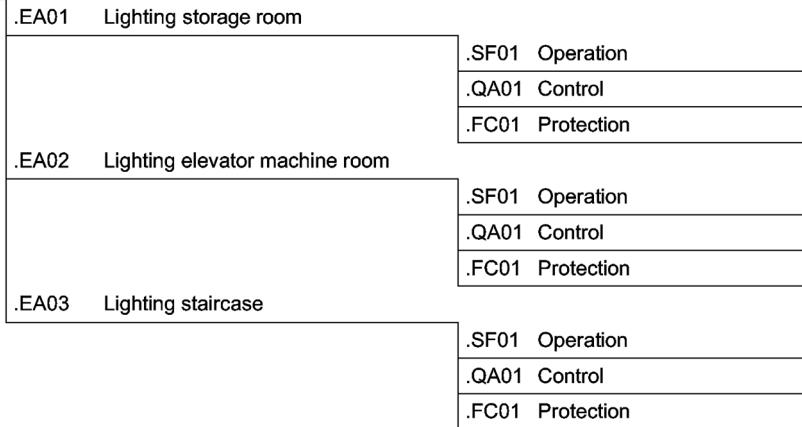


Figure B.16 — Graphical representation of objects of a lighting system

Functional-oriented structure

=TE100 Lighting storage building



Product-oriented structure

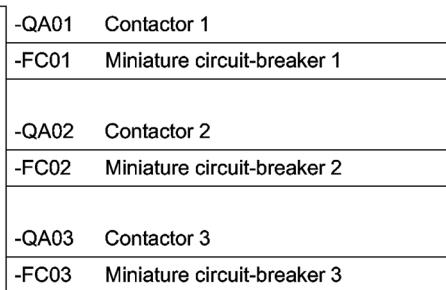
+TE100.UC01 Lighting storage building
Switchgear cubicle

Figure B.17 — Product- and function-oriented structure trees of a lighting system according to Figure B.16

B.2.7 Electrical supply of a chiller unit

Figure B.18 shows the function-oriented designated objects of an energy supply system of a chiller unit. They are added with product-oriented designations based on the location-oriented designation of the electrical equipment.

- =TK017 Cooling production
- +TE031.UC01 Sub-distribution 3.1, Section 1
- ++R.U1.R36 Main cooling room

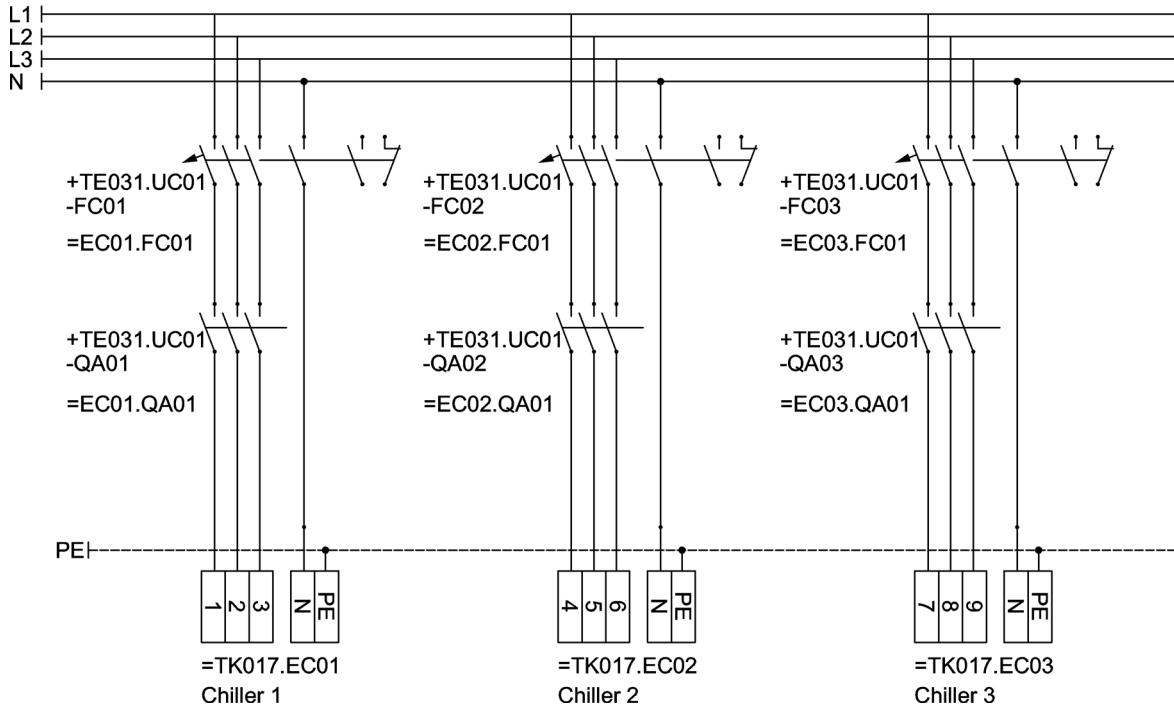


Figure B.18 — Graphical representation of the electrical supply system of a chiller unit

B.2.8 Intrusion detection system

Figure B.19 shows the objects of an intrusion detection system with their function-oriented designation and the place where they are located using the location-oriented designations.

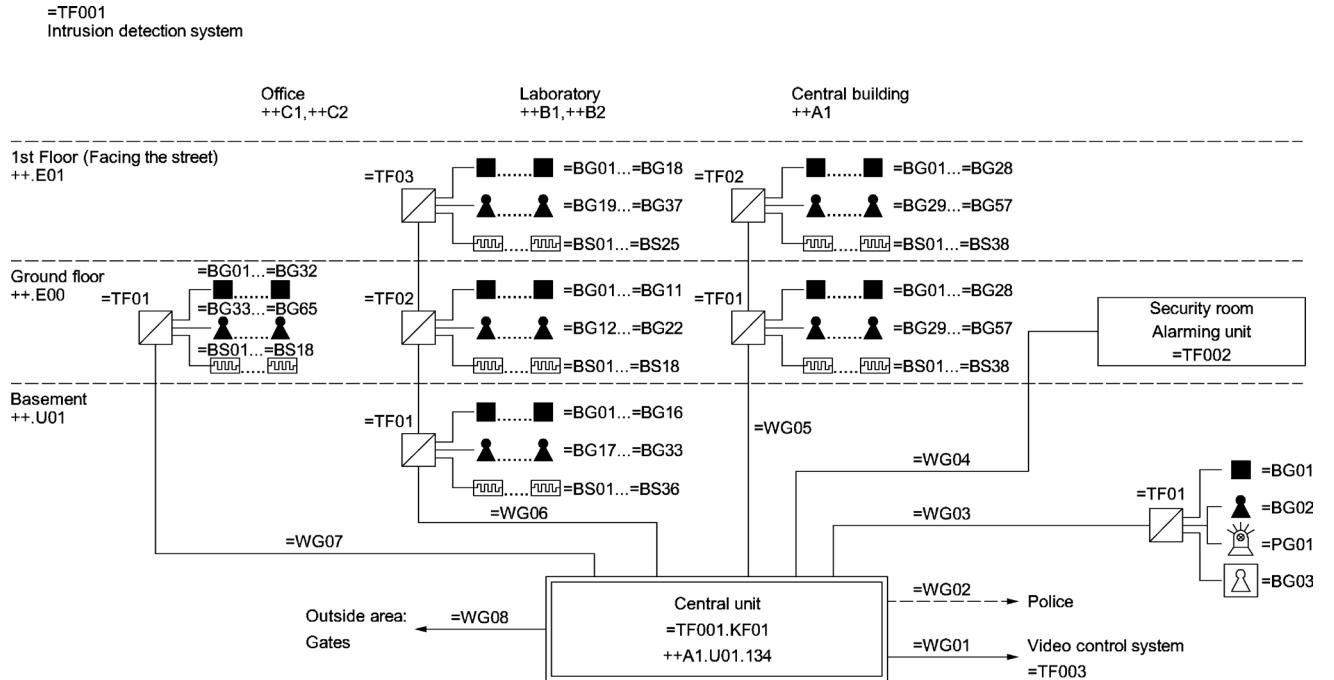


Figure B.19 — Graphical representation of the functional objects of an intrusion detection system

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